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Professor Stanisław Leszczycki

The collection of studies presented to
Professor Stanisław Leszczycki
in commemoration of the 50th anniversary
of his scientific activity

CONTENTS

PROFESSOR STANISŁAW LESZCZYCKI'S ACTIVITIES ON THE NATIONAL AND INTERNATIONAL SCALE

Professor Leszczycki was born in 1907, on May 8th, St. Stanislas' Day which brought him his first name.

In 1926–1930 he studied at the Jagiellonian University in Cracow. That university, founded in 1364, the oldest in Poland and one of the oldest in Central Europe, was at that time characterized by a specific tradition and atmosphere. There young Stanisław Leszczycki was lucky to have excellent masters. Two of them should particularly be mentioned: Ludomir Sawicki and Jerzy Smoleński. Sawicki, a universal geographer of wide interests who had carried field research both in Poland and abroad, an indefatigable investigator especially of mountains and mountain life, has greatly influenced and encouraged his young student's interest in similar matters; Smoleński, whose own work, marked by extreme precision and accuracy, was centred mainly on physical geography yet by no means limited to it — he was also well familiar with social and economic problems — has deepened young Leszczycki's theoretical and methodological interests.

Very soon Leszczycki was appointed assistant and later senior assistant at the Chair of Geography. In 1932 he was granted a Ph.D. for the thesis *Geographical Research on Rural Settlement in Beskid Wyspowy* (in Polish). His main interest at that time was settlement and tourist geography of mountain areas; in his studies he aimed at the determination and discussion of mutual relations between the conditions of geographical environment on the one hand, and the rural settlement and tourist economy on the other.

Very early he also established the first international contacts. As a student he was member of several geographical excursions involving some field work. As an assistant he visited Czechoslovakia, Austria, Germany, Britain, Finland, Sweden, Norway, Latvia, Estonia, Italy and Switzerland. His early research work abroad was carried on in the Austrian Alps, the Scandinavian countries, Yugoslavia, and Turkey. It involved investigation of the dependence of middle-sized farms in various latitudes on their geographical environment (within 35–70°N latitude). The field research carried by Stanisław Leszczycki in 1936 in Anatolia, Turkey, deserves a particular mention here since the data collected there constituted the basis of his habilitation dissertation on the *Geographical Research of Rural Settlement in Southern Anatolia.*

In 1936 he organized a postgraduate course of tourism at the Jagiellonian University in Cracow; the course had its own publications. His foreign contacts

concerning research on tourism and recreation developed widely and involved, among others, specialists from Austria, Switzerland, Italy, Germany, Greece and the Scandinavian countries.

Soon after graduation he took an active part in the IIIrd Congres of the Slavonic Geographers and Ethnographers in Yugoslavia in 1930. In 1934 Leszczycki took part in the XlVth International Geographical Congress in Warsaw.

During World War II — this time not very willingly — Stanisław Leszczycki also spent a few years abroad: in the Nazi concentration camps in Sachsenhausen and Dachau.

Very soon after the liberation he was appointed expert on boundary problems at the Polish Ministry of Foreign Affairs; in 1946–1950 he was Deputy Minister of Foreign Affairs. In that capacity he took part in several international conferences in Paris, Potsdam, Moscow, Prague and Copenhagen. He also made several other trips abroad, travelling as far as Montevideo for the general conference of UNESCO in 1954.

In 1945 he was appointed associate (extraordinary) professor of the Jagiellonian University. In 1948 he was offered the Chair of Economic Geography at the University of Warsaw, which he accepted. He laid foundation for the creation of the Institute of Geography of this University and was Director of the Institute between 1952–1970. In 1952 he was elected member of the Polish Academy of Sciences and became its Deputy Scientific Secretary. In that capacity, while he was busy organizing research work on the national scale, he also made several trips abroad.

When, due to his effort, the research Institute of Geography of the Polish Academy of Sciences was established in 1953, he became his first and only Director. During the 25 years of his directorship, attracted by the atmosphere he was able to create, a number of scholars from various centres have become affiliated to the Institute. Together with those who were educated at the Institute, they have developed it into a strong centre of research both on the national and international scale.

Despite his growing organizational and administrative responsibilities, Professor Leszczycki has always had time for his numerous students, of both the University and the Academy Institutes, who worked under his supervision for their master's or doctoral degrees.

Nor did he neglect his own research at this time: he had been working on the history of geographical sciences, on theory and methodology of geography, and on industrial geography.

Professor Leszczycki has always well understood the need for the practical application of geographical studies. Thus as early as 1933 he started his cooperation with regional planning. His prewar book *Region Podhala* (Podhale Region) which was at the time criticized for its practical approach may indeed serve up to date as an example of a fundamental geographical study purposely written to be used in planning.

He renewed his contacts with planning after the war. This approach could clearly be seen in the way he oriented the research work of the Academy Institute of Geography. Without neglecting theoretical and methodological investigations he always stressed the need for the practical approach to geographical studies. In result, from its very beginning a number of studies have been carried on at the Institute which contributed to the better knowledge and to spatial development of individual functions and regions. As the Institute has eventually become a well-known centre of such research, in 1970, within the so-called priority or key problems selected by the government as most important for

the country development, the Institute was made responsible for the organization and coordination on the national scale of studies concerning the foundations of the spatial development. In result of thorough investigation the Institute promoted the idea of the polycentric structure of the spatial development of the national level through moderate growth of some twenty urban-industrial agglomerations.

This and similar research in which the Institute has been engaged has eventually brought about a change of its name to the Institute of Geography and Spatial Organization. In order to furthermore promote and concentrate the efforts of people interested in spatial problems, an interdisciplinary body, the Committee for Space Economy and Regional Planning was established in 1958 at the Polish Academy of Sciences. Professor Leszczycki, thanks to whose initiative the Committee had been created, became its Chairman; he has performed this function up till now. The Committee has very soon become an excellent platform for discussion among various specialists of the common problems of the spatial development of the national and regional levels. The Committee has also initiated and promoted a number of research projects the results of which are published in its Bulletin and in a series of Studies.

In 1972 Professor Leszczycki was appointed Deputy Chairman of the group of experts for spatial planning, and in 1974 he became Deputy Chairman of the State Council for Spatial Economy (the Chairman of the Council being a Minister).

In addition, the other field of Professor Leszczycki's interest and research had concerned the man-environment interaction problems, which he first treated in several of his articles published in the years 1936–1939. In 1958 he was appointed head of the Committee for the Problems of the Upper Silesian Industrial District organized at the Presidial Office of the Polish Academy of Sciences. The Committee was to carry research on the improvement of the living conditions of the inhabitants of this largest industrial district in Poland. The Committee issued ca 70 special bulletins concerning its work. The results of the Committee's research were synthetized in the book entitled *Some Problems Concerning the Living Conditions in the Upper Silesian Industrial District.*

In the years 1970–71 Stanisław Leszczycki was appointed an expert on environmental problems by the European Economic Commission (ECE) in Geneva. He also published a number of articles in foreign languages concerning the theory and models of the man-environment interaction. In 1974 he published a study on *The Problems of Protecting Man's Environment* (in Polish, with English and Russian summaries).

When holding all those positions Professor Leszczycki has always understood and promoted international contacts and cooperation. Under his direction both the Institute and the Committee have established close cooperation with the USSR and other socialist countries of Europe. Contacts with the West European countries in general, and with Britain and France in particular, have also been renewed and developed; new contacts have been established, with the United States, Canada, and some other non-European countries. One of the new forms of this cooperation well deserves a mention here, namely the periodically organized bilateral seminars on some specific research problems. Initiated with Britain, they have been extended to France, and more recently to the USSR, Czechoslovakia, the German Democratic Republic and Yugoslavia. It is characteristic of these seminars that they stimulate open discussion on a number of important problems, often of a practical utility; the results of the proceedings are presented in ensuing publications. The Committee for Space Economy and

Regional Planning has also been responsible for the organization of several international meetings. Many of them were initiated by Professor Leszczycki; in many he took an active part.

Professor Leszczycki has always been anxious to acquaint foreign scholars with the results of Polish scientific investigations. At first the special supplements of the Polish leading geographical journal *Przegląd Geograficzny* (Polish Geographical Review) containing articles in foreign languages were published; in 1964 a special foreign-language serial publication *Geographia Polonica* was established. Over 30 volumes of *Geographia Polonica* published by the Academy Institute of Geography under the supervision of Professor Leszczycki as editor-in-chief have already appeared. They have presented both the materials of various international meetings organized or co-organized by Polish geographers and results of original studies carried out in Poland. Well-known and highly appreciated abroad, this magazine has become one of the standard geographical journals in many libraries outside its native country, which resulted in the increasing number of articles sent from abroad to be published in *Geographia Polonica*.

Foreign-language publications of the Committee for Space Economy and Regional Planning have also gained the good opinion among specialists in many countries.

A special card of Professor Leszczycki's manifold activity consists of his taking an active part in the work of the International Geographical Union. Already in 1956 during the first postwar Congress attended by Polish geographers, he was elected a regular member of a newly-established IGU Commission on National Atlases. In 1960–64 he was Chairman of the IGU Commission on Economic Regionalization. Very active in those commissions, he broadened his international contacts that led in 1964 to his being elected Vice-President of the International Geographical Union. His competence and activity in that position was recognized in 1968 by his election to the presidency of the Union. In 1972–76, as Past-President, he continued to be a member of the Executive Committee of the IGU. At that time he also became a member of the IGU Commission on Man and Environment. In this Commission he coordinated work on environmental cartography on the worldwide scale. It is precisely this field in which he has been very active in the last decade both on the national and international scale, which is testified by his numerous publications that have appeared in various languages.

In course of his 20 years' activity in the International Geographical Union Professor Leszczycki had visited a number of countries in Europe, America and Asia. He has become a very well-known and highly esteemed personality in the international geographical — and not only geographical — scientific life, one of the leading names in world geography. That position has been acknowledged by honorary memberships of the Czechoslovak, Austrian, Serbian, Croatian, British, Dutch, Hungarian, French, German DR and of two Italian (in Rome and in Firenze) geographical societies. He is also *Doctor Honoris Causa* of the Charles University in Prague. Professor Leszczycki is member of Regional Science Association, the American Geographical Society and the Association of American Geographers. He is holder of several Polish and foreign decorations, among others: *Suomen Valkoisen Ruusun Ritarikunnam* (Illuohan) 1948; Honorary Knight Commander of the Most Distinguished Order of St. Michael and St. George IInd class (1965).

An excellent organizer, he has been able to combine an astonishing number of various activities. But at the same time he has never neglected his research work. Altogether Professor Leszczycki has so far published 230 studies, mostly

concerning the theory and methodology of geography, applied geography, industrial geography, and the problems of man and environment, as well as the scientific foundations of spatial planning. The two-volume collection of his studies has recently been published in Polish, under the title of *Geography as a Science and Applied Discipline*. He has also edited a number of collective works, including the *National Atlas of Poland* and the *Atlas of Polish Industry*. Moreover, he has initiated several other projects which are either being carried on or prepared at present.

In accordance with Polish law in the year of the seventieth anniversary of his birth — as a matter of fact this will also be the fiftieth anniversary of his scientific work since he had his first article published in 1928 — Professor Leszczycki is going to retire, but I do not think he will ever retire from his activity.

This volume of papers sent by his friends from abroad is their tribute to Professor Stanisław Leszczycki's incessant work and large contribution to all aspects of modern Geography.

Jerzy Kostrowicki

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A MESSAGE TO PROFESSOR LESZCZYCKI

MICHAEL J. WISE

Professor, The London School of Economics and Political Science, Britain; Vice-President, Royal Geographical Society; President, International Geographical Union

It was in September 1957 that Dr. Antoni Kukliński came to see me in my room at the London School of Economics and Political Science to suggest to me that an Anglo-Polish Geographical Seminar should be arranged. Dr. Kukliński and I were, at the time, members of a UNESCO seminar studying problems of urbanisation. I had just returned from attending the meeting in Dublin of Section E (Geography) of the British Association for the Advancement of Science of which I was the Recorder.

The idea presented by Dr. Kukliński, whom I now count as valued colleague and friend, appealed to me because of a background of interest in Poland which had derived from the awareness aroused by my teacher, R. H. Kinvig, who had travelled extensively in Poland in the inter-war years and had contributed a valuable introductory study of its geography inspired by his knowledge of history as well as of the physical environment. I had also had an unforgettable experience, during the war-time years, of serving with Polish men and women in the Middle East and of learning in many ways of the strength with which, even in most remote places and in alien environments, they carried within them, and were happy for others to share, a strong bond and force derived from past circumstances in which their own people had struggled and survived through good and bad days, from strong intellectual traditions, keen loyalties and a firm sense of purpose.

Dr. Kukliński and I discussed the possibility that Section E of the British Association should act as the United Kingdom sponsoring body for the first Seminar but, on reflection, we agreed that the appropriate body in Britain to undertake the sponsorship would be the Institute of British Geographers. Professor A. Smailes, then the Honorary Secretary of the Institute, was equally enthusiastic. The Council of the Institute agreed and the idea prospered to materialise in the First Anglo-Polish Seminar of September 1959 at Nieborów.[1]

It is not too much to say that the success of the First Anglo-Polish Seminar established a pattern of arrangements, continued in further successful Anglo-Polish meetings, which set an example leading Polish and British geographers to arrange seminars of similar kinds with geographers in many countries. The example was taken up by other pairs of countries and a new form of international academic collaboration was born. Such seminars have been valuable for the communication which has taken place across frontiers of geographical ideas

[1] *Problems of Applied Geography*, Proceedings of the Anglo-Polish Seminar, Nieborów 1959, Geogr. Studies, 25, Institute of Geography, Polish Academy of Sciences, PWN, Warszawa 1961.

and of the results of research. Equally important, there has been communication of the ways in which geographical concepts and techniques have been applied to the benefit of the national communities. It is greatly to be hoped that, through the extension of such interchanges and through strenghening their influence, we shall be able to intensify the application of geographical research to the benefit of the international community. At least, the Anglo-Polish seminars have ensured that friendship and collaboration between the geographers of two countries has not been a monopoly of one group or one generation, for successive seminars have introduced new themes and new, young members in order to ensure the constructive nature of the meetings both in subject of study and in contact between individuals.

It soon became clear to the 12 British geographers who, under the leadership of Professor K. C. Edwards, had the privilege of being at Nieborów in 1959 that the guiding genius which had inspired the arrangement of a new form of academic collaboration was that of Professor Stanislaus Leszczycki. Here, it was apparent, was a leader of research in his own country, well studied in the traditions of his subject but capable of adapting its traditions and techniques to new problems. Here was a geographer capable of looking ahead, of anticipating the needs of the future and of guiding its progress appropriately. Here, too, was a geographer whose stature towered above national problems and who searched for contributions which geography could make to the betterment of the conditions of life of all men in all lands.

By agreement, the first Seminar was concerned with "the problem of utilising the results of geographical studies for practical needs connected with regional planning". Four main subjects were studied — geographical studies for regional planning; land utilisation studies as the basis for regionalization and planning of the development of agriculture; alterations in geographical environments resulting from economic activities; research in urban settlement geography as a basis for the planning of settlement. An aim was to connect geography "more closely with life and society"; the seminar was confident that the "application of geographical research and analysis to practical purposes is growing in scope and importance". Such was the spirit conveyed to me by Professor Leszczycki's own contributions to the discussions and it was thus an especial pleasure to be joined with him, at the second Anglo-Polish Seminar, held at the University of Keele in September, 1962, on the theme of the scope and aims of Applied Geography.[2]

Much could be written about the experiences of the Anglo-Polish seminars, and of the example which they set. Here, as one who played a small part, as I have related, in arranging the first seminar I wish simply to express my own sincere thanks to Professor Leszczycki for his role in initiating and leading discussions from the Polish side. And I am sure this expression will find warm support from British colleagues who have taken part in the series of seminars but lack the opportunity to contribute to this volume. The seminars have played an important role in establishing strong personal and intellectual bonds between Polish and British geographers for which, on the British side, we are grateful.

Since the happy days of Nieborów in 1959, I have had many further opportunities to appreciate both the personal and the academic qualities of Professor Leszczycki. Through my own interests in economic geography and regional planning, I have been aware of some, at least, of the studies of his own country

[2] *Problems of Applied Geography II*, Proceedings of the Anglo-Polish Seminar, Keele 1962, Geogr. Pol., 3, Institute of British Geographers and Polish Academy of Sciences, PWN, Warszawa 1964.

which he has carried out, or for which he has been responsible, and know that the value of this work has been appreciated beyond the borders of Poland.

From 1968 to 1972 I had the privilege of serving as a member of the Executive Committee during the period of his Presidency of the International Geographical Union. It was possible then to admire, on a much wider scale than that of the bi-lateral Anglo-Polish seminars, the capacity of a scholar to bind together, in the interests of geographical science, colleagues from all the member countries of the International Geographical Union, treating colleagues not simply as delegates of a particular country but as individual scholars and scientists each with his or her own contribution to make to the solution of problems of international interest. Professor Leszczycki presided over an International Geographical Union which was growing in size, from the 59 full members of 1968 to the 76 of 1972, and becoming more representative. He stressed the importance of the contributions which geographers were making, and could make, to problems of national importance as a necessary basis on which programmes of international work could grow. He had clear practical ideas on the roles which commissions could play and secured acceptance of the idea that the Union should also establish Working Groups.[3] He presided over the successful IGU Regional Conference in Budapest, August 1971, the first occasion on which an IGU Conference had been held in a socialist country. He upheld the rights of participation in the Union and its congress and conferences by member countries and by individual geographers.[4] At the Montreal Congress of 1972 he gave a *Perspective on Development of Geographical Sciences*[5] which revealed his familiarity with current trends in the subject and of its growing grasp of techniques which enabled him to initiate discussion on the major tasks which lay ahead and to set goals for endeavour. He has kept to his belief in Geography as a disciplined study "in the vanguard of sciences serving mankind" and has shown ways in which the results of its studies can serve humanity.

Still more recently he has advanced the idea of bringing into being an International Geographical Institute which would forward, on a global scale, research on the environment and on man's use of resources and act as an international focus for research by geographical organisations and by individuals. His expression of this idea typifies the vision which Professor Leszczycki has consistently held of geographical science contributing fully and fruitfully to the solution of the great environmental problems of our time.

Professor Leszczycki's achievements have been great but we know that he does not rest content with the past and that his studies will continue. The worldwide regard in which he is held rests not only on his achievements but also on the qualities of personality for which he is so widely held in affection: his friendliness, his sense of humour, his sense of purpose.

For such reasons, it is a privilege to contribute some lines of appreciation to a volume commemorating Professor Leszczycki's seventieth birthday, to send him warm congratulations and to express the wish that he will have many years ahead in which he and Madame Leszczycka will continue actively to contribute to the further accomplishment of the tasks which they have set themselves over so many years.

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[3] *IGU Bull.*, 22(1971)2, pp. 30–32.
[4] *Ibid.*, pp. 32–33.
[5] *IGU Bull.*, 23(1972)2, pp. 1–10.

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QUELQUES RÉFLEXIONS SUR LA GÉOGRAPHIE

JEAN DRESCH

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Le Professeur Stanisław Leszczycki, dans son adresse présidentielle au XXII[e] Congrès International de Géographie à Montréal, a exprimé des opinions sur les perspectives de développement de la Géographie qui méritent toujours réflexion. En effet, l'objet de la géographie, s'il n'apparaît pas utile de lui chercher une définition générale nouvelle, comme le dit le Professeur Leszczycki, est du moins de plus en plus difficile à circonscrire, à délimiter. La documentation est, même en pays sous-développés, toujours plus abondante, spécialisée, difficile d'accès. Elle paraît néanmoins d'autant plus insuffisante qu'elle est plus abondante parce que la quantité de données disponibles fait découvrir des relations dans l'espace et dans le temps insoupçonnées, des lacunes dans les connaissances, les insuffisances de celles-ci en quantité et en qualité, variables et différentes selon les échelles.

Certes, les méthodes de la géographie quantitative, l'usage des mathématiques, des ordinateurs, la recherche des structures et des systèmes, celle des modèles permettent d'utiliser une documentation sans cesse améliorée. Mais contrairement à ce que s'imaginent beaucoup de jeunes ou moins jeunes géographes "occidentaux", il n'y a pas lieu d'opposer pour autant une géographie "nouvelle" à une géographie traditionnelle, volontiers assimilée à une géographie de patrons, vieille, conservatrice, burnée politiquement réactionnaire... bien que ce soit parfois le cas. La géographie telle que nous la concevons tous est une des sciences dont le développement est récent. Qu'elle tire parti de techniques nouvelles et que l'usage de ces techniques, en modifiant la quantité et même, au bout du compte, la qualité des données utilisables, rien de plus rationnel, comme pour toute autre science. Il n'y a pas de quoi voir là ni miracle, ni révolution, ni crise, terme couvent avancé en France et même ailleurs. Heureusement que la géographie est en crise, car une science qui ne serait pas en crise permanente serait une science décadente, mourante. Notre rôle est d'entretenir la crise, de tâcher à en bien préciser les caractères, les conditions, les conséquences, d'éviter que sous prétexte de substituer une soi-disant géographie nouvelle à une soi-disant géographie ancienne, on ne conduise la géographie vers de fausses routes ou des impasses, aussi bien idéologiques que pratiques. On s'est aperçu du danger dans les pays où la géographie nouvelle avait connu le plus de succès, notamment dans les pays de l'Amérique du Nord.

Or les difficultés que beaucoup ressentent sont nombreuses mais pas toujours clairement perçues. Il suffit d'en signaler quelques-unes.

L'une est une difficulté de vocabulaire. Ce n'est pas là une difficulté formelle car une science qui n'est pas sûre de son vocabulaire est menacée dans son

progrès. La géographie a à traiter des questions concernant l'espace, un espace concret, défini dans chaque pays, dans chaque région par des termes empruntés aux langues, ou même aux parlers locaux. Ces termes sont d'autant plus particuliers qu'ils concernent des faits plus limités. Mais la terminologie de l'espace n'est pas qu'une collection de termes dont la signification est très étroitement localisée. La géographie se définissant comme science doit être capable de rassembler toutes les observations de détail en un corps de doctrine général, une systématisation conceptuelle, utilisable internationalement, dans la mesure où elle est exprimée à l'aide d'un vocabulaire internationalement compréhensible. Dans ce but, les géographes utilisent soit des termes usuels dans leur propre langue, quitte à en préciser de façon restrictive l'acception scientifique, soit des termes de leur langue précisés à l'aide, par exemple, de préfixes ou de suffixes, soit des termes, fabriqués plus ou moins bien du point de vue des linguistes, à partir d'étymologies grecques ou latines, soit enfin des termes empruntés au vocabulaire de disciplines voisines et d'origine également variable. Mais les géographes, par suite des conditions très particulières de leur discipline, assujettie à l'infinie variété des particularités spatiales et en même temps désireuse d'être compréhensible, utilisable par des non spécialistes, ont recours beaucoup plus que les physiciens, les chimistes ou même les naturalistes, à des termes empruntés aux langues courantes.

Qui d'entre nous, dans ces conditions, n'a pas peiné chaque fois qu'il a dû faire des traductions, avec la conviction inquiète, qu'il n'était pas sûr soit d'avoir bien compris soit d'avoir trouvé la traduction exacte? C'est pourquoi les dictionnaires multilingues sont si rares et, dans l'ensemble, si déficients, pourquoi la confection d'une terminologie internationale se heurte à des difficultés qu'il est malaisé de surmonter, parce qu'on ne trouve pas d'équivalences exactes, terme pour terme, parce que des termes de même origine étymologique "savante", grecque ou latine, sont employés dans des sens différents dans différents pays où l'acception originelle a été déformée par l'usage, parce que des langues de grande culture sont inégalement riches, inégalement susceptibles d'être enrichies en termes nouveaux. Dans une même langue, un terme, ancien ou nouveau, est utilisé dans des sens différents, par différents auteurs, soit qu'ils en ignorent le sens originel, soit qu'ils en étendent ou rétrécissent intentionnellement le sens. Encore heureux s'ils prennent soin de signaler leur conception personnelle. Ainsi s'expliquent des confusions et discussions formelles, trop souvent bien inutiles, par exemple en géomorphologie et, spécialement en France, sur le sens de glacis et pediment, sur celui, en américain et chez les auteurs non américains qui ont adopté les mêmes termes, de *sheet wash, sheet-flood, bahada,* etc. On pourrait multiplier les exemples. Aussi n'est-il pas surprenant qu'on ne soit pas parvenu à préparer une bibliographie géographique internationale plurilingue moderne, à se mettre d'accord, pour commencer, sur un thesaurus.

Il faut regretter également que les géographes manifestent, en trop grand nombre, une telle paresse à pratiquer des langues étrangères, que les Anglo-Saxons s'imaginent que l'anglais est la langue internationale car on la parle plus ou moins partout, que les publications en anglais sont les plus nombreuses et que les non anglophones sont, par suite, obligés d'emboîter le pas. La conséquence est non seulement que la communication géographique internationale est rendue difficile par la diversité et la complexité des langages géographiques nationaux, mais en outre que chaque groupe linguistique a tendance à s'enfermer dans sa langue, en y ajoutant plus ou moins l'anglais. Il suffit pour s'en convaincre d'examiner les références bibliographiques. C'est là un frein grave

pour la recherche, car les observations, l'expérience, la réflexion des uns restent ignorées des autres. Il est vrai que sans cesse plus nombreux sont les publications, revues ou même ouvrages qui font précéder ou suivre le texte d'un résumé dans une ou deux langues étrangères, ainsi que les revues multilingues. Les géographes polonais ont été depuis longtemps des initiateurs à cet égard et ils ont toujours eu le souci de connaître les recherches étrangères et de faire connaître les leurs à l'étranger. L'Union Géographique Internationale a recommandé cette pratique. Encore n'est-elle pas générale et beaucoup de résumés sont trop courts pour pouvoir être utiles.

Ces entraves sont d'autant plus graves que l'objet de la géographie est plus étendu dans l'espace comme dans le temps, plus varié en fonction des échelles adoptées. La spécialisation à l'intérieur de la géographie, la nécessité d'assimiler l'apport des disciplines voisines a rendu inévitable la spécialisation de la documentation et du langage au point que les géographes de spécialités différentes éprouvent de la difficulté à se comprendre entre eux et que certains ont pu redouter une scission, un fractionnement divergent de leur discipline. Mais l'unité de la géographie apparaît nécessaire au moment où les ressources naturelles sont l'objet d'une exploitation anarchique, où des techniques de production, de consommation et aussi de destruction sont une menace pour la conservation de l'environnement et de l'espèce humaine elle-même, où les populations les plus pauvres s'accroissent au point d'être menacées de famine et de misère accrue, où les inégalités entre les pays ou groupes de pays, à l'intérieur même de ces pays, créent, du moins dans le monde capitaliste, des tensions dangereuses dont l'analyse, l'explication, le devenir sont, par excellence, du domaine de la géographie.

Une géographie globale, totale, soucieuse de rechercher les interconnexions complexes, dialectiques, entre les données fournies par l'étude de l'espace physique et biologique et par celle des activités humaines; une microgéographie à l'échelle du minéral, de la plante, de la famille, du champ, du terroir, de l'entreprise, de la rue ou du quartier, "microstructurale", et une macrogéographie à l'échelle de la biosphère et de "macrostructures" ou "macrosystèmes" ou encore, pour parler plus simplement, de systèmes de production, d'échanges et de rapports de production: elle suppose une coopération nationale et internationale. Elle suppose aussi plus qu'un langage clair et commun: la masse des données est perçue telle que les méthodes mathématiques, l'automatisation, l'emploi des ordinateurs soient jugés utiles ou nécessaires. Mais on ne peut utiliser mathématiquement, fournir à l'ordinateur que des données sûres, établies selon les mêmes méthodes et comparables, sans sélection préalable. Il faut reconnaître que jusqu'à présent les résultats en géographie ne sont pas à la hauteur des espoirs et que l'ordinateur a été utilisé plus utilement comme simple machine à calculer, à sélectionner, à mémoriser. Ce n'est déjà pas si négligeable il est vrai. Aussi bien les résultats de la télédétection et de la cartographie automatiques sont-ils un indiscutable progrès.

Mais l'hétérogénéité des données que les géographes sont actuellement amenés à utiliser réduisent la confiance qu'ils peuvent avoir en elles et, par suite, les possibilités d'utilisation parce qu'ils doivent souvent les emprunter et n'en ont pas le contrôle. Les exemples en sont multiples. Une tâche majeure de la géographie physique devrait être de mesurer l'efficacité, la rapidité des différents systèmes d'érosion. Or les techniques adoptées pour mesurer les débits bruts ou spécifiques et les charges solides en suspension ou au fond, ou dissoutes, l'action du ruissellement en nappes ou de ravines ou de l'eau dans le sol en relation avec les enregistrements continus de précipitations ou températures

vraies, sur une tranche de la biosphère et de la lithosphère allant d'au-dessus des arbres à la roche saine... ces techniques n'ont pas fait jusqu'à présent l'objet d'accords internationaux, d'applications programmées dans l'espace et dans la durée. Certes des efforts et des résultats sont appréciables comme ceux de la décennie hydrologique internationale, du programme de "L'Homme et la Biosphère", d'autres encore. Mais beaucoup d'observations restent ponctuelles, leur densité est insuffisante, d'immenses lacunes spatiales subsistent, les durées d'observation, inégales, sont souvent trop courtes, la somme des observations est différente.

De la sorte les généralisations, modélisations, systématisations sont dangereuses. Il suffit d'évoquer les estimations concernant l'érosion superficielle physique, les processus concomitants de morphogénèse et de pédogénèse sous forêt tropicale humide, claire, méditerranéenne, tempérée, froide, considérée comme naturelle ou dégradée, sous défrichement, jachère plus ou moins ancienne, labour à la pioche, l'araire, la charrue ou au tracteur, ou encore l'efficacité de l'érosion karstique en pays froid ou chaud, ou celle des divers types de névés dans l'explication du cirque glaciaire, ou des divers types de glaciers alpins dans l'explication de la vallée glaciaire: tous les chiffres présentés sont contestables et discutables, inquiétants par l'amplitude des divergences dans les résultats en volumes, poids ou durée. Certes, des estimations, des modèles sont néanmoins utiles; la théorie, le "modèle" du cycle d'érosion normale de W. M. Davis qui a marqué une étape fondamentale de l'évolution de la géomorphologie bien qu'il fût faux, avait pour résultat de faire considérer les autres morphologies comme des "accidents climatiques" (Cotton) ou d'obliger W. M. Davis lui-même à multiplier les modèles. Si l'on tient compte, comme il convient de faire, de la multiplicité des héritages bioclimatiques et des données de plus en plus précises de la néotectonique, la multiplicité et la complexité des interactions rendent désormais difficile de concevoir un modèle général et universel.

Des difficultés de même ordre sont rencontrées en géographie humaine, et plus encore, en géographie régionale qui est, par définition, totale. Chacun sait avec quelle prudence doivent être utilisés les résultats des recensements en pays sous-développés et même en pays développés, les définitions des groupements sociaux et des types d'activité, les données des statistiques douanières ou sur les productions, celles sur la comptabilité des sociétés, les investissements de capitaux, les produits intérieurs bruts et leur répartition sociale, les revenus, la consommation et les niveaux de vie, du moins en régime capitaliste.

Ces difficultés devraient-elles condamner toute tentative de systématisation? Non évidemment puisque tel est le but de toute recherche scientifique. Du moins convient-il d'en tirer quelques conclusions évidentes. Les progrès de la collecte des données et de leur conceptualisation se déterminent mutuellement, la lenteur ou l'insuffisante quantité des premières compromettent la qualité de la seconde. Ils ne peuvent être contrôlés que dans la mesure où ils sont soumis à une expérimentation, naturelle ou artificielle, en géographie physique, déterminant du moins leur valeur pratique, applicable. Ils supposent un abandon de distinctions encore fréquentes entre science dite "pure" et science appliquée et l'adoption de prises de position politiques afin d'obtenir soit les moyens nécessaires à la recherche, soit l'utilisation pratique des résultats acquis. Ils supposent enfin une organisation nationale de plus en plus minutieuse de la recherche géographique, en liaison avec une organisation internationale. Celle-ci, par l'intermédiaire de l'Union Géographique Internationale — puisque tel est son rôle — devrait avoir pour tâches principales de favoriser la compréhension entre les géographes des divers pays, et leur information réciproque, ainsi que

de mettre au point, par l'intermédiaire de ses commissions, non seulement des vocabulaires et, par suite, des concepts communs, mais aussi des méthodes et programmes de recherche qui permettent d'obtenir, sur toute la surface du globe, des résultats comparables et d'en préparer à la fois la systématisation et l'application.

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LES CARTES THÉMATIQUES INTERNATIONALES DANS L'ASPECT DE LEUR DÉVELOPPEMENT

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La multiplicité des intérêts et la variété des relations entre les sciences sont parmi les traits caractéristiques attrayants de la géographie. Ces particularités sont parfaitement reflétées dans les ouvrages des éminents représentants de la science géographique et constituent toujours un ornement de leurs activités. Cette idée ne manque pas de vous venir à l'esprit quand vous prenez connaissance de la creation scientifique et des oeuvres pratiques du Professeur Stanislaw Leszczycki. Sa vaste contribution à la théorie de la géographie, à sa rénovation et à son organisation dans la République Populaire de Pologne, au renforcement des liens avec la pratique de l'économie nationale et de la planification, ainsi qu'au développement de la coopération internationale sera sans aucun doute présentée dans ce recueil dans toute sa plénitude.

Quant à l'auteur de ces lignes, cartographe de par sa spécialité, il apprécie tout particulièrement les initiatives et les recherches concrètes du Professeur S. Leszczycki dans le domaine de la cartographie. Et notamment: la direction de l'édition de l'Atlas national de la Pologne et l'élaboration à cette fin de nombreuses cartes; l'organisation au sein de l'Institut de Géographie de l'Académie Polonaise des Sciences d'une section de cartographie qui a conquis une bonne renommée grâce, entre autres, aux publications sur la théorie de la science; la mise au point d'un ensemble de cartes reflétant les changements du milieu géographique de la Pologne sous l'influence des activités de l'homme — fort actuelles, considérant le problème de la protection et de l'amélioration de l'environnement; le soutien systématique, en sa qualité de président de l'Union Géographique Internationale, de toutes les actions cartographiques à travers le monde, et la mise en oeuvre active de plusieurs engagements concrets, par exemple, la publication systématique par l'Institut de Géographie de l'APS de recueils sur la bibliographie des atlas nationaux (*National atlases: sources, bibliography, articles*) en connexion avec les activités de la Commission des atlas nationaux de l'UGI, et bien d'autres réalisations encore. Cette attention du Professeur S. Leszczycki pour la cartographie est aisément explicable: en effet, rien ne lie si étroitement la géographie à la pratique que les cartes géographiques. Or le Professeur S. Leszczycki, en tant que dirigeant de la géographie académique polonaise, s'est toujours fixé comme objectif principal de l'orienter vers les impératifs concrets de la vie. Nous en voulons pour preuve le récent ouvrage capital de S. Leszczycki (1975): "La géographie comme science et connaissance pratique". Ce sont précisément ces faits — l'action internationale énergique et l'intérêt constant de S. Leszczycki pour la cartographie thématique — qui m'ont

suggéré de choisir comme sujet du présent article les cartes internationales, pour les envisager dans l'optique des aspirations de la science cartographique de nos jours.

Cn peut rencontrer des emplois différents, parfois abusifs, de la notion "cartes internationales" (par exemple, dans les titres des "atlas internationaux", publiés par certaines firmes privées). Par la suite, sous ce terme de cartes internationales on n'entend que les cartes de toute la planète ou de ses grandes parties, élaborées dans le cadre de la cooperation internationale d'après un programme unique pour chaque carte, cette coopération pouvant englober la participation de différents établissements gouvernementaux ou (et) organisations non gouvernementales: unions, associations, sociétés scientifiques internationales et nationales, etc...

On connaît bon nombre de publications consacrées à telles ou telles cartes thématiques: à leurs histoire, projets, réalisation, analyse des travaux effectués. Enfin, on a vu apparaître les premiers articles fournissant des vues d'ensemble et des analyses des travaux relatifs aux cartes thématiques internationales (Salichtchev 1976) et à la question de leur présentation complexe (Demek 1975). D'ailleurs, dès la fin des années cinquante, on souhaitait déjà la concertation des programmes des cartes internationales. Ce souhait découlait de l'idée de la cartographie complexe en tant que méthode de représentation à la fois multiple et compacte de la réalité par les moyens cartographiques, idée qui est à la base même de la cartographie géographique et qui a été magnifiquement incarnée dans de nombreux atlas complexes, aussi bien nationaux que régionaux. Leur propagande et leur perfectionnement ont été grandement favorisés par l'Union Géographique Internationale à travers les vingt années de travaux de sa Commission des atlas nationaux et régionaux, créée en 1956. Cependant, à l'égard des cartes thématiques internationales, l'idée de leur caractère complexe s'est avérée être dans le passé apparemment prématurée. L'expérience accumulée lors de l'élaboration de ces cartes, qui étaient encore éparses, n'était pas riche et plutôt unilatérale; les géographes abordaient seulement leur elaboration; on déplorait l'absence de cartes géographiques générales, prises comme fond des cartes thématiques. A présent, la situation s'est sensiblement modifiée. Pour mieux comprendre les changements intervenus, jetons un bref regard sur toute la collection des cartes internationales.

Comme on le sait, l'idée de la création des cartes internationales est née au sein des associations scientifiques internationales. Le plus grand retentissement s'est rattaché à la proposition d'Albrecht Penck visant à la création d'une carte homogène de la surface terrestre, qu'il a faite au 5^{e} Congrès géographique, en 1891, à Berne, mais réalisée beaucoup plus tard en tant que Carte internationale du monde au millionième, principalement grâce aux efforts des services cartographiques d'Etats des pays évolués. Un autre souhait, inclus dans les décisions du 7^{e} Congrès géographique de 1899, à Berlin, sur l'élaboration d'une carte thématique du relief du fond des océans, a trouvé son incarnation dans la Carte générale bathymétrique des océans aux dix-millionième (1 : 10 000 000) réalisée par l'Institut international d'océanographie, à Monaco, déjà en 1904, pour le 8^{e} Congrès. Le volume relativement modeste des travaux (vu la petite échelle de la carte) et leur concentration dans un même endroit ont assuré le succès de l'entreprise. Point n'est besoin de retracer l'histoire de ces cartes populaires, bien exposée dans la littérature géographique par suite des rééditions de la carte bathymétrique et la fréquente discussion, dans les congrès géographiques, des difficultés de la carte au millionième. Notons seulement que dans la création de ces cartes, le facteur véritablement international n'a eu qu'une part fort mode-

ste. Pour la carte au millionième, il a été limité à l'élaboration internationale de son programme, à des conférences spécialement réunies en 1909 et 1913, et au perfectionnement du programme à la conférence technique de l'O.N.U., en 1962, et pour la carte bathymétrique, à l'utilisation de sources nationales, auxquelles il est fait appel dans le cadre de la coopération internationale.

Les travaux concernant les cartes géologiques internationales sont particulièrement variés et, comme nous le verrons plus loin, instructifs, encore que moins connus dans les larges milieux géographiques, puisque ces cartes se trouvent en marge des intérêts géographiques. Déjà six ans après l'instauration du Congrès géologique international (1875), à sa session de Bologne (1881) a été mise sur pied une Commission de la Carte géologique internationale de l'Europe, et plus tard a été fondée la Commission de la Carte géologique internationale du monde, qui, avec le temps, a créé plusieurs sous-commissions pour s'occuper de cartes internationales tectoniques, métallogéniques et hydrogéologiques, de l'Atlas géologique du monde, ainsi qu'en groupes de travail relatifs aux cartes de métamorphisme, de la tectonique récente, etc. Leurs activités ont été très fructueuses.

En bref, les résultats des travaux concernant les cartes géologiques internationales sont les suivants. La 1re édition de la Carte géologique de l'Europe, à l'échelle 1 : 1 500 000, sur 49 feuilles, a vu le jour en 1894–1913; dans la 2e édition, entamée en 1933, vers 1975 29 feuilles avaient paru, 2 feuilles se trouvaient sous presse, 9 en originaux d'auteurs; à partir de 1969, ont commencé à paraître des feuilles de la 3e édition. En 1971 a été éditée la Carte géologique de l'Europe et de la Région Méditerranéenne (*International Geological Map of Europe and the Mediterranean Region*), à l'échelle 1 : 5 000 000. Dans cette même échelle paraissent les cartes d'autres continents: Asie et Extrême-Orient (1re édition — 1959, 2e — 1971), Afrique (1re édition 1964, 2e — 1973), Amérique du Nord (1965), Amérique du Sud (1964), Australie et Océanie (1966).

La majorité des autres cartes géologiques internationales sont également élaborées et publiées par continents: la Carte tectonique internationale de l'Europe, à l'échelle 1 : 2 500 000, sur 16 feuilles (1re édition — 1964, 2e édition, élargie, sur 20 feuilles, en 1973–1976), les cartes tectoniques internationales, à l'échelle 1 : 5 000 000, d'Afrique (1968), d'Amérique du Nord (1969), ainsi que de l'Antarctide, à l'échelle 1 : 10 000 000; les cartes internationales de l'Europe, à l'échelle 1 : 2 500 000 — de gisements de houille (1967), de gisements de fer (1967–1971), métallogénique (1968–1973), des champs de gaz naturel (1971–), métamorphique (1973); la Carte hydrogéologique internationale de l'Europe, à l'échelle 1 : 1 500 000, sur 35 feuilles (1967–); les cartes métallogéniques, à l'échelle 1 : 5 000 000, de l'Amérique du Nord (1971) et de l'Australie (1971). A cela se rattache un vaste groupe de cartes géologiques d'ensemble, à l'échelle 1 : 2 500 000, pour l'Union Soviétique (dont il est convenu de considérer le territoire comme une section particulière dans le système des cartes internationales des continents): géologique (1965/1968) (le premier chiffre indiquant l'année de l'élaboration, et le deuxième, celle de l'édition de la carte), tectonique (1964/ /1968), tectonique des champs de pétrole et de gaz (1969/1970), métallogénique (1967/1971), des formations magmatiques (1968/1971), des surfaces d'aplanissement du manteau détritique (1971/1972), hydrogéologique (1964/1969), de génie-géologique (1969/1972); ces cartes, élaborées entièrement en U.R.S.S., sont considérées comme une composante organique de la cartographie géologique internationale des continents.

Bien dans la sphère des intérêts géographiques se trouve la Carte internationale du Quaternaire de l'Europe, à l'échelle 1 : 2 500 000, en cours d'élabora-

tion par l'Association internationale pour l'étude du Quaternaire (INQUA) avec l'assistance de l'UNESCO; elle a été conçue dès 1932 (initialement à l'échelle 1 : 1 500 000), mais jusqu'à ce jour n'ont paru que 8 feuilles sur 16.

L'Union Géographique Internationale a assumé le soin de la coopération internationale dans la cartographie géomorphologique, similaire des branches susmentionnées de la cartographie géologique; elle a fondé en 1968 la Commission de recherche et cartographie géomorphologiques, sous la direction de J. Demek. Cette commission a à son actif l'élaboration de manuels de relevé géomorphologique à échelles grandes et moyennes, la mise au point du projet de la Carte géomorphologique internationale, à l'échelle 1 : 2 500 000, le travail pour la réalisation de cette carte étant déjà bien avancé.

Les initiatives internationales pour la création d'autres cartes de la nature se rattachent à la cartographie des sols et géobotanique. L'aide des institutions spécialisées de l'O.N.U. — de l'Organisation pour l'alimentation et l'agriculture (FAO) et de l'Organisation sur les questions de l'éducation, de la science et de la culture (UNESCO) — ainsi que l'assistance de la Société internationale de pédologues, ont permis d'élaborer, en 1961–1970, le projet de la Carte des sols du monde (*Soil Map of the World*), à l'échelle 1 : 5 000 000, et de commencer à la publier graduellement sous forme de 9 blocs de feuilles (Amérique du Sud, 1970; Amérique du Nord, 1972; Mexique et Amérique Centrale, 1972; Afrique, 1972, etc.), accompagnés par des volumes de texte explicatif. L'étape suivante dans l'élaboration des cartes internationales des sols doit être constituée par la carte de l'Europe, au millionième (1 : 1 000 000). Pour la Carte internationale de la végétation mondiale, son échelle ayant également été fixée à 1 : 5 000 000, on en est encore aux travaux préparatoires.

Beaucoup plus modestes sont les réalisations concernant les cartes internationales socio-économiques, dans le cadre de l'Union Géographique Internationale. C'est l'initiative pour l'élaboration de la classification des terres de différentes utilisations économiques pour composer les cartes d'utilisation du sol, supposées au millionième, ainsi que pour l'élaboration de la légende et des modes de représentation graphique pour la Carte de la population mondiale, à l'échelle 1 : 1 000 000 (1956–1964). L'application de ces légendes, qui étaient considérés comme des recommandations pour l'élaboration des cartes nationales par les savants de différents pays dans l'espoir d'obtenir des représentations comparables, a donné des résultats différents. En ce qui concerne la carte de la population au millionième, ils se sont ramenés à environ une dizaine de feuilles pour différents pays, principalement d'Europe, en tant que fragments plus ou moins comparables de la carte mondiale. Quant à la légende, proposée pour les cartes d'utilisation du sol, elle n'a servi que de point de repère lors des travaux nationaux pour l'étude et la cartographie des sols, exécutés dans une gamme très vaste d'échelles — de 1 : 10 000 jusqu'à 1 : 5 000 000 — avec l'entrée dans le détail ou la simplification de la légende selon les particularités économiques et naturelles du pays, ce qui a entraîné une diversification des cartes et l'absence d'une véritable unité entre elles.

Dans l'ensemble, un énorme travail, digne d'un profond respect, a déjà été consacré à la création des cartes thématiques internationales. Les travaux sur différentes cartes et les résultats acquis ont constamment retenu l'attention de la presse scientifique. Cependant, il n'existe pas encore d'analyse comparative ni d'appréciation de ces cartes. Pour ce faire, on peut utiliser différents critères, mais du point de vue de l'idée initiale des cartes internationales, qui exige la représentation homogène des phénomènes sur la superficie de toute la planète ou, pour commencer, de ses grandes parties, l'unité et la cohésion internes de

chaque carte sont particulièrement nécessaires. Or, à cet égard, les cartes susindiquées sont loin d'être d'une valeur égale entre elles.

L'unité et la cohésion internes d'oeuvres cartographiques fondamentales dépendent de nombreux facteurs; pour les cartes internationales sont très importants, premièrement, la qualité et le détaillé des programmes, définissant d'une façon concrète la classification des phénomènes cartographiés, la plénitude de leur reproduction et les modes d'expression, et, deuxièmement, la forme d'organisation de la coopération internationale et de la direction scientifico-technique des travaux.

Au minimum, le programme indique l'échelle de la carte, les classifications et les modes d'expression. Même dans ce contexte, son élaboration exige souvent de gros efforts et beaucoup de temps, en particulier pour l'analyse et la comparaison des conceptions théoriques utilisées dans différentes classifications. Par exemple, la définition des principales unités de sols, l'instauration de leur nomenclature et l'élaboration de la légende générale pour la Carte des sols du monde à l'échelle 1 : 5 000 000 (sans quoi l'interprétation scientifique et la synthétisation des cartes nationales de sols de caractères différents auraient été impossibles) a pris une dizaine d'années. Des versions plus complètes de programmes suggèrent le degré de généralisation, englobent des modèles de carte et définissent les formes organisationnelles du travail.

La forme la plus élémentaire d'organisation se limite à une préparation collective du programme à l'échelle internationale, lorsque l'élaboration ultérieure de la carte se fait dans différents pays par parties, sans liaison, et parfois sans coordination aucune. C'est ainsi que fut créé la Carte internationale au millionième, et le même procédé était prévu pour la Carte mondiale de la population. Cette façon de faire libère, le programme terminé, de tout souci supplémentaire, se distingue par sa souplesse, mais ne garantit nullement une véritable unité des parties composant la carte. Un exemple tristement instructif: la carte au millionième, fort peu homogène dans différents blocs de feuilles quant à la plénitude du contenu et au caractère de la généralisation. Dans ce sens, fort convaincant est le contraste entre les feuilles de la carte pour le même territoire, composées en double et indépendamment les unes des autres, par exemple, entre les blocs des feuilles du Brésil, sortis par la Société géographique américaine et le Club brésilien des ingénieurs. Rappelons que dès 1946, N. V. Vinogradov (1946) a montré une multitude de différences dans le contenu et la présentation des feuilles de la carte au millionième parues à l'époque; cependant, la section cartographique du Département des affaires économiques et sociales de l'O.N.U., qui parraine en quelque sorte cette carte et qui a contribué à l'élaboration, en 1962, de son nouveau programme, se contente d'enregistrer les feuilles à leur parution.

Un procédé plus perfectionné prévoit, outre la préparation du programme, la direction de rédaction des travaux de l'élaboration de la carte dans les feuilles séparées ou par blocs. On connaît différents types d'une telle direction. L'un des moyens possibles est de constituer une carte internationale dans plusieurs pays par blocs de feuilles sous la direction d'un groupe commun de rédaction, surveillant la réalisation homogène des principes du programme de la carte et la concertation de ses parties. Ce moyen est commode lorsque les sources utilisées présentent un certain degré d'homogénéité. On peut citer comme exemple la Carte internationale du monde, à l'échelle 1 : 2 500 000, réalisée par les services cartographo-géodésiques des pays socialistes d'Europe.

Cependant, la cartographie thématique présente généralement une grande diversité de sources, déterminée non seulement par les contrastes dans le degré

d'étude territoriale des phénomènes, mais aussi par les différences des conceptions scientifiques. Ces facteurs compliquent la tâche et engendrent la nécessité d'un travail comportant de nombreuses étapes, ce qui s'est nettement manifesté lors de l'élaboration de plusieurs cartes géologiques internationales (Salichtchev 1976). La carte mondiale est généralement précédée par l'élaboration de cartes régionales, principalement par continents, que l'on commence pour les superficies les mieux étudiées, c'est-à-dire pour l'Europe. Tout d'abord, partant de l'expérience des cartes existantes, on prépare le projet de la carte régionale initiale. Sa discussion à une "table ronde" rapproche les points de vue sur les questions débattues et permet de trouver leur solution opportune, acceptable pour tous les participants. Parfois, les débats sont portés sur le terrain pour des recherches conjointes et la solution des problèmes litigieux.

En règle générale, les cartes des continents sont élaborées par parties, d'après le projet adopté, à l'intérieur des différents pays par leurs établissements scientifiques ou services spécialisés. Les contradictions et les désaccords éventuels entre des cartes sont éliminés par une discussion conjointe des originaux d'auteurs (maquettes). La concertation des différentes cartes et l'élaboration de l'original d'auteur de la carte dans son ensemble entrent dans les tâches de son rédacteur ("coordinateur") ou du groupe de rédaction, ce travail étant parfois effectué au préalable par blocs de pays. En même temps, on met définitivement au point la légende, compte tenu des additifs et des précisions dont la nécessité peut se faire jour pendant l'élaboration créatrice de la carte, qui s'accompagne souvent par la révision des concepts théoriques existant auparavant, par la constatation de régularités et de faits nouveaux. Les cartes suivantes — d'autres continents et du monde dans son ensemble — sont élaborées compte tenu de la légende et de l'expérience de la carte initiale.

Lors de la mise en projet des cartes internationales dans des branches de la cartographie thématique relativement jeunes et se développant à nouveau, le schéma organisationnel peut se perfectionner (et se compliquer) toujours, quand on prévoit les prémisses pour une certaine unification des sources initiales. Un exemple en est fourni par la Commission de recherche et cartographie géomorphologiques de l'UGI, déjà citée; tout en travaillant sur la Carte géomorphologique internationale, à l'échelle 1 : 2 500 000, elle a parallèlement élaboré des directives pour la cartographie géomorphologique à grandes échelles (1 : 25 000–1 : 50 000) et moyennes (1 : 200 000–1 : 1 000 000), permettant d'organiser des relevés géomorphologiques nationaux conformément aux conceptions prises pour base de la carte internationale.

Autrement dit, l'expérience acquise est déjà suffisante pour choisir avec certitude la forme d'organisation des travaux, assurant une unité et cohésion internes des cartes internationales nouvellement projetées.

Revenons maintenant à l'idée d'une coordination des cartes thématiques internationales. Son actualité se rehausse grâce au développement ultérieur de la géographie et de ses bases méthodologiques, ainsi que par suite de nouveaux problèmes que pose la vie. Au point de vue théorique, il est très important d'introduire dans la géographie une approche de système et de renforcer l'attention pour la recherche des rapports dans l'étendue et le temps des phénomènes de la nature et de la société, recherche particulièrement productive quand il s'agit d'utiliser des modèles cartographiques de la réalité. Une approche de système a abouti à une compréhension plus profonde des tâches et de l'essence de la cartographie des ensembles territoriaux naturels et de production, comme géosystèmes de différente complexité hiérarchique et d'englobement spatial dans le cadre duquel ces systèmes sont considérés comme étant composés d'un complexe

d'éléments divers (par exemple, des composantes de paysage ou de branches d'économie dans des ensembles de production), soit d'un complexe d'unités territoriales de rang inférieur (par exemple, des parcelles de paysage, d'un complexe de micro-secteurs constituant une région économique, etc.). Cela étant, la nécessité se présente naturellement d'élaborer des cartes reflétant non seulement les éléments et la structure des géosystèmes, mais également les liens, les facteurs et les processus déterminants leur fonctionnement et leur développement. Connaître et tenir compte de ces liens, facteurs et processus est nécessaire pour pouvoir influencer pertinemment les géosystèmes. L'importance pratique et l'envergure de ces tâches sont bien illustrées par le problème de la protection et de l'amélioration du milieu ambiant. La solution de ce problème exige un complexe de cartes englobant non seulement les sujets habituels tels que des cartes typologiques des composantes naturelles, mais également des thèmes nouveaux. Un exemple en est offert par les cartes de modification du milieu géographique sous l'influence des activités de l'homme, dont l'élaboration doit beaucoup au Professeur S. Leszczycki (1975).

Les cartes thématiques internationales sont réalisées d'après des programmes individuels non concertés entre eux, ce qui complique l'utilisation conjointe de différentes cartes, surtout lors de l'étude des problèmes globaux tels que la protection de la nature. La coordination et l'élaboration complexe des cartes, qui sont suggérées, doivent assurer la comparaison des cartes et la fiabilité des conclusions obtenues. Cela permet d'élargir fortement la sphère d'application des cartes et de rehausser ainsi sensiblement leur portée scientifique et leur valeur pratique, surtout lors de l'introduction d'une approche de système.

Soulevant la question de la création de cartes thématiques internationales coordonées, on ne saurait fermer les yeux sur les difficultés de la tâche. Tout d'abord, il est nécessaire de résoudre les questions purement cartographiques: les échelles, les projections et les fonds des cartes. Comme il ressort de la revue des cartes thématiques internationales, le choix de leurs échelles s'est précisé ainsi — 1 : 15 000 000 pour les cartes du monde, 1 : 5 000 000 pour l'Asie, l'Afrique, l'Amérique du Nord et du Sud, l'Australie et l'Océanie, 1 : 2 500 000 et 1 : 1 500 000 pour l'Europe (selon les sources dont on dispose); par ailleurs, l'échelle 1 : 1 000 000 a été recommandée pour la Carte mondiale de la population et est proposée pour la Carte des sols de l'Europe.

La situation est beaucoup plus embrouillée en ce qui concerne les fonds des cartes et les projections cartographiques. Il n'y à la ni unité ni filiation. Pour de nombreuses cartes, les projections et les fonds étaient élaborés spécialement, indépendamment les unes des autres, par exemple, les projections et les fonds 1 : 1 500 000 et 1 : 2 500 000 pour les différentes cartes géologiques de l'Europe, ce qui non seulement compromet la filiation des cartes, mais encore entraîne des dépenses superflues. Il faut croire que la publication de la Carte internationale du monde à l'échelle 1 : 2 500 000 (terminée en 1975), lors de l'élaboration de laquelle on avait songé à son utilisation également comme fond des cartes thématiques, permettra d'évincer certaines difficultés, du moins pour les travaux dans cette échelle. Mais la construction d'une carte à l'échelle 1 : 2 500 000 pour six zones différentes, séparées par les parallèles 0, 26 et 64°, exige des recherches pour la réunion des blocs de feuilles, pour une représentation d'ensemble des continents et des grands bassins océaniques. Ensuite se pose la question des projections et des fonds pour les cartes à d'autres échelles, de leur corrélation et succession. On ne doit pas oublier non plus les cartes thématiques internationales déjà existantes ou en voie d'élaboration, leur place et leur avenir dans

le cadre du système international projeté de la cartographie thématique complexe.

Les conditions suivantes, d'une grande importance pour le succès de la cartographie complexe, consistent, premièrement, dans l'élaboration pour différentes cartes de phénomènes interconnectés de légendes équivalentes (similaires) sur le plan de la taxonomie, facilitant l'analyse conjointe de ces cartes, et, deuxièmement, dans l'adoption de mesures comparables de généralisation. Autant que l'on sache, ces questions primordiales n'ont pas encore fait l'objet d'une étude spéciale, et il est douteux qu'elles puissent être résolues avec succès en dehors d'une large coopération cartographo-géographique internationale et en marge des efforts conjugués de l'Union Géographique Internationale et de l'Association Cartographique Internationale. Notamment les activités de la Commission de la cartographie thématique de l'ACI pourraient être orientées dans ce sens.

Nous avons déjà eu l'occasion de noter que la création de cartes thématiques internationales, entraînant, en règle générale, la révision de nombreuses orientations théoriques et la découverte de nouvelles régularités portant sur l'étendue et le temps parmi les phénomènes cartographiés, constitue toujours une contribution importante au développement de la science concernée. Quant à la solution du problème de la présentation complexe, elle ne manquera pas de rehausser le niveau qualitatif des cartes thématiques internationales et d'ouvrir des voies nouvelles pour leur application pratique. Il semble bien que cet objectif soit très proche des vues du Professeur S. Leszczycki sur les tâches contemporaines de la science géographique, sur le renforcement de ses aspects appliqués.

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BEACH CHANGES AND RECREATION PLANNING ON THE WEST COAST OF BARBADOS, WEST INDIES

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INTRODUCTION

White, coral sand beaches, interrupted occasionally by low limestone cliffs form the west coast of Barbados for 20 km between Harrison Point in the north and Fresh Water Bay near Bridgetown. Clear, usually calm seas wash the coral reefs that fringe the coast and sunshine exceeds 3000 hours in the year. It is hardly surprising that tourists from northern countries have increased ten fold in the past seventeen years to more than a quarter million persons annually. Although today they produce an income for the island comparable with that from sugar, the traditional economic leader, they have brought with them inevitably various environmental, economic and social problems. Not least of these is the danger that continuing pressure from hotel construction and from the new and large, if albeit transitory, population along the coasts will be followed by degradation of the inherently high quality coastal environment that attracted visitors in the first place.

Damage to the littoral physical environment may include pollution of the beach and adjacent terrace areas, pollution of inshore waters with destruction of the reefs, and alteration of the beach morphology and associated sediments. This third aspect forms the core of the present study. The environmental system of the shore zone is dynamically complex due to the interaction of physical variables of both marine (waves, longshore currents) and terrestrial (fluvial, groundwaters, etc.) origins, biological variables (coral, beach vegetation), and man's activities since settlement commenced in the early seventeenth century. The basic environmental question facing recreational planners on the west coast of Barbados is whether a steady state exists between the interdependent variables, and over what duration of time this has been achieved; and particularly whether changes in specific variables generate further changes, normally perceived as being degradatory, or do feedback relationships exist so that the system is selfregulatory at least until a specific threshold of disruption is reached.

GEOLOGICAL EVOLUTION

Studies during the past decade have revealed that the island of Barbados emerged from the sea when Tertiary sediments were compressed and elevated along the junction of the Atlantic and Caribbean tectonic plates.[1] Coral reefs

[1]Chase, R. L. and E. T. Bunce, Underthrusting of the eastern margin of the Antilles by the floor of the western North Atlantic Ocean and origin of the Barbados ridge, *J. Geophysical Research*, v. 74, 1969, pp. 1413–1420.

formed over the sediments as they approached the surface and today an elevated Quaternary limestone cap covers the island except in the northeast where it has been breached to form the hilly Scotland district. During the second half of the Quaternary the island has emerged apparently without major interruption at about 0.3 m/1000 yr;[2] glacio-eustatic changes of sea level superimposed on the uplift have resulted in a fluctuating sea level and the construction of a series of raised coral terraces along the west and south sides of the island. Off the west coast a broad submerged terrace terminates in a submarine ridge that may be a drowned barrier reef. The terrace developed possibly as an erosional feature during the low Wisconsin sea level phase[3] but more probably as a complex constructional reef flat that was exposed during low sea level stages at which time it was crossed by streams. The terrace was flooded during the Flandrian transgression and sea level had risen to its present position by about 6000–4000 years BP. No clear indication either in sediments or morphology has been found for significant emergence since then. It is therefore assumed that studies of the present beach zone need not take into account recent changes of sea level particularly as the island uplift of 0.3 m/1000 yr, even if it is continuing, is slow when compared with changes of beach form and of the coral reefs.

The rear of the western coastline is marked by emerged coral terraces that developed during the Sangamon and early Wisconsin phases of the Pleistocene glaciation (125,000–60,000 years BP).[4] Today the sea reaches the coral rock of these terraces for a distance of 6500 m (32% of the total soastline); morphologically these sectors are either cliffs which are being actively eroded or they retain the sloping front of the fossil reef.

BEACH SEDIMENT SUPPLY

As the Flandrian transgression covered the submarine terrace a barrier reef developed along its outer margin. Apparently at some stage the sea rose too rapidly for the coral to survive and the reef ceased to flourish. Meanwhile other coral colonies were growing on the inshore side of the terrace and today they form intermittent fringing reefs along the coast. Attrition of debris from the reefs together with abraided coral rock from the cliffs provide the main sediments, overwhelmingly of coral origin, that compose the present beaches. In addition streams introduce fine and coarse grain sediments including the majority of the silica sand (normally 10%) on the beaches. This is derived from 'red sands' preserved today on the medium-level terraces above the west coast, and was transported to the west side of the island from the Scotland district during higher sea levels.

In the past few thousand years there has been a sufficient supply of sediment for beaches to develop along two-thirds of the west coast in front of the elevated coral-rock terraces. At many localities there has been an excess of sand and the beaches have prograded seawards leaving a sand terrace overlying coral rubble at a height of about 2.0 m. This corresponds to the altitude of the berm on the inner margin of the beach.

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[2]Mesolella, K. J., R. K. Matthews, W. S. Broeker and D. L. Thurber, The astronomical theory of climatic change: Barbados data, *J. Geology*, v. 77, 1969, pp. 250–274.

[3]MacIntyre, I. E., Sediments off the west coast of Barbados: diversity of origins, *Marine Geology*, v. 9, 1970, pp. 5–23.

[4]James, N. P., E. Mountjoy and A. Omuro, An early Wisconsin reef terrace at Barbados, W. I. and its climatic implications, *Geological Society America Bulletin*, v. 82, 1971, pp. 2011–2018.

Superimposed on the long-term pattern of beach accretion are cyclical changes of sediment gain and loss, and possibly one-time modifications that are non-repetitive. To determine the character of these changes and their significance in the resource utilisation of the west coast, studies were started at Bellairs Research Institute (of McGill University) near Holetown in 1966.

COASTAL CHARACTERISTICS

The west coast may be divided into three sectors. A northern portion, the St. Lucy sector, extends from Harrison Point to Smitons Bay; it is dominated by limestone cliffs, which at several points exceed 30 m in height. The cliffs are fronted by a submerged coral rock platform with little contemporary reef growth. The sand beach is discontinuous; where present it is narrow and often changes rapidly in profile and width due to strong wave action. At the south end of the coast, a comparable sector except for the lower wave energy level extends from 'South Paynes' Bay to Fresh Water Bay. For 13 km between these two cliff sectors is a succession of bays separated by low headlands. The plan of the early Wisconsin shoreline in the central sector resembled the present shore except in the north between Six Men's Bay and Speightstown, and in the centre at Holetown where deep bays, now filled with sediments, existed.

In the middle and southern part of the central sector there is a succession of symmetrical beach cells. Although they vary in size from 75–800 m between

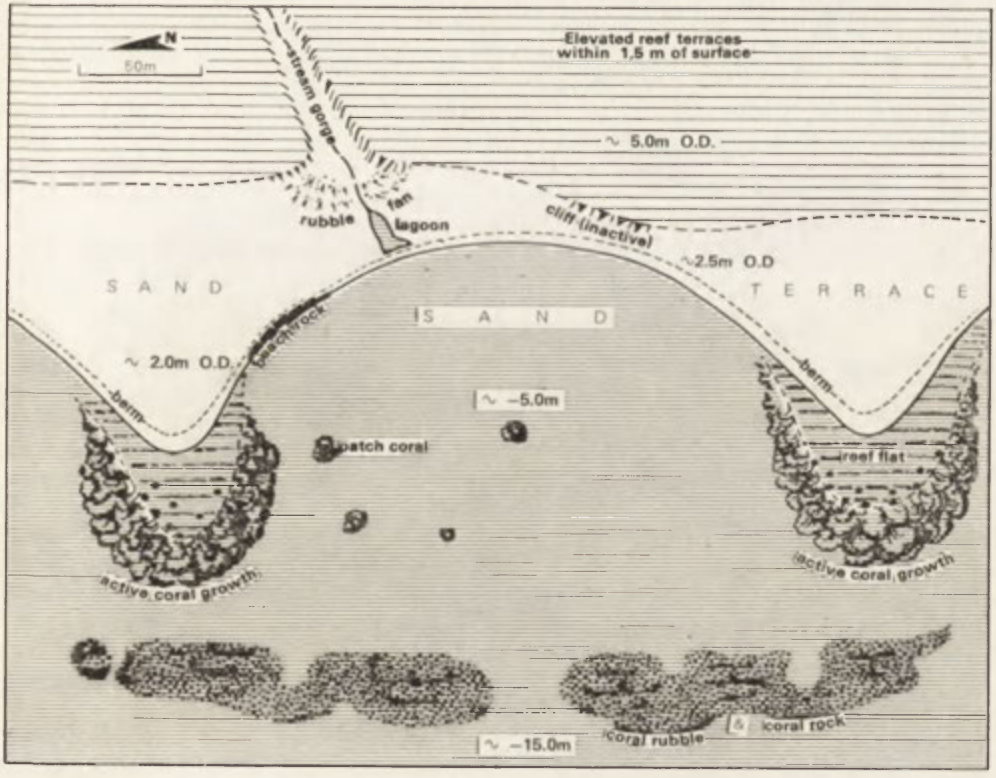

Fig. 1. Model beach cell, west coast of Barbados

headland to headland they resemble each other closely. They are characterized by sandy headlands with offshore reefs that are separated by semi-circular sandy beaches with a sandy inshore zone in which there are isolated coral patches (Fig. 1). The sand terrace behind the inner bay is frequently crossed by a stream channel that terminates in a lagoon immediately behind the berm. However, water may only enter the bay following heavy rains. Early Wisconsin (or older) coral rock is often exposed at the head of the bays.

HISTORICAL CHANGES OF LAND UTILISATION

Prior to European settlement in the seventeenth century the west side of Barbados was covered with deciduous and semi-deciduous tropical forest that reached close to the sea. Along the coast, localities that were inadequately drained, especially where lagoons had formed behind the beach, most prominently in the Holetown area, supported mangrove forest. Today only a small patch of mangrove survives on the south coast at Graeme Hall swamp. The cliff summits and the elevated coral terraces were probably covered with scrub and thorn woodland.

Cn a narrow strip on the sand terrace immediately above high water the manchineel apple (*Hippomane mancinella*) and the shrub-tree seaside grape (*Coccoloba uvifera*) were dominant.[5] Both species continue to be widely distributed although the former has been removed in many areas because of its poisonous characteristics. Introduced *Casuarina equisetifolia* and coconut (*Cocos nucifera*) are also common today. The manchineel apple can live with its roots temporarily in seawater and it survives several years when beach erosion exposes its roots. It has therefore an important role retarding erosion on a threatened beach.

In the moderate wave energy zone at the extreme north of the west coast, salt water spray is detrimental to the foliage of the manchineel apple and crab grass (*Sporobolus virginicus*) colonizes a zone between the manchineel and the active beach.[6]

The original vegetation was cleared from the west coast at an early stage of colonization but the sand terrace does not appear to have been attractive to settlement and although some sugar cane was grown on it, the high incidence of malaria until as recently as 1926,[7] the immature soils, and frequent fluvial and marine flooding appear to have favored settlement at the rear of the sand terrace where it was in contact with the coral rock and along which the main highway was located.

Land utilization on the sand terrace has changed drastically in the past three decades, especially south of Speightstown. Initially this took the form of construction of large and medium-size residences and a small number of luxury hotels adjacent to the shore. The development of commercial jet aircraft links with North America in the early 1960's was followed by rapid increase of hotels close to the beach and smaller residential properties on the rear of the sand terrace and lower coral rock terraces. The number of visitors to the west coast grew rapidly and by the late 1960's a mass tourist traffic had developed from

[5]Watts, D., *Plant introduction and landscape change in Barbados, 1625 to 1830*, Unpublished Ph.D. thesis, McGill University, 1963.

[6]Randall, R. E., *Vegetation zones and environment on the Barbados coast*, Unpublished M.Sc. thesis, McGill University, 1968, 192 pp.

[7]Fonaroff, L. S., Geographic notes on the Barbados malaria epidemic, *Professional Geographer*, v. 18, 1966, pp. 155–163.

Canada and the United States with smaller numbers of visitors from northern Europe and Latin America. Within a few years some sectors of the coast notably between Holetown and 'South Paynes' Bay had been virtually taken over by tourist facilities. Barbados residents were also visiting the beaches in increasing numbers for recreation purposes encouraged by the new mobility provided by private cars and the policy of the island government to provide public access to the beaches.

It was soon evident that pressures from the tourist and resident population and especially construction close to or on the shore threatened the beach environment. There was a real danger that degradation of the beaches through erosion would reduce their environmental quality by narrowing or removing the sand and replacing it with coral rubble and at the same time endangering buildings and property on the sand terrace. To a more limited extent the converse was true if a sector of beach was inherently of low quality, it might prove possible to improve it without endangering adjacent beaches, preferably using sand of local origin.

There is no evidence that early settlement (and related vegetation modification) led to significant beach changes. However, in the late eighteenth and early nineteenth centuries a series of defensive forts were constructed on the headlands and some at least were given protection by coral rock walls from wave attrition. The forts, and short piers must have provoked coastal changes in the sensitive beach conditions that prevail. A study of the cartographic evidence for shoreline alteration fails to show major changes but the detail of the map is invariably coarse. No evidence of excessive coastal change can be deduced from the location of the forts. Probably the largest changes, at least in the past few decades, have occurred at Fort Denmark south of Speightstown where erosion is today destroying the foundations of the fort. Active recession at this point is confirmed by other data.

Within living memory, changes have occurred at numerous points along the coast according to local tradition but they appear to be of a detailed nature of a magnitude no greater than occurring in short periods today.

DYNAMICS OF COASTAL CHANGE

The beach zone along the west coast is effected by terrestrial and marine processes. The former include flooding from the sand terrace and by streams whilst the latter result from longshore currents and wave action. The semidiurnal tidal range at springs is about 1.0 m and at neaps 0.25 m. Tidal currents are weak in the offshore zone and are frequently masked by longshore currents generated by waves breaking over the reefs at the headlands. This leads to complex currents which reach their maximum at high tide during storms when alongshore flow towards the centre of a beach cell and from there a current out to sea may exceed 0.65 $msec^{-1}$.

