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Aller au sommaire du numéro

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FRENCH, H.M. et RACINE, J.-B., éditeurs, **Quantitative and Qualitative Geography : la nécessité d'un dialogue,** Ottawa, Les éditions de l'université d'Ottawa, 1971, 216 p.

Despite and perhaps because of a decade and a half of active quantification into ever widening spheres by geographers, the cleavage between « quantifiers » and « qualifiers » persists. This division within the discipline served as the subject of a symposium held at the University of Ottawa in March 1970. The proceedings of this symposium, attended by several well-known Canadian and European geographers, are presented in this paper-bound volume as the first in a series of occasional papers published by the Department of Geography at the University of Ottawa. Professors Stanley Gregory and Jean Labasse, who typify the opposing viewpoints, served as key contributors and spokesmen for their respective approaches. Eleven others contributed in varying degrees to the discussion. Each participant spoke in the language of his choice with the result that the report is a pleasant melange of Canada's two languages.

In the introduction the editors describe the dramatic transformation which has evolved in geography with respect to *what* is being studied and *how* these studies are being carried out. The reader is introduced to two terms which are used interchangeably with quantitative and qualitative approaches, throughout the volume. These terms are « new approach » and « traditional approach ». While the meaning of these terms is always clear, it might, nevertheless, have been better to have refrained from their use since they tend to imply that any non-quantitative approach dates from another era while all quantitative approaches are new. The inaccuracy of this implication is obvious ; for example, David Lowenthal's qualitative work in perception is very new while the « gravity model » which has been used so frequently for so long by so many could justifiably be classed as traditional.

When one traces the historical development of any movement by citing the names of its chief contributors, as Professor French does in the introduction, he runs the risk of leaving out some of the very important ones. Professor Racine compounds this fault in a later chapter in which he identifies the « line of authority » of the quantitative movement as passing from Ullman to Berry by way of Garrison. Without wishing to minimize the contributions of Berry, this over-simplified genealogy tends to ignore equally important innovations in quantitative geography made by a host of brilliant students, *confrères* of Berry and students of Garrison, at the University of Washington and of others at the University of Iowa.

Professor Racine, in revealing that with the exception of Paul Claval the French economists rather than geographers have made the French public aware of geography's « new approach », calls our attention to another important cleavage which is tacitly apparent throughout the symposium, i.e., that which separates in time and space the French and North American schools of geography.

Apart from the introduction (Part I) and the conclusion (Part V), the book is divided into three sections. Part II, Quantitative and Qualitative Geography, in which Professors Gregory and Labasse define their approaches and give an example of each, serves as the basis for all discussion which follows. Part III, Problems and Concepts, Development and Trends, is as its title would imply a somewhat « mixed bag ». The em-

phasis is perhaps placed upon the need for and the problem in applying quantitative techniques of analysis to various geographic problems. Finally, part IV, the Necessity for Discussion, reflects the same themes as part III but with more and shorter presentations.

Professor Gregory concurs that « certain data of geographical relevance cannot be measured », but recognizes this to be of only minor importance for quantitative analysis goes beyond the question of data — the use of numbers — to one of fundamental intellectual approach. He finds it strange that many within our discipline are apparently proud of the fact that geographers cannot or do not apply the processes of logical reasoning and enquiry that the pure and social sciences have sound rewarding. Owing to this soomewhat unusual scholarly mentality, our discipline has been basically « undisciplined », lacking a genuine theoretical base to guide our scientific investigations. Only the quantitative approach can fill this void and enable geographers to more effectively carry out these investigations. Gregory's approach is illustrated by an interesting multiple regression analysis of the orographic component in rainfall distribution patterns in Sierra Leone. While his approach is well illustrated by the example, it would appear that the researcher neglected to establish the independence among the independent variables with the resultant effect of weakening the analysis.

In defense of his position, Professor Labasse seeks to identify and isolate the problems he sees in quantitative geography. Despite two dangers Labasse does not wish to reject quantitative methods but protests against their pretentiousness, i.e., the « excess of their ambitions and absolutism ». The two dangers which he sees are in reality the same one. The danger is that the geographer who analyzes isolated quantifiable variables abstracts so completely from the « real world » that his capabilities as a scientific observer and his ability to understand reality are diminished. He concludes his position statement with two very curious ideas. First, he expresses the desire that geography's purpose not be one of analysis of *spatial systems*, but rather one of *spatial combinations*. The reader is left with the lingering question of what the difference might be between these spatial constructs. Second, he hypothesizes that the retarded development in quantitative analysis in Europe is historically and culturally determined, attributable to a different European conception of space relative to North America and to the « supercharged » history of Europe.

