

which links motion with the life of the heavens.

11. Spencer effectively raises questions which have recently been treated under the head of proto-evolution, or chemical evolution. See also A. I. Oparin, *The Origin of Life* (Dover, New York, 1953), especially chapter 1. Geneticists, organic chemists, and physiologists are all converging upon this problem of what happens to simple salts, metals, and so on to make them capable of self-transformation so that they can sustain life processes.
12. This is not quite an innovation of Darwin's. See, for example, M. Mandelbaum, "The scientific background of evolutionary theory in biology" [*J. Hist. Ideas* 17, 345 (1957)]. Much remains to be done to find out whether, for Aristotle himself, species are fixed in the sense that Darwin denied that they are. Before an answer could be given, one would need to master a great deal in Aristotle's metaphysics, logic of science, and physics, as well as his biology.
13. See E. Rádl, *The History of Biological Theories* (Oxford Univ. Press, London, 1930). On pages 63 and 64 Rádl seems to hedge on whether Darwin gives more descriptive or more causal accounts of variation. Rádl ought to be altered to read "causal," without question. This opinionated and often fuzzy book should be read for the valuable leads it gives into material not ordinarily examined nowadays.
14. Most of these distinctions are made in the first four chapters of *The Origin of Species*, and many are summarized in the final recapitulation.
15. Rádl goes even further when he says (*The History of Biological Theories*, p. 71): "It is true that Spencer did pursue definite biological studies, but these hardly bore any relationship to the substance of his explanations—and his explanations far exceeded the range of his observations, both in quantity and in quality."
16. Spencer himself says (*First Principles*, chap. 1) that the analysis of many phenomena can go only so far before it ends in contradiction or an unanswerable question. For Bradley's neat reply to this, see *Appearance and Reality* (Clarendon Press, Oxford, 1930), p. 111, footnote.
17. For a compact account (taken from the *Autobiography*, mainly) of Spencer's education and of his principal doctrines, see W. Durant, *The Story of Philosophy* (Simon and Schuster, New York, 1929), chap. 8.
18. C. Darwin, *The Origin of Species* (Modern Library, New York).
19. The laws of variation are given in *The Origin of Species* (chap. 5, summarized on p. 122).
20. A grain in the balance, says Darwin (*The Origin of Species*, p. 359) determines which individuals, and even which species, shall survive.
21. The last chapter of *The Origin of Species*, entitled "Recapitulation," gives in striking form the evidence of observations throwing light upon the hypothesis and its attendant objections.
22. The "tree" appears on pages 99-100 of *The Origin of Species*, but not in connection with growth of individuals, only of groups.

23. Of course, this is not so old-fashioned as it may seem. William King Gregory, in the text volume of his comprehensive *Evolution Emerging: A Survey of Changing Patterns from Primeval Life to Man* (Macmillan, New York, 1951), differentiates what he calls polyisomers and anisomers in terms that would apply just as well to cosmic phenomena as they do to the invertebrates and vertebrates.
24. One excellent summary of the contributions of Darwin was contained in a public lecture delivered at Southern Illinois University by Alfred E. Emerson, 1 Oct. 1958. The lecture was entitled "The Impact of Darwin on Biology," and its author, the well-known ecologist and zoologist from the University of Chicago, presented a comprehensive list of ideas that were enunciated by Darwin but more fully elaborated by his successors. Among those foretastes of later evolutionary theory which Emerson located in *The Origin of Species* are the following: latency of genetic characters, spontaneous variability (mutations), heterosis, palingenesis, recapitulation, and homeostasis. Nowhere was it asserted by Emerson that these notions all originated with Darwin, but certainly Darwin gave them clearer voice than did most of his predecessors or even his contemporaries.
25. See Spencer's essay "Progress" for the admission that he derived a number of ideas on evolution from Lamarck. However, most of the *Principles of Biology* is neutral as regards the inheritance of characters acquired through practice.

## Introducing Industry in Peasant Societies

Modern industrial production need not drastically disturb local ways of life.