The major beach modifications result directly from wave action. Barbados is under the influence of the Northeast Trade Winds for most of the year, and winds from the northeast, east and particularly in summer the southeast, blow with great constancy. Waves produced by these winds both in local waters and from far out in the Atlantic Ocean break without pause on the east side of the island. The west coast is sheltered from their direct action but they are refracted around the northern headlands and to a lesser extent by the south coast,

and, much diminished in energy (by an order of two magnitudes)[8] wave trains approach the lee coast from the northwest and southwest.

Observations taken in the centre of the west coast over a 12-month period (1967–1968)[9] show that the annual regime consists of a long winter spell of waves of moderate energy arriving from the northwest and a shorter quieter summer spell with waves from the southwest. As might be anticipated from the configuration of the island and the offshore terrace, the greatest wave energy on the lee coast is concentrated in the north between Cape Harrison and Fryer's Well Point. Farther south wave energy declines rapidly and for much of the centre and southern part of the west coast is uniformily low. The reverse situation in summer, with a concentration of energy at the Bridgetown end of the coast is not marked.

The normal wave energy system is broken in winter by the arrival of storm swells that last for two to four days and may occur two or three times during the winter. These wave trains of greater wavelength and amplitude than the normal waves, approach the island from a more northerly quarter. They are generated by storms in the North Atlantic and travel into the Caribbean producing considerable rough water and modifications along the leeward coast[10].

Medium and high energy waves from the Caribbean Sea directly onto the west coast of Barbados were not observed during the study period. Local waves of small amplitude may approach from the west when the trade wind circulation breaks down during the summer and local onshore breezes develop but at no time do they compare in energy with the refracted waves. It must be assumed that waves from the west will occur with considerable magnitude, during the infrequent passage of hurricanes immediately north of the island.

ANNUAL CHANGES IN THE BEACH ENVIRONMENT

In attempting to identify changes in the beaches induced by man's activities in the past few decades it is essential to recognize changes that result over the same period from natural causes. The most conspicuous modifications have an annual recurrence and this is especially marked in the beach cells. During a 12-month period in 1967/1968 and again in a 6-month period in the first half of 1970, selected beach cells were surveyed in detail for changes in profile, planform and the movement of sediments[11]. They were related to variations in magnitude and direction of the incident waves and alongshore currents. Several elements of change were identified. The most obvious is that the planform of a beach cell shifts asymmetrically so that the axis of the cell (an orthogonal from the centre of the beach — seawards) tends to face the seasonally dominant waves, turning towards the northwest in winter and to the southwest in summer. The annual change of orientation does not require movement of sediments outside the bay cell but rather transport from one sector to another within the

[8]Hernandez-Avila, M. L. and H. H. Roberts, *Form-process relationships on island coasts*, Louisiana State University Coastal Studies Institute, Technical Report, 166, 1974, 76 pp.

[9]Richards, A. and J. B. Bird, *Beach studies on the west coast of Barbados, 1967–1969*, Bellairs Research Institute and Department of Geography, McGill University, 1970, 83 pp.

[10]Donn, W. L., and W. T. McGuiness, Barbados storm swell, *J. Geophysical Research*, v. 64, 1959, pp. 2341–2349.

[11]Richards, A. and J. B. Bird, *op cit.* and P. P. Wong, *Beach changes and sand movement in low energy environments, west coast, Barbados*, Bellairs Research Institute and Department of Geography, McGill University, 1971, 108 pp.

cell and its return to the former sector within the year. The visible effect is beach recession close to the north headland of a cell during the winter and near the south headland during the summer. The two areas are the environmentally sensitive parts of a beach and an extended storm surge in winter may result in the retreat of the berm by 2 to 3 m: a most disturbing event for property owners along the beach.

The immediate applied problem of the annual change results from the enclosure of the sand terrace either for private homes or hotels right up to the berm. If there is an excessive erosive phase the berm retreats to or in some cases beyond the property line. If this happens repeatedly or there is danger of damage to buildings a normal response of the owners is to place minor beach protective works, usually wire-mesh gabions, along the threatened areas. In the past fifteen years this has been attempted piecemeal for individual properties. The main result has been to transfer the erosive problem to adjacent parts of the beach. Normally during the annual cycle, the beach recovers its former position, although occasionally this may be spread over several years.

The inner part of the bay cell is extremely stable in terms of longshore sediment movement although the beach profile may fluctuate in steepness. It is the zone of highest swash velocity and this is associated with berm height which may be 0.5 m higher than the headlands.

Around a headland the reef provides protection at low water. At high water, complex wave trains break across and round the headlands and beach sediments are rapidly dispersed; but despite the dynamic position net change on most profiles is not great. Conditions appear to fluctuate over several years with accretion on the sandy headlands and a seaward shift of the berm by several metres, only for it to retreat in subsequent years.

On some headlands the natural sequence of events has been disturbed by local protective works. The immediate effect is for increased erosion in the limb of the beach cell immediately south of the headland. In bad cases this degradation spreads back to the headland with undercutting of the protective wall and loss of the beach at the headland.

Whilst within beach cells annual changes of beach profiles and planform may be considerable, changes over several years are rarely great. If property lines were maintained several metres inland of their present position close to the berm, the continuing beach fluctuations would be absorbed on the edge of the terrace and on the sand beach without consequent damage either to the property or to adjacent beaches.

Storm surges intensify the changes already described. They occur several times a winter and produce considerable sediment upheaval in the inshore zone with rapid erosion of vulnerable profiles and combing down of the beach at many points. At this time the sea over the submarine terrace may be opaque with fine sand particles in suspension. During a surge, waves breaking on the headlands lead to piling up of water at the rear of the reef and this generates offshore currents from the center of the cell. It is inferred that at these periods there is a net seaward movement of sediments. Coarse sand and coral rubble are combed down from the beach and deposited immediately below the beach step within 50 m of the shore producing a shallower profile than is normal. Although there may be some loss of sediment seawards, the main movement during a surge is apparently from one beach cell to the next.

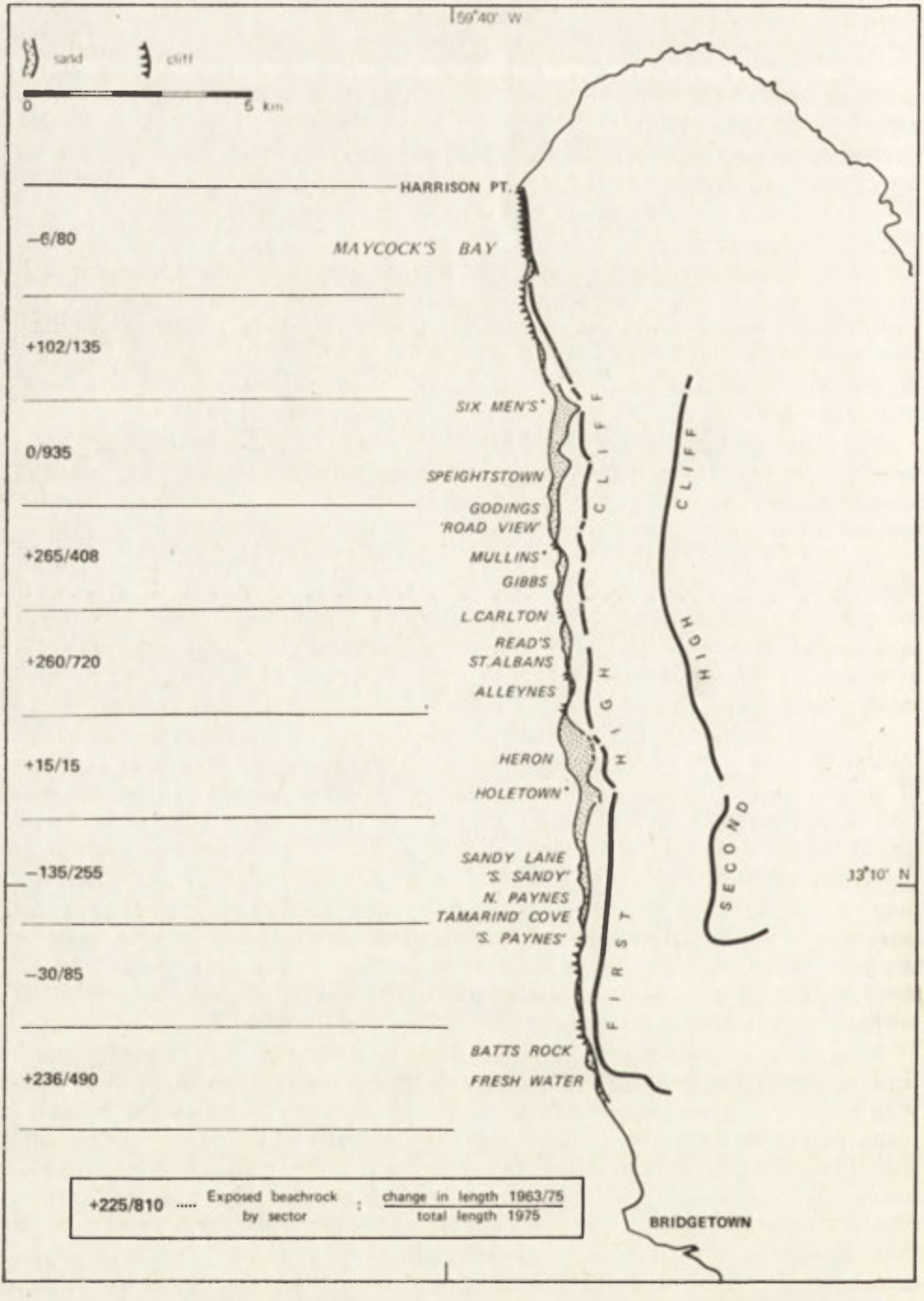

Fig. 2. The west coast of Barbados identifying beach cells (*incompletely formed), exposed beachrock length (m), changes in beachrock in past 12 years, and the sand terrace

BEACH CHANGES IN THE PAST THREE DECADES — EROSION

On the west coast of Barbados beachrock is an indicator of active erosion; however, once it is exposed, it becomes a stabilizing element retarding further beach changes. Beachrock is widely distributed on warm temperate and tropical shores; it results from the cementing of beach sand and rubble by aragonite and calcite derived from seawater and/or groundwater.[12]

Characteristically on the west coast of Barbados it is present on the lower part of sand beaches between high tide mark (0.5 m) and extreme low waters springs (−2.0 m); in 1975 it was exposed along 3200 m (15.8%) of the shore. When recently uncovered it resembles in content and appearance nearby beach sediments and is easily crumbled in the hand; on prolonged exposure it becomes increasingly indurated with a tough outer skin that eventually develops a flaggy, fluted, or dimpled surface with micro-scarps facing inland.

As beach rock develops initially *within* the beach sediments, its exposure is strong evidence for sand depletion and consequently from its appearance conclusions of the degree of recent erosion and an estimate of relative age may be obtained. It must therefore be a matter of concern to beach planners in Barbados that in the last 12 years (1963–1975) the length of exposed beachrock on the west coast has increased 46%.[13]

Beachrock is not distributed evenly along the west coast and the major outcrops are concentrated in a few areas (Fig. 2). The largest exposure is on the straight coast between Six Men's Bay and Speightstown. During the 1950's this was recognized as a coast that was experiencing sand depletion. Much of the beachrock observed today is deeply eroded. It is deeply pitted by biological erosion and slabs have broken free from the main body. The characteristics of the beachrock and engineers' reports indicate that the major outcrops date from the 1950's or earlier. Little new beachrock is appearing in this area today and the beach system north of Speightstown appears to be in rough equilibrium.

The largest increase in beachrock has occurred further south along the coast between Speightstown and Alleynes Bay, especially between Mullins Bay and Carlton. Although there are few wide outcrops of beachrock in this sector it shows considerable increase in the past 12 years and is possibly the most seriously receding coastline at the present time. In most cases the recession will not proceed far inland because the early Wisconsin reef-cliff is close to the sea but it will certainly be accompanied by a narrowing of the present beach. The beach cells in this area are especially vulnerable to change particularly at the headlands.

A third zone of extensive beachrock is in the south of the study area adjacent to Fresh Water Bay. Beachrock has been exposed by the erosion of a sandy foreland that is in part underlain by eolianite. Whilst the age of the foreland is uncertain, the size of the trees on it and the developed soil horizons suggest an age at a minimum of many decades and possibly centuries. It may even be of early Wisconsin age as the surface of the foreland is significantly higher than other sand terraces on the west coast. If the latter explanation is correct it may

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[12]Stoddart, D. R. and J. R. Cann, Nature and origin of beach rock, *J. Sedimentary Petrology*, v. 35, 1965, pp. 243–247.

[13]The total length of outcrops was measured early in 1975 and compared with a study made in 1963 by MacLean (Cf. McLean, R. F., *Mechanical and biological erosion of beachrock in Barbados, W. I.*, Unpublished Ph.D. thesis, McGill University, 1964, 266 pp.). The area of exposed beachrock has increased somewhat less (30%) than the total length but it is considered a less reliable indicator due to difficulties of measurement of the outer face which is normally in the sea.

have been undergoing slow attrition for an extended period, hastened by the removal of the greater part of the tree cover. There is no field evidence that the recent erosion is related to the construction of the new Bridgetown Deepwater Harbour 3 km to the south which must marginally influence wave trains from a southerly sector in summer.

In general, beachrock is missing or of limited extent within the beach cells. Where it occurs as in Gibbs Bay, it is normally friable and recently exposed in the limb areas of the cell; and is covered with sand at the change of season. An exception is at 'South Paynes' Bay where the southern rim of the cell is missing and is replaced by cliffs.

ZONES OF ACCUMULATION

The observations on beachrock suggest that sand depletion from the shore north of Speightstown was active several decades ago and has shifted south of Speightstown in the past decade. No significant accumulation of sand is found south of this area and it must be assumed that the sand has been lost to the offshore terrace. An area of sand accumulation exists in the south at Prospect where the berm has extended seawards a maximum of 20 m in the past decade. The source of this sand was probably a beach that existed along the foot of the cliffs between Prospect and 'South Paynes' Bay and which is today a narrow and intermittent strip of sand.

Changes have therefore appeared in the past several decades, the immediate cause of which is probably increased wave energy from the north. It is too soon to confirm that a wave of depletion had moved along the coast from the north but this possibility must be considered. In terms of beach recreation value the most sensitive area at present is south of Speightstown. If the analogy of Heywoods Beach is followed this zone may stabilize in a decade or less but in turn additional degradation may spread farther south. The active zone south of Speightstown and the area immediately south of it are the two where construction close to the beach should be avoided and where backshore property owners should not place too high a price on the presence of a permanent beach.

TROPICAL STORMS AND COASTAL CHANGES

Tropical storms pass close to the island with a recurrence interval of several years. They are not accompanied by high winds but may produce heavy rains, exceeding 18 cm within 48 hours, during the passage of a storm. The immediate effect on the beaches is slight but heavy rain in inland drainage basins may lead to the flooding of the lagoons which burst across the beaches emptying out organic material and old sand from the lagoon hollow. Exceptionally heavy precipitation results in overland flow across the sand terrace and water breaks through to the beach at several points with gullying down to the coral rubble base. The immediate changes of the beach profile are considerable and lead to rapid deterioration of the beach amenity. However, within several months the profile is restored with little trace except at the rear of the terrace.

It must be assumed from experience elsewhere in the Caribbean that the near passage of a hurricane will produce considerable shore modification.[14] In the present century there has only been one hurricane and the effects of a hur-

[14]Stoddart, D. R., Effects of Hurricane Hattie on the British Honduras reefs and cays, October 30–31, 1961, *Atoll Research Bulletin*, v. 95, 1963, pp. 1–142.

ricane have yet to adequately be described. Conditions for coastal changes on the west side of Barbados are optimum with the slow passage of a fully-developed hurricane close to the north end of the island. This, however, has not happened for at least 150 years although it must be anticipated for the future. It is quite possible that the sand terrace as far as the first elevated reef will be flooded by both the sea and the terrestrial waters and that permanent changes of the order of a magnitude greater than observed at present will be produced. Under such conditions a large part of the construction for tourists on the west coast will be at risk.

Tsunamis may also produce major beach and terrace changes but experience in the Caribbean suggests that major tsunamis have a recurrence interval of many centuries.

CONCLUSIONS

The changes of profile, planform and sediment volume described for the low energy coast of western Barbados are not great; but it is this very aspect of near steady-state conditions that encourages the development of tourist facilities in vulnerable situations. The sand layer overlying the coral rock terrace and rubble is rarely more than 2–3 m deep and small changes lead to disproportionately large effects on the beaches. Whilst it is clear that there is an annual beach cycle, the reality of longer-term cycles and the causal agents have to be verified. In the short term the implementation of existing legislation for planned shoreline development of the whole coast should avert serious environmental degradation. The feasibility of planning for longer-term beach and sand terrace modifications (including those generated by hurricanes) awaits a better understanding of these changes and cost analysis studies of these infrequent events. On the constructive side the possibility of increasing artificially the sand supply must be examined; an obvious source is the *offshore* zone of the south coast of Barbados but the theoretical and applied beach problems of this area will have to be solved before it is desirable to redistribute these sands.

ACKNOWLEDGMENTS

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DEVELOPMENT AND ESTIMATION OF THE MIGRATIONAL PROCESSES IN BULGARIA

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The migrational movement are due to social-economic and historical-political reasons. The development of the migrational processes in Bulgaria are due to these two factors too. If the historical-political reasons have played an active part in the external migrations, then the greatest importance for the internal migrations during the capitalist and the socialist period have had the social-economic factors.

DEVELOPMENT OF MIGRATIONS

During the period of capitalism, in social-economic terms Bulgaria could be characterized as a backward agrarian country with slowly-developing industry. The unequal economical development of its regions is due to this basic feature. It restricted the migration processes and the territorial redistribution of the population, which forms the basis of the development of the productive forces in the time of capitalism. Internal migrations during that period were directed mainly from the mountains towards the plain because of the better soil, the greater natural fertility and the better climate of the latter areas.

The Socialist revolution and the basic changes which took place in Bulgaria after 1944 and the socialist way of production had a great influence on the development of the migrational processes. The planned economy, the socialist industrialization, the development of co-operation systems in agriculture, etc., deeply changed the character of the internal migrational movements. They now proceed mainly from the agrarian to the industrial regions — from the rural villages towards the towns, from the towns towards the cities, from the smaller villages and the scattered villages towards the bigger ones.

Both the character and the intensity of the migrational movements have changed. The absolute growth which is closely connected with them has changed as well. It has greatly increased in the towns and in the cities, and it leads to highly and rapidly increasing of the population size and strengthening of the process of urbanization. At the same time the absolute growth in many rural regions began to show a tendency of diminishing, and at the end of the 50's and during the 60's it had turned from positive to negative.

This tendency in the development of the population growth, closely connected with the character of the migrational movements, has resulted in a rapid diminishing of the rural population. In this way the professional structure has changed greatly. From 3,355,000 people (82%) occupied in the agricultural

production in 1948, their number diminishes to 1,605,000 (39%) in 1968. That means that 1,750,000 people have left agricultural production during this period and 1,400,000 people have settled down in the towns. The diminishing goes on and in 1970 it came down to 35%, in 1975 to 31% and in 1990 is supposed to come down to about 18%.

The development of the migrational processes leads to rapid increases in urban population in comparison with the rural population, while in 1944 the proportion between the urban and the rural population was 24:76, in 1965 it changed to 54:46 and in 1975 was already 58:42. This is a clear point about the strong urbanization, which shows the development of the migration from rural villages towards the towns. The result is not only the diminishing of the relative part of the rural population but of its absolute number as well.

The internal migrational processes and the tendency for their development during the last 10 years have lead to such a great outflow of the population from the villages that it surpasses its natural growth. That is why one can notice in some regions not only a mechanical outflow as a result of the migrational movements, but a tendency to diminish the rural population as well. The information from the last 10 years (1961–1970) shows that the positive balance of migrations occurs only in the districts of Bourgas, Varna, Gabrovo, Sofia-city and Stara Zagora. In all other districts it is negative, which shows clearly an outflow of the rural population.

MIGRATIONAL RELATIONS

The migrational relations which cause to a great extent the migrational flows as well, are of four types: village–town; town–village; village–village and town–town.

The dominating importance of the migrational relation village–town is noticed both in the time of capitalism and in socialism. This relation is closely connected with urbanization. The migrational relation village–town shows certain development for the period 1961–1971 (1961–1965 — 51.4%; 1966–1971 — 53.3%), about which we have the necessary official statistical information. In recent years one notices a certain tendency of stabilization of that relation.

The average number of people who have migrated from the rural villages into the towns has increased from 82,210 during the period 1961–1965 to 84,062 during the period 1966–1971.

The migrational relation village–town is not equal for all districts. From a territorial point of view it expands. During the period 1961–1965 only 10 districts have surpassed the average percentage of the country while in 1966–1970 the number of such districts increased to 15.

The migrational relation town–village is characterized with a considerable increase (for the period 1961–1965 — 4.3% for the period 1966–1971 — 8.3%). It shows, that conditions have not been created for a constant tendency of return migrations from the towns towards the villages yet and the mentioned relation town–village is of a secondary importance. This migrational relation is concentrated in the districts of Gabrovo (40.8%), Sofia-city (25.9%), Rousse (15.4%), etc. The cause for that must be identified with the transfer of the productive forces from the towns of these districts into rural settlements with a newly created industrial nucleus.

The migrational relation village–village is characterized by a definite tendency towards a rapid diminishing (for the period 1961–1965 — 30.3% and for the period 1966–1971 — 14.9%). The information shows that for the whole period

1961–1971 this relation has diminished almost by half. From a territorial point of view this migrational relation is less evident. During the period 1961–1965 only 7 districts have surpassed the average percentage for the country. In the second period (1966–1971) one notices a gradual diminishing.

The migrational relation town–town shows a constant increase (for the period 1961–1965 — 14.0%; for the period 1966–1971 — 23.4%). For each year the increase is constant. That shows that many towns have no necessary conditions for retaining population which moves therefore to other towns. The migrational relation town–town is characterized by the moving of the population from the smaller towns with smaller economic potential towards the towns and cities, where the industrial concentration is greater and the economic and cultural potential higher. In almost half of the districts the migrational relation town–town accounts for a higher percentage of total moves than the average for the country.

As a result of the various migrational relations the average annual mechanical growth of the urban population has diminished from 75,373 people during the period 1961–1965 to 70,905 people during the period 1966–1971.

The migrational relations and the tendencies which one notices in their development have a definite influence upon the migrational movement. These relations have a definite influence upon the geography of the migrational flows as well.

MIGRATIONAL FLOWS

The internal migration movements under the conditions of socialism change completely their geographical orientation as a result of the social and economic transformations. In the first years after the socialist revolution and at the end of the 50's the migrational movements were characterized by mass migrations from rural villages into towns and especially into the main industrial centres, like Sofia, Plovdiv, Pernik, Varna, Rousse, Stara Zagora, Pleven; into the newly-built towns and industrial centres — Dimitrovgrad, Devnya, Madan, Rudosem, etc.; and also towards the mining towns.

Sofia and all other bigger towns attract a great number of migrants. From north-west Bulgaria (and especially from the districts of Vidin and Mihailovgrad), which is characterized at that time with a definite agrarian character, the migrational flows are directed not only towards Sofia and Pernik, but towards the Rhodopes coal-basin as well. A great number of people migrate here from south-west Bulgaria and from the Upper Thracian Plain. Migrational flows take place from South-West Bulgaria and from other parts towards north-east Bulgaria, and precisely towards the regions where a mass emigration of Turkish population to Turkey took place (1950–1951). Unfortunately we have no statistical information either about the mechanical growth or about the geography of the migrational movements.

During the 60's the changes that have taken place in the territorial distribution of the productive forces, the allocation of investments, the development of the mechanization in agriculture, etc. introduce certain changes in the geography of the migrational movements.

The city of Sofia continues to attract migrants from the whole country (regardless of the administrative limitations). Now part of these migrations are directed towards the villages of its surroundings which play a "spring-board" part for working and to living in the capital.

The data about the period 1961–1966 show that 74% of the settlers in the district of Sofia originate mainly from the neighbouring districts of Vidin, Mihailov-

grad and Vratza, Pleven, Pernik, Kyustendil and Blagoevgrad; 16% from the districts of Lovetch, Great Tirnovo, Haskovo and Kirdjali and the remaining 10% from other districts. A considerable number of settlers come from the district of Sofia into the city of Sofia and from the villages around the city. This tendency goes on during the next years as well. Considerably smaller is the migrational flow from the district of Pernik into the district of Sofia, but on the other hand it is very intensive towards the district centre of Pernik.

Typical for the 60's is the direction of the migrational flows towards the districts with the most rapid development of the productive forces and especially towards their district centres — the city of Sofia, Plovdiv, Stara Zagora, Varna, Rousse, Gabrovo. Bourgas and recently towards the districts of Smolyan and Lovetch.

The remaining districts are characterized by a negative migrational balance. Their district centres and their towns contribute to the out-flow of rural population. Besides the flows towards Sofia-city and the district of Sofia, there are migrations taking place from the districts in north-west Bulgaria (Vidin, Mihailovgrad and Vratza) towards the district of Pleven, from the district of Pleven towards the districts of Lovetch and Gabrovo, from the district of Great Tirnovo towards the district of Gabrovo. The basic migrational flows are directed from the districts of Silistra, Razgrad and Turgovishte towards the district of Rousse and those from the districts of Tolbukhin, Shumen and partly from Turgovishte and Silistra towards the district of Varna. The migrational flow from south-west Bulgaria and mainly from the district of Blagoevgrad is directed towards the districts of Kyustendil, Pazardzik and partly towards the district of Plovdiv. From the district of the Rhodopes (Kirdzali, Smolyan, Haskovo) the migrants move to the districts of Plovdiv and Stara Zagora and towards the district of Bourgas (the town of Bourgas). The migrational flows from south-east Bulgaria which originate mainly from the villages of the districts of Yambol and Sliven, are oriented towards the districts of Stara Zagora and Bourgas. From the rural areas of Strandja-Mountain the migrations are mainly towards the town of Bourgas.

The internal migrations and the stability of the direction of migrational flows have produced some definite changes in the territorial distribution of population in Bulgaria. Out-migration regions have been formed, typically agricultural in character or with a borderline or peripheral situation. Such regions are Trun and Kraishte, the Balkan Range (the parts of Belogradtchik, Berkovitza, Teteven, Troyan, Gabrovo, Drayanovo, Elena), the southern and borderline regions of the districts of Bourgas, Yambol, Kirdzali and Smolyan and some parts of the districts of Blagoevgrad and Kyustendil, the Balkan Range part and the Western part of the district of Sofia, Dobrudja and Ludogorieto, East Balkan Range.

INFLUENCE OF THE MIGRATION UPON THE NATURAL INCREASE

The trends in the geographical patterns migrations and the related territorial changes in the distribution of population, have a great influence upon the natural increase of population in Bulgaria and the factors on which it depends.

The migrations of the population towards cities and towns, as a constant process causes a gradual outflow of the rural population. The largest part of that migrational population is from the 20–30 age group. This results in a gradual decline of birth-rate and the natural increase in the villages from which the migrants come. Until 1965 the birth-rate in the rural areas was still higher

than that in towns (15.9‰; and 14.7‰ respectively). One can say that till the middle 60's the main source of human resources in Bulgaria is still the rural village. After 1966 the birth-rate in the towns surpasses that of rural areas, and it is characterized by a definite tendency of increase, while in the villages it diminishes (the birth-rate in towns was 15.5‰ in 1966 and 16.8‰ in 1972; in the rural areas — 14.4‰ and 13.6‰, respectively).

The prevailing migration flows from the villages into the towns lead to the worsening of the age structure in the rural areas, particularly in the Vidin, Mihailovgrad, Vratza, Pleven, Lovetch, Gabrovo and Great Tirnovo districts, i.e., in those districts from which the biggest outflow of rural population occurs.

The distortion of the age structure in the villages is also reflected in a gradual increase of death-rate in the rural areas after 1964 (in 1964 — 9.1‰, 1972 — 12.9‰). At the same time the natural growth in the rural areas shows a strong decline. While in the period 1959–1961 the natural growth in the rural areas was near to the average for the country as a whole, it has started to decline, more recently.

These changes in birth-rate, death rate and the natural growth in urban and rural areas in Bulgaria are connected with the dominating tendency of the migrational movements from the rural towards the urban settlements. The tendencies which determine the natural growth indices are connected with the territorial pattern of migrations. In those territories which are characterized by a constant outflow of the population and its migration to other regions, one can notice a strongly diminished and still diminishing birth-rate and a rapid increase of the death-rate. There are settlements characterized by an absolute population decline. Between 1946–1972 the number of rural settlements in Bulgaria declined by 737 (including 226 villages and 509 hamlets). This figure accounts for resettlement schemes connected with dam-building, as well as the annexation of territory by towns.

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AMENITY AREAS IN THE NOTTINGHAMSHIRE AND DERBYSHIRE SUB-REGIONAL UNIT

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The advent of a Labour Government in 1964 initiated a new phase of economic and social planning in Great Britain. The following year the government issued a 5-Year National Plan which, however, was soon abandoned; it set up a Department of Economic Affairs and, in order to achieve regional co-ordination, established a series of Economic Planning Councils, consisting of members appointed by the government, including industrialists, trade unionists, business men and academics. These were supported by Economic Planning Boards composed of civil servants from all the relevant Departments. The regions, ten in number, were similar to the old Standard Regions which had been used for statistical purposes since the Second World War. The East Midlands (formerly called North Midlands) was one of these, but it was reduced in extent by the transference of north Lincolnshire to the Yorkshire and Humberside Region and by the Soke of Peterborough to East Anglia.

Incidentally the system of planning was based largely on that practised in France, another West European capitalist country with a 'mixed' economy, i.e., with both public and private sectors.[1] Here it should be remembered that as far back as 1947, a geographer, J. F. Gravier, in his work entitled *Paris et le desert francais* first sought to convince the French people that the strength of the economy did not rest wholly on the historical factor but also on modern technological changes and innovations. Moreover, in 1964 an illuminating paper by Prof. K. Dziewoński [2] was published in Poland in which the author stated that one of the difficulties preventing a global picture of economic regions was the lack of properly defined concepts and theories of socio-economic spatial phenomena. This is certainly one of the contrasts between the French and British systems.

For purposes of closer study the East Midlands Economic Council divided its Region into the following sub-regional units, following county boundaries: Nottinghamshire and Derbyshire (without the Derbyshire portion of the Peak National Park); Leicestershire; Northamptonshire; the Eastern Lowlands. The first of these, Notts. and Derbys., contains, in a belt of less than 30 km wide, running on either side of the county boundary, nearly 50% of the population of the Region, actively engaged in coalmining, quarrying and manufacturing (engineering, chemicals, knitwear and lace) and is the most intensively urbanised part. Within this sub-region however, changes were apparent. Particularly in Derbys.

[1] J. R. Boudeville, *Problems of Regional Economic Planning*, Edinburgh 1966.
[2] K. Dziewoński, Economic Regionalization, *Geogr. Pol.*, 1, Warsaw 1964.

in the Erewash and Rother valleys, the basic industry of ironworking had declined sharply and coalmining had moved from west to east into central Nottinghamshire, leaving disused collieries and spoil banks amid much dereliction of land, so that recovery was debatable.

Following the attempts of all post-war governments to wrestle with the problem of persistent unemployment, the Labour Government embarked upon new measures. By the Industrial Development Act 1966, the Development Areas were more widely defined and a little later on Special Development Areas, receiving even more generous State aid, were established within these. There were also intermediate areas outside the Development Areas where unemployment was growing, especially in coalmining and other basic industries. One of these was situated in the East Midlands, as just mentioned, located in the Erewash valley. Earlier the Derbyshire County Council, the local planning authority, had envisaged the redevelopment of this area including the growth of Alfreton as an expanded town with new industries.[3] In 1969, Sir Joseph Hunt reported fully on the Intermediate Areas and they were added to the Development Areas, though not qualifying for the same amount of aid. Thus it came about that the East Midlands, formerly considered as a prosperous region, with lower unemployment than elsewhere, became recognised as a region with at least one area of economic vulnerability. In common with other regions the East Midlands Economic Planning Council in 1966 published 'The East Midlands Study', a survey with future planning recommendations, and in 1969 'Opportunity in the East Midlands', a sequal to the first report, showing how the work in planning was progressing and how problems were being faced.[4] In both publications refrence was made to the necessity for a detailed study of the Notts.–Derbys. Sub-Region, though in the second this was claimed to have been started. Indeed it was published late in 1969, just after the Hunt Committee had accepted the Erewash Valley Intermediate Area.[5]

In 1970 a Department of the Environment was formed by the Government, bringing Planning, Housing and Transport under a single organisation, and at the same time providing an improved means of securing an evaluation of environmental factors and establishing the concepts of environmental quality. This was a notable step forward especially as there had been for years a growing feeling in professional and public opinion that, with increasing living standards and leisure, both quantity and quality of environment should be included in all prospective planning.[6] In his famous report on 'Traffic in Towns' Colin Buchanan first raised the question of how environmental costs in any transport project might be sought and this was a question dating from 1963 which was accepted by the new planning machinery. This provides an opportunity to review the numerous types of land which for one reason or another are scheduled as amenity areas set aside from various other forms of development and over which the Department of the Environment has control.[7] Almost all of them, except for

[3]K. C. Edwards, *et al.*, Survey of the Derbyshire Coalfield, University of Nottingham, 1963.

[4]*The East Midlands Study* (E. M. Reg. Econ. Planning Committee), H.M.S.O. 1966; *Opportunity in the East Midlands* (E.M. Reg. Econ. Planning Committee), H.M.S.O. 1969.

[5]A. Thorburn, *et al.*, *Nottinghamshire and Derbyshire Sub-Regional Study*, Alfreton, Derbys. 1969.

[6]Landscape Evaluation (various authors), *Trans. Inst. Brit. Geogr.*, 66, 1975, pp. 119–161.

[7]I. G. Simmons, Conservation at Regional and National Scales, in: J. A. Dawson and J. C. Doornkamp, *Evaluating the Human Environment*, London 1973.

coastal locations, are found within the boundaries of the Notts. and Derbys. Sub-Region.

The first of these, though bordering but not within the Sub-Region, is the Peak District National Park. This was formed under the National Parks and Access to the Countryside Act of 1949; it was designated in 1950, and though the earliest, it was quickly followed by the Lake District and Snowdonia National Parks. There are now ten National Parks in England and Wales and they are entirely of the post-Second War period, whereas in America and the rest of Europe they are far older. In Poland, for example, a portion of the Białowieża Forest was established in 1921 as a (52 ha) reserve containing bison and elk, and later became a National Park. In the High Tatra a national park was formed in 1932; in fact it was an international park since this group of alpine mountains was shared by agreement with the neighbouring state of Czechoslovakia, "estab-

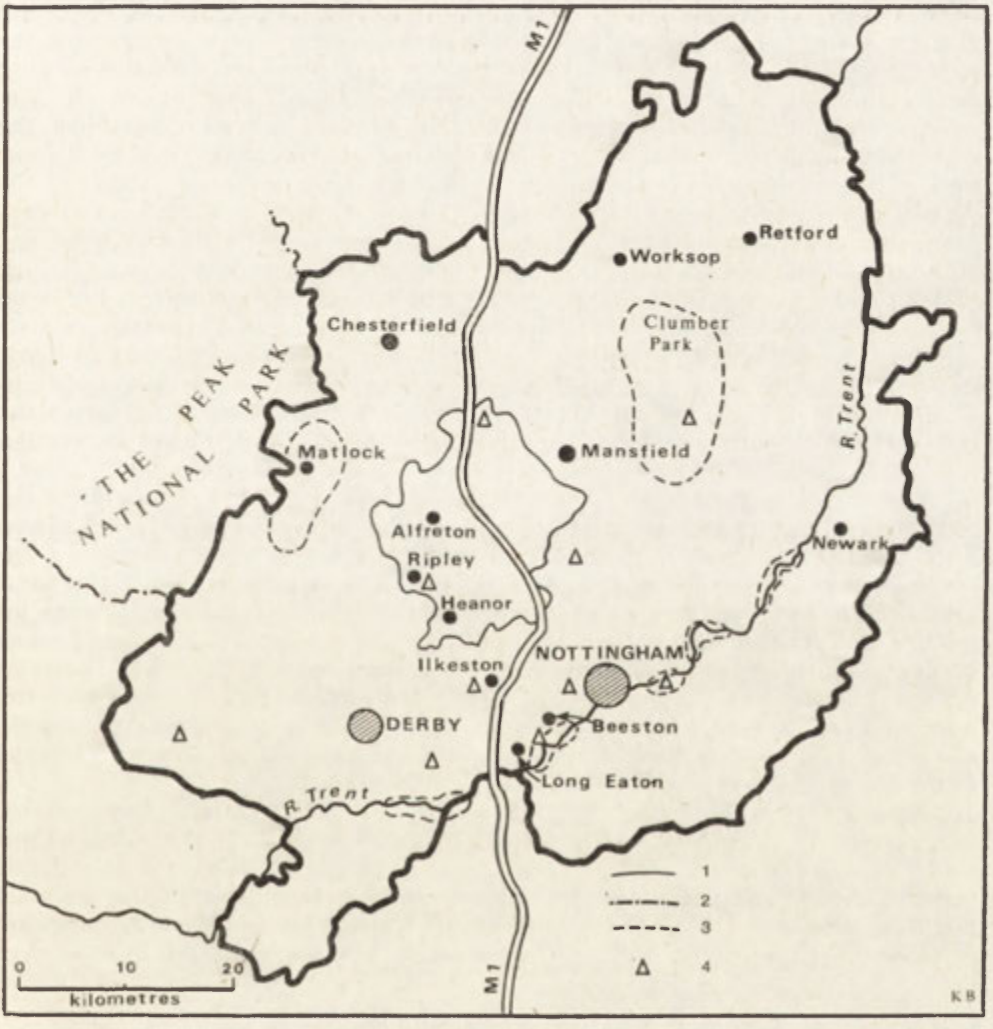

Fig. 1. Nottinghamshire and Derbyshire Sub-Region

1 — intermediate area; 2 — national park; 3 — regional park; 4 — country park and amenity areas

lishing a precedent for settling a difficult frontier situation in a truly civilised manner".[8] The Peak District is one of the Pennine uplands which give rise to exceptionally attractive scenery and for over two centuries has been visited by the curious, by those seeking good health in the fresh upland air, and by holiday-makers. During the industrial period it has seen the rise of large cities and smaller manufacturing towns around the margins: Manchester and the Lancashire cotton towns; the woollen towns of the West Riding of Yorkshire; Sheffield, and Nottingham and Derby. Quite apart from this surrounding belt of urban centres, the Peak is the nearest of the national parks to the metropolis, e.g., by the M1 (London to Leeds) it is only 240 km (150 miles) or three hours' travelling.[9] Some 5 million people visit the Park each year.

It has been claimed that these reservations are neither "national" nor "parks" and in one sense this is correct. They consist of country, much of which is not park-like and they are not national, either in land ownership or in their administration. Little of their territory is publicly owned and in the Peak District most of the moorland and farmland is owned by large landowners, including several well-known ducal families. There is, however, virtually nothing feudal about these private owners. Nevertheless this is one reason why the existence of national parks was so long delayed. In a democratic country the movement in support of them had to await popular opinion. Thus in Britain national parks have arisen without the nationalization of land. About 43,000 people live in the Peak National Park. They are engaged in farming, forestry, quarrying and rural industry, and their occupations must be allowed to persist and indeed to develop. Comparatively large towns, Buxton (20,000) and Matlock (20,000) were not included in the Park when it was first delimited. Likewise near Buxton are large quarries in high-grade Carboniferous Limestone, including the Tunstead Quarry, reputed to be the largest in Western Europe, presenting a double-face well over a kilometre in length. The site is comparable in size with the Tarnobrzeg sulphur workings in Poland. It lies so close to the National Park boundary that it constitutes the most serious threat in relation to future development.

A further function of the Peak National Park, as with the others, is the continued use of its streams to provide water supply for the surrounding cities. This has long been accomplished by damming some of the streams to form artificial lakes, a feature which adds greatly to the attractiveness of the scenery. Besides the natural landscape with its rare plants and trees in some localities, and its rare birds, there are the time-honoured relics of former human occupation, prehistoric sites, ancient field systems, bounded by low, uncemented stone walls, and early industrial sites which are of interest to a growing number of observers.[10] On the other hand, no new large-scale developments are permitted. In 1966 the Peak District was the first National Park in Europe to be awarded a diploma by the Council of Europe.

Though far smaller than the National Parks and sometimes lying within their territories, are National Nature Reserves belonging to the Nature Conservancy, also founded in 1949. These areas have been chosen to protect landforms, habitats and plant and animal associations, together with recreational facilities where possible. The Attenborough Nature Reserve near Nottingham is an example, and the Nature Concervancy has surveyed other sites near

[8]R. Dyboski, *Poland*, London 1933, p. 209.
[9]K. C. Edwards, *The Peak District*, London 1973, pp. 16–25; 217–232.
[10]D. Lowenthal and H. C. Prince, The English Landscape, *Geogr. Rev.*, 54, 1964, pp. 309–346; English Landscape Tastes, *Geogr. Rev.*, 55, 1965, pp. 186–222.

Matlock and in central Nottinghamshire as worthy of future recommendations but, in general, areas of high ecological value are infrequent in the Sub-Region for the original natural character of the land has been destroyed by human interference. Land ownership is as varied as in the National Parks and so far there are nearly 120,000 ha safeguarded in the country.[11]

In 1968 the Countryside Act initiated a Countryside Commission, replacing the National Parks Commission of 1949, which gave greater powers to Local Authorities, not only for National Parks but for establishing Regional and Country Parks. Three areas within Nottinghamshire and Derbyshire have been selected for Regional Parks but so far they have to await the official approval of the County Structure Plans. These are firstly, the hilly country around Matlock on the east side (though this is immediately adjacent to the Peak District National Park); secondly, the Sherwood Forest area in central Nottinghamshire; and thirdly, much of the Trent Valley between the confluence of the Dove and Newark. This last would be of interrupted rather than continuous extent because of existing forms of urban and industrial development. Another feature of this long-term development would be the connection between towns and industrial districts and the Regional Parks by Greenways, or strips of land traversed by road and footpath, kept free from obtrusive or unpleasant buildings.

Country Parks, of restricted size, are also for the recreative and cultural enjoyment of the public and they are located so as to be readily accessible to cities and densely peopled areas. To the east of Derby, within easy reach of Nottingham, Long Eaton and Ilkeston, is the Elvaston Country Park provided jointly by the Derbyshire County Council and Derby Corporation in 1970.[12] It consists of 80 ha of woods and gardens surrounding Elvaston Castle, built in 1817 on the site of an earlier structure dating from the seventeenth century, and was one of the first Country Parks to be opened.[13] On the fringe of the Erewash Valley, serving the mining and manufacturing area, is the Shipley Country Park near Ilkeston. It is an example of the reconditioned use of an old mining landscape still in the initial stages of organization. Another projected Country Park is the estate of Hardwick, where the great Elizabethan house, Hardwick Hall, stands high on the west-facing Permian escarpment between Mansfield and Chesterfield on the Derbyshire-Nottinghamshire border.[14] Yet another proposal for a similar sort of park is that to create a Railway Museum, using a section of disused line near Ripley, just off the main Midland line which passes along the Erewash Valley.[15] The surface workings of an old colliery have already been reclaimed as part of the museum site. This recreative and educational venture is appropriately located amid the still-active Butterley Works where in 1851 the ironwork for the great roof of St. Pancras Station, the London terminus of the line was made, and subsequently rolling-stock and other railway equipment. Not far away, at Crich, there exists a Tramway Museum formed by a society of enthusiasts, with and old quarry as its quarters. The siting of the Railway Museum in the heart of Derbyshire's early ironworking district is recognisably appropriate, but tramways are

[11] *First Report of the Nature Conservancy Council*, H.M.S.O., London 1975.

[12] Before the changes recommended by the Local Government Boundary Commission in 1972.

[13] J.A. Patmore, *Land and Leisure*, London 1970, pp. 235–241.

[14] *Derbyshire Structure Plan (Topic Reports)*, Derbyshire County Council, Matlock 1975.

[15] H. Cowley, *Countryside Projects* (Derbys. County Leisure Committee), Matlock 1974.

memorable on account of their conversion to iron rails by Benjamin Outram, the Butterley Company's engineer (1792) who gave part of his name to the use of one of the common nouns in the English language. It is perhaps regrettable that the two museums cannot be located nearer to one another.

In Nottinghamshire, the County Council has acquired the grounds of Rufford Abbey (60 ha) as a Country Park. Its central position within the county makes it more or less equidistant from Nottingham, Mansfield, Newark, Retford and Worksop, and it is in the heart of the newer mining settlements like Ollerton, Bilsthorpe, Edwinstowe, Calverton and Bevercotes. Closer to Nottingham itself are two contrasted amenity sites along the Trent valley. Downstream, beyond the city, is the Colwick and Holme Pierrepont Country Park. At Holme Pierrepont the County Council and the East Midland Sports Council have promoted a National Water Sports Centre, of which the leading feature is an enclosed water stretch 2215 m × 135 m providing six lanes for 2000 m races (rowing, canoe-ing and water ski-ing). Alternative water for sailing is available on the Trent itself. This is so far the only large Water Sports Centre in Great Britain, complying with Olympic Standards. In 1973 the International Rowing Championships were held there. The site is based on a number of disused gravel pits partly filled with water.[16]

Upstream from the city, between Beeston and Long Eaton, is another group of former gravel-workings. Many of them are worked-out and flooded; they have been left in a wild state with reeds, willows and other aquatic plants, and a bird sanctuary has been established. It is known as the Attenborough Nature Reserve. It is equipped with public footpaths and is administered by the landowners, the Trent Gravels Limited, and the Notts. Trust for Nature Conservation.

The public parks in our old towns were largely a matter of nineteenth century development and the more recent demand for open-space outside the built-up area is a later product of urbanisation.[17] The first park in any town was actually in Derby (1840), the gift of Joseph Strutt, son of the textile inventor, and was called the *Arboretum*, a collection of trees and shrubs. It was designed by the well-known landscape architect J. C. Loudon. Not long afterwards another park appeared in Nottingham (1852) and it was also called the *Arboretum*. Since that time parks, gardens, and recreation grounds have been added as towns have developed. In 1924 the Nottingham Corporation bought Wollaton Hall, an outstanding Elizabethan mansion standing in 320 ha of park-like grounds. This was divided into land for a housing estate, a golf course, and the mansion which became a city museum, surrounded by 200 ha of open-space. Later, in 1931, a wealthy citizen presented to Nottingham Corporation, Newstead Priory (132 ha). The house, with much of its ecclesiastical origin surviving, had been the home of Lord Byron the poet, in the early nineteenth century. It lies off the road between the city and Mansfield and this historic site was opened to the public who enjoyed the precincts and the ornamental gardens. In these days of environmental conservation it is greatly appreciated as a quiet outdoor place to visit.

Lastly are the properties of the National Trust which are scattered over the country including the Notts.-Derbys. Sub-Region. These recall the powerful pleading of Octavia Hill and others who voiced the reaction against Victorian

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[16]East Midlands Sports Council, *Recreation in the East Midlands, an initial appraisal of major facilities*, Nottingham 1967.

[17]J. L. and B. Hammond, *The Bleak Age* (Ch. V. The State of the Towns, and Ch. VI. The Loss of Playgrounds), London 1947.

materialism towards the close of the nineteenth century. A public company, not operating for profit, was founded in 1895, called the National Trust for Places of Historic Interest and Natural Beauty. This appealed to a small but dedicated section of the community whose support enabled it to acquire sites and to safeguard them in the public interest. The widening range of activities of the National Trust make it the greatest conservation and preservation society in Great Britain, and today it is the third largest landowner in the country, after the Crown and the Forestry Commission. It owns some 160,000 ha of land. In the Peak National Park the Trust has over 400 ha of primeval ashwoods (*Fraxinus excelsior*) in Dovedale, and 3200 ha of mixed forest in Hope Woodlands. A recent acquisition is Sudbury Hall, a Jacobean/Caroline house, the former seat of the Vernon family, now open to the public. In Nottinghamshire it owns part of the Clumber estate in Sherwood Forest. Here the residence of the Duke of Newcastle was finally demolished in 1938 and the vast wooded grounds, in which there is an impressive avenue of lime trees 5 km long, are open to the public. It is a valuable possession of the Trust.

In a modern industrial society the demands of the community for outdoor recreation and other leisure pursuits, including educational and cultural activities, promotes a conflict of interest with the various forms of agriculture and other uses of land with which the planning process must contend. This is especially the case in a small country where the population continues to rise. The evolutionary system as found in Britain, and as the examples in the Notts.-Derbys. Sub-Region show, indicates that many sections of land, large and small, are obtained from government departments, from agencies, public and private, and from individuals, so that before long there must be some degree of rationalization undertaken by the government to bring this proliferation into some sort of order. Nevertheless, the United Nations Conference on the Human Environment held at Stockholm in 1972 did much to stimulate further effort at understanding environmental problems. From the standpoint of its own population the conference showed that in Britain amenity areas of all types were either in being or under consideration, and even experiments in the control of air pollution (Clean Air Act, 1956) were advanced.

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SPATIAL DISTRIBUTION OF INDUSTRIAL EMPLOYMENT IN SPAIN

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With this work we hope to attain three objectives. First, the spatial analysis of transformations which have taken place within the employment structure — with special attention given to industrial employment — during the eleven-year period between 1962 and 1973. Second, knowledge of regional, subregional and provincial tendencies with regard to dynamism, stagnation or retrocession. Third, the cartographical analysis of the different models of spatial location with respect to employment in Spain.*

With these ends in mind we have used several documentary sources. The studies dealing with the distribution of provincial income [1] have enabled us to analyze the evolution of absolute and active population employed in the three classical sectors, Primary, Secondary — or active industrial population — and Tertiary, which we refer to also as active service population. We have not taken into account for these purposes the construction sector. The last *Directorio* [2] published classifies all industrial firms with 50 workers or more; from this source we have been able to draw a map (Fig. 2) which shows the location of industrial employment at the municipal level, achieving thus the highest degree of detail possible in a study which purports to analyze the whole country.

1. EVOLUTION OF ABSOLUTE AND ACTIVE POPULATION IN SPAIN

The utilization of the cross-section 1962–1973 is interesting because the first year represents the consolidation of Spain's economic development which was initiated in 1959 with the well-known Stabilization Measures, while 1973 represents the end of this first development phase.

1.1. GREAT SPATIAL UNITS

Figure 1 shows the spatial divisions which we distinguish for this study, using as our starting point the structure of urban systems in Spain.[3] In each system, as can be seen by the map (Fig. 2), we have separated those provinces

*We wish to thank our collaborator Stephen Pereira who has elaborated the data used in this study, and who has drawn the map (Fig. 2). Alban d'Entremont translated the article from the Spanish original.

[1] Banco de Bilbao, *Renta nacional de España y su distribución provincial, 1973*, Bilbao 1975, 227 pp.; Banco de Bilbao, *Renta nacional de España y su distribución provincial, 1962*, Bilbao 1965, 150 pp.

[2] Organización Nacional Sindical, *Directorio de empresas y trabajadores*, Madrid, December 1974.

[3] Ferrer, M., *Processes and patterns of urbanisation in Spain*. Answer to a questionnaire by Prof. A. E. Smailes, prepared for a Reader destined to the International Geographic Congress of Moscow.

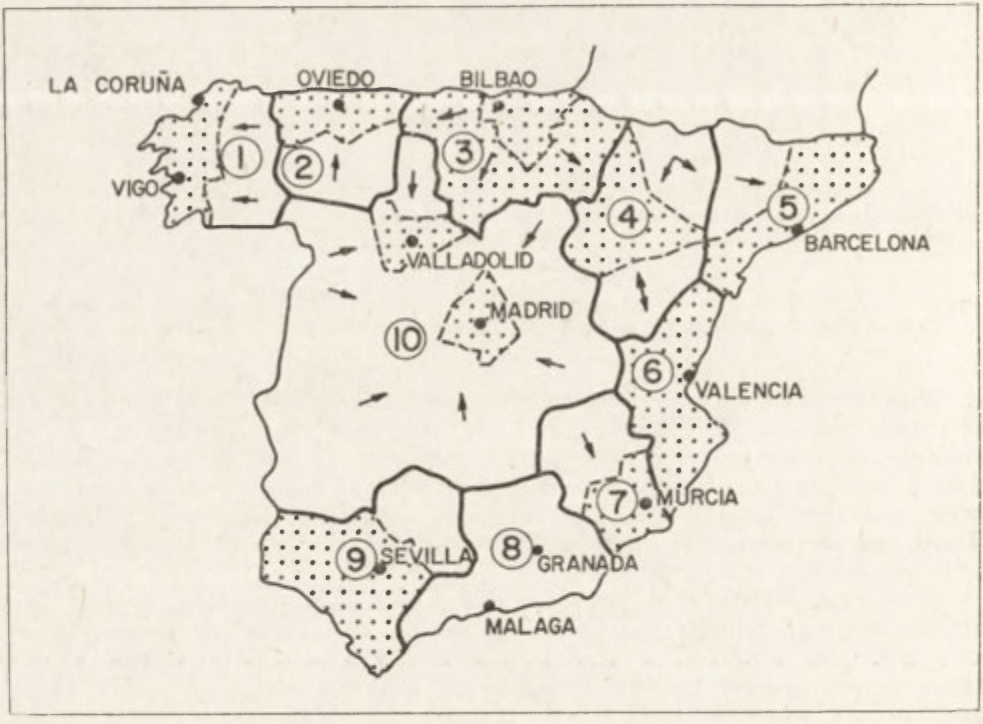

Fig. 1. Urban systems and industrial provinces in Spain
As may be observed, the urban systems arrange themselves round the periphery of the Iberian Peninsula. The great Interior Space is dominated by Madrid, the nation's capital, the centralization effect of which hampers the structure and vertebration of the area. Not even Valladolid, the only existing regional metropolis, has managed to integrate its surrounding provinces coherently. The arrows indicate the metropolises and subsystems which organize spaces integrated by tertiary flows; in the Basque Country and Periphery the arrows have been drawn in the opposite direction, as the system is a policentral one

1 — Galicia, 2 — Asturias-León, 3 — Basque Country and Periphery, 4 — Aragón and Zaragoza 5 — Cataluña, 6 — Levante, 7 — Murcia-Albacete, 8 — East Andalucia, 9 — West Andalucia, 10 — Interior

having the greatest industrial densities.[4] With the purpose of grouping together data about the provinces, and of presenting the results in conformity with the existence of urban systems which can be arranged in large regional spaces, we have distinguished within the Iberian Peninsula three large territories. In the first place we make reference to **Peripherical Axes** which are composed of several systems and subsystems which are integrated by secondary and tertiary flows: the Cantabrian Axis, including Asturias, the Basque Country and its Periphery, the Ebro Valley with Zaragoza which unites it with the aforementioned axes, and the Litoral Gallician Axis. Thus we have continuous peripherical axes, formed by the Litoral Cántabro-Atlantic and Mediterranean Catalano-Levantine provinces, soldered together by the South-eastern Basque Provinces and Zaragoza. In the second place, we distinguish between these axes

[4]See the last work of Alcaide Inchausti, J., *La distribución provincial de la renta (evolución temporal y sectorial)*. Research paper presented at the "Jornadas Sociales del Valle de los Caídos", 1975.

and another large territory comprised of **Interior Spaces** which occupy a vast peninsular area and which are characterized by economic underdevelopment and by lack of vertebration. In this area the provinces of Madrid and Valladolid, which boast the nation's capital and an important provincial capital respectively, stand out as veritable islands in this economically depressed territory. Both these provinces receive separate treatment in this work, for obvious reasons. In this great territory, apart from the provinces of the interior, we have included as well Lugo, Orense, Huesca, Lerida and Teruel, for the simple reason that these provinces function as underdeveloped areas (providing raw materials, energy and agricultural products) with respect to the systems to which they belong. A third territory considered is **Andalucia**, in Southern Spain, well-known as being over-urbanized, overpopulated and underdeveloped. At the present moment this region is undergoing a process of development and of tertiary integration, both these phenomena being more advanced in Western Andalucia than in Eastern Andalucia.

1.2. EVOLUTION OF ABSOLUTE POPULATION AND OF PRODUCTIVE SECTORS

The demographic behaviour of the three territorial divisions mentioned has been characterized by notable differences. In fact, the Peripherical Axes have experienced a substantial population increase, concretely 20.3%. Andalucia in contrast has suffered a slight demographic retrocession. The most spectacular phenomenon, however, has been the rate of depopulation in the Inter-

TABLE 1. Evolution of population

	1962	1973	%
Peripherical Axes			
Galicia Occidental	1,714,397	1,796,012	4.7
Asturias	1,011,619	1,000,565	0.0
Pais Vasco	1,455,114	1,985,199	36.4
Periferia	1,468,157	1,549,120	5.5
Zaragoza	680,120	784,529	15.3
Cataluña Litoral	3,794,091	5,046,073	33.0
Levante	2,570,221	3,200,893	24.5
Murcia	820,687	857,989	4.5
Total	13,514,406	16,270,380	20.3
Andalucía			
Andalucía Occidental	3,394,024	3,382,623	-0.4
Andalucía Oriental	2,680,283	2,655,762	-0.9
Total	6,064,307	6,038,385	-0.6
Interior Spaces			
Madrid	2,735,931	4,029,906	47.3
Valladolid	369,423	423,818	14.7
Remaining Int. Spaces	7,218,552	6,165,987	-14.6
Total	10,323,903	10,619,711	2.8
Baleares	453,278	579,981	27.9
Canarias	990,998	1,230,844	24.2
Total	1,444,276	1,810,825	25.3
TOTAL	31,356,898	34,739,301	10.7

ior Spaces, where the figures for 1973 are down 14.6% with regard to the effectives on hand in 1962.

Such changes are completely new with respect to previous decades.[5] In fact, until 1960, the population of Andalucia had followed a constant increment curve, and the population of the Interior Spaces had also grown, although very modestly. In contrast, however, the rate of increase in the Peripherical Axes had been inferior to the one experienced during the eleven-year period which we are studying.

The recent transformations with regard to demographic tendencies have been accompanied by profound changes with respect to the evolution and structure of active population. As a phenomenon which has affected the whole country, we wish to point out the losses of Active Agrarian Population. Spain, which in 1962 had 4,773,361 active agricultural workers, by 1973 had but 3,389,099 which is to say that in that period almost a million and a half workers abandoned their farms. Translating these figures into terms of space, we find in reality no great differences between the three territories distinguished: the highest percentage of loss is to be found, as expected, in the Interior Spaces (31.5%) and the lowest in the Peripherical Axes (24.8%), with Andalucia occupying the middle position with a loss of 29.5% which also corresponds to the national average.

Much more significant are the changes in Active Industrial Population which has undergone sensible increases not only in the Peripherical Axes, but also in both Andalusian regions. In the Interior Spaces, however, the Active Industrial Population has remained practically stabilized, with a slight loss

TABLE 2a. Evolution of sectorial employment between 1962 and 1973

	Primary					
	1962	1973	%			
Periphery	1,793,562	1,348,372	-24.8			
Andalucía	991,375	699,406	-29.5			
Interior spaces	1,744,251	1,195,256	-31.5			
	Secondary			Tertiary		
	1962	1973	%	1962	1973	%
Periphery	2,272,351	2,851,733	25.5	1,727,307	2,326,286	34.6
Andalucía	475,163	586,620	26.1	549,157	820,031	49.3
Madrid	436,826	591,330	35.3	646,381	914,628	41.5
Valladolid	35,536	58,085	63.4	51,124	60,178	19.4
Remaining Int. Spaces	559,912	551,254	-1.5	570,664	690,359	20.9
Baleares	71,990	76,553	6.3	82,049	111,768	36.2
Canarias	63,516	119,007	87.3	91,776	207,204	125.8

[5]See, for example, Garcia Barbancho, A., *Las migraciones interiores españolas. Estudio cuantitativo desde 1900*, Madrid, Instituto de Desarrollo Económico, 1967, 128 pp. plus Statistical Appendix. See also, by the same author, *Las migraciones interiores españolas en 1961–1970*. Instituto de Estudios Económicos, 1975, 119 pp. plus Statistical Appendix. And also Casas Torres, J. M. *et al.*, *Mapas de densidades y de aumento y disminución de la población. Anos 1900–1950–1960–1965*, Madrid, C.E.C.A., various dates of publication.

of 1.5% only. This last number acquires much more significance, however, when we consider that Spain on the whole had an increase of 15.8% during the period we are studying.

No less relevant nor expressive are the changes affecting Active Service Population. In the first place, we wish to point out the fact that the last few years have been more decisive for the tertiary sector than for the secondary one. Thus the percentage of increase of Active Service Population has been no less than 37.5%, which means that during the time period under study the process of tertiary development has been more intense than the process of industrialization. This tertiary progress has affected the three territories in different manners. Hence, Andalucia occupies first place in this respect with an index of growth of 49.3%, which is superior to that of the Peripherical Axes (34.6%) and of the Interior Spaces (20.9%). This last figure denotes a modest increase, but it is nevertheless very interesting to note that the tertiary sector is the only dynamic sector in the Interior Spaces, which happens to be the largest of the three territories in the country.

Evidently, the importance of the growth of services is related to a three-dimensional fact. These last years signify the incorporation of a consumer society in Spain, which has led to a substantial improvement of urban services and to the subsequent growth in the number of people active in this sector. Spain, on the other hand, has embarked upon an urbanization process which has overtaken and surpassed the industrialization process also underway.[6] Finally, we must not forget that tourism has accounted for a considerable increase in demand for active tertiary population. It is not strange, then, in relation with these last two factors, that Andalucia should be, at the same time, a highly urbanized region and a prime focal point of tourist attraction. This explains the exceptional rank which Andalucia occupies as far as rate of increase is concerned. The only other Spanish region which has enjoyed a faster growth in this respect has been the Canary Islands, with a degree of service growth and of industrialization related to services which are both superior to the growth rates to be found in Andalucia: an 87.3% increase with regard to Active Industrial Population, and an increase of 125% with regard to Active Service Population. Both these increases are no doubt due fundamentally to tourism.

Finally — and what we point out here by way of summary is not the result of the evolution which has taken place during the eleven-year period only, but also the result of previous decades — we wish to draw attention to the great spatial disparities which affect not only the population distribution[7] but also the distribution of industrial employment. The Peripherical Axes, which account for a quarter of the total surface area of the country, account for practically one-half the nation's population (47.1%) and industrial labour force (51.3%). In strong contrast with this, the Interior Spaces, which account for exactly half the nation's total surface area, contain but 17.3% of the nation's population and only 10.4% of its industrial labour force. Andalucia, for its part, once again occupies the middle position, with 17% of the total land surface area, 17.5% of the population and 8.3% of the industrial contingent.

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[6] Ferrer, M., *El proceso de superpoblación urbana*, Madrid, Confederación Española de Cajas de Ahorros, 1972, 280 pp.

[7] Perpiña Grau, R., *Teoría estructural y estructurante de la población de España (1900–1950)*, Madrid, Consejo Superior de Investigaciones Científicas, 1954, 210 pp. Prof. Perpiña Grau was the first author to point out the unequal distribution of the Spanish population.

2. CHANGES AND TENDENCIES AT THE REGIONAL AND PROVINCIAL LEVELS

Evidently, the indicators which we have used to define the three "Spains" permit us in the last instance to define the Peripherical Axes as the nation's dynamic area *par excellence*, Andalucia as an area of moderate growth and develcpment, and the Interior Spaces as a depressed or stagnated area. A more detailed analysis, however, of the regional and provincial components of the three territories allows us to point out very important nuances which lead us to a more operative regional classification which at the same time conforms more truly to the country's spatial reality.

Until the last few years of the 1950's, the location and development of industry in Spain was strictly confined to the Catalan coast, the Northern Basque Subsystem and Asturias. These are the pioneer focal points of the country's industrialization process, the evolution of which between 1962 and 1973 has taken place under the same sign of growth and expansion in the case of Cataluña and the Basque Provinces, but under a sign of stagnation in the case of Asturias. Both the Basque Provinces and Cataluña have reached the typical stages characteristic of industrial societies, as can be seen by the distribution of active population per thousand inhabitants: minimal number of agrarian population, high percentages of industrial population, and a lower figure with respect to service population. Asturias on the other hand, due to a crisis in its coal-mining industry and its failure to industrialize properly,[8] maintains a high proportion of agrarian population still, which is quite superior to the national average.

Levante represents the incorporation of a new region to the industrial development of Spain, produced precisely during the eleven-year period under consideration.[9] Hence, from the starting point of a basically agrarian economic structure, the region has achieved a new development stage, in which the weight of industry and services is naturally notably superior to that of the previous stage. Logically, a change of such magnitude would not have been possible without the presence of artisans and of a semi-modern industry at the time of the initiation of industrial development; these were well linked to exterior markets, relatively dispersed, and the region enjoyed as well the support provided by an intensive and commercialized agriculture and by a flourishing tourist trade. At the present moment the importance of the food processing sector is still great (30.2%) but it is to be expected that the metallurgical sector (22.5%) will undergo a rapid growth in the near future, due to the present establishment of a large siderurgical plant and of an important automobile plant which will alter considerably both the sectorial structure and the industrial density. *Murcia* can be considered as the continuation of this phenomenon to the south, and as an example of the traditional levantine economic structure as well (food processing and modernized craftsmanship), in a similar agrarian milieu and with a very promising tourist trade. Hence the changes undergone with regard to the employment structure, as well as demographic transitions in recent years away from retrocession towards pro-

[8] With regard to the Asturian crisis, see, for example, Ferrer, M., Les problèmes économiques du Nord de l'Espagne: Asturias, Bordeaux-Toulouse, *Rev. Géogr. Pyrénées et du Sud-Ouest*, Octobre-Décembre, 1975. See also Precedo, A., Galicia: red urbana y desarrollo regional, Madrid, *Rev. de la Real Sociedad Geográfica* (in print).

[9] See, for example, Pérez Casado, R., Consideraciones en torno a la industrialización valenciana, in: *Localización económica y desarrollo regional*, Servicio de Estudios del Banco Urquijo, Ponencias, 10° Aniversario, Vol. 1 and 2, Barcelona 1975, pp. 343–350.

TABLE 2b. Evolution of sectoral employment between 1962 and 1973

	Primary				Secondary				Tertiary				Total			
	1962	%	1973	%	1962	%	1973	%	1962	%	1973	%	1962	%	1973	%
Galicia Occidental	450,663	9.4	392,407	11.6	140,366	3.6	212,693	4.4	119,352	3.2	225,831	4.4	710,381	5.7	830,931	6.2
Asturias	165,514	3.5	142,011	4.2	172,432	4.4	149,151	3.9	99,533	2.7	135,438	2.8	437,479	3.5	426,600	3.2
Pais Vasco	105,005	2.3	72,664	2.1	349,111	8.9	421,708	8.7	215,749	5.8	275,507	5.3	669,865	5.4	768,879	5.8
Periferia	214,545	4.5	196,328	5.8	199,890	5.1	220,053	4.6	177,188	4.8	194,628	3.8	591,627	4.8	611,009	4.6
Zaragoza	102,181	2.1	63,296	1.9	94,051	2.4	114,453	2.4	92,922	2.5	115,941	2.3	289,154	2.3	293,690	2.2
Cataluña Litoral	211,666	4.4	153,009	4.9	883,524	22.6	1,107,808	22.1	617,873	16.6	776,822	15.1	1,713,063	14.0	2,037,639	15.2
Levante	425,243	8.9	249,711	7.4	351,324	9.0	512,650	10.5	328,611	8.8	477,761	9.3	1,105,178	8.9	1,240,122	9.2
Murcia	118,741	2.5	78,946	2.3	81,653	2.1	113,217	2.3	76,079	2.0	124,358	2.4	276,473	2.2	316,521	2.4
Andalucia Occidental	495,613	10.4	388,964	10.0	290,731	7.4	356,201	7.4	323,495	8.7	484,083	9.4	1,109,839	8.9	1,179,248	8.8
Andalucia Oriental	495,762	10.4	360,442	10.6	184,392	4.7	230,419	4.8	235,662	6.3	335,948	6.5	915,816	7.4	926,809	6.9
Madrid	70,812	1.5	39,843	1.2	436,826	11.2	591,330	12.2	646,381	17.3	914,628	17.8	1,154,019	9.3	1,545,801	11.5
Valladolid	54,545	1.1	34,481	1.0	35,536	0.9	58,085	1.2	51,121	1.3	60,178	1.2	141,202	1.1	152,744	1.7
Rest Interior	1,618,894	33.9	1,120,932	33.1	559,917	14.3	551,254	11.4	570,661	15.3	690,359	13.5	2,749,470	22.1	2,362,545	17.7
Baleares	73,158	1.5	44,231	1.3	71,990	1.8	76,553	1.6	82,049	2.2	111,768	2.2	227,197	1.8	232,552	1.7
Canarias	171,015	3.6	101,834	3.0	63,516	1.6	119,007	2.5	91,776	2.5	207,204	4.0	326,307	2.6	428,095	3.2
Total	4,773,461	100.0	3,389,099	100.0	3,915,254	100.0	4,834,582	100.0	3,728,455	100.0	5,130,454	100.0	12,417,070	100.0	13,354,135	100.0

gress, make us think that Murcia is just a step away from incorporating itself to the actual industrial structures of Levante.

Occidental Galicia, the Basque Periphery and Zaragoza are three examples also of recent incorporation into the country's industrial development process, although they are hampered by the lack of any previous industrial infrastructure, except for industries related to local resources (food industry in areas of clear primary sector domination), or of typical industries which cater to urban demand. Various factors have enabled the change experimented in recent years, which has been of a varied nature also due to the different dates of initiation of change in the different regions. Zaragoza, Navarra and Alava began their industrial take-off in the 1950's as a result of, respectively, the "spread effect" and the "bridge effect" between the Basque Country and Cataluña. Thanks to State and Provincial Development Plans, growth in these areas was consolidated in the 1960's. The State Policies also reached Occidental Galicia (first to the development focal points of La Coruña and Vigo, and after that to the Great Gallician Industrial Area) and the remainder of the Basque Periphery (Burgos and Logroño) except for Santander. At the present moment Occidental Galicia retains the highest proportion of Active Agrarian Population per thousand, in agreement with the rural overpopulation found there, although, as in the case of Murcia, demographic change is underway in this region also. In the Basque Periphery the indicators of active population are not sufficiently expressive of transformation because we are dealing here with two types of provinces: those which began their industrial take-off in the 1950's, and those which initiated it in the period we are studying,[10] meaning that these latter provinces are still in the beginning stages of the industrialization process.

It is interesting to note that in spite of being an economically and demographically depressed area, the Interior Spaces boast provincial capitals which have all grown at rates superior to 10% between 1960 and 1970,[11] and, in some cases, the growth rate has been substantially greater still: Guadalajara (49.9%), León (43.2%) and Salamanca (38.4%). Especially spectacular has been the rapid development of the tertiary sector in all these cities. Furthermore, in some of these, industry has also enjoyed a relatively rapid growth. Guadalajara in this respect warrants special attention for being the prime focal point of decongestion with respect to Madrid. Toledo is also quite important in this regard.[12]

From the 1950's onward, Madrid, in accordance with State policies, has become not only a tertiary and quarternary city, but also an industrial centre of national relevance.[13] Its evolution has been rapid, to such an extent that at this moment the entire province of Madrid can be considered as an urban area. The

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[10]With regard to the Basque Country and its Periphery, consult Saénz de Buruaga, G., *Ordenación del territorio. El caso del País Vasco y su zona de influencia*, Madrid, Guadiana de Publicaciones, 1969, 326 pp. See also Ferrer, M., La industria en la vertiente septentrional del País Vasco, Aportación Española al XXI Congreso Internacional de Geografía, Madrid 1968, pp. 111–146. And by the same author, La industria navarra, Jaca-Pamplona, Actas V Congreso Internacional de Estudios Pirenaicos, 1967, *Pirineos*, nos. 83–86, pp. 121–136.

[11]Instituto Nacional de Estadística, *Las migraciones interiores en España, Decenio 1961–1970*, Madrid 1974, 141 pp.