An article which originally introduced his book *l'Organisation de l'espace* illustrates Professor Labasse's point of view. In it we see how Labasse applies his vast geographic knowledge and wealth of experience in actual planning for the study of spatial problems. He stresses the importance of the human element in space and introduces the concepts for which he is well known, *harmonization*, *diversification* and *proportion*.

Henri Reymond's comments in Part III echo the theme of Alvin Tofler's *Future Shock*, i.e., humanity is evolving so rapidly that man must find new means to cope with the problems posed by this evolution. Reymond's thesis is that only quantitative geography is capable of taking up the challenge imposed by a rapidly changing geographic milieu. He cites two example of this rapid change : (1) consumption outstripping resources and (2) « knowledge overload » or the accumulation of information at a rate faster than the rate at which the information can be digested. He leaves it somewhat unclear, however, as to how quantitative geography could solve these problems. In the case of the latter, it seems quite likely that the differential accumulation and digestion would increase through the use of quantitative methods. In any case, Reymond establishes himself as a true disciple of the quantitative method.

Rolf Wesche, on the other hand, takes a position equally as strong as Reymond, but as a non-believer. He re-echoes Labasse's warnings and adds one of his own. He maintains that the poor quality of data on developing countries prohibits the use of the quantitative approach except, perhaps, at the macro scale. While Wesche is undoubtedly correct in his evaluation of third world data, it would seem that these inadequacies should

not preclude the consideration of the most rigorous of geographical analyses, namely the quantitative approach. While recognizing the importance of cultural factors, it would make sense that scientific sampling techniques would be useful in the collection of « good » data for further analysis, qualitative or quantitative.

David Douglas's purpose is to illustrate the importance and applicability of the electronic computer to cartography and to show how cartography is an integral part of quantitative geography. He accomplishes very well the first objective in a concise functional description of an electronic computer and its auxiliary equipment. The popular SYMAP program is described and a sample output shown. Douglas states that SYMAP is the « most popular and useful mapping program available ». This assertion is undoubtedly correct if one is only concerned with choropleth maps. If, however, one is more interested in spatial series and continuous variables, SYMAP is not as appropriate and other programs are more useful and just as popular, e.g., trend surface. If one makes the traditional assumption that geography and cartography belong together, an assumption which tends to be weakening in many quarters, then Douglas also accomplishes his second objective.

The geographer who is just beginning to utilize quantitative techniques faces two problems, according to Hugh French : (1) the necessity of mastering the arithmetic associated with various statistical methods and (2) the choice of the method most suitable to a particular purpose. Unfortunately many do not learn to overcome these two problems yet still utilize the method. French points out the reticence or inability of geographers to normalize their data in order to comply with the assumptions of normality which underlie all parametric tests. He suggests, therefore, that they make better use of the non-parametric tests for which normalization is not necessary but which are sufficiently powerful in their own right.

Racine's theme in Part III is « quantify to better qualify ». He recognizes certain problems which are common to both approaches, especially that of *scale*, but expresses very well how the quantitative approach is better armed to solve this problem.

Part III concludes with some reflections by Bryn Greer-Wooten on systems analysis in geographical research. He points up the differences between systems analysis and General Systems Theory in geographical research. He then outlines the field theory approach originated by Lewin in the systems terms of two of its proponents, Berry and Rummel. Finally, Greer-Wooten attempts to show how field theory propositions are derivable from an extension of Berry's « geographic matrix » arguments.

The series of short communications in part IV give opinion and raise questions with respect to the discussion. There appears to be more questions than opinions though Professor Elizabeth Lichtenberger states categorically that at the present time it is impossible to integrate the two approaches. Professors Labasse and Gregory conclude this section by attempting to put into perspective the various ideas and concepts expressed during the symposium and to correct any ambiguities or errors which might have been introduced during the evolution of the proceedings of the day.

