Book Reviews

Automatic Language Translation. Lexical and technical aspects, with particular reference to Russian. Anthony G. Oettinger. Harvard University Press, Cambridge, Mass., 1960. xix + 380 pp. Illus. $10.

Automatic Translation. D. Yu. Panov. Translated from the Russian by R. Kisch. A. J. Mitchell, Ed. Pergamon Press, New York, 1960. viii + 73 pp. $3.50.

Translation by machine, in order to present a passable product, must incorporate at least a partial solution to the two basic problems of selection and arrangement: namely, the selection of the correct equivalent from among several possible alternatives presented by a bilingual dictionary, and the rearrangement of the translated elements whenever there is a variance between the word order found in the original sentence and the word order required in the translation for an intelligible rendition of the content of the original. Semantics, which, very roughly speaking, deals with selection problems, and syntax, which, among other things, deals with rearrangement, have emerged as the two crucial (though overlapping) problem areas in the machine translation field. Neither of the books under review deals in a substantive way with either problem (nor does either pretend to do so), although both acknowledge the importance of the problems. The two books are quite dissimilar, titles and chapter headings to the contrary notwithstanding.

Automatic Language Translation, by Oettinger, is a serious, well-written account of a specific project of the Harvard Computation Laboratory. The author treats exhaustively a very limited aspect of the subject of machine translation; some good discussion of computer programming and data processing is included. *Automatic Translation*, by Panov, touches upon a broad spectrum of machine translation problems but, in effect, is little more than a superficial account of the early (1955–56) work in this field at the Institute of Precision Mechanics and Computer Engineering (Moscow), plus some brief description of a few subsequent lines of investigation.

Oettinger's book can usefully be looked upon as containing two major packages. Chapters 1 and 3 present a quite good introductory account of computer programming and data processing, but the material is more appropriate for the specialist or the student than for the layman. Section 1.6 in particular should serve to illuminate a number of often confused questions concerning random versus sequential access. The second major package, beginning with chapter 5, is a detailed account of the methods, procedures, and results of the Harvard "automatic dictionary" project at the time the book was written. This project was then primarily concerned with problems of dictionary maintenance and lookup, and with those aspects of morphology represented by the stem-affix splitting procedures necessary in automatic translation. Other solutions to the problem of word inflection through stem-affix splitting have been developed and presented in the literature, but nowhere else (other than in several progress reports made by that same project to the National Science Foundation) can so exhaustive a treatment of a specific method be found. The Harvard book will probably be of particular interest to workers in the field of machine translation or in related fields involving the processing of language data, if such workers wish to establish or develop a well-organized discipline of computer procedures associated with dictionary lookup and problems of word inflection. Even these readers must be cautioned that Oettinger has not concerned himself with the efficiency or the speed of computer usage, and other works in the literature may be consulted to find ingenious and efficient dictionary lookup procedures for general-purpose computers. Although Oettinger exhibits his usual eloquent command of English and, for the most part, the book is easily read, one suspects that had he occasionally substituted natural language for some of the mathematics and, perhaps, exploited a few golden opportunities to omit detail, the interests of digestibility would have been better served.

Most portions of *Automatic Translation* by Panov can be identified in literature dating back to 1956. A pamphlet published in Moscow in 1956 by the Academy of Sciences of the U.S.S.R. (*An Experiment of the Machine Translation of Languages Carried out on the BESM*, by I. S. Mukhin) is largely represented in sections 1, 5, and 6 of the Panov book. Section 7 is carried over from an earlier (1956) Moscow book published in English (November 1958) by the U.S. Joint Publications Research Service (JPRS/DC–379). The rest of the book, Sections 8 through 11, was published (January 1959) by the U.S. Joint Publications Research Service (JPRS/DC–487D). Sections 2, 3, and 4 are apparently new and attempt to give the layman an intuitive impression of the processes performed by a human translator and of how these processes might reasonably be mechanized. This treatment is quite brief, falls well short of the mark, and is of little interest.

In the last several years a rather large quantity of Russian publications in the field of machine translation have been made available in English (and on a timely basis) by the U.S. Joint Publications Research Service. Much of this material is quite good, very informative, and reflects a large-scale, serious effort on the part of the U.S.S.R. in the field of machine translation. The Panov book, however, in no way approaches a comprehensive account of even the early Russian work. It is, to a large degree, based on the 1955–56 experiments with the BESM computer but, even on this subject, is fragmentary. From these experiments a number of examples are given of machine translation of English into Russian; if taken at face value these examples exhibit a highly advanced machine translation capability well beyond that which has been, at this time, legitimately demonstrated anywhere else. Curiously enough, even though most of these examples have been available for inspection for several years, the inexplicably high quality illustrated has not before been commented upon, to our knowledge. (Especially sophisticated is an example from Dickens' *David Copper-*