[12]García Ballesteros, Aurora, *Los polígonos de descongestión de Madrid*, Paper presented at the IV Coloquio sobre Geografía, Oviedo, October 1975. For a good example of the structure and evolution of the most depressed provinces in the Interior Spaces, see Estébanez, J., *Cuenca, Estudio Geográfico*, Madrid, Instituto de Geografía Aplicada, 1974, 373 pp.

[13]Ferrer, M., *Geografía económica y social de España*, Madrid, Mundo del Trabajo, 1966, 115 pp. This book includes a very extensive bibliography of related works.

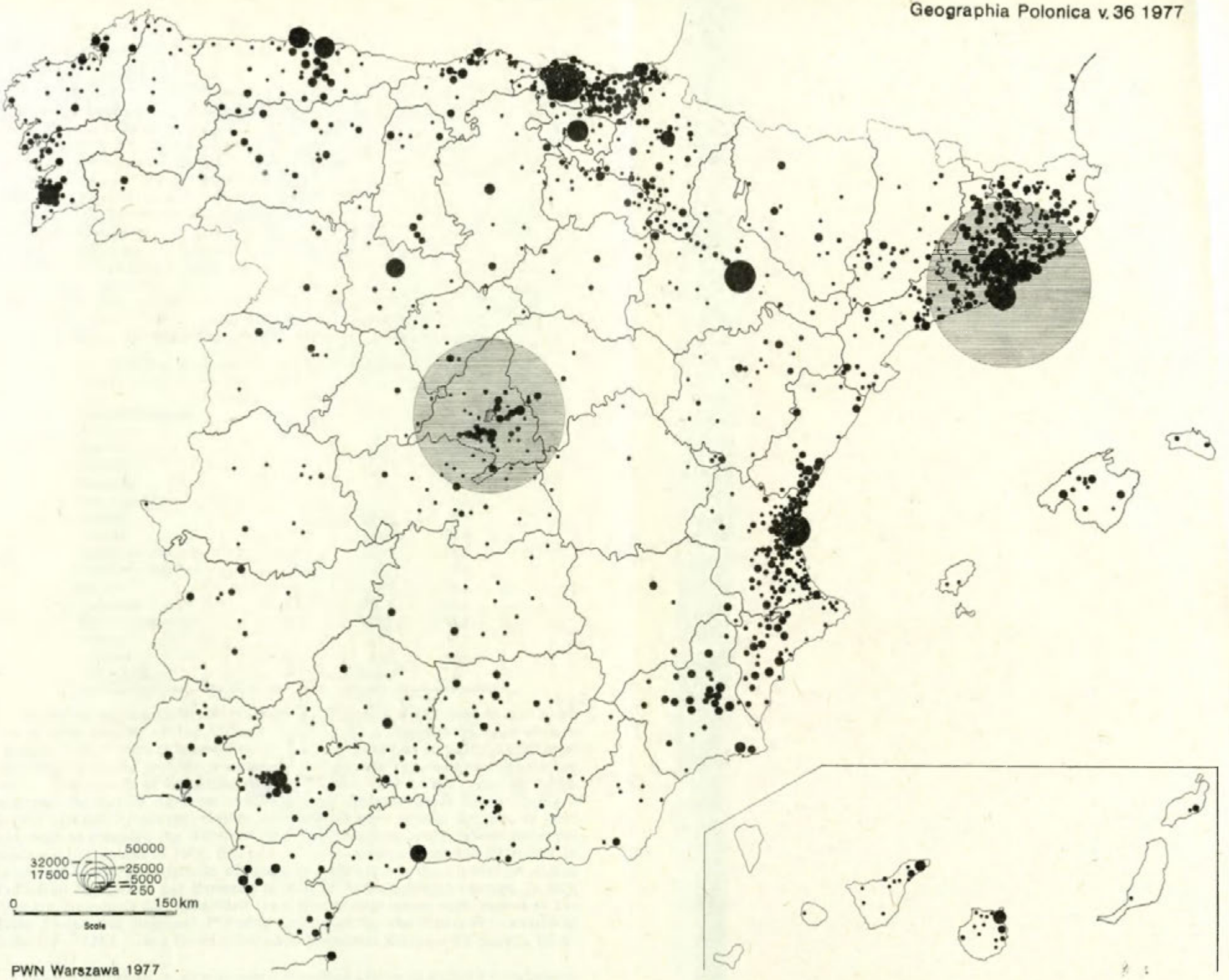

Fig. 2. Location of industrial employment
The shaded areas correspond to employment in the municipalities of Madrid and Barcelona, obviously exagerated as explained in the article

transformations have taken place above all in the actual Municipality of Madrid (3,792,561 inhabitants in 1970) and in the 22 municipalities which make up the city's Metropolitan Area (which has undergone a growth of 219.3% between 1960 and 1970). Other indicators express the role of the Madrid Region very adequately: it contains the lowest proportion of Active Agrarian Population in the entire country (0.9 per thousand), and one of the highest income increases known in the country with respect to industry (35.3%) and services (41.5%).

Valladolid, an excellent geographical link between the nation's capital and the Cantabrian coast [14] is an example of the practical aplication of State policies of development and promotion over an original adequate urban infrastructure. The most salient feature of changes undergone by the province has been the notable disparity between the growth of Active Industrial Population (63.4%) and that of Active Service Population (19.4%). It is important to emphasize, however, that a large part of this development has taken place exclusively within the municipal boundaries of the provincial capital.

TABLE 3. Active population per 1,000 inhabitants in 1973

	I	II	III
Galicia Occidental	21.8	11.8	12.5
Asturias	14.1	14.9	13.5
Pais Vasco	3.6	21.2	13.8
Periferia	12.6	14.2	12.5
Zaragoza	8.0	14.5	14.8
Cataluña Litoral	3.0	21.9	15.3
Levante	7.8	16.0	14.9
Murcia	9.2	13.1	14.4
Andalucía Occidental	10.0	10.5	14.3
Andalucía Oriental	13.5	8.6	12.6
Madrid	0.9	14.6	22.6
Valladolid	8.1	13.7	14.1
Interior Spaces	18.1	8.9	11.1
Baleares	7.6	20.5	19.2
Canarias	8.2	9.6	16.8
AVERAGE	9.7	13.0	14.7

As far as Andalucia is concerned, having already noted here in this work the growth pattern of the tertiary sector in both the western and eastern reaches of the region, it is now time to focus our attention on what has occurred with regard to the secondary sector, with a passing reference to the primary sector. The growth of industrial employment has been in the order of 23.7%, whereas the Active Agrarian Population has suffered great losses during a period marked by overpopulation accumulated over several decades. A good indicator to compare the different Andalusian regions is the labour force per thousand population in 1973; this permits us to observe a notable difference in favour of Western Andalucia, although in both regions the number of Active Industrial Population per thousand is inferior to the national average. In fact, Western Andalucia has benefitted from preferential status with regard to the State Policies of Regional Planning (promoted by the National Institute of Industry — I.N.I. — and Development and Promotion Schemes for Sevilla, Huel-

[14] García Fernandez, J., *Crecimiento y estructura urbana de Valladolid*, Valladolid, Los Libros de la Frontera, 1974.

va and Córdoba) which have brought about a new situation within the so-called Sevilla–Huelva–Cádiz Triangle [15] which has a tendency towards making underdevelopment disappear.[16]

3. IMPORTANCE OF BARCELONA AND MADRID

In spite of the incorporation of new regions into the industrial development process, the location of industrial employment still remains exclusively polarized around the provinces of Madrid and Barcelona which are situated at the top of the industrial hierarchy, giving it a bipolar character. We have chosen, to express this situation, as our indicator the number of industrial establishments and firms, as well as the number of employees found in both regions. We see thus that Barcelona contains within its provincial limits 42.6% of all textile establishments in the country, 40% of the food companies, 31.9% of the chemical plants and 23.8% of the metallurgic concerns. Madrid for its part contains 24.5% of the paper plants, 19.8% of the chemical plants, and 15.3% of the metallurgic industrial establishments. Furthermore, both provinces account for fully 44% of the total number of industrial firms with more than 50 workers existing in the country. Although these figures are somewhat superior to those actually found in reality — owing to the large number of industrial firms established outside these provinces but *registered* there, especially in Madrid — they nevertheless remain quite significant. Note also that Barcelona has more than double the number of establishments than Madrid (3,000 versus 1,277), thus firmly establishing it as Spain's primary industrial centre.

On the other hand, both these provinces have *four* industrial sectors having more than 100 establishments each. This contrasts vividly with the ranking to be found in other provinces, six of which have but *one* sector with more than 100 firms: in the metallurgic sector we have Vizcaya (413), Guipuzcoa (273), Oviedo (136) and Castellón (124); in the food sector Murcia (140) and Sevilla (127). Valencia, with 772 establishments distributed among *three* sectors, ranks in importance just after Madrid and is thus the third industrial centre in Spain according to our indicator. When we compare absolute employment figures, however, we find that Valencia (74,050 workers in industry) is surpassed by Vizcaya (134,749), Oviedo (98,707) and Guipuzcoa (92,130). These numbers, quite naturally, are nowhere near the ones offered by Barcelona and Madrid (478,819 and 262,674 respectively). The industrial employment total of these last two provinces by themselves adds up to 38.5% of the total employment in the country.

4. LOCATION OF INDUSTRIAL EMPLOYMENT AT THE MUNICIPAL LEVEL

The consideration of employment data per municipality [17] has enabled us to draw a map (Fig. 2) which is in fact more closely related to the spatial reality of industry in Spain than are the numbers at the provincial level. In this

[15] Instituto de Desarrollo Económico, *Análisis de complejos industriales. Estudio de los sectores mecánico y químico en el Triángulo Huelva–Sevilla–Cádiz*, Madrid 1971.

[16] The last work published about regional development in Spain has been by Richardson, H. W., *Regional development policy and planning in Spain*, Lexington, Ky., U.S.A., 1975, 250 pp. With regard to Andalucia the works of Joaquín Bosque Maurel are basic.

[17] This map has been elaborated using as its basis the *Mapa de Base Municipal. Espana*, 1973. Consejo Superior de Investigaciones Científicas, Vol. 1 and 2, prepared by J. M. Casas Torres *et al.*

TABLE 4. Provinces having more than 100 industrial establishments

	Food	%	Chemical	%	Wood	%	Metal	%	Paper	%	Furni-ture	%	Textile	%	Glass	%	Total	%
Barcelona	1,283	39.9	415	31.9	—	—	836	23.8	167	32.4	—	—	612	42.6	—	—	3,313	33.2
Castellon	138	4.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	138	1.4
Madrid	123	3.8	257	19.8	—	—	538	15.3	126	24.5	—	—	110	7.7	—	—	1,154	11.6
Murcia	140	4.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	140	1.4
Sevilla	127	3.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	127	1.3
Valencia	305	9.5	—	—	—	—	134	3.8	—	—	—	—	104	7.2	—	—	543	5.5
Guipuzcoa	—	—	—	—	—	—	273	7.8	—	—	—	—	—	—	—	—	273	2.7
Oviedo	—	—	—	—	—	—	136	3.9	—	—	—	—	—	—	—	—	136	1.4
Vizcaya	—	—	—	—	—	—	413	11.7	—	—	—	—	—	—	—	—	413	4.1
Total	2,116	65.8	672	51.7	—	—	2,330	66.3	293	56.9	—	—	826	57.5	—	—	6,237	62.5
Total Country	3,215	100.0	1,300	100.0	460	100.0	3,513	100.0	515	100.0	395	100.0	1,436	100.0	392	100.0	9,979	100.0

map we can see the true spatial structure of industry, and, in passing, the proper urban structure, which is difficult to perceive using population data.

If we admit the theoretical affirmation [18] that a mature industrial region conforms spatially with the double effect of polarization and dispersion, then Cataluña Litoral and Levante coincide perfectly with this model. In these two regions, industry is concentrated in the metropolises, but also dispersed in circular formations among numerous hierarchical nuclei which are ranked according to their employment strength, and which are more and more narrowly spaced together as their proximity to the central cities becomes greater.

The case of Asturias is different, because we find here a much smaller density with regard to the nuclei, and a hierarchy which is bipolar at the top. Since we are dealing in this case with one of Spain's pioneer industrial focal points, it is logical to assume that the stagnation suffered by Asturias in recent decades has impeded its transformation into a model similar to the one just mentioned.

Western Galicia and Western Andalucia both dispose of a nascent development structure which is polarized and dispersed at the same time: focused on Pontevedra-Vigo and La Coruña in the first case, and on Sevilla in the latter instance. We can guess that in both cases the way is clear for the formation of concentrated and dispersed structures.

The Ebro Valley and the Guadalquivir Valley constitute industrial links between the Basque Country and Cataluña–Levante in the first case, and between the Mediterranean Valenciano–Murcia Region and the Atlantic Ocean in the second case. The Ebro industrial axis follows the Ebro River from the highlands to the metropolis of Zaragoza, and then skirts, although very feebly, the Pyrennees through the piedmont areas of Huesca and Lérida until reaching the Catalan coast. As for the Guadalquivir Valley, it would be logical, were it not for the physical factors of the area, that the union between the Mediterranean and the Atlantic should take place by means of the Andalusian coast. However, in the very same way that the Pyrennees account for the important role of the Ebro Valley, the Penibetic Cordillera accounts for the fact that the point of union will take place along the Guadalquivir Valley, and not along the sea-coast. It is also logical that the province of Jaen, in the Upper Guadalquivir, will eventually become included in the Western Andalusian "Industrial System", since the Eastern Andalusian region will become yet more reduced and isolated as time goes on.

Finally, there remains to be analyzed the half-empty interior of the country, as well as the case of the primacy of the province of Madrid. Bordering on Madrid we find a dispersed structure organized in corridors (following road and rail) and which is much less dense than in the other large industrial focal points in the country. This is due to the excessive centralization and polarization exerted by Madrid. For this reason, the organization in this case is completely atypical in terms of the other models studied. Between Madrid and the Cantabrian coast, we can consider Valladolid as a focal point of a very discontinuous industrial axis which is divided into nuclei which correspond to the railway network, and the maximum density of which is to be found in the province of León, due to the mining activities developed there. In summary, the zones lying to the west, south and east of Madrid comprise a practically empty indus-

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[18] Aznar, N., Modelos regionales: un intento de integración, Barcelona, Servicios de Estudios de Banco Urquijo, *Localization económica y desarrollo regional*, 1975, pp. 175–184. A good summary of the theory can by found in Smith, D.M., *Industrial location. An economic geographical analysis*, New York, J. Wiley and Sons, 1971.

trial wasteland, with the exceptions of Toledo and Ciudad Real which unite — in a very diffused and feeble manner — the national capital and the Guadalquivir Axis.

CONCLUSIONS

(1) Spain is undergoing a rapid process of agrarian decline which is made manifest by the accelerated descent in Active Agrarian Population. Although this phenomenon dates back to several decades ago, the highest number of migrations have taken place during the period considered in this study. There is no relation between population losses and the degree of development, however, at either the provincial or regional level.

(2) During the period considered here, the process of tertiary development has been in fact more important than the rate of industrialization. The increases in secondary and tertiary active population have been relevant in areas undergoing development, and minimal in the underdeveloped interior of the country. Comparing the increases in active secondary and tertiary population, we observe a notable disparity: in the underdeveloped areas (interior) and in those areas presently undergoing development (Andalucia, Galicia Occidental and above all Murcia), the increase in Active Service Population has been much greater than the increase in Active Industrial Population. In any case, the percentage of tertiary employment between the different Spanish regions and provinces is very similar, except for Madrid and the major focal points of tourist attraction (Baleares and the Canary Islands).

(3) The industrialization process has extended itself from the traditional focal points of Cataluña Litoral and the Northern Basque Country — towards the south as far as Murcia in the case of Cataluña, and in a broken expansion towards the surrounding provinces in the Basque example. These provinces in the case of the Basque Periphery have become somewhat dynamic, and even the coastal region of Galicia has become industrialized, but Asturias as we have already pointed out has become stagnated. The changes in Levante, Murcia and Western Galicia between 1962 and 1973 are eloquent examples of the extent to which the industrialization process has taken root in Spain. The interior, on the contrary, with the notable exceptions of Madrid and Valladolid, retains to a large degree its level of underdevelopment. In Western Andalucia we can observe a positive tendency towards the growth of industry.

(4) The spatial structure of industry in Cataluña, the Basque Country and Levante appears to coincide with the theory of industrial location in mature industrial regions. There exists, however, a double phenomenon: the focusing of employment in the large cities (Barcelona, Bilbao and Valencia), and the dispersion of employment in small and middle cities within the rank-size framework. Such a hierarchy, we may add, is linked in turn to that of the central places, since employment is graded in volume from the Metropolises to the Metropolitan Areas, Middle Cities, Municipal Centres, and lower-entity nuclei, reaching the bottom rung with industrial villages and villages boasting a mixed way of life. What does not conform to the theory, however, is the succession of chronological stages which range from concentration in the first instance, to dispersion in the second, to reach a third stage characterized by the creation of peripherical subcentres which in the end come to constitute a vaster region consisting of functionally interdependent cities. Thus in the Basque Region and in Cataluña, industry sprang up in the last third of the 19th century, both concentrated and dispersed, and Levante has recently become an industrial

region with the same original model as its starting point. The creation of peripherical subcentres and their posterior integration into urban systems to which they come to belong has taken place in the Basque Country with regard to its surrounding area, but not in the case of Cataluña nor Levante. By a stretch of the imagination we could consider Zaragoza as a subcentre, simultaneously, of *both* the Basque Country and of Cataluña.

(5) The models of spatial location in the remainder of the country (except for Asturias, which does not conform due to its mentioned crisis and stagnation) respond to a combination of spontaneous and guided forces. The State Policies of Creation of Promotion and Development Poles have been carried out in urban nuclei belonging to underdeveloped regions which previously had an industrial employment structure which was closely related to local resources (food processing and mining), or with regard to sectors which are typical of economically underdeveloped areas (textiles, and multi-sectorial crafts). It is logical that the State Policy has not surpassed the proper Pole, in function of resources which would have been necessary in order to create, beforehand, an industrial dispersion based upon the urban network and not upon the provincial capitals. On the other hand, if the State initiatives had tried to conform themselves to the network, and had tried to create, from the beginning, a concentrated and dispersed structure, it is doubtful that the positive results achieved would have been accomplished, given the lack of so many pre-requisites which are absolutely essential for industrialization to take place: culture and qualified employment, economic and social services, adequate consumer and per capita income levels, plus the technical infrastructure which all modern industrial development requires. To claim that an underdeveloped region achieves growth by some other means than the driving force of national industries, as is put forward by several authors, is an unrealistic approach. One cannot accept either criticism of regional planning which takes as its starting point purely theoretical models. Such criticism based on theoretical presuppositions arises only on considering the absence of programming in relating the Spanish policies and the urban networks and hierarchies. But how can one possibly integrate a region industrially, when it is devoid, in the first instance, of any integration with regard to services, or, on the other hand, when it lacks any qualified demand, owing to the existing low standard of living? The results of the Spanish regional policies concerning Development Poles cannot be evaluated on a short-term basis, because the spatial multiplication effect takes time to produce itself, due precisely to the fact that the surrounding areas are economically depressed.

The point is that in both the Interior Spaces and in Andalucia the spatial structure of industry is concentrated either in areas where the rise of industry has either been spontaneous (provincial capitals and municipal centres) or where there was a combination of spontaneity and State planning. Only in those nuclei where traditional urban industries were important (La Coruña, Vigo, and above all Sevilla) do we find a slight tendency towards dispersion, which nevertheless is strictly confined to the Metropolitan areas. The case of Madrid, finally, indicates that an artificial industrialization, promoted by the State and based exclusively on aglommeration economies which arose only recently, is incapable — except on a very small scale — of extending its development to other areas.

(6) When we speak of spontaneous industrialization, we mean that industry has sprung up as a result of a series of favourable local and regional factors. However, the location of the first industrial regions in the country — the Bas-

que Country and Cataluña — lead us to believe that this circumstance is also related to the Centre–Periphery Theory. That is, both these regions are the nearest and the most accessible with respect to Western Europe's diffusion centre, and they sprang up as peripherical areas. Posteriorly they have in turn been converted into centres themselves with reference to the rest of Spain, so that the degree to which they are more or less accessible from other regions has facilitated or hampered, depending on the degree of contact, industrial growth in the rest of the country. Thus we find growth in the areas surrounding the Basque Country, and in Levante in terms of Cataluña. It is not strange, therefore, that the bulk of the nation's industrial growth and development should be confined to what some authors have referred to as the "North-east Quadrant of the Iberian Peninsula" (although in our view the developed area is much smaller). Nor is it strange, on the other hand, that Madrid has been incapable of organizing its surrounding area, since it is an artificial centre with regard to industry.

THE REGIONS OF SLOVENIA*

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Since the end of the 19th century the Slovenian geography regarded as one of its main tasks to present Slovenia and her regions in a synthetical regional study. Because Slovenia is an extraordinary varied mosaic, in spite of her small size, both from the point of view of her physical characteristics and from the point of view of the socioeconomic set-up of the country, the question of the best model of regionalization was always raised. When the leading Slovenian cultural organization of the time, the "Matica Slovenska", started a series of homeland monographs on history and geography about the regions of Slovenia it simply adopted the presentation by the "crown provinces" (Carniola — Krain, Styria — Steiermark, Carinthia — Kärnten, Coastal province — Küstenland) of the Austrian empire which were the political administrative units into which the territory of the ethnic Slovenia was partitioned prior to the year 1918.[1]

After most of the Slovenian speaking territory has been included into the new state of Yugoslavia and after the university of Ljubljana was founded (in 1919) and its Geographical Institute set up (in 1921) the need of a modern regional geography of Slovenia has become even more acute. This was considered to be one of his life tasks by the initiator of the modern geography in Slovenia, the late professor Anton Melik (1890–1966). Even before the last war he edited the first, general part of his monumental geographical treatise of Slovenia,[2] based to a large extent on his own research. The work was continued after the liberation in 1945 and four volumes that deal with particular regions of Slovenia were published by 1954–1960. The technique of arranging the text for publication in succesive volumes was largely responsible for the fact that the author could not construct in that monograph a proper model or scheme for regionalization based on unitary criteria. As demonstrated already by the titles of the volumes in that series[3] Melik was wavering and searched a com-

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*Reprinted from: *Geografski Vestnik*, Ljubljana, 44, 1972.

[1] *Slovenski Štajer. Dezela in ljudstvo*, Spisali rodoljubi, vol. 1, 3, Ljubljana 1868, 1870; S. Rutar, *Poknežena grofija Goriska in Gradiscanska. Prirodoznanski, statisticni in kulturni opis*, Ljubljana 1892; S. Rutar, *Samosvoje mesto Trst in mejna grofija Istra*, Ljubljana 1896; S. Rutar, *Beneška Slovenija*, Ljubljana 1899; F. Orožen, *Vojvodina Kranjska. Prirodoznanski, politicni in kulturni opis*, Ljubljana 1901; M. Potočnik *Vojvodina Koroška 1, Prirodoznanski, politicni in kulturni opis*, Ljubljana 1909.

[2] A. Melik, *Slovenija I. Geografski opis. Splošni del*, vol. 1–2, Ljubljana 1935, 1936, new edition: *Slovenija. Geografski opis. I. Splošni del*, Ljubljana 1963.

[3] A. Melik, *Slovenija, Geografski opis, II. Opis slovenskih pokrajin*, 1: *Slovenski alpski svet*, Ljubljana 1954, 2: *Štajerska s Prekmurjem in Meziško dolino*, Lubljana 1957, 3: *Posavska Slovenija*, Ljubljana 1959, 4: *Slovensko Primorje*, Ljubljana 1960.

promise between different criteria. In the first volume (on the "Alpine area of Slovenia") the physiognomic criterion was used for the definition of the area but in the second volume (on the "Slovenian Styria with Prekmurje and the Mezica valley") the historico-administrative criteria were in the foreground while in the third volume (on the Savaland Slovenia) the hydrographical criterion was decisive and in the fourth volume (on the "littoral Slovenia") the delimitation was based on a combination of the physico-geographical and the historico-geographical notions of the "littoral" western part of Slovenia. This intertwining of different criteria could not produce nor had the purpose of producing a simplified and intuitive model or scheme for regionalization which should have served for the presentation of the regional geography of the Slovenian territory.

Such a scheme, however, was more and more needed for practical purposes; not only at all school levels, from the elementary schools to the university, for presenting the regional geography of the country but also for research on regional structures for the purpose of the applied geography and, in particular, for the regional spatial planning. The author of this paper, therefore, has set himself the task of trying to construct such a regionalization scheme. The effort started with a brief outline of the physiognomic regions which was based on the types of landscape features.[4] Later a scheme of the socioeconomic regionalization was devised[5] which was based on the regional socioeconomic and notably on the gravitation functions. This second scheme was conceived as an initial and preliminary one, but concrete regional analyses have largely confirmed it and its bases of regionalization are in great accordance also with later analytical studies of the functional classification of the central places of Slovenia and of their hinterlands[6] as well as with the spatial differentiation of Slovenia as revealed in the studies of the migration mobility of population.[7] This functional classification of the regions of Slovenia was also adopted by F. Planina as a scheme of regionalization in his popular regional geographical book about the country.[8] The author of this article took also his preliminary scheme as a basis for his contributions to the study of the socioeconomic regional structure of Slovenia which were published both in the Yugoslav and in the foreign (Austrian, Belgian) geographical periodicals.[9]

In spite of the stronger stress on the socioeconomic and gravitational regionalization the author still thinks that no scheme or model of regionalization, prepared for the general purpose, should overlook the differentiation of Slovenia into landscape types and ecological areas which are presented on Map 1

[4]S. Ilesič, Slovenske pokrajine, *Geografski obzornik*, 3, Ljubljana 1956, pp. 25–38.

[5]S. Ilesic, Problemi geografske rajonizacije ob primeru Slovenije (Rés.: Sur le problèmes de délimitation et classification des régions géographiques d'après l'exemple de la Slovénie), *Geogr. Vestnik*, 29–30 (1957–1958), Ljubljana, p. 83–140.

[6]V. Kokole, Centralni kraji v SR Sloveniji. Problemi njihovega omrezja in njihovih gravitacijskich obmocij (Sum.: The central places of Slovenia. Problems of their network and their service areas), *Geogr. Zbornik* (*Acta Geogr.*), 12, 1971, Ljubljana, pp. 5–133.

[7]V. Klemencic, Prostorska diferenciacija Slovenije po selitveni mobilnosti prebivalstva (Sum.: Spatial differentiation of Slovenia according to the migration mobility of the population), *Geogr. Zbornik* (*Acta Geogr.*), 12, 1971, Ljubljana, pp. 135–220.

[8]Fr. Planina, *Slovenija in njeni kraji*, Ljubljana 1963.

[9]S. Ilesic, Regionalne razlike w druzbeno-gospodarski strukturi SR Slovenije (Rés.: Les différences régionales dans la structure socio-économique de la Slovénie), *Geogr. Vestnik*, 11 (1968), Ljubljana, pp. 3–18; S. Ilesic, Die wirtschaftsgeographische Struktur Sloveniens in regionaler Sicht, *Mitt. Österreich. Geogr. Ges.*, 112 (1970), 1, pp. 56–77; S. Ilesic, La Slovénie et ses problèmes régionaux actuels, *Bull. Soc. Belge d'étud. géogr.*, 41 (1972), 2, pp. 23–42.

(Fig. 1). As indicated on that map the following belts of the landscape regions may be discerned in Slovenia (the figures and letters in the map refer to those used in this paper):

I. *The alpine landscape regions* (I on the Map 1) include the high mountain areas of Slovenia together with the valleys and basins. They provide good ecological conditions for alpine agriculture, for forestry, for hydroelectrical power-stations and for tourism but also for manufacturing that is based on traditional skills. Two parts can be discerned with regard to landscape topography: (a) *the western Slovenian alpine regions* (I A) with intermediate valleys and small basins of Bohinj, the upper Sava valley (beyond Jesenice) and the area of well pronounced terraces (*dobrave*) in the Radovljica-Bled basin which is, at the same time the most northern part of the large Ljubljana basin (I 2b); (b) the *eastern Slovenian alpine regions* (I B) which include the eastern Karavanke mountains, the Savinja or Kamnik Alps and the valley of Jezersko in between as well as the valleys in the upper reaches of the Savinja river. The junction between the western and the eastern Slovenian alpine regions is made by the Trzic Alps, where the eastern Karavanke mountains and the Kamnik Alps are already united.

Fig. 1. Landscape types and ecological areas of Slovenia

II. *The regions of the subalpine uplands* (II) which include the subalpine mountainous regions of Slovenia extending from the middle course of the Soča river in the west and then to the uplands around Ljubljana and further east all the way to Maribor. Several parts can be discerned: (a) *the western Slovenian subalpine upland region* (II A) includes the mountains between the Soča and Sava valleys which reveal both the subalpine and, partly, the subdinaric structural geological features (II, 1–3) that are concealed, in the next region of the Ljubljana basin (II 4), under the Tertiary and, even more, Quaternary sediments forming the flat areas in the central part of the basin; (b) *eastern Slovenian subalpine regions* (II B) which include both the high (II 5) and the

low (II 6) Sava mountains to the east of the Ljubljana basin, the subalpine Savinja uplands (II 8, 9) and the Lower Savinja valley viz. the Celje basin (II 7) and its rim; some subpannonian characteristics are present (e.g., the Tertiary hills with brown-coal deposits, some subpannonian traits in the climate and agriculture and in the way of life); (c) *the northeastern Slovenian subalpine* regions (II C) consisting of crystalline mountains of the (so-called) Pohorje Dravaland (along the Drava river with the main valleys of Drava, Meža and Mislinja) which is an area of woods and isolated mountain farms as well as of mining and manufacturing in the valleys.

III. *The Slovenian subpannonian regions* (III) can be divided into: (a) the *true subpannonian regions* (III A) to which belong the plains along Drava (the Drava plain, III 4), along Mura (the Mura plain on the right side of the river and the Prekmurje plain on the left side, III 2), and along the lower course of the Sava river (the plain of Brezice-Krsko, III 9) as well as the surrounding low Tertiary hills: III 1, 3, 5, 6, 8: the "Goricko" area of Prekmurje, the hills of "Slovenske gorice" ("Slovenian hills") between Drava and Mura, the foot-hills of the Pohorje mountain, the "Haloze" hills to the south of Ptuj, the hills along the Sotla river; (b) the *subpannonian-subdinaric regions* of Lower Carniola (III, 10–12: The middle Krka valley, the Gorjanci mountain, "Bela Krajina" or White Carniola in the extreme south). With regard to ecological conditions these are, on the continental side of Slovenia, the most suitable areas for agriculture, vine-growing and fruit-growing.

IV. The *karst regions of Inner Slovenia* (IV) include, apart from the low karst area of Lower Carniola (IV 1), the high karst plateaus and poljes of Lower Carniola and Inner Carniola (IV 2). They descend with a steep escarpment (IV 3) to the southwest towards the lower submediterranean regions. These karst regions are the characteristic forestry areas.

V. The *submediterranean or littoral regions* (V) where low lying belts of either karst or flysch topography stand out with their strong mediterranean traits in agriculture and the way of life. They include: (a) the *true submediterranean regions* (V B) with marked submediterranean traits in the cultural landscape (vine, olive-trees also); to this group belong the plain of Gorica (V 5), the flysch hills of Brda (V 4), the flysch area of the valley of Vipava (V 6), the Kras (Karst) region above Trieste (V 7) and the flysch area of Koper littoral (V 9); (b) the *submediterranean transitional regions* (the submediterranean-subalpine regions, V A, and the submediterranean-subdinaric regions, V C) where the mediterranean influences are manifested more in the forms of settlements and houses and, also, in the way of life than in the agriculture; they include the middle Soča valley (or the Kanal region, V 2), the karst area of Podgorje and Hrpelje (V 10) under the Čičarija mountains (V 11) and the flysch hills of Brkini (V 12).

It is evident that this scheme deals only with the landscape-typological zonal divisions where the regions of the same or similar physiognomy can be spatially far away and in no functional relation. Typological belts, in particular the subalpine belt, are broken already by topography of the landscape into several landscape units (or cells) which are transversely separated by the river valley systems of the east-alpine rivers of Drava, Savinja, Sava, and Soča. These valley systems were used since early historical times by regional or interregional traffic which has made them transportation regions and, in each of them, has interwoven the life within such sections cut out of the homogeneous landscape belts. To this, the administrative and political dismemberment of the Slovenian territory into former Austrian provinces was added and had

enhanced the polycentric regional pattern of Slovenia which is based already in the general topographical and landscape features of the country.

It became therefore necessary to base a general purpose regionalization scheme of Slovenia also on the second scheme or model which was conceived in the above mentioned study [10] and which takes into account not only the natural conditions and characteristics but also the historical and modern gravitaticnal polycentric pattern of Slovenia. In that latter scheme Slovenia was divided into five main regional units: into the three distinctly evident "macro-regions", two of which have their strongly marked centres in the subalpine basins of Celje and Ljubljana and the third in the eastern Slovenian Dravaland at Maribor, and two other major areas (the southeastern and the western Slovenia) which are without distinctly predominant main centres of macro-regional character and where the two nearest large cities outside Slovenia (Zagreb, Trieste) partly perform the functions of such centres. Only within the framework of these major regional units further subdivisions can be made in the regional geography of Slovenia of the sections from the homogeneous landscape belts of which each regional unit is consisting and, on the other hand, a classification of the functional socioeconomic regions of a lower order (mezoregions and sub-mezoregions) can be made which, with few exceptions, do in fact coincide with the territories of contemporary large communes of Slovenia (60 in number) or with groups of them.

The author proposes on the basis of such considerations the following general purposes scheme of geographical regionalization of the Socialist Republic

Fig. 2. Geographical regions of Slovenia

I — Regions of the Central Slovenia, II — Regions of the Savinja and Upper Sotla river basins, III — Regions of the Northeastern Slovenia, IV — Regions of the Southeastern Slovenia, V — Regions of the Western Slovenia, 6 — boundaries of the macroregional units, 7 — boundaries of the mezoregional units, 8 — boundaries of the communes, 9 — the frontier of the SFR Yugoslavia, 10 — the frontier between the SR of Slovenia and the SR of Croatia

[10] Cf. footnote 5.

of Slovenia (see Map (Fig.) 2; the symbols used there correspond to those used in the following text);

I. **Central Slovenia** (the central Slovenia region or the region of the Upper Savaland, I on Map 2 — cf. Fig. 2) mainly corresponds to the area of the Ljubljana basin in the broadest sense. It comprises in its northern part the areas of the western Slovenian alpine region (the *Julian Alps*, the *western Karavanke*) and part of the eastern Slovenian alpine region (the *Kamnik Alps*) both drained by Sava river, as well as valley regions in between, in particular the *terraces* and *plains of Upper Carniola*. In its central part the central Slovenian region includes the *central plains of the Ljubljana basin* surrounded by the parts of the *western* and *eastern subalpine mountains* that are drained by the Sava river, and in its southern part the western part of the *low karst of Lower Carniola* as well as most of the high *karst poljes and plateaus of the interior of Slovenia*.

The central Slovenian macroregion can be further subdivided on the basis of the socioeconomic regional structure into six regions of a lower order ("mezo-regions"). These are:

A. The *Ljubljana region* proper, to which belongs all the territory of the five communes which constitute the town (Ljubljana-Centre, Ljubljana-Bežigrad, Ljubljana-Šiska, Ljubljana-Moste-Polje, Ljubljana-Vic-Rudnik) and extends far outside the urban agglomeration to comparatively strongly urbanized rural areas. To these areas the territory of the two communes of Kamnik and Domzale should be added, in their western sections (the plain of Bistrica) also affected by a strong but dispersed urbanization, while their eastern mountainous sections are still predominantly agricultural with depopulation in progress. Further is included the commune of Vrhnika with the near southwestern hinterland of Ljubljana extending into the Inner Carniola, and two more remote and much more agrarian communes in the east: that of Litija in the Sava mountains and that of Grosuplje in the low area of the Lower Carniola.

B. *The region of middle Upper Carniola*, with its focal point in the strongly industrialized town of Kranj, includes the north-western part of plains and terraces in the Ljubljana basin but also the western section of the Slovenian alpine region (the Trzic Alps), the western part of the Kamnik Alps and eastern Karavanke mountains and most of the western part of the Slovenian subalpine uplands which belong to the Sava drainage basin (the mountains of Škofja Loka). The region includes two heavily industrialized communes of Kranj and Trzic and the commune of Škofja Loka which — like the communes of Kamnik and Domzale — include besides the urbanized plain around the town the subalpine mountains in the west with predominant agriculture and depopulation.

C. *The region of northern Upper Carniola* which includes all the western Slovenian alpine region that belongs to the Sava drainage basin: the industrial and tourist region of Upper Sava (Jesenice) valley, the intermontane alpine basin of Bohinj and the most northern part of the Upper Carniola plains and terraces around Radovljica and Bled. The area is included in two communes: the commune of Jesenice with its steelworks and the tourist resort areas of Kranjska Gora and Planica and the commune of Radovljica with a dispersed industry in the plain and with strong forestry and touristic activities in the alpine regions of Bled in Bohinj (including the famous lakes).

D. The so-called *Black Country region* in the Sava mountains east of Ljubljana with mining of oligomiocene coal (the mining-industrial communes of Trbovlje, Hrastnik and Zagorje).

E. *The wooded mezo-regions of Inner Carniola* to the southwest of the Ljubljana basin which include the heavily wooded karst plateaus and the intermediate poljes in the two communes of Logatec and Cerknica.

F. *The wooded mezo-regions of Lower Carniola* with the same characteristics to the southeast of the Ljubljana basin in the communes of Ribnica and Kocevje.

II. **The region of the Savinja and Upper Sotla river basins** (II on Map 2) with its centre in Celje includes the entire drainage basin of Savinja, but also, because of the gravitational pull of Celje, the upper part of the drainage basin of the Sotla river which is a left tributary of Sava and forms the boundary between Slovenia and Croatia. The core area of this region is *the basin of Celje* or the *Lower Savinja valley* with its hilly or even mountainous rim. The region is continued to the west in the *subalpine Savinja mountains* (the valley of Dreta and the area of Gornji grad, the subalpine plateaus of Dobrovlje, Menina and Golte). The *lignite basin of Velenje* along the left tributary of the Savinja river, the Paka river, also belongs to that major region. To the south of Celje the *gorge of the lower Savinja river*, cut through the subalpine Sava mountains, and to the east the extensive subpannonian area of the *upper Sotla valley* also belong to that region; the hilly country of this valley passes over, to the southeast of Celje, into the subalpine mountainous *Kozjansko country.*

A more detailed subdivision of the macroregion of Savinja and upper Sotla would be as follows:

A. *The central region of Savinja* corresponds to the most developed areas of this part of Slovenia. It includes, besides the industrial and transportation focus around Celje (the commune of Celje), the western part of the Celje plain, an area of small dispersed manufacturing centers and of specialized hop-growing (the commune of Žalec), the lignite basin of Velenje with newly established industries (the commune of Velenje) and the gorge of lower Savinja river with a local urban centre at Laško and the railways node of Zidani most at the confluence of the Savinja and Sava rivers (the commune of Laško).

B. The region of the *Upper Savinja valley* (the commune of Mozirje) which is mostly an area of mountain farms, forestry, timber industry and tourism, delayed in its development by poor transportation facilities.

C. The *subpannonian region of Savinja-Sotla* which includes the proper subpannonian eastern part of the Celje basin but also the entire Slovenian part of the upper Sotla drainage basin including the Kozjansko mountainous country. Both communes of this region (Šentjur pri Celju and Smarje pri Jelsah) are, together with the other subpannonian communes, among the most agrarian and least developed in entire Slovenia.

III. **The Northeastern Slovenia** (III on Map 2) or the macroregion of the **eastern part of the Slovenian Drava land** (the western part of Slovenian Dravaland is across the border in Austrian Carinthia) consists of two basic geographical units. The western part consists of the subalpine wooded uplands on both sides of the river Drava (*the Pohorje-Dravaland*) and of the corresponding valleys (the Drava valley with a chain of hydroelectrical power plants, the Mežica valley with its mining and metallurgical industries and the Mislinja valley which is an important transportation route). On the other hand, the eastern part of the region (*the low Slovenian Dravaland*) consists of extensive plains along the Drava and the Mura rivers and the surrounding Tertiary hills, an area of good ecological conditions for the subpannonian type of agriculture, notably for vine-growing and fruit-growing. The main subalpine route (both

railway and road) in the direction Vienna–Graz–Maribor–Ljubljana–Trieste follows — in Slovenia — the line dividing both major geographical units of this part of Slovenia; also, the industrial city of Maribor, the economic and cultural centre of the entire northeastern Slovenia and the focus of strong urbanization influences, has developed on this line.

Taking into consideration the socioeconomic regional structure the following mezoregions can be discerned in northeastern Slovenia:

A. *The Maribor-Ptuj Dravaland* where the areas of both the western subalpine and the eastern, subpannonian Dravaland meet along the above mentioned transportation axis. Apart from the focal area in the commune of Maribor, which extends also further west, into the wooded and, in the north, into the agricultural hinterland, two more communes along the main transportation route to the south are included into this region, both with dispersed minor industries (Slovenska Bistrica and Slovenske Konjice). The second of the two communes also strongly gravitates towards Celje and its inclusion into the northeastern region may not be quite justified. Three more communes on the eastern subpannonian agricultural and vine-growing side are also included. First, the commune of Ptuj which is still a predominant agrarian territory, but where traditional agriculture is rapidly changing owing to the big socialist agricultural enterprise; also, the large aluminium smelter at Kidričevo is located in that commune. The two remaining communes in the subpannonian east of the Maribor-Ptuj Dravaland belong, however, to the most highly agricultural and backward areas of Slovenia. These are the communes of Ormož in the extreme eastern part of Drava plain and the commune of Lenart in the western part of the hill-land of Slovenske gorice between Mura and Drava.

B. The *Muraland* (*"Pomurje"*) which includes the Slovenian part of the drainage basin of Mura both on the left side of the river ("Prekmurje" — region across the Mura river) which, in the times of the former Danubian double monarchy, belonged to the less developed Hungarian portion, and the areas on the right side of the river ("Prlekija"), which belonged to the Austrian province of Styria. All four communes of the Muraland (Murska Sobota and Lendava on the left side and Gornja Radgona and Ljutomer on the right side) are of distinctly subpannonian character, still mostly agricultural and underdeveloped and also characterized by strong seasonal or permanent emigration. Murska Sobota alone among the submezoregional centres of the four communes has attracted somewhat more of the industrial and tertiary activities which raised the status of the town to a mezoregional level in the polycentric system of Slovenia. A few tourist centers based on mineral water or thermal springs are also quickly developing and, in the hills of Slovenske gorice, large vine-growing socialist enterprises are the starting-points of modernization.

C. *The Carinthian region* includes that part of the historical Duchy of Carinthia that was included to Yugoslavia after World War I as well as some other parts of the Pohorje Dravaland with strong traditional ties to Carinthia. The best developed commune in the region is that of Ravne na Koroškem (Ravne in Carinthia) in the Meža valley with industries and mining. Less developed are the communes from Slovenjgradec in the Mislinja valley and the two communes in the Drava valley (Dravograd, Radlje) with well developed forestry and hydroelectrical power-stations. Although the Carinthian region is included into the macro-region of the northeastern Slovenia one must also recognize that it plays a rathed independant role within that major region. The links with Maribor are rather loose while there are new tendencies of closer ties with the industrial and mining town of Velenje to the south in the Savinjaland.

IV. **The Southeastern Slovenia** (IV on Map 2) includes the lower part of the Slovenian Savaland including the drainage basins of the local tributaries of Mirna, Krka, Kolpa and lower Sotla. The eastern, lower parts of the subalpine Sava mountains area are also included, but the two contiguous core areas are the subpannonian plain of Brezice-Krsko along Sava with its vine-growing rim of Tertiary hills and the subpannonian-subdinaric middle Krka valley (or the Novo mesto country). The low karst area of Bela Krajina that lies beyond the subpannonian-subdinaric Gorjanci mountains also belongs to this part of Slovenia.

In spite of the fact that Novo mesto is lately developing within the polycentric pattern of Slovenia as one of the important foci of manufacturing and of tertiary activities — in particular since the modern new road has been built from Ljubljana to Zagreb — it is still impossible to characterize this town as the dominant centre of Southeastern Slovenia, since some other towns along the Sava river (Brezice as a central place, but in particular Krsko with its paper industries and the projected nuclear power-station) also show signs of lively development and the submezoregional functions were also retained by the two local centres of Bela Krajina (Črnomelj, Metlika). Away from both main focal areas (Novo mesto, Brezice-Krsko) the southeastern Slovenia is still a rather agrarian country with the subpannonian agriculture. As there is no distinct common centre for the entire territory it can be clearly subdivided into two subregions:

A. *Eastern Lower Carniola with Bela Krajina* includes the two communes of Novo mesto and Trebnje (the latter of the two being one of the predominantly agricultural communes in Slovenia) and the two communes of Bela Krajina, Črnomelj and Metlika, that have just begun to emerge out of the extreme agrarian backwardness.

B. *Lower Slovenian Savaland* including the communes of Sevnica, Krsko and Brezice where the main railway line towards Zagreb (which is now hundred years old) has induced non-agricultural activities and had laid foundations for quicker development.

V. **The Western or "littoral" Slovenia** (V on Map 2) is a transitional region to the Mediterranean (a submediterranean region) both with regard to the natural environment and to strong cultural influences that were penetrating the area from the west. During the existence of the Austro-Hungarian empire the area was included largely into the Austrian province of Küstenland (Primorsko) while it was under Italian rule between both world wars. Since, at that time, some parts of the historical province of Carniola (around Idrija, Postojna and Ilirska Bistrica) were also annexed to Italy, they may be with some justification classified as "littoral", although the gravitational pull of the Central Slovenian region in those parts is so strong that some of them (Idrija, Postojna) might nearly just as well be included into the Central Slovenian region.

A considerable degree of the macro-regional unity for areas of the Western Slovenia during the Austrian period and during Italian domination was provided by the strong gravitational pull exercised by Trieste. Now that the city is across the international boundary the areas of its hinterland lack a centre strong enough to tie them together into a macro-regional unit. Koper with its new functions (the port, important central functions for the Slovenian littoral area) has indeed developed as one of the most dynamic foci in the polycentric development of the S.R. of Slovenia, but is in no position to match the former role of Trieste. First of all, Koper cannot attract by its general activities the northern part of the Western Slovenia (the Socaland — Soca valley). Moreover,

that part which is really more continental than "littoral" is getting its own regional centre at Nova Gorica that is striving to become the main gateway-town for road traffic to Italy. The fact that the traffic from the interior of Slovenia which passes through the well-known Postojna gates and through other karstified valleys or lower gaps in the flysch hills (Razdrto) necessarily splits into two flows when it passes Postojna (and reaches the area that might best be described as the "littoral karst hinterland") was essential for the bi-polar regional development in Western Slovenia. The first direction leads to the seaports (Trieste and Koper) and the second direction of the traffic flows is the overland route to Italy passing through Gorica (Gorizia).

In accordance with such an evolution in the Western Slovenia, three regions of a lower order can be discerned. They are:

A. The *Soča-land* (Soča valley) that includes the valleys of Soča and its tributaries from the high alpine areas (Bovec) across the subalpine uplands (the Tolmin country) and the subalpine-submediterranean stretches along the middle Soca valley (the region of Kanal) all the way down to the plain of Gorica. The alpine and the subalpine Socaland is included into the commune of Tolmin, whereas the area along the middle and the lower Soca is included into the commune of Nova Gorica. The area along the larger left tributaries (Idrijca and Vipava) is contained within the two communes of Idrija and Ajdovscina. More dynamic recent development was limited to the lowland areas, to Nova Gorica with the surroundings and, to a much lesser extent, to Vipava valley with its town of Ajdovščina. The uplands and, in particular, the upper Socaland remained a very backward area with strong depopulation since many decades.

B. The *littoral karst hinterland* (the communes of Postojna, Ilirska Bistrica and Sežana) where transportation and forestry with related processing industries in the inner wooded borderland animate only places along the main traffic arteries whereas the remote villages both in the karst plateaus and in the flysch hills (Brkini, Vipavska Brda) remained backward and in process of depopulation.

C. *The Koper littoral* is the most typically submediterranean and truly "littoral" area of the S.R. of Slovenia with its port and navigation functions (Koper, Piran) and its tourist activities (Portorož, Piran, Strunjan). The three existing communes were formed around the three old coastal towns (Koper, Izola, Piran). The coastal settlements are rapidly developing and strongly attract new population, but they are — even when put together — still an isolated island of development in the Slovenian polycentric system; even in their immediate surounding there are backward areas of depopulation.

CULTURE, PERCEPTION AND THE ENVIRONMENT

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What separates the field of geography from the other sciences are the kinds of questions geographers ask. In the past — at least until 1950 — these questions largely had to do with Man and his environment. At that time geography was seen to be the study of man-environment relationships, the influence of the environment on Man or the way in which Man adjusted to his environment. Because the claims made for an environmental impact on Man and human history were often excessive, geographers about 1950 began to throw out not only the environmental framework of their questions but also their interest in the environment as well.[1]

In the past decade or so, as the implications of population growth, of food and other resource scarcities, pollution and blight, not to mention questions of public health and housing, have begun to impress peoples, the geographer, following the biologist, the ecologist, and others, has once again turned his attention to questions pertaining to Man and his environment. The danger for mankind writ large, however, is that even with the scientific knowledge and the capacity to preserve the environment and mankind as well, we — the peoples of the earth — may not have the *will* to act. And, a great responsibility falls on the shoulders of the peoples of the advanced industrialized countries.

As René Dubos has pointed out: [2]

> Western civilization has displayed immense ingenuity and vigor in using scientific technology for the exploitation of nature; nevertheless modern societies are deteriorating because they are inept in applying their scientific and technological prowess to the concerns of human life.
> Everywhere in the Western world the amenities of existence are threatened by ecological degradation and existential nausea. The mounting roster of environmental and psychological problems creates the impression that mankind has lost control of its affairs....

ENVIRONMENT AND ENVIRONMENTAL PERCEPTION

In the past when geographers spoke about the environment, most frequently they meant the physical environment — the earth, its landforms, climates, soils, fauna and flora. It was recognized that man might affect the quality and condi-

[1] Kenneth Hewitt and F. Kenneth Hare, *Man and Environment. Conceptual Frameworks*, Commission on College Geography, Resource Paper No. 20, Association of American Geographers, Washington, D.C., 1973, p. 1.

[2] René Dubos, *Reason Awake, Science for Man*, New York: Columbia University Press, 1970, p. 1.

tion of the environment, subject to the mighty forces at work in nature which would determine what man did and where. The concept was later modified and it was recognized that even though the environment might impose some limitations on what man could do, he had a choice. There *was* possibility of choice.

Today when the term *environment* is used it has at least two broad meanings. There is, of course, the physical environment, but the environment is seen not as a set of relationships in nature apart from man, but rather as a vast network of delicate relationships and balance between the environment and the environed. In the other meaning, the physical reality of the world is present, but greater emphasis is given to the socio-economic or cultural aspects of man's existence. American geography from 1950 to 1965 may be said to have concerned itself with the latter meaning and only recently have begun to dig more deeply into the implications of the former.

But, in addition to man's environment, whether that be expressed in ecological or cultural terms, geographers have become increasingly aware that Man may react not so much in terms of what the environment is but rather as he perceives it. As a result there has grown up in recent years a strong interest in what is termed environmental perception.

As Prof. Saarinen has pointed out:

> Perception is an extremely complex concept... In its simplest terms, *social perception* is generally concerned with the effects of social and cultural factors on man's cognitive structuring of his physical and social environment. Perception then depends on more than the stimulus present and the capabilities of the sense organs. It also varies with the individual's past history and present 'set' or attitude acting through values, needs, memories, moods, social circumstances, and expectations. The major problem in studying people's preception is that of measurement, since people often have difficulty articulating the conscious or unconscious feelings, attitudes or ideas associated with perception.[3]

THE WESTERN ATTITUDE TOWARD NATURE

Some ecologists and writers have sought to place the blame for much of our misuse of our earth habitat and our feeling of being separate from nature on our heritage which has its roots in the teachings of the Bible. Among these critics are Ian McHarg,[4] the ecologist, and Lynn White,[5] the historian. Both argue that the problem stems from the opening chapters of Genesis. In Genesis, you will recall, it is said that God created Man in his image and enjoined male and female to be fruitful and increase, to fill the earth and subdue it, to rule over every living creature.[6]

Clearly the notion of the primacy of Man under God over all earth's creatures is implicit in the Genesis account. Still the most populous nations of the earth today are not nations which would regard the Judaeo-Christian heritage as part of their own. This is true of India and of China. The heritage is true of much of Europe and America, but as a result of the demographic transition, associated with industrialization and urbanization, population growth has slowed.

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[3]Thomas F. Saarinen, *Perception of Environment*, Commission on College Geography, Resource Paper No. 5, Association of American Geographers, Washington, D.C., 1969.

[4]Ian McHarg, *Design With Nature*, Published for the American Museum of Natural History, Garden City, New York: The Natural History Press, 1969.

[5]Lynn White, The Historical Roots of Our Ecological Crisis, *Science*, 155, 1967, pp. 1203–1207.

[6]*The New English Bible*, Oxford University Press, 1970, Genesis 1: 27–29.

On the other hand, throughout the entire course of recorded history and of some prehistory as well, Man has always had an impact on his environment. Where human skills and technology (culture) were primitive, the impact could only be modest and highly localized. With the coming of the bronze and iron ages, Man entered a new technological era when his capacity to impose changes on the earth's surface was greatly enhanced. Even so, his implements were usually such that the human hand was the guiding force and again impact was localized, although less so than before.

Man's capacity to affect profound changes in his habitat came with the scientific and industrial revolutions. And, accompanied in part by the "discovery" of the non-European parts of the world, the impact of the machine technology began to reach into every corner of the globe. The massive technology of the 20th century which can fashion an atomic bomb and lift Man into space — available to the most advanced Western nations (USA, USSR), and most likely available to other industrialized nations (Western Europe, Japan, China), and in time presumably available to most of the industrializing nations — has promise for good if the will is there or it could spell disaster for all.

One cannot, of course, blame technology for the misuse of the earth's physical components, or the deterioration of the environment or indeed of Man himself, but it is Man, for reasons often little understood or perceived, who relentlessly pursues a course that leads to ever greater crowding and ever greater resource consumption. As Dubos points out: "Technology is giving man immense power over the cosmos, but in its present form it is depriving him of the sustenance he could derive from direct contact with nature." [7]

Lynn White, the historian, has proposed that ecologists adhere to the imagery of St. Francis of Assisi and take him as their patron saint. The reason for this is that St. Francis preached and practiced absolute identification with nature. White believes that the example of St. Francis can help mankind achieve a sense of belonging to nature, a kind of harmony and equality with nature, which recognizes the integrity of all forms of life, plant or animal. Dubos, on the other hand, suggests that the example of St. Benedict and the Benedictine monks is more appropriate. They, particularly through their work in the fields, achieved a close relationship with nature. Dubos observes that the second book of Genesis, unlike the first, stresses the concept of Man's stewardship over the earth and all its resources. Here, says Dubos, is the key to Benedictine life — the wise use, management, and conservation of the earth. "Throughout the history of the Benedictine order", writes Dubos, "its monks have actively intervened in nature — as farmers, builders, and scholars. They have brought about profound transformations of soil, water, fauna, and flora, but in such a wise manner that their management of nature has proved compatible in most cases with the maintenance of environmental quality..." [8] To this extent, Dubos would nominate St. Benedict to preside over the society of ecologists.

What draws Dubos to the Benedictines is, of course, his love of the cultivated landscape, or more precisely, the garden.

THE GARDEN IN HUMAN IMAGERY

The concept or image of the garden is probably as old as sedentary man. Certainly the notion is well documented in Genesis.

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[7]Rene Dubos, *A God Within*, New York: Charles Scribner's Sons, 1972, p. 13.
[8]Dubos, *A God Within*, p. 169.

Then the Lord God planted a garden in Eden away to the east and there he put man whom he had formed. The Lord God made trees spring from the ground, all trees pleasant to look at and goods for food; and in the middle of the garden he set the tree of life and the tree of the knowledge of good and evil...[9]

Not only does God act as a divine gardener, but he does it for Man. Man, of course, not content to live in Arcadian bliss is tempted to eat of the fruit of the tree of knowledge (which gives him the capacity to choose between good and evil) and in so doing is expelled from Paradise (a Persian word meaning "garden").

What is ultimately of interest here — quite apart from the interest in gardens down through the centuries from the geometric gardens of Versailles to the romantic gardens of the English gentry — is the notion of meaningfully structured space. If the garden is seen as something set apart, that which lay outside was the wilderness. Throughout the Bible, the wilderness is seen variably as a place of temptation, a place of tribulation, a place even of evil.

The purpose of much early New England thought, if not directed toward making the new land a vast garden, was at least directed toward the reduction of the wilderness. The errand into the wilderness of the Puritan settlers of America was, of course, to spread the gospel, but in reality it meant the taming of the wilderness. As William Bradford wrote:

May not and ought the children of these fathers rightly say: Our fathers were Englishmen which came over this great ocean, and were ready to perish in this wilderness; but they cried unto the Lord, and he heard their voyce, and looked on their adversities...[10]

Thomas Jefferson's image of America was essentially of a cultivated landscape, dominated by yeoman farmers.

According to Paul Shepard, the garden in the human image is the perfect habitat, but it can only be achieved by transforming the surface of the earth.[11]

SACRED AND SECULAR SPACE

Similar in nature to the concept of the garden is the concept of sacred space — a section of land or a place set aside wherein lies the embodiment of Man's spiritual visions and aspirations but where he may also play out a special role meaningful to his life.

In the modern world where nature has been secularized and religion has lost the pull that it had in earlier centuries, the landscape tends to be both uniform throughout and reduced through a process we might call homogenization. There are few sacred places or spaces. So fast has the process become and so widespread is it throughout the industrialized world, that the scholar Mircea Eliade asks, "...is this secularization... really final... (is there) no possibility... for nonreligious man to rediscover the sacred dimension of existence in the world." [12]

It used to be said that Man's home is his castle; once he had crossed the threshold (or carried his bride over it) he had entered a world apart. Modern tract housing can offer Man little in the way of a retreat. Some find the latter in a back-to-nature movement that may have almost the intensity of a religion.

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[9] *Genesis* 2:8–25; 3:1–24.

[10] Perry Miller, *Errand into the Wilderness*, New York: Harper and Row, 1956, pp. 3–4.

[11] Paul Shepard, *Man in the Landscape*, New York: Ballantine Books, 1967, p. 114.

[12] Mircea Eliade, *The Sacred and the Profane*, New York: Harcourt, Brace and World, Inc., 1959, p. 51.

But today most of our sacred spaces are to be found in churches and even the latter may be more a social club than the living body of Christ. In any case, when the Church emerged in the very early Christian period, it set about destroying those natural sacred spaces — glens, groves, whatever — that were associated with the pagan past. It brought them indoors!

Biblical man, however, had his sacred spaces — they were often in mountains, at high places, near large rocks. Moses received the Ten Commandments on Mt. Sinai. Thereafter the Ark of the Covenant was the holy of holies, and it was carried with the Israelites wherever they went, ultimately coming to rest in Solomon's Temple built on a mount in Jerusalem. The Greek gods had their home on Mt. Olympus, a snow-covered peak in northern Greece.

A sacred place, however, was not always a high place: it could be and often was any space set aside for the worship of God. The bedouin Muslim today will place a series of stones in a huge square before kneeling on his prayer mat to bow his head toward Mecca. And, of course, some cities have taken on a sacred quality because of events associated with them. Jerusalem is meaningful to Jew, Christian, and Muslim alike. Rome became eternal Rome, to be succeeded by the Second Rome (Byzantium) and the Third Rome (Moscow): in this case the name of Rome blended both spiritual and political power that dominated every aspect of life.

It can be seen that these sacred spaces constituted an *axis mundi*, an axis of the earth, around which life evolved. The *axis mundi* gave people a sense of place, it rooted them and gave them a feeling of belonging to a large community. Early medieval maps made in Europe always designated Jerusalem as the center of the earth — much as Chinese were to feel about the Forbidden City of Peking. Today, of course, we take our bearings from Greenwich, England, which has absolutely no religious significance.

In the modern nation-state, birthplaces of presidents, tombs of unknown soldiers, or other spaces associated with the political history of the people have assumed almost the importance of sacred spaces, and its symbols — flag or constitution — are regarded as almost sacrosanct. In the USSR, the orthodox cathedral has been replaced by the tomb of Lenin which dominates Moscow's Red Square.

THE IMAGE OF THE CITY

Imagery can plan an important role in designing Man's habitat. It is, of course, essential to know more about Man, his wants, his feelings, his aspirations. Not only can Man through his technology help fashion his future environment, but he can do so in a way that hopefully will have the most sanguine effect on his own life.

In attempting to understand the role of environmental images in our urban lives, Kevin Lynch set out to study and analyze the central areas of three entirely different American cities: Boston, Jersey City, and Los Angeles. As a result of interviewing a number of inhabitants in each city, he came to certain conclusions as to how a city might be structured so as to promote *imageability*, a city that is well-formed, distinct, remarkable, one that would invite the eye and the ear to greater attention and participation.[13]

This image, Lynch notes, is "the result of a two-way process between observer and observed, in which the external physical shape upon which a designer can operate plays a major role...

[13]Kevin Lynch, *The Image of the City*, Cambridge, Mass: M.I.T. Press, 1971, p. 10.

A clear and comprehensive image of the entire metropolitan region is a fundamental requirement for the future... Large-scale imageable environments are rare today. Yet the spatial organization of contemporary life, the speed of movement, and the speed and scale of new construction, all make it possible and necessary to construct such environments by conscious design..." [14]

Through the study of spatial organization and spatial interaction we come to see that the earth represents a global pattern of interrelationships and structures. "Like a spider with its web", it has been said, "so every subject weaves relationships between itself and particular properties of objects; the many strands are then woven together and finally form the basis of the subject's very existence." [15]

Man's interest in space (i.e., earth space) is vital to his very existence. This is not to say as some ethologists would argue that Man, like other mammals, has a sense of territoriality, but rather that he needs to grasp vital relations in his environment, so to bring meaning and order into a world of events and actions.[16] And, in order to realize his goals and carry out his intentions, he needs to understand spatial relationships and organize them in a spatial concept.

Just as *axis mundi* is a concept that may be useful when applied to a society — or even to an individual — so, too, there is a need for an *imago mundi*, an image of the kind of world we want to live in. But Man cannot proceed *then* to plan a world *without* designing himself. Man needs to subject his culture to close scrutiny in an effort to retain those components that may contribute to the kind of society he wants and discard others.

[14]Lynch, pp. 118–119.

[15]Jakob von Uexkull, quoted in Christian Norberg-Schulz: *Existence, Space and Architecture*, New York and Washington: Praeger Publishers, 1971, p. 9.

[16]Robert Ardrey, *The Territorial Imperative*, New York: Atheneum Press, 1966.

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PALEOGEOGRAPHICAL REMARKS TO SOME SCYTHIAN RIVER NAMES OF HERODOTUS RELATED TO SLAVONIC AND HUNGARIAN LANGUAGES

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To Professor Stanisław Leszczycki, former President of the IGU, honorary member of the Hungarian Geographic Society, awarded with the "Alexander Csoma de Kōrös" medallion of this society at its centenary festivity, dedicated at his 70th birthday.

When people give a name to a river, they express usually one of its notable features with that. Rivers flowing through countries dwelt by different folks, posses often more names, which have the same sense in the different languages of those folks. Nevertheless, there are instances, that a river name given by one folk, has been taken over by another one simply as a proper name without any consideration of its meaning. That is the case regularly by second-hand acceptations of river names and toponyms given by peoples lived there long ago. The intention of this paper is to explicate some river names of the one-time Scythia bequeathed to us by Herodotus, which are somehow related to Alexander Csoma de Körös.

It is more or less commonly known, that A. Csoma, a great linguist, geographer and historian, born in 1789 in the village Körös in Transylvania, died in 1842 in Darjeeling, devoted himself to discovering the very early original home of Hungarian peoples (Huns and Magyars) in Central Asia. Thus it may be strange, that one of his last notices is concerned with their last home, which lay in the west of Scythia, before they conquered the Carpathian Basin. He gave a Hungarian explication of Herodotus' enigmatic river name Βορυσθένης (*Borysthenes*), which meant the Dnepr, simply by reading it in Hungarian as *bor-istenes*, which means "worshipper of the God of Wine", i.e., of Bacchus. This is shocking and odd enough that one could remember it in a joke of callow students in the college of Nagyenyed. Yet, A. Csoma supported his opinion by geographical argumentation, pointing at the fact, that Hungarian Scythians met viniculture for the first time at the Dnepr during their westward wandering along the belt of the southeast-European steppes; and Herodotus himself wrote something remarkable about the Scythians' behaviour towards Bacchus. They derided the Greeks' Bacchic mysteries, because they considered it ridiculous to worship a god, who makes men raging mad (IV, 79).

Herodotus also tells us a story about a Scythian king, Scyles, who prefered Greek customs to Scythian ones, since his mother was Greek, and he himself was educated in Hellas. He dwelt often among the Greeks in Olbia, where he had a house and a wife. His Scythians had seen him one day drunken and tottering after a Bacchic mystery. Then they revolted against him, and made his brother the king. And at last they killed him.

Thus it seems to be very likely, that Scythians called the citizens of Olbia and their river mockingly Boristenes. And the Olbian Greeks heard this word in their own tongue as βορυσ — θένης (*borys-thenes*). Since — θένης is a Greek postfix making a proper name from a common noun (e.g. Demosthenes) or from and adjective (see Eratosthenes!), hence, they abstracted a new word, βόρυς (borys), which is at least as similar to the old familiar βους (= neat, cattle) as the aurochs is to the neat. Thus they adopted a Scythian word falsely, and developed from it the Greek name of the aurochs, since they were aware that the Scythians called both Dnepr and Dnestr Aurochs Rivers in their languages. There is a lot of evidence which may strengthen that supposition.

(1) There is no word in ancient Greek meaning the aurochs, which was spread over the whole semi-arid belt of North Africa and Eurasia (Fig. 1), because the difference between that beast and the tame neat was smaller than the ones between the bull and the cow, and, respectively, between those and the bullock and the heifer.

Fig. 1. Former area of aurochs (*Bos primigenius*) according to E. Thenius
Dashed lines show the directions of spreading; dotted areas are steppes and semi-deserts, respectively

(2) Ancient Greeks and Romans personalized the river gods as wild bulls with human face, with two horns either with or without a barb.

(3) Turkish Scythians called some of their rivers Tana-, or Dana- (= Bullock-) River. Hence the classical name of the Don River was Tanais; and the early Greek names of Dnepr and Dnestr were Δάναπρις (*Danapris*) and Δάναστρις (*Danastris*) meaning the Western Bullock River and the one near the Istros (see M. Vasmer!). The Osset names of those were Don (= River) which is still their name in Russian or, respectively, the root of them.

(4) Herodotus tells a tale concerning the origin of the Scythian nation (IV, 5). "There appeared in this country, being then desert, a man whose name was Targitaus. His parents, they say... were Zeus and a daughter of the river Borysthenes". Targitaus was the first king of that nation, which was called by the Greeks Scythians (IV, 6–7). That tale reminds us of the myth of Europa's abduction by Zeus who took on the shape of a bull, since the Borysthenes, as a river-god, was a fancied bullock, too, in Olbia.

The aurochs-bull was the symbol of majesty, of power and strength, of courage and fortitude by ancient Sumerians, Babylonians, Assyriens, Syrians and Egyptians. Therefore they represented their gods, genuises and kings often with horns and, respectively, with horned crowns or helmets. They used the figure of the aurochs and of aurochs-man on their signets just like that of the lion (Fig. 2).

Fig. 2. Aurochs-bull and lion with human bearing on a signet from the Near East, about 2900 BC (after H. v. Lengerken)

(5) The Greeks, when they settled in Scythia, changed some river names about in the days of Herodotus, because there dwelt then already Scythians of other languages than previously. They called the Dnestr Τύρης (*Tyres*) instead of Danastris, because its name was Tur by the Slavonic Scythians. Tur again is the Polish name of the aurochs, which was at that time already more separated from the tame neat, than earlier. And they called the former Danapris then Borysthenes. It is perhaps possible that the word borys developed in Olbia, where the Greeks could see cattle breeding by farming Scythians west of the river, and aurochs-hunting east of it in the land of the Nomads.

(6) Herodotus himself met possibly that newer word in Olbia. He wrote enraptured about the river Borysthenes. It "provides for beasts the fairest pasture lands and best nurturing... Its water is most sweet to drink, flowing with clear current.... There is excellent tilth on its banks, and very rich grass where the land is not sown..." (IV, 53). He did not say which kinds of beasts were grazing there, probably because that followed from the name of the river.

Later, when he wrote about Libya, he used the word borys as the name of the aurochs, though it probably was not familiar to all Greeks. Thus, the consequence of this investigation is the following: A. Csoma's odd and bold explication of the word Borysthenes is in any case worthy of attention and it might be near to the truth. And our investigation helped us to discover the meaning of the word borys, forgotten long ago, independently from the question whether it existed before Herodotus' days, or it was introduced by him.

Among Herodotus' Scythian rivers the *Hypakyris* deserves our special interest. The first part of this name, *hypa* is a Greek word meaning low or lower. The second part of it resembles the Hungarian and Romanian river name Cris and, respectively, Körös. They are rather common in Transylvania and in the eastern part of Hungary. The Hungarian Koros (or Körös) is equally common as a name of settlements, of villages and towns. It denotes in the name of A. Csoma de Körös the village where he was born. Nevertheless, the meaning of this river name is enigmatic.

Herodotus' Hypakyris means thus "Lower Kōros" river. Such a name supposes an "Upper Kōros", too. Seeking after such a river name or a toponym of any kind, one finds a hamlet beyond the crest of the East-Carpathians, in the valley of the Black Tisza, the name of which is in Hungarian *Kōrosmezō*, in Slovakian *Jasiňa* and in Russian *Yasinya*. Yaseny is the name of the "ash tree" (*Fraxinus excelsior*), which is called in Hungarian *kőris(-fa)*.

The ash tree "is one of our most interesting trees from ecological point of view. One form of it is the tree of groves in lowland plains; it forms shrubberies together with the elm and the oak on higher river-flats. Its other form appears in the woods of rocky hills and mountains mixed with the lime, too." (R. Soo, 1953). And the river name Kōros appears also both in plains and mountains. There is also a brook in Transylvania near the town Odorhei, which is called *Kōris patak* (Fig. 3).

One may speak about an association of river names in Hungary, in which — among others — Tur and Kōros are very common. It was strange till now, that

Fig. 3. The location of Hypacyris (Y thin pecked-line) and Gerros (Г, Д = Donetz) shown on H. Walter's map of the areas of some deciduous trees and pines in East-Europe (see also Fig. 4!)

The area of the ash tree is dotted. Ca = *Carpinus betulus*, hornbeam; Fa = *Fagus silvatica*, beech; Fr = *Fraxinus excelsior*, ash tree; Qu = *Quercus robur*, oak; *A* = *Abies sibirica*, fir; La = *Larix sibirica*, larch; Pi = *Pinus sibirica*, yellow pine

none of them appears in the belt of the steppes in Eastern Europe. Now we discovered them in Herodotus' work.