Manning Nash

In the Malay Archipelago, in China, in Africa, and in India the spread of industrial technology and factory production methods has destroyed many aspects of native cultures. Many thinkers have come to regard such destruction as inevitable. Social scientists in particular have almost taken it for granted that industrialization sets up a chain of social and cultural events that sunders the social fabric of peasant and primitive societies. There is evidence, however, that under proper conditions an indigenous, non-Western community can adjust to factory production and still maintain the main features of its

own special way of life. A case in point is the coexistence of a textile factory and a peasant society in Cantel, an Indian community located 200 kilometers west of Guatemala City in the Guatemala highlands. The factory was established some 70 years ago and employs about one quarter of the population. Cantel has the same family structure, the same role in the regional market, the same roster of saints, the same notions of law and justice, the same basis for status and prestige, and the same quality of social life that it had before the factory was established. Cantel is like the neighboring Indian communities in all respects except that among the economic opportunities that it offers is a wage job at a factory.

### Cantel and Its Neighbors

The cultural pattern of the Indian communities in the western highlands of Guatemala reflects a blend of Spanish-Indian influences, more or less stabilized in the region some 400 years ago. The chief features of the pattern are a simple farming technology, without the plow or machine tools (Fig. 1); a low level of wealth, without class lines; a political organization, tied to a religion with a hierarchy of saints; and a system of markets based on local specialization. Each community in the western highlands has some economic specialty. Markets are held in different communities on different days of the week (Fig. 2); people bring their goods to sell, and buy the things they need. The village markets are held in conjunction with central markets held daily in the larger towns.

Witches, spirits, mountain demons, and the personification of many aspects of nature are all part of the culture and world view, as is the use of the old 260-day Maya divinatory calendar.

These Indian societies, while sharing a single broad cultural pattern, vary endlessly in dialect, costume, economic specialty, roster of saints, and sacred ceremonies and even in the physical appearance of their members. Each of the Indian societies is a locally organized culture, distinct from its neighbors in fact and in its own view, and each is made up of a "people" who

The author is on the staff of the Graduate School of Business of the University of Chicago, Chicago, Ill.

have long intermarried and who feel themselves to be an ethnic group with particular characteristics and virtues.

Cantel is a *municipio*, the administrative unit of Guatemala, similar to

our township. Within the *municipio* are several settlement patterns. There is a *pueblo*, which also bears the name Cantel. This town center is the administrative, religious, economic, and

festal headquarters of the community. Of the community's more than 8000 inhabitants, slightly over 1900 live in the town center. The rest of the population lives in the rural *cantones*, which

