Book Reviews

Geometrical Thinking

Space through the Ages. The Evolution of Geometrical Ideas from Pythagoras to Hilbert and Einstein. CORNELIUS LANCZOS. Academic Press, New York, 1970. x, 322 pp., illus. $11.50.

When Einstein, in 1928, was looking for a capable assistant, he happened to meet a 35-year old Hungarian mathematician who was working at the University of Frankfurt-am-Main. Impressed by the mathematician's knowledge and personality, Einstein invited him at once to work on certain problems in general relativity. At the first session Einstein asked him to solve a new type of field equation so that certain conditions would be satisfied. Proud of this assignment, Einstein's new collaborator got deeply absorbed in the problem and after three or four days, to his greatest satisfaction, found the required solution. At the appointed hour, happy about his success, he showed Einstein that the solution indeed met all the conditions required. "Quite remarkable," replied Einstein, adding after a short silence, "But don't you see, I gave you the wrong equation."

Einstein's collaborator of those days is the author of the present monograph on the evolution of geometrical thinking from the distant past to the present. Cornelius Lanczos, since 1954 professor at the Dublin Institute for Advanced Studies, is well known to scientists for his texts *The Variational Principles of Mechanics, Linear Differential Operations*, and *Applied Analysis*, as well as for his profound papers in professional journals, and to nonspecialists for his popular *Albert Einstein and the Cosmic World Order*.

Lanczos's latest publication lies between these two extremes; based on a course of about 40 lectures delivered to mathematicians, physicists, chemists, and engineers at North Carolina State University in 1968, it assumes some general familiarity with the elements of higher mathematics but no specialized knowledge of any of its branches. In fact, it is designed to present the history of geometrical thinking and its import for science not only to mathematicians but also to physicists, philosophers, logicians, and all those to whom man's conceptions of space are of interest.

The first three chapters of the book, about one third of the text, are devoted to a bird's-eye view of the historical development of geometrical ideas from the great civilizations of antiquity, through the Greek miracle, the times of Descartes and of Kant, the discovery of non-Euclidean geometries, up to the work of Minkowski and Einstein. The next three chapters offer a detailed reformulation of the monumental geometrical achievements of Gauss and Riemann and contain a lucid presentation of tensor algebra and tensor analysis. As the author rightly remarks, a student interested in relativity could, without preliminaries, come into possession of the mathematical background of Einstein's papers on the basis of these three chapters alone. In the next two chapters Einstein's theory of gravitation as an application of Riemannian geometry, and abstract spaces, such as the Hilbert space, so fundamental for the mathematical formalism of quantum mechanics, are discussed in an interesting and often original manner, interspersed with many apropos strokes of wit. The last chapter, the only one concerned with nonmetrical structures, deals with the foundations of projective geometry and, to bring it into the context of the preceding material, concludes with an exposition of Klein's ingenious establishment of a complete isomorphism between projective geometry of the Euclidean plane and the metrical geometry of the hyperbolic type (Bolyai-Lobachevski).

Obviously it was not the author's intention to offer an exhaustive history of geometrical thinking and its applications to other fields within and without mathematics. Surely conceptions such as Minkowski's "geometry of numbers" and its use in number theory, or "Minkowski's geometry"—not to be confused with the geometry of "Minkowski space"—to mention only two examples, are legitimately ignored, for they did little affect the mainstream of geometrical thinking. The material has been selected very well. Still, some readers may regret the almost complete exclusion of any topological subjects; for, although at present only of marginal importance (as for example in the geometrodynamics of Wheeler, Misner, *et al.*), topology may well offer fundamentally new avenues to profound insights in science. Other readers may miss a chapter in which an expert like Lanczos explains his view on epistemological issues connected with geometrical thinking, such as the controversy between the empiricist, conventionalist, and absolutist conceptions of congruence.

The most valuable feature of the book, however, lies not in its mere presentation of information but in its contribution to the furthering of what Felix Klein used to call "general mathematical culture." One of the means by which Lanczos achieves this laudable aim is his great skill in interpreting the formulas of geometry by revealing their association with other branches in science—a technique in the acquisition of which his experience of 1928 was probably of some avail. Also his optimism that, although Einstein's efforts in formulating a unified theory accounting for all physical effects on the basis of geometrical conceptions alone have not been successful, "his program will be tried again and again, until one day full victory will come" (p. 98) seems to stem likewise from his intimate collaboration with Albert Einstein.

Geometry has sometimes been called the art of reasoning correctly about figures which are poorly constructed. Cornelius Lanczos's book shows that geometry is more than that.

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Values and Experience

Class and Conformity. A Study in Values. MELVIN L. KOHN. Dorsey, Homewood, Ill., and Irwin-Dorsey, Georgetown, Ontario, 1969. xxiv, 320 pp. Cloth, $8.65; paper, $5.65. Dorsey Series in Anthropology and Sociology.