Nevertheless, we did not yet found the Upper Kyris, since Korosmezö (= Yasinya) is a village. And it is also far away from the place, where Hypakyris flowed into the Black Sea. Consequently we have to seek elsewhere after the upper part of it, most probably northwards, in the land of the Gerri, whence according to Herodotus the Gerrus, the assumed tributary of Hypakyris flowed southward. It had the same name as the country; and it divided the country of the Nomads and that of the Royal Scythians (H. IV, 56). According to W. W. How and J. Wells, 1967, "the Hypakyris, Gerrhus defy identification, while the last name presents special difficulties. ...Stein suggests that this name meant boundary." Herodotus himself wrote otherwhere, that the burial places of Scythian kings "are in the land of the Gerri, which is the end of the navigation of the

Fig. 4. The location of Borysthenes, Hypacyris and Gerros drawn on the geological map of the Pleistocene Era of the Geological Atlas of the Ukrainian Academy of Sciences (Investigations during the printing showed that the names Panticapes and Borysthenes should be inverted because the Dnepr (= Borysthenes) flowed then along the bed of the Ingulets of our days, and Panticapes, its left tributary, formed the actual lower reach of the Dnepr)

1 — erratics; 2 — solifluctional valleys; 3 — periglacial block-covers; 4 — fluvio-glacial valleys with sand and gravel; 5 — fluvial valleys with sand and gravel; 6 — streams; 7 — loess cover; 8 — pods in loessy regions

Borysthenes" (IV, 71). This place was very probably near the point where the Gerrhus parted "from the Borysthenes at about the place, which is the end of Herodotus' knowledge of that river" (H. IV, 56). It is easy to verify on these descriptions, that Gerrus was the upper reach of the contemporary Donets. Thus Gerrus was in fact a river. (Herodotus wrote its name so, without *h*, in chapters IV, 19, 20 and then in IV, 71, too). The burial places of Scythian kings were usually on the banks of rivers. If one supposes that Gerri were a Hungarian folk of *e* dialect, one may find in the Gerrus River the Upper Kyris. The three Kőrös Rivers of Hungary were called Swift-Keres, White-Keres and Black-Keres till the 16th century, because the sounds *ő* and *ö* change in certain idioms into *e*(= *a*). The hard *k* again sounds often like soft *g* for foreign ears, in that case for the ancient Greeks. Consequently, they convulsed that river name into γέρρος (Gerrus), which did not happen with the Kőrös form. The latter may sound in Hungarian Kőris, like the name of the ash-tree (kőris), which is very near the Greek (Hypakyris). Figure 4 shows, that the burial place of Scythian kings, i.e., the point where the Donets, the former Gerrus turns toward SE, is in the middle of the area of the ash tree. Here was the end of the country of the Gerri, which stretched southward to the southern rim of Donets Plateau, which is congruent with the border of the ash tree area. Thus Gerri were a folk, which liked ash-woods, from which they borrowed their name.

There is a further question, concerning the Hypakyris, which needs a geomorphological explication. This river flowed namely into the sea "near the city Carcine, bordering on its right the Woodland (Hylaya) and the region called the Racecourse of Achilles" in Herodotus' time (IV, 55). A. D. Godley, his English translator, has remarked aptly that the Molotchnaya river, with which Hypakyris was identified, is considerably farther to the east; and it flows into the Lake of Azov. Carcine lay at the eastern end of the Karnikitskiy Zaliv near the eastern end of the spit, which was in Herodotus' days the still unbroken Racecourse of Achilles. There are still some cornet-shaped limans on the shore west of Perekop suggesting former river mouths. And there is a line of SW–NE direction formed by a row of pods connecting that point of the shore with the upper reach of Molotchnaya River (Fig. 4). Pods are very shallow depressions of up to more than 10 km in diameter on the south Russian steppes containing temporary lakes. They reflect ancient river beds in the more or less even and flat loess-surface developed from silt, carried and deposited by rivers in their flood area mostly during the cold and dry periglacial climate. This line of pods testifies, that the water of the Hypakyris River flowed toward Carcine at the end of the Pleistocene Era, and, respectively, also in Herodotus days. Let us remember that according to L. S. Berg (1916) loess develops recently, too, from fluvial silt under semi-arid continental climates. The lower reach of Hypakyris perished by capture when the headward erosion of the small Molotchnaya Brook led its headwaters towards the Lake of Azov, an event which might have happened only 2400 years ago.

Thus, we could elucidate three enigmatic ancient river names of the former Scythia and discover the two hidden ones of them by making use of linguistic and historical data with geographical methods. A paper containing all rivers of Scythia and of the adjacent regions appears in *Acta Geographica Debrecina*. vol. 14, 1975/6.

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DEMOCRACY IN REGIONAL DEVELOPMENT. VILLAGERS' PARTICIPATION IN THE RURAL RESETTLEMENT OF SAWAUCHI-MURA*

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The Japanese society is often considered of a Western nature due to the high standard of its industrialization. It has, however, quite characteristic phases peculiar to this country, from the aspect of regionalization, or rather of a creation of regional character, by its inhabitants. The author attempts to reveal its nature by showing some of the latest tendencies in regional development in rural Japan.

The author herewith presents a case-study of Sawauchi-mura**, Iwate Prefecture, of North Eastern Japan, although its situation may be rather exceptional in Japan. The object of this study is limited in its area; such factors as the personalities of the leading figures of this region must be taken into consideration because of their powerful effect on the character of the region.

Under competent guidance of eminent leading persons, the inhabitants of a district of this administrative area made great progress in regional development. They took the initiative in making a plan for the resettlement of this snowy district since the central government could hardly entertain the idea of such measures.

Forced by the need of funds for the realization of this plan, they were obliged to ask for financial help from the central government. This resulted in the direct control of the government over the district, and was followed by an actualization of previously latent conflicts among the inhabitants of the district.

The author was recently informed that the well-known plan of "Reformation of the Japanese Islands", proposed by former Prime Minister Tanaka, was criticized by John Sargent, a British geographer, as a "Social Disaster" at the Conference of Modern Japan held in Oxford at the beginning of April, 1973. The author believes that "the disaster" in this modification is in complete sympathy with Sargent's view and has resulted from the basic nature of the Japanese society and not from the personality of the former prime minister. It is, needless to say, neither possible to analyze here all aspects of this basic nature, which is so complicated, nor required in this geographical study. The author intends to limit his focus to one case-study of a rural resettlement in Sawauchi-mura. It is an example of an improvement project and presents some of the basic phases which may bring about "the disaster".

*This paper was originally published in the Japanese journal of *Keizai-chirigaku Nempo*, vol. 19 (1973), 2. It has been revised.

**'Mura' is the smallest unit of self-governing body in rural regions of Japan, which has a definite territory covering many more or less separate settlements.

It is, however, necessary to tell the readers, that this represents a rather exceptional case in present day Japan. But the author hopes that the readers can get a picture of more or less general images of this sort of project in Japan, even though this is an exceptional case.

A SHORT DESCRIPTION OF SAWAUCHI-MURA AND THE NAGASENO DISTRICT

Sawauchi-mura is located in the Ōu Mountains in the Tōhoku district of north-eastern Honshū. Its territory extends 28 km from east to west, and through it runs the Waga River from north to south. The area is 288.5 km², of which 81.4% is forest, mostly owned by the state. The area is in a remote corner of Japan. The Nagaseno district lies in the central part of this area (we will treat this district later in detail). It takes about two hours by car to reach Kitakami, the statistically defined DID area (Densely Inhabited District) from the Nagaseno District (Ministry of Agriculture and Forestry, Agricultural Settlement Cards, 1970). Incidentally, the villagers had cars in a ratio of one car to one and half families in 1973 (Ebisuno and Nakamura, 1973, p. 15).

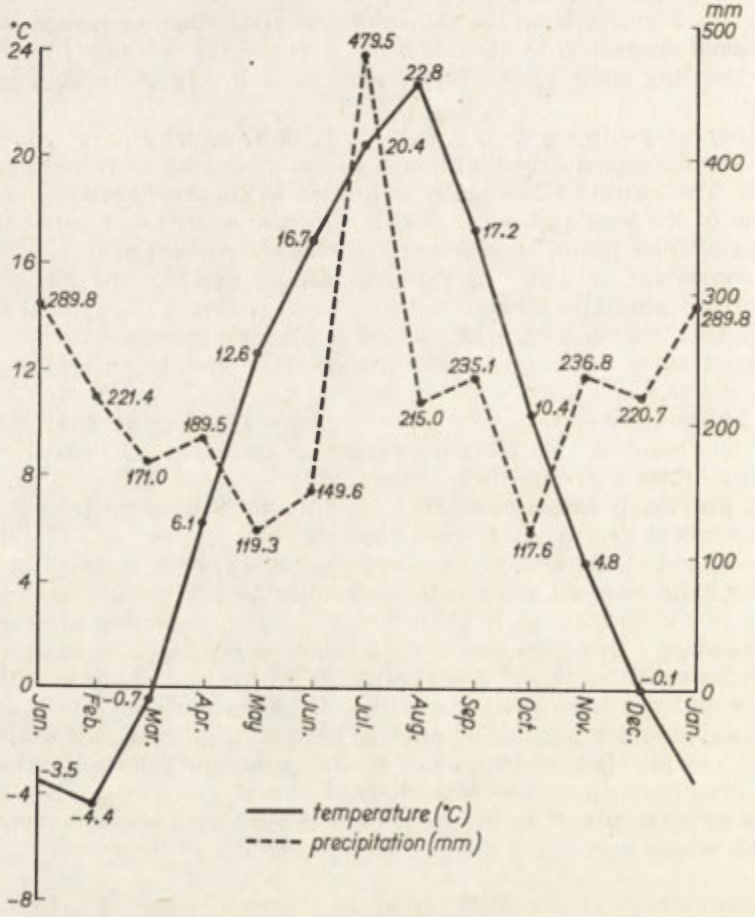

Fig. 1. Temperature and precipitation in Sawauchi-mura (1962–1965)
Data given from the office of Sawauchi-mura, 1971

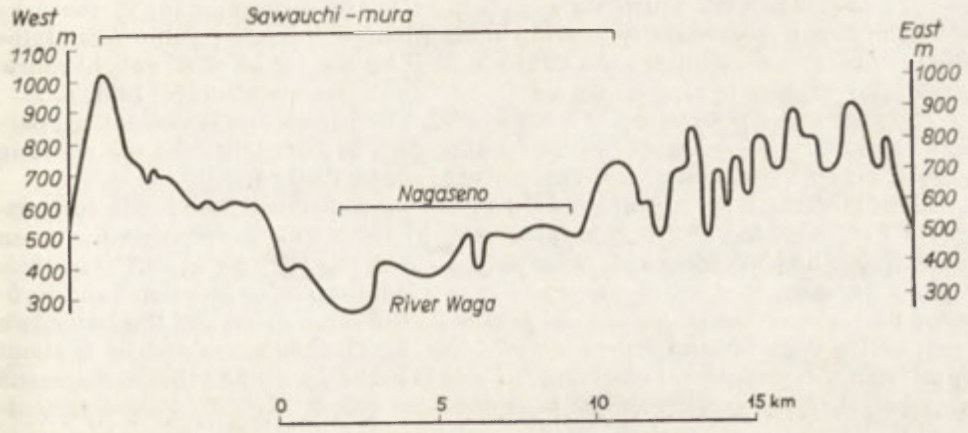

Fig. 2. East-west cross-section of Sawauchi-mura at Nagaseno

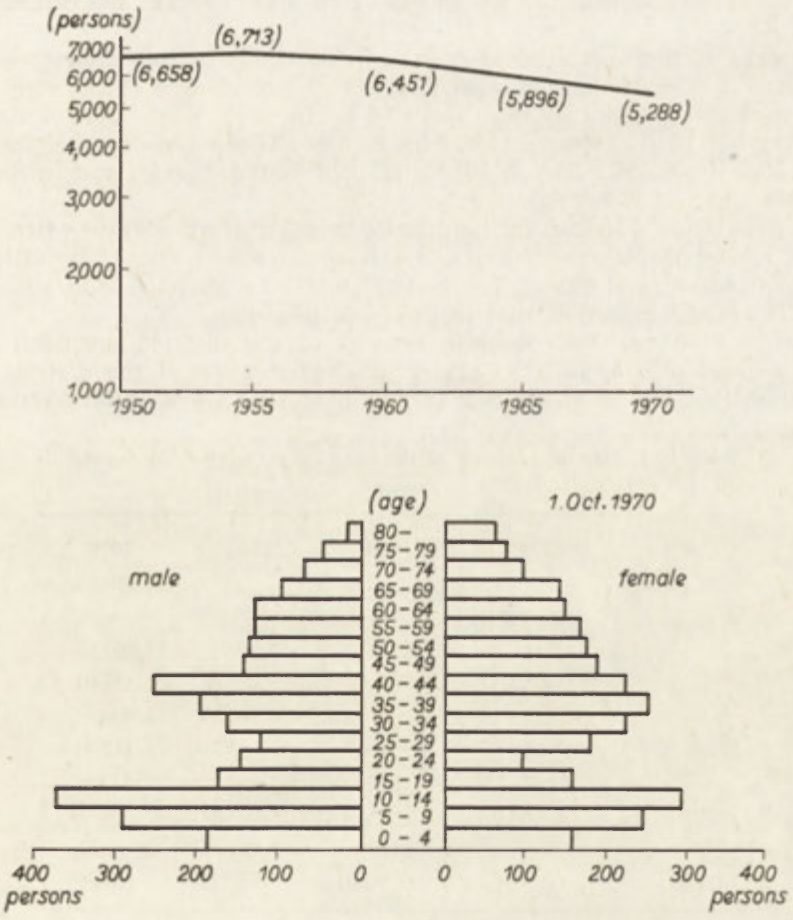

Fig. 3. The population of Sawauchi-mura

This area has very much snow in winter because the climate of the area is of the Japan Sea coast type and, in addition, it lies among the mountains (Figs. 1 and 2). According to the data supplied by the office of Sawauchi-mura, snow is 2.1 m deep in a usual winter (the office of Sawauchi-mura, 1971, p. 2).

The area had a population of 5,382 in 1972. The population is decreasing, particularly among the younger generation (Fig. 3). The distribution of the working population by industries of the village is shown in Table 1.

Rice is the main agricultural product of Sawauchi-mura. Rice fields accounted for 81.1% of the entire cultivated area in 1970. This percentage has risen recently but has become stable since 1970. Indeed, the figure was 68.7% in 1965.

The Nagaseno district is comprised of two subdistricts — Nagaseno and Ryōzawa. The former comprises one settlement of the same name and the latter two settlements, Wasanai and Shichinaigawa (Fig. 4). The Nagaseno district is about 3 km from the prefectural road and the single highway of the village. Nagaseno is a district of 439 persons and 82 households, of which 72 (87.8%) were agricultural (in 1969). The percentage of the agricultural households, whose income is exclusively based on agriculture, is 28%. This figure was 18% for the whole Sawauchi-mura in 1969 (Sasaki and others, 1969, p. 368). About 30% of the agricultural households of the district have an agricultural land area greater than 2 ha. This is only 13% of the whole Sawauchi-mura (Sasaki and others, *op. cit.*, p. 368).

The rate of the areal enlargement of rice fields in this district was more rapid than in the whole of Sawauchi-mura; the total area of the rice fields of the district was 49.3 ha in 1960 and 96.4 ha in 1970, while that of Sawauchi-mura was 594 ha in 1960 and 1,033 ha in 1970. The percentages of increase in the area of rice field between 1960 and 1970 in the district and in Sawauchi-mura are 1.96 and 1.75, respectively.

The population decrease in the district is relatively moderate when compared with the whole Sawauchi-mura. As shown above in Fig. 3, the village population in 1965 was 91.4% of that in 1960, while the district population in 1965 was 95.4% (478 persons) of that in 1960 (501 persons).

As shown above, the economic activity of the district has been directed mainly to agriculture, and the agricultural production of the district is more stable than that of the whole Sawauchi-mura. This allows a larger population

TABLE I. The distribution of the working population in Sawauchi-mura

Industry \ Year	1955	1960	1965	1970
Primary	persons			
	2,784	2,571	2,049	1,950
	(85.3%)	(80.6)	(73.7)	(69.4)
	161	203	265	346
Secondary	(5.0)	(6.4)	(9.5)	(12.3)
	317	415	467	513
Tertiary	(9.7)	(13.0)	(16.8)	(18.3)
	3,262	3,189	2,781	2,809
TOTAL	(100.0)	(100.0)	(100.0)	(100.0)

Source: Ebisuno and Nakamura, 1973, p. 21.

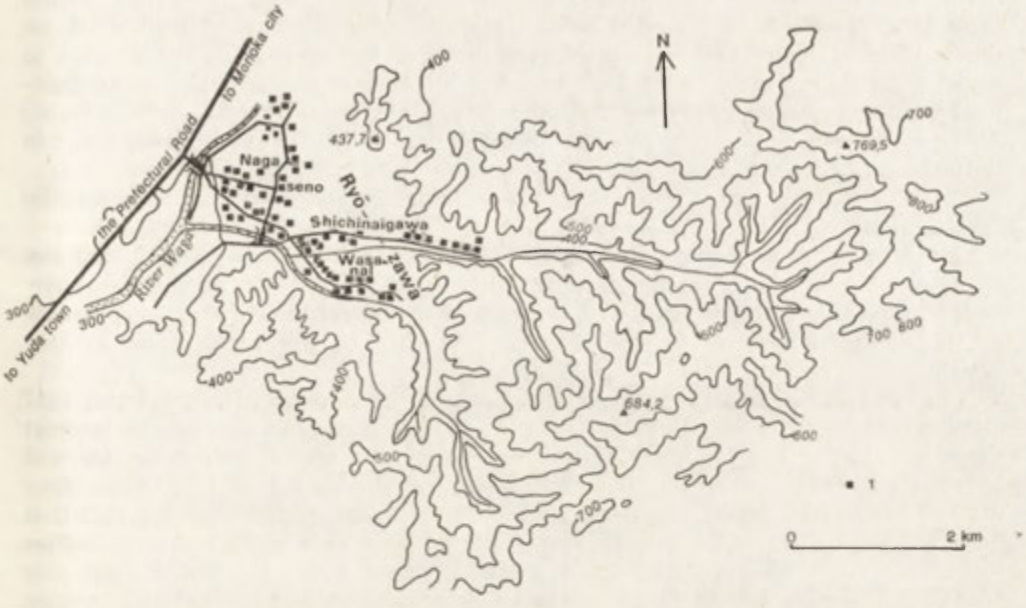

Fig. 4. Nagaseno district, 1970
1 — a house

to remain in the district than in other parts of Sawauchi-mura. Thus, the inhabitants of the district intended to improve their living environment on one hand, and to improve their economic base on the other. This intention has been taken into account by the resettlement program.

HOW THE RESETTLEMENT PLAN DEVELOPED

(a) The inhabitants intended to improve their rice production. They wanted, first of all, to achieve the adjustment of the rice fields in the district. That is, the modification of the irregularly shaped rice fields and the mutual exchange of rice fields which had a spacially mixed ownership. This is important for the improvement of rice production if irrigation water is to be used most efficiently. The conditions for producing rice in the mountainous Nagaseno district are the worst in Sawauchi-mura; namely, there is a lack of sunshine and the irrigation water is very cold (Kimizuka, 1973, p. 21).

The young men of the district first organized a 4-H club and a study group on agriculture, and at the same time, the inhabitants of the district were guided by authorities of the central government. As the reclamation for the new rice fields went on, the young men of the district began preparing for the adjustment of their cultivated lands. One of the leaders of this district, Terui Kō (Nagaseno settlement), personally informed the author in 1972 that they carried out a soil survey using boring sticks. The adjustment work began in 1941 (Sasaki and others, 1969, p. 372).

At this time a doubt arose that one could expect to enjoy highly effective results of the adjustment work; because the dispersed nature of the settlements

in the district would leave each house in the midst of each piece of adjusted farm land. These houses would be obstacles to effective agricultural work on the adjusted lands. This expectation led some of the leaders of the district to make a plan for a new settlement in a newly selected place along the prefectural road. (However, the new settlement was not actually established there.) This resettlement plan was also connected with a plan for an improvement in living conditions.

(b) The inhabitants wished to improve their living conditions through the resettlement program.

The agricultural income increased by the widening of rice fields and the adjustment of the cultivated lands, which was begun in 1961 as shown above. But, this economic improvement did not solve the problem of the heavy snow in this district. Several lines are needed to explain the background of this problem.

The late Fukazawa Masao was the headman of Sawauchi-mura from 1957 until his death in 1965. His promise to the villagers as headman was to protect their lives from illness. More about his humanistic activities can be learned by reading a book in a famous series, which can be called the Japanese "*Que sais-je?*" (Kikuchi, 1968). The name of Fukazawa is associated with the fact that Sawauchi was the first pioneer among all the Japanese self-governing bodies to provide free medical treatment for aged persons. From December 1960, this was realized in Sawauchi-mura for those older than 65 and for babies. Because of the extraordinary poverty of the villagers, this institution of free medical treatment had to overcome innumerable difficulties. Fukazawa believed that aged persons should be protected by society and should not be "abandoned" because of their loss of "productive forces" (Kikuchi, *op. cit.*, pp. 136–137). Four months after its commencement, this free medical treatment was extended to villagers older than 60. Sawauchi-mura is noted for its unforgettable impression that the aged persons look extraordinarily vigorous (Kikuchi, *op. cit.*, p. 22).

One event, forming an important link in a series of humanistic works of Fukazawa's administration, was the clearing away of the snow. It was believed for a very long time that nothing could be done about the isolation of this area in winter caused by snow (author's interview with the villagers in 1972). The snow created not only isolation but also poverty and poor health among the villagers. During the long winter, the agricultural and forest products could not be dispersed due to the blockage of road traffic. The villagers were confined to their houses, which had few and small windows.

Ota Soden, the former superintendent of education, the present headman of Sawauchi-mura, regarded snow, poverty and poor health as the three evils in Sawauchi-mura (author's interview, 1972). Fukazawa began fighting against snow in 1957. Assisted by Ota, Fukazawa encouraged the villagers to fight against snow. He persuaded individual villagers to contribute money to hire a bulldozer. On this occasion, he was said to have attached great importance to the process of getting the people's consent (Ota, author's interview). This type of community leader was rather rare at that time, and even now in this country.

We cannot say even one word about the social features of the present Sawauchi-mura without considering the role played by Fukazawa.

The bulldozer which had been hired cleared the snow along the prefectural road between the southern neighbouring town of Yuda (which attracted many visitors to its hot springs in winter) and the central settlement of Sawauchi-mura where the village offices were located. At first 13 km of the prefectural road were cleared. As the years went by, they bought several bulldozers, which

were effectively used for clearing snow in winter and reclaiming new rice fields in summer.

At the same time, Fukazawa visited the offices of the central and local governments frequently and criticized the officials' idea to focus their activities exclusively on the densely inhabited central areas of the country. He explained to the officials the irrationality of clearing away the snow on the prefectural road at the expense of 'mura'. Finally, since 1963, this kind of expense was no longer paid by Sawauchi-mura.

Since 1963, regular bus service between Morioka, the prefectural capital, and Yumoto (in Yuda town) was established in winter days. The isolation of this village caused by heavy snow was finally overcome as far as the prefectural road was concerned (Sawauchi-mura, Resettlement Plan, 1972, p. 13).

This clearing away of snow along the prefectural road brought certain changes in the state of mind of the people of Nagaseno district. The inhabitants of the district no longer considered their winter isolation to be a part of their fate (Terui Kō, author's interview, 1972). They realized the possibility of change in their traditional existence. Once they perceived this, they felt obliged to do something actively about their progress.

The group for improving their living conditions organized then was quite active.

From former days, Nagaseno district has been characterized by its initiative. An example of this is the investigation into the nutrition of the school children of the district. This investigation was performed by the women's section of the PTA of Nagaseno Primary School in 1957. There were five squads in the section, three in Nagaseno settlement, one in Shichinaigawa and one in Wasanai. Each squad had four or five members. All the squads performed the investigations at the same time following the same methods. The amounts and the kinds of foods (protein, mineral, vitamin and so on) their children ate were studied for four or five days during the investigations. These investigations were mainly done by the PTA members themselves, but they were assisted by a public health nurse. These investigations were later followed by all villagers. After they studied the results of the investigations, the inhabitants strove to overcome the defects of the children's nourishment. They bought dried fish in common and co-operated in raising chickens. Prior to the survey, they were informed by a school teacher that their children had inferior physiques, and that it was necessary to get more fish, more oils and more fats. But, at that time, they were bewildered, because they had no money to do so. But after the investigations, they determined to improve the inferior level of their children's physiques. They learned to save money by simplifying the social expenses of the district which, they felt, had been traditionally too extravagant (author's interview with the head of the section at that time, Terui Ai, 1973).

One can find a pattern in the social activities of this district by considering this example. Many of the common people often performed some social action under local leaders, but at the same time this kind of action was guided by a specialist from outside.

From this point of view, by the way, Fukazawa was an indigenous leader on one hand, and an outside specialist on the other. Fukazawa was educated at Tōhoku University, one of the best universities in Japan, and after graduating from it, he worked in some foreign countries. Just after the war, he came back to the village and worked as a farmer for three years. However, he again left Sawauchi-mura and worked as the vice-director of a famous shipyard at Sasebo in Kyushu for four years. After that he went back again to Sawauchi-

mura and worked on his farm lands. Through his agricultural labour, he realized its bitterness (Kikuchi, *op. cit.*, pp. 10–11). Being isolated by snow was too much of an out-of-date phenomenon from his point of view. His ideas had been influenced by his long experiences in the outer and wider world. In his first speech in the assembly of Sawauchi-mura, he declared his administrative policy: "First of all I believe that the elimination of every barbarous living condition should have priority over any other policy ... Newborn babies are dying one after another. Sawauchi-mura is, however, not the interior of New Guinea. In the time of moon rockets, the villagers have to trudge on a snow covered road. It is quite anachronistic ..." (Kikuchi, *op. cit.*, p. 12). His views are quite clear now.

Ota Soden, who helped Fukazawa, is also a man who has been abroad (USA and Brazil) and had worked in other prefectures just prior to his return home. He returned home when he accepted the call from Fukazawa, who was going to become the headman of Sawauchi-mura. Ota also believed that something could be done about the snow.

This attitude of the leaders of the village can also be applied to the district leaders of Nagaseno. Connected with the resettlement movement, we can distinguish two leaders. Both of them lived in the Nagaseno settlement and now are living in the new settlement. Here, the author intends to write about one of them. Terui Kakuji is now in his middle fifties. He personally informed the author that he had been to Tokyo when he was about twenty years old and made every effort to know the "real" Tokyo until he learned that there were many children who did not attend school and many young people without regular occupations. Finally, he came to believe that one could not always be happy in a metropolis. Likewise, people should not always be miserable in their home villages. (In the mid-thirties of this century, when he was in Tokyo, the Tohoku or north-east district of Japan, where Sawauchi-mura lies, was struck by extraordinarily cold weather from which crops could not be protected. Many girls from Tohoku district were sold as prostitutes in Tokyo. This is one of the darkest aspects of the history of modern Japan).

The author considers him to be a villager who sincerely believes that the living conditions in the villages should be at least equal to those of the cities. He does not consider any conditions around him beyond reform.

Another point worthy to be noted is that all of those leaders above mentioned had personalities which made them respect democratic processes rather than disregard them in pursuit of immediate results. Ota defined a leader like Terui Kakuji as the producer type and not the performer type. This type of leader, who cannot be satisfied with persons who only follow the orders of their superiors, is quite rare in Japanese politics from the conservatives to the communists.

(c) Under the community leaders, the inhabitants of the Nagaseno district conceived the idea of resettlement without being directed by either the central government or the prefectural government. The idea germinated in the villagers themselves and was not administered by the office of Sawauchi-mura during the earlier stage.

The inhabitants themselves organized "the Society for the Study of the Construction of the New Settlement", and being based on this organization, the inhabitants surveyed the state of management and living conditions of the individual homes. Then they constructed a resettlement plan based on this survey. Once Terui Kakuji proudly told the author that probably no survey existed which could be more minute and more precise even if it were organized by

Fig. 5. Plan of the new settlement

1 — main road (paved, clear away snow), 2 — branch road, 3 — road for productive activity, 4 — road for pedestrians, 5 — water supply and draining

competent scholars. In reply to one of the author's questions, Terui stated that on conditions of absolute secrecy almost all the inhabitants of the Nagaseno settlement were open in offering data to the investigators who were also inhabitants of the same settlement. Data were collected both in the fields and in the houses. They spent many days at each home. Terui further explained that the investigators gathered and estimated the conditions of the few homes which were not open to the investigators. These estimates were considered to be quite accurate because the estimators had full knowledge of the production and the living conditions in the area.

At that time it was found that many wooden houses in this district (not only in Nagaseno settlement but also in Ryōzawa) were dilapilated and had to be rebuilt.

TABLE 2. Ages of Houses (1970)

Nagaseno (mean)	32.6 years
Ryozawa (mean)	45.7 years

Source: Calculated from the data given from the office of Sawauchi-mura.

Among the inhabitants of the district there were many who wanted to build new houses at the same time (hence the resettlement). By doing this, they thought they could get social (official) support. Having thought this, they talked the matter over with Kubo Toshirō, the new headman of Sawauchi-mura in 1965. Kubo visited many of the state offices whenever he went to Tokyo. But at that time no office was ready to respond to the problem of rural resettlement as there was no definite policy for it at that time. But soon after, the problem of the too thinly (too thin to maintain community) populated areas came into question in the government; DID (Densely Inhabited District) areas attracted too many persons from underdeveloped areas in Japan. Because these problems were particularly serious in western Japan, the central government tried to find some effective policy to meet this new problem. A group of inspectors were also sent to the Nagaseno district by the central government in 1965. Later, the resettlement plan was accomplished under the guidance of the Economic Planning Agency of the State Government (cf. Fig. 5).

Now one can visualize the conflict between the villager's autonomy and the central government's control.

Japan today is a highly industrialized country. But this does not mean there is an affinity between a Japanese society and a Western one. Japanese society is quite different in many basic aspects from Western society. One of the social differences is the centralized nature of Japanese society.

In this country of centralization, even rural communities are highly controlled by the central government. If the development of inner Anatolian villages in Turkey, for example, is hindered by "the absence of the central government" in village lives (cf. P. Stirling, 1965, p. 209), the development of Japanese villages is apt to be distorted by "the over-abundance of the central government" in village lives.

HOW THE PLAN HAS BEEN UNDERMINED

(a) Owing to the conflicting interests of the inhabitants of the district, a single plan for resettlement could not be made which would be accepted by all at that time.

Even a glance at Figure 6 shows the regional differences in behaviour between the inhabitants of Nagaseno and those of Ryōzawa sub-districts.

This comes, first, from the different interests of each sub-district brought about by the different expected distances from the new settlement to the inhabitant's farm fields. In this district each farmer's fields were located close to, rather almost around his house. So, one can roughly calculate the distance from the new settlement to each farmer's fields by using the location of each farmer's house. The result of this calculation is shown in Figure 7. In this instance, distance is measured by actual route used and not the direct distance.

The figure shows us a polarization into two factions because of distances among the group which was to move. (This group will be called "the moved group". This group comprised 35 families, while "the remained group" comprised 40 families. 5 families emigrated from the district.) Five farm houses which were located in the deepest part of the Shichinaigawa moved because of snow (author's interview with Nitta Kisōta, who was interviewed with the resettlement problem by NHK T.V. just prior to the author's interview. He is one of the richer farmers living in Wasanai.)

Except for these five families, and another family that keeps a shop and whose location neighboured on the Nagaseno settlement, the members of the

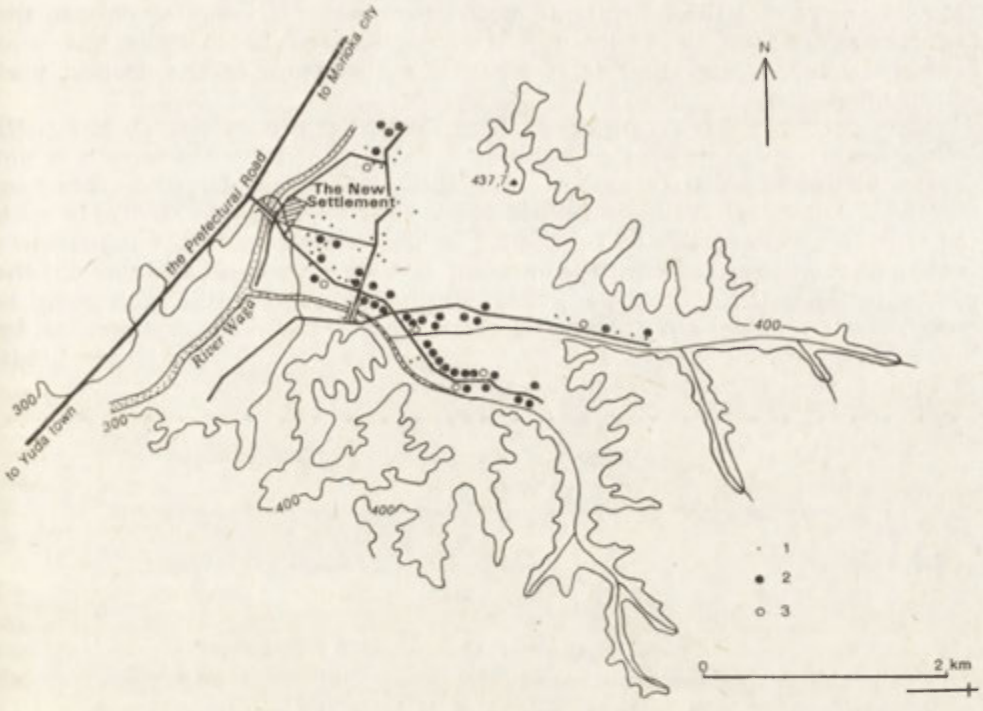

Fig. 6. Moved, remained and emigrated groups (1971)
1 — moved group, 2 — remained group, 3 — emigrated group

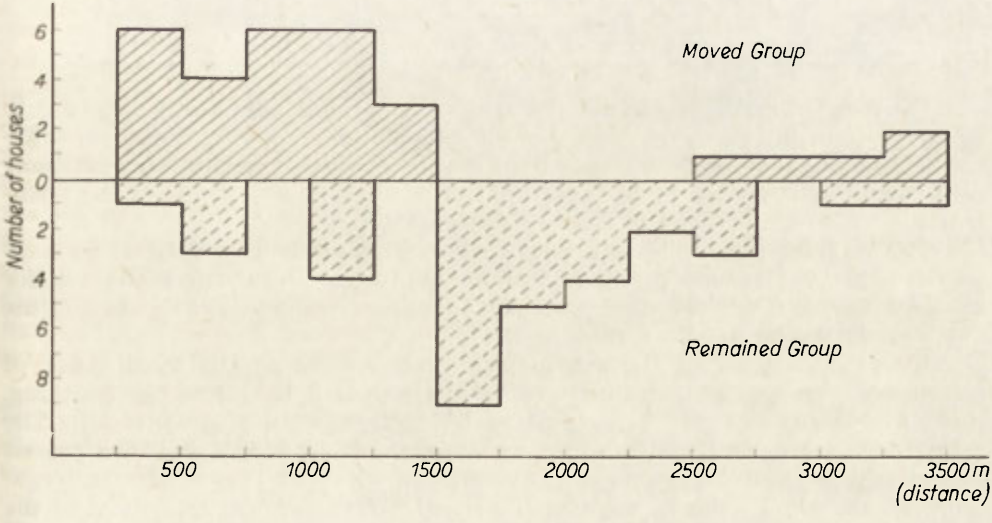

Fig. 7. Distribution of the number of farmhouses by the distance from the centre of the finally designed new settlement measured by actual route used (1970)

"moved group" are the inhabitants of the settlement. If we refer only to the farmhouses, the members of the moved group are the inhabitants of Nagaseno settlement, except for the five farmhouses which were in the deepest part of Shichinaigawa.

"Distance" has been considered here, but, distance is not absolute. Its influences or effects depend on complex social conditions. Therefore, it is not correct to examine the influences or effects of distance always by lumping various occupational groups together. It becomes necessary to deal only with the farming group on this occasion. The problem which concerned the farmers about the resettlement from the viewpoint of distance was whether or not the movement to the new settlement brought about worse conditions in going to and from the fields. On this occasion, moreover, the influences caused by lengthened distance are more serious for farmers who operate larger fields. In Table 3, one can find some regional characteristics.

TABLE 3a. Regional aspects of area of the cultivated lands of Nagaseno district (1970)

		Rice field/family (in ares)	Other field/family (in ares)	Total field/family (in ares)
Nagaseno	moved group	134.3	8.1	142.4
	remained group	181.2	20.7	201.9
	Total	148.6	12.0	160.6
Ryōzawa	moved group	147.0	36.0	183.0
	remained group	161.7	17.5	179.2
	Total	159.0	20.9	179.9
TOTAL	(excl. five farmhouses at the deepest Shichinaigawa)	161.7	17.5	179.2

Source: Calculated from the data given from the office of Sawauchi-mura.

It is clear from Table 3a that the area of rice fields per family is larger in Ryōzawa than in Nagaseno. But at the farms of the remained group in Nagaseno, the equivalent area is larger than that of any other group. This fact may help us to understand why they did not move when 69.4% (25/36) of the farmhouses of Nagaseno moved to the new settlement.

"The remained group" has a larger mean area under rice cultivation compared with "the moved group". If other conditions were equal, the smaller the area of rice fields (which is the main economic resource in this district) the more easily the household can be resettled.

This tendency can also be demonstrated much more readily by the ratio of farmhouses whose rice farming area is more than 2 ha — roughly speaking, this size enables a farmhouse to make a living by agricultural work only. The ratio in Nagaseno is 27.8%, while in Ryōzawa it is 44.4%. In "the moved group", this ratio in Nagaseno is 16.0%, and in Ryōzawa it is 45.5%. In Nagaseno, on the whole, the farmers of the smaller areas moved and those of the larger ones remained while in Ryōzawa (excluding the five farmhouses in question) almost half of the total farmhouses could not be relocated.

TABLE 3b. Area of the cultivated lands of Nagaseno district by the „moved" and the „remained" groups (1970)

	Rice field/family (in ares)	Other field/family (in ares)	Total field/family (in ares)
Moved group	136.4	12.8	149.2
Moved group (excl. five farmhouses at the deepest Shichinaigawa)	134.3	8.1	142.4
Remained group	168.2	18.6	186.8

Source: Calculated from the data given from the office of Sawauchi-mura.

Though the reliability of data declines to some extent, readers can estimate the existence of the same tendency from the data of the area of the farm fields in Table 4. Thus, the tendency to remain on one's own farm fields was stronger in Ryōzawa and in "the remained group".

There is, however, one more question: What about the remaining half in Ryōzawa? Ryōzawa is surrounded by state forests. Owing to these state forests many jobs are supplied to the inhabitants of the Nagaseno district (Nagaseno and Ryōzawa sub-districts). This factor acts rather as a detrimental factor to the resettlement of the inhabitants of Ryōzawa.

TABLE 4. Ratio of agricultural income to the whole income of farmhouses (excluding five farmhouses in the deepest part of Shichinaigawa in 1970)

Nagaseno	72.8%	moved group	74.9%
Ryozawa	84.6%	remained group	79.7%

Source: Calculated from the data given from the office of Sawauchi-mura.

Japanese are fond of *nameko* (a kind of mushroom) which is raised here utilizing stumps in the state forests. The market price of *nameko* is quite changeable, and it is difficult to estimate the economic contribution of *nameko*-raising to the households of the farmhouses. But one can get data which at least enable him to grasp the regional difference between Nagaseno and Ryōzawa. The area used by the inhabitants for *nameko* raising is 200 hectares in Ryōzawa and 30 to 40 ha in Nagaseno (Sasaki and others, *op. cit.*, p. 393). The role of the state forests in inhibiting the resettlement is stronger in Ryōzawa than in Nagaseno. Utilization of the state forests for *nameko*-raising is the most profitable extra enterprise for the inhabitants (but the resources are very limited).

The state forests need a lot of local labourers, who come mainly from those farmhouses whose income is not exclusively based on agriculture. In this regard, these farmers could not have much confidence in their agricultural development in the new settlement on one hand, and they could not be strongly encouraged to have the jobs in the forests on the other (cf. Sasaki and others, *op. cit.*, p. 397). But in Nagaseno, those who did not rely exclusively on agriculture could move with no concern for the state forests because they could search

for jobs in factories in the village center, due to the superior transportation facilities which existed even prior to the building of the new settlement. At the same time, by an inquiry made on May 10, 1973, four families in Ryōzawa expressed their intention to move to the new settlement; one family intended to move in 1973 (Wasanai); and three others intended to move in 1974 (Wasanai). Two other families in Shichinaigawa would like to leave for some other district in Sawauchi-mura (the inquiry was made by the office of Sawauchi-mura). Further, it is estimated that there are some families who have the desire to move but have not yet expressed their intention. These families must obtain co-operation in many aspects of their lives from the families of the larger households in the settlement who have a positive intention not to move. The former families hesitate to state their intentions clearly, and in some cases have not made a clear decision. This trend, concerned with decision-making and expression of one's intentions, is traditional in Japan. The recent development of the high degree of industrialization in this country has had an effect on this; many villagers of Tōhoku district, whose houses are still in the villages, are drawn to the larger cities (mainly to Tokyo) in winter for half a year as seasonal labourers at construction sites (thus, they are always half-farmer, half-labourer). Consequently, these farmer-labourers bring certain urban ideas into their native villages. The decision-making tendency in question has been weakened, but has not yet disappeared. On the other hand, Japanese urban life is not as "purely urban" in the sense of the Western world. It still has more or less a "rural" flavour. Even in a meeting of highly educated people who have stayed long in the urban communities, one can find the same tendency mentioned above.

In addition to economic aspects, it is important to point out the regional differences of the polygeneration farmhouses of both sub-districts. If other conditions were equal, a family is more socially mobile when it consists of the nuclear family and has few or no relatives living with it.

TABLE 5. Ratio of the number of families with more than three generations (1970)

	Moved group	Remained group	Total
Nagaseno	48.0%	100.0%	63.9%
Ryōzawa	60.0	77.3	74.1
Total	50.0	84.8	68.3

Source: Calculated from the data given from the office of Sawauchi-mura.

As mentioned above, there were potential conflicts between Nagaseno and Ryōzawa or between "the moved group" and "the remained group", which could easily come to the surface if some improper decisions were made by the administrators.

(b) It was a big project to realize the resettlement of the inhabitants of the district. There were many difficulties to overcome.

The first one of those difficulties was, of course, economics. The inhabitants of the district who wished to move, and Kubo, the headman of Sawauchi-mura, who had intended to help them, wanted to ask for aid from the central government.

According to the working program of the Economic Planning Agency, the state office in charge of the resettlement policy, less than half of the total

expense was given to the inhabitants who would resettle (Economic Planning Agency, 1970).

When the inhabitants are subsidized by the national government, the prefectural government supplies half of the national amount, and the office of 'mura' does the same. The total expense for this resettlement reached about ¥ 210,000,000 of which ¥ 120,000,000 was subsidized, and so, for the dwellers of the new settlement (35 families) it was enough to bear a little less than ¥ 90,000,000 or about 42.9% of their total expense. It was quite obvious to the inhabitants that they could not resettle without financial assistance.

One of the required conditions of the working program as proposed by the Economic Planning Agency was that the plan of resettlement had to gain the approval of the entire population of the area concerned (Economic Planning Agency, *op. cit.*, p. 6). Consequently, many differences of the living conditions of the inhabitants were neglected, at least for the time being, and the policy to gain the inhabitants' quick approval was exclusively pursued. This was a mere formality, however, for both those asking and those being asked. The resettlement plan gained the oficial approval of the inhabitants of both sub-districts for the purposes of the subsidy, but only in a superficial, formal way. The people of the asking side were satisfied with the paper signed by all of the inhabitants. On the other hand, many who signed their names merely did so for the purpose of the signing itself (those persons could not possibly refuse signing under the environment of the rural community).

Fig. 8. Old farmhouse

Excluding the 6 families who were going to leave the district, 75 families signed their names. No one refused to sign in the district. Among those 75 families, 35 intended to move following the first project. Another group was planned to move following a second project, but their signatures were only superficial since they did not really want to move.

The first group was planned to move in 1971 and 1972, because it was required by the working program to complete the project in two years (Economic Planning Agency, *op. cit.*, p. 8).

But the unreality of the second group's intention could not manifest itself officially. All the members of the district gave their approval to the plan. Of-

ficially, the members of the second group were urged to realize their intention to move.

It was at this time that conflicts arose among those inhabitants, who had different interests concerning the resettlement plan from those of the first group.

Fukazawa was no longer in the village and so the principle of persuasion was replaced by the principle of efficiency of administration.

To make matters worse, the people of the second group could not forget an experience when two 30 HP tractors were obtained and were to be used co-operatively. Unfortunately, the tractors were too few and the farmers too many for success in their venture (Sasaki and others, *op. cit.*, pp. 372–373). (In Japanese villages, except for Hokkaido, farmers do not usually use tractors. They usually use power cultivators which are more suitable to the small scale of management.) And further, co-operative agricultural production, which is still being tried now in the new settlement — in stock raising and in *shiitake* (a kind of mushroom) raising — cannot boast of any remarkable success as a co-operative venture. Consequently, some of the smaller households in the new settlement have to search for sources of income other than farming. This situation does not encourage the resettlement movement for the farmers in the Ryōzawa district.

Fig. 9. New farmhouse

But the factor most responsible for making matters worse is, in the author's opinion, the recent agricultural policy of the government. By this policy, the area for rice production is restricted. This has been a serious blow to the farmer's efforts in the new settlement. (By the way, Ota, the new headman of Sawauchi-mura, told the author in May, 1973 of his wish to oppose this kind of policy).

The resettlement movement was promoted by the initiative of the inhabitants, but later it was controlled by the government. Because of this change, the resettlement plan as an expression of regional development in a democratic way changed into an expression of regional conflict.

If the necessary conditions for the resettlement plan proposed by the government were more generous in their terms, and at the same time, recent

agricultural policies had been more suitable for the rice producing farmers, it is doubtful that the present conflict among the inhabitants of Nagaseno district would have occurred.

This example in Sawauchi-mura suggests a better way of regional development in Japan today.

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ECONOMIC IMPACTS IN SMALL COMMUNITIES IN THE BOSTON REGION

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Economic impact analyses have a long history in geography and regional science. For the most part, the impact studies have concentrated on large areas and adopted a rather broad perspective. These two characteristics are related because the available models of the multiplier relationships have been rather general in design. Economic base, input-output, regional income and product accounts, and econometric designs are all models of a very general economic system for large administrative, political, and other geographic units.

Probably because of the availability of census data, or a more general concern with the economic health of the larger community, the SMSA and the city have been the principal observational units. In concentrating on these large areal units, considerable information is lost in assessing the *local* impacts of specific changes in the regional economic system, as impacts do not spread equally over all parts of the city or metropolitan region.

In the last few years attention has been directed to collecting and compiling very detailed data on the linkages between industrial establishments. Considerable resources have been invested in original surveys of firms wherein management provided detailed records of their business transactions. These surveys produced some results which appear to contradict the location theory tenet of the importance of transportation costs in affecting the locations of suppliers and customers. The detailed Philadelphia SMSA Input-Output study (Isard and Langford 1971) revealed that the products of Philadelphia manufactures cover the entire breadth of the nation. Distance did not have an appreciable effect upon value and volume of purchases nor availability of supply; the product flows are best described as almost "random," certainly not dominated by short distance flows (Karaska 1966). Beyers, reporting the results of elaborate input-output studies of the State of Washington, indicated that the backward linkages of the Puget Sound region were spatially widespread; the indirect structural relationships were powerful enough to make the direct and indirect ties of *every* sector greater outside the region than inside it (Beyers 1974). Similar evidence of the overwhelming strength of non-local linkages

were found by Brosse (1971), Moseley (1973), Sokai (1972), Czamanski (1971), and Steed (1970).

Intraregional geographic linkages are generally assumed to be even more diverse. The ease of commutation, shopping travel, and transfer of industrial goods within a metropolitan region is such that large inter-community leakages are expected as the norm. But most regional economic studies fail to consider these leakages which can have such a profound influence on the differential multiplier effects among small areas.

We report here a study of multiplier relationships in very small communities whithin the Boston Metropolitan Region. Our model emphasizes the multipliers resulting from wage, salary, and overhead payments by a manufacturing firm. The materials purchased by the firm leak out of the region, thus the multiplier effect of these purchases is quite small for the region. On the other hand, the wages, salaries, and overhead expenditures by the firm generate a large "regional" multiplier; and, these expenditures generate substantial "local" multipliers for many of the towns close to the manufacturing firm.

Some towns, characterized by "low" *local* multipliers, are the residences of workers of the firm and receive substantial wage payments, but these towns have very limited retail facilities and leak consumption expenditures to surrounding towns. Other towns, which are not residences of the workers but the sites of retail establishments and the residences of retail workers, are identified as having "medium" multipliers because they receive only the induced effects of the wage payments by way of consumption expenditures. Another set of towns are identified as possessing large multipliers because they contain not only large retail complexes but also residences of the workers of both the manufacturing firm and the retail establishments. In addition, our model incorporates the effects of proximity of each town to all other towns in terms of the overall travel patterns for shopping and commutation to work. Finally, the towns are additionally differentiated on the basis of the salaries and expenditure patterns of the technical versus managerial labor forces.

IMPACTS OF THE QUINCY SHIPYARD

The research problem is an assessment of the potential economic losses to local communities in the Boston Metropolitan region which might result from closing of the General Dynamics, Quincy Shipyard (Regional Science ..., 1975). The specific concern arises from a request by the ship company to the Massachusetts Department of Public Works to build a new bridge over the Fore River; the existing bridge hampers the passage of very large supertankers (LNG tankers) currently being constructed, and newer larger vessels would not be able to utilize the existing passage.

The strategy for measuring impacts employs a modified input–output analysis. We adapt the very detailed Philadelphia Region Input–Output Table to the Boston region; we evaluate the expenditure characteristics and patterns of the Quincy Shipyard; and, we emphasize the consumption effects of the input–output matrix.

An analysis of the expenditure patterns of the shipyard revealed that the "leakages" of dollars outside the metropolitan region were considerable. The direct purchases of local materials used in constructing an LNG carrier accounted for only $5.18 per $100 of shipbuilding materials. These small, local material purchases, in turn, produced only $4.57 of indirect purchases per $100 of ma-

terials (as calculated from the input-output matrix). Thus, every $100 of materials purchased by the shipyard generated only $9.75 of local expenditures.

While these facts attest to the general patterns described earlier, that the interindustry linkages of American industry are geographically widespread, they also reflect the peculiar nature of shipbuilding and the Boston economy. A supertanker is steel plate, pipes, steel, and electrical components. None of these are manufactured in the region. The largest single component manufactured locally are turbines; however, most of the components for turbines are also imported into the region.

It is obvious that the multiplier effects of the shipyard were not going to be imported through the interindustry or materials purchased. Approximately two-thirds of the costs of a LNG supertanker falls into the "value-added" category — about equally divided between wages, salaries, and overhead. Thus, the impacts can be seen as occurring through the consumption and local services effects. The analysis of these effects, thus, uses an input–output model which concentrates heavily on retailing and services. The model generates its indirect and induced effects through the wages and taxes paid by retailing and services and the household purchases made as a result of these wage payments. The entire process is stimulated in the first place by shipyard wage and salary payments and local overhead expenditures, including property taxes.

The impact analysis is split into two parts — one concentrating upon the *regionwide* impacts of the shipyard's expenditures; the other concentrating upon the *local* impacts resulting from wage and salary payments within the *cities and towns* where most of the shipyard workers and managers live.

THE REGIONWIDE MODEL

Input–output analysis provides a very detailed accounting of the impact of one sector of the economy on all other sectors. The more detailed the breakdown of the economy the more accurate will be the results of any impact analysis. However, an enormous amount of detailed data is required to construct an input–output table. Since no suitable table was available for the Boston Region, the 490–sector, Philadelphia Region Input–Output Table was adapted to the conditions existing in the Boston Region (Isard and Langford 1971).

The materials (interindustry) coefficients from the Philadelphia Table were transferred directly to the Boston Table. Next, an estimate was made of the proportion of each material input which would be supplied by the region rather than being imported. These regional purchase coefficients were augmented by specific information from the shipyard company's records. This set of regional purchase coefficients is, thus, used in the running of the model to determine the outputs of materials suppliers within the region generated by increases in outputs and demands for inputs by all other industries in the region.

Because the shipyard's wage and salary payments constituted the principal source of economic impact, it was felt that the most important adjustments of the Philadelphia model should be directed to improving the accuracy of the consumption patterns of shipyard employees. Therefore, the single consumption column of the Philadelphia Table was replaced by three columns reflecting three income categories representative of the shipyard labor force — $7–10,000, $10–15,000, and greater than $15,000. Consumption distributions for the three income groups were derived from national data and covered the major categories of food, housing, transportation, medical services, clothing and personal

care, and state and local taxes (US Congress..., 1974), and reflected the higher costs of living found in the Boston area.

These adjustments and subsequent calculations in the input-output matrix revealed that for every dollar spent by the shipyard on wages, material purchases, and overhead within the Boston Metropolitan Region an average of 77 cents worth of additional wages is generated. In addition, approximately 11.7 cents worth of local taxes and approximately 8.1 cents of state taxes are generated as a result of the combined effects of the shipyard's direct expenditures and the consequent indirect and induced expenditures.

LOCAL ECONOMIC IMPACTS

Since the significant part of the study is the multiplier effects occurring through the wage, salary, and service components, the next logical step is to evaluate the more detailed geographic patterns of these impacts. Thus, the consumption patterns of the workers and managers of the shipyard were analyzed and a *local* input-output matrix was developed for the cities and towns which housed the workers and managers.

It was determined that no less than 14 per cent of the labor force of the shipyard resided outside the Boston metropolitan area, reflecting the fact that the specialized skills for shipbuilding are heavily concentrated in the region. Twenty-six towns in the SMSA were found to be the residences of the shipyard's labor force (a town was so designated if it contained at least 0.5 per cent of the shipyard's labor force), see Figure 1. This portion of the metropolitan area was assumed to be the principal recipient of any direct effects of changes in the structure of the shipyard. The induced effects result from the purchases of labor and services by retailing, local government, and other sectors which serve the shipyard and its employees.

Since the multiplier effects within the local communities would be generated through the trade and service sectors, only 75 of the 490 sectors in the Boston Regional Input-Output model were necessary. However, even this level of detail would have involved considerable difficulty in estimating shopping and commutation patterns for each sector. Therefore, the 75 sectors were aggregated into 18 sectors on the basis of general similarity of function, magnitude of average household expenditure, and shopping and commutation patterns.

The other basic element in the model is a distribution matrix which expresses the proportion of the demand for the goods and services, including labor, for each of the 18 sectors in each town which would be satisfied by the town itself, each of the other 25 towns, and in areas outside the 26-town region. Estimating the shipyard's direct and indirect economic impact on a town-by-town basis is complicated by the fact that people do not make all of their expenditures within the towns in which they live, and not all retail and service workers required by establishments in a town necessarily reside in that town. In particular, many major household purchases are made outside the town of residence, especially if major shopping centers are located in other towns. Also, many employees of retail and service establishments commute a significant distance to work. It was necessary, therefore, to distribute for the other 25 towns in the area the impacts which originated with the shipyard payments received by each town.

The distribution matrix was developed from an analysis of retail sales patterns within the 26-town area, based in part on an automobile license plate survey of 12 major shopping areas. The survey permitted the proportion of shopping travel between town of residence and locations of shopping center

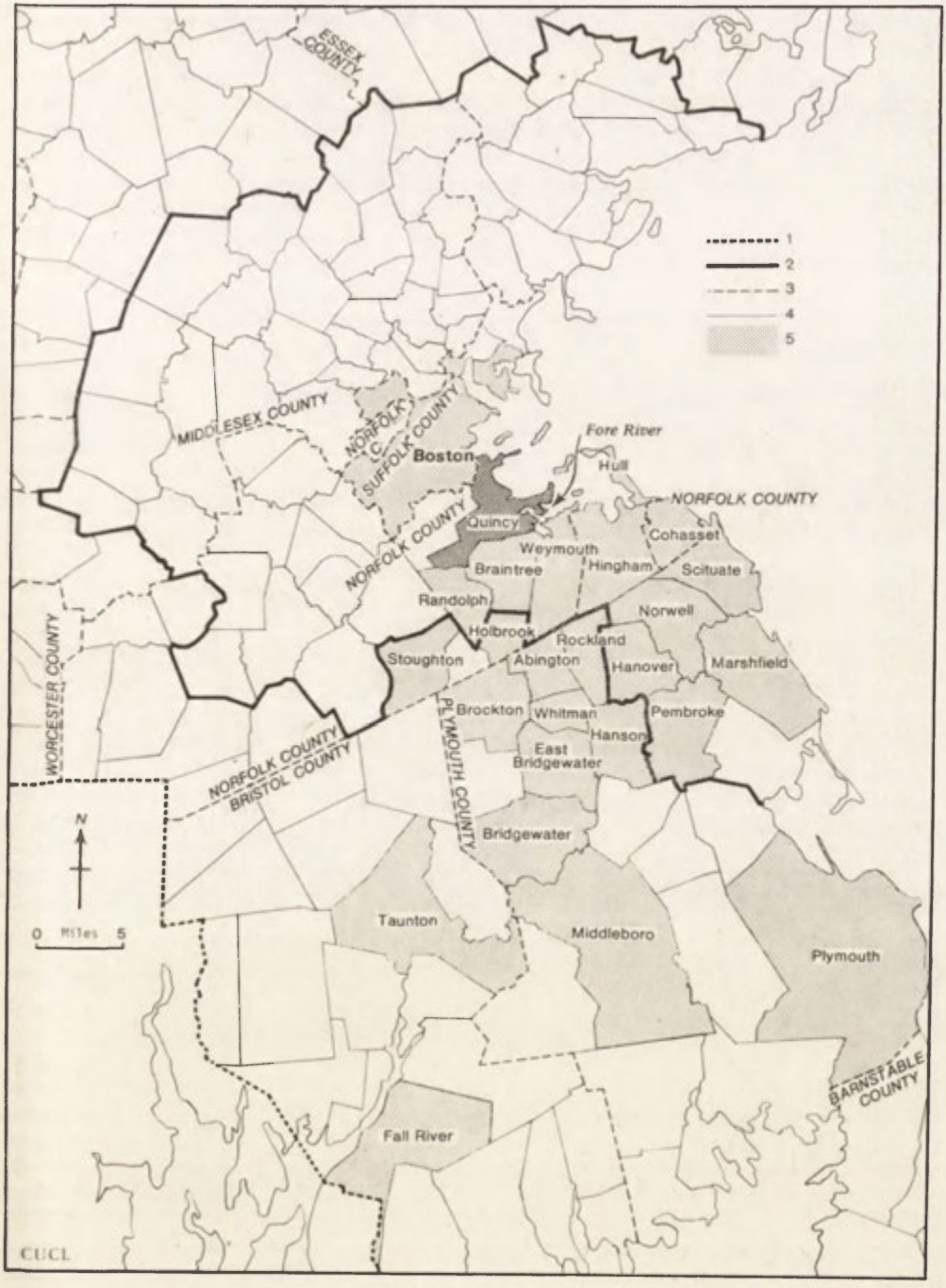

Fig. 1. Impacts of the Quincy Shipyard
1 — state boundary, 2 — SMSA boundary, 3 — county boundary, 4 — town boundary, 5 — town impact area

to be estimated by distance-decay functions on the journey from hometown to the shopping location. Journey to work data were used to fit other distance-decay functions which determine the proportion of trade and service workers employed in each town which is made up of residents from every other town.

Postulating that the General Dynamics, Quincy Shipyard will stay in business producing large supertankers and with a new bridge in place, the Local, 26-Town, Input–Output is run for twenty-five years (see Tables 1 and 2) with future impacts discounted at 7.5 per cent per year. The resulting economic and fiscal impacts of the shipyard vary considerably among the communities in the South Shore Area.

TABLE 1. Economic and Fiscal Impacts on the 26-Town Area

Town	Direct Wages	Indirect Wages	Total Wages	Wage Multiplier	Local Taxes	State Taxes
Boston	76,290.50	13,527.50	89,818.00	1.177	5,137.20	5,928.00
Fall River	9,889.10	1,634.40	11,523.50	1.165	645.50	760.50
Brockton	46,204.40	9,176.20	55,380.60	1.199	3,266.40	3,655.10
Quincy	158,950.80	56,629.40	215,580.30	1.356	34,480.30	14,228.30
Weymouth	151,762.70	25,097.80	176,860.50	1.165	9,403.30	11,672.80
Taunton	5,135.70	1,943.20	7,078.90	1.378	419.40	467.20
Braintree	64,242.30	36,807.20	101,049.50	1.573	11,417.00	6,669.30
Randolph	8,157.40	7,902.30	16,059.70	1.969	946.50	1,059.90
Stoughton	5,691.60	3,650.70	9,342.30	1.641	519.00	616.60
Hingham	22,897.50	8,978.60	31,876.10	1.392	1,873.70	2,103.80
Plymouth	21,620.80	3,228.60	24,849.50	1.149	1,369.50	1,640.10
Scituate	21,880.90	4,513.50	26,394.50	1.206	1,392.60	1,742.00
Rockland	17,499.70	6,902.70	24,402.40	1.394	1,406.10	1,610.60
Marshfield	14,281.40	2,986.40	17,267.70	1.209	921.90	1 139.70
Middleboro	5,853.60	2,385.70	8,239.30	1.408	513.30	543.80
Whitman	14,054.40	7,980.60	22,035.00	1.568	1,381.10	1,454.30
Abington	20,394.40	8,510.30	28,904.70	1.417	1,685.70	1,907.70
Bridgewater	8,222.10	2,670.70	10,892.80	1.325	594.40	718.90
Holbrook	12,910.00	8,911.30	21,821.40	1.690	1,278.90	1,440.20
Pembroke	13,803.90	3,965.50	17,769.50	1.287	989.90	1,172.80
Hanover	12,202.50	6,041.10	18,243.70	1.495	1,175.70	1,204.10
Hull	12,452.40	4,842.60	17,295.00	1.389	947.80	1,141.50
E. Bridgewater	5,783.90	3,365.10	9,149.00	1.582	517.60	603.80
Norwell	12,628.60	4,759.60	17,387.70	1.377	985.20	1,147.60
Hanson	6,862.00	3,699.40	10,531.40	1.535	596.60	695.10
Cohasset	12,448.20	6,418.00	18,866.20	1.516	1,209.30	1,245.20
Totals	762,121.20	246,498.00	1,008,619.20	1.323	85,074.10	66,568.90

One notable feature of the resulting impact patterns is the wide diversity of wage multiplier effects. This is due mainly to the fact that the larger cities and towns, such as Boston and Brockton, import many of their trade and service workers in the form of commuters from suburban towns such as Stoughton and Whitman. The latter, which receive only a small fraction of direct shipyard wages, receive a disproportionate share of secondary wages, and thus exhibit

TABLE 2. Dependence of 26-Town Area on Direct and Indirect Shipyard Impacts

Town	Average annual shipyard dependent employment 1975–1999	Column (1) as % of 1975 employed residents	Average annual shipyard dependent local taxes* 1975–1999	Column (3) as % of local taxes
	1	2	3	4
Boston	667	0.26	440,360	0.09
Fall River	86	0.21	65,344	0.17
Brockton	415	0.97	280,552	0.65
Quincy	1,690	4.41	2,979,500	5.64
Weymouth	1,308	5.76	806,652	2.95
Taunton	56	0.30	35,984	0.29
Braintree	835	5.04	983,752	3.69
Randolph	140	1.25	80,872	0.79
Stoughton	79	0.85	44,432	0.55
Hingham	253	3.15	160,672	1.63
Plymouth	183	2.23	117,696	0.61
Scituate	199	2.94	119,548	1.34
Rockland	195	2.56	120,612	2.21
Marshfield	130	2.18	79,164	0.74
Middleboro	66	1.14	44,048	0.98
Whitman	182	3.42	118,460	2.93
Abington	231	3.82	144,620	4.17
Bridgewater	85	1.87	51,008	1.19
Holbrook	184	3.59	109,484	2.35
Pembroke	137	3.74	84,968	2.39
Hanover	148	3.74	100,868	1.45
Hull	137	2.87	81,220	1.33
E. Bridgewater	75	1.86	44,388	1.46
Norwell	137	3.76	84,344	1.83
Hanson	87	3.87	51,156	1.39
Cohasset	154	4.89	103,644	1.93
Total	7,859	1.01	7,333,348	1.01

* At 1974 tax rate.

higher multipliers. Randolph is a prime example; due to its fortuitous location, its residents are easily accessible to trade and service jobs in most of the major surrounding commercial areas. Braintree, as another example, has a heavy concentration of shopping centers employing its own residents as well as commuters, and it is also the residence of a considerable number of shipyard employees.

The employment multipliers (not in the Tables) also, of course, vary widely among the communities. They are higher overall than the wage multipliers because shipyard wages average about $12,500 per year as compared with about $8,000 per year for trade and service workers. Thus the employment multipliers range from about 1.6 to well over 3 for the individual towns for the trade and service impacts alone. The overall regional employment multiplier is about 1.9 when material and other purchases are considered along with wage and salary payments.

The data in Table 1 are absolute numbers. They do not, therefore, permit evaluation of the impact of the shipyard relative to total economic activity or tax base. A clearer picture is provided by measures of the relative dependence of each community on the shipyard presented in Table 2. This table shows how the wage and tax losses of the shipyard closing after 1985 would be distributed among the 26-town South Shore Area and how significant these losses would be for each town.

Clearly, the most affected towns would be Quincy, Weymouth, and Braintree, which depend on the shipyard and its employees for about five per cent of their employment, taxes, or both. Cohasset would also be strongly affected because of the number of shipyard executives and professionals who reside there.

SUMMARY

Our impact analysis of prospective changes in the General Dynamics, Quincy Shipyard emphasized the geographic patterns of multipliers for local communities generated by wage, salary, and overhead expenditures. The variation in local multipliers was felt to result from characteristics of the people and the towns: whether the town was the site of residences of workers, technicians, or managers of the shipyard; the nature and magnitude of the retail complexes found in each town; the commuting patterns cf the retail and service workers; and the shopping habits of the employees of the trade and service establishments.

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PHILOSOPHIZING ON THE REGION

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One of the results of the discussions in the fifties and sixties of our century about the problem of economic regionalization, in which the Poland geographers took such an important share, consists in the fact that they have brought us to a renewed understanding on the concept of the region. Less on the "economic region" as possibly a tool for governmental purposes, that was elaborately studied by a special commission of the IGU, than of the "true" or the "total" region, that phenomenon of a spacial entity of restricted extension, a phenomenon occurring in all parts of the world and in all times of history, and finally, in constituting the basis of regional geography, one of the most important topics of human geography.

Experience has taught us that any effort to sub-divide the world into regions, exclusively on the basis of physical-geographical criteria inexorably comes to a standstill as soon as it becomes confronted with the activities of man, a difficulty that already was felt by Alexander von Humboldt. Within the scope of human geography we therefore have to put that the region is essentially a creation of man. This concept is justified since it can be derived directly from the two principles of Paul Vidal de la Blache — man's intelligence and his living in social contexts — by adjoining to them a third one, namely the need of space of any individual in building up his *genre de vie* whereas then the region may be defined as the spatial embodiment of an integrated complex of *genres de vie* using this French term for convenience's sake.

Far more important for our philosophy is the statement that many of the present regions have a long history by their predecessors, or are the result of a long historical development. Perhaps it is more preferable to state that mankind has a long history of economic and social development, in which the different stages almost never coincided in the various parts of the world, such as shown in the instructive map of the situation about 1500 in the study of Hans Bobek [1] related to this matter. Nevertheless one may assume, that with each stage in this development a special type of region — owing its character to a cooperation of physical, economic, social, institutional and especially technological factors — is corresponding to its content as well as to its spatial extension. Further by putting together the different types of a region, something like a kind of a "genesis of the region" becomes outlined.

In the initial stage of occupation when the struggle for existance still nearly totally takes place in the field of agriculture and when under the influence of a defective technology the occupation had to a high degree to adapt itself to

[1] H. Bobek, Hauptstufen der Gesellschafts- und Wirtschaftsentwicklung in geographischer Sicht, *Die Erde*, 1959.

the physical environment, the region — seen as a human creation — cannot easily be defined. As to its content, the region is strongly determined by the quality and the possibilities of the material environment. As to its extension the region is merely no more than the addition of the need of space of a number of similar *genres de vie* of the individual occupants.

It has to be granted that this initial region bears to a high degree a hypothetical character. To be sure we cannot pass over the forms of social or even governmental organization that already exist in primitive agrarian societies, however, without being allowed to relate these institutions to a purposeful endeavour of fostering the prosperity of the whole population of the region. In the inventory of these societies and their institutions by the sociologist Gerhard Lensky,[2] the author stresses the social stratification and social inequality as the consequence of the share one is receiving of the — using a very heavy term — "national" or "regional product". Thus we get a strong impression that these institutions in the first place are to secure certain privileges in the distribution of the results of agrarian production or as a justification and legalisation of the existing economic and social inequality. In this connection the institution of "kingship" has to be doubted seriously and the incidental features of expansion as for instance the historical African kingdoms, will have to be interpreted as expeditions of rape and robbery to increase the share of the principal participants in the total "national" income. Under these circumstances it will be easily understood that the exact delimitation of the region becomes of lower interest and that the French geographer Sautter takes the *ethnies*, tribe- or clan territories as the starting point for a regionalization of some parts of tropical Africa. Regional frontiers only become vaguely vivid in mutual conflicts between the different *ethnies*.

However, already in the next stage, the evolution of material technics, which imply a more efficient control of the natural environment as well as the development of a division of labour and of specializing, gives birth to a system of social organizations and institutions with quite clearly regional contents and consequences, such as the German *Flurzwang*, the French *vaine pâture*, the British "commons", the "polders" in the Netherlands, the organization of irrigation in Spain, etc. Even the specific judicial organization of the towns during the middle ages contrasting with the law in rural regions might be mentioned in this connection. As a matter of fact these institutions are region-builders, in that they gave birth either to regions which are the smallest spatial embodiments of the cooperation of various material, social and spatial technics, such as the territory of a village (Dutch: *dorpstoebehoren*, German: *Dorfgemarkung*) or of larger regions which are a spatial amalgating of similar minor regions with eventually a town as a regional centre. The growth of a regional consciousness on the basis of the common interests accentuates this type of region.

Many examples of this type may be found in a remote or recent past. So the *pagus* (*go, gau*, etc.) of the karolingian administration may be interpreted as still vaguely delimited natural regions. In the later middle ages this type of region is characteristic for those areas where the feudal society did not obtain a firm footing, as in the coastal parts of the Netherlands and North-western Germany, where it is often indicated by the suffix *-land*. As to the many *Pays* of France, a country that was strongly feudalized, the situation is somewhat more complicated, since — following the I.N.S.E.E. report — at least three types may be distiguished: (a) *pays*, deriving their name from a central town (Biter-

[2]G. Lensky, *Power and privilege. A theory of social stratification*, 1966.

rois from Beziers; Dunois from Chateaudun), but without a clear indication of their special economic or social structure. (b) *pays*, bearing the character of a physical-geographical unit, however, without a well developed urban centre; (c) like type b, but with a well developed regional urban centre.

Meanwhile a process of differentiation and integration has been starting gradually. Differentiation consists in the development of new or seperate regions within the already existing regions, which mainly may take place in at least two ways, either by cultivating waste land, which, however, may produce different *genres de vie*, different from the traditional one, or in the developing of local or regional specialisations in the agrarian, industrial or tertiary sphere of production.

Within the scope of a philosophy of the region as to its genesis and dynamism, the process of integration is much more interesting. By integration may be understood the amalgamating of a number of different regions into a larger spatial entity, however, partly changing their original character. Integration can also take place by subordinating a region into a larger unit, towards which it will perform a special function. This process of integration is therefore interesting, since these developments do not need to take place spontaneously — i.e., out of the population itself — but by the power of a higher authority, in other words by political or social-political factors. In this way a great variety of political formations arise, such as principalities in the form of absolute kingdoms or even despoties, civilian republics either aristocratic, oligarchic or democratic, or state-buildings on an ideological basis, etc., however, each with its own pattern as to the organization of the production and distributing of its yields. Perhaps in this context also the subdivision of France by Albert Demangeon — made in 1940, and posthumously published in 1972 — may be mentioned in which most of the different regions, called "provinces", are showing a close resemblance to the *gouvernements* of the ancien *régime*.[3]

From a more strictly geographical point of view and next to the extension of these more or less political regions, the question is intriguing, to what degree the state-policy as a whole or to the different integrated regions separately, was purposively bent on the prosperity of the population, thus principally fostering the welfare of every individual inhabitant, which aim becomes manifest by the distribution of the total income and in the level of consumption of the several groups.