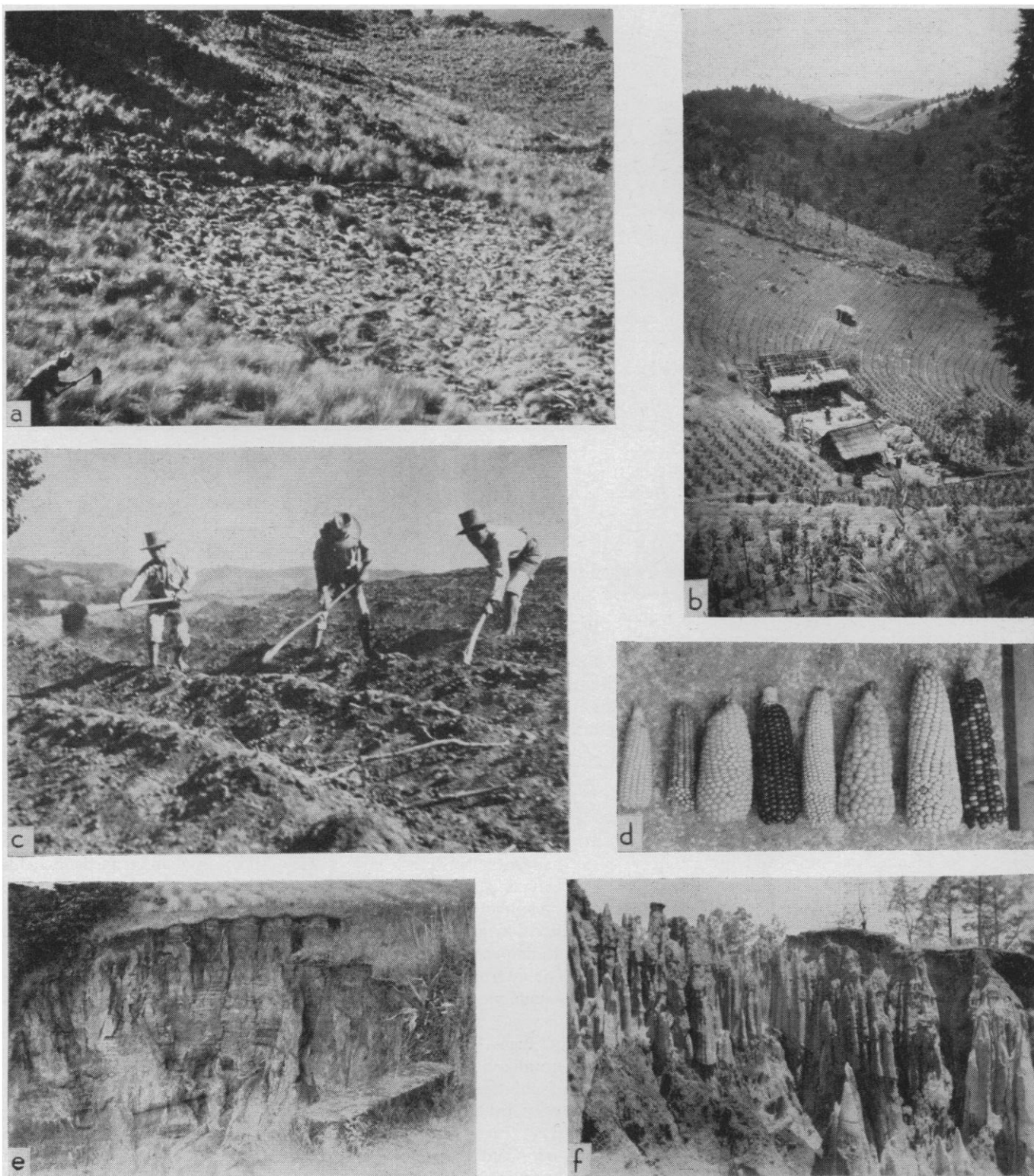


Fig. 1. (a) Clearing high bunch grass with a hoe in the Cuchumatanes Mountains of western Guatemala. (b) A cornfield and rural dwellings near Momostenango, Guatemala; the small structure in the center of the field is a shelter for lookouts, to be occupied when the corn is ripe. (c) Digging furrows 18 inches deep on a hillside, for planting corn. (d) Ears of eight species of maize from the Santa Cruz region. (e) Head of a deep ravine with old furrows of a wheat field at the ground surface, and (f) pinnacles some 60 feet high, which develop in these gullies. Such badly eroded areas have reduced the amount of arable land, stimulating the growth of artisan industry. [F. Webster McBryde (5)]



Fig. 2. Market in the central square of San Francisco El Alto, Guatemala. White Cantel cotton goods may be seen at right. Blankets and other woolen goods, colored cotton skirts, hats, rope, dried chili, pottery, and corn are also displayed. This is primarily a wholesale market and redistribution center. [F. Webster McBryde (5)]

are agricultural settlements, with house sites scattered among the cultivated fields.

The factory was set up in Pasac, one of the *cantones*, and a second compact settlement developed around it. The introduction of the factory generated some new social pressures. It caused modification of the settlement pattern, for factory workers require a compact residence area. It presented a new economic opportunity, involving new occupational roles and new behavior. Some of the Cantelenses employed by the factory had traditionally not been income earners, and thus, operation of the factory raised the net income of the *municipio*. It brought together workers under central direction in a production unit far greater in scale and in continuity of operation and far more complex in organization than anything Cantel had ever seen before.

For the individual, the radical changes introduced by the factory are more income, more contact with non-kinsmen in the work situation, and a work schedule geared to the factory instead of the farm. The factory worker has, very clearly, a wider range of alternatives than those who are engaged in traditional occupations. And the extent to which the factory work-

ers reorganize their lives governs the degree of shift, modification, and innovation that occur in the society as a whole.

It was possible, in studying the effects of the factory on Cantel, to carry out two kinds of detailed comparisons: (i) a comparison of the social and cultural life of the factory worker with that of his agricultural counterpart; and (ii) a comparison of Cantel, viewed as a community, with surrounding communities which had no factory. The comparison between communities was made by comparing descriptions of neighboring communities with conditions in Cantel, and by visiting other Indian communities in the highlands. The internal comparison, between factory-employed persons and agriculturalists, was made on a "matched family" basis—by comparing families that were alike in age of members, number of children, and wealth, and dissimilar only in the occupation of the members.

The study of Cantel meets the methodological requirements of controlled comparison, for Cantel was similar to the surrounding Indian communities prior to the building of the factory. The factory was built in Cantel not because of special labor ad-

vantages or because the community was thought to be one in which innovation would be readily accepted, but rather because the river which flows through the *municipio* could provide the water power to run the turbines of the mill. This is the only instance of factory production in the region. Moreover, other agents of change are known and can be discounted. Altogether, this comes as close to being a "laboratory" situation as the social anthropologist is likely to find.

The study of Cantel sheds light on the way in which the process of smooth accommodation to industrial production was worked out and, at the same time, adds to our knowledge of the kinds of culture that are compatible with industrialization.

### The Small Differences

The Cantelenses who work in the factory still maintain the main features of their traditional way of life, but there are some small differences, and some larger differences too, between them and their farmer neighbors that are worth noting.

Factory workers' houses do not differ from other houses in Cantel in



any consistent way. The size of a house, its state of repair, and whether or not its adobe walls are covered with tinted whitewash depend in part on wealth. But the factory worker's income is not spent on decorating his home, any more than the agriculturalist's is. In his kitchen one finds the slapdash arrangement of utensils, the three-stone hearth, the windowless walls, the earth floor, and all the other features typical of a Cantel house. However, certain possessions characterize the domestic economy of factory workers and are largely restricted to them. Radios, wrist-watches, bicycles, and canned goods are to be found primarily among factory personnel. The bicycle is useful only to factory workers, for with the same amount of money a farmer can buy a horse, much more useful to him. As for expenditures for food, the differences are differences of proportion. All of the items in the diets of factory workers are consumed at some time during the year by farmers, but factory families tend to consume the more expensive items more often and in greater quantity than do farm families.

On an ordinary working day it is difficult to distinguish the factory worker from the farm worker by his dress or costume. On fiesta days, however, the economic advantage of factory work is apparent, for at these times factory workers are uniformly better dressed than farmers and their families. Some factory men have adopted Ladino (non-Indian) dress. Factory women wear the same kind of clothing as nonfactory women, but they tend to buy finer skirts and blouses and to have a "wardrobe," rather than a single costume.

As for family life, there is virtual identity in the basic pattern of the factory worker's family and of the farmer's. The typical Cantel family is composed of a man, his wife, and their unmarried offspring, all living together in their own household. The family is the unit of consumption, production, worship and ritual, child rearing, and religious activity. It is the family which has a social status in the community, and it is the family, rather than individuals, which takes its turn in the discharge of civil and religious offices. The families of factory workers and farmers are similar in form and make-up but diverge in two respects. First, the greater economic resource of the factory family, in relation to the prevailing income in Cantel, promotes integration of the basic family by resolving some of the tensions that arise from

having very limited means. Second, the factory worker takes on the support of his parents, should the need arise, at an early age and under conditions formerly not found in the community. These divergences have not so differentiated the factory family from the farm family that the potential friction-producing

disparities in the social situation of the two groups are apparent.

As for their religious life and world view, the factory worker and the farmer of Cantel participate to the same extent in the activities of the Catholic Church and of related secular organizations, such as the "Christian mothers"



Fig. 3. An Easter procession in Sololá. Ladinos carry the richly clad image of Christ to the accompaniment of a dirge. In the foreground, Indian members of a *cofradia* or religious society carry lighted candles. The market is suspended for three days before Easter. [F. Webster McBryde (5)]

or the Catholic Action groups, and in the folk ceremonies of the corporate religious groups (*cofradías*), and they subscribe about equally to esoteric beliefs and practices. The corporate religious brotherhoods are groups of men who take care of the image of a given saint for a year. They light candles daily and observe the saint's day by celebrating mass and carrying the image in a procession through the streets of the town (Fig. 3). Every year the groups change, through a system of communal service and selection.

In addition to Cantel's nominal Catholics there is a small group of Protestants, numbering about 400. Factory workers have turned toward Protestantism with less frequency than have farmers or artisans. Protestantism, in a community like Cantel, is the religion of the marginal man. The embracing of Protestantism entails the reforming of personal habits. Cantelenses who feel a desire to reform are those who for some reason are not at

ease in their social and cultural environment. The comparative rarity with which workers turn toward Protestantism is an indication that factory employment is not of itself a source of stress.

Unquestioning acceptance of folk ideas of reality is part of everyone's life, irrespective of his occupational role. In Cantel this includes acceptance of folk remedies, origin myths, modes of cure, and the belief that foods and persons are "hot" or "cold," that smoke from candles carries one's prayer to heaven, that the sacrifice of a sheep keeps death from a household, and that an eclipse is a battle between good and evil. What is apparent in this matter of world view is the extent to which spheres of rationality and irrationality coincide among factory and nonfactory workers. The factory has not changed traditional beliefs, nor have physical theories involved in the operation of the mill been extended to other areas of Cantel life. Factory

workers understand, in empirical terms, how their machines work, and their approach to work is straightforward and technical, not mythopoetic or mystical. But they keep the mystical explanations for other aspects of their lives. It certainly poses no problem from the standpoint of analysis to note the coexistence of mythical and casual explanations in the same society, or in the same head, for that matter.

### The Larger Differences

One area of life where the differences between factory workers and farmers are greater is that of friendship and personal relationships. In traditional Cantel, friendship, in its Western sense, is virtually unknown. One interacts with relatives, not with neighbors or with friends. Before the factory was built there were no associations based on mutual liking or special interest. Fun and play were, and still are, for agri-

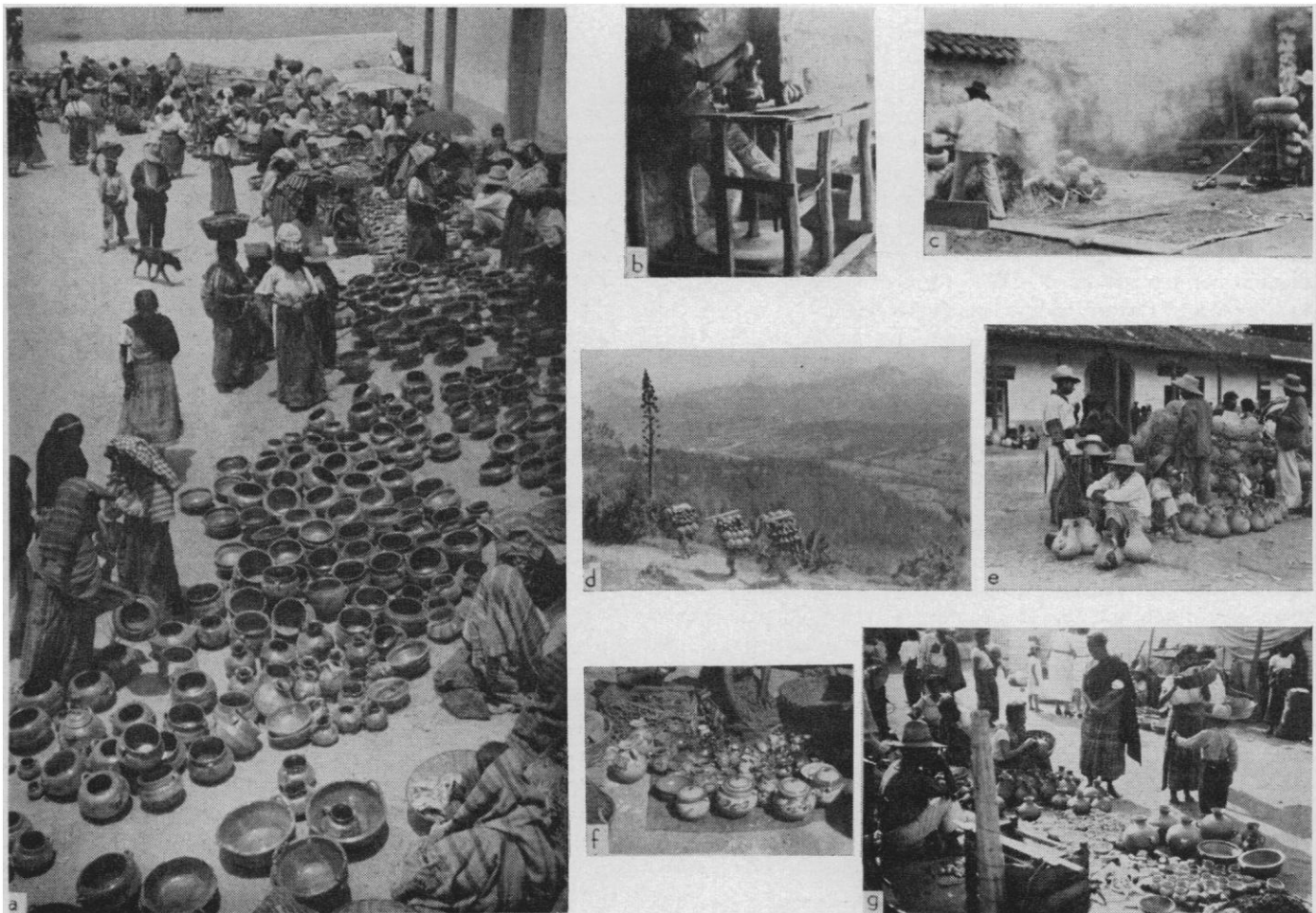


Fig. 4. Pottery in western Guatemala. (a) Common types of pottery for cooking and washing, made in San Cristobál Totonicapán and sold in the local market. (b) Ladino potter using a wheel. (c) Open-air firing of pottery with twigs and bunch grass. (d) Three Totonicapán merchants with pottery bought in the San Francisco El Alto market, heading for lowland Mazatenango. (e) Pottery in the San Juan Ostuncalco market. (f) Small ceramic ware from Totonicapán. (g) Pottery bought at San Francisco El Alto being sold by merchants in the Mazatenango market. [F. Webster McBryde (5)]

culturalists, part of the functional context of work and worship. The factory workers developed intimate personal bonds and friendships. Some of them had patterns of leisure much more like those of factory workers elsewhere than like those of Guatemalan Indian peasants. And because of the factory, a union was organized, as were a sports club, a bicycle club, and a basketball team. The union as a political structure was particularly important. Its full effect is seen not in the personal lives of the participants but in the shifting basis of social and political power which the union's entry into national and local politics initiated. The union formed a link between the community and the national government and tried to implement the national program of social change.

This union activity in a revolutionary decade in Guatemala, from 1944 to 1954, changed the political structure of the community and lessened the reliance on age and previous service to the community as criteria for leadership in local affairs. Since most factory workers were young, and since the leaders of the local union were therefore young, there was an increasing accent on youth in the competition for political and social power. This was an indirect result of factory production in this instance; the union came in the wake of the factory and the union came in a revolutionary decade. Factory production per se does not necessarily lead to a conflict between generations.

### Why Adjustment Worked Smoothly

The more general explanation of Cantel's smooth accommodation appears to be that *only* factory production was added to the community, unaccompanied by the simultaneous advent of new ideologies of political and social organization. The factory came into a community in which there had been ethnic continuity. People who were to work in the factory or join new political parties had already worked out a set of social understandings and personal relationships prior to the revolution.

A second factor was that the organization necessary for operation of the industrial firm was carried out beyond the bounds of the local society. The local society was not concerned with those special devices and social arrangements necessary to the operation of a firm in a situation where con-

tinued existence may depend upon fine calculation and maximization of production.

Third, there was no effective transfer of the means of social coercion to persons outside the local society. And no new social class arose in Cantel. Since outsiders did