A recurring theme in sociological theory is that the social environment in which an individual finds himself will be responsible in large measure for the way he views the world around him and, as well, for a variety of subjective states. One of the most enduring aspects of social structure is the hier-

archical ordering of social classes, reflecting inequalities in wealth, in occupation, in education, and so on. Classes are not, strictly speaking, groups (they do not have distinct boundaries, and in modern societies they are too large to have coherence), but we can speak of class environments and class cultures because of the way in which inequality is distributed in broad bands or strata in all modern societies. Everyone lives in some class environment, notwithstanding that in the course of their lives some people manage to change their class positions. And, as the author says at the beginning of the work under review,

> It is a commonplace among social scientists that, no matter what the subject of study, we should always measure people's social class positions, for class is nearly always significantly involved. Remarkable though it seems, one aspect of social structure, hierarchical position, is related to almost everything about men's lives—their political party preferences, their sexual behavior, their church membership, even their rates of ill health and death. Moreover, the correlations are not trivial; class is substantially related to all these phenomena.

How are these "impressive and massive regularities" to be explained? Kohn's concern with this question derives from his study of the sociology of mental illness, but in this book he directs the question to the study of people's values. Most of our theorizing about the relation of class position to values and orientations has been at a high level of generality—a height from which Kohn leaps to reach the level at which he can establish a researchable problem, one to which he can bring all the statistical and survey techniques of modern social science. As he puts it,

> Sociological classicists may shudder at the thought of despoiling a classical tradition of inquiry with statistical significance levels, correlation coefficients, and the like, but we think these modern methods are appropriate to the old, important problems.

I think the classical tradition is well served by his contribution, for he is clearly a master of these techniques of analysis.

The basic question of Kohn's research is, What are the class differences in parental values for children, and what is there about class that makes for these particular differences? His analysis leads him to two polar sets of values —those that emphasize self-direction and focus on internal standards of behavior, and those that emphasize conformity and focus on externally imposed rules or the dictates of authority. The middle class espouses the former, the working class the latter, and these orientations emerge in association with certain aspects of occupational experience. The key condition has to do with the experience of self-direction, of the exercise of initiative and independent judgment. This is not simply a matter of the degree to which the worker is subject to authority; the context of the work is also important. Those who do complex work with data or with people, who synthesize and coordinate, are more self-directed and value self-direction for their children; those whose work is closely supervised, who work with things and at simply organized tasks, do not experience this self-direction and do not seek it in their children.

Kohn's data are derived from sample surveys of three different populations with successively elaborated questionnaires. The first survey, done in Washington, D.C., in 1956–57, consisted of interviews of all the mothers and a small subsample of the fathers in 339 white families, either middle class or "stable" working class, in which there were fifth-grade children. A principal feature of the questionnaire was a list of 17 characteristics—such as being happy, having self-control, being dependable, being "curious about things" —from which the respondent chose the three he or she regarded as "most important" for the fifth-grade child. The patterns of choice indicated the middle-class emphasis on self-direction and the working class emphasis on conformity to external standards.

Similar findings came out of a replication of this study (under the direction of a colleague, L. Pearlin) six years later in Turin, Italy, with a somewhat larger sample in which all the fathers, as well as most of the mothers, were interviewed. Here the notion that the class differentials in values were tied to differences in certain aspects of work had its first test, by means of a series of questions in the interviews concerning the degree of supervision or independence the father experienced in his occupation.

The third and richest body of data was obtained from a sample survey of the male labor force of the United States in 1964. The sample of 3100 respondents included 1500 fathers of children 3 to 15 years of age. Kohn was now able to undertake a much more complex and refined analysis of his major themes, to elaborate on the earlier findings, and to extend the range of items relating to social orientations and occupational experience. The relation between class and values held within racial, religious, urban, rural, and regional groups, over a range of five class positions. Other findings related to class differences in the performance of parental roles within the family. Still others go well beyond parental values to show the class differences that exist also in the values men hold for themselves and in their orientation to their work and to society. Consistently, the lower men's social class position, the more rigidly conservative their views and the more intolerant of nonconformity they appear to be.

These findings will come as no surprise to anyone acquainted with the wide range of literature linking social class to attitudes, values, and behavior. The major contribution of the study, apart from the supporting evidence it provides for theory, is that it specifies a good deal more clearly how certain conditions lead to certain effects. The class-related values and behavior are interpreted in the light of the book's major theme, the influence of occupational conditions that are conducive to or restrictive of self-direction in work. The crucial conditions are found to be the substance of the work (data, things, or people), the closeness of supervision, and the complexity of the organization of the work. Of a host of other class- and work-related variables for which the data are analyzed, only education is found to be related, irrespective of occupational status, to the value placed on self-direction.

Kohn ends his book on a somewhat contradictory note that is both pessimistic and optimistic: pessimistic because working-class parental values of conformity are transmitted to the next generation, helping to perpetuate inequalities; optimistic because the historical trend is to an occupational structure with increasing opportunities for self-direction. The importance of equality of educational opportunity if working-class children are to break out of their conformist environments is clear: education is important because it helps to provide the capacity for self-direction.

The thesis concerning the generational transmission of class values could be tested by a study of children's values along with those of their parents. By the dangerous method of believing

one's eyes, one is led to believe that there is a good deal of conformity among middle-class young people to their peer group styles and norms. On the other hand, there seems also to be a good deal of self-direction in the current unrest of middle-class youth. Perhaps Kohn is right that when they get into the work world their values become more fixed. At least it would be interesting to come at the problem from the point of view of the young. If somebody does it is to be hoped that the task is undertaken with the care and skill that Kohn has brought to his.

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Modern Maya

Zinacantan. A Maya Community in the Highlands of Chiapas. EVON Z. VOGT. Belknap (Harvard University Press), Cambridge, Mass., 1969. xxxii, 736 pp., illus. $25.

Modern Mayan-speaking Indians fascinate Americanists. Some 5000 years of continuity in highland Guatemala and later in the Yucatan peninsula and highland Chiapas, the heritage of a now-attenuated civilization of monumental architecture, astronomy, and calendrical mathematics, the stubborn maintenance of identity in the face of pressure from Spanish and Spanish-influenced outsiders, and the complex ritual and political organization, all present problems and at the same time offer opportunities for at least partial answers to questions about the nature of prehistoric Mayan society and culture, about forces for continuity and change in acculturation processes, and about the relationships among ideology, ritual, and social organization.

The highland Chiapas municipio of Zinacantan and its 8000 inhabitants are an example of this kind of problem and opportunity, and are interesting in themselves as a community of people coping with their natural and social environment. The book thus promises to serve, along with such classic reports as Bogoras's *The Chukchee* and Radin's *The Winnebago Tribe,* as a source for library fieldwork. Certainly such a report should come out of a project that has been going on since 1957 and that has involved 93 fieldworkers and has produced over 150 published and unpublished specialized reports.

Although the book attends to some aspects of material culture, such as corn production, house building, and clothing, and of social organization, such as social groupings and settlement patterns, kinship and *compadrazgo,* and religious and religio-political offices, more attention is paid to ideology and ritual. Ritual behavior, especially in healing and religio-political contexts, serves as a basis for examination of patterning in Zinacanteco society and culture, and of "encapsulation" as a process of adjustment to influences from the outside. Inferences from ritual behavior also serve as a basis for speculation about the nature of Mayan culture in the prehistoric past and Zinacanteco culture in 1984, when the Harvard Chiapas Project will still be operating if plans are successful.

Vogt describes a highly integrated culture and society and implies that this integration is one of the reasons for the tenacity with which Zinacanteco identity is maintained. The points of integration of subsistence system, world view, and social organization are the rituals expressing land rights of localized patrilineages, rituals renewing and circumscribing the territory of waterhole groups, Year Renewal ceremonies conducted by hamlets, and the cargo rituals that involve members of hamlets throughout the municipio. In part this integration is a result of the participation of close to 90 percent of the male population in a hierarchical system of offices through which a man may move by gaining seniority and respect and by performing community service, and a complementary hierarchy of shamans who may also hold cargo offices; in part the integration is a result of the structural similarity of the rituals and their embeddedness one in the other. The structural similarity and repetition of ritual acts Vogt terms "structural replication," and the extension of terminology and symbolism in ritual and nonritual contexts he terms "conceptual replication." Both processes of "replication" and "encapsulation" contribute to the maintenance of Indian identity through centuries of contact.

These concepts help organize thought about aspects of acculturation that can be isolated for heuristic purposes. But somehow social scientists are still surprised when they find people "mixing" traits diffused from European culture with their traditional traits. This seems to be especially startling in the case of religion and ritual, in spite of evidence of the same processes in European Christianity, from the expressions of Astarte in the exaltation of Mary to the honoring of Norse gods in the days of the week. For the most part, Vogt recognizes that this is a natural and ordinary process, and presents Zinacanteco culture as a whole culture, but his occasional lapses, punctuated by exclamation marks, when he discovers a Zinacanteco, for example, wearing traditional garb, ribbons flying, bearing a tuba across the Pan American Highway, give a false air of the 19th-century folklorist amazed and amused at the adulteration of the "pure" tradition. (One of the joys of anthropology is discovering these incongruities, and one's sense of humor will get the best of one sometimes.) Such lapses are few, however, and the data will serve students well in developing alternatives to the outmoded "acculturation continuum" and trait-list approaches to the study of culture contact and culture change.

In spite of the excellence and care it manifests in general, this book fails in a respect in which no modern ethnography should fail—especially one with the amount of preparatory fieldwork that this book has had. In spite of the fact that approximately two-fifths of the fieldworkers were women, the women of Zinacantan remain shadowy figures hovering in the background, waiting on the men at appropriate times or appearing and disappearing on cue. Vivid descriptive passages and careful attention to detail elsewhere demonstrate that this is a result not of lack of skill but of conceptual inertia. The study of the roles of women in different cultures has been frustrated by this lack in past ethnographies; modern social scientists should be sensitive to this problem.

Zinacantan contains 200 graphic illustrations, 8 drawn maps, and 16 tables. About three-quarters of the illustrations are photographs, which makes this one of the most richly documented ethnographies in American publication. The book deserves attention as a milestone in visual anthropology.

Through the years of the Harvard Chiapas study many thousands of photographs must have been made by the stream of fieldworkers who have participated in this project. The illustrations in the book, therefore, are a