In this connection we again may distinguish two cases for the first of which the answer to this question has to be negative. In spite of the danger of exageration one might put that in the beginning the main function of the political region (c.q. its eventual sub-divisions) is that of a taxation-district, such as the Netherlands in the 16th century on behalf of the King of Spain. The often very heavy taxation of the inhabitants is but one of the drawbacks of these political regions, another and perhaps more serious, is the way of spending the yields of this taxation. A part of it is reserved for the costs of political (including military) expansion, but a larger part is by the ruling prince invested in its private and unproductive sector, for instance in the building of sumptuous residential palaces, the paying of a court-nobility, etc.

The examples of this situation, which especially have to be referred to dominantly agrarian societies, are manifold. Restricting ourselves to a rather nearby past, the heavy taxation of the French people during the 18th century may be mentioned and likewise the enormous sums spent on the court and its

[3] A. Demangeon, Les provinces françaises et le problème d'une organisation régionale, *Acta Geographica*, 1971.

courtiers. Similar features can be signalised in the *Kleinstaaterei* of the dismembered Holy Roman Empire in Germany: Small princes imitating their larger colleagues in building more or less sumptious residential castles, which have to be paid for out of principalities, which are often to small and feable to support a princely way of life. Younger sons and sometimes even the reigning prince, are compelled to look for a living by serving as an officer in the armies of mightier potentates or in a subordinate governmental function, for instance in the Dutch Republic of the 17th and 18th century.

It is only after the French revolution that a fundamental change sets in, and that — although otherwise only very slowly in the beginning — the modern state is developing, in which the organization for fostering the welfare of its population becomes the most important item in the program of its appointed task, which is embodied in the state's economic and social policy.

Nevertheless with this new task of the political region as the state may be called, the process of differentiation and integration is continuing, the former tendency being fostered by the industrial revolution, which for the rest does not show everywhere the same intensity and speed in its working. In the Netherlands, for instance, its influence only becomes perceptible in the second half of the 19th century. In this stage a new kind of region is developing, which we might call "functional". This functional region is a very complicated one, as it is built up out of a complex system of activities and interrelations, on both the economic and the social level, and into a function towards the state as a whole. The territory of the state as a whole is a functional region in itself, as such becomes manifest in the national balance, the amount and the structure of the national income, etc.

It will be evident that with these functional regions, the homogeneity of the former types of regions, consisting to a high degree in a uniformity or similarity of the *genres de vie*, has been substituted by the external function. Furthermore it must be stated that the functional region is heterogeneous, integrated by an intricate system of interrelations, whereas the determination of the functional region is decided by the range of these interrelations, producing the external function. In this situation it also will be evident that in most cases it will be impossible to denominate these functional regions by a single geographical or topographical name, but that they will have to be called by a compact description.

With this final remark, we have arrived at the verge of a philosophy of the methods and technics by which in the actual situation a functional region may be discerned. As a matter of fact it was the functional region — that phenomenon characteristic for the modern western civilization — which formed the main topic of the discussions in the commission of the IGU on economic regionalization. However, when we are confronted with the regional structure of less advanced parts of the world, the historical-geographical approach of the region which is leading us to distinguish different types of regions may be of some use. Moreover, for pure geographical scientific purpose this historical approach may offer not only a starting point for regional geography but also the occasion to many alluring scientific adventures.[4]

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[4]An effort for a subdivision of the Netherlands in functional regions: H. J. Keuning, *Het Nederlandse volk in zijn woongebied*, 2nd ed. 1965. An example of a functional regional geography of the Netherlands, by means of a historical approach: H. J. Keuning, *Mozaiek der functies*, 1955 (A revised edition is in preparation).

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ON THE IMPACT OF SOCIALIST ECONOMIC INTEGRATION ON THE SPATIAL STRUCTURE OF INDUSTRY IN THE GDR

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The advance of planned international territorial division of labour within the community of states affiliated in the Council for Mutual Economic Aid, is aimed in the long run at the development of a highly effective economic organism for the benefit of working and living conditions of the people involved. This labour division presents a regionally limited stage, of what V. I. Lenin has put in his forecast as the "... uniform world economy as a whole to be controlled by a common plan of proletariate of all nations".[1]

The territorial specialization has made marked progress during recent years within the socialist states, as a necessary consequence of the international labour division. While the proportion in the GDR exports of specialized products, according to CMEA agreement, amounted in 1970 to approximately 1%, the corresponding figure as regards GDR exports to the USSR rose to 17% in 1974, and was expected to exceed nearly 30% during 1975.[2]

Acceleration of the rate of international labour division as planned by the CMEA, as well as that of specialization accomplished by entire state territories, and of economic areas within those latter, have run out in a new scope of work opening before geographers and economists, equally important from both the theoretical and the practical angle. This new scope of work is ever more distinctly reflected by the scientific literature.[3] An attempt is made below, to pose and answer certain questions pertaining to industrial location, and resulting from the processes of international territorial labour division with reference to the territory of the GDR.

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[1]Lenin, W. I., *Werke*, vol. 31, Berlin 1959, p. 135.

[2]*Neues Deutschland* 8/9.3.1975.

[3]The below works, published in the GDR, have been quoted herein for the sake of example: Huber, G., Der Einfluss der internationalen sozialistischen Arbeitsteilung auf das ökonomische Wachstum der RgW-Länder unter besonderer Berücksichtigung der Angleichung des ökonomischen Entwicklungsniveaus, in: *Probleme der Politischen Ökonomie*, Jahrbuch des Institutes für Wirtschaftswissenschaften, Berlin 1968; Kohlmey, G., *Vergesellschaftung und Integration im Sozialismus*, Berlin 1973; Kohlmey, G., Wahl von Produktionsstandorten und internationale Mobilität von Produktivkräften in der Wirtschaftsintegration der RgW-Länder, *Wirtschaftswissenschaft* 9, 1973; Zimm, A., Zum Problem der Internationalisierung der Standortverteilung der Produktion im Prozess der sozialistischen ökonomischen Integration, in: *50 Jahre UdSSR*, Leipzig 1973; Zimm, A., Zu einigen Phänomenen der Herausbildung einer internationalen sozialistischen Standortverteilung, *Petermanns Geogr. Mitt.* 1, 1975.

1. STARTING POINTS OF THE GDR FOR SPECIALIZATION OF HER ECONOMICS WITHIN THE SOCIALIST ECONOMIC INTEGRATION DRIVE

In the case of the GDR the two basic facts of paramount importance from the standpoint of territorial conditions to be put to the optimum use — are: the absence of domestic raw materials in the first place, and in the second, the relatively high skill of the labour force.

1.1. RAW MATERIAL POSITION OF THE GDR

The territory of the GDR is noted for the presence of relatively rich deposits of brown coal (districts of Halle, Leipzig, Cottbus and Dresden), potash and rock salt (districts of Magdeburg, Halle, Erfurt and Suhl) as well as tin ore (districts of Karl-Marx-Stadt and Dresden). On the other hand, there is a shortage of crude oil and natural gas, black coal, iron and non-ferrous metals ores, raw materials for the production of aluminium, etc.

It may be noted that the output of brown coal as one of raw materials in an abundant supply has been reserved to meet the basic requirements of power demand of the GDR over a long period ahead. On the other hand, tin ore deposits have only a minor bearing on the specialization drive. Therefore, it is only potash and rock salt deposits — with view to the prospects of their processing by the chemical industry — that remain of a greater importance for the international labour division.

The above characteristic proves the point that the national economy of the GDR has to rely on imports of large quantities of raw materials and/or of intermediate products. This position is spectacularly manifested, i.e., by pipelines that have been laid, over thousand-kilometre long distances, from the USSR to the GDR or those in construction to date, like, e.g., the crude oil pipeline "Friendship" running from the Ural-Volga area, or "Northern Lights" natural gas pipeline from the West-Siberian area of Tyumen, and the one at present under construction, run from the natural gas deposits of Orenburgh to the West. Equally large are the major freight shipments through seaports and border stations, especially via Frankfurt on Oder. An example are large-scale transhipment installations for handling iron ore and black coal imported from the USSR and the People's Republic of Poland, at the steel plant of Eisenhüttenstadt.

The conclusion due with regard to the rational, in terms of economics, international labour division, will therefore stress the fact that specialized production branches to be established and/or expanded in the territory of the GDR, to operate for supplying other socialist states or the socialist community of states on the whole, must embody the features of a limited demand for raw materials. Any greater raw material requirement would equal increased costs, if one considers the transport routes involved.

1.2. LABOUR SITUATION IN THE GDR

The situation as regards the quality of the labour force in the GDR is marked by the relatively high level of skill of those employed. This level of training is both the result of accumulation of experiences gained by the workers of a highly industrialized state in general, and the outcome of a planfully implemented policy of promoting skill. It is due to this latter that, e.g., the share of graduate or vocationally trained personnel per 1000 employees in the socialist economy, has gone up from 21.8 to 55.8 or from 39.0 to 87.8 respectively, through-

out the period between 1961 and 1974.[4] The high standard of qualifications on the part of those employed is not solely prerequisite for reproduction to be intensely expanded in the GDR, but it provides furthermore for a starting point to promote in general, specialization lines within production branches in the GDR in the process of international labour division of the socialist community of states.

The final conclusion as regards the present conditions to be made an optimum use of, must therefore run that the most favourable prospects for specialization are opening for the GDR above all in the field of production branches that require a high level of skills and creative capacity.

1.3. THE RAW MATERIAL AND LABOUR DETERMINANTS OF THE PRODUCTION PROFILE OF THE GDR WITHIN THE ECONOMIC INTEGRATION OF THE CMEA STATES: CONCLUSIONS

The considerations heretofore make a production specialization of the GDR appear reasonable clear. They support the specialization in those branches of industry which involve advance processing and know-how, for the benefit of a high effectiveness, wih the simultaneously low demand for raw materials. Such specialization possibilities are offered particularly in the field of machine and vehicle engineering, of electrical engineering and electronics, as well as of the production of industrial equipment.

The machine and vehicle engineering, electrical engineering, electronics and equipment production, have boosted up the index of their gross production, in connection with the planned use made of the scientific-and-technological revolution, enormously rapidly, from 1950 (= 100) to 917 and 1,648 respectively in 1974, and thus they have increased their share in the industrial gross production of the Republic, from 21.5% to 35.2%, during the period of 1949–1974.[5] The above branches have basically conformed as to their development with the afore-mentioned lines of specialization, and they have exerted an influence upon the structure of the foreign trade of the Republic. The chapter "Machines, Industrial and Transportation Equipment" in the classification code of the foreign trade of the CMEA countries that corresponds roughly to the above industrial group, accounted in 1974 for no less than 49.4% of exports by the Republic, the corresponding figure as regards her imports, was running to merely 26.4%.[6]

The development in the GDR of the machine, vehicle, and electrical engineering, as well as electronics and industrial equipment production, in compliance with the labour division within the CMEA states, answers particularly to the requirements of the above mentioned trend towards the limited demand for raw materials, with a high level of processing. One may quote in this connection the production of process-controlled machine tools in the Berlin Capital and in Karl-Marx-Stadt, the output of the precision iron rolling mills in Magdeburg, the manufacture of passenger railway coaches, dining cars and refrigerator waggons in Halle, Dessau and Bautzen.

The trend towards production branches offering a high level of processing with the simultaneous limited raw material demand, results out of the general situation within the national economy. Should, however, special requirements be asked in particular cases, as, e.g., in connection with demand on the part of

[4] *Statistisches Jahrbuch der Deutschen Demokratischen Republik 1975*, Berlin 1975, p. 62.
[5] *Ibidem*, p. 17.
[6] *Ibidem*, p. 266.

large-scale brown coal strip mining, in the line of machine construction, the possibilities are also provided to develop material-consuming manufacture like the production of strip mining machines on the basis of extensive manufacturing experiences aided by highly developed cooperation systems, to the rank of a specialized production branch.

2. QUESTIONS OF SPATIAL INDUSTRIAL STRUCTURE IN THE GDR ON THE BASIS OF THE SOCIALIST ECONOMIC INTEGRATION PROCESSES

The planning of expansion oriented production branches, poses location questions, in connection with the economic integration of CMEA countries. Certain of these questions will be presented below, particularly with regard to industry branches exporting final products, and to those relying to a high degree on imports of raw materials and of semi-products.

2.1. EXPORT ORIENTED INDUSTRY BRANCHES

Most of the export-oriented industries are grouped within the agglomerations of Berlin, Halle-Leipzig, Dresden and Karl-Marx-Stadt-Zwickau as well as within other large cities, e.g., in Rostock, Magdeburg, Erfurt and Gera. The above concentrations have been growing over long stretches of time, and they are noted today both for their land development status and their skilled labour force, as dynamic centres of industrial potential.[7]

The agglomerations and large cities thus present essential advantages for the development of export-oriented industry branches from the standpoint of the economic integration of CMEA states. The above advantages of urban and industrial concentrations will gain impact due to the territorial planning that aims at increasing the effectiveness of production and at improving the working and living conditons of employees in the areas involved, by way of rational land development and complex housing projects. This is accompanied, by the increased possibilities of contacts with scientific institutions, particularly important from the angle of the scientific-and-technological revolution. Such institutions are frequently showing a still higher degree of concentration in agglomerations and in larger cities than the industry itself. Even while considering that the rapid progress in the electronic communications and data processing systems renders the spatial neighbourhood of no longer prime importance from the angle of contact possibilities, they still present an important advantage for specialized and export-oriented production branches.

Final conclusions to be drawn from the above considerations may thus confirm, in general, the particular qualifications of urban agglomerations areas and large cities for further development of specialized production branches, and for those to be newly established, from the standpoint of CMEA states. This, of course, depends on the individual labour, production, infra- and resource structures involved.

2.2. IMPORT-ORIENTED INDUSTRIES

Growing in parallel with the progressing international labour division within the CMEA states the possibilities of a more rational spatial industrial structure in the GDR have, in case of import-oriented industries, far reaching con-

[7]Kohl, H., Grundfragen der komplex-territorialen Entwicklung in älteren Industriegebieten sozialistischer Staaten, *Petermanns Geogr. Mitt.* 2, 1976, p. 81.

sequences. Generally speaking, the production branches based on imported weight-loosing raw materials (e.g., pig iron production) show little or no growth since such production is knowingly more economical in the vicinity of raw material deposits (e.g., iron ore output). Production branches, on the other hand, based on raw materials other than weight-loosing types (e.g., crude oil processing), display a trend towards a further pronounced growth, since the transport of a homogeneous raw material proves easier than that of multiple substances that are won out of it in course of processing (e.g., in case of crude oil, fractions of petrol, Diesel fuel oil, furnace oil grades, etc.).

This is why, generally speaking, industrial complexes in the GDR based on the processing of weight-loosing raw materials, are not expected to undergo any major expansion; their present growth depends in most cases on intensification of production. As concerns the pig iron production, this has been restricted even in the case of the major works of Eisenhüttenstadt and of Unterwellenborn near Saalfeld; those latter, however, owing to the increased efficiency, supply today almost as much pig iron as they did previously together with the works of Calbe an der Saale which has in the meantime been assigned other production line. The increased demand for pig iron was being met mainly by imports effected to favourable terms of trade; the pig iron import total has therefore increased from 1960 to 1974 to 155% of its initial value, while domestic pig iron production only to 114%.[8] The confrontation of the above two values is meant to explain the development which will continue. This is so, since the participation of the GDR in the project covering the metallurgy combine of Stary Oskol in the south-eastern part of the magnetic anomaly area of Kursk, USSR, will involve long term deliveries of metallurgy products from the USSR to the GDR.

Production branches based upon the processing of those raw materials which do not fall into the weight-loosing category, on the other hand, become increasingly important in the spatial industrial structure of the GDR. This is manifested above all by imports of crude oil as well as of phosphates and of apatites which now have grown to 846.7% and 250.2%, respecively, between 1960 and 1974,[9] and which have, in turn, permitted an increase in industrial production branches, such as, e.g., those of Schwedt and Leuna, as well as of Salzwedel, Magdeburg and Rüdersdorf.

Considerations concerning the location of industries which process imported raw materials, will be confronted in the first line with the question, whether or not it would be more of an advantage to establish or expand production directly at a border crossing point or near it, or else to move it further inwards.

The answer to the above problem should be made dependent above all, upon the distribution of destination points for commodities manufactured on the basis of imported raw materials. Plants to supply their products to far-off destinations within the Republic (e.g., pig iron production or crude oil processing works) will find favourable sites within areas near the border crossing points (districts of Rostock, Neubrandenburg, Frankfurt, Cottbus, Dresden); they will be in the position — as this is the case in Schwedt and Eisenhüttenstadt — to collect raw material shipments forwarded to them over a single transport route, and to ship their multiple final products (e.g., various grades of petrol, Diesel

[8]Calculated according to: *Statistisches Jahrbuch der Deutschen Demokratischen Republik 1975*, Berlin 1975, p. 119 and 282.

[9]Calculated according to: *Statistisches Jahrbuch der Deutschen Demokratischen Republik 1975*, Berlin 1975, p. 283.

fuel oil, petrochemical production materials) to numerous destinations, within the GDR with no necessity to rely on opposite bound shipments of raw materials and/or products. Production capacities involved in integrated operations over limited areas (e.g., the processing of crude oil for petrochemical production purposes, as well as that of imported phosphate) would be localized to a greater advantage within the integrated works of the industries concerned (e.g., petrochemical production as well as phosphate fertilizer works) in any area of the Republic.

2.3. LOCATION OF EXPORT AND IMPORT-ORIENTED INDUSTRIES OF THE GDR FROM THE PERSPECTIVE OF ECONOMIC INTEGRATION WITHIN CMEA: CONCLUSIONS

The problems of location of the afore discussed large-scale industries engaged in export production or based upon extensive imports of raw materials, are calling for various answers. While export-oriented industries face advantageous development prospects above all within long established agglomerations, or in large cities, the best possibilities for siting industrial establishments based on large scale raw material imports are provided, depending on the pattern of destinations for their products, within both the border regions and other areas of the Republic.

Export-oriented large-scale works within urban agglomerations promote by their expansion the industrial and urban concentration processes. Such processes, controlled by spatial planning, are aimed at increasing the effectiveness of economy and at improving the working and living standard of employees. They are associated with comprehensive land development projects. Those latter attempt to cope with an excessive dispersion of production facilities, the left-over of capitalism and now an obstacle to the development of production. The projects aim at provision of expansion space for interwined production and storage facilities, social installations, transport routes, etc., as well as at separation at industrial sites from housing zones, in order to improve the living standards of residents.

Large-scale industrial works based on imported raw materials are in general located in formerly underdeveloped areas. Their influence in combination with the corresponding urbanization processes, is not limited to the economy only, but extends also in the social, cultural, and other fields.

Thus trends deriving from the socialist economic integration and governing the spatial pattern industries, exert an impact upon the territorial development within the GDR on the whole. They establish directions for general land development and improvement projects with view to old-established industrial zones and sites, they constitute starting points of an equal importance for the new improvement and expansion projects within the formerly underdeveloped areas.

FREIN DÉMOGRAPHIQUE DE L'URBANISATION

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Il est bien connu que l'urbanisation de la population est la cause principale du déclin de la fécondité humaine. Mais de notre temps, cette connexité devient réciproque. Les résultats du recensement de 1970 permettent d'aboutir à la conclusion que le déclin de la fécondité s'est répercuté sur l'évolution de l'urbanisation.

Notre comparaison statistique considère d'abord 13 des plus grandes agglomérations urbaines de la Grande Bretagne et des Etats allemands, pays à natalité très basse. Pendant les années 1960–1970 ces agglomérations n'avaient qu'un très faible accroissement de population, 565 mille habitants au total, c'est-à-dire 1,7% en moyene. De l'autre côté, en Europe méridionale, où la population est plutôt prolifique, toutes les 10 villes millionnaires montrent un accroissement élevé: 4,4 millions d'habitants, 26,7% en moyenne.

Pareillement la comparaison de ces mêmes changements dans les villes de plus de 100 mille habitants, montre, elle aussi, une telle relation entre la natalité et l'urbanisation. Les données suivantes se rapportent aux pays européens, groupés selon leur natalité en 1950, étant donné qu'avant l'âge de 20 ans l'émigration vers les grandes villes n'est pas fréquente. Quant à l'Union Soviétique, notre statistique n'est pas sans lacunes vue que les données correspondantes sur la natalité n'ont été publiées que pour l'Etat entier, quelques républiques fédérées ou autonomes et quelques grandes régions administratives. C'est ainsi que notre arrangement statistique ne se rapporte qu'à 34 unités territoriales qui comprennent 88% de la population de l'Europe, 54% de la partie européenne de l'Union Soviétique inclus. Nous les indiquons ci-dessous rangées selon 9 classes de natalité (N) et avec le nombre de villes de plus de 100 mille habitants en 1970:

1) Suède 10, Royaume-Uni 56, République Démocratique Allemande 12, Autriche 5, République Fédérale d'Allemagne 57, Belgique 5, République fédérée de la Lettonie 2;

2) Suisse 5, Danemark 3, Norvège 3;

3) Grèce 3, Hongrie 6, Espagne 33, France 36;

4) Irlande 2, Italie 48, Finlande 3, Région administrative de Krasnodar 5, République fédérée de l'Ukraine 41;

5) Pays-Bas 17, Tchécoslovaquie 6, Région administrative de Moscou 9, République fédérée de la Lituanie 3, République fédérée de la Biélorussie 9, Portugal 2, Roumanie 13;

6) Bulgarie 6, République autonome des Tatars 1;

7) Région administrative de Kirov 1, Yougoslavie 9;

8) Pologne 24;

9) Région administrative d'Arkhangelsk 2, Albanie 1, République autonome des Komis 1.

Les données suivantes (Tableau 1) rangées selon la natalité en 1950 (*N*) se rapportent au chiffre total de population des grandes villes en 1960 en milliers (*a*), à l'accroissement de ce chiffre pendant les années 1960–1970 en milliers (*b*), et à son pourcentage (*c*).

TABLEAU 1

N	*a*	*b*	*c*	
15–16,9	58 732	170	2,9%	
17–18,9	3 302	273	7,4%	
19–20,9	28 101	5276	18,7%	
21–22,9	26 451	6341	24,0%	(18,2%)
23–24,9	19 445	3209	16,5%	(21,2%)
25–26,9	2 034	607	29,8%	
27–28,9	1 635	469	28,7%	
29–30,9	6 374	1394	21,9%	
31 et plus	554	222	40,1%	

Bien que le nombre total d'unités considérées ne soit que de 34, la dépendance supposée est assez évidente et presque régulière s'il n'y avait deux faits qui dérangent cette régularité: l'urbanisation rapide de l'Ukraine et la natalité élevée aux Pays-Bas, tout à fait exceptionelle en Europe occidentale. A l'exclusion de ces deux pays, l'accroissement considéré des grandes villes serait de 18,2% et 21,2% respectivement.

Nous présentons maintenant les données plus détaillées et mieux comparables. Elles concernent les régions administratives de cinq pays socialistes de l'Europe centrale: la République Démocratique Allemande, Hongrie, Pologne, Tchécoslovaquie et Yougoslavie; quant à la Roumanie on ne dispose pas des données correspondantes. Afin que l'étendue des unités considérées ne varie pas beaucoup, les données de 3 régions administratives de la R.D.A. et de 12 de celles de la Hongrie sont rassemblées avec les régions voisines. D'autre part, 3 régions très étendues de la Yougoslavie (Uza Srbija, Croatie et Bosnie-Herzégovine) sont considérées en deux parties distinctes.

Après ces modifications l'étendue des régions considérées ne varie que de 7,8 mille à 29,8 mille kilomètres carrés (Francfort — Varsovie). Mais il y a une autre difficulté principale: existence de l'immigration exogène, dont l'importance dépend de l'étendue de la région d'immigration. En Tchécoslovaquie, par

TABLEAU 2

(1)	(2)	(3)	(4)	(5)	
10–14,9	2	3060	26	0.8%	
15–19,9	9	6620	545	8,2%	
20–24,9	16	4925	1058	21,4%	
25–29,9	14	8958	1988	22,2%	
30–34,9	6	1427	433	30,3%	
35–39,9	5	1610	562	34,9%	(30,6%)
40 et plus	5	1673	479	28,7%	(35,0%)

exemple, où l'étendue moyenne de la région administrative est de 12,8 mille kilomètres carrés, la proportion des immigrants provenant d'une autre région varie de 30 à 45%. Il est remarquable que cette proportion diminue: 47% en 1950–54, 44% en 1955–59, 37% en 1960–69.

La comparaison se rapporte à toutes les villes ayant plus de 20 mille habitants en 1970. Dans le Tableau 2 les régions sont groupées selon leur natalité et pour chaque groupe est indiqué l'accroissement total de la population des villes pendant les années 1960–1970. La colonne 1 donne les classes de natalité, la colonne 2 le nombre d'unités considérées, la colonne 3 la population des villes en 1960, la colonne 4 son accroissement en 1960–1970 et la colonne 5 son pourcentage.

Bien que le nombre d'unités considérées ne soit que de 57, la comparaison des accroissements relatifs fait bien apparaître la corrélation supposée, excepté la dernière classe, où la régularité de la régression statistique est dérangée par la natalité extraordinaire de la région de Wrocław, 44,2 en 1950; la natalité moyenne approximative en 1951–1954 n'était que de 39. Si l'on change la classe de cette région suivant cette natalité moyenne, le pourcentage des deux dernières classes serait de 30,6 et 35,0% respectivement.

Nos résultats statistiques ne donnent, il est vrai, qu'une approximation assez grossière, notamment à cause de l'immigration exogène. Néanmoins ils permettent une généralisation suffisante pour soutenir notre thèse initiale: le déclin de la fécondité devient frein de l'urbanisation. Car c'est l'accroissement naturel qui est le facteur primordial de la croissance des villes, quoique, en Europe, l'immigration semble être plus importante. Mais l'immigration n'est que la conséquence de l'accroissement naturel de la campagne. C'est une vérité première mais souvent négligée par les géographes. Il est remarquable que c'est la grande ville qui est le foyer des tendances antinatalistes qui se répandent dans des environs toujours plus larges. Et c'est ainsi que la grande ville, elle même, affaiblit les sources de sa propre régéneration.

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RÉFLEXIONS D'UN GÉOGRAPHE ÉCONOMISTE SUR LE DÉVELOPPEMENT DE LA RÉDUCTION DIRECTE DANS LA SIDÉRURGIE MONDIALE

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La plus ancienne et principale aspiration des sidérurgistes à produire l'acier directement à partir du minerai de fer, sans passer par le moment complexe et coûteux du haut-fourneau, s'est acheminée vers sa réalisation concrète grâce à l'accroissement des nouveaux procédés de réduction directe, employés aujourd'hui à échelle industrielle sur des installations qui se multiplient rapidement dans de nombreux pays.

Il s'agit, comme nous le savons, de procédés permettant la réduction du minerai de fer sans passer par la fusion du métal, c'est-à-dire à des températures sensiblement inférieures et utilisant comme réducteur à la place du coke, trop cher, des hydrocarbures ou des combustibles solides de qualité plus courante. Les produits qu'on obtient, éponge de fer, boulettes ou agglomérés à haute teneur de métallisation (grâce à certains procédés autour du 95%) peuvent être utilisés, non seulement dans les fours d'aciérie avec de la ferraille ou à sa place, mais aussi en tant que charge de fer dans les hauts fourneaux en l'ajoutant au minerai pour réaliser une économie en coke. Mais l'emploi le plus important reste celui des fours électriques à arc, davantage liés aux fluctuations du marché des ferrailles, marché essentiellement spéculatif. On peut aussi affirmer que les progrès technologiques (fours *UHP*) et l'importance croissante du procédé électrique ont concouru à faire apparaître des conditions favorables à une diffusion de la réduction directe.

Ainsi voit-on apparaître une nouvelle sidérurgie intégrée qui à partir du minerai remplace le schéma classique "haut-fourneau — aciérie de conversion — laminoir" par un nouveau schéma "four pour la réduction directe — four électrique — coulée continue — laminoir". Nous savons en effet, que les techniques de la coulée continue se lient d'une façon plus satisfaisante aux dimensions et aux rythmes de l'aciérie électrique.

Quoique les procédés de réduction directe aient dépassé depuis quelques années le stade des installations pilotes, leur réalisation industrielle s'est pratiquement adaptée à l'échelle de mini-usines, la tendance à rejoindre les capacités d'une usine moyenne n'étant que tout à fait récente.[1] Nous en venons maintenant à l'analyse d'une autre raison en faveur de l'adoption de la réduction directe. Face aux gigantesques investissements nécessaires pour la construction

[1]La plus puissante des aciéries électriques sera réalisée au Venezuela, sur commande de la *SIDOR* (*Siderurgica de l'Orinoco*), par un consortium sidérurgique de la R.F.A. Les contracts étant déjà signés, l'installation sera remise "clés en mains" avant la fin de l'année 1978. On prévoit une capacité productive de 2,4 millions de tonnes par an. Six fours électriques seront alimentés par du matériel préréduit.

des grandes installations propres aux usines intégrées traditionnelles, dont la capacité optimale de production est autour de dix millions de tonnes d'acier par an, les aciéries électriques avec des procédés de réduction directe, en raison de leur coût moins élevé sont fréquemment adoptées même par les petits pays. Les aciéries électriques ne demandent pas d'importantes concentrations de capitaux publiques ou privés, possèdent des capacités productives à la mesure des pays sous-développés et offrent des productions aisément adaptables à la demande du marché sans la rigidité productive propre aux grandes installations. On explique ainsi la faveur qu'elles rencontrent auprès des pays en voie de développement et leur apport à la prolifération récente des pays sidérurgiques même dans les régions tropicales où, à l'insuffisance des capitaux s'associe la pénurie de la ferraille, alors que l'on y trouve une grande quantité de minerai de fer à haute teneur.

La hausse constante des prix du coke et les perspectives des difficultés d'approvisionnement en charbons à coke ont encouragé un emploi grandissant du four électrique, augmentant la demande en ferraille, parallèlement à la diffusion de la coulée continue. Celle-ci, éliminant les trains dégrossisseurs, a réduit la disponibilité en chutes sidérurgiques[2] ce qui explique les niveaux exceptionnels atteints par la cote de la ferraille pendant l'année dernière et que seules les conséquences de la conjoncture ont ramenées, pour quelque temps, à des justes proportions.[3] Par conséquent, la réduction directe, capable de remplacer la ferraille par d'autres produits a enregistré un nouvel essor.

Encore récemment, les mini-usines, abstraction faite de certains facteurs locaux ou d'un héritage historique comme dans le cas italien du Bresciano et surtout de la Val Camonica, étaient davantage liées aux marchés à tel point qu'à l'occasion d'un précédent essai nous les avons classées à l'intérieur de la sidérurgie d'intégration, celle-ci justifiée en raison des besoins propres à des régions industrielles préexistantes. Nous avons ainsi expliqué leur grande dispersion en présentant le cas des États-Unis où les mini-usines s'étendent dans leur ensemble du Midwest à la Floride, à la Californie et rejoignent Long Beach et les Hawaii.[4] Par contre, pour ce genre, nouveau, du point de vue de

[2]Sur les indications fournies par une enquête de la *Japan Iron Steel Federition* dans 65 pays, la capacité globale des installations de coulée continue, y compris les installations en construction, atteindra, dans l'année en cours, 205 millions de tonnes, c'est-à-dire presque un tiers de l'acier produit à échelle mondiale.

[3]Les remarquables fluctuations de prix de la ferraille inquiètent beaucoup les sidérurgistes qui sont obligés à des approvisionnements sur le marché international. Un indicateur du prix est le *composite price* de la ferraille en Amérique du Nord qui est calculé toutes les semaines par la revue *Iron Age*. Le prix le plus bas a été celui du 1971 de 29,67 dollars par tonne, après il a graduellement atteint le maximum de 144,5 dollars en avril 1974, pour redescendre en novembre 1975 à 58,5 dollars par tonne. Les cotations suivantes enregistrent une hausse et indiquent 72,17 dollars par tonne au début de 1977. Or, puisque le coût d'une tonne d'éponge de fer s'élève autour de 60 dollars, de nouvelles conditions plus favorables à la réduction directe vont se délinéer.

[4]Nous nous sommes occupés des mini-usines à l'occasion de précédentes études. On peut se rapporter surtout à M.E., Un nuovo tipo geografico-economico: la mini acciaieria, paru dans les *Scritti in onore di Ferdinando Milone*, Roma 1971, pp. 45–59. On peut mettre à jour la situation mondiale qui y figure grâce à des récentes enquêtes parue sur *Metal Bulletin* (juillet 1974), sur *33 Magazine* (juillet 1974) et à d'autres informations tirées de la presse économique. On relève que les mini-usines avec une capacité productive entre 60 000 et 600 000 tonnes, en service ou en projet, sont en nombre de 220 (pays socialistes exclus), dont 95 figurent en Europe 59 en Amérique anglo-saxonne, 31 en Extrême-Orient, 25 en Amérique Latine, 4 en Afrique. L'Italie est classée à la première place avec 54 mini-usines, suivent les États-Unis avec 50, le Japon avec 15, l'Espagne 14, le Canada 9, le Mexique 8, le Royaume-Uni 7, la R.F.A. et l'Inde 5, la France et Taïwan 4, La C.E.E. en comprend 70.

la géographie économique, que sont les aciéries électriques intégrées par la réduction directe, le choix d'une installation optimale se pose en tout autres termes. C'est-à-dire qu'on observe une reprise de l'installation sur le minerai, comme au tout début de l'activité sidérurgique quand on réalisait la réduction directe dans des "bas fourneaux" et selon la méthode catalane.

Dans l'analyse des coûts de l'éponge de fer, le produit par excellence de la réduction directe, après le coût du minerai ou des boulettes il faut considérer celui du réducteur. Il est maintenant nécessaire de recourir à la distinction entre les usines qui suivent des procédés employant des réducteurs à partir des hydrocarbures et celles qui se servent de la houille, car selon le cas, l'installation optimale en résulte différemment. Cette distinction est aussi remarquable à cause de ses nombreuses conséquences sur les coûts liées à l'aggravation de la crise de l'énergie.

Les procédés de réduction directe qui ont été expérimentés dépassent largement la centaine, mais bien peu d'entre eux ont été employés à l'échelle industrielle. Parmi les plus répandus se servant des hydrocarbures en tant que réducteur il y a le *Midrex*, le *Hyl*, l'*Armco*, le *FIOR*, le *Purofer*; parmi ceux qui emploient le charbon on alligne le *SL-RN*, le *Krupp*, le *Lurgi*, le *Lubatti*, l'*Echevarria* et le *Kinglor Metor*.

Jusqu'à présent on peut remarquer une préférence pour les procédés basés sur l'emploi des hydrocarbures et, en particulier, pour la méthode *Midrex* qui emploie le gaz naturel réformé et qui a été répandue par le groupe *Korf*, véritable promoteur de la réduction directe en Amérique.[5] Au Mexique, où la réduction directe a connu son démarrage industriel à Monterrey, déjà dès 1957, on a vu s'affirmer le procédé *Hyl*,[6] deuxième par importance, introduit par la suite au Venezuela et au Brésil et aujourd'hui présent dans les différents projets d'autres pays parmi lesquels l'Indonésie. Il faut aussi rappeler le procédé *Purofer*[7] réalisé par Thyssen à Oberhausen, dans la République Fédérale d'Allemagne et introduit sur plus grande échelle dans une usine à Santa Cruz de la Cosigua au Brésil. Est aussi en train de gagner du terrain le procédé *FIOR*,[8] appuyé par *Esso* dans le but de développer l'emploi des combustibles liquides en réduction directe, déjà réalisé à Matanzas au Venezuela et à l'étude en Australie pour la production d'éponge de fer dans la région de Pilbara, très riche en fer.

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[5]W. Korf, Une nouvelle voie du minerai à l'acier par l'utilisation du procédé *Midrex*, "International Iron and Steel Institute", Bruxelles 1973 (*Actes du Congrès de Johannesburg*), p. 14. Le procédé est, en résumé, la transformation de l'oxide de fer en fer à l'aide d'un gaz réducteur chaud et il possède donc des caractères qui sont plus proches d'un procédé chimique que d'un procédé métallurgique. Pour le craking du gaz naturel on utilise l'oxygène provenant du minerai de fer. La réduction directe est effectuée dans un four à cuve. La consommation d'énergie atteint 3,25 millions de calories par tonne d'éponge de fer.

[6]C. G. Sada, Procédé *Hyl* de réduction directe du minerai de fer, "I.I.S.I." (*Actes du Congrès de Johannesburg*), op.cit., p. 12. Dans le procédé *Hyl*, la réduction directe est faite en lit fixe dans quatre réacteurs verticaux. Le minerai est réduit en éponge de fer utilisant en tant que gaz réducteur un mélange d'oxide de carbone et d'hydrogène. La consommation d'énergie est d'environ 5,5 millions de calories par tonne d'éponge de fer.

[7]W. H. Philipp, Le procédé *Purofer*, "I.I.S.I." (*Actes du Congrès de Johannesburg*), op. cit., p. 13. Ce procédé est réalisé dans un four à cuve et à chargement continu. Les charges sont traversées à contre-courant par du méthane réformé. Un tiers de ce gaz est utilisé, après recyclage, pour chauffer les fours de *réforming*.

[8]Le procédé *FIOR* est à couche fluidisée. Il demande des minerais fins concentrés. Le produit est essentiellement de la "brichette", obtenue par pressage de l'éponge de fer. On utilise en tant qu'agent réducteur le mazout.

La revalorisation récente du charbon en tant que source d'énergie a attiré les pays intéressées sur les procédés employant des réducteurs solides. Le plus répandu d'entre eux est le *SL-RN*[9] qui est déjà appliqué dans des régions qui disposent de combustibles pauvres au Canada (Sudbury), Brésil (Charquedas), Japon (Fukuyama), Corée du Sud (Inchon), Nouvelle Zélande (Glenbrook), République Sud-africaine (Witbank); d'autres installations sont en projet en Inde, au Pérou, en Australie. Suit, par ordre d'importance, le *Krupp-Renn*[10] employé dans la République Sud-africaine (Benoni) et au Japon (Mitsushima). D'autres installations ont été projetées, une fois de plus, au Japon et au Canada (Hamilton). Il faut aussi mentionner le procédé *Kinglor Metor*, réalisé en Italie où, en plus de l'installation pilote (Buttrio, aux environs d'Udine) il existe déjà une installation intégrée par une aciérie électrique à Cremone,[11] cependant que des négociations sont en cours avec plusieurs pays, surtout africains.

Il est évident que les procédés employant des hydrocarbures sont sujets à des coûts plus élevés à cause de la crise de l'énergie, sauf dans le cas des installations des pays où le gaz naturel ou le mazout abondent et se trouvent à bon marché. On explique, de cette manière, les réalisations du Mexique, du Venezuela et du Canada, riches en minerai de fer à haute teneur mais pauvres en charbons à coke (ou bien ils en possèdent mais les gisement sont, comme au Canada, fort loin). On explique aussi le nombre croissant des initiatives et des projets au Moyen-Orient, où le gaz naturel qui sort des gisements mixtes au pétrole est, le plus souvent, brûlé ou dispersé. Une nouvelle zone potentielle de la sidérurgie vient aussi se dessiner, destinée à des évolutions intéressantes grâce aux conditions favorables concernant les hydrocarbures, les pétrodollars et d'une façon subordonnée les minerais de fer qui peuvent aussi provenir des importations des proches gisements indiens ou sudafricains.

Parmi les plus importantes initiatives du Moyen-Orient il faut signaler celles de l'Iran, de l'Arabie Saoudite, du Koweït, du Qatar, de Abu Dhabi et de l'Égypte.

L'**Iran** précède les autres pays sur le plan des réalisations. D'après les plans présentés au 8ème Congrès annuel du I.I.S.I.,[12] la production d'acier en Iran devrait atteindre en 1983 un chiffre minimale de 15 millions de tonnes, prove-

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[9]La dénomination du procédé *SL-RN* vient des initiales des sociétés qui l'ont mis au point (*Steel Co. of Canada, Lurgi, Republic Steel, National Lead*). La réduction directe est effectuée dans un four rotatif tubolaire et on utilise des minerais courants. On peut aussi traiter directement des minerais pauvres en fer à gros calibrage.

[10]Pour le procédé *Krupp-Renn* on utilise aussi un four rotatif employant en tant que réducteur du charbon courant poudreux. On peut y traiter même des minerais pauvres et, grâce à la présence, dans la partie terminale du four de 1300°C on obtient des agglomérés par sintérisation.

[11]R. Ferrari, F. Colautti, Directe reduction experiences according to the *Kinglor Metor* Process with solid reducing agents, *Open Week Danieli*, 1974, Buttrio, pp. 28. Le procédé *Kinglor Metor* utilise un four à tour, réchauffé par l'extérieur et chargé du haut par bandes transporteuses. La réduction des minerais d'1/4 a 1" de diamètre ou de boulettes est faite à 1050°C, en utilisant des réducteurs solides (charbon, houille, charbon de bois, tourbe). Le minerai le meilleur est l'hématite, avec calibrage inférieur à 25 mm. La consommation d'énergie est de 3,8 millions de calories par tonne d'éponge de fer. Dans l'installation-pilote on a utilisé avec succès du charbon polonais et des boulettes de Scarlino (dérivées des cendres de pyrites par le procédé *Montecatini*).

[12]Mohamed Reza Amin, Der Aufbau der Stahlindustrie in Iran, *Actes du 8ème Congrès de l'Institut international du fer et de l'acier*, Monaco, octobre 1974, pp. 61–73. L'Auteur est *Managing Director* de la *NISIC*, que le gouvernement a instituée en 1973, dans le but exclusif d'une promotion de la sidérurgie utilisant la réduction directe et le four électrique, tandis que la *NISCO* (*National Iranian Steel Co.*) était chargée du développement de la production de l'acier selon les procédés à oxygène.

nantes surtout d'installations de réduction directe qui seront réalisées par la *NISIC* (*National Iranian Steel Industries Co.*) avec la participation des groupes sidérurgique de l'Occident.

A Ispahan, avec la participation de la *British Steel Corp.*, une nouvelle installation de réduction directe sera implantée. Elle aura une capacité d'un million de tonnes, sera intégrée par une aciérie à lamination à froid et aura des approvisionnements en minerais de fer provenant des mines de Bafq ou de Gol-a-Gohar et en méthane par les gisements du Midi (achèvement prévu pour 1979).

On réalisera à Ahwaz trois unités de réduction directe *Midrex,* trois unités *Hyl* et une unité *Purofer* avec une capacité totale de trois millions de tonnes. Une usine pour le bouletage a été prévue. Le minerai et les boulettes seront importés par la route de Bander-Chahpur et le méthane proviendra des gisements proches.

Un groupement d'intérêt économique, liant les firmes allemandes *Krupp, Korf, Salzgitter, Mannesmann,* est en train d'étudier la réalisation d'une installation côtière près du bassin de gaz de Kangan, dans le but de produire 2–3 millions de tonnes d'éponge de fer, utilisant du minerai provenant de l'importation. On a aussi prévu la construction d'une station de dessalage de l'eau de mer qui sera réalisée, si approuvée, avant la fin de l'année 1980.

Un accord entre la *NISIC* et la *FINSIDER* italienne prévoit la construction à Bander Abbas d'une usine complète pour la fabrication de produits plats ayant une capacité d'environ de 2–3 millions de tonnes par an. Le minerai sera fourni par la mine de Gol-a-Gohar, à 330 km au Nord. Une station de dessalage fournira l'eau nécessaire. L'achèvement des travaux est prévu avant la fin de l'année 1979. La construction du port est déjà commencée.

Sur la base de la découverte récente d'une zone minière, presque à 300 km au sud de Mashad et de la présence du gaz naturel dans le proche gisement de Sarahl, la *NISIC* a envisagé la construction d'une mini-usine intégrée par une installation de réduction directe, dans la région de Mashad, pour la production de 400–500 000 tonnes par an de profilés.

Toutes les mines et les installations seront reliées par des lignes de chemin de fer dont la construction a été amorcée. Un accord signé entre l'Iran et l'Inde garantit à la sidérurgie iranienne du minerai de fer provenant de la mine de Kudremuskh, en Inde sud-occidentale, qui sera exploitée par des capitaux iraniens. On prévoit une disponibilité de 7,5 millions de tonnes par an.

L'**Arabie Saoudite** s'appuye sur sa richesse en hydrocarbures et sur la possibilité d'exploiter de remarquables gisements de fer à Wadi Fatimah et à Djebel Idsas, dont les réserves sont évaluées dans leur ensemble à 134 millions de tonnes de contenu en fer. Elle est ainsi en train de réaliser un complexe utilisant la réduction directe aux environs de la ville de El Djebeil, près des gisements de pétrole de El Berry (capacité 1 million de tonnes par an). Cette installation alimentera l'aciérie de Djeddah qui sera agrandie, mais une certaine quantité d'éponge de fer sera aussi exporté au Japon. En effet, d'importants intérêts japonais se rencontrent avec la société semi-publique arabe *Petromin* pour la réalisation de cette initiative. L'*Armco* a aussi manifesté son attention pour le gaz naturel de l'Arabie Saoudite.

Un accord a été signé entre l'**Iraq** et un consortium français pour la construction de deux usines produisant de l'éponge de fer aux environs de Khor-al-Zubair: elles auront une capacité globale de 1 150 000 tonnes par an et seront fabriquées sur le procédé *Hyl.* La quantité produite servira en partie pour l'exportation.

Au **Qatar**, la *QASCO* (*Qatar Steel Co.*), société à majorité publique avec une participation japonaise (*Kobe Steel* et *Tokio Bocki*), a engagé des travaux pour la construction d'une installation *Midrex* de 400 000 de tonnes par an d'éponge de fer. L'usine sera ensuite équipée d'une aciérie électrique à coulée continue et d'un laminoir à barres.

Le **Koweït** et l'**Abu Dhabi** ont eux aussi en projet la construction de mini-usines par des implantations *Hyl* ou *Midrex*.

D'après une recherche récemment publiée sur "*Stahl und Eisen*",[13] la capacité productive du Moyen-Orient est en mesure de toucher dans peu de temps 50 millions de tonnes, surtout grâce à l'emploi de la réduction directe.

Un problème qui se présente, strictement lié à la localisation géographique des installations, est celui de la tendance du minerai préréduit à l'oxidation, menaçant les stockages prolongés et les transports sur grande distance à cause des dangers de combustion spontanée à la suite de la formation de températures élevées. L'emplacement optimal des installations de réduction directe serait alors à côté des aciéries comme dans le cas des usines intégrées existantes. Mais ce problème sera peut-être résolu par un traitement de passivation de l'éponge de fer et par l'emploi pour le transport de containers spéciaux.[14] En cas de renforcement de cette tendance, les installations de réduction directe pourraient être décentralisées, s'implantant sur les mines, à côté des usines de bouletage.

Voici encore une raison en faveur de la décentralisation de la sidérurgie primaire vers les pays producteurs de fer en Afrique, Asie et Amérique de Sud, tandis que les pays industrialisés garderont pour eux l'importation des demi-produits pour la transformation suivante en produits finis. En faveur de cette tendance, qui s'est présentée pendant les dernières années et qui a déjà rencontré une application pratique par d'importants groupes sidérurgiques occidentaux, on retrouve aussi des considérations de politique économique internationale attachées à une plus grande participation du Tiers-Monde aux moments de la production et d'importants soucis en écologie pour pas augmenter l'importation de la pollution.

Après ce qui précède, on peut maintenant s'occuper des régions où se présentent les plus importantes concentrations dans l'installation de la réduction directe pour analyser les principaux facteurs qui en sont à l'origine.

Nous ne répéterons pas ce que nous avons déjà exposé à propos de la région du Moyen-Orient, où des initiatives en cours de réalisation trouvent leur raison d'être dans la richesse en hydrocarbures. En Afrique du Nord, l'**Algérie** veut associer au gaz naturel l'exploitation de ses importantes ressources en minerai de fer et des pourparlers sont en cours avec le groupe *Korf* pour une installation de réduction directe intégrée par une usine de bouletage (capacité 2 millions de tonnes par an) et par une aciérie électrique (capacité 1,2 millions de tonnes par an) à réaliser à Jejel au cours du plan quadriennal. On reçoit des nouvelles de projets semblables même en **Tunisie** (1 million de tonnes par an à Gabès), en **Libye** (utilisant le fer de Wadi Shatt), en Egypte (une usine de 800 000 tonnes par an d'éponge de fer qui sera intégrée par le complexe sidérurgique de Hélouân, en utilisant le minerai de la région d'Assouan).

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[13]K. Helmich, Stahlindustrie im Wandel, *Stahl und Eisen* 1975, n° 13, pp. 573 et suiv.

[14]W. Thumm, et al., Die Reoxidation von Eisenschwaum und Massnahmen zur ihrer Verhinderung, *Congrès international sur le four électrique à arc en aciérie*, Cannes, juin 1971, p. 8.

La plus grande concentration de la production est signalée en Amérique Latine, avec le Mexique en tête, suivi par le Venezuela et le Brésil.

Au **Mexique,** où la première usine de réduction directe est en service à Monterrey — comme on trouvera ci-dessus — dès 1957 six installations ont atteint le stade productif. Elles seront douées, après l'achèvement des travaux d'agrandissement qui sont en cours, d'une capacité s'élevant à presque 2 millions de tonnes par an d'éponge de fer. La réduction emploie le gaz naturel selon le procédé *Hyl.* Trois installations se trouvent à Monterrey, deux à Puebla et une autre à Vera Cruz. La richesse en hydrocarbures, la disponibilité en minerais de fer, la pénurie en ferraille et en charbon ont produit les conditions favorables à l'affirmation de la nouvelle technique.

Au **Venezuela,** qui présente des conditions semblables, la première usine pilote a été installée à Matanzas à partir de 1963. La plus grande de ces usines intégrées, près de Porto Ordaz, produit 1 million de tonnes par an d'agglomérés métallisés, selon le procédé *HIB.*[15] Une nouvelle et tout à fait récente usine ouverte à Matanzas possède une capacité de 400 000 tonnes par an et produit de l'éponge de fer selon le procédé *FICR.* Deux autres installations, en construction elles aussi à Mantazas, dans la région connue comme la Guinée du Venezuela, ont atteint un stade avancé. Elles utiliseront l'une le procédé *Hyl* et l'autre le *Midrex* et produiront près de 400 000 tonnes par an d'éponge de fer chacune. Elles fourniront à la *SIDOR* (*Siderurgica dell'Crinoco*) des indications concernant les techniques à suivre pour le plan de développement d'après lequel, d'ici 1985, le Venezuela sera un pays exportateur d'acier. La région en question est favorisée par la richesse de ses mines de fer, évaluées à 2,5 milliards de tonnes (teneur 60%) qui se présentent à une distance moyenne de presque 200 km de Ciudad Guayana, un des nouveaux ports industriels sur l'Orénoque. On peut aussi utiliser le gaz naturel qui se trouve à des distances presque pareilles, et un gazoduc servant la zone industrielle est déjà en train de fonctionner. On prévoit l'installation de neuf usines pour la réduction directe, avec une capacité globale de 3,8 millions de tonnes par an d'éponge de fer.[16] Trois installations *Midrex* ont déjà été commandées au groupe *Korf*, pour une capacité globale de 1 275 000 tonnes par an (décembre 1975). L'agrandissement de l'unité de Matanzas jusqu'à 5 millions de tonnes par an d'acier s'est ainsi acheminé vers sa réalisation. La matière première sera fournie par une usine de bouletage ayant une capacité de 6,6 millions de tonnes par an, en cours de réalisation avec l'aide de la firme autrichienne *VOEST-Alpine.*

Par contre, au **Brésil,** qui peut utiliser de remarquables réserves en lignite et en charbon de qualité moyenne, la première installation implantée à Charquedas sur le Rio Grande do Sul utilise le procédé *SL-RN* à réducteur solide. La capacité productive est maintenant de 60 000 tonnes par an. Elle sera élevée à 220 000 tonnes par an grâce à une deuxième installation. On y trouve, en outre, la réduction directe avec le gaz, selon le procédé *Hyl*, dans une usine intégré à Salvador dans l'état de Bahia (268 000 tonnes par an), tandis que le procédé *Midrex* sera utilisé dans une usine intégrée en cours de réalisation à Sao José dos Campos. Le procédé *Purofer* sera, par contre, utilisé dans l'usine de Santa Cruz (350 000 tonnes par an).

Il faut aussi signaler un très important accord de collaboration technique

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[15]Le procédé *HIB* (*H-Iron Briquette*) a été perfectionné aux États-Unis par *U.S. Steel.* Il appartient au genre à couche fluidisée et utilise en tant que réducteur l'hydrogène obtenu par du méthane réformé par de la vapeur d'eau.

[16]A. Gamboa, Die Entwicklung der Stahlindustrie in Venezuela, "I.I.S.I." (*Actes du Congrès de Monaco*) *op. cit*, pp. 96–101.

entre *Korf* et *Usiminas* pour l'emploi, en tant que réducteurs, de gaz de cokerie et de haut-fourneau: le procédé *Midrex* pourrait ainsi gagner d'autres chances même dans les régions sidérurgiques liées au charbon. L'*Usiminas* viserait à réaliser deux usines de réduction directe ayant une capacité globale de 800 000 tonnes par an d'éponge de fer.

Des projets viennent d'être annoncée par l'**Argentine,** le **Pérou, El Salvador** et **Trinidad.**

Dans la région nordaméricaine anglosaxonne, le *Midrex* est présent aux **États-Unis** en 1969 à Portland en Oregon et en 1971 à Georgetown dans la Caroline du Sud avec des installations de 400 000 de tonnes par an d'éponge de fer qui représentent la dimension propre des usines adoptant ce procédé. Au contraire, à Houston dans le Texas, l'*Armco Steel* a mis au point sa technique dans une usine de 360 000 tonnes par an. Il s'agit chaque fois d'emplacements éloignés des grandes régions sidérurgiques mais possédant de bonnes perspectives pour l'approvisionnement en minerai et en gaz naturel. D'autres projets semblables, concernant l'Arizona, Porto Rico et le Minnesota, sont à l'étude.

Au **Canada,** la réduction directe est née en 1971 avec une installation employant un réducteur solide *SL-RN* et ayant une capacité de 300 000 de tonnes par an. L'usine a été réalisée à Sudbury dans l'Ontario, utilisant un emplacement favorable du point de vue de l'approvisionnement en charbon et en fer. En 1973, à Contrecoeur, une usine *Midrex* de 400 000 tonnes par an était déjà en service. Ici la *SIDBEC-DOSCO*, société à financement semi-public, va ériger une deuxième usine de bouletage de 650 000 tonnes par an. Des intérêts japonais sont à l'origine d'un projet à amorcer dans la Colombie britannique, pendant qu'à Hamilton en Ontario, toujours à la suite d'une promotion japonaise, on va réaliser un complexe comprenant une usine pour l'enrichissement des agglomérés de poussière de haut-fourneau et des convertisseurs à oxigène, selon le procédé *Kawasaki Scitetsu*, comme ceux qui sont en service à Mitsuchima.[17]

En Asie Orientale, le **Japon** s'est bien vite tourné vers la recherche et l'expérimentation concernant la réduction directe. Il s'intéresse beaucoup à ce nouveau procédé en tant que principal importateur du monde en ferraille et en charbon à coke dans l'espoir d'achats moins onéreux. Depuis 1969 la *Kawasaki* a réalisé à Chiba une installation pilote pour 75 000 tonnes par an, en utilisant son propre procédé à four rotatif et ensuite avec une usine de 240 000 tonnes par an à Kirashiki. Suit la *Nippon Kokan* avec une installation de 350 000 de tonnes par an à Fukuyama selon le procédé *SI-RN*. Entre-temps, la *Nippon Steel* a approuvé la réalisation d'une installation pour 180 000 tonnes par an qui sera ensuite intégrée par son usine de Hirohata; elle va aussi employer un nouveau procédé avec réduction à gaz dans un four vertical.

L'importance attribuée par les Japonais à la réduction directe se manifeste par la poussée imprimée aux recherches pour l'emploi de l'énergie nucléaire dans la production de gaz réducteur à haute température. Nous en reparlerons encore dans les conclusions de cet article.

En 1969, en **Corée du Sud** on installa à Inchon une usine utilisant un réducteur solide *SL-RN* ayant une capacité de 190 00 tonnes par an d'éponge de fer, favorisée par la richesse en charbon et par la disponibilité en minerai de fer. L'installation fut endommagée à la suite d'une explosion et on n'a pas d'autres nouvelles sur la reprise de la production. On est, par contre, au courant d'un autre projet présenté par un groupe de la R.F.A.

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[17]E.C.E., Evolution des formes d'énergie utilisées dans l'industrie sidérurgique, *Comité de l'Acier*, septembre 1975, pp. 75.

En **Inde** il y a déjà une première usine de réduction directe à Vijayavada (Andhra Pradesh) qui possède une capacité productive de 30 000 tonnes par an d'éponge de fer et emploie comme réducteur le charbon.

Un autre projet, très intéressant par ses dimensions prévues, est en cours de réalisation en **Indonésie.** Il appartient à la *Krakatoa Steel* qui opère avec une groupe mexicain (*Hojalata y Lamina*), détenant le procédé *Hyl.* On a commencé la construction d'un complexe qui aura une production de 2,3 millions de tonnes par an d'éponge de fer (on a prévu une usine sur quatre modules); ensuite l'installation sera équipée d'une aciérie de 2 millions de tonnes par an à réaliser conjointement avec la *Ferrostaal.* Cette usine est en construction à Tjilegon, dans l'ouest de l'île de Java, dans le cadre du deuxième plan quinquennal (1974–79). La richesse en hydrocarbures explique le choix de l'emplacement.

En **Australie**, deux usines sont au stade d'étude, la première utilisant le procédé *FIOR* ou *Purofer* dans la région des mines de fer de Pilbara et la deuxième utilisant le procédé *SL-RN* dans la région des mines de fer des Hamersley. En **Nouvelle-Zélande** est en service depuis 1970 une installation *SL-RN* de 135 000 tonnes par an, à Glenbrook. Il y a aussi des intérêts japonais sur la région sablonneuse, riche en titane et en magnétite, qui s'étend autour de Taranaki.[18] De cette région en 1974 les Japonais ont importé 2,8 millions de tonnes de minerai et 170 000 tonnes furent aussi envoyées à la *New Zealand Steel Ltd.* En outre la zone ne manque pas d'autres ressources en fer et il y a beaucoup de lignites qui peuvent justifier d'autres initiatives employant des réducteurs solides.

La réduction directe peut trouver des conditions particulièrement favorables dans la **République Sud-africaine** où, à la richesse en minerai de fer s'associent les grandes réserves de charbons non cokefiants. Depuis 1968 une usine à four rotatif capable de fournir 1 100 000 de tonnes par an est en service à Witbank au Transvaal. Encore au Transvaal, à Benoni, une usine plus récente produit 150 000 tonnes par an d'éponge de fer utilisant le procédé *Krupp* avec réducteur solide. D'autres initiatives sont à l'étude; elles se relient à la réalisation du projet Sishen-Saldanha Bay pour la valorisation des ressources en fer.

En Europe occidentale, à la suite de nombreux essais effectués surtout en Suède et en R.F.A., la réduction directe a eu des applications à échelle industrielle, surtout en R. F. A. A Oberhausen, en Ruhr, où le procédé *Purofer* a eu son origine, est en train de fonctionner une usine complète, ayant une capacité de 175 000 tonnes par an, réalisée par le groupe *Thyssen.* Par contre à Hambourg le groupe *Korf* a réalisé un complexe sidérurgique en 1971; il s'agit de la première installation européenne employant la réduction directe. On appela cette installation "la plus moderne d'Europe" car elle se fondait sur la formule réduction directe-aciérie électrique appliquée à une mini-usine de dimensions moyennes. Pour la réduction on utilise le gaz réformé selon le procédé *Midrex.* La capacité productive est de 400 000 tonnes par an d'éponge de fer mais elle sera augmentée grâce à la mise à feu d'un troisième haut-fourneau permettant l'augmentation de la production d'acier jusqu'à 850 000 tonnes par an. L'approvisionnement en gaz ne pose pas de problèmes grâce aux gisements hollandais qui se trouvent à faible distance; le minerai de fer est importé surtout de la Suède.

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[18]D. A. Bold, N. T. Evans, Uso de arenas ferruginosas titaniferas y carbones subbituminoses en siderurgia basada en reducción directa: Neozelandia, *Revista latinoamericana de siderurgia*, septembre 1975, n. 185.

Sur l'initiative de ce même groupe une nouvelle et plus importante installation sera réalisée à Emden. Elle aura une capacité de 2 millions de tonnes par an d'éponge de fer et sera équipée d'une usine de bouletage ayant une capacité de 4 millions de tonnes par an et d'une aciérie électrique.

La découverte de riches gisements d'hydrocarbures dans la Mer du Nord a ouvert de bonnes perspectives sur la réduction directe au **Royaume-Uni.** On sait que la *British Steel Co.* a récemment commandé au groupe *Korf* deux installations *Midrex*, de capacité de 400 000 tonnes par an chacune, qui surgiront sur la péninsule de Hunterston, sur les côtes occidentales de l'Écosse. Une partie de l'éponge de fer sera utilisée dans une grande aciérie électrique qui sera intégrée dans un nouveau complexe de grandes dimensions. D'autres initiatives sont à l'étude soit par la *BISPA*, réunissant les petits producteurs du secteur privé, qui voudrait réaliser une entreprise en consortium surgissant au Sud du Pays de Galles ou en Humberside, soit par un groupe mixte greco-suisse à réaliser à Newport.

En **Italie**, le nombre remarquable des mini-usines, la diffusion des fours électriques, la disponibilité en méthane, la présence de lignites et la pénurie en ferraille sont à l'origine des conditions favorables pour l'adoption de la réduction directe. Au cours des années cinquante on expérimenta le procédé *Lubatti* qui produisait des minerais fins utilisant du charbon dans le four électrique. Ensuite, en 1968, la firme *Danieli*, spécialisée dans la production d'outillages et d'appareillage pour les mini-usines ouvrit un centre de recherche. Là, en collaboration avec la suisse *Monteforno*, on a réalisé le procédé *Kinglor Metor* qui a été appliqué à Buttrio, aux environs d'Udine. La *Danieli* y possède l'usine pilote dont nous avons déjà parlé. On y produit de l'éponge de fer en employant des réducteurs solides selon un propre procédé. Le module de base *Kinglor Metor* a une capacité de 20 000 tonnes par an mais les installations peuvent s'articuler sur plusieurs unités. Une première installation à deux modules vient d'être réalisée à Crémone: elle est intégrée avec la mini-usine Arvedi ayant une capacité productive de 40 000 de tonnes par an d'éponge de fer.

La *Sideradriatica*, consortium constitué par dix mini-usines de Odolo (Brescia), a aussi en projet la construction d'une autre installation. Elle sera à l'appui de l'aciérie de Porto Nogaro (Udine) qui est relié à la mer par un canal navigable de deux kilomètres. Même l'*EGAM*, organisme semi public qui est préposé aux mines — mais qui s'occupe aussi d'aciers spéciaux — vise pour l'approvisionnement de l'aciérie électrique qui sera installée à Lamezia Terme (Calabre) à utiliser — à la place des ferrailles — des boulettes fournies par une usine intégrée pour laquelle on prévoit une capacité de 2 millions de tonnes par an. Une dernière information concerne l'aciérie de Piombino (*Italsider-FIAT*) où on a réalisé une usine expérimentale employant le procédé à couche fluidisée, sous la promotion du *Centro Sperimentale Metallurgico* (FINSIDER).

Parmi les pays dont la sidérurgie se présente décidément orientée vers l'emploi de la réduction directe il ne faut pas oublier l'**Espagne.** On prévoit le fonctionnement des installations suivantes, entre 1978: deux usines de 400 000 tonnes par an à Huelva, sur projet de la *Prenosa* (*Prereducidos del Norte de España*), et deux autres usines de 400 000 tonnes par an chacune, à Algésiras et à Barcelone.

Enfin la *Sidegasa*, qui réunit deux sociétés sidérurgiques, s'est engagée à présenter à court terme un projet pour une installation de 602 000 tonnes par an d'éponge de fer. Pour ce qui concerne les procédés, semble gagnant le *Nuevo Proceso* dérivé par un procédé de la sidérurgique *Echevarria* qui s'est intéressée à un projet de 206 000 tonnes par an d'éponge de fer, tandis que la *Pre-*

nosa est probablement orientée vers le procédé *SL-RN*. En relation avec tout cela, des usines de bouletage, implantées généralement sur des mines de fer, sont à l'étude. On voit ainsi apparaître la tendance à réserver les minerais à plus haute teneur pour la production des boulettes servant à fournir des minerais concentrés.

Un intérêt grandissant pour la réduction directe montrent les pays socialistes et l'**Union Soviétique** où les premières expérimentations ont concerné surtout les aciers-spéciaux. On connait l'installation pilote réalisée à Krivoi-Rog, sur le gisement de fer de l'Ukraine. Cette usine va utiliser comme réducteur du gaz naturel dans un four sur grilles. Plus récemment s'est affirmé la tendance à l'emploi des techniques nouvelles permettant la production d'aciers courants et qui écarte la taille des mini-usines à l'avantage des installations de grandes dimensions. On a des nouvelles sur un accord entre la *Metallurgimport*, organisme soviétique, et le groupe *Korf*, qui a reçu aussi l'adhésion d'autres importants groupes sidérurgiques de la R.F.A. pour réaliser un complexe *Midrex* ayant une capacité de 5 millions de tonnes par an d'éponge de fer, s'articulant sur 10 modules. On en prévoit l'implantation dans la région de l'anomalie magnétique de Koursk, aux environs des mines de fer de Lebedinsk (Staryj Oskol). On a aussi parlé d'un autre projet étudié pour la Mer Baltique mais il est fort probable que ce dernier se trouve être dépassé par celui concernant Koursk.

En **Roumanie**, à Galati, est en train de fonctionner une usine expérimentale qui emploie le procédé *ICEM*, reposant sur le principe de la réduction avec du gaz naturel, dont le pays est très riche, dans un four à cuve. Des installations ayant une capacité de 240 000 tonnes par an sont à l'étude.

En **Hongrie** on a expérimenté le procédé *Carbotermico* qui emploie comme réducteur le charbon ou la lignite dont on dispose largement.

Il n'était pas dans nos intentions de présenter un tableau détaillé sur le nombre des installations de réduction directe dans le monde. Nous visions plutôt à une documentation des progrès achevés à échelle mondiale par ce nouveau procédé de production de l'acier. En 1974, il y avait 19 installations de réduction directe ayant des caractéristiques industrielles et une capacité globale de production de 5,2 millions de tonnes par an. A la date du 31 décembre de la même année on avait commandé des nouvelles installations ayant une capacité de 13,7 millions de tonnes par an. Leur distribution par régions géographiques se trouve dans une publication du *Metal Bulletin* (Tableau 1) où figurent même les installations prévues, en construction et à l'étude. Des évaluations plus récentes prévoient pour l'année 1980 une capacité productive de 50 millions de tonnes par an tandis que d'autres prévoient pour 1985 une quantité d'au moins 124 millions de tonnes par an en produits préréduits, dont 71% serait employé par les aciéries et 29% par les hauts fourneaux. Une confirmation de nos observations sur la prééminence du Moyen-Orient et de l'Amérique du Sud est apporté par le Tableau 1.

L'avenir de la réduction directe semble se dérouler surtout en fonction de trois variables: disponibilité et coût du charbon à coke, disponibilité et coût de la ferraille, disponibilité et coût de l'énergie électrique. Une quatrième variable, disponibilité et coût des hydrocarbures peut se présenter — comme on vient de le remarquer — en tant que facteur de discrimination à l'égard de certains procès de production.

La hausse des coûts et la pénurie en coke exerceront leur influence vis à vis de très grandes immobilisations qu'exige la réalisation des grandioses implantations de hauts-fourneaux-convertisseurs à oxygène, en déterminant les choix en faveur de la réduction directe. Instructif, à cet égard, est le rapport

TABLEAU 1. Installations de réduction directe dans le monde (en milliers de tonnes par an données décembre 1974)

Régions géographiques	Installations					
	en service	commandées	prévues	en stade avancé	à l'étude	capacité totale
Amérique du Nord	1 330	1 025	800	900	1 900	5 975
Amérique du Sud	1 940	3 210	—	1 320	2 600	9 070
Europe Occidentale	350	—	—	1 500	2 500	4 350
Europe Orientale	—	2 500	—	—	2 500	5 000
Afrique	810	310	2 600	—	2 300	6 020
Moyen-Orient	—	4 030	1 750	3 000	400	9 180
Autres pays asiatiques	650	2 700	1 000	50	900	5 300
Océanie	120	—	—	—	2 020	2 140
Total	5 200	13 775	6 150	6 790	15 120	47 035

Source: *Metal Bulletin*, 21 janvier 1975.

présenté par un groupe d'étude de l'OCDE, constitué en collaboration par le Comité de l'énergie et le Comité scientifique et technique sur le rôle du charbon. Dans la zone de l'OCDE, le besoin total en coke de la sidérurgie, même en tenant compte de la réduction de la consommation spécifique dans les hauts-fourneaux,[19] pourrait monter, des 166,5 de millions de tonnes utilisées en 1972, à 206 millions en 1980 et 220 millions en 1985. Les pays de l'OCDE européenne devraient en même temps doubler leurs importations, de 21,5 à 45 millions de tonnes, tandis que le Japon devrait augmenter ses achats de 46,5 à 78 millions de tonnes en 1985. Puisque d'après une prévision de l'Institut Battelle, la principale zone d'exportation (après celle de l'Australie, d'ailleurs déjà accaparée par le Japon) représentée par la zone E.U.–Canada, verra augmenter sa demande de charbon coke de 76,8 à 87,1 millions de tonnes, il semble bien improbable que la tendance du *trend* actuel à l'augmentation des prix du coke puisse s'inverser.[20]

Pour ce qui concerne la ferraille il est improbable que l'offre puisse tenir le pas avec la demande, d'après les prévisions sur le développement de la sidérurgie mondiale en général et sourtout celui de l'électrosidérurgie en particulier, d'autant plus que les principaux exportateurs, les États-Unis, se sont orientés vers un contingentement des exportations, en les considérant sur le même plan d'exportations d'énergie. Or, puisqu'une tonne d'acier produite avec le haut-fourneau et le convertisseur *LD* exige près de 0,635 tec, tandis que la même tonne produite avec la ferraille, au four électrique, n'exige que 0,180 tec, il s'ensuit qu'une tonne de ferraille — en tenant compte de la dispersion d'énergie électrique — équivaut à 0,450 tec.

Un rapport de l'*Italsider* sur les perspectives de la demande complexive de ferraille, élaboré par un expert connu, M. A. Candia, rend évident le fait que l'excédent disponible aux E.U. est destiné à diminuer de 10,9 millions de tonnes

[19]On prévoit une diminution de la consommation moyenne spécifique du coke dans les hauts-fourneaux à partir de 540 kg/t en 1972 jusqu'à 413 kg/t en 1985. Mais cette diminution étant liée à un plus important emploi des combustibles liquides dans les hauts-fourneaux, on peut présumer que ces prévisions se révèlent trop optimistes en conséquence de la hausse du pétrole, jusqu'à cinq fois son prix.

[20]*Energy use by the steel industry in North America*, Battelle Memorial Institute, Columbus, Ohio, juillet 1971.

en 1974 à 5,8 millions de tonnes en 1980. Pendant la même période, la demande du Japon augmentera de 6,8 à 9,3 millions de tonnes et celle de l'Italie de 2,99 à 3,99 millions de tonnes; ces deux pays étant, notoirement, les principaux importateurs sur le total mondial; même en tenant compte de l'accroissement des exportations que prévoit l'URSS, on calcule que le solde négatif d'un demi million de tonnes en 1974 pourra augmenter à 6,19 millions en 1980. Le compte-rendu annuel du Comité pour l'acier de la Commission Economique pour l'Europe de l'ONU s'accorde avec ces prévisions pessimistes.[21] La réduction directe devient ainsi une option inévitable, comme vient d'écrire récemment un autre expert de la sidérurgie.[22]

En ce qui concerne le coût de l'énergie électrique, les experts de l'E.C.E. retiennent qu'il sera sujet à des augmentations inférieures à celles des autres sources d'énergie, non seulement à cause de l'emploi croissant de charbon dans les centrales thermoélectriques, mais aussi grâce à la diffusion croissante des centrales thermonucléaires.[23] Il s'ensuirait ainsi une poussée ultérieure en faveur du four électrique.

On prévoit que l'utilisation de l'énergie thermique produite par les réacteurs nucléaires aura des effets révolutionnaires pour la sidérurgie, dont pourra s'avantager particulièrement la réduction directe. Des études sur ce sujet sont désormais amorcées dans tous les pays industriels européens, comme le prouve la naissance de l'*ENSEC* (*European Nuclear Steelmaking Club*), de même qu'aux E.U., au Canada et jusqu'a Japon. Les principales applications concernent la production de gaz réducteur et d'éponge de fer. Significatif, en particulier, est un projet de gazéification des lignites de la Rhénanie du Nord et Westphalie (dont on estime les réserves autour des 30 milliards de tonnes), en utilisant la chaleur des réacteurs nucléaires à haute température.

Les conséquences de ces possibles développements à l'égard de la géographie économique, peuvent être mises en évidence sous deux aspects. Le premier concerne les dimensions des unités productives d'éponge de fer, que l'on prévoit bien supérieures à celles des installations du genre équipé par les mini-usines et qui rejoindront les proportions de la grande industrie.[24] Le deuxième aspect

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[21]Comité pour l'acier de l'E.C.E., *Le marché de l'acier en 1974*, Nations Unies, New York, 1975, p. 28.

[22]J. Roume, Réduction directe: une option inévitable, *L'Usine Nouvelle*, n° 45, 6 novembre 1975.

[23]Comité pour l'acier, *Le marché de l'acier en 1974*, *op. cit.*, p. 128.

[24]En R.F.A. vient d'être élaboré un projet concernant la construction d'un complexe sidérurgique ayant une capacité de 6,2 millions de tonnes par an d'acier. Il sera équipé d'un réacteur nucléaire produisant l'huile qui sera utilisée en partie dans une turbine pour l'alimentation d'un générateur électrique et pour le reste dans la production du gaz réducteur. En France, un projet analogue prévoit l'installation d'une usine ayant une capacité de 3,6 millions de tonnes par an d'acier, produisant de même des aciers alliés et de l'alluminium. L'éponge de fer sera produite par six réateurs à couche fluidisée pour un potentiel de 1 800 t/j, utilisant de l'hydrogène en tant que réducteur. Au Royaume-Uni, on a en programme la construction d'un établissement pour une capacité de 4,5 millions de tonnes par an d'éponge de fer et 5,4 millions de tonnes par an d'acier électrique en utilisant un réacteur à haute température refroidi à gaz. Au Canada, suivant un programme qui vient d'être élaboré par la *STELCO* et l'*Atomic Energy of Canada*, le réacteur nucléaire "Candu" sera relié avec un complexe sidérurgique ayant une capacité de 3–5 millions de tonnes par an d'acier. Le réacteur fournira l'hydrogène pour la production de l'éponge de fer, obtenu par électrolyse de l'eau. Le réacteur produira aussi l'energie électrique pour l'aciérie. Au Japon on veut aussi perfectionner un réacteur nucléaire à haute température, refroidi à gaz, pour l'utiliser dans une installation qui pourrait être mise en service avant la fin de l'année 1979. Entre-temps on va réaliser le prototype d'une usine douée d'un potentiel de 20 t/h d'éponge de fer. Si ces travaux sont couronnés de succès on envisage de construire plusieurs usines de grandes dimensions, qui, utilisant la chaleur

concerne le projet de grandes zones industrielles sidérurgiques, pétrolières, chimiques, équipées de centrales nucléaires, c'est-à-dire en fait la programmation de grands complexes industriels intégrés, capables d'absorber toute l'énergie produite, en utilisant la chaleur nucléaire, soit pour le *cracking* des hydrocarbures, soit dans la production d'hydrogène à bon marché et de gaz réformé que l'on utilisera dans les fours de réduction. Par conséquent, la localisation des installations de réduction directe ne serait plus autant conditionnée par les mini-usines, c'est-à-dire par les marchés ou par les mines des pays en voie de développement, mais évoluerait vers les grandes zones industrielles des pays technologiquement plus avancés.

Mais bien avant que ces évolutions puissent se concrétiser de façon consistante, pas avant les années 1990, d'après l'avis des techniciens de l'E.C.E., d'autres innovations pourront dériver des tendances de localisation des installations de réduction directe, soit grâce à l'emploi de gaz de cokerie, de haut-fourneau ou de convertisseur, soit grâce à la gazéification du charbon, méthodes auxquelles la hausse des prix des hydrocarbures a donné un nouvel essor. Des expériences dans cette direction sont en cours pour ce qui concerne l'application du procédé *Midrex*, au Brésil par *Usiminas* et dans l'Afrique du Sud par *ISCOR*. Les installations *Midrex* pourraient ainsi s'affranchir d'une localisation conditionnée par l'abondance et le bon prix du méthane et la localisation sur le charbon trouverait un nouvel argument en sa faveur.[25]

A plus forte raison nous pouvons donc conclure que l'affirmation de la réduction directe dans la siderurgie mondiale est de toute façon destinée à rendre dynamique la géographie de l'acier, autant dans les pays en voie de développement, que dans les pays exportateurs de pétrole et dans les pays industrialisés.

En 1930, première année de la grande crise, la production mondiale de l'acier s'écroula de 21,5%, en tombant de 120,9 à 95,1 millions de tonnes. En 1975, première année de l'actuelle récession mondiale, malgré les coups que la crise pétrolière a infligés à l'industrie automobile, un des principaux secteurs consommateurs d'acier, il résulte, d'après les premiers chiffres disponibles que la production sidérurgique mondiale a diminuée de 7,7% seulement, c'est-à-dire de 710 a 655 millions de tonnes; et ceci, quoique dans les E.U. la diminution ait été de 19%.

Ce qui confirme le changement de la structure de l'économie de l'acier sous l'effet de la multiplication des mini-usines et de la progression de la réduction directe, qui — surtout dans les pays en voie de développement — est conduite par des initiatives publiques ou semi-publiques, et moins conditionnées par les oscillations cycliques du marché.

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fournie par un réacteur nucléaire, seront en mesure d'assurer, d'ici 1985, de 20 à 30% de la production nationale d'acier. La capacité productive de l'usine sidérurgique, économiquement la plus petite possible, ne doit pas être inférieure à 3–3,5 millions de tonnes d'acier par an. (Source: E.C.E., Evolution des formes d'énergie utilisées dans l'industrie sidérurgique, *op. cit.*, pp. 105–116).

[25]Une installation pilote pour la gazéification du charbon par pression sera réalisée dans le bassin houiller de la Sarre, à Fürstenhausen. Sa capacité de traitement sera établie en 150 t/j de charbon.

SUR LA STRUCTURE GÉOGRAPHIQUE

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Le concept de structure est très ancien. On sait que le mot "structure" vient du mot latin *structura*, c'est-à-dire "construction". La structure suppose donc un *objet* réalisé, ses parties constitutives devant être coupées et placées, pour que l'objet existe et dure, de telle manière que le *tout* — la construction — résiste. Généralisée, l'idée de structure a le sens d'un "tout", ou "ensemble", dont les parties (ou éléments) sont solidaires et "ne peuvent être ce qu'ils sont que *dans* et *par* cet ensemble" (Lalande, cité par Nemoianu 1967, p. 20). Ce qui intéresse donc à une structure (en commençant par la structure de la matière et en finissant par la structure de l'Univers), ce n'est pas seulement la disposition dans une construction, mais aussi, et surtout, les relations réciproques et réversibles entre les éléments du "tout", relations qui assurent l'unité, le fonctionnement de l'ensemble et ses transformations dans le temps. C'est-à-dire, que d'après l'avis de J. Piaget (1937) "ça n'intéresse dans une structure, en soi, ni ses éléments, ni la totalité, mais les relations entre les éléments, c'est-à-dire les procédés ou les processus de composition (dans la mesure où il s'agit d'opération rationnelle ou de la réalité objective, la totalité n'étant autre chose que la résultante de ces relations ou compositions)".

Le structuralisme, un des moyens de connaître la réalité (matérielle ou spirituelle), fut une sorte de réaction contre l'évolutionisme "qui, appliqué sans mesure et souvent à contre-temps, fut une des causes des spéculations excessives sur les transformations des choses, sur les causes de ces transformations, donc aussi sur leur genèse (Nemoianu 1967, p. 29 et 76). De cette manière, les hommes de science, quelques fois même les hommes d'action, s'éloignaient de la connaissance des objets comme ensembles non dissociables et soumis, dans l'intimité de leur structure, à des lois propres. De là, priorité accordée à l'objet en lui même par toutes les formes de structuralisme. C'est pour ce motif qu'on lui supposait un caractère statique, sans observer que l'analyse de la structure d'un objet, appréciée comme un système, ne s'arrête pas qu'à son hypostase statique. Elle est continuée par l'observation des transformations de l'objet et par la prévision de son développement futur. Il n'est donc pas question d'exclure la genèse dans l'analyse de la structure ni d'abandonner ou de sousévaluer son évolution, mais seulement d'un autre ordre dans la manière d'aborder les choses. "Assurons-nous d'abord du fait avant de nous inquiéter de la cause" — disait Fontenelle il y a plus de 250 ans, et on constate la même nécessité aujourd'hui.

Il est un fait indiscutable que le structuralisme s'applique actuellement dans tous les domaines de la connaissance. La géographie ne fait pas exception et depuis longtemps, en Roumanie aussi, car la définition de la géographie par S. Mahedinţi, promoteur de la géographie moderne dans ce pays, est, vers 1900,

une définition structuraliste: "La géographie a comme objet la Terre regardée dans les relations réciproques de ses enveloppes tant du point de vue statique (distribution dans l'espace), que du point de vue dynamique (distribution dans le temps)". On n'emploie dans cette définition ni le mot structure, ni le mot système mais elle rapelle très bien le "structuralisme" de J. Piaget, par exemple. On a introduit au cours de notre siècle beaucoup de termes pour la même idée d'ensemble structural terrestre: *ensemble territorial, complexe territorial, enveloppe géosphérique ou terrestre, épiderme terrestre, géosphère, biogéosphère,* etc., jusqu'au plus récent, celui dé *géosystème*(qui, si on tient compte du fait que les éléments solidaires d'un "tout" sont soumis aux lois du système, inclut, le mieux entre tous les termes cités, aussi l'idée de structure). On doit ajouter que l'objet de la géographie est, nécessairement, non dissociable tant dans l'analyse que dans la synthèse, ce qui suppose l'idée d'un ensemble (structural) et son analyse avant la recherche de la cause.

Mais, en même temps, sous l'influence de la conception évolutionniste, apparaît, persiste et se généralise, aussi dans la recherche et la présentation géographique, la priorité de la direction génétique (évolutionniste), ce qui provoque la baisse de l'intérêt pour l'ensemble territorial, c'est-à-dire pour la structure géographique non dissociable. Heureusement — pour le concept unitaire de la géographie — l'alarme déclenchée, dans les dernières décennies, par la dégradation et l'épuisement local ou régional du milieu ambiant, a provoqué la reconsidération de l'ensemble territorial, y compris l'homme, et ses imprudences; et plus précisément, l'analyse des conditions de l'équilibre entre l'énergie de la nature et l'énergie de l'homme (équilibre écologique). Très explicable donc l'attention qu'on doit accorder de nouveau, depuis quelque temps, dans la recherche géographique, au "tout" territorial, à sa structure, donc — de manière synthétique — au géosystème.

Il est vraiment merveilleux de voir comment les hommes de science passent d'un extrême à l'autre et reussissent à compromettre les plus essentiels et les plus acceptés concepts fondamentaux. Dans le cas qui nous intéresse, espérons que personne n'aura peur que le retour à la structure géographique et la priorité qu'on lui accorde dans l'analyse de la réalité terrestre non dissociée implique une baisse d'intérêt pour la genèse et l'évolution du complexe terrestre régional ou planétaire.

Voyons de plus près ce qu'on doit comprendre par la structure géographique, et, pour mieux saisir les choses, comparons la à la structure géologique.

Tout le monde sait ce que c'est qu'une structure géologique (la nature et l'agencement des matériaux dans l'écorce terrestre); mais que peut être une structure géographique? Si on part de la définition commune de la structure et du fait que la structure suppose un objet précis qui doit être connu avant d'être expliqué, la réponse n'est pas trop difficile à donner. L'objet de la géographie — la surface de la Terre — se trouve au devant de nous, et nous nous engageons à l'observer, décrire et expliquer tel qu'il est en réalité. On sait que l'objet propre et direct des recherches géographiques est *l'enveloppe terrestre* (zone ou sphère d'interférence des quatre enveloppes terrestres qui, par leurs relations réciproques et réversibles, assure à l'ensemble une structure dynamique et des fonctions propres, spécifiques exclusivement à la planète que nous habitons). Pour mieux comprendre le contenu et la sphère de la notion de structure géographique, il n'est pas nécessaire de nous rapporter à l'enveloppe terrestre toute entière. Il suffit de prendre un seul exemple. Nous prenons le massif de Bucegi, qui, géographiquement, appartient aux Carpates méridionales et, géologiquement, aux Carpates orientales.

Toute structure — donc la structure géographique aussi — suppose, nous le répétons, un nombre d'éléments solidaires qui constituent un complexe (un "tout", un "ensemble", une "totalité") aux caractères et aux fonctions autres que les caractères et les fonctions de chaque composant pris séparement. Dans le cas du massif de Bucegi, l'analyse nous montre: des *éléments spatiaux* (altitude absolue 2000–2500 m; massivité accentuée — environ 30/30 km; orientation d'ensemble égale, N-S et W-E); *éléments structuraux géologiques* (direction des plis approximativement N-S; couverture épaisse de conglomérats calcaires mésozoïques qui enveloppe le cristallin de Leaota; lambeaux calcaires triassiques et jurassiques dans l'axe de la vallée de Ialomița, dans le couloir de Bran, dans la cime de Piatra Craiului); *éléments dérivés: morphologiques* (plate-formes d'érosion policycliques, surfaces structurales, formes glaciaires reliques, formes périglaciaires, ilôts karstiques, processus nivals et gravitationels, relief d'érosion fluviatile dans des vallées profondes qui dépassent 500–1000 m); *climatiques et écologiques* (étagement du climat et de la végétation de moyenne montagne en bas; alpins et sub-alpins, sur les sommets dépassant 1800–2000 m; densité de la population de 5–10 sur les sommets, plus de 100 au pied de la montagne; utilisation du terrain pastorale, forestière, touristique).

L'altitude absolue, associée à l'orientation générale du massif a dirigé et dirige dans l'ensemble, le modelé du relief, le topoclimat et la composition dynamique du paysage. C'est pour ce motif que, dans la haute et même la moyenne montagne, l'altitude absolue et l'orientation générale passent, comme facteurs génétiques courants, avant la structure géologique (facteurs passifs dans le modelé du relief de détail et dans la composition et la structure du paysage). Et tout cela, sans doute, pas en elles même mais par leurs effets sur le système territorial tout entier.

On le voit, c'est une question de priorité dans le mécanisme de la connaissance. En effet, comme l'altitude absolue et l'orientation générale (moins statiques que la structure géologique), en qualité de facteurs opérationels indirects dans les structures géographiques, embrassent un nombre plus grand d'éléments et de processus — en d'autres termes, sont mieux et plus profondément refléchies dans la structure géographique, la priorité qu'on accorde à ces facteurs est tout à fait normale, ce qui ne doit pas être interpreté comme une invitation à négliger ou sousestimer ni la structure géologique, ni le dynamise de l'écorce terrestre et du niveau de la mer.

En conclusion, la géographie, science de la description sélective, critique et explicative de la Terre, cherchant à garder la juste mesure entre l'informatif et le speculatif, pourra conserver son rôle millénaire à la condition qu'elle serve son objet (le géosystème) en commençant par l'analyse intégrante de sa structure, pour arriver ensuite à l'explication (dans la mesure ou genèse et évolution assurent l'intelligence et la valorification du complexe terrtiorial). Car la géographie fut, et doit rester, une science à application immédiate.

Sans doute, la cause précède l'effet (c'est-à-dire, l'objet avec sa forme, son aspect, sa dynamique); mais, dans l'ordre de la connaissance des choses, l'effet précède la cause. Il est vrai que cela ressemble un peu à de pures spéculations. Non pas. Personne n'a jamais nié la nécessité et l'importance de la spéculation (qui est, on le sait, "recherche abstraite, théorique") mais à une condition: une spéculation doit s'appuyer sur des faits bien controlés, surtout dans les disciplines à caractère applicatif, comme la géographie par exemple.

Revenons au massif de Bucegi. Si nous commencions par le "film" de l'évolution palécgéomorphologique, en reconstituant avec beaucoup d'imagination et d'approximation toutes les phases orogéniques et glyptogéniques, en com-

mençant par le précambrien et en finissant avec le quaternaire, nous ne serions pas en faute sur le plan scientifique, mais nous aurions renoncé au spécifique géographique: la description (et l'explication) de la réalité territoriale d'ensemble actuelle, réalité dans laquelle le relief (ancien et récent) entre, lui aussi, comme élément et comme facteur opérationnel du géosystème respectif. L'ordre adopté dans la recherche et la présentation des résultats ne se réduit donc pas à une simple question de priorité, mais il peut changer — quand il n'est pas respecté — le sens de la géographie comme science du tout territorial non dissocié.

Comment s'explique la situation actuelle de la géographie scientifique? Pourquoi les géographes de notre siècle évitent-ils, en général, dans la recherche scientifique, la description intégrale, non dissociée de leur objet, en la considérant, tout au plus, comme une sorte d'introduction à la recherche et à la reconstruction génétique de l'objet?

Pour la géographie de la première moitié de notre siècle, ce changement de position représentait une transition, avec discernement, vers une description géographique sélective et expliquée; dans l'enseignement, vers une description fondée non exclusivement sur la mémoire, comme dans le passé, mais aussi sur la raison. Au commencement, quand S. Mehedinţi avec sa vaste culture philosophique a provoqué le changement dans la pensée géographique roumaine, il a imaginé et appliqué dans les lycées du pays, sous la forme d'une synthèse de géographie générale élémentaire, une sorte de "modèle" représentant "l'organisme planétaire" comme un "tout" unitaire auquel on devait rapporter les structures géographiques des continents et des pays. Pendant ce temps là, on ne parlait ni de structure, ni de système mais on voyait dans l'objet de la géographie une structure non dissociable et, dans l'analyse de cette structure on rapportait chaque composant à l'ensemble comme dans n'importe quel système. C'est-à-dire on respectait l'intégrité de l'objet dans les recherches de géographie régionale, ce qui ne veut pas dire que l'analyse par éléments n'était pas admise et pratiquée, mais c'était une analyse "intégrante". Les premiers élèves de S. Mehedinţi (Al. Demetrescu-Aldem, G. Vâlsan, C. Brătescu, N. Orghidan) commençaient à travailler dans cette direction, se spécialisant surtout en géomorphologie, géographie de la population et géographie des villes.

On sait que, surtout après 1920, sous l'influence de l'évolutionnisme, l'objet de la géographie fut répartis entre différentes spécialités qui devinrent objets des "branches" de la géographie ou "géographies particulières". Petit à petit, on arriva ainsi à ce que le géographe français A. Meynier (1969) appele "le craquement de la géographie".

On ne peut pas arriver à la synthèse avant de passer par l'analyse (c'est un truisme). La spécialisation est donc obligatoire aussi en géographie. En conséquence, on ne doit pas avoir peur que, en respectant la non dissociabilité de l'objet de la géographie, on exclut la spécialisation; celle ci doit aider, non freiner la pensée géographique c'est-à-dire la synthèse. Pour éviter le craquement de l'objet et donc la disparition de la géographie comme science unitaire (théorique et appliquée), nous avons essayé de prouver que l'élaboration géographique doit avoir comme but principal l'analyse critique, intégrante, de la structure géographique (locale, régionale, planétaire). On y trouvera la place et les proportions justes de la recherche génétiques dans n'importe quelle étude géographique.

Voilà pourquoi nous avons trouvé nécessaire d'attirer l'attention et d'insister sur le sens et l'importance théorique et pratique de la notion de structure géographique.

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A SCHEME OF SIDE-PROCESSES RELEVANT FOR ENVIRONMENTAL DEVELOPMENT

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THE PROBLEM

For about 30 years the author has been elaborating —within the planning of the rebuilding of Dresden and its region — regularities in the development of cultivated landscapes, which may be important for the systematic arrangement of functions in a limited territory. One of the results was published in a study 1951 dealing with the problem of causality in the development of cultivated landscapes. The process systematically introduced by the society in order to secure the fixed necessities of life must be sharply separated from unexpected side-processes leading to negative effects in the landscape. These processes cause the so-called side-effects. They play an important and steadily increasing role in environmental research work. At that time a constructive organization of the territory and the relations between man and environment were still not a problem. First of all the study was an analysis of historical examples. Meanwhile the international interest has turned more and more to the problems of environment, and social sciences have begun to study the behaviour of social groups to environmental phenomena. The interpretation of the scheme published in the study mentioned above can give some hints for investigations in environmental problems. It shows that natural and social aspects must be combined in order to control environmental situations. It is one of the most important tasks of the organization of research work in the next years to avoid the isolated work of the different disciplines. The mental control of any discrepancy in the environment must be based on the analysis of natural and social sciences. First of all there are psychical and mental links which connect the starting point of (considerations about) negative changes in the environment with the decision to correcting actions.

THE SCHEME

The course of environmental processes and their mental and practical control may be defined as the period between the rise of an initial discrepancy and the finishing of compensatory actions in the landscape. In Figure 1 the horizontal line marks the axis of time. The main stages of the process following one after another are marked by the signatures t_0 ... t_6. This single stages of the process are marked vertically one above another. Thus the scheme shows the form of a staircase. The starting point 0 represents the pre-existent status, the final

point is the new form after finishing compensatory measures. Generally the changes take place in a very complicated environmental system and often the effects of different processes may overlap. The investigation of dynamic systems demands the analysis of each single event. Each change must be studied as a special case. In this sense the scheme is valid only for isolated processes caused by a fixed impulse.

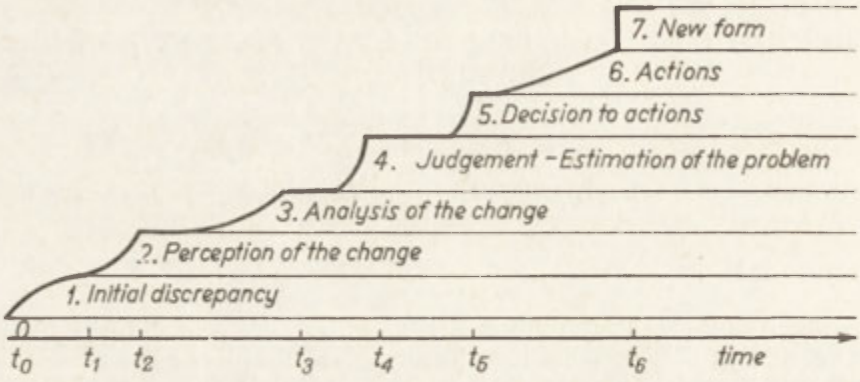

Fig. 1. Scheme of a side-processes

The general course of an environmental process always shows typical stages as follows:

(1) The rise of an initial discrepancy between the necessities of men and their settlement,
(2) the perception of this discrepancy,
(3) the analysis of the facts,
(4) the judgement of the problem,
(5) the decision to actions,
(6) the performance of actions,
(7) the new form as a solution of the special problem.

Each of these seven stages shows some peculiarities and depends upon conditions of different origin. Especially the stages *2* to *5* are influenced by material and immaterial, objective and subjective, natural and social circumstances. These influences are specified in the original papers and can't be described here once more. Besides, mostly it is easy to gather a great number of conditions influencing both natural processes and the decision making in each special case.

THE INTERPRETATION OF THE SCHEME

All development and all changes in the landscapes take place in time and space. Even in geographical analysis time is often a decisive factor and must be taken into consideration if prognostic estimations are intended.

Time appears in different form, such as speed of processes, duration of disturbing influences, critical time of the accumulation of toxic substances or other effects of side-processes leading to dangerous consequences. It may appear as retardation of social decisions or human actions. Finally the relations of time between .different processes, increase or decrease of speed and the time-lag between the single stages of the development must be taken into consideration. The relations between natural processes and human activities are of crucial importance for the success of the control of environmental changes.

The lapse of time in environmental processes may be divided into three periods: The first period is the stage of "hidden processes". From the starting point t_0 up to t_1 — the moment of perception — the rise of the discrepancy is generally very slow and the changes in the environment are very insignificant. In spite of all, the germs of the later development and its dangerous symptoms originate in this period; it is often difficult or even impossible to prevent the consequences in later stages of the process. Therefore the environmental research should pay great attention to this initial phase of the devlopment and check what consequences may be caused from the hidden disturbances of this first period.

The second period comprises the stages 2 to 5. It begins with the perception of the change, deals with the checking of the event, the interpretation of causes and motives and comes to a judgement of the problem in question in order to work out suitable measures against the detrimental process and its symptoms.

In this period the process in question continues according to the laws of nature since regulations by the society are not yet in action. The time-lag between the analysis of the events and the beginning of contra-actions must be checked with special attention, for in this time the natural process may reach critical limits, joined with considerable troubles in the environment, or incite new processes which intensify the damages. The greater the time-lag the wider the progress of the disruptions into greater parts of the territory. The observations of the natural processes is indispensable even in the period of preponderant mental and psychological inquiry. That means that natural and social sciences must be coordinated in a interdisciplinary research work.

The middle part of the scheme is the field of human decision. We have to discern between the real environment and its dynamics on the one side and the perceived environment, the mental reception of this reality, on the other side. The behaviour of sccial groups is ruled by ideas resulting from the mental reception of the phenomena in the real surroundings. The mental attitude to the environment depends on the education which has formed the customs of men and the level of knowledge, especially the sense for environmental relationships, and it also depends on numerous influences caused by social organization.

The more the reception of the environment differs from the real environment and the less men understand the importance and the inevitable consequences of environmental processes, the less it may be expected that effective solutions of the problems can be found. Thus the attention must be directed to the relations between real and perceived environment. A very good solution can only be found if the perceived environment is nearly identical to the real environment.

The third period begins with t_5, in that moment, when man intervenes and operates with planned actions. This period is characterized by the combination of natural and compensatory technical processes initiated by the society in order to correct the undesired side-effects of other activities and to regulate the geotechnical metabolism. The goal of these measures may be of a different kind:

1. removal of the negative side-effects and restoration of the former state,
2. reduction of damages and threats to a tolerable level, or
3. quite new arrangements by inserting the undesired side-effects into a combination with other activities and aims of the society.

In this way the side-effects can be made harmless and great advantages may be achieved in some branches of the production at the same time. A good

deal of solid wastes, e.g., are used as secondary raw materials in the form of recycling.

If the measures for regulating the metabolism between landscape and human activities are expected to be effective, it shall be necessary to know the disturbing process itself, its stages of development, the magnitude of the effects and the future course of the process in question.

Though we know that the dynamics of the environment can only be understood as a network of different processes, it is inevitable to study the single process, since they are the bricks of the whole system. But additional to the special and isolated analysis of the single process, it is indispensable to learn how the process in question interferes with others and how this interference appears in the features of the landscape.

Whereas the natural process run off directly according to the laws of nature, the mental processes are much more unstable. The motives of the behaviour are of different kind. They may be based upon social or personal regards to customs of social groups, ideological conceptions, scientific doctrines or — not least — to economical facts and others. It is evident, that any change in these relations must provoke changes in the mental attitude of men to the environmental problems in question. The training of the skill of observation, the appearance of new needs and even new fashions, the growth of knowledge, the change of economic conditions, the technical progress — they all provide new aspects of the problems and allow one to introduce new methods, which can be applied to the stages of the whole course such as perception, analysis, judgement and decision-making. According to the character of the new insights a revision of the former decisions may be possible and better solutions may replace the older ones. It is often not necessary to repeat the full scale of considerations, but the revision may be focused to those arguments and those facts which have received a new interpretation.

The social aspects are — compared with the course of natural processes — very much more changeable and therefore of great interest for the idea of environmental problems. The natural processes often seem to change, whereas only the mental attitude to environmental facts has changed. This ambiguity points to the possibility to interpret the developments in the environment as a game between natural processes and social impulses respectively.

SOME CONCLUSIONS

The survey of side-processes changing the quality of the environment suggests some conclusions with regard to urgent problems in environmental research. The heuristic value of such a scheme is incontestable. In our case the figure gives hints to some questions of a better education with intent to level up the general knowledge of environmental facts, to raise the responsibility of men for the preservation of the nature.

The understanding of the processes which may trouble the relations between man and environment is the base of the right behaviour of men to the problems of environmental disturbances. Moreover, the scheme shows deficiencies of the research and makes evident where gaps in our knowledge prevent a more effective control of the geotechnical metabolism. This applies to the single scientific disciplines as well as to the interdisciplinary co-operation. The author suggests that among the urgent problems the greatest attention is due to the control of the first (mostly hidden) stage of environmental changes. Most of the side-effects originate from very little changes caused by the side-processes

mentioned above. Society can only do something against the dangerous development, when these mostly negative changes are perceived. But at that time structural changes of parts of the environment have often already reached such a state that effective measures against the processes and their consequences are difficult and very expensive. In some cases it is totally impossible to stop the process and to re-establish the former state. It would be a great advantage to recognize the beginning of such a troubling process, using applicable methods, which allow a diagnosis as early as possible. To this purpose it is necessary to find out the single impulses caused by a certain human activity in the landscape. These impulses are represented by all changes of the balance of nature by loss or supply of matter or energy. As it is usual to give technical parameters of the function of any technology, each innovation in the landscape may be analyzed and characterized by the impulses resulting from the use of natural resources and from the pollution of the air, water and soil by the wastes of the production and consumption. Technical and natural sciences provide much information about the reactions of each substance and it is possible to elaborate closed sequences of typical reactions. It would be a task of the geographer to check in what manner these series of reactions will provoke changes in the environment. Each innovation in the landscape initiates side-processes and leads to side-effects. The knowledge of the kind of the expected changes and the study of the spatial differentiation of the environmental effects in combination with the susceptibility of the endowment of a region presents numerous data which are important for the actual and future quality of the environment. The preservation of our cultivated landscapes and their wealth of natural resources and beauties cannot be warranted without prognostic studies. Thus the early diagnosis of side-processes may be a key to better results of environmental research.

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SOME PROBLEMS OF GEOGRAPHICAL SCIENCE IN THE FEDERAL REPUBLIC OF GERMANY

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The activities of the geographers cover a wide range which may be divided according to some main points. In a superior group research and teaching oppose each other. The teaching includes studies of geography at universities, geographical courses at the school level, and public information about geographical facts that are of general interest. These facts have to be prepared and to be shown by means of all media for the broadest public. In addition, there is the application of geographical research results for the country by public services, e.g., official statistics, cartography, regional science, and topographical survey. Finally, private enterprises, publishing houses, marked researches, and experts' reports offer a wide field of applications. None of those fields can be strictly separated from the other. They all overlap personally as well as materially. From all fields there might be suggestions for the others. Everyone working on one of the above-mentioned subjects might obtain excellent results in a neighbouring field. Here are now some examples concerning the specific situation in the Federal Republic of Germany. Most frequent is the combination of teaching at all school levels and research in regional geography. This stems from the simple fact that the teacher, living for some time in a region knows this region and its research problems. Thus he is able to contribute to the solutions which may be in the field of physical geography, regional geography of culture, or in the field of applied geography. These solutions later may help the regional science. The working fields of basic research, cultural geography, and applied research are hard to separate. The roots and the unit of regional effects belong together. In the same way, teaching and public work belong together. The unity of research and teaching at German Universities is a traditional principle. Nevertheless, we have to distinguish between two principles of geographical teaching: one is the unity of research and teaching, serving both pure and applied research, the other is the instruction of future school teachers for all school forms. Different models are being proposed for discussion: one is the university with a broad spectrum of facilities for all purposes, the other is the concentration on instructing teachers for all school forms at pedagogical high schools. Such a classification according to the students' future professions entails organizational and structural problems for some subjects. Among these is geography. The major part (about 95 per cent) of the students of geography at the universities of the Federal Republic of Germany intend to be teachers at high schools or secondary schools. Only a small part will work in private enterprises or deal with regional science or topographical survey, though the number of

private institutions has increased much lately. Institutions for pure research do not exist any more since the "Federal Research Institute for German Geographical Survey" only has to do with the problems of regional order and not with the problems of regional science. Existing institutes or academies work in applied research and only give single contracts to their members. But there is no institution promoting geographical research. This is exclusively the task of university departments.

As an example we have the University of Cologne where young future geographers are instructed for their future professions as certified geographers, teachers at high schools and secondary schools, or teachers at vocational schools. Most of the students come from A-level high schools, only a small part from evening schools. Apart from the university curricula, the pedagogical universities offer courses for future teachers of primary and secondary schools. These universities, too, offer the possibility of habilitation and graduation.

The development of the position of the geographical sciences at the local combination of universities cannot be predicted at the moment due to the present policy of the Ministers of Education of each federal state.

Since most students of geography intend to be teachers, the following question arises: does high school teaching and its aims determine the university curricula, or can universities train students in the scientific methods of geography without regard for their future practical applications? The demand of the didactic specialists is considerable. However, one might say that two years of learning the methods and didactics of the subject after having finished the basic studies are enough. In comparison, the four years of scientific studies are really short.

For the definition of the present subject it should be noted that today there is no isolated teaching of geography in higher school classes due to the reforms of curricula which up to now are not yet finished. The form of politically and sociologically located social and political studies (or whatever their name is) only has to offer a general wash-up which cannot be studied at universities because it cannot be taught. And certainly it cannot be a field of research. At the most one can discuss the didactic questions of the subject, i.e., how to present a combination of facts without being a specialist in all the fields concerned. In order to give good lessons in social and political studies, one has to learn the fundamentals of economics, sociology, political science, and history.

A student of geography cannot be asked to do all this. He is forced to organize for himself the necessary knowledge. The careless student is brought to amateurishness, the efficient and seriously thinking student is brought to avoiding the studies of geography. Many conversations with students make this dilemma apparent. This leads to negative selection, to a critical attitude towards geography as a subject of university studies and as school subject, and to the deepening of the gap between research and teaching. Though many experts try to fill up this gap, a great many other experts hide in the ivory tower of a very specialized field in order to seek there the possibilities of research progress. Research and teaching drift apart.

The geographical research takes place within this narrow framework, because there are no special institutes of research and only very few research institutes "at" the universities or "of" the universities. The difference between the latter two is their financing system. The first are paid for by private foundations etc., the latter by the budget of the universities. Thus research work in geography is restrained to the short time that is left by teaching obligations and the number of the members of the institutes. There are big differences between

the different institutes. There are critically understaffed institutes with a high number of lectures to be held, where one has almost no time left for research. There are other institutes, though, that are better equipped and have fewer teaching obligations. In addition there are difficulties in financing a substitution in case of a longer trip abroad. As a rule, every seventh semester is a semester for research. It is necessary to organize a substitution for this time, since the number of lectures held should not decrease.

The necessary time for oral and written examinations and for administrative work for university is not interrupted during these research semesters. But these are all restrictions that one can get over with. With all energy even a one-man institute with a limited staff can do some research work.

Geographical research is mainly individual research. Large geographical projects do not exist at the moment. Some projects within the framework of federal research are directly financed and partly organized by the Ministry of Research, for example nuclear physics, reactor research, computer research, maritime research, and other branches which require substantial means. In this context there are several branches that originally belonged to geography, but whose special methods later separated them from scientific geography. Now, however, their aims converge in ecology as the fundamentals of environmental research, such as hydrology, botanical ecology, ecology of the atmosphere in connection with air pollution, and maritime research. The last big project of this kind was the investigation of Spitzbergen by the Geographical Institute of Würzburg under J. Büdel. The objective was glacigen-morphological with periglacigen-morphological orientation, being effective for large areas.

Now some projects in ecological research in crowded industrial and residential areas are on their way, being initiated by UNESCO. First regional studies have been presented and surely promise consequences for future research. As an example it may be useful to bring out a homogeneously drafted map of environmental stresses at a large scale. This map will have to be drafted in agreement with the independently organized cartographical services of each federal state and may show in detail the nature of the region and its potential use by man. For the federal state of Hesse we already have the example of such a map. Costal research, too, is thinkable with the background of a centralized large scale research with the objective of a cartographically unified inventory with the scales 1 : 10,000 to 1 : 25,000 and may be done in the scale 1 : 100,000. An administrative difficulty consists in arranging the autonomous research facilities of the different federal states.

Apart from these large scale research and cartographical tasks, the emphasis lies on individual research which is done by the individual scientist or with the help of the *Deutsche Forschungsgemeinschaft*. Here the determining factors are the personality and the objectives of the researcher. The requirements for individual research have remained the same since the beginning of research work. These are the mental independence, the discriminating thirst for knowledge, the untiring pleasure of work, the knowledge of the work of the scientific ancestors, the longing for recognition and fame, i.e., the longing for a professorship. Thinking about these basic virtues of a geographer one may find some problems. Contrary to the mental independence is the inclination towards accomodation. Some scientists want to change the objectives, some want to change the methods, others just want something new, that means they want to change all the methods and objectives of geography. In their statements the common geography is totally abolished. In this situation, research has to decide what it really wants to do, whether it wants to dedicate its work to objectives or if it

only wants to pursue the methods of research. To combine both things is hardly possible. In our opinion the scientific analysis is the only valid method for the empirical sciences. It is based on the experience of reality, analysis, tests with the help of comparison, and on the conclusions one can draw. The region as the objective remains in the centre. It is not always easy to keep this aim, because the region only speaks through its fulfillment, through the activities and processes that happen in it. The often cited geographical thinking is a simple thinking in causal sequences. These sequences radiate from things or cause appearences in the region. This sequential thinking appears more natural to us than the consideration of complex networks of phenomena.

Younger reformers smile at the often blamed objectives of geography as a synthetic view of a region as a whole. In geography these reformers only see an informative small talk about some loosely connected facts. They propagate a quantifiable general investigation of the causal relations with the end of finding general laws. For them the geographical region can be computerized. The map, produced mechanically with the help of computers, is an important intermediate aim, if not the end. The knowledge of the laws that govern the regional processes is declared the main objective of geography. And not, as it should be, the knowing of the individual region. The analysis becomes an important instrument of research. In addition to that they tolerate the investigation of present-day problems; geography is becoming a "case-study". Projecting this mentally into the future, then it is quite possible that the "Hegau" or the "Kaiserstuhl" could become a case-study. The vulcanism also reduced to the problem of using it as a source of energy, and the loess can be treated as a research problem in the field of soil studies as well as agricultural economics.

The equilibrum between research for the common laws that govern a region and special geographical knowledge of an individual region has not yet been found in geographical research. But both belong together. If one accepts the axiom that geography is the science of the surface of the earth then of course this includes the regional variances. Also it includes the existence of units of regional effects of nature and mankind, that means the knowledge of the region on an empirical basis. The knowledge of the system of these units of regional effects belongs, of course, to the scientific consideration and solution of a given research problem. In addition, the units' functions as well as the science of dynamics and the knowing of the processes happening inside one unit and between some of them belong to the consideration and solution. The theory of regions belongs there, too. Neither the theoretical nor the empirical branch can be pursued on its own. There might be an emphasis on one side or the other from time to time, dictated by a fashionable current. Even a definite determination of the objectives of research leaves enough individual freedom to every researcher, thanks to the broadness and universality of the science. The research field is not limited to only one sector, all aspects have to be investigated. This tolerance cannot always be taken for granted. It lies in the character of man to present one's views, be it in politics, science, or religion, in such a way as to induce intolerance of other opinions. So tendencies have opposed and still oppose: some want to drift towards general geography, others want to keep together or want to divide physical geography and geography alone, still others want to push social geography to the front and everything else into the background. Then there are the "quantificators" who believe in using the different computer systems for analyzing the region and for cartography. They only accept what is computable and deny the description of structures. These different views and the ensuing conflicts, of course, have serious effects on the individual's research.

If one had not only looked for problems, methods, and fashions, but had a universal objective, there would easily be found a generally accepted direction in research. This direction would have to promise advances in research, however, it has not yet been found. Fortunately, many younger geographers follow the genuine tradition on the way to scientific improvements, namely to show their scientific versatility. The one-sided geographers, e.g., the quantificators, the supporters of a pure social geography, and the pure analysts do not matter anyway.

It is quite remarkable that geomorphology as a basic group of physical geography has kept itself in its scientific working direction, while climatology, geology, and oceanography became independent sciences long ago. Now parts of scientific geography came together again in ecology in order to solve problems of environment. The common geographer cannot say much about these problems, because cooperation of forestry, agricultural science, meteorology, hydrology, and soil science is necessary to solve all problems of settlements and land utilization. This example makes it clear how geography can partly disintegrate and perhaps come together again, never losing its essential orientation towards the region as its objective.

Region are dynamic, they breathe inside their limits, but remain essentially the same. The contents of the regions may change as well as their functions. Only the region as the object of research has to remain the same, the region cannot be substituted by a single problem, even if this problem is of great regional relevance. This statement may be understood as a provocation of a certain direction of research, but if one does not fulfill this demand for a continuous scientific geography, then geography disintegrates, just as political parties are disintegrated if one of them become the country's only party.

In the scientific geography of the Federal Republic of Germany there are some fashionable trends since the fundamental discussions about the preponderance of either regional or general geography. One of the fashionable directions deals with social geography. This direction started with the understanding that the physical and historical description of a region is not enough and that one has to consider the socio-regional structure. This conclusion is correct, but it was done without the connecting link of population geography which had to be created first. Besides, the so-called social geography is obviously one of the fundamentals of economical geography, because trade, production, and communication take place in social groups that populate the economy regions of the world. No economical action is caused by itself. So it is evident that if a modern economical geography does not only understand itself as a production geography, it also has to catch the social background of production geography. That makes an independent social geography superfluous. The tendency of geography to turn towards general principles does not justify a social geography, because both sciences are still struggling for their basic concepts and can help each other very little. Sociology still has not found the middle course between philosophical and empirical orientation. Geography is undecided between an empirical research of objects or a general research of systems. The working directions of social geography are extended to peripheral problems, such as foreign workers, commuters, reconstruction of ancient parts of a city, social housebuilding. All of these are important, but they are not really geographical problems. Regional statistics are necessary for the solution of these problems.

One more fashionable variant of geography comes from the tendency to turn to regional structure. Following the principle of Christaller, one reaches for the predomination of central places. Besides the geography of "central places"

(which means a flattening of the geography of cities) the geography of commuters and the structural analysis of a city play a substantial role in cultural geographical research. A part of the city research geography even settled down in the geography of floor-utilization. This goes too far. A special branch of cultural geography is the geography of commuters. It is easy to find out the range of commuter traffic because one only needs regional statistics. Probably the commuter problem will loose its importance when municipal units are reduced and near-by commuters will no longer be detectable. When suburbs are incorporated into a city, the working people who go to the centre are no longer registered statistically as commuters.

To investigate the concentration points in regions and to analyze their relations to the surrounding regions is an essential point of modern human geography. So far the geography of central places and the observation of commuters belong to a unit, that helps the knowledge of the processes of concentration. Thus the geography of settlements is led away from the traditional historical and individual views of city and country and has become an analysis that can be quantified. The settlements lose their meanings as historically formed phenomena in specific sites with their specific accomplishments. They disappear in statistical systems of settlements, grouped according to size and equipment. This change in the direction of research on one side results from the necessity for practical applications and on the other side from a tendency in today's geography not to take up single problems which scientists have discovered on their own. Today one wants the problems of human geography to be teachable for a simple average of staff members, one does not want to think any more about grown or ever-changing typological systems, one wants to make the problems computable, one creates simple statistically defined regional categories. With these, even people with simple instructions can do well. The fixing of "concentrations", "suburban regions", and "rural regions" takes away the breathing air from the geography of cultural regions. In addition, there is no possibility of activities outside regulations and development plannings because of the well regulated distribution of funds. This is plainly shown by the change of the institute for regional geography at the Federal Institute for Regional Geography and Research. The institute mentioned above does not pursue any more research in pure geography or as basic research. Today it is trying to solve problems of infrastructure as well as settlement problems for central cities or small towns in a very simple, not to say primitive way.

Tourism, recreational industry or whatever you may call it has become another working field of geography. Here are no problems left after the first paper of the geographer Hans Poser. It is just the question how to allocate suitable regions to the recreational industry according to the leisure time available and the appeal that a region holds for the prospective tourist. The combination of forest, water, interesting views, and good accomodation is the optimum for the medium term recreation. There are no limits to long-distance tourism. The possibilities reach from Bali to the crossing of Greenland. The scientific research questions are the same from place to place. The problems change with the question of how these regions are connected with nature and the agricultural environment, how far is the development of transportation facilities and what is the significance of tourism for the economy of the host country. The typological starting points are the character of available possibilities, the way the combination of the elements on the supplier's side is made, the social character of guests and hosts, and the character of their mutual integration. These modern research branches all have in common that they are quantifiable and

that they are in direct contact with the socio-economical change of the region. They are all interested in a practical use of their results. Research will be getting inferiority complexes, if its results are not applicable practically, and in consequence research does not find any recognition. But it is well worth asking whether the characteristic qualities of a scientist, such as originality, intellectual perception, and power of judgment, are promoted if the only question asked is the question for practical use. The basic principle of individual research is the originality of restraining oneself to a certain field, yet at the same time recognizing influences that go to or come from distant fields. The scientific task of geography is to recognize the individuality of regions. Geography's task is not the analysis of the regional interactions which may be quite interesting but change from time to time and usually are effective only for a short period.

Today's idea of the regional shapes cannot be definitive. We are at a turning point of realizations that turn away from the idea of freely disposable regions to the idea of narrowing regions. In connection with that we have the orientation on preserving free regions for the future, i.e., to arrange the regions with the orientation towards the future. But each fixing for longer periods means an anticipation of a future that we are not able to predict in advance.

A critical examination of present ideas in geography shows some problems. One may find them in the socio-ecological field of tensions in the concentrations. Here the possibilities of individual research come to an end, the concerns of society meet the unchangeable laws of nature. No one, not even with the highest qualifications, is able to judge the complexity of this system, he only can suggest and promote its scientific examination. Some of the concrete questions are: what do people do in the agrarian regions if they are not able to earn their living by only making use of their land? What do people do in the conflict between their places of employment and of residence? Which one will they consider more important?

Certainly it is good for the unity of geography to investigate very small regions. With this, geography combines orthodox thinking in classified systems with direct observation. Interviews and statistical inquiries may be used. The geography of places, complex settlements, and studies of suburbs, centres, or central cities is practicable till the end of the education of the geographer. In this dimension many things have been done and still are being done. But the emphasis of research is in the area of medium-sized regions. Here individual research may investigate complexes of regional effects, using analytical and synthetical methods. This has been postulated by Th. Kraus a long time ago, but it has hardly been followed. There are only few recent examples of such surveys by individual scientists. In this size the regions are comparable and their functions can be tied together. The Ruhr region, the Rhine-Main area, the Neckar region, the Upper Rhine area, the Rhenish slate mountains, and the loess belt at the northern border of the highland sill as essential regions of economic activity are no more objects of modern research and description as a whole. Even for the big seaport of Hamburg, there is no comprehensive study conducted by a single scientist. But of course there are single papers about all above-mentioned regions dealing with nearly all problems and aspects. This situation has existed for some decades. The comprehensive treatises about Germany, which had been planned by the big publishing houses in the thirties, always were given away to several authors. The following essays, *The Northwest* by H. Schrepfer, *The Southwest* by N. Krebs, and *Southern Germany* by R. Gradmann, have kept their lasting effects from that time until today. These essays are forty years old and were written in a system of geography

which is laughed at today. The younger generation denies the research character of this work and puts it into the category of schematic geography which only has informative value. What counts today are actual problems out of everybody's research field, mainly from urbanization, environmental research, and the econometry of development. In these fields the geographer cannot make too many original contributions due to his nature and education.

The special situation of the Federal Republic of Germany is the reason why there is no comprehensive geography of the territory. Indeed, a masterly inspired mind would be necessary to achieve any such study, to make a unit of the pieces that were formed after World War II. A national map of the Federal Republic of Germany and a corresponding geography only may be possible on a broad regional basis, and only if all available sources, national and international, can be taken into account. At present, the geographical methods vary greatly from one European country to another, and the different national maps do not form a homogeneous picture.

The same difficulties appear within the Federal Republic of Germany, and there are several reasons why. The planning maps of the federal states lack homogeneity in methods and in contents. Only some basic maps are standardized. The threshold values differ, the periods needed for preparation are too long. Especially the continuous reforms of municipal and district boundaries make it hard to recognize the fundamental structures from the genetical point of view. We will have to wait till the present has become part of the past. Then we will be able to pursue sufficiently the complete individual geography at all scales. This means finding the natural, historical and sociological foundations, finding the structures of forms and effects, and realizing the direct linear relations and the complex mutual interactions in the genesis and dynamics of a region.

As in all prognostic sciences, geography lacks the strictly scientific methods to classify the possible changes. Applied to geography this means: we know nothing about the ideologies that determine the power and the regional conditions in the countries of the world. We know little about the technical development in the future, and there are only a few things we know about the concepts of future generations concerning settled areas. These concepts have to be seen in combination with the corresponding ideas of regional communication and their development in all means of communication.

Finally there are three questions left of how geography may develop if the research objective (the unit of regional effects) is generally recognized. If this is the case it will affect all the analytic disciplines that have become independent. It was already successful in the concept of modern botanical geography and partly in the concept of geomorphology. It failed in the concept of climatic geography and in hydrogeography. The normal way of reasoning proceedes from recognizing the regional individual, then comparing and finding a typological classification and at last the general laws and rules. This course should be followed by division of labour, but always with unity in mind. The last two questions result from the first: is it possible to improve this schedule by using quantification on one side and team work on the other?

These two questions will be answered separately: preparatory statistical analysis for the investigation of geographical subjects should be done with the help of computers without hesitation. The different computer programs available may well be used for the calculation of proportional numbers in simple regional connections, such as the social stratification of employed persons. A great number of methodical studies with convincing results exist. But the

things one wants to know in the area of applied regional research cannot be expressed in this system, such as the complexity of a unit of regional effects in all its functional relations and causal interdependencies. The computer, serving geography, works fast, because the machine does not think, it only calculates fast. The main work is the analysis and the programming of the masses of data, and then the evaluation of results. Since the basic statistical units are too big, the modern quantitative method of analysis is not useful for the work of geography. Geography has to place in its centre the research object, the unit of regional effects. The so-called mathematical, in reality statistical calculus, does not promise any improvements of geographical methods. They just do it faster.

The last question has to deal with the problem whether team work may bring any improvements to geography.

Many forms of team work do exist. The *Deutsche Forschungsgemeinschaft* offers many of them:

— the special research branches, which are engaged in cooperation of many disciplines,
— the special emphasis programs. These programs are for single research tasks in a number of special fields, such as agrarian geography, industrial geography, African research and so on. Until now this is the most prolific form of guiding scientific geography,
— furthermore there are the forms of "units". This is a joint operation for the research of specific problems in geography.

From the programs mentioned, the "special emphasis program" has found special liking by scientists, because there the individual freedom of research is preserved. One condition for this form of research is the strict confinement to a research program on one side, and on the other side the freedom of the investigating personage. This condition is documented in the focal points: agrarian geography, industrial geography, African research. In the "special research branches" geography ranks at the periphery, never in a dominant role. This can be said from our knowledge of the branches: Latin-America, South Eastern Europe, and so on.

From the experiences of the past one can say: the conduct of the research efforts succeeded occasionally, especially when they were directed by one leading hand. Where this was not the case, the efforts only became effective when they were divided in single research fields. The present observation shows some fields where team work produced lasting results: *The Natural Regional Structure of Germany, The Geographical Structure of the Economy of the Federal Republic of Germany* and *The Map of the Forms of Fields and Sites in the Federal Republic of Germany around the Year of 1850*, edited 1970. These works emerged from an exactly fixed concept with specified contents and form and with the help of many geographically skilled collaborators. Regional research works, such as the research of the North Sea coast and of the Lake of Constance, were not produced dominantly by geography.

There will have to be a distinction between some types of team work: areal inventories are to be made under a unified management following fixed instructions with the collaboration of many, possibly all institutions of geography. There are research tasks in ecology that have to be solved by interaction of several disciplines. Here the geographer will have to renounce to the managing position as long as the specialists from natural sciences have not drawn the important conclusions about the regional efficiency of their investigations. The interactional cooperation of geography with all sociological and ecological disciplines is promising success for the future.

Looking over the total working field of scientific geography, it is clear that it is narrowed by the specialization of sciences. We do not see any deterioration of its position from this specialization. The research results of all emancipated branches come together again in general geography as the science of regionally effective forces, of typology, and of the general laws and rules that prevail in regions. Decisive for the continuing existence of geography is its main objective, that forms the complex unit of regional effects in unity of nature and intellect. With all its diversity and complexity it can be the object of the mechanical quantitative analysis only in some first steps and intermediate phases. Including more and more the intellectual fundamentals in its system of structures, geography obtains humane features. According to its research object, geography is research by an individual. Better results are to be found in research by individuals, in contrast to the scientific disciplines where in some branches team work supported by quantitative methods may achieve more.

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GÉOGRAPHIE, ESPACE ET ORGANISATION DE L'ESPACE

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Depuis une vingtaine d'années, le mot espace, surtout à travers son qualificatif anglais: *spatial*, occupe le premier rang du vocabulaire géographique. La géographie s'occupe de l'espace terrestre, des propriétés spatiales, la géographie entreprend des analyses spatiales et procède à la recherche de corrélations spatiales. La géographie se présente comme la science de l'organisation et de la différenciation de l'espace.

MILIEUX — PAYSAGES — ESPACE

Cette utilisation en force s'est faite brusquement après un temps assez long durant lequel le mot, utilisé par certains auteurs, n'était pas "reçu", ne connaissait pas un très grand succès. Le mot subissait d'ailleurs le handicap de son emploi à propos des espaces aériens et des espaces planétaires: "conquête de l'espace", "voyageurs de l'espace".

Il est d'autant plus curieux de constater que ce succès récent du mot espace et des expressions qui en dérivent vient de ce qu'il apparaît comme neuf; de fait, espace était fort peu usité, car c'est le mot milieu qui avait la première place dans le langage de la géographie de l'entre-deux guerres. Milieu naturel, milieu géographique, relation des sociétés et des milieux, le milieu, semblait être le concept géographique par excellence, exprimant la combinaison de données naturelles et éventuellement humaines dont les interactions lui conféraient une grande originalité. Cette attitude était normale, la filiation naturaliste, écologique, de la géographie étant évidente lorsque naît la géographie moderne.

Les fondateurs de la géographie européenne, Ratzel, Vidal de la Blache, recourraient bien à des concepts spatiaux: configuration, physionomie, position; mais ceux-ci ont rapidement disparu du langage géographique tant la pression du "naturel" était grande.

Le conflit était inévitable entre une géographie établie sur le paradigme des relations nature–société et le développement de la pensée antidéterministe. Du jour où la recherche d'une relation — fut-elle bilatérale — entre un environnement naturel et les activités humaines était automatiquement considérée comme traduisant une idéologie déterministe, la position de cette géographie devenait intenable. Se dénaturalisant, la géographie s'est en même temps despatialisée. Elle s'est alors divisée en deux grandes tendances; la géographie de la population et des sociétés, la géographie des paysages.

Le fait population a toujours fasciné les géographes, d'abord à travers les analyses de la distribution des hommes sur la terre, de leurs inégales densités. Outre la facilité qu'offrait la disponsibilité des sources statistiques, les possibi-

lités de mesure, de comparaison et d'évolution suivie dans le temps ont renforcé une orientation très démo-géographique. Ce mot a été forgé en fait pour illustrer l'approche spatiale des faits démographiques, leur répartition dans l'espace. Les géographes ont considéré comme tout-à-fait géographique de cartographier les taux démographiques et d'interpréter les cartes ainsi dressées. Ainsi a prospéré dans de nombreux pays une géographie de la population qui a produit des oeuvres marquantes.

La géographie des paysages est apparue au début de ce siècle en Europe Occidentale. Elle a pris véritablement forme avec l'étude des paysages ruraux, se poursuivant par celle des paysages urbains et donnant aux écoles géographiques européennes leurs caractéristiques majeures entre les deux guerres mondiales. La géographie croyait avoir son domaine spécifique avec le concept de paysages, expression visible, enracinée dans le sol, des réalités économiques et sociales.

ESPACE SUPPORT — ESPACE AGENT

Le concept d'espace était loin d'être absent de ces deux grandes tendances de la géographie; mais il s'agissait essentiellement d'un espace support, support cartographique, c'est-à-dire support de la distribution spatiale de phénomènes démographiques, sociologiques ou autres ou de phénomènes paysagers. On expliquait les raisons des distributions décrites mais sans mettre en évidence des causalités spatiales, sans que la représentation cartographique spatiale fasse intervenir des mécanismes, des processus spatiaux.

Si le mot espace a mis longtemps avant d'entrer dans le vocabulaire courant de la géographie, c'est qu'il apparaît beaucoup plus neutre, indéterminé, que les termes de milieu ou de paysage. C'est récemment que les géographes ont parlé d'espace urbain, d'espace rural; auparavant, le mot était utilisé couramment aux deux extrémités de l'échelle, en parlant des vastes espaces du désert ou des grandes plaines et des espaces industriels.

L'espace se définit, par ses propriétés propres, en termes de dimensions, de distances; c'est en fonction de sa proximité ou de son éloignement relatif par rapport à un fait ponctuel, linéaire ou central qu'un fait géographique se situe dans l'espace et acquiert de ce fait un ensemble de qualités, de propriétés, se mesurant en temps, en coûts, en économies ou déséconomies, mais aussi en composition visuelle.

La relation au milieu est relayée par la relation à l'espace. Il est significatif que la diffusion du concept ait été lente, difficile, depuis von Thünen et Lösch en passant par Christaller et Walter Isard.

D'une part, la géographie traditionnelle axée sur le paradigme de la description régionale n'y retrouvait aucun de ses concepts familiers, aucune de ses certitudes monographiques régionales; l'approche théorique, modèlisante, la déroutait.

D'autre part, le contenu même de l'espace ne lui apparaissait pas d'une exceptionnelle richesse. Car faire de la géographie la discipline de l'espace pouvait apparaître séduisant. Mais une réflexion très élémentaire conduisait à s'interroger sur la validité de cette définition et à se demander si elle constituait un progrès par rapport aux définitions antérieures. Certes l'espace du géographe pouvait être opposé au temps de l'historien, l'histoire et la géographie se différenciant ainsi des autres sciences aux finalités tout autres. Mais cet espace réservé au géographe, ou que la géographie se réservait, n'était-il pas la version moderne de la géographie science de synthèse d'il y a peu? Car tous

les phénomènes présents à la surface de la terre ont nécessairement des localisations, une distribution, des différenciations, des relations spatiales. Dès lors que tout est spatialisé, tout est géographique; une certaine géographie allemande, puis nord-américaine a depuis longtemps tenté de restreindre le champ de la géographie, non aux phénomènes mais à leurs propriétés spatiales.

A l'évidence, la géographie ne peut revendiquer l'espace d'autant plus que la notion même d'espace est complexe. Sans parler des problèmes de son essence même (espace objet ou espace idée) la relativité de la saisie de l'espace, de sa perception, de sa lecture a été redécouverte récemment.

La perception de l'espace a introduit le relatif, le subjectif, le psychologique dans la relation des hommes à leurs "cadres de vie". L'espace a été analysé dans ses déformations, ses représentations éloignées de la réalité objective, différentes de l'analyse standarisée, universalisée. L'espace a ainsi reçu d'autres appellations; espace latent, espace manifeste, espace vécu, espace reçu, espace subi, espace banal. Il est d'ailleurs curieux de remarquer le regain d'intérêt des géographes pour l'espace à partir du moment où il était relativisé, subjectivisé. On pourrait même s'étonner de ce que l'étude subjective et perceptionniste de l'espace ait si rapidement suivi la redécouverte du concept de l'espace et son approche objective, sans doute parce que l'espace objectif apparaît "inhumain" sans véritables "relations" sociales.

Les autres sciences humaines et économiques n'ont pas manqué de voir à nouveau dans cette attitude d'annexion de l'espace par la géographie une nouvelle manifestation de son impérialisme — de son exclusivisme, alors que l'espace appartient au psychologue comme à l'économiste et au sociologue. Certains ont d'ailleurs réagi en opposant l'espace banal, c'est-à-dire sans intérêt, du géographe à l'espace spécifique de l'économiste.

ESPACE ORGANISÉ — ESPACE EVALUÉ

Les géographes ont cru laver la géographie de ces soupçons en abandonnant cette conception extensive de l'espace et en donnant pour objet à la géographie l'analyse de l'organisation de l'espace. Depuis quelques années, en titres ou en sous-titres, l'organisation de l'espace est l'expression à la mode, obligatoire pour "faire moderne". Sous ces titres se cachent bien des analyses purement traditionnelles, la touche de modernisme étant seulement fournie par l'analyse des réseaux urbains. A l'autre extrémité de la gamme prennent place les études théoriques, les modèles, les techniques quantitatives appliquées aux faits de l'organisation de l'espace. Ces études sont finalement répétitives, il n'est que de voir à quel point ce sont les mêmes articles, les mêmes figures qui apparaissent dans les volumes de *Readings*, dans les manuels généraux. Entre deux, persiste la crise de la géographie régionale incapable de se renover alors que l'organisation de l'espace aurait du être l'outil conceptuel permettant son *aggiornamento*.

Il nous paraît très révélateur que les études essayant très simplement de confirmer ou d'infirmer les théories de Christaller par des analyses régionales soient si peu nombreuses. Au mieux, l'organisation de l'espace introduit dans l'analyse régionale un certain nombre d'idées; pôles, hiérarchies, réseaux, flux, qui permettent un meilleur ordonnancement des données, qui introduisent une certaine logique dans l'exposé des faits. Mais ces instruments conceptuels s'avèrent tourner court rapidement. L'étude de l'organisation de l'espace dans une certaine région conduit (ou devrait conduire) à en évaluer les effets, à en apprécier l'efficacité. Or les recherches sur ce terrain sont très peu nombreuses, les résultats

acquis discutables. Il faudrait d'abord définir les points d'application de ces évaluations, l'ambiguïté devenant la même que pour l'évaluation du paysage.

L'évaluation peut être économique, sociale, écologique, esthétique mais mesurée par rapport à quelles moyennes, à quels standards? Cela n'empêche pas bien des auteurs d'employer un vocabulaire qualitatif bien difficile à justifier: organisation cohérente, harmonieuse, proportionnée, efficace...

Les analyses quantitatives demeurent trop souvent statiques, non évolutives. Elles ne permettent pas de définir des tendances et d'en apprécier les résultats. D'autre part elles révèlent des relations statistiques, des régularités dans les rapports de tailles, de fonctions qui ne préjugent pas de leurs valeurs et *à fortiori* de leurs ajustements dynamiques aux structures des sociétés et des ensembles territoriaux contemporains, en raison de l'ampleur de l'inertie des faits spatiaux. Car toute organisation spatiale est, par essence, déphasée, en retard sur l'actualité démographique, sociale, économique.

ESPACE ORGANISÉ ET PAYSAGES

L'analyse de l'espace en terme d'organisation a eu un autre effet. Elle a certes attiré l'attention de façon très positive sur ce qui était l'ensemble des systèmes de relations, assurant le fonctionnement (bon ou mauvais) de l'espace en réponse aux besoins des collectivités qui l'habitent. Mais en contrepartie, les muscles, la chair, les carnations de l'épiderme qui enveloppent ces systèmes nerveux et sanguins ont été négligés. En langage de géographe ce sont les paysages, les aspects visibles de la surface terrestre qui sont retombés dans l'oubli.

Entre les branches des réseaux, en dehors des axes structurants le reste de l'espace devient résiduel, hors réseau, donc inintéressant. Cet effacement d'une partie de la réalité géographique est également la conséquence d'un changement dans les échelles d'analyse. Afin d'embrasser la totalité d'un réseau, les analystes sont passés de la grande échelle aux petites et moyennes échelles.

Il ne faut pas sous-estimer les inconvénients de ce "dessèchement" de la réalité jusqu'alors objet de la géographie. Car les réseaux n'ont pas de raison d'exister, de fonctionner sans cette réalité faite de champs, de vignobles, d'usines, de résidences.

Cette opposition, cette dualité d'éclairages aboutit à renforcer l'idée de deux géographies, celle des paysages et celle de l'organisation de l'espace. Et cette partition introduit alors la notion très discutable, que le concept d'organisation de l'espace ne s'applique qu'à une partie du territoire et à une certaine échelle de son analyse. Il est plus exact de considérer que tout espace est organisé mais à des échelles différentes et, avec des effets intégrateurs très inégaux.

Le siège d'une exploitation agricole, petite ferme ou grande plantation organise l'espace autour de lui:

— en premier lieu, dans la distribution des parcelles qui constituent l'exploitation; ces parcelles rentrent dans une politique de location ou d'acquisition des terres. Elles sont situées par rapport au siège en fonction de la perception par l'exploitant des avantages de leurs positions, avantages définis en terme de proximité, de voisinage, mais aussi en termes de qualités de la topographie et des microclimats;

— en second lieu, dans la répartition des types d'utilisation agricole des parcelles;

— en troisième lieu, par les flux et les trafics engendrés à partir du siège d'exploitation entre celui-ci et les parcelles, entre celui-ci et le monde extérieur, c'est-à-dire le village, le bourg, la ville, la coopérative...

La même analyse pourrait être conduite à propos d'une mine, d'une usine, d'un campus universitaire... C'est aux niveaux supérieurs à ce niveau élémentaire des unités économiques ou de peuplement de base qu'apparaissent les noeuds d'une organisation de l'espace.

ESPACE DIVISÉ — ESPACE DIFFERENCIÉ — ESPACE ORGANISÉ

En réalité, l'expression apparemment si évidente "organisation de l'espace", si rapidement acceptée et adoptée, doit être analysée, définie, être à la fois objet de réflexions théoriques et d'analyses empiriques.

Le mot organisation est souvent confondu avec différenciation, structuration, division... Depuis des décennies la géographie décrit, cartographie, mesure des ensembles élémentaires homogènes qui correspondent à une différenciation territoriale: types d'utilisation du sol, types d'exploitation, types de quartiers résidentiels. Cette différenciation est la résultante des processus d'organisation plus ou moins agissants et s'exerçant à des échelles variées. Mais ces processus se traduisent très inégalement, avec une extrême discrétion ou au contraire une force considérable dans la différenciation de l'espace. Et les utilisations du sol sont loin de s'ordonner en cercles concentriques — plus ou moins retouchés par les influences radiales, autour des nouveaux centres de polarisation.

L'existence de structures du type parcellaire traduit une action organisatrice qui n'est pas de même nature que celle des réseaux. Ces structures correspondent au second groupe des organisations spatiales, celles qui divisient l'espace: 1 — divisions territoriales de type administratif dont on ne saurait méconnaître le puissant effet d'organisation; 2 — divisions territoriales du type foncier qui créent la trame parcellaire de base et localisent les agents géographiques.

Au total, trois composantes de l'espace du géographe apparaissent à la fois distinctes et interdépendantes:

1 — L'organisation spatiale qui s'exprime à travers des centres et des réseaux de relations;

2 — La division spatiale qui s'exprime en termes de trames parcellaires, foncières, administratives et politiques;

3 — La différenciation territoriale, qui exprime inégalement les résultats des effets de l'organisation spatiale sur la division spatiale.

Toutes les combinaisons, toutes les gradations sont possibles entre les trois composantes, suivant leur synchronisme, leur monogénisme ou au contraire les mosaïques d'héritages multiples et les polygénismes. C'est un immense domaine d'analyses théoriques, empiriques et pratiques qui s'offre à la géographie.

LE NORD DE LA MOLDAVIE, PRINCIPALE RÉGION TOURISTIQUE DE LA ROUMANIE

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Dans la société contemporaine, le tourisme tient un rôle social important, car tourisme signifie santé, connaissance et rapprochement entre les hommes. Le tourisme exerce également une fonction économique non négligeable, par le relèvement du niveau de vie de la population des régions où il est pratiqué. Le tourisme moderne, sur le plan national et international, est un facteur essentiel de développement et de progrès. La vie dans les agglomérations urbaines d'un grand nombre de travailleurs, par les conditions de leur activité loin de la nature et en continuelle sédentarité, a fait naître la nécessité de voir de nouveaux paysages, de jouir de beaucoup de belles choses, en compensant l'espace limité habitation–usine par l'espace infini de la libre nature.

La pratique du tourisme par des masses de tous âges et de toutes professions est devenue de nos jours une véritable nécessité, un vrai phénomène social qui embrasse le monde entier. Le tourisme est pratiqué sous diverses formes, allant du caractère sédentaire au caractère itinérant, en automobile ou à pied; il se pratique à des fins diverses: loisir, sport ou cure. Le flux touristique s'oriente vers des régions d'attraction possédant des monuments de la nature ou des monuments d'architecture ou d'art, des monuments historiques, ou bien vers des contrées d'intérêt ethnographique et folklorique. Ce sont d'ordinaire des régions à potentiel touristique élevé.

Dans cette catégorie rentre aussi, du fait de la richesse et de la variété de ses objets d'intérêt touristique, la région de Suceava du Nord-Est de la Roumanie. A la différence d'autres régions touristiques importantes du pays, comme, par exemple, le littoral de la mer Noire, où l'on pratique un tourisme de haute intensité, mais à caractère saisonnier limité à quelques mois, à Suceava le tourisme peut être pratiqué avec la même facilité à longueur d'année. Le tourisme a plutôt, sur le littoral, un caractère de récréation et de cure; celui de Suceava est plus complexe, il embrasse toute la gamme du tourisme, depuis le repos et la cure jusqu'au tourisme sportif, automobile, les tours en montagne, tant en été qu'en hiver, auxquels se joint un intérêt artistique et ethnographique de tout premier ordre.

Située dans la partie Nord des Carpates orientales, à leur contact avec le Plateau moldave et au croisement du méridien 25°E avec le parallèle 47°30'N, la région de Suceava présente un relief très varié, qui descend en degrés d'une hauteur de plus de 2000 m dans le massif éruptif du Căliman jusqu'à 300–400 m d'altitude dans les collines à profil aplati et dans la basse plaine du Siret. Possédant des ressources naturelles importantes, de vastes forêts de conifères, où se font remarquer les plus beaux bois d'épicéa de Roumanie, divers gisements de minerais, dont le principal est le manganèse, la région de Suceava fut le

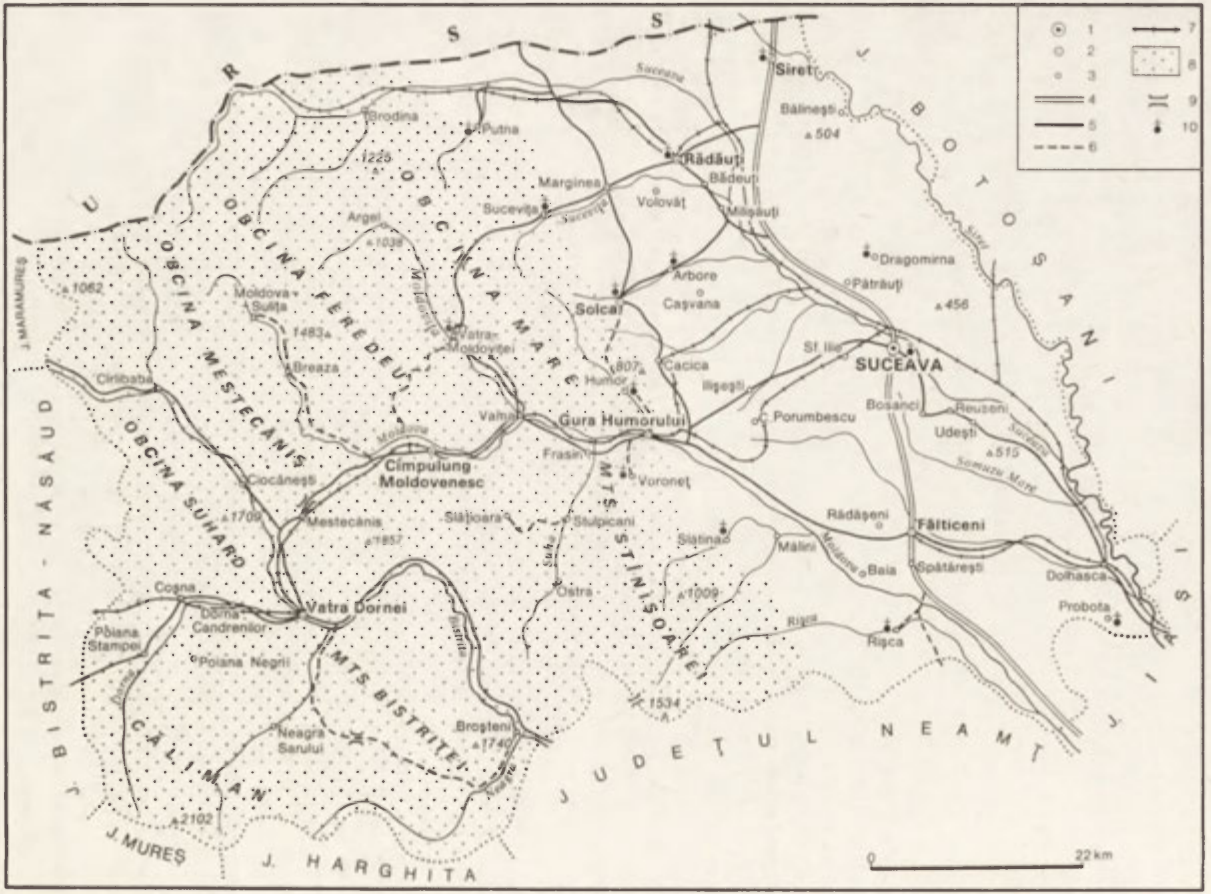

Fig. 1. Carte touristique du Nord de la Moldavie (dép. Suceava)

1 — Chef-lieu de département; *2* — ville; *3* — village; *4* — route internationale; *5* — route modernisée; *6* — autre route touristique; *7* — voie ferrée; *8* — zone montagneuse; *9* — col; *10* — monument d'art féodal

berceau de l'Etat féodal moldave. Pays de vieille tradition touristique, la Moldavie septentrionale offre de remarquables monuments de la nature, une richesse sans égale en pièces ethnographiques et folkloriques inaltérées et de nombreux monuments historiques et artistiques de prestige international. Tout cela non seulement explique le développement du tourisme et des équipements et aménagements touristiques, en premier lieu des voies d'accès modernisées qui atteignent tous les objectifs touristiques d'importance, des établissements d'hébergement: hôtels, motels, campings, auberges touristiques, villages de vacances, distribués géographiquement aux points d'intérêt du département, mais a entraîné aussi, par voie de conséquence, l'élévation du bien-être de la population et le développement différencié de la vie économique de la contrée. Les conditions naturelles du département, mises en valeur par sa population très travailleuse, ont fait du "Pays d'en haut" (Tara de Sus) de la Moldavie, l'une des régions de Roumanie à standard de vie très élevé.

Le répertoire touristique de Suceava comprend un grand nombre d'objectifs qu'on peut classer, suivant leur caractère, en plusieurs catégories, ou bien grouper par centres:

1. *Monuments de la nature.* La grande étendue d'espace montagneux qui couvre presque deux tiers de la superficie du département (plus de 5000 km²) offre une vaste gamme de beaux paysages et de raretés de flore et de faune. Un centre touristique important, dont l'intérêt principal réside dans la *nature,* est la ville d'eaux Vatra Dornei, station balnéaire et climatique, de cure et de repos, point de tourisme alpin (800 m d'altitude), situé au milieu de la dépression intramontagneuse "Le Pays des Dorne" (Tara Dornelor). Les eaux carbogazeuses qui jaillissent de l'auréole de mofettes du volcan Căliman, l'air ozoné des forêts de résineux et le réseau de routes touristiques modernisées qui s'y concentrent font de Vatra Dornei un remarquable point de tourisme complexe, routier et de séjour, satisfaisant tous les âges et tous les goûts et offrant aussi des possibilités d'agréables trajets en montagne, de pêche sportive et de sports d'hiver.

A partir de Vatra Dornei on peut atteindre diverses réserves botaniques ou zoologiques qui abritent de nombreuses espèces protégées par la loi comme monuments de la nature. Sont à mentionner comme survivances glaciaires les arbustes *Betula nana* (bouleau nain) et *Arctostaphylos uva ursi* (raisin de l'ours) ou la mousse arctique *Sphagnum wulfianum* et la réserve scientifique Tinovu Mare de Poiana Stampei, où se trouvent les plus importantes tourbières de Roumanie, fournissant de la tourbe à valeur thérapeutique. Il y a encore les plantes alpines rares, telles que *Allium sibiricum, Gentiana Clussi* (croisette), *Leontopodium alpinum* (edelweiss), *Arnica montana* (plante médicinale). On y rencontre aussi *Petrosia levitomentosa,* plante rare qui ne se trouve nulle part ailleurs en Europe. Présentent un attrait particulier aussi la magnifique orchidée *Cypripedium calceolus* (sabot de Vénus) et une tulipe hydrophile *Fritillaria meleagris* (tulipe bigarrée).

Le plus intéressant oiseau protégé, qui est de plus en plus rare, ne vit que dans la zone des pâturages alpins; c'est *Lyrurus tetrix* (coq du bouleau).

D'un pittoresque particulier, offrant de belles vues, sont les réserves scientifiques rehaussées de curieux monuments de la nature, tels les rochers "Les 12 apôtres" du Căliman, ou les "Pietrele Doamnei" (Pierres de la princesse) du mont Rarău, ainsi que le paysage glaciaire de la réserve Lala-Bila des monts Rodna.

La faune cynégétique de forêt, abondante et variée, attire de nombreux chasseurs du pays et de l'étranger. Elle comprend des espèces de prix, rencon-

trées toujours plus rarement dans le reste de l'Europe, tels l'ours des Carpates (*Ursus arctos*) ou le cerf des Carpates (*Cervus elaphus*).

A mentionner aussi la réserve de la "forêt séculaire de Slătioara" et la réserve botanique pour fleurs des "prés séculaires Ponoare".

Mais ce ne sont pas seulement les amoureux de la nature qui peuvent trouver leur compte en parcourant la région de Suceava, mais aussi ceux qui s'intéressent à l'art, au folklore ou à l'histoire.

2. *Monuments historiques et sociaux.* Suceava peut se vanter de tenir en Roumanie la première place quant à la richesse en monuments et souvenirs historiques du Moyen Age. La personnalité la plus éclatante, dont le prestige rejaillit non seulement sur "le pays d'en haut" (la Bucovine) et la Moldavie entière, mais encore sur l'histoire nationale dans son ensemble, est le voïvode Etienne le Grand (1457–1504), à ses côtés son digne fils et successeur Petru Rares (1527–1546). Monuments et souvenirs historiques de Suceava attestent encore leur gloire passée.

Les plus importants événements de l'histoire de l'Etat féodal moldave aux XIV–XVII siècles se sont déroulés sur le territoire de Suceava. C'est ici qu'ont été situées les capitales successives, c'est ici qu'ont été élevés d'admirables monuments d'art féodal. A eux se joignent les foyers folkloriques et d'art populaire, des musées et maisons de souvenir et l'expression de prestige de cette richesse inestimable est le chef-lieu départemental lui-même, la ville de *Suceava* (48 000 hab.; 75 000 hab. avec la banlieue).

Dans le département ont été inventoriés 24 monuments d'architecture, de vrais bijoux d'art, parmi lesquels sont à mentionner plus particulièrement: l'église Saint Nicolas (Bogdana) de la ville de *Radauţi*, la plus ancienne construction en style roman conservée en Moldavie, édifiée par le fondateur de l'Etat féodal moldave, le voïvode Bogdan, peu après 1350; ensuite l'église de la Sainte Trinité de *Siret*, datée de 1356, le plus ancien monument d'architecture de Moldavie présentant des influences byzantines, caractéristiques pour le XIII[e] siècle, prototype du style trilobé qui se rencontre encore dans une province très éloignée, l'Olténie, située dans le Sud-Ouest de la Roumanie, d'où ce style semble aussi être venu en Moldavie; le monastère de *Putna* (1466), fondé par Etienne le Grand, qui garde son tombeau en marbre, et le plus riche musée d'histoire et d'art religieux (orfèvrerie, broderie en fil d'or, manuscrits enluminés); puis *Probota* (1530), la plus importante nécropole princière de Moldavie, édifiée par Petru Rares qui y est enseveli. Près de Suceava, le monastère de *Dragomirna* (1609), dont la tour de l'église (la plus haute de Moldavie) est une vraie dentelle de sculpture en pierre, et la sveltesse, un miracle de proportions harmonieuses, a été construit par le métropolite Atanasie Crimca, grand artiste enlumineur, dont les manuscrits peuvent être admirés dans le musée.

Mais les plus précieux monuments d'architecture médiévale, uniques en Roumanie et fameux dans le monde entier, portés dans l'état de l'UNESCO pour leur importance universelle, sont les cinq églises en style gothique moldave des monastères: *Voronet* (1488), fondation d'Etienne le Grand; *Arbore* (1503), de son fidèle ministre et châtelain de Suceava — Luca Arbore; *Humor* (1530), du grand chancelier Teodor Bubuiog, fidèle collaborateur de Petru Rares; *Moldovi.a* (1532), de Petru Rares et *Sucevita* (1584), du métropolite Gheorghe Movilă, monastère agrandi et fortifié ultérieurement par ses frères, les princes Ieremia et Simion Movilă. Toutes ces églises en pierre et briques, tout comme les autres mentionnées avant, ont été élevées sur l'emplacement d'autres églises en bois. Il y eu jadis beaucoup d'églises peintes à cette époque (XVI[e] siècle), mais ce n'est que ces cinq dernières qui ont conservé jusqu'à présent leurs

fresques extérieures. L'idée de décorer de fresques les murs extérieurs appartient au métropolite Grigore Rosca, cousin de Petru Rares. Il n'est donc pas étonnant que la première église peinte aussi à l'extérieur (en 1530) ait été la fondation même de Rares, Probota; mais ici — par malheur — les fresques se sont effacées. En revanche elles se sont admirablement conservées dans les cinq églises mentionnées. Sucevita a été la dernière église peinte aussi à l'extérieur; avec elle prend fin, en 1597 la tradition, établie par Rares, des fresques extérieures, qui a fait époque, notamment au temps de la formation et de l'apogée du style gothique moldave. Ces fresques, "d'une mirifique exubérance chromatique", sont comparées, comme valeur artistique, aux peintures murales de l'église San Marco de Venise. Des cinq monuments d'art féodal qui appartiennent à la période de la rennaissance roumaine, celui de Voronet est le plus précieux par ses peintures monumentales et leur effet décoratif. Les historiens de l'art (Petru Comarnescu) placent Voronet au-dessus des églises du Mont Athos et de Pise.

En Roumanie, on n'a pas construit au Moyen Age tant de châteaux et de forteresses comme dans l'Europe centrale. En Moldavie particulièrement, ce sont les monastères qui ont pris le rôle de centres fortifiés et de lieu de refuge pendant les temps difficiles, car ils étaient munis de murailles puissantes, pourvues de donjons et de tours de défense. Les monastères ont été également des centres de culture où furent installées les premières imprimeries. L'un de ces centres de culture a été Voroneţ, où l'on a découvert deux manuscrits à rhotacisme, textes parmi les plus vieux écrits en roumain (XVI[e] siècle), notamment le "codice voronetean" (manuscrit de Voronet). C'est ici encore qu'au temps de Grigore Rosca a fonctionné une école de peintures moldaves. Le métropolite était tellement attaché à Voronet, qu'il l'a choisi pour sa sépulture.

L'oeuvre des artistes (anonymes) moldaves est comparée comme valeur aux oeuvres de Giotto, Léonard de Vinci ou Michelange. C'est pourquoi George Vâlsan s'est senti autorisé, en se référant à ces trésors d'art, de noter: "Seul un peuple de pâtres montagnards d'une contrée enveloppée de brouillard, comme celle des montagnes de la Bucovine, a pu concevoir une telle merveille artistique (il pense en premier lieu à Voroneţ), estimée aujourd'hui comme une des créations artistiques populaires les plus remarquables d'Europe". "Une beauté pure, froide et néanmoins souriante, qui vous fait comprendre d'où ont pu sortir les surprenantes peintures des murs extérieurs des vieilles églises de Bucovine, où, sur le fond blanc dominent le vert et un bleu divin comme celui de Fra Angelico".

La composition des couleurs — le rouge de Humor, le jaune de Moldavita, le bleu de Voronet, le vert de Sucevita, qui sont les couleurs de fond des fresques — reste encore inconnue. Le bleu de Voronet est entré dans la peinture universelle comme une nuance spécifique de bleu.

La fraîcheur des couleurs est demeuré inalterée, bien que plus de 400 ans se soient écoulés depuis l'exécution des fresques, qui dans leur majorité ont été peintes au cours de seulement 10 ans, entre 1537 et 1547.

3. *Suceava*. Le chef-lieu du département tient une place importante dans la galerie des monuments historiques et d'art féodal de la Moldavie du Nord et se range avec un éclat particulier en tête de la série des anciennes capitales moldaves: Baia, Rădăuti, Siret.

Baia, première résidence princière au début du XIV[e] siècle conserve les ruines de la plus grande cathédrale gothique de Moldavie, élevée en 1415 par Alexandre le Bon en mémoire de son épouse, la catholique Marguerite.

Radauti avait été en 1359 la résidence du fondateur de l'Etat féodal moldave, le prince Bogdan, qui y a son tombeau dans l'église qui porte son nom.

Siret est l'endroit où Marguerite-Musata, la protectrice des missionnaires dominicains, avait élevé en 1371 l'église romano-catholique St. Jean, et où elle est ensevelie.

Le fils de Musata, Petru Musat, le fondateur de la plus brillante dynastie princière de la Moldavie, laquelle pendant trois siècles à veillé aux destinées du pays, a fait construire en 1388 la "citadelle des Musat", château-fort résidentiel et vraie acropole de Suceava, devenue capitale de la Principauté et restée telle jusque vers la fin du XVI^{e} siècle. Etape importante sur la vieille route commerciale des marchands de Lvov vers les comptoirs de la Mer Noire et Constantinople, la ville de Suceava offre à l'admiration de vieux monuments architecturaux de grand intérêt: l'église de sacre, Mirăuti, fondation de Petru Musat, ancienne cathédrale métropolitaine aux XIV–XV^{e} siècles; puis la nouvelle cathédrale des XVI–XVIII^{e} siècles, St. Jean le Nouveau, dont la construction fut commencée en 1514 par Bogdan, fils d'Etienne le Grand; enfin l'église St. Démètre, de grandes proportions, fondée par Petru Rares en 1535, et bien d'autres monuments religieux. A retenir l'auberge princière, une des plus anciennes constructions laïques de Moldavie (XVI^{e} siècle) conservée jusqu'à présent, où est abrité le musée d'art populaire. Suceava, ville blanche, où l'ancien et le moderne s'allient harmonieusement, comprend pas mal d'édifices nouveaux, dont deux remarquables: la maison de culture des syndicats et l'institut pédagogique universitaire. Elle possède deux hôtels de grand confort (Arcasul, Bucovina) et c'est le point de départ, rien que sur des routes modernisées, vers tous les points d'intérêt touristique de la haute Moldavie.

4. *Foyers de folklore et d'art populaire, musées, maisons de souvenir.* Les foyers folkloriques et ethnographiques abondent dans le département de Suceava, en des formes multiples et originales, depuis les chansons et les danses populaires, les costumes nationaux traditionnels, jusqu'aux types de maison et de dépendances, aux ustensiles et arts ménagers, aux coutumes et usages immémoriaux, tout cela constituant une attraction touristique inédite.

L'art populaire se fait remarquer surtout à *Arbore*, renommé par ses tissus et broderies; à *Cîmpulung* pour vestes et manteaux en fourrure brodés et instruments à vent en bois; au village touristique *Ciocanesti*, sur la Bistrita dorée, avec ses maisons les plus joliment ornées; à *Marginea*, près de Rădăuți, unique dans le pays pour la céramique noire produite dans ses ateliers par des artisans potiers paysans.

La région de Suceava est avantagée d'un réseau de musées à riches collections d'objets d'un prix inestimable. Outre les musées d'art religieux de *Dragomirna* (particulièrement des manuscrits enluminés), de *Putna* (vrai trésor d'objets de culte et broderies anciennes), de *Moldovita*, *Sucevița* et *Probota*, dont les recueils illustrent l'art médiéval moldave, il y a les musées à caractère ethnographique, les uns spécialisés, tels ceux de *Radauti*, de *Gura Humorului*, avec ses collections de milliers d'oeufs ornés de modèles colorés géométriques et végétaux (usage qui ne se rencontre en Roumanie que dans cette contrée). *Cîmpulung*, avec son musée d'art national du bois; ensuite le muséum d'histoire naturelle de *Vatra Dornei* et le musée de la chasse de *Falticeni*.

La haute Moldavie a été la terre natale de nombreux hommes de culture et d'art, parmi lesquels il faut mentionner *Simion Florea Marian* (1847–1907), le premier folkloriste roumain (aussi était-il tout naturel qu'un folkloriste n'apparût que dans un pays au folklore roumain le plus authentique et conservé comme tel), *Ciprian Porumbescu* (1853–1883), le créateur de l'opérette roumaine, l'acteur *Matei Millo* (1814–1896), promoteur de l'art scénique roumain, le poète progressiste de grand talent et de grandes promesses *Nicolae Labis* (1935–1956).

La ville où ont séjourné une certaine période où toute leur vie d'illustres écrivains a été *Fălticeni*, où l'on peut visiter les maisons habitées naguère par le grand narrateur *Ion Creanga* (1837–1889), le nouvelliste *Nicu Gane* (1839–1916), le fameux romancier *Mihail Sadoveanu* (1880–1961) et d'autres représentants des lettres roumaines. On y peut visiter aussi le musée des "personnalités éminentes".

Dignes d'intérêt sont la maison de souvenir et le parc dendrologique du village natal du musicien et compositeur Ciprian Porumbescu, Stupca.

5. *Voies d'accès.* La région de Suceava est traversée par trois axes routiers et deux lignes majeures de chemin de fer. Ce sont: la route internationale E 20 Salonique–Sofia–Bucarest–Lvov–Varsovie, par Suceava; puis la route touristique Suceava–Cluj Napoca qui traverse les Carpates par leur partie de la plus grande largeur, de Gura-Humorului, par Cîmpulung, Vatra Dornei et Bistrița Năsăud, dont une distance de 192 km rien qu'en montagne, en suivant exactement l'axe de la zone de plus grande intensité touristique. Enfin la route touristique de montagne le long de la rivière Bistrița, qui relie le Maramures à la Moldavie par le col le plus élevé des Carpates, Prislop, à 1415 m; cette route suit la vallée de la Bistrița, qui se fcurvoie entre des pics escarpés par des gorges, depuis la source jusqu'à Piatra Neamt, sur une distance de 222 km. C'est une des plus pittoresques vallées des Carpates roumaines. Les trois axes sont reliés entre eux par tout un réseau de routes modernisées qui rejoignent les principaux objectifs touristiques.

Les deux voies ferrées majeures parcourent la région en se croisant à Suceava. L'une d'elles est la grande voie du Siret, Bucarest–frontière (URSS), se continuant vers Varsovie et Cracovie, l'autre est la grande voie transcarpatique du Nord, Iassy–Cluj Napoca–Cradea. Un aéroport international à Salcea (près de la ville de Suceava) complète les voies d'accès vers et à partir de la zone touristique de Suceava.

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Il y a une étroite interdépendance entre la dotation touristique d'une région et son élévation à tous les points de vue. L'afflux touristique concourt au progrès économique, social et culturel de la région et, inversement, le développement économique, social et culturel d'une contrée, donc aussi sa capacité d'hébergement touristique, fait s'accroiître l'affluence des touristes. Le point de départ doit être cependant le potentiel touristique initial, c'est-à-dire l'attrait touristique spontané: beautés naturelles, monuments d'intérêt artistique et historique, musées à collections de valeur, richesses ethnographiques et folkloriques (costumes populaires, musique et danse authentique, habitations traditionnelles etc.). Une fois ce fonds donné, le processus d'influence réciproque se déclenche: du développement vers le tourisme et de celui-ci vers le développement.

Sous cet angle, l'aire touristique de Suceava se caractérise comme une région à standard de vie des plus élevés de Roumanie, jouissant d'un essor économique spectaculaire. L'alliance harmonieuse entre la beauté du paysage, la splendeur du passé, illustré par des souvenirs historiques, et des monuments artistiques inégalés, et les réalisations prestigieuses du présent, surtout du domaine industriel, économique, de l'urbanisme et de la civilisation, confèrent à Suceava un attrait touristique tout particulier. Ici se confirme une fois de plus la dualité inséparable: le tourisme facteur social et éducatif et le tourisme, branche industrielle.

A Suceava le tourisme peut être pratiqué tout au long de l'année. Les touristes sont aussi bien gens du pays qu'étrangers. Le Nord de la Moldavie est compris dans les circuits intérieurs et internationaux, car la région de Suceava à côté du littoral de la Mer Noire et de la Vallée de la Prahova–Brasov est l'une des trois principales zones touristiques de la Roumanie.

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THE SENSIBILITY TO DROUGHT IN COUNTRIES OF ARID CLIMATE

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The agricultural utilization of the world is still to a high degree dependent upon the climate and will also continue to be so without any doubt. In the countries with an arid or semiarid climate, precipitation primarily determines the potential and the productivity of agriculture (concerning the natural conditions of climate, vegetation and land use — see Planhol and Rognon 1970). In arid climates, the amount of precipitation shows a particularly high variability from year to year. Wet years produce prosperous natural vegetation, grazing stocks and cultivated plants and result in yields which can be brought to the market, far beyond the demand of domestic consumption. Dry years bring droughts with them which may involve crop failures, losses of domestic animals and famines for the people. Normally there is a direct relation between the amount and distribution of precipitation and agricultural production.

Now a look at the map shows that the arid belts of the earth, with some exceptions in the Southwestern USA, Western Asia within the Soviet Union, South Africa and Australia, are occupied by developing countries of the so-called Third and Fourth World. These are to an especially high degree dependent on their agricultural production, the more so if they are not provided with mineral resources or with an efficient industry. In this case they need the production of their agriculture not only for the nutrition of their own population which would otherwise be left to expensive imports or to humanitarian assistance actions, but their agriculture has to meet also the costs of he governmental activity and the administrational apparatus, and of all investments for developments in handicraft or industry. The agricultural taxes are the most important revenues of the states. Such countries are extremely sensible to droughts and crop failures. Certainly catastrophic situations in the arid countries of the world are evident far into the past. But apparently the sensibility to drought has increased very much in recent times. It is the responsibility of geographers to ask for the reasons for this situation affecting more and more developing countries and leading them into an ever increasing dependence on the world market and on the surplus countries in cereals and in animal products which remarkably are situated mostly in the highly industrialized parts of the Western world.

Among the natural hazards with which the IGU Commission on Man and Environment is dealing (White 1974), drought is also specified. In this context, a number of studies is concerned with problems of drought, the majority of them in developing countries of Africa. But there are questions of adjustment and perception and of social and technological behavior of populations placed

in the foreground, to which geography as we understand it has to contribute only relatively few of its own reflections (see also Rathjens 1973). It seems to be remarkable also that in contrast to other natural hazards like cyclones, floods and earthquakes, no global summary for drought could be prepared up to now.

About the dimensions of the variability of precipitations and about the probability of wet and dry years in the countries of the arid belts, there is only very little to say at the moment, because the existing series of meteorological observations are still too short in many cases and do not register the extreme dates possible in certain climates. Often also climatology has attached more importance to the report of the mean annual precipitations than of the weather conditions of extreme years, though these are in most cases much more informative for the ecological understanding of arid regions. In the regions of winter rain reaching from Morocco to Afghanistan through the whole Orient, the continuous period of precipitations has more evidence than the amount of precipitation during the calendar year. Moreover, Mensching (1971) has, with good reasons, drawn attention to the point that in many arid climates one should not refer simply to a season of rains but to a time or season of possible rainfalls which should be defined by the number of days with rain or better by the number of profitable rainfalls (Mensching 1974), especially if the soils are not humidified thoroughly by each rain. Subsequently there are to be mentioned only some characteristic examples from the arid regions of Northern Africa and Southwestern Asia with which the author is relatively well acquainted.

In his regional geography of Tunisia, Mensching (1968) in a methodically impressive way has contrasted precipitation maps for the dry year 1960/1961 and the wet year 1958/1959. The same was done by Stuckmann (1968) in a more detailed way for the basin of the Medjerda in Northern Tunisia. Mensching and some of his staff members (1970, 1971) — after detailed studies in the Western Sudan, in the Sahel and in the Southern Sahara — were able to report reliably about the drought disaster and its consequences affecting the area between Mauretania and Ethiopia in the years 1968 to 1973 and proceeding apparently from West to East (on this subject see Mensching 1974, Schiffers 1974). In Syria Zimpel (1969) in an investigation of the precipitation variability and the insecurity of agricultural production has compared the dry year 1960 with the wet year 1963 and has noted the frequency of dry years. Wirth (1971) in his regional geography of Syria considers especially the four successive dry years 1957/1958 till 1960/1961. Finally, Afghanistan (Rathjens 1975) was touched by a drought period in the years 1970 and 1971 causing crop failures and famines in several parts of the country. Then there followed the year 1972 being very wet like in Iraq, Syria and Libya and causing even a record harvest in 1973. The same year 1972, it is true, was too dry in all Southern and Southeastern Asia.

From this and other material which cannot be enumerated here, conclusions may be derived about the sensibility to drought in the concerned countries. In question are mostly countries which cannot compensate the deficit in the production of food by the export of mineral oil or of other highgrade industrial raw materials, which come into great economic difficulties and in years of drought are dependent on foreign assistance. Relatively less dependent on a deficit of precipitations are countries where the agriculture is based predominantly upon irrigation with river water and which get their water from another climatic region, like Egypt, or from more humid high mountain regions, like the irrigation oases in Morocco and Algeria, in the Lebanon, along Euphrates and Tigris, in the Iranian highland, on both sides of the Hindukush or in the

Punjab. In such regions under certain circumstances, floods mean a greater danger for man and his economy than droughts. Agriculture on rainfall, on the other hand, works under marginal conditions and is heavily affected by droughts, often up to a total failure of crops. In this connection we may fix the boundary of agriculture on rainfall in subtropical regions of winter rain with about 300 mm (200–350 mm), in regions of tropical summer rain with at least 500 mm per year. Also the water supply out of the groundwater is heavily affected during droughts, partly concerning regions of irrigation by wells (Cyrenaica, Jordan, Northwestern and Central India), partly of irrigation by *karez* or *foggara* (Iran, Southern Afghanistan, Northwestern Africa). The livestock economy in the arid regions is influenced not only by the production of feeding-grasses but also by the supply of drinking-water in periodic or episodic rivers, wells or storage lakes (tanks) filled only during the time of rains. Cattle breeding is, therefore, often nomadic or semi-nomadic till today and in periods of drought characterized by especially large migrations (Sahel, Northern Arabia, desert of Thar in Northwestern India). When we ask for the reasons why these countries have begun to react to periods of drought more and more sensibly, the following answers might be offered.

1. The population in the developing countries of the arid belts mentioned above is growing rapidly. Increases of more than 2% per year are standard, in some countries the increase amounts even to more than 2.5% per year. That means a duplication in one generation. The absolute production of foodstuff can barely keep pace with this increase of population, in some countries it is not able to do so any more, so that the per-capita-production of food has already decreased in the last years, as in parts of Latin America and of Southern and Southeastern Asia. Dry years with crop failures which could be surmounted in former times by accumulation of reserves, now are a specific danger.

2. The strong increases of population do not occur uniformly, but are concentrated on the towns, especially the big cities which have a disproportionately much quicker increase, sometimes with 5% per year and more. From the countryside where there is not enough work offered any more, an emigration occurs into the towns offering only more social welfare instead of occupations. So the portion of people productively active in agriculture becomes smaller and smaller. Countries like Afghanistan where 80–85% of the population are estimated to be occupied in agricultural activities, have been exceptions for a rather long time. Moreover the population of towns generally makes increasing demands on its standard of living.

3. The cultivated areas can be enlarged in an arid climate only very insignificantly, because the supplies of water are already used to a maximum in most cases. Large new irrigation projects with the construction of dams across rivers require mostly high costs of investment which can normally be met only with great difficulties and with the help from foreign countries. Beyond that, irrigation by water canals often results in salinization of soils made sterile thus for further cultivation, as in the Punjab of Pakistan. Agriculture based on rainfall is not extensible any more, its boundaries, on the contrary, should be withdrawn in favour of cattle breeding and of a better ecological balance, the more so as the shifting cultivation on rainfall apart from overstocking is to be blamed for the destruction of the natural vegetation and for the extension of desert conditions. In parts of the Sahel and in the Indian Thar one speaks with good reasons about a "man-made desert".

4. These phenomena are in the same way traceable also to the excessively raised livestock damaging the vegetation often vigorously for many years or

even irreversibly. Because of the bad state of livestock, the provision of men with animal proteins is mostly defective. Here in recent times, several factors have collaborated: the increase of population considering the number of cattle more as a matter of social prestige than of economic profit; the technical development of water holes and wells and the better protection by veterinarian medicine against epidemic diseases decimating the herds of cattle now and then in former times; the improved marketing for animal products (wool, hides) by the development of transportation. The droughts of the last years, in the Thar for example in 1968, in the regions of astrakhan sheep in Northern Afghanistan in 1970/1971, have caused immense losses of livestock. Because of the damages of overstocking (degradation of vegetation, soil erosion, wind deflation, etc.), the losses surely have been heavier than in former times. It is still open to question whether the nomads or the sedentary cattle-breeders are afflicted more. Governments and farmers have to be warned very energetically to reconstruct the stocks of cattle again to the old extent in humid years or periods of such years. Climatology also is beginning to be engaged by the geographical consequences of the changed albedo and of the increased production of dust in the arid belts of the earth. It is not possible here to enter deeper into this question.

5. The influence of the so-called "green revolution" by the cultivation of hybrid varieties of bread grain with high yields (wheat, maize, rice) has to be commented on very carefully for the countries of the arid belts (Glaser 1974). The new productive varieties demand irrigation and more fertilizing. In countries like Mexico or Pakistan their application has been a full success. In many other countries with arid climate, however, there is a shortage of water for irrigation purposes or of financial means for technical installations and for the purchase of artificial fertilizers. Therefore, from this side no weakening of drought dangers may be expected within a reasonable space of time.

6. In many regions of irrigation the cultivation of bread grain is displaced today by the cultivation of cash crops with higher market value. An already old example is the cultivation of cotton in the irrigation oasis of the Nile in Sudan and Egypt. In other countries also sugar-cane, tobacco, peanut, sisal, etc., are advancing, because these products allow a financial realization on the market. In some countries, for instance in Afghanistan, the cultivation of hemp (hashish) and poppy (opium) has been extended again. These tendencies reduce the supply with foodstuff for the population and also increase the sensibility to drought.

7. The traffic systems, the administration and storage control of developing countries in general are not yet equal to the problems of natural hazards or catastrophes like floods or droughts. In India the British railway net normally was able to prevent famines. There the last great famine of the colonial epoch happened in 1942 in Bengal when the traffic system was monopolized by the war against the Japanese in Burma. In the countries of the Sahel, however, the aid to the suffering population had to be brought by air even in recent years. In India, the delivery of American and Canadian wheat failed, at times, because there did not exist enough big harbours with adequate shipping facilities. There are many reports how the incapacity or the corruption of administrations in recently created states have hindered or brought into difficulties the punctual supply of the population with foodstuff. Sometimes there is a shortage also of public storage dumps where the differences between good and bad harvests could be compensated. These differences are used then for speculations by the private trade. So in Afghanistan the surplus of the good wheat harvest of 1973

had to be exported at low prices, though the country in other years is dependent on imports of cereals.

Apparently, therefore, we have to face the fact that the sensibility to droughts in the countries of an arid climate will increase considerably in the near future.

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ASPECT GÉOGRAPHIQUE DE L'ÎLE DE HVAR

Une contribution à la connaissance de la valorisation des îles adriatiques

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Les îles vivotent dûrement à l'époque d'un isolement et d'un retardement social général. La position côtière est beaucoup plus favorable que la position de haute mer, et ce qui est surtout important, c'est la corrélation qui existe entre la position d'une île et les lignes de trafic.

La navigation réalisée entre la Méditerranée antique et le bassin adriatique menait à travers l'archipel yougoslave. La prépondérance d'un karst pauvre joue un rôle limitatif dans la valorisation de cet archipel. L'île de Hvar occupe la quatrième place, en ce qui concerne la superficie qu'elle retient dans l'archipel, et son nombre d'habitants (299,66 km² et 11 390 habitants d'après le recensement de 1971), mais elle excelle par ses particularités naturelles et son importance sociale.

LE NOM, LA FORME ET LA POSITION

Le nom lui provient des colonisateurs grecs, provenants de l'île égéene de *Paros*, qui ont ainsi dénommé sa colonie de *Pharos*, dans la première moitié du IV^{e} siècle av. notre ère. L'emplacement de cette colonie se situe sur le lieu où se trouve la ville de Starigrad aujourd'hui. Le fait que le dénomination plus ancienne de cette île n'aie pas été conservée indique que l'île était peu habitée et qu'elle n'était pas reliée avec des espaces plus éloignés. Les trouvailles archéologiques provenant de la civilisation troglodytique du IV^{e} milliénaire av. notre ère peuvent être expliquées par les grandes discontinuités dans les liens maritimes. Les colonisateurs grecs ont fixé leurs domiciles sur la place la plus favorable à l'économie agraire, et il n'existe pas de preuves qu'ils aient rencontré une opposition de la part des peuplades indigènes qui étaient peu nombreuses et à l'état de vie basé sur un vivotement de chasseurs et d'éleveurs. Le fait que c'est la colonie grecque qui a donné le nom à l'île, témoigne d'une certaine supériorité socio-économique de cette colonie (l'économie agraire, la pêche, la vie maritime, l'artisanat, etc.).

Les dénominations portées par l'île et par la localité principale sont habituellement des homonymes, ce qui est d'ailleurs très compréhensible étant donné que le chef-lieu, en plus de ses autres primautés, demeure une liaison pour l'enchainement dans la vie des espaces plus éloignés. Même sur la place de la ville de Hvar d'aujourd'hui il se trouvait une localité grecque nommée *Dimos*; occupant une position prépondérante sur la route maritime de Venise, elle s'empare de la dénomination homonyme de l'île. La colonie grecque principale

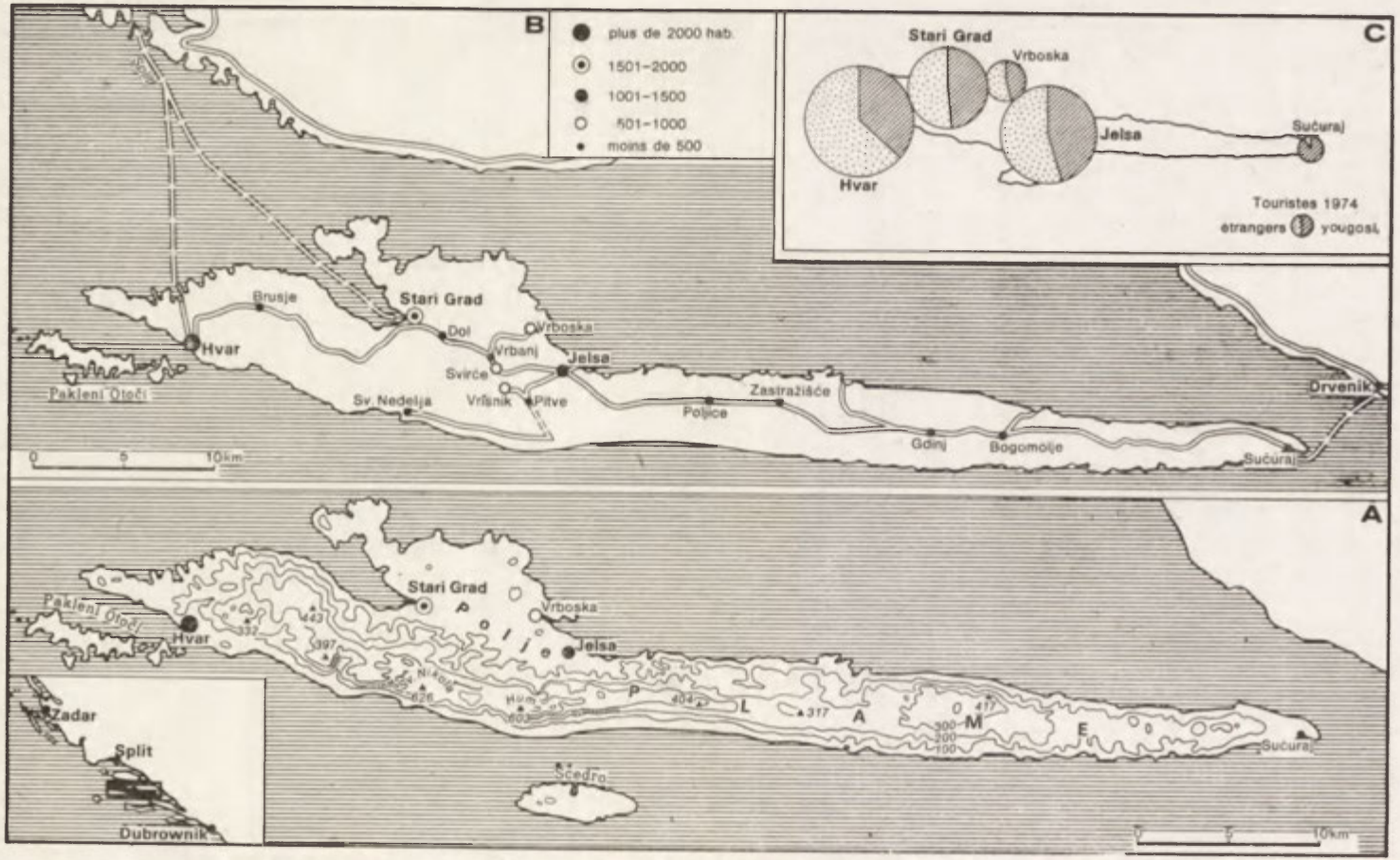

Fig. 1. A — Éléments du relief et position géographique de l'île de Hvar (l'équidistance entre les isohypses est de 100 m), B — Réseau interne et liaison (*ferry-boats*) avec le trafic routier sur la terre ferme, C — Localisation des touristes dans les principaux centres de l'île de Hvar (en 1974)

obtient la dénomination très significative et consolante de Starigrad ("la ville ancienne").

La dénomination italienne de l'île *Lesina* (jamais acceptée dans le pays) a conditionné un malentendu quand elle a été mise en relation avec l'étymologie slave: *les* ("la forêt, le bois"), ce qui serait expliqué comme "une île boisée". Cependant, le mot italien, ou vénitien *lesina* veut dire "l'alène", ce qui correspond bien à la forme et au rôle de cette île (Fig. 1, A). Dans le sens Ouest–Est l'île de Hvar est longue de 67,8 km et elle est la plus longue parmi les îles adriatiques. Ce qui est surtout mis en relief, c'est sa partie allongée et la plus restreinte, dénommée par les habitants de l'île *Plame*. A côté de l'allongement, ce qui est surtout caractéristique c'est la direction géographique de l'île (W–E).

L'île de Hvar fait un angle avec l'allongement générale (NW–SE) de la côte dinarique. Sur la voie traditionnelle et allongée du trafic maritime l'île de Hvar jouait le rôle d'une barrière. La navigation initiale et nécessairement côtière devait faire le tour de l'île et utiliser le passage entre le cap Est de l'île et la terre ferme avoisinante, large seulement de 4,5 km. Ce détour conditionna une navigation dure et pleine de dangers. Les marins n'ont pas tardé à comprendre qu'ils font un détour autour de la partie de l'île qui est restreinte et allongée ce qui leur fit rappeler la forme d'une alène, ou mieux *lesina* en italien. Le détour et le passage par le détroit ont été très dangereux, étant donné que les navigateurs avoisinaient la côte d'un littoral montagneux qui était pauvre et en même temps le nid d'une piraterie hardie. Les conflits des pirates côtiers et des marins ont eu lieu jusqu'à une époque historique assez récente. Même la dénomination Plame pour la partie Est de l'île, est en rapport direct avec les conflits entre des pirates et les navigateurs. Par conséquent, celui qui était le possesseur de cette partie de l'île faisait au moyen de feux *(plame*, "les flammes") des signes avertissant les approches de l'ennemi ou de la proie, c'est-à-dire du danger venant du littoral ou du navire du côté de la mer.

A l'opposé de l'"alène" de l'Est, la partie Ouest de l'île est plus composite et agroupée ayant la forme d'une "tête". C'est dans cette partie que les colonisateurs grecs ont établi Pharos tandis que sur la partie donnant au large l'occupation vénitienne a aménagé l'important point d'appui, la ville de Hvar d'aujourd'hui.

LES CARACTÉRISTIQUES PRINCIPALES DE LA BASE NATURELLE

Les Plame d'Est, ou mieux l'"alène", sont de relief, composition et structure simples. C'est un anticlinal presque normal des calcaires mésozoïques, à la crête duquel apparaissent des dolomies. La côte Sud est un peu plus abrupte et relevée à mesure qu'on approche de la partie Ouest de l'île. Le terrain explicitement karstique augmente l'isolement des Plame ce qui fait qu'il a peu de signification dans le vie sociale de l'île.

Dans la partie plus composite d'Ouest prédominent des calcaires et des dolomies mésozoïques, très disloqués. Ce soubassement est modelé de manière différentielle: les crêtes calcaires sont en saillie tandis que sur les dolomies prédominent les vallées (Fig. 2). La dissymétrie de l'île est ici plus prononcée: les parties les plus hautes (Sv. Nikola 626 m, Hum 603 m, etc.) se dressent abruptement au-dessus de la côte Sud. Au Nord de la hauteur principale on trouve une dépression qui est située entre Starigrad et Jelsa. Elle est couverte de sable et de loess pléistocènique; c'est *Polje* ("champ"), un élément spécifique du terrain qui joue un rôle-clé dans la vie économique de l'île.

Par sa composition et le rôle dans la vie humaine se distingue une zone de flysch paléogénique entourant la ville de Hvar. Cet ajout stratigraphique est sujet au modelement spécifique. Le relief a facilité un arrangement du port, la construction d'un point d'appui et son approvisionnement essentiel. Son exposition au soleil et son abri topographique ont créé les avantages écologiques de la ville de Hvar ("la Madère adriatique"): la température moyenne pour le mois de janvier y est de 8,4°C.

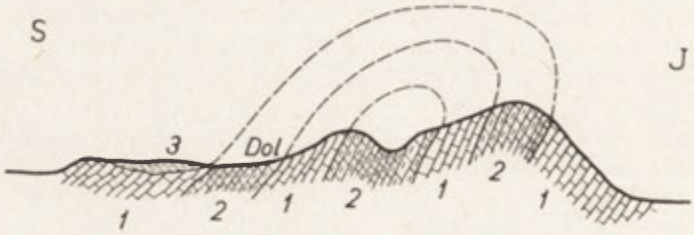

Fig. 2. Coupe structurale à travers l'île de Hvar (d'après M. Herak, simplifiée)
1 — calcaires; 2 — dolomies; 3 — couverture pléistocènique (sable et loess)
S = Nord, J = Sud

LA VALORISATION SOCIALE

Les différences naturelles existant dans l'île sont importantes pour la vie humaine. Comme nous l'avons déjà dit, c'est l'île la plus longue dans l'Adriatique, mais plus de la moitié de cette longueur (56%) est comprise dans la partie étroite et allongée des Plame. Les Plame comprennent approximativement quelques 42% de la superficie de l'île, mais le nombre de leurs habitants est d'une importance moins significative. Au temps où l'île comptait le plus grand nombre d'habitants (18 097 âmes en 1900), la part des Plame n'y était que de 17,5%. Au cours des recensements centenaires la part des Plame dans le nombre des habitants de l'île de Hvar était la plus grande en 1910 (20,5%), mais c'est déjà l'époque où la totalité de la population de l'île commence à diminuer. Cette particularité en ce qui concerne la population et ce retardement dans l'attitude des Plame par rapport au reste de l'île sont très significatifs, pour les tendances générales qui existent dans les rapports intérieurs de l'île.

Du point de vue humain, la principale importance revient à la partie Ouest de l'île qui est plus découpée et plus exposée au large. Les Plame d'Est qui se rapprochent de quelques 4,5 km de la terre ferme, n'ont qu'une importance réduite à cause de la prédominance d'un terrain karstique et à cause d'un tel allongement. Le terrain est inapproprié à une valorisation agraire et la dispersion des habitants ne favorise pas une association qui est un facteur décisif d'un progrès social. A cause de ces particularités naturelles et sociales des Plame, les destins de l'île de Hvar n'étaient pas reliés avec la terre ferme peu éloignée. La partie Ouest de l'île, la "tête" exposée au large, comprend la presque totalité (pour la plupart 80%) de la population insulaire. C'est cette partie qui a eu l'importance prépondérante dans les destins de l'île. Le terrain en est beaucoup plus favorable aussi bien pour l'élevage primordial que pour l'économie agraire plus récente. Les parties hautes (Sv. Nikola 626 m, Hum 603) en étaient jusqu' aujourd'hui un support de la composante d'élevage de l'économie d'autarcie, tandis que le Polje dans la dépression, entre Starigrad et Jelsa, favorisait le développement d'une économie agraire, surtout d'une viticulture commercialisée. La côte septentrionale de la partie Ouest de l'île est plus découpée, elle

abonde en baies dont la plus importante est celle de Starigrad. La connection d'une large baie et d'un champ était très convenable au désir et aux besoins des colonisateurs grecs. Cette localité est restée d'une manière permanente un foyer principal pour l'économie agraire de l'île.

Le port de la ville de Hvar, sur la côte méridionale est assez petit mais bien abrité; son importance est grande à cause de sa position sur la partie Ouest, exposée au large. Les relations très anciennes entre la Méditerranée antique et l'importante baie adriatique ont été spontanément dirigées, après le passage de Korcula, le long des côtes méridionales de l'île de Hvar. Les vestiges trouvés dans les grottes de l'île confirment que ces relations existaient déjà au cours du IV[e] millénaire av. notre ère. C'est par cette voie que sont venus les colonisateurs grecs qui se sont établis à Vis et dans le Polje de Hvar. L'expansion romaine trans-adriatique établit son appui sur la partie Ouest de l'île de Hvar. Le fonctionnement des voies d'entremise commerciale vénitienne, entre l'arrière-pays européen et le Levant méditerranéen, dépendait d'une bonne organisation de la voie maritime adriatique, qui devait forcément suivre les passages abrités à travers l'archipel devant la côte Nord-Est. Il ne tarda pas à être confirmé que la ville de Hvar représentait une base navale très importante. Même d'autres particularités locales correspondaient aux besoins de Venise. Le port est très bien abrité par l'ilot calcaire de Galesnik et partiellement au moyen des Pakleni otoci (les "îles à goudron"). Aux environs, sur le terrain de flysch, il y a des sols cultivables et sur des couches argileuses sont retenues des eaux souterraines qui ont été mises à profit par le creusement de puits. Au-dessus de la zone de flysch saillit un escarpement calcaire, très approprié à la localisation de forteresses efficaces et à la surveillance du large peu rassurant.

Ce qui est surtout important pour la vie et aussi pour le rôle de la ville des nouveaux temps, c'est son avantage écologique. C'est en l'année 1000 qu'a lieu l'usurpation vénitienne qui, avec des intervalles, dure jusqu'à la chute de la République (en 1797). Pendant ce temps viennent d'être établies des relations spécifiques socio-économiques entre la ville et le reste de l'île de Hvar. Dans la ville privilégiée se forme une noblesse séculière et ecclésiastique exploitant les colons de l'île, tandis que des ressources financières importantes proviennent du rôle joué par la ville en tant que base maritime. C'est de cette époque là que provient un riche patrimoine culturel, surtout architectural, ce qui augmente l'attractivité contemporaine de la ville.

A la suite d'un rapprochement du littoral adriatique avec l'arrière-pays européen au cours de la seconde moitié du XIX[ème] siècle il y eut un essor de la viticulture commerciale qui fut un tournant pour le changement des conditions socio-économiques dans la partie Ouest de l'île. A la suite d'un aménagement laborieux du sol et des soins apportés à la vigne et au vin, le prix du travail fut augmenté et les revenus en argent devinrent un facteur revivificateur pour l'économie du village. Les conditions écologiques favorisent de bonnes récoltes et les vins de Hvar acquièrent une bonne renommée sur le marché. L'incorporation du village dans l'économie du marché change la manière de vivre et augmente le rapprochement et la polarisation sociale. Les maisons du village sont reconstruites et adaptées à l'économie viticole et à l'accroissement du niveau de la vie. Etant donné que la viticulture de l'île est la plus prospère dans le Polje, le rôle central de la ville de Hvar diminue. Les villes de Starigrad, surtout celle de Jelsa et dans une moindre mesure aussi de Vrboska, qui sont au bord du Polje, deviennent des centres médiateurs très actifs. L'exportation des vins et l'approvisionnement du marché revivifié favorisent le développement de la navigation.

Les liens économiques avec les espaces plus étendus conditionnent une incorporation dans le réseau des centres de polarisation plus grands. Le rôle clé est joué par Trieste, le plus grand intermédiaire dans l'espace de gravitation plus étendu, puisque Rijeka se développa plus tard. L'importance de Split voisine, et isolée de l'arrière-pays au point de vue des communications, augmente peu à peu. Les nouveaux liens deviennent tout autres que ceux qui existaient dans le passé. Dans la nouvelle époque le rôle principal est dévolu aux liens avec la terre ferme avoisinante. Dans cette renaissance socio-économique un rôle principal est joué par la partie Ouest de l'île. La base naturelle, la dispersion des habitants et les faibles relations avec les pays lointains ont empêché l'incorporation des Plame dans le nouveau processus; les différences sociales existantes entre les deux parties de l'île sont devenues plus grandes. Dans les Plame, jusqu'aux temps les plus récents, prédomine une économie pauvre de polyculture et d'autarcie.

L'incorporation dans la vie sociale et économique des espaces plus étendus créa une connaissance de nouvelles et meilleures conditions de vie. C'est que à cette époque eut lieu une émigration spontanée et non limitée vers les pays d'outremer. Par l'intermédiaire de la viticulture commerciale, on a obtenu les ressources nécessaires à la réalisation de l'émigration. Le travail pénible, exigé par la viticulture et le pauvre rendement financier obtenu de ce travail, ont stimulé l'émigration. La crise du marché des vins et l'épidémie de *phylloxéra* à la fin du siècle ont haté l'émigration. A la suite de l'émigration sont changés les rapports numériques entre les habitants de la partie Ouest et ceux des Plame. La part de ces derniers dans la population de l'île faisait 17,5% en 1900 tandis qu'en 1910, dix ans après, elle a augmenté à 20,5%. L'émigration d'outremer représente, du point de vue général, une répercussion d'épanouissement des possibilités économiques, pauvreté en moins.

La coïncidence de diminution de la population et de dévastation des vignes représente une des plus grandes tragédies dans l'histoire de l'île. Les possibilités d'un redressement étaient très limitées. La main-d'oeuvre indigène était trop déficitaire pour un renouvellement de la viticulture et un supplément de main-d'oeuvre provenant du marché de travail, devenu plus cher, ne pouvait être envisagé. Les nouvelles vignes, greffées contre le *phylloxéra*, réussissent seulement sur des bons sols; la viticulture n'est pas renouvelable sur le terrain karstique acquis par des défrichements. La culture et la distillation des plantes aromatiques (elle est traditionelle en ce qui concerne le romarin et la lavande est nouvellement répandue) suppléait peu à la grande perte. Le dépendance des marchés éloignés et des médiateurs peu fidèles se refléta dans l'instabilité insupportable des prix: on n'a pas réussi à trouver une substitution à la viticulture dévastée. C'est ainsi que l'émigration est restée la principale perspective à envisager. La population de l'île est en diminution progressive: de 1900 à 1971 de 35.0%! Toutefois, la donnée statistique mentionnée ne reflète pas le processus socio-économique le plus récent qui change les conditions de vie sur l'île, aussi bien que les relations de cette île avec les espaces plus étendus.

L'accroissement contemporain du temps de loisirs, de l'excédent des profits, aussi bien que la dégradation des centres urbains, surtout des villes industrielles, font augmenter le besoin et la possibilité de se relaxer et de s'amuser. C'est d'ici que provient un intérêt tout nouveau porté à la côte adriatique, spécialement à l'île de Hvar. L'île ensoleillée, et surtout la ville de Hvar, acquiert une renommée spéciale sur le marché des plaisirs. La ville de Hvar est devenue un centre touristique yougoslave qui le plus continuellement valorise son avantage et sa fonction: elle offre en hiver un séjour moins cher ou même gratuit en cas

de mauvais temps (la nébulosité moyenne au mois de janvier, qui est le plus nébuleux, est seulement de 5,0, tandis que le nombre d'heures ensoleillées pendant l'année est en moyenne de 2715). La valorisation touristique dépend des conditions socio-économiques changées dans le cadre étendu national et international. Après de modestes commencements dans la ville de Hvar avant la première guerre mondiale, l'explosion urbaine de la moitié de la troisième décennie de notre siècle a eu une répercussion dans la ranimation touristique même des autres centres existants de l'île (Starigrad, Jelsa, Vrboska). La crise économique des années 30 et les conditions instables qu'elle amena ont freiné le développement touristique. Le caractère significatif de cette étape demeure le rôle prédominant de la ville de Hvar qui, outre les avantages écologiques, abritait un patrimoine culturel très riche et qui était du point de vue des communications, la mieux reliée.

L'explosion touristique qui s'est produite au cours des deux dernières décennies est la conséquence de nouveaux rapports. Le cercle social s'est épanoui très vite comme aussi le nombre de ceux qui cherchent de participer au marché des plaisirs. Le moyen de transport principal est devenu l'automobile qui eut pour conséquence le percement et la modernisation des communications routières du littoral continental (en 1964: la route cotière) et l'ouverture d'une route traversant l'île de Sucuraj jusqu'à Hvar (79 km, en 1969; Fig. 1B). C'est ainsi qu'il est devenu possible pour l'île entière de participer à la vie commune; il y a même d'autres changements faisant un certain tournant historique. L'île est rattachée au moyen d'un cable sous-marin au réseau de distribution électrique du pays. Après le captage des sources modestes existant dans l'île, on envisage même d'amener de l'eau provenant de la terre ferme. Les liaisons régulières ou occasionnelles au moyen de bateaux sont remplacées par les *ferry-boats* qui sont plus fonctionnels et dont le but est de rapprocher l'île au rythme de la circulation routière de la terre ferme. A coté des liens dominants et traditionnels avec Split (Split Hvar, 43 km), c'est maintenant aussi le voisinage de Sucuraj avec la terre ferme qui compte. Les Plame, toujours isolées, deviennent une partie de l'île qui est maintenant accessible. L'accès à travers Sucuraj par les Plame est devenu important à la suite de la prédominance de l'automobile dans le transport touristique et du désir du déplacement le plus rapide et le plus court possible, et l'accessibilité de l'arrière-pays national joue aussi un rôle important. Même les escales d'autrefois pour le rattachement dans la vie des espaces plus éloignés se trouvaient sur le littoral, mais les mobiles en sont aujourd'hui plus complexes et plus forts. A côté de l'abritement du port on apprécie aussi la fraicheur des parties en éminence, outre les plages accessibles on estime aussi les hauteurs des côtes escarpées. Les magasins des pêcheurs d'autrefois sont reconstruits en confortables résidences; le long de la côte sont situés les hotels et autres lieux de détente — la côte devient une façade complexe de l'île. Le déplacement permanent ou temporaire sur les côtes de l'île demeure une caractéristique de notre temps.

La nouvelle valorisation est influencée par les particularités de la base naturelle. La côte Sud, exposée au soleil, plus abrupte et plus difficilement accessible, offre moins de possibilités que la côte Nord qui est plus découpée. C'est ainsi que la côte tournée vers la terre ferme est valorisée davantage. Les transformations exécutées sur le littoral et la littoralisation de la vie de l'île représentent le processus le plus intensifié et le plus composite qui soit effectué dans la vie de l'île jusqu'à présent. Eût égard au allongement de l'île et au découpage de la côte (254,2 km), la littoralisation représente de grandes chances et elle va donner une nouvelle valeur à l'île entière. Le processus

de la transformation du littoral et la valorisation de la totalité de l'île sont en accord avec les avantages de la base naturelle, ce qui est une des caractéristiques générale du processus géographique actuel. La ville de Hvar, avantageuse au point de vue écologique et riche en patrimoine culturel, est bien détachée du reste de l'île; mais, le nouveau processus de la valorisation littorale embrasse aussi l'archipel non lointain des Pakleni otoci, ayant 54 km de côte. C'est ainsi qu'autour du noyau historique se forme un complexe touristique, très varié et attractif. Dans le nouveau processus de littoralisation sont embrassées aussi les Plame retardées; ainsi ici la vie migre des crêtes et de leurs villages vers les côtes avoisinantes. A cause de la petite distance, il n'y aura probablement pas de transfert de population, mains plutôt seulement une symbiose spécifique. Le plus vaste regroupement se forme sur le littoral du Polje, dans la partie Nord-Ouest de l'île. Déjà en 1974, il y avait dans les trois localités principales, existant sur la côte du Polje (Jelsa, Starigrad et Vrboska) 52% de touristes et 58% de nuitées (Fig. 1C). La revivification touristique augmente l'importance des centres qui s'étaient développés à l'époque de l'économie de viticulture et de vie maritime. Même le Polje obtient une nouvelle importance: on y peut appliquer un labourage à la machine et on peut s'orienter vers les cultures commerciales à condition qu'on trouve une solution à l'irrigation des champs. Dans des nouveaux rapports seront maintenus ou même développés les villages de l'intérieur (Dol, Vrbanj, Svirce, Vrisnik et Pitve), étant donné qu'ils se trouvent dans le voisinage de la côte et qu'ils sont possesseurs du Polje.

Le rattachement dans la vie des espaces plus éloignés est en relation étroite avec les centres médiateurs parmi lesquels c'est Split qui joue un rôle prédominant pour l'île de Hvar. Dans ces conditions, Starigrad, ayant la position la plus favorable, devient la jointure principale pour les liaisons avec l'île. Sur la côte Nord, voisine de la ville de Hvar, on a construit aussi un port (Vira) spécialement pour le *ferry-boat*. Les nouveaux rapports conditionnent une restructuration intérieure de l'île. Les changements survenus ces derniers temps représentent une conséquence du rattachement à la vie des espaces plus éloignés. La transformation contemporaine ne survient pas seulement à la suite d'une activité de la part de la population indigène mais aussi au moyen de l'enjeu de la part de la société et de la population provenant du cadre national plus étendu. Ces rapports ne sont pas révélés dans les données du recensement. Le recensement est exécuté au mois de mars, alors que le chiffre de la population indigène elle-même n'est pas réel; étant donné que dans cette saison "morte" maints habitants autochtones ne sont pas dans l'île à cause de l'école qu'ils fréquentent ailleurs, ou bien ils s'absentent pour un séjour dans leur famille. Au contraire la revivification sociale et économique de la vie de l'île en été entraine le rassemblement dans le pays paternel.

Le processus de développement exige qu'on tienne compte, en tant que facteurs importants, également de ceux qui ont contribué à la transformation de l'île par leurs ressources financières et par leur apport personnel (un grand nombre des maisons de repos privées). Ils représentent une catégorie physique et juridique de la population qui est essentielle dans la vie contemporaine de l'île. En 1974, le nombre de touristes enregistrés dans l'île était de 117 225, alors que le chiffre réel était beaucoup plus grand. Cela revient à dire que la population résidant l'île en été était presque 11 fois plus grand que le nombre statistiquement constaté! Il faudrait mettre en accord le processus de développement et le procédé de recensement. Le recensement est exécuté en hiver à la suite de l'expérience d'autrefois qui disait qu'à cette époque-là la majorité des habitants autochtones est regroupée autour du foyer paternel. Mais nous voyons

que ce n'est pas le cas à notre époque, surtout en ce qui concerne l'île de Hvar. Il serait important de savoir le nombre exact d'habitants de l'île qui participent à sa valorisation. Si l'on tient compte de ce fait, on pourra conclure que le nombre de la population ne diminue pas mais qu'au contraire ces derniers temps l'île de Hvar attire au surplus une immigration spécifique et nombreuse.

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REMOTE SENSING FOR REGIONAL AND ENVIRONMENTAL PLANNING

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During the last years the contents of the term "regional planning" have undergone decisive changes. This implies a new distribution of scarce resources in their widest sense, i.e., creating living conditions that respond to up-to-date social, economic and cultural requirements. The consequence of this task is a redistribution of various sectoral and departmental tasks with regard to regional planning. In this context, I want to emphasize the necessity of creating an optimal structure of land-use in harmony with these requirements. The traditional means of expression to visualize these considerations is the cartographical representation, the map and the plan. The data used in this process have their origins in official and special statistics or in cadastral surveys. The introduction of aerial photography and the photomap after the First World War made available a new base for mapping. But it is only recently, and in a rather sporadic manner that aerial photography and the other results of remote sensing are being used as one of the data bases for regional planning.

In order to facilitate the knowledge of linkages, interdependencies and changes, regional planning needs for the realization of its sectoral and departmental coordination task most recent data relating to spatial units of varying size. Owing to the differentiation of local, regional and national planning there are requirements for data on different levels of scale and exactness of details.

Data are needed for:

— inventory of land-use,
— monitoring of land-use changes,
— detection of land-use conflicts,
— delimitation of urban und rural areas,
— inventory and monitoring of ecological stress,
— decision process for planning measures,
— monitoring of planning realization.

These points may be a framework for the requirements of regional planning with regard to remote sensing as a source of data and an instrument of planning.

Remote sensing processes, that are to serve regional and environmental planning, must consequently offer a broad spectrum of data by a combined application of all presently relevant sensors. According to the tasks and the required scales, the specific advantages of remote sensing are being used for the following purposes:

— stereoscopic evaluation and/or
— multispectral evaluation in the visible and invisible spectral bands, such

as infrared color photography, infrared or multispectral line-scanning or infrared radiometry and microwaves,

— complete overview of larger areas at the same time,

— facility for short-time repetition of information collections,

— facility to retrieve information in digital form,

— ease processing and applicability of information in digital form for the observation analysis and planning of areas,

— low cost of the process: on average the cost of this process amounts to 50% of that for conventional process assuming the same quality of information. Observation takes place by helicopter, by low and high flying aircraft, balloons, rockets, space vehicles, earth observation and meteorological satellites.

If we try to get an overview of the use of remote sensing methods for regional and environmental planning including socio-economic and ecological surveys, only a few publications are relevant in the sense of a methodological interpretation that has chosen appropriate sensor for certain data. There is no doubt about the fact that vertical aerial photography is still the most informative source of remote sensing, even if more than topographical data are needed. Three basic levels have to be taken into consideration when preparing a systematical interpretation of aerial photography for the purposes of regional planning:

— classification of land-use,

— construction of a photo-interpretation key,

— transformation of data into an information grid.

Consequently, the interpretation of selected problems will give additional information surpassing the survey of sectoral planning, e.g.:

— quality of housing by construction of a system of indicators and weightings with regard to various types of living areas,

— evaluation of administrative reforms, observation of development axes,

— analyses of traffic flows,

— suitability of areas for recreation by systematic synopsis of land use, relief, interface of watercourses and forests, height of river banks, climate, etc. which facilitate the planning of recreation areas,

— multiple uses and use conflicts, e.g., between agriculture and recreation facilities or housing and industry,

— monitoring of areas, damaged by floods, soil erosion, water and air pollution as well as damages to vegetation,

— distribution and differentiation of no longer cultivated areas, e.g., within the umland of cities or of land that is to be used for building in future,

— suitability of mountain areas for agriculture by evaluation of the micro-relief.

Apart from the conventional black and white-panchromatic emulsion which corresponds to the tone sensitivity of the human eye in the visible range, it is the infrared color-emulsion that shows a differentiated state of vegetation, penetrates industrial haze and emphasizes water courses and their edges in black. Thermal (infrared) and multispectral scanner as well as radiometer and microwaves complement aerial photography by data from the invisible bands of the electromagnetic spectrum. The choice of remission of certain spectral bands facilitates quantitative and qualitative evaluations with regard to the characteristics of objectives.

It is a very recent development to examine the problem, how far satellite data can furnish material for regional planning, especially in industrial countries. Discussion about this began with the preparations of the start of earth

observation satellites, e.g. LANDSAT 1 and 2. There is no doubt that in the first instance intercontinental and supra-regional tasks are being tackled by these satellites, e.g.:

— preparation and correction of the International World Map 1 : 1,000,000,
— preparation of a universal land-use map,
— monitoring of sea-ice coverage and mountain glaciation as well as estimates of run-off from the melting snow cover,
— monitoring of dry farming,
— monitoring of transport of sedimentation to shores and estuaries,
— early diagnosis of floods, volcanic eruptions and large-area damages,
— prospection of resources,
— monitoring of global environmental disadvantages.

On the other hand — and this is quite surprising — it facilitates the information in regional and local dimensions, such as:

— preparation of a topographical map 1 : 200,000–1 : 250,000,
— mapping of small-scale natural units,
— mapping of special land-use types and changes, and of uncultivated areas as fallow land,
— surveys of soil-erosion,
— mapping of haze and smog over agglomerations,
— surveying of areas with thermal emission or of cold air ponds and fresh air breaks,
— delimitation of agglomerations,
— surveying of settlement developments,
— monitoring of floods.

The most important advantages of satellite imagery, should be compared with supposed disadvantages:

— continuously repeated coverage of the earth surface (at present every 18 days) facilitates the monitoring of all dynamic processes as well as of extreme situations;

— synchronous overview of a large area avoids disparities resulting from various exposure-times and reflexion. On the other hand, it permits a better surveying of large-area configuration, and their interdependencies;

— surveying of features that up to now have been unknown or only partially known, brought unequivocal successes. This applies especially to the surveying of mineral resources;

— multispectral surveying in relatively narrow bands facilitates the most exact differentiations of emission, reflexion and thermal state of objects. This permits one to emphasize special features such as: haze and smoke in the blue band, land-use and water permeation in the green band, vegetation and floods in the infrared band.

Supposed disadvantages should be mentioned, such as:

— extreme height (920 km) of the satellite results in small-scale information only. Consequently, the limit for enlargement is at the scale of 1 : 200,000, and the resolution between 50 m and 100 m furnishes a framework for the identification of objectives;

— up to now, the small number of receiving stations has retarded the direct use of data; this is especially so as the processing of the enormous amount of data ought not to be restricted to a few institutions;

— furthermore there are uncertainties, as the owner of the satellite has the possibility of switching it off temporarily for technical or political reasons;

— processing and evaluation by computer and plotter offer on the one hand optimal information. But, on the other hand, it must be supposed that owing to the concentration at too few data centers, the process is too cumbersome.
When we now look at the pros and cons as well as at the results then it seems to be sensible to support data gained by the use of aircraft as well as the application of information from satellites for the problems of regional planning.

There can be no doubt about the fact that the great interest of regional planning in the systematical application of remote sensing processes — including data from satellites — is based on experiences gained in the interpretation of aerial photography during the last fifty years. In the first instance, planning authorities and joint planning-boards promoted the preparation of the airphotomap. At the same time, research promoted a number of projects with regard to methodology of remote sensing as exemplified in land-use, water pollution, soil erosion, division of land into natural units, and monitoring of water quality. Combined with these examples are modern methods of data gathering and processing which often represent a compilation of data gained by various sensors.

In the near future, preparations for the creation of a global environmental monitoring system will begin. Naturally, all countries of the world will have to cooperate in this undertaking by rendering highly qualified work. The well-considered reasons for this are that the results of measures are deeply influencing the environment as well as the economic and social structure of each state, and that the cooperation by way of furnishing detailed data for the preparation of norms and rules is necessary. Aerial photography as well as all other data of remote sensing represent local as well as supra-regional information that is needed preponderantly for resolving difficult problems in regional planning and environmental monitoring.

We do not yet posses a detailed cost-benefit analysis for the problems of regional planning with regard to the presently offered multi-channel sensors. Results so far are encouraging. Therefore, we recommend intensification of systematic use of remote sensing processes based on detailed problem studies and promotion of regional studies. This will allow a continuous critical examination and amelioration of methods before they are in all cases operational.

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URBANIZATION, INDUSTRIALIZATION, AND MODERNIZATION

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During the past two centuries, first in Britain, but later in many other countries, urbanization, industrialization, and modernization have been such closely associated aspects of the transformation that has taken place both in the way of life of the people and in the face of the country that the terms have come to be used loosely as interchangeable in describing this metamorphosis.[1] It has too readily been assumed that they proceed in step together, and that their time-spans are the same, yet this is not the case.

By definition, modernization must be a continuing process, but urbanization and industrialization, on the contrary, are processes that can and do reach a maximum state. By the standards by which they can be measured statistically, moreover, the completed processes must necessarily fall short of reaching absolute maxima. In some countries they have run their course, and at varying times have reached and even fallen back from their maxima, so that modernization continues there without further urbanization or further industrialization in the strict senses of these terms. Furthermore the conditions that made the processes so convergent no longer apply as they once did. In some situations urbanization may continue today without the accompaniment of further industrialization; and in the Third World it is happening in advance of industrialization. It is a source of confusion not to distinguish the different processes involved, with their different time-spans, even though they do often occur together, supporting and reflecting each other. Their mistaken identification can only hinder a true understanding of the nature of contemporary changes in the modern world, and especially of their differential impact in fresh contexts of time and place.

Several advanced countries, by the conventional standards that have been used for measuring the processes by which they were becoming urban and industrial, are no longer becoming more so. Concentration of people into continuously built-up areas, whether towns, cities, or conurbations, reached its maximum more than half a century ago in Britain, and the pattern has loosened appreciably since then. So has the degree of concentration of the working population in industrial employment, which for even longer has ceased to be an expanding sector of the work force. It cannot be expected that figures as high as 80% for urban population or 50% for industrial employment will be reached in any settlement systems and economies in the future. Like parameters of

[1] A. E. Smailes, The definition and measurement of urbanization, in: R. Jones (ed.), *Essays on World Urbanization*, 1975, pp. 1–18. See this volume for a comprehensive treatment and bibliography of the processes and patterns of urbanization, with 28 illustrative national essays.

80% for the rural population and 70% for the agricultural sector of the workforce they have become anachronisms.

A closer examination of the nature of the changes which are now taking place and are likely in future to be emphasized in maturely developed countries, and of the progression that is there presented by continuing modernization, as well as of the theatres in which the phenomena of urbanization and industrialization are currently most manifest may serve to clarify the contemporary situation and contribute to a better understanding of the geographical, economic, and social trends that are most significant towards the end of the twentieth century and likely to continue into the next.

By the time that the first Census of England and Wales, in 1801, allows us to see the situation measured with some degree of exactness, Britain had already advanced so far along the path of change from a traditional pre-urban, pre-industrial society that about one-third of its population, by then growing both rapidly and consistently, already lived in towns and cities, and about one-third of its active inhabitants were engaged in industry. Already the proportion employed in agriculture was as low as one-third. By 1850 the British had become an urban nation, with more than half their number living in an urban setting, and an industrial nation to the extent that twice as many were engaged in industry as in farming. Production of food and tangible goods employed two-thirds of the workforce, but by the end of the century this share had fallen back to little more than half as the farming population dwindled and came to employ fewer than 10%. By this time, however, the shift of employment was into service occupations rather than industry.[2]

By the time of World War I the population was very urbanized and, with 80% recorded as town-dwellers in 1921, the English had become the most urbanized notion in history. Subsequent censuses have not shown any further degree of urban concentration. The continued fall in farm employment to less than 3% has accompanied a shift of employment from producing goods to rendering services and from work in factories, mines, and homes to work in offices and welfare institutions, with increasing colonization of the traditional settlements of the countryside by these people of largely urban derivation. It is long since the typical Englishman was a yeoman farmer; he is no longer a factory worker, or indeed a manual worker, and among the service occupations that employ half the active population the office worker rather than the shopkeeper or personal servant is typical. He, and she, are the typical residents alike of suburbs and countryside.

The country has never been so well farmed, but for very few people are farms their place of work. This does not mean that villages and countryside are deserted. On the contrary, they are occupied by people from the cities who retire there, or commute thence, or use them as week-end and holiday homes; and these are complemented by as many others who are engaged locally in performing services of one sort or other for them and for the residual farm population.

Similar structural changes have taken place in North America, beginning more recently and proceeding much faster. Agriculture retained more than

[2]For a succinct exposition of the growth of services in modern economies, see R. M. Hartwell. The service revolution, in: the Fontana Economic History of Europe (edited by C. M. Cipolla), Vol. 3. *The Industrial Revolution*, (1973), pp. 358–396. Hartwell sees such service economies appearing as a progression from agricultural, industrializing, and industrial economies. With agricultural employment minimal, the service sector is growing mainly at the expense of industry, employment in which has passed its peak, and has become the growth sector of the economy.

one quarter of the American labour force until after World War I; it has subsequently dropped to less than 7% so that further increase in the service sector, which is larger even than in Britain, must depend mainly upon further shift from industrial employment, and automation will ensure that this happens while industrial output continues to grow.

Meantime structural changes, with attendant changes in workplaces, are simultaneously taking place in the expanding service sector in advanced countries and their efficient measurement lags behind. So heterogeneous are the occupations not directly concerned with production of food and other tangible goods in modern economies [3] that the identification within the swollen tertiary sector of revised, more meaningful groupings or sub-sectors is often suggested. Jean Gottmann has been emphasizing the role of what he calls "quaternary" employment, in administrative, technical and clerical jobs, for the dynamics of these advanced societies and he estimates that "on the occupation scale this sector may be from 15% to 40% of total employment in most industrial countries".[4] At present the aggregated statistics that are readily available for analysis of employment structure, and especially for comparisons from country to country, leave much to be desired. So, too, does geographical analysis of office and institution location which, although it has become of such major importance, has never been given a tithe of the attention lavished upon industrial location.

In the present context employment statistics by occupational categories are more significant than those by industrial categories. Gottmann points out that more than one quarter of total employment in manufacturing industry in Britain is probably accounted for by administrative, technical, and clerical jobs, work of a transactional nature, instead of in direct production. Employment classification must increasingly be concerned with recognition and presentation of the most significant groupings of job categories. Trends of change in the location of workplaces and of homes, and in the relationships between them, necessarily depend upon such appropriately aggregated and geographically refined statistical data for their proper understanding and social direction.

It is those countries of the Western world (including Japan, which has not only adopted, but advanced Western technology significantly) where large numbers of workers (from one-third to one half) remained in the agricultural sector until after World War II that have recently achieved fastest economic growth. Application of the most modern techniques of production has been facilitated by organizational changes in the countryside, and has been accompanied by recruitment of workers from farms into expanding industries, but also into services. The farm exodus is in full spate, posing to governments difficult problems of avoiding serious regional imbalance and creating such disparities as have been highlighted by J.-F. Gravier's portrayal of *Paris et le Désert français* (1947, revised edition 1958), and more starkly demonstrated by the plight of Italy's Mezzogiorno.

Japan's absorptive economy has especially exploited the capacity for rapid growth provided there by a large, intelligent and industrious peasantry living in close proximity to established coastal cities. Population expansion, from thirty to more than one hundred million, and modernization have taken place

[3] R. M. Hartwell, *op. cit.*, clearly demonstrates the complexity of the service component in modern economies, and the problem of disaggregating available statistics for re-groupings that are meaningful for different types of analysis and comparison is evident.

[4] J. Gottmann, The dynamics of large cities, *Geogr. J.*, 140, 1974, pp. 254–261.

since 1868 in the short span of little more than a century, and they have not involved such a high degree of industrialization, or indeed of urbanization, as in countries where the 'take-off' (in the Rostovian sense)[5] started earlier. The transition has been rapid to a truly megalopolitan society in which not only is the difference between town and country blurred physically, but factory and office workers also retain immediate family links with farms and return in large numbers to rural homes daily, weekly or seasonally. These features are characteristic of contemporary Japan in peculiar degree.

Opportunities for industrial growth in the immediate future appear to be most promising in those industrial countries where, even today, a considerable agricultural sector (15% or more)[6] in the employment structure offers continuing scope for industrial recruitment. In the longer term, however, the greatest potential for industrialization must rest with the Third World,[7] where it is so desperately needed to grapple with the problems which accompany the population explosion. Belief that the developed countries will be able to export their advanced technology to a Third World able to absorb it has been given a great fillip by the enhanced prospect of at last being able to bridge the yawning technological gap. New techniques of communication provided by the current development of telecommunications and the computer, including learning systems, are now at last likely to make innovation exponential. Technology seems poised for a major breakthrough in the communication of knowledge, and international and transnational organizations exist to plan and carry out the operations that are involved. It may be expected, therefore, that actual production, using an increasingly automated technology, will increasingly move to these countries, while the established industrial countries retain and concentrate more and more upon administrative, research and technical services that are concerned with the organization of production and marketing.

The experience of some advanced countries has already shown how small is the proportion of farm workers needed substantially to support the whole community, and other mature countries are rapidly following in their wake. In the underdeveloped countries of the Third World, however, although the surplus population of the countryside is flocking into cities in advance of industrialization, the great majority of families are still directly dependent upon agricultural employment.[8] Modern agricultural practice, not traditional labour, is what is needed effectively to increase food production there, and the teeming population of the countryside offers the workforce for the industrialization that has been slow to take off. The scale of redundancy of farm labour is frightening to contemplate, as indeed are the scale and pace of potential urbanization, with the demands it must make for even minimal housing and welfare services, and the social problems it must bring in its train. Nevertheless the population problem that marks the demographic transition of these countries commits them to seek industrialization which, whatever its attendant problems, must been seen as pointing the only hope of bettering the lot of their people.

[5]W. W. Rostow, *The stages of economic growth* (1959, 2nd edition 1971).

[6]This still applies in Japan, the USSR and other countries of eastern Europe, as well as of southern Europe. In the EEC, however, structural change in the economies has reduced the agricultural sector so rapidly since 1950 that it now remains larger than this figure only in Italy and Ireland.

[7]Since Alfred Sauvy introduced the term *le Tiers Monde* in the fifties, 'Third World' has also spread rapidly in the English-speaking countries to connote the desperately poor, mostly ex-colonial states of the tropical world, as a third group in international affairs besides the capitalist Western and Socialist Eastern blocs.

[8]D. B. Grigg, The World's agricultural labour force, *Geography*, 60, 1975, pp. 194–202.

MEGALOPOLITAN CONCENTRATION

The differential incidence of technological development in various countries as modernization has 'taken off'[9] during the past two hundred years means that it has operated under varying constraints. The massing of the new steam-powered factories, with their workforces, on and near the British coalfields was a feature of the early phase of the Industrial Revolution in the eighteenth century that was firmly established before any railway system relaxed the control that tied the pattern to the accessible coalfields. The delayed industrialization on mainland Europe, however, was largely preceded there by the provision of railway networks, so that it developed in closer conformity with an old-established pattern of urban centres.

More recently, manufacturing has become much more foot-loose as its location has been freed from narrow dependence upon coal and untransmissible steam-power. It has become more widespread, although economic considerations of market and labour orientation have curbed dispersion. From the middle of the nineteenth century the multiplication of service jobs and the massing of office work in city centres have brought about their pre-emption for non-residential functions. The suburban extension involved has been made possible by simultaneous relaxation of the tight reins that held workplace and residence together before the coming of modern methods of mass transport as represented notably by the electric tramway and railway, and especially the automobile. Continuous enlargement of the service sector of the workforce has greatly emphasized suburbanization and even further scattering of residence over urban fields and city regions. Where these are closely set they coalesce to create megalopolitan[10] cores of highly integrated settlement systems.

It has been emphasized that a growing proportion of the employment that manufacturing industry now generates is in associated offices and research laboratories which, often with advantage, are separable from factory locations. They add to other offices, research establishments, and educational institutions that are moving out of cities, even to greenfield locations, though for the most part they keep within metropolitan zones.[11]

For distance still presents a constraint, even when the emphasis shifts in increasingly affluent societies from cost in money to cost in time. Man's essential nature as a social being, seeking togetherness with his fellows, is reinforced by the permanent friction of distance, which can be mitigated only in some respects by telecommunications, to ensure the persisting implosion of human beings in favoured regions of the earth, as opposed to their untrammelled dispersion over its habitable surface. The effective frontier of man's colonization of the earth has been closed for some time past following a period of rapid extension of the *oikoumenē*. More than this, withdrawal from the margins, especially by the thinning of occupance of harsh environments, has ensued. Few human beings seek the solitude, hardships and deprivations of the pioneer fringe as their permanent home or, having tasted the amenities of metropolitan cities, turn their backs completely upon the service provision there. As hedonistic life-styles, nourished by affluence, come within reach of and are adopted

[9] W. W. Rostow, *op. cit.*

[10] It is of interest to note that Lewis Mumford in his seminal work, *The Culture of Cities* already in 1938 described the emergence of the megalopolis and used the term in this generic sense.

[11] J. M. Hall, Industry grows where the grass is greener, *Area*, 1970, 3. See especially Fig. 1.

by growing proportions of the members of the most technologically advanced societies, naturally favoured environments, for example in respect of climate, can exert powerful attractions. Yet most of the conveniences and luxuries of *la dolce vita* belong to the built environment, and the magnets of their enhanced welfare provision draw more than outright hedonists into the metropolitan and megalopolitan core areas of settlement systems.

True, the margins of these are not inelastic and are susceptible to extension, especially as their built infrastructure is augmented. They swell and push out tentacles of access to outlying nodes, but do not lose their identity. As the connections that bind together existing metropolitan nodes are strengthened, certain axes of development will be emphasized and these may forge additional belts of developed megalopolitan character. Thus in North America what Jean Gottmann labelled Megalopolis,[12] the urbanized Atlantic seaboard in the north-east, and the congeries of metropolitan regions across the Appalachians, stretching a s far as Chicago to include the region of the Great Lakes and extending in Canada down the St. Lawrence valley, seem certain to coalesce in the near future to form a continuous, integrated megalopolitan area. Its essential unity and the implosion of wealth and population within its extent were pointed out fifty years ago by Sten de Geer, who designated it appropriately the Manufacturing Belt.[13]

Since then the scale of the North American continent has allowed another emergent megalopolitan core to appear along the Pacific seaboard in California. Its burgeoning has been powerfully promoted by strategic considerations that have operated hand in hand with amenity attractions.[14] Allowing for expansion of other existing metropolitan areas and even possible additions to their number, it is most unlikely that these megalopolitan cores will not continue to absorb as high a proportion of North Americans in the twenty-first century — but they will become less urbanized and less industrialized.

Similarly the vast continental scale of the USSR system and the exploitation of new fixed-resource bases in the form of mineral fields, near and beyond the Urals, have enabled new regions of economic growth and population concentration to develop in the continental interior, again under the powerful stimulus of defence strategy. In the closed world of today, however, additional growth poles are less likely to be so distant from established foci and, although some more may develop in association with the exploitation of new fixed-resource bases, more probably they will appear as modifications of the revealed macropattern of man's occupation of the earth. Most likely are growth regions marked out by national and international government policies of decentralization and/or socio-economic relief to become counter-magnets to megalopolitan concentration and so to be equipped at massive cost with the needed infrastructures. Britain's post-war experience of New Towns, in its success and in its limited impact, has demonstrated the possibility of planned decentralization of modest complexes of workplaces and residences and also the cost, and therefore the scale limitations, of creating *de novo* the needed infrastructure, even within an existing megalopolitan system.

In Western Europe, as the unity of the European Economic Community is

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[12]J. Gottmann, *Megalopolis, the urbanized north-eastern seaboard of the United States*, 1961. Following its use as the title of this book, Megalopolis gained widespread currency as a particular name for this region, which implied its singularity, whereas even then the English megalopolis was comparably developed.

[13]Sten de Geer, The American Manufacturing Belt, *Geogr. Ann.* 9, 1927.

[14]E. L. Ullman, Amenities as a factor in regional growth, *Geogr. Rev.*, 44, 1954, pp. 119–132.

strengthened, concentration within an already emergent European core may be expected to proceed. Recent enlargement of the Community has added Britain's highly developed megalopolis to the incipient megalopolis across the North Sea and Channel in the Low Countries and Rhineland, with extensions embracing proximate metropolitan regions of France and Italy. As these become increasingly bound together by north–south highways through France and the Rhineland, with cross-braces and outward prongs, a European axis from the North Sea front of Scotland to the coastlands of the western Mediterranean basin in France and Italy will appear, enveloping and unifying what has been politically the interface of nationalist Europe. The economic and political unification of Europe will henceforth go hand in hand with the further integration of this axial belt. The complexity of its structure must be a lasting legacy from its troubled and divided past. The links that will forge its unity follow and augment the historic routes as shaped by physical geography and developed from Roman times, but supplemented by a new criss-cross pattern of air services connecting the metropolitan nodes.

It would be unrealistic not to acknowledge the special problems that this development and the further implosion of population foreshadowed must present for marginal regions of the constituent countries. Some of these problems are already pressing and engage the attention of the European Community in deploying its Regional Fund. They are problems of spatial organization that must loom large in future decades.

In Japan the remarkable industrial development of the past hundred years has been concentrated very largely in the main coastal lowlands of these mountainous islands. Apart from extension of industry along the shores of the Inland Sea to a new western node beside the Straits of Shimonoseki, it has happened in the self-same areas that were the traditional heartland of the Japanese nation and the main concentrations of her peasantry. The lateness of its start, and the short period of only a few generations which spans modern development, combined with the short range from which so much factory and office labour has been recruited, have meant much less uprooting of families from the land than happened in Britain during her Industrial Revolution.

Thus Japan's modernization has enormously emphasized the concentration of wealth and population within the closely set, but discontinuous mountain-girt lowlands of south-eastern Honshu, connected by the Tokaido, the imperial road between the old and new capitals, Kyoto and Tokyo. In Japan modernization, urbanization and industrialization have compounded what in peculiar degree is a phenomenon of national implosion, and the historic Tokaido axis has become the megalopolitan core [15] of modern Japan, where in the past century her extra population has found prosperous employment.

As further modernization proceeds, surplus farm population is being drawn away from the remoter farmlands, where they have lived in scattered pockets of valley and coastal lowland, so that rural depopulation has now come to be characteristic of most of the country's extent. The spatial scale of the Japanese megalopolitan core is not dissimilar to that of Britain, but the strongly etched physique makes its internal structure considerably different, and there is a sharpened front between the 'densely inhabited districts' (*jinkō-shuchūchiku*) of continuing population growth and those of progressive depopulation nearby.[16]

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[15]It is so identified by S. Kiuchi and Y. Masai on Fig. 14 in *Essays on World Urbanization, op. cit.*

[16]M. Kishimoto, *Urbanization around the metropolitan areas in Japan*, Proceedings Eleventh Pacific Science Congress, 10, 1966.

An urban-rural dichotomy, however, has never been so clear-cut in Japan as in Victorian Britain, and it is not surprising that urban and rural components derived from Japanese censuses are correspondingly less meaningful.

THE THIRD WORLD — URBANIZATION AND METROPOLITANIZATION

In a cogently argued survey of international business in *The Economist* (22 Jan. 1972), Norman Macrae has forecast that "over most of the next forty years the trend may be increasingly for manual manufacturing jobs to move to today's less developed areas, while today's richer countries turn to knowledge-producing and knowledge-processing employment". Already modern technology has been transplanted in spectacular fashion to booming port-metropolises in the Far East at Hong-Kong and Singapore. Elsewhere other port-metropolises and primate cities of independent states are appearing as the first reception centres in the Third World, with mineral fields which are also scenes of capital investment as other likely growth poles.

Over much of the Third World the political fragmentation that has followed emancipation from earlier colonialism has marked out a multiplicity of independent systems, each pressing its claims for development aid from rich countries. At the same time the world powers compete for client states. These conditions are conducive to a somewhat scattered implanting of capital investment among growth points which constitute a pattern of metropolitan cities, many of them closely associated if not identified with the ports of the colonial age, and they are usually quite disproportionately large elements of as yet undeveloped urban systems.[17] Where, exceptionally, the territorial scale of system is sub-continental, however, as in India and Brazil, and metropolitan growth is not entirely confined to primate cities, the shaping of future megalopolises, or what at present may be described more modestly as growth axes, comprising constellations of urban industrial nodes, is discernible — in India notably along the Hooghlyside–Chota Nagpur axis in Bengal and Bihar and along the Bombay–Poona axis in Maharashtra, and in Brazil in the São Paulo–Rio de Janeiro axis along the Paraiba valley.

Before productive employment is available on a scale at all commensurate with the urban concentration that has already begun in the Third World, what is so aptly termed *le tertiare refuge* is already swollen by an insurgence of the rural poor. They swarm into the cities to scrape an urban existence as they thrust excessive manpower into petty trading activities, urban transport, and other personal servicies. Behind the patent evidence of beggary and destitution lies a state of chronic overmanning of service occupations. So pressing is the crisis that immediately besets these overgrown cities, with their implosion of hapless poor in slums and shanty-towns, and so weak and limited the infrastructure that has yet been provided, that it is difficult to see beyond an early phase of extremely concentrated industrialization and exaggerated metropolitanization. That the rundown of the farming sectors of their populations will continue to supply a great influx of poor people into cities in advance of provision of adequate housing and basic services, and even of work opportunities, is only too likely.

Nevertheless the sheer vastness of some continuous areas over which proliferating peasants are spread in the Third World, and the enormous potential for urban growth that their pressure presents must mean that mankind can only

[17] A. E. Smailes, Urban systems, *Trans. Inst. Brit. Geogr.*, 53, 1971, pp. 1–14.

look hopefully to more general extension of industrialization there. Regional and local opportunities for productive, as well as service, employment must spread to affect cities and towns over the nascent urban systems. Only in so far as a measure of such diffusion of gainful employment is achieved can there be promise of any real solution of the problems attendant upon population growth in these countries.

CONCLUSION

The relative poverty to which the Third World is condemned for years to come by a persisting, oppressive problem of population explosion while the demographic transition is worked out must point there to a future of urbanization and especially metropolization. On the other hand, the wealth of advanced countries and its diffusion among their peoples point increasingly to a more open texture of settlement, with less local crowding of buildings in continuously built-up areas that are urban in the strict sense. On a macro-scale, however, continuing implosion of growth and welfare in favoured regions, of megalopolitan character, to which other metropolitan regions are attached ever more strongly, may be expected. Concomitant withdrawal from the marginal territory of national settlement systems seems inevitable.[18] As capital investment in the necessary infrastructure is built up in the former, a relatively deprived situation must hold out less and less attraction.

POSTSCRIPT

This paper has deliberately omitted to consider the countries of the Socialist World, where spectacular urbanization and industrialization have also been experienced in the past half century. These processes have taken place as modernization has seen increasingly productive agriculture make possible the transfer of labour to industrial production, with concomitant movement of people from the countryside into towns and cities. The author's limited acquaintance with these countries partly explains the omission, but equally important is his recognition that economic and social aspirations, and the political framework in which they are being realized, are significantly different in their emphasis. Nevertheless some pointers seem clear.

Further reduction in farm employment is certain as efficiency continues to increase. Although the industrial sector will doubtless increase further, and under state planning may even exceed the proportion of the workforce that industry has ever attained in Western systems, the application of the most modern technology, with its emphasis upon automation, must before long free an increasing proportion of workers from essential production. Especially is this encouraged by the absence of capitalist emphasis upon production for deliberate obsolescence. And just as the kinds of production which continue to be emphasized may be considerably different from those in Western economies, so also the sort of service provision must depend upon the conception of welfare that is accepted, and this may differ considerably from that currently pre-

[18] A somewhat different view is advanced by J. L. Sundquist in a recent book, *Dispersing population, What America can learn from Europe*, 1975, but the above conclusion is supported and illustrated by a recent geographical analysis of welfare in New Zealand, a notably egalitarian and modernized country. See R. J. Johnston, Who gets What, Where, and How in New Zealand, *Geography*, 4, 1975, pp. 255–268.

vailing in the non-socialist world. What is certain is that command of resources in the foreseeable future will become so effective as to satisfy relatively inelastic requirements such as for food and shelter and the more elastic, but hardly insatiable, demands for consumption goods, and free people to pursue the good life as it may be conceived.

In this advance, so far as Poland is concerned, it may be expected that further urbanization will fall appreciably short of the figures of 75% or more that have been reached earlier in the West. While further industrialization is likely to produce a more widespread colonization of the country by factories, with attendant urbanization, it is certain that implosion within a geographically favoured heartland, with metropolitan poles in Warsaw and Cracow–Katowice will be further emphasized. This has been determined by the infrastructure that is already established. The country's geographical endowment and historical inheritance make a radically different pattern inconceivable now, although modifications are to be expected as planned regional development proceeds.

Poland, like some other countries of eastern Europe, has now reached a stage in its modernization when a traditionally agricultural and therefore rural society has become one in which considerably more than half its active members are engaged in non-agricultural employment and more than half the population live in towns and cities. It has reached a stage which matches that of England in the middle of the nineteenth century, but the technological, socio-economic and political conditions are vastly different from those of Victorian England.

Man's measure of freedom to organize space to his benefit now makes it possible to achieve a regional balance in spatial dispositions and the national settlement system that can provide the setting both for an efficient economy and a healthy society to a degree that transcends any opportunity that existed when Victorian Britain reached this transition point from an agrarian rural to an industrial urban society.

Geographers in 1977 have an equipment of knowledge and experience and a command of diagnostic tools and data that can enable them to make an important contribution to the achievement of desirable goals in national, regional, and local planning — a role which in Poland, under the leadership of Professor Stanisław Leszczycki, they already have had an opportunity to play and which they have already demonstrated their ability to discharge.

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PROLEGOMENA TO A HISTORY OF THE PACIFIC

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In his introduction to the monumental volumes of Pierre and Huguette Chaunu, *Seville et l'Atlantique*, Lucien Febvre calls for

studies of maritime relations, these reconstructions of the histories of oceans considered as real entities, historical personalities, as factors of prime importance in the collective effort of man...[1]

The work on which the author of this paper is now engaged, a general history of the Pacific, is designed as a contribution, or at least the first outline or check-list, for such a study. For the terminus, there is a choice of dates, from 1898 to 1945, and this will be determined by the progress of the work and the strength of the author; for the beginning, Magellan imposes himself, since strictly speaking there was no such thing as 'the Pacific' until in 1520–21 he traversed the huge expanse of waters which then received its name. Nevertheless, the ocean had an intellectual prehistory, in the debates going back to classical times on the questions of the sphericity of the earth and of the Antipodes; and although as a conceptualised entity the ocean is a European (and latterly American) artefact, its islands had a concrete prehistory in the more usual sense of the word: both will demand some attention.

Europeans were not of course the first 'discoverers' of the shores and islands of 'the Pacific'. For those who lived on its continental shores there was an objective entity: here a mysterious and limitless expanse of strangely salt water; there an avenue for active but littoral or thalassic, not oceanic, trade; for the islanders of Oceania, this expanse provided if not a highway, then at least a net of local ways with a few widely-known nodes within an extensive but closed system. For neither group, however, did this entity correspond to 'the Pacific': it could not do so, since they were not aware of its bounds. For the Europeans themselves, the establishment of a Pacific entity took time; Balboa in 1513 did not see 'the Pacific' but the 'Mar del Sur', the South Sea, and so it remained, in common speech and very generally in maps and academic discourse, for over two centuries: Charles de Brosses in his *Histoire des Navigations aux Terres Australes* of 1756 used 'Mer du Sud' exactly twice as often as 'Pacifique', and in the seamen's reports he cites, the proportion is seven to one. One may suspect that 'the Pacific' did not become standard usage until the fur-traders following Cook, and after them the whalers, brought European shipping north of the Equator, into seas until then scarcely traversed except by the annual galleons between Manila and Acapulco. Yet the process which will be the general

[1] SEVPEN, Paris, 8 volumes, 1955–59, p. XV (Introduction).

theme of the work — the turning of the greatest blank on the map, an emptiness crossed by one thin line (Magellan's), into a network of communications and exchanges (cultural as well as commercial) and a focus of global-competition — goes back long before 'the Pacific' took form: to the Luso-Castilian struggle over the Spice Islands, the founding of Manila, the raids of Francis Drake, of Dutchmen and buccaneers, on Spanish ports and trade-routes.

The theme, obviously, has a strong geographical component: the objective is in fact an outline of the geostrategy of the ocean. Nevertheless, a most difficult part of the task, perhaps the most difficult, will be concerned not so much with what geographical elements should be included, as with what must be excluded. Our Pacific is not the Mar del Sur of the 16th century, not even the South Seas of the 19th; and in assessing the human response to its immensities, one must always consider the setting as known at the time: an essay in the difficult art of controlled forgetting. So far as may be, the specifically geographical component will be presented not directly, in the manner of those introductory sketches of the geography so dear to conventional national historians, but as it were allowed to unfold, as it presented itself to the actors on the stage. The charts of Pacific winds and currents familiar to us are misleading if taken as providing the rationale for human activity in an earlier age: it took the Spaniards over forty years to establish the return track from the Philippines to Mexico, which looks so obvious and easy on our maps; and indeed the sailing courses were not perfected into a complete system until, in the mid-19th century, Matthew Fontaine Maury codified an immense number of observations in *The Physical Geography of the Sea* and other works. It looks obvious, again, that it would have been advantageous for the Manila galleons to have had an American base, even if only a way-station, much further up the coast than Acapulco; and indeed Monterey was cast for this role as early as 1603.[2] But the real need, which could not be met, was for a port of succour in the stormier seas over towards Asia; there was nothing in California (as known) to warrant the costs and risks of settlement, which had to wait until a change in the geostrategic position — a change arising from the Russian thrust into Alaska in the 18th century.

The over-riding question in a broad synoptic survey must always be that of selection, of limitation; and this holds in social and cultural as well as the geographical sectors. The domination of the world by the West from at least 1800 to 1950 is a cardinal fact of history, and cannot be gainsaid; much of the study must therefore deal with the inter-relations of Western powers in the Pacific. The shaping of the Pacific, its very name, are European. But of course the Europeans did not work in a vacuum, and to understand their actions one must have some idea of the nature of the polities they met, both on the bordering littorals and in the islands of the ocean itself. To attain and present this is a delicate and difficult task. For the greater civilisations on the shores of the Ocean, east and west, one is perhaps entitled to take some general ideas as read: on the necessitated scale, one cannot go into detail (even were one competent to do so) on Aztec and Inca society. But one can at least pick out some significant features which facilitated the Spanish Conquista and which left permanent effects on the structures which the Spaniards built, mortared as they too often were with the blood of the Indians. *A fortiori* much the same will be the

[2]See the account, by Fray Antonio de la Ascensión, of Vizcaíno's voyage (1602–03) in H. R. Wagner, *Spanish Voyages to the Northwest Coast of America in the Sixteenth Century*, 1929 (reprint Israel, Amsterdam 1966), pp. 245–47 and pp. 275–83; cf. W. L. Schurz, *The Manila Galleon*, Dutton, New York 1959, 232–44, and C. E. Chapman: *A History of California: The Spanish Period*, New York 1921, pp. 138–42.

case with the great Asian civilizations; though here the stress must naturally be more on the factors that impeded, not facilitated, Western domination, which was never able to impose its own terms to anything like the extent possible in America, except locally and briefly in parts of the 'Dutch East Indies', most of the islands of Oceania, and all of Australia. In the major realms — ancient Mexico and Peru, China, Japan, Indonesia — there is a plethora of excellent secondary works and, while interpretations are open to constant revision, the actual events and the main factors are pretty standard and pretty well-known.

The island societies actually within the Pacific are less vast and multiform, but even more difficult to treat: the material for an assessment is much more scattered, and also much more dynamic in that the historical perspective changes very rapidly with the progress of archaeological and anthropological research. The work is a history of the Pacific, not of the Pacific peoples; nevertheless, for the island peoples the Pacific as an entity is far more all-embracing, their relations with it far more intimate, than is the case with Mexicans, Peruvians, Chinese, or even Japanese and Chileans. This warrants independent treatment not only of the local response to the Euro-American impact expressed in the island kingdoms of the 19th century — Hawaii, Tahiti, Samoa, Tonga, Fiji — but of the pre-contact history of Oceania.

The question of geographical limits is not easily resolved: just as Chaunu must spill into the Pacific, so must a Pacific study spill over into the Atlantic, or at least the Caribbean: for Panama was a node centuries before its Canal was built. But in the particular case, the impulse came from the Atlantic, and the spill is only a limited counter-eddy, across the Isthmus to Puerto Belo and its annual fair. On the other side of the Ocean, the delimitation of what areas should be included in a Pacific-centred study is a much more complex problem.

Except for trade relations, perhaps only at certain critical points of time, and for some attention to its role as locus for imperialist manoeuvres at the turn of this century, probably not a great deal need be said of China. It is not only marginal to the Pacific, screened off from it by the island-arcs, but in itself surely the acme of continentality — even though the Muslim eunuch Cheng Ho took fleets, greater than those of any contemporary European monarch, as far as East Africa, returning to Canton from his fourth voyage in August 1415 — the very month in which the Portuguese initiated the whole European expansion by capturing Ceuta from the Moors [3]. Japan, on the other hand, is totally Pacific; the worst difficulty for the Western historian here is linguistic, and he may well be grateful that the Japanese policy of exclusion, not building anything larger than a fishing-boat, took them out of Pacific history for two centuries!

In the insular world of Southeast Asia relationships are intricate. The Moluccas, the Spice Islands *par excellence*, were the magnet drawing Magellan and the early Spanish expeditions across the Pacific, but they lapsed, as it were, from a Pacific into a Southeast Asian role when the Portuguese maintained their hold by the Treaty of Zaragoza in 1529, and again later when the Dutch finally repelled Spanish probes from the Philippines. But Portuguese and Dutch approached the archipelago by the Indian Ocean, and its connection (in historic times) with the Pacific is rather tenuous, except to a limited degree as providing a base for Pacific explorers (for instance, Tasman's voyage of 1642 around New Holland to New Zealand and Fiji) and, more frequently, a relief-station

[3] Ma Huan, *Ying-yai Sheng-lan: The Overall Survey of the Ocean's Shores*, trans. and ed. J. V. G. Mills, Hakluyt Society, Cambridge 1942; J. Needham, *Science and Civilisation in China*, Cambridge University Press, Vol. 4, 1971, pp. 486–503.

for ships which had crossed the Pacific: it would be interesting to determine just when Batavia replaced Guam in this role. For the Indies, the Indian Ocean approach is more significant; and there is also the significant difference between American and British attitudes, culturally and politically as well as economically, stemming from the fact that the British, like their predecessors from Portugal and the Netherlands, came round the Cape of Good Hope, from the west and south: hence to them India was always the primary Asian entity, while to the Americans, coming to Asia straight across the Pacific, it was always Japan or China; whence much of the secret and some of the public history of World War II.

In contrast to the Indonesian archipelagoes, the Philippines have had a constant Pacific significance since Legaspi founded Manila in 1571. Intrinsically the group did not amount to much — Spanish economic development was slight, even under the Bourbon reforms and in the 19th century; but Manila had a key role as the Asian entrepôt in the great shipping system, spanning two oceans, Macao–Manila–Acapulco–Vera Cruz–Seville. This commercial axis was disrupted when Mexico gained independence in the 1820s, though the Mexican silver peso long remained dominant in the financing of East Asian trade; but the direct trans-Pacific link was revived, with new dimensions and new functions, by the American taking of the Philippines in 1898.[4]

The problem on the eastern shores of the Ocean takes a rather different form: it is not so much a matter of which units are properly comprised in the Pacific realm, but of delimiting, for any one unit, how much should be included. On the Asian side we have archipelagoes and (in the north) peninsulas, set off from the main landmass by marginal seas: except for China, which in modern times has had as a rule only a very restricted maritime facies, whole units — Japan, Formosa/Taiwan, the Philippines — can be taken in. But from Alaska or indeed Kamchatka right down to Tierra del Fuego (and again on the eastern Australian littoral), the coasts are of 'Pacific' or 'Dalmatian' type, with major relief features lying close and parallel to the general run of the coast. European settlements are ocean-oriented and indeed, in the reality of communications if not on the map, often virtually insular. For North America, this persisted right up to the second half of last century, till the building of the trans-continental railways; and in South America even today, many important centres are accessible for bulk trade only by sea. But one cannot restrict their hinterlands to the narrow littorals and it becomes a question of where to draw the line.

Chile is obviously no problem at all, and Peru, despite its great plateaus, not much of one; but from Tehuantepec in southern Mexico northwards, it is very difficult to set bounds: pragmatically, one may simply accept 'the Pacific Slope' of American geographers — British Columbia, Washington, Oregon, California. But certainly Acapulco and the ports from Guayaquil south must in some ways be considered as Pacific islands.[5] Seapower has been of greater significance in South American history than is generally recognized; right at the beginning of the Spanish dominion we have a preview of the Wars of Independence and the War of the Pacific (1879–81) in the only bloodless phase of the

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[4]P. Chaunu, *Les Philippines et le Pacifique des Ibériques*, SEVPEN, Paris 1960; J. McMaster, Aventuras Asiáticas del Peso Mexicano, *Historia Mexicana* VIII (1958–59), pp. 372–99.

[5]Cf. S. Zavala, *El Mundo Americano en la Epoca Colonial*, Porrua, Mexico, 1967, Vol. I, 15; J. Basadre, *Chile Perú y Bolivia Independientes*, Barcelona/Buenos Aires 1948, p. 477.

bloody civil wars of the Peruvian conquistadores, the naval 'campaign' which enabled the reassertion of royal power against Gonzalo Pizarro.[6]

Yet another problem of limits is suggested by the question: how far dare one go down the innumerable fascinating by-ways one meets in these explorations? As example, for some forty years, between the Dutch founding of Fort Zeelandia in 1624 and its capture in 1662 by the Chinese sea-rover (and patriot) Cheng Ch'en-kung or Coxinga, Formosa was an important strategic base for the Netherlanders, whether for military activities against the Spaniards or commercial activies in Japan. After the new Manchu dynasty had wrested it from Coxinga's son in 1681 its history, however interesting for its own inhabitants, virtually recedes from general history until in the 1870s it becomes a bone of contention between the Chinese Empire and a Japan making its first trial run in imperialism. External contacts were confined to an occasional shipwreck, a marginal involvement in the British 'Opium War' of 1840 and a rather nominal opening after the Anglo-French 'Arrow War' of 1856–58 — and the visit in 1771 of Count Benyowski, who had fought with the Confederation of Bar and was escaping from captivity in Kamchatka. One would gladly excerpt at length from his vivid narrative; and yet, on the oceanic scale, does he warrant even a footnote? [7]

Again, Nootka Sound on Vancouver Island has a legitimate and important place in general Pacific history: it was there that Captain Cook's people got, by barter with the local Indians, the sea-otter skins which were in great demand in China, and so in a few years triggered off the first major maritime — not just littoral — commercial intrusion into the North Pacific. It also led to the Nootka crisis of 1790, which brought Spain and Britain to the edge of war: the British diplomatic victory was potentially a catastrophic breach in the battered but still standing Spanish monopoly of Pacific-American trade, but the effects which it might have had were swamped by the greater upheavals of the French Revolutionary Wars.[8] So far, then, Nootka has a place; but what of the details? These include the disreputable dealings of John Meares and Richard Cadman Etches, global operators whose careers are fascinating but somewhat shady — Etches even tried to interest Tsar Alexander I in a quasi-piratical expedition against Aden and Jeddah! — but also, alas, irrelevant on our scale.

What may well be significant about Etches — and this point does not seem to be taken in the voluminous literature about Nootka — is that he directed one of his captains to send his reports back 'under cover to George Rose, Esq., Treasury' — and Rose was no mere Treasury clerk, but Pitt's right-hand man on finance.[9] This indeed is a clue well worth following up; but on the monographic, not the synoptic level. While the importance of Nootka must be recognized, both in the initiation of the sea-otter skin trade and as a crisis in power relations, what is quite as significant in the broad view is that the fur trade overland, in Siberia and Canada, was older than Nootka; and with the same economic base — furs, in a savage and almost empty country, at the end of trans-continental or trans-oceanic lines of communication — we find the same mechanism of exploi-

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[6]Garcilaso de la Vega, *Royal Commentary of the Incas and General History of Peru* (Madrid 1609), trans. H. V. Livermore, Texas University Press, Austin/London 1966, Vol. II, pp. 980–1129 *passim*.

[7]For Coxinga and Benyowski, see *i.a.* W. Campbell, *Formosa under the Dutch*, London 1903 (reprint Ch'eng-wen, Taipeh 1967), pp. 383–458 and 518–38.

[8]The fullest recent account of the Nootka affair is in W. L. Cook, *Flood Tide of Empire*, Yale University Press, New Haven 1973.

[9][John Etches], *A Continuation of an Authentic Statement... relative to NOOTKA SOUND*, London 1790, p. 29.

tation: the Company with a Royal Charter, whether Hudson's Bay from Charles II or Russian American from Paul I. And here the overland and the oceanic approaches converge into a pretty geopolitical tangle: so much so that almost the only Anglo-French defeat in the Crimean War was at Petropavlovsk, while, on the other hand, the Hudson's Bay and Russian American companies had a formal agreement, condoned by their Governments, to preserve their neutrality.

And, as a last ironic comment on this question of limits and by-ways, one may mention the real mystery of Nootka, a startling error in the history of imperialism: Spaniards and British agreed to leave the inlet to the local Indians. It is still in their hands, and when the British Columbia Historical Society set up a monument to mark the 150th anniversary of the Nootka crisis, a key speech was made by Chief Napoleon Macinna, a direct descendant of the Chief Macinna who had neatly played off all parties — British, Spanish, Yankee, and nondescript traders — in 1790 ...[10]

Cheng Ho, Magellan, Pizarro, Tasman, Coxinga, Etches, Meares, Benyowsky, Heyerdahl — they personify just samples of the topics and problems involved in an over-view of the Pacific 'considered as a real entity, an historical personality ...'; there are so many others. Was there really anything in supposed Russian and French designs on California in the 1840s, or that (alleged in French diplomatic documents) for an Anglo-Russian conquest of Japan in 1776? Probably not, especially in the latter case; but at least they indicate the interplay of interests.[11] Why did it take some Indians of the Pacific Northwest no time at all to grasp European trading notions, and to proceed to corner markets in the best entrepreneurial manner? How significant was the rapid dispersal of Hawaiians, as employees of European entrepreneurs, to the northwest Pacific shores? To what extent did the mercantilist cold war, rather than the advancement of learning, motivate the great 18th century explorations, Cook, Bougainville, and the rest? Why, after the triumph (or at least semi-triumph) of American 'Manifest Destiny' in the Oregon dispute of 1846, did the vision of Pacific Empire fade for nearly half a century? [12] On some such topics one may be able to distil more specialized work into a useful summary; on others, merely to hint that there is something worth pursuing; but always the aim must be to show interrelations.

If it would take a life-time to visit all the shores and islands of the Pacific, it would take nine or ninety-nine lives to explore fully the vast literature of that great deep: the Spaniards for instance recorded *everything* — in 1544 two shoemakers had arrived in nine-years'-old Lima and had the fact established by an impressive document drawn up by a notary.[13] One cannot hope to make a full survey; but one can put down judicious soundings, and one may hope to lay out one's lines with enough intelligence to bring out the main lineaments of the Ocean. Put simply, the aim is a general chart, with a few insets of coasts and harbours; the objective is to give the specialist a framework of general reference, so that the expert on one particular sector can get a first

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[10]British Columbia Historical Society, *Annual Report* No. 2, 1924, pp. 17–36.

[11]Anon., *On the Ambitious Projects of Russia in Regard to North West America*, London 1830 (reprinted Book Club of California, 1955); A. P. Nasatir, *French Activities in California prior to Statehood*, Stanford University Press, no date (?1940); G. Lefèvre-Portalis, Project de Conquête du Japon par l'Angleterre et la Russie, *Annales de l'Ecole Libre des Sciences Politiques*, Paris, IV (1889), pp. 434–56.

[12]Cf. the bitter complaints of national neglect by the Californian editor J. M. Crane in *The Past, the Present and the Future of the Pacific*, San Francisco 1856.

[13]J. Lockhart, *Spanish Peru 1532–1560*, University of Wisconsin Press, Madison, 1968, p. 68.

approximation of some impinging sector: the state of the art about it, areas of general agreement or controversy, the lines of enquiry being opened up, at least a few main and authoritative sources for his own further investigations.

Of course, there can be no doubt at all that, on the scale of treatment dictated by so large a design, the specialist will find superficialities and perhaps downright error in his own specialist sector; certainly errors of detail. This is the hazard of the generalist game; but it is a game which may bring great rewards in new insights, and is certainly great fun to play. As for the success with which it is played — that is of course altogether another matter. One can only do one's best, trust in God or Clio, and get one's footnotes right.

In such an enterprise, there will be errors and omissions, faults of emphasis, failures of understanding. But there will also be, given reasonable competence, honesty, and luck, a useful synthesis, some revealing juxtapositions of phenomena usually thought discrete, some stimulating leads to further research and more insightful interpretations. The cartographical simile is irresistible: even the greatest navigators went astray — Cook himself, misled by the wrong longitude given him for Santa Caterina, failed to find Bouvet Island and more than doubted its existence. So the historian who attempts so oceanic a theme will probably take wrong courses, fail to sight islands which a little more perseverance on the track would have revealed to him, find some coasts so shrouded by mists that the true position is uncertain, become becalmed in doldrums of irrelevancies ... There are some well-charted seas with excellent guides; others are studded with reefs, and the lights and sea-marks are very uncertain. But it will surely prove an exciting navigation.

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ENVIRONMENTAL HEALTH IN DEVELOPING COUNTRIES

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CONCEPTS OF ENVIRONMENTAL HEALTH

For a long time activities in the public health field were organized principally around the concept of disease control. More recently, applications of this approach have tended to center upon efficiency analysis of health needs and cost effectiveness analysis of delivery systems, or on economic development. At the same time the idea of controlling environmental pollution gained prominence as a central concern of regulatory activities. A broader concept of human well-being in particular environments is now emerging. It draws together the other concepts and thereby emphasizes the harmonious relationship of human life to life-supporting systems, and thereby encompasses a wider range of human needs and of factors affecting their attainment.

THE DISEASE-CONTROL TRADITION

The control of specific diseases, especially communicable diseases, and of certain types of accidents, especially industrial accidents, has been at the heart of a large proportion of public health analysis and of preventive medicine. Under this view environmental health is considered as being attained when the incidence of specific diseases and of accidents had been reduced to a level judged to be the lowest practicable within the limits of physical and social action available to curb them. Any case of typhoid fever or life lost from hurricane flooding is seen as preventable and to be prevented. The appropriate action thus is open to a kind of benefit-cost analysis in which the cost of a preventive measure might be compared with the social benefits to be gained from reduction in the disease or accident.

A more positive view is taken in the World Health Organization's definition of health as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity." This shifts emphasis from the negative items of disease to qualities of daily life. It has the disadvantage, however, of directing attention to disease and to social indices of physical and mental health rather than at the fabric of individual and community life in which disease occurs and is generated. Moreover, when placed in practice it tends to be expressed in terms of operating programs rather than expected outcomes.

DELIVERY SYSTEMS TO MEET HEALTH NEEDS

The customary view of health delivery systems as revolving primarily around physicians, nurses, midwives, and para-medical personnel organized in offices, clinics, or hospitals also requires expansion to include the public services directly or indirectly administered under public agencies. These include: community water supply, community waste disposal, air quality control, food handling and storage inspection, housing quality regulation, family and planning services.

Often, a delivery system is organized around the practicability of managing it rather than around the ultimate impacts upon the human population affected. For example, in recent years there has been lively and dramatic concern for the health effects of introduction of toxic substances into natural distribution systems. Public activity in halting the distribution of mercury in waters affected by pulp plant effluents is relatively intense in a number of countries. At the same time, concern for promoting breast feeding among mothers as a means of assuring adequate health on the part of infants is largely neglected. The social effect of toxic substances is several orders of magnitude less than those of practicing breast feeding during the first six months of life. Indeed, the introduction of health delivery systems patterned after those of Western countries discourages breast feeding even though this is the only satisfactory way — on grounds of cost, convenience and freedom from contamination — of assuring adequate nutrition for the young child in a developing country. Like the nocturnal car driver looking for his lost keys under the street light because the illumination is better, health workers tend to concentrate on those delivery systems lending themselves most readily to whatever administrative and financial management is available.

POLLUTION CONTROL

With the spread during the late 1960's of concern for the maintenance of the integrity of environmental systems, the concept of pollution control was added to the others. As voiced by the Special Meeting of Ministers of Health of the Americas in 1969 (Official Document, PAHO 89, p. 35), it holds:

> In the years ahead the governments will have to cope with environmental problems of greater magnitude and complexity. Advancing technology will leave in its wake a more sophisticated array of human stresses. Environmental contaminants will increase and will broaden from microbiological pollutants to those having their origin in chemical substances. Long-term exposure to toxic substances will be more significant and more difficult to diagnose, with wide separation of cause and effect. The growth of cities will aggravate problems of traffic congestion, accidents, and noise hazards. Population densities and poor housing will increase the hazards of communicable diseases and problems of mental health. In industrial complexes, occupational health will require more focused attention and remedial measures.
>
> In the future, health agencies must expand their activities to include the health-related considerations of slums, poverty, and filth; of ignorance, delinquency, and crime; and of the effects these have on the total health of the people.

Here the view of health embraces the whole range of human activities. However, the emphasis continues to be somewhat pathological, to focus on polluting actions, including stressful urban life, and their inducement of disease or social disruption.

HUMAN WELL-BEING

When the view is taken that the primary concern is with the well-being of the entire community over the long-run, less attention may be paid to delivery

systems and disease rates than to measures which affect the interaction of human and natural systems. Three types of projects illustrate the point.

A remarkable feature of economic development in tropical Africa during the past fifteen years was the construction of a series of man-made lakes intended to provide water for generation of hydro-electric power and for associated purposes such as navigation, flood control, and irrigation. These include the Sadd el Ali on the Nile, the Kariba on the Zambezi, and the Kainiji on the Niger.

The Volta Lake in Ghana is the largest man-made lake in the world, accounting for about one-fifth of the total land area of that country. After a comprehensive period of planning it was constructed under a program which gave primary emphasis to electric power production and which planned to provide the relocation of more than 80,000 people living in the reservoir area (see Figure 1). Pressure for opening of the generating works was so intense that the reservoir flooding began before studies of the population to be relocated were completed, and there ensued a long period of difficult adjustment in the livelihood and living patterns of people dispossessed of land and heritage. The responsible reloc-

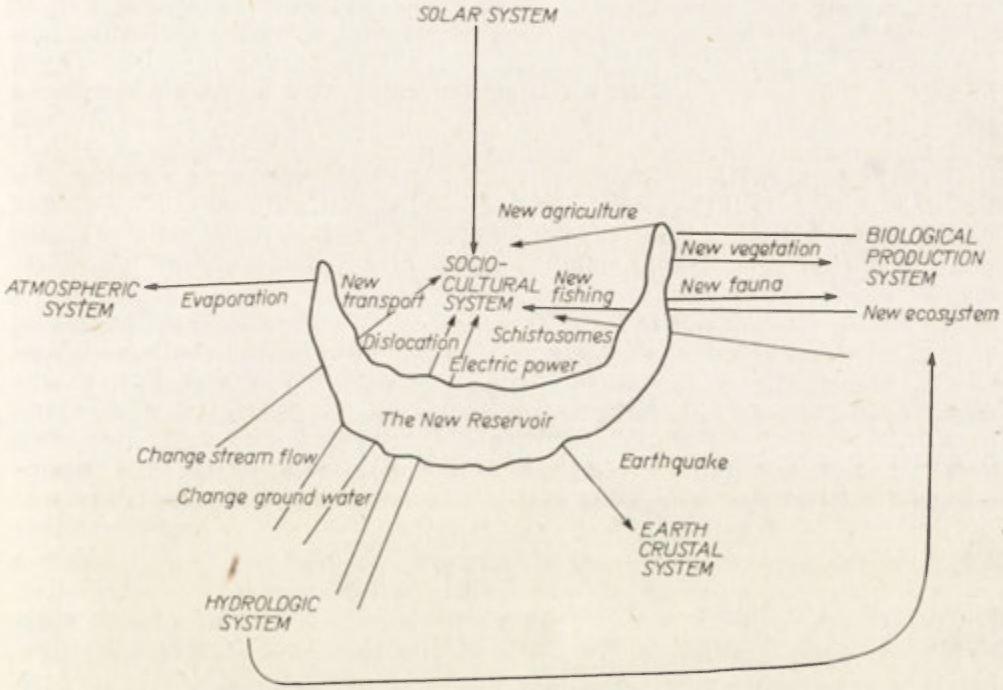

Fig. 1. Major alterations in ecosystem caused by Volta Lake

ation authorities did provide for housing, using a somewhat ingenious unit construction plan, and tentative arrangements were made to enable various groups of people to establish themselves in new agricultural land above the level to be reached by the reservoir waters.

Within three years after the initial relocation, a substantial proportion of these housing units was unoccupied, more than half of all of the population was on food relief, and the disorganization of both community and family

structure was severe. This was not because those planning the project had ignored the possibility of the impounded waters providing opportunities for spread of schistosomiasis, nor of the need for new housing, or the vital role of highways connecting the new communitites, or the need for credit and technical assistance in developing farming on the upland areas. Careful attention had been given to local water supply and waste disposal. The basic disorganization occurred because the planning had centered upon physical features and had not been directed at means of lasting livelihood in a tropical environment where the maintenance of soils is a delicate process, where land clearing is expensive and tedious, and where community organization and process was not well adapted to rapid social change.

Another example is found in pilot projects and plans for larger projects in the development of the Lower Mekong Basin of Southeast Asia. There, the prevailing problems for generations to come will be those of growing food for the rapidly expanding population and of providing alternative sources of employment for people flowing from rural areas into the burgeoning cities. There has been proper and intense concern with investigating possible ecological impacts of the dams which have been initiated or proposed for construction. This included consideration of more effective devices for promoting solid relocation of farmers. Decisions by government planners, as well as by the individual farmers who were required to move or to change their farming practices, hinged in part on the meeting of food needs and on adjustment to market conditions resulting from the new production. They also involved readjustment in soil and water management essential for the maintenance of a permanent agriculture. A healthy environmental condition will result in the long run in the Lower Mekong only if the combination of development and relocation measures produces a stable set of environmental systems as well as social activity assuring minimum income, family stability, community competence, and individual dignity and initiative.

A dramatic instance of the way in which concern for a segment of disease control or provision of delivery systems can fall short of contributing adequately to the promotion of human well-being is in water supply systems in numerous urban areas of Latin America. Many cities in the South American continent have a relatively well designed and constructed system for providing domestic water to a considerable proportion of the population. It is not uncommon to find city facilities operated so that a domestic consumer cannot draw water from a tap with high confidence that it will be free from serious contamination from infectious organisms. A city has a chlorination plant but it does not work full time or it does not work effectively. Or, the treatment is satisfactory but leaks in the pipes and defective distribution points lead to contamination before the water reaches the household. A city may have elaborate arrangements to bring water into homes that have multiple taps and are in the high income bracket, but in the interest of providing those supplies it arranges only standpipe distribution for large parts of the urban worker population. In such instances a small marginal change in the operation of a system, in its construction, or in its planning in terms of land use arrangements would have a profound effect upon the physical health and aspirations of the city dwellers. The test of the efficacy of the power plant, storage dam or water system is neither its design nor its honest and reliable construction. It is in the effect which the daily operation of the system has upon the living patterns and quality of lifestyles among those served.

LACK OF SEARCHING POST-AUDITS

Much of what has just been asserted is subject to a singular circumstance that attaches to virtually all efforts at public health and environmental management. It is the lack of precise and searching appraisals of what the exact impacts are of different schemes of development. Post-audit of any social program is at best a highly speculative effort, and it is an especially troublesome exercise for health programs. Schistosomiasis is one of the widespread infectious diseases in tropical and subtropical areas, and conservative estimates have placed the number of people affected by the disease as upwards of 200 million. It is known to be debilitating and to combine with unfortunate or fatal consequences with congenital weaknesses and other diseases. Given this information, the eradication of schistosomiasis is one of the great public health challenges. Yet there has been remarkably little effort to find out the precise consequences of schistosome infection among the affected people.

A pioneer and exhaustive study of the effects of schistosomiasis and four other parasites (hookworm, *Ascaris, Trichuris*, and *Strongyloides*) on the island of St. Lucia yields basically baffling conclusions. It fails to demonstrate significant association of parasite infection with the death rate, academic performance of students, weekly earnings of laborers, or absentee rates. It suggests that the daily productivity of male laborers on plantations in schistosomiasis-infected sections of the island is decreased as a result of the infection, and that only one parasite — *Strongyloides* — adversely affects actual productivity for female farm workers. An equivocal set of findings comes out of one of the few careful efforts ever made to tests the health effects of a particular environmental threat. We may exaggerate the consequences for working populations or we may have failed to find adequate measure of those consequences (Weisbrod, 1973).

It would be whimsical to expect solid and definitive findings on matters such as this on the basis of less carefully controlled investigations. Thus, the investigation of the community of Zaina in Kenya where a new water supply was introduced in comparison with a nearby community (without such improvements) leaves doubt as to how much of the change in local health condition was derived from the water supply improvement and how much to other changes such as in health education, if, indeed, there was a genuine change in prevailing conditions.

Of even greater significance, as Howard has pointed out, we do not understand fully why the reduction in total death rate preceded modern health programs. (Howard, 1972, p. 75). He poses the question as follows:

> Since a very high majority of the population of the developing countries ... currently have no ready access to modern health care; since only four major diseases have ever been seriously tackled on a comprehensive global scale; since the developing world does not yet have the health infrastructure or the manpower to cover more than a small fraction of its population, it is difficult to identify specific health factors which have resulted in the progressive world-wide decline in mortality with its consequent effect on population increase.

When information on the relationships between changes in the physical parameters of an area and the well-being of its inhabitants is indecisive, how much do we proceed on faith? How much do we hold off certain measures until we are more confident as to their long-term implications? It is neither common, nor palatable to raise these questions. Unless they are explored with vigor in the months and years immediately ahead nations run the risk of launching additional environmental health programs without any strong assurance of attaining the social aims in mind.

HEALTH AND RISK BEARING

The environment presents an immense array of hazards — natural and man-made — to human well-being. People make a wide variety of adjustments to these hazards and take quite different risks in dealing with them. Societies will not tolerate a hazard where loss of life is certain as with use of a deadly poison as a food additive but rarely do they provide assurance that a risk is eliminated entirely. In most instances the individual or the community adopts an adjustment that lies in the spectrum between complete vulnerability and complete prevention as when it permits air pollution that is generally harmless but might cause illness to vulnerable groups, such as the aged.

The role of the expert in environmental health centers on helping society decide what combination and degrees of risk it is willing and able to bear. Inevitably this involves tradeoff among the various risks in judging what is a practicable approach to well-being at a given stage of economic development.

HEALTH AND DEVELOPMENTAL PLANNING

Two popular beliefs about economic growth and environmental health are sufficiently incorrect so as to have a profoundly misleading effect upon public policy. One is the belief that increases in national production of goods and services will usually be accompanied by proportionate improvements in health. The other is the notion that improvements in health are essential to economic development.

It already has been shown that augmentation of gross national product *per capita* will not necessarily be reflected in environmental health. As for Volta Lake, the opposite may occur. Likewise, the way in which health advances will be reflected in economic productivity, as in the case of parasitic diseases, is in doubt. There is a great deal of loose and unsubstantiated argument, for example, that upgrading the quality of water supply will accelerate economic growth. In these circumstances the planning for environmental health as a part of economic development programs should proceed with keen regard for differences in environment and culture and for the need to assess the national and regional planning aims in relation to alternative methods and the preferences of the people affected.

TYPES OF ENVIRONMENT

It is helpful to distinguish at least four major types of environment in developing countries upon the basis of patterns of population distribution and social organization. Each has a unique combination of conditions affecting the character and achievement of environmental health.

In urban areas those parts of the population living in a well organized social system with a community government that provides basic social services are typical city dwellers in the Western tradition. They may be termed city in contrast to those parts of the urban area where the individuals dwell in temporary quarters (bidonvilles, shanty town, barrios, bustas) without formal political organization, with a highly temporary time horizon, with minimal provision of municipal facilities, and a transitory and disorganized social system. These urban peripheries account for as much as 25–50% of the urban population of developing countries (Morocco, Nigeria, and Zambia are examples).

At the rural level those populations which are arranged in clustered communities with nuclei of industrial and administrative land use, may be divided from those where the population is scattered across the countryside in irregular patterns and with commercial services concentrated in markets, market towns, and central places.

The world's population can be assigned very roughly to those classes as shown in Figure 2, and the proportion of each in developing countries can be estimated. The urban peripheries are distinctly a product of urbanization in low income countries, and the cities of those countries present generally different conditions than do the high income cities. As pointed out in a recent review of urbanization in Nigeria, "Far from being prime movers and catalysts of change, towns and cities can only too easily degenerate into national liabilities" (Green and Milone, 1971, p. 36).

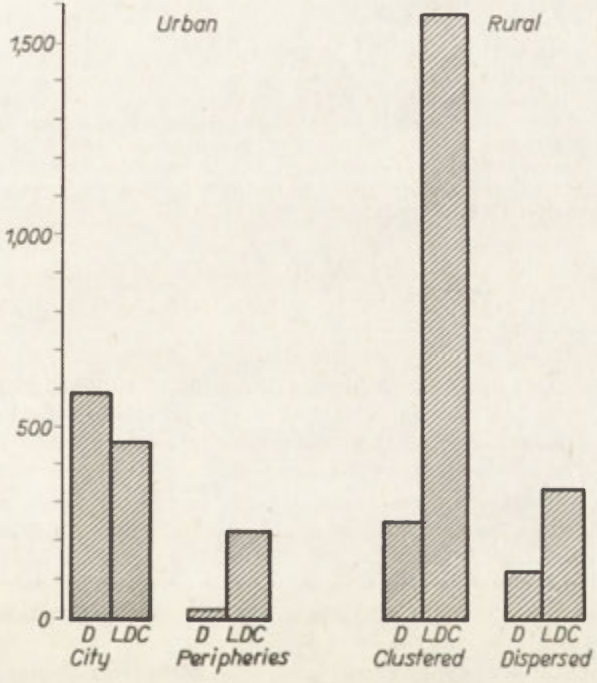

Fig. 2. Estimated distribution of world population among 4 types of settlement

NATIONAL AND REGIONAL PLANNING AIMS

In addition to lacking incisive investigations into the relationships between health activities and health, we know very little about the effectiveness of administrative and political efforts to achieve national aims. The importance of such inquiry is illustrated by recent observations by a Swedish health expert who examined the experience in two countries having similar GNP — South Korea and the People's Republic of China — in dealing with child nutrition (Mellander, 1972a, 1972b). He found in South Korea a rather heavy commitment to medical faculties, nursing schools, and health centres which were dependent upon central financing and administration and had a relatively small impact upon the nutrition of the children. Percentage of total deaths among toddlers

(aged 1–4) is 7.5. In the People's Republic of China where more than 80 per cent of the total population of roughly 800 million lives in rural communes malnutrition is nowhere to be seen, and health activities have relatively little central government help in the direction of organizing clinics or providing technical personnel. The political system and mode of planning operation is radically different between the two countries; some of the People's Republic activities obviously could not be managed under the social system prevailing in South Korea. So far, however, no developing country receiving Western aid has eliminated malnutrition. There is reason to believe that a crucial determinant of efforts to improve environmental health consists in the way in which local and regional groups see their contributions to long-term national aims. If they view their responsibilities as primarily operating specified delivery systems, their work may be quite different than if they feel responsible for achieving specified ends by whatever means seem suitable to local organization and resources. Mellander concludes his China report:

> It is easy to state that the results in China have been achieved without very much of nutrition minded activities. For example no international nutrition conferences or seminars, no unconventional proteins from single cells, leafs or oilseeds. No protein rich foods and apparently no applied nutrition projects and certainly no systems analysis, etc. What is behind the realities then? My answer would be: a genuine family level approach, providing simple food and simple advice to all families on a basis of absolute administrative priority for prevention in health service and medical and paramedical education (Mellander 1972b, p. 7).

EVALUATING PROGRAM ALTERNATIVES

A characteristic of most economic development work is that it rarely presents to those responsible for making program decisions a choice among the whole range of possible alternatives that might be used in dealing with a particular problem. An example is the treatment of crop disease in tropical countries. Usually, the public initiatives center on one or two technical measures. In some areas a particular pesticide may be strongly recommended, in other areas a mix of crops may be indicated, and in still others a different arrangement of crops so as to impede the growth of the pest. Each of these has social benefits and handicaps, but programs are presented as recommendations of a single measure rather than as a choice among options having different combinations of risks. The classic case of concentration on one technological fix is to be found in water development where the usual means of dealing with flood is to construct levees and dams to control flood flow. When these are proposed there usually is no mention of the practicability of flood-proofing buildings to resist flood damage or of readjusting land use to progressively encourage vulnerable property owners to move out of the flood plain. The result in countries as unlike as Canada, Hungary, India and Sri Lanka is that while new works are constructed the flood losses grow larger, more people are exposed to the hazard, and the stream channels degrade.

Similarly, in urban areas it is common to put forward a single plan for mass transport without the diversity of other kinds of measures which might attain the same general purposes of communication and transport. For example, decentralized patterns of land use or small-scale devicies for transport may entail lower construction costs than mass transport and avoid certain of the social costs of traffic delays, air pollution, and waste disposal (Koenigsberger *et al.*, 1971).

Neither education nor analytical method encourages a genuine canvass of alternatives in environmental management. It is a hard task and it demands a variety of skills and experience never found in one technician.

USER PREFERENCE AND RISK-BENEFIT ANALYSIS

Government agencies may take three basic stances in coping with the environmental hazards with which people contend individually or collectively in seeking well-being. They may: (1) leave the decision entirely up to the individual as in the case of rural water supply improvement in many developing countries; (2) guide the conditions in which individuals are able to exercise individual choice, as in the provision of information and materials for families interested in family planning; and (3) take direct responsibility for controlling individual hazard as when they prohibit effluents from a manufacturing plant or ban a pesticide or build levees to protect a village from floods.

In the first circumstance the user chooses with some kind of consideration — sometimes misinformed, sometimes ill informed — of the amount of benefit expected in relation to the risks involved. Where the choice is guided or controlled individuals may or may not exercise influence over what the government will do by supporting or opposing the proposed activity. Individuals as well as societies differ in the degree of risk they are willing to knowingly accept for each environmental risk at any given time.

The world situation with respect to domestic water supply demonstrates this point. There are only a few water systems that may be rated as absolutely safe from all contamination all of the time. At the other extreme, people do not use supplies that are certain to cause death. The world's population may be thought of as distributed along a scale of drinking water hazard extending from highly polluted to insignificantly polluted. Figure 3 gives a first approximation of the

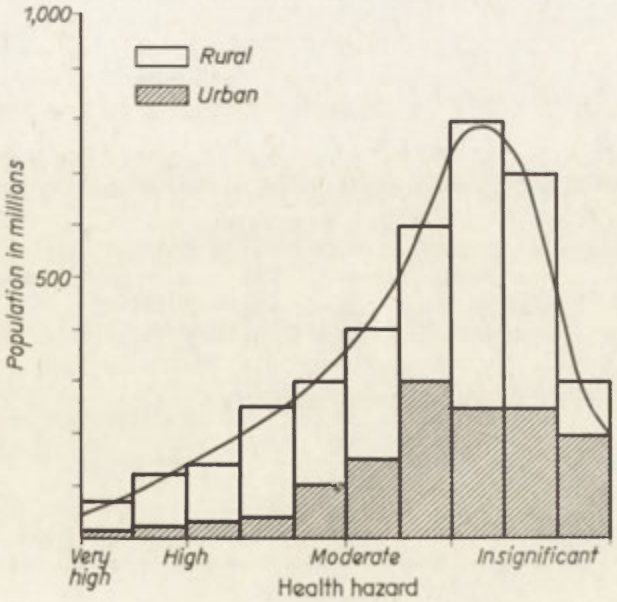

Fig. 3. Estimated distribution of world population on a scale of health hazards for 1970 (White, 1973)

numbers of people sharing in each of ten degrees of health hazard from domestic water. We know that rural people when they learn the health consequences will pay substantial costs for avoiding polluted supplies, but that their perception of the benefits may be quite unlike those of a sanitary engineer. It would be misleading to assert categorically that a certain per cent have "bad" water and the remainder have "good" water, or to go on and argue that an essential aim of environmental planning is to provide all people with completely "good" water.

In some nations this formulation of the problem leads to very costly improvements for a small proportion of the rural population while a larger proportion enjoys no improvement. There will have to be a basic change in strategies of water improvements if the world is to avoid having as many rural people on the more hazardous sectors of the risk scale in 1980 or 1990 as in 1970. The change probably must be aimed at shifting population in the direction of insignificant hazard and at giving the people affected an opportunity to decide how much risk, as they come to understand it, they are prepared to bear at what cost. It seems likely that only by harnessing the concerns of individuals and local communities to enhance their well being as they themselves define that well being will rapid advances be made. In cities a central decision can determine the risk level. In most urban peripheries, smaller communities and rural areas the preferences of the users usually will set the limits of what can be achieved through self help, local initiative and local financing.

IMPLICATIONS FOR MANPOWER NEEDS

THE CURRENT SITUATION

A frequent complaint about the pace of development in low income countries is that there is not enough trained staff in health agencies. This may seem most acute in regions such as with Latin American water supply where small, closely-knit groups may be expected to expand to wider areas at an accelerated rate (Donaldson, 1971). In a survey of the development of new African nations, Harbison concluded that their "growth, prosperity and viability will depend ultimately upon their ability to develop systematically and to utilize their human resources" (n.d. p. 23). He finds the most critical problems to be urban unemployment, rural underemployment, shortages of skills, educational systems out-of-gear with needs, brain drain, and high growth rates. The corrective measures are seen as including labor-intensive urban employment, increased rural productivity, training in new skills, renovation of formal educational systems, and building the capacity of non-formal education.

These observations probably apply to most developing countries. However, in reviewing their relevance to environmental health they need to be made specific at three points.

INTEGRATED TEAMS OF EXPERTS

Unlike some other development problems, the solution of environmental health questions inevitably calls for experts from several fields. It never can be a lone engineer or a lone medical worker — however competent — if the full spectrum of alternatives is to be canvassed.

Teams of experts are difficult to assemble and harder to get to work together. Genuinely integrated teams are jewels of great value. Yet, ways must be

found to create them and use them. These ways will not come rapidly at higher echelons, and the experience in some areas is that it is far easier to cultivate integrated action at the level of community workers than among the administrators.

UNDERSTANDING THE IMPACTS OF OTHER MEASURES

Implicit in the cooperative work of experts is the capacity to identify the numerous environmental impacts which may be expected to flow from concrete development measures. Unless they are recognized, whether or not they are measured, they will certainly be neglected. Even if identified nothing may be done about them: sometimes this is because people underestimate them as with livelihood at Volta Lake; sometimes because administrators don't know what to do about them as with certain pesticides and sometimes the corrective measures are considered too costly as with pure water for dispersed farm settlements.

Methods of carrying out an "environmental impact statement", as required under the National Environmental Protection Act of 1970 in the United States are just beginning to receive careful attention. In the absence of better methods, administrators must make long guesses or work out accomodating agreements not to challenge the guesses of others or admit to plain ignorance as to the probable effects of an environmental measure. None of these solutions is comfortable, and learning to live with the burden of uncertainty may be most troublesome. But this is the lot of environmental health; it must persistently ferret out the possible consequences of proposed actions and frequently find them clouded with doubt.

CONSUMER PREFERENCES AND EDUCATION

The third aspect of such planning is the sensitive sounding of consumer preferences when people are given adequate information about the benefits and risks involved. It is not simply a matter of taking an opinion poll: there is no direct relationship between articulated opinion and behavior. Information needs to be presented as to risks and opportunitites. Then, the preferences of users need to be determined by observation or experiment or interview.

Skill in education and finding out what choices the consumers will make is not important where the planning is central and there is little latitude for response, as in city water supply. However, in rural areas and where the consumer can choose it is crucial to effective environmental management.

EXISTING PERSONNEL

Very little education for present workers in the field of environmental health prepared them to handle the appraisal of alternatives, the assessment of impacts, or the investigation of user preferences. Some workers in practice deal with these matters with sound intuition. Others avoid them because of feelings of incompetence or inappropriateness.

To help existing personnel two kinds of action may be usepful. Stort-term or in-service training programs can be arranged. Condensed materials on methods and case experience can be developed to give both guidance and competence in tackling these new problems. Any efforts in that direction must be experimental: the experience is limited, and innovation and invention are in order.

NEW PERSONNEL

The task of preparing new personnel for the work is more complicated. The approaches which it requires run counter to most of the conventional training of professional and intermediate workers. They are encouraged to specialize and to respect disciplinary boundaries. Few clusters of professionals in Western countries have larger "No trespassing" signs on their occupational domain than do medical and engineering specialists. This is embedded in educational curricula and hierarchies which are slow to change. While in theory the place to start is in the colleges and universities, in practice the in-service training of a field operation where the multiple impacts of one environmental change are obvious may be a more promising place.

THE OUTLOOK

To continue the present emphasis upon disease control and health delivery systems is to court the probability that after another decade or two of effort on a modestly expanded level of public funding the environmental health of a large proportion of the world's population will be little better than it is in 1975. Government financial support of organized health services is unlikely to expand faster than national income. The prospective rate of growth in national product is generally small, and where it is rapid the inequities of income distribution may be so great that the side-effects of manufacturing and urban development may improve only slightly. Much of the current enthusiasm for curbing degradation of the natural environment is likely to spend itself and to sag under the weight of claims for accelerated economic growth.

Even if economic development programs were to have no explicit component dealing with health they would inevitably affect it for good or bad through perturbations in both natural and social systems. The most challenging opportunity to improve environmental health lies in shaping the emphasis of development programs so as to contribute more directly to enabling the people affected by the many hazards of the total environment to choose how much risk they are willing to bear and how much reduction in risk they can achieve through their own efforts. There is no prototype for such a change in emphasis. However, there is enough experience to suggest that the types of action deserving imaginative exploration include the organization of integrated teams of experts, the systematic appraisal of the environmental effects of development measures, and the training of both existing and new personnel to apply a unified approach in situations in which the people involved have the opportunity to select in some degree the elementary quality of well-being and corresponding risk they will enjoy.

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