field, though in all examples the implication is given that all multiple meaning problems have been resolved!) The rules for translation outlined in the Panov book and, for that matter, the rules presented elsewhere in the Russian literature do not even begin to explain how the sample translations could have been achieved. Since no other evidence to date supports the hypothesis that the Russians in 1956 were ahead of where the rest of the world is now, it seems reasonable to infer that the translation samples shown probably represent text that was studied beforehand in order to develop rules, the applicability of which was guaranteed by such prior analysis. The foregoing inference may not be justified but, in the absence of a detailed exposition of all rules used, it is difficult to conclude otherwise. (We of course assume that neither the original English text nor the final machine output of Russian text was in any way subjected to human editing.) Any thoughtful scientist will recognize that a sensationally elegant machine translation of a limited and specific body of text can be produced on the basis of prior study of that text by essentially anyone with a small amount of ingenuity plus the ability to program a general purpose computer. The only matter of real interest then lies in the question of the general validity of the rules when applied to text other than that used as a basis for developing the rules.

Chapter 10 of Panov's book contains a few pages of gratifying discussion, much more indicative than is the rest of the book of the depth and nature of the problems of machine translation. It is pointed out that machine translation is not solvable in a formal or mathematical sense, as is, for example, the problem of code breaking. Panov justifiably criticizes Weaver's analogy between machine translation and code breaking and points out briefly a few of the essential and profound differences between the two.

With all its shortcomings, the book by Panov should be of some casual interest to the layman for its presentation of an introductory, though quite superficial, account of the nature of an automatic translation process.

The field of automatic translation still awaits a book which presents the subject adequately and informatively to the scientific community.

PAUL L. GARVIN
DON R. SWANSON
Ramo-Wooldridge Laboratories, Canoga Park, California

Cochiti. A New Mexico pueblo, past and present. Charles H. Lange. University of Texas Press, Austin, 1960. xxv + 618 pp. Illus. $10.

The Pueblo Indians of the Rio Grande are visited by thousands of tourists every year and have been known to history ever since their discovery by Coronado in 1540. But Spanish attempts to obliterate their native religion in the process of Christianization led to the erection of a wall of secrecy, and until very recently little has been known of their inner life. Charles Lange's monograph on Cochiti, the first comprehensive account of the culture of a Rio Grande Keresan-speaking pueblo, will therefore be of great interest to all students of the Southwest.

We know from the archeological record that the Keres moved into the Rio Grande region from the west in the 13th century and formed a wedge among the Tanoan-speaking pueblos in the present vicinity of Santa Fe, N.M. In addition to mutual interaction and cultural exchange, all of these pueblos have been subjected to the impact of Spanish and, later, American culture over a period of some 4 centuries. For Cochiti there are only a few accounts from the Spanish period, but within the last century important observations have been made by a number of scholars, including Bandelier, Starr, Goldfrank, Benedict, Parsons, and Boas.

Lange has built his account, in part, on the work of his predecessors, but the bulk of his materials comes from his own researches covering the period 1946–53 and including three summers' residence in the pueblo with his family. He presents a balanced and satisfying integration of modern pueblo life, in the perspective of the last hundred years. On the other hand, comparative discussion is held to a minimum, in part because of the lack of comparable data from many of the eastern pueblos.

The volume is organized in terms of geography, history, resources, economy, political organization, ceremonial organization, and the social system; 44 appendixes cover a wide range of statistical and other data. Of particular interest is Lange's discussion of the political system, including the "progressive" and "conservative" factions, and his detailed account of the ceremonial organization, including the Katsina cult. While Cochiti is the most progressive of the eastern Keresan pueblos, social and cultural change has been gradual enough to make the author hopeful for the future. But whether the pueblos can maintain a social and ceremonial system, geared to community values, in the face of electric power, farm machinery, modern schooling, and a growing dependence on wage work remains to be seen.

The University of Texas Press has produced a handsome volume that should have a wide appeal. It is also a volume in which the data for the author's conclusions are fully presented. Here we can see the effects of 400 years of contact with Spanish and American cultures and can begin to understand the complexities of social and cultural change in a society with values that are quite different from our own.

FRED EGGAN
Department of Anthropology, University of Chicago

Agriculture and Ecology in Africa. A study of actual and potential development south of the Sahara. John Phillips. Praeger, New York, 1960. 412 pp. Illus. $13.50.

This book, written by a man with special competence in agriculture, is intended for scholars of other disciplines and for administrators and others concerned with economic development in Africa.

John Phillips' subject, the landscapes of Africa and man's use of them for agriculture, is a complex matter for analysis and one of importance. The vast, essentially rural continent is impoverished. Real levels of living, as measured by per capita food and shelter inputs, are among the world's lowest. Most of the population is dependent on subsistence rather than on cash-crop agriculture. Productivity per acre is low, and land deterioration, a forerunner of further decrease in yields, is widespread. These are the reasons why this and other books on the subject are needed.

African lands have been tilled for some thousands of years by indigenous cultivators of root and grain crops, using systems of shifting cultivation. They have been worked by European land-use techniques for as much as three centuries. Since World War I, European agricultural officers in colonial territories have had widespread influence on land use by Africans. These officers have brought to the task experience and training gained in mid-latitude agriculture. In the mid-20th