Finally the volume concludes with a hope and a plan. The plan is for the improvement of geographical studies through the use of the scientific method. Description, hypothesizing, experimentation, and discovery are the explicit steps cited without which geographers cannot arrive at scientific knowledge. The hope is for the reconciliation of the quantitative-qualitative dichotomy with the effect of developing a general « geographical » methodology which might, in turn, eliminate such other dichotomies in the field as the old problem of determinism — possibilism and the more recent though equally hackneyed question of the regional approach versus the systematic.

This book makes a contribution to the geographic literature, perhaps not so much for the new light which it sheds upon this persistent division within geography, but

because it is the results of an encounter of geographers having varied interests, coming from different cultural and linguistic backgrounds, and, most importantly, representing at least two very different schools of geographic thought. University of Ottawa, owing to its very unique nature and personnel, is in an outstanding position to make geographers of both schools, on both sides of the Atlantic, aware of the state of the discipline in their respective areas. It is for this reason that the second and each succeeding issue should be welcomed by geographers everywhere.

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BOTT, Martin H. P., **The Interior of the Earth,** Londres, Ed. Arnold, 1971, 316 p.

Il faut offrir des félicitations toutes spéciales à l'auteur pour son ouvrage de qualité remarquablement supérieure. Non seulement il a su éviter la tendance trop suivie de publier pour le seul gain sans rien apporter de neuf, mais il s'est fixé comme objectif, à prime abord téméraire, de présenter une vision moderne de l'intérieur de la terre. En effet, les sciences de la terre traversent une crise ; les découvertes géophysiques de la dernière décennie ont tout bouleversé l'ordre établi. Loin d'imiter les auteurs qui se croient de leur temps en signalant dans leurs conclusions l'urgence de refaire certains manuels, M. Bott accepte le défi sans prétention, et dès sa préface il nous annonce une synthèse faite à la fois des connaissances anciennes bien fondées et des trouvailles toutes récentes.

Dans neuf chapitres, dont l'égale longueur révèle un souci logique de ne pas laisser l'abondance et l'intérêt des sujets ralentir un développement de soi complexe, l'auteur résume les points essentiels de la structure et de la dynamique internes de notre planète. Il le fait clairement, en toute objectivité, ne leur attachant de crédibilité ou de certitude que dans la mesure où le consensus actuel leur en accorde. Son jugement sûr se manifeste dans le choix qu'il fait des apports récents des diverses sciences géophysiques et dans le condensé qu'il extrait des vieilles théories. Il s'emploie alors à agencer le nouveau avec le classique dans une synthèse formulée avec nuances qui laisse à chaque facette sa luminosité propre et souligne l'unité du phénomène et ses implications.

Dans le Chap. 1 il traite en gros de la forme, de la structure, de la composition, de l'âge et de l'origine de la terre. Les données numériques sont mises à date et seules les théories les plus valables sont résumées. Suivent quatre chapitres où il explore successivement la croûte continentale (Chap. 2), la croûte océanique (Chap. 3), le manteau (Chap. 4) et le noyau (Chap. 5). Le processus d'exposition est logique : un court aperçu théorique des méthodes d'exploration et la présentation illustrée des résultats. Les graphiques sont très expressifs. Viennent ensuite quelques-unes des interprétations les plus en vogue. Le tout s'accompagne de brèves remarques critiques et se termine souvent dans un court résumé qui reflète alors la position personnelle. Les ondes séismiques et les mesures de gravité forment la base du Chap. 2, alors que les anomalies magnétiques s'y ajoutent pour orienter les analyses chimiques et minéralogiques du Chap. 3. Le Chap. 4 est remarquable par la clarté. Les études du manteau s'appuient sur quatre grandes techniques séismologiques, sur des mesures de conductivité électrique et de température. L'inhomogénéité latérale est mise en relief comme l'idée principale et les variations dans la verticale des modules élastiques, de la pression et de la densité gardent toute leur importance de jadis. Au Chap. 4, l'auteur réussit ce que tant d'autres ont raté : une explication claire des ondes PKP et PKIKP ainsi que des relations du noyau interne, de sa composition et de sa structure avec le phénomène géomagnétique. Les aspects dynamiques font l'objet des quatre derniers chapitres. C'est d'abord l'énergie thermique, sa cause, sa distribution, ses anomalies et son transfert que l'auteur étudie (Chap. 6). Les effets suivent logiquement. Le Chap. 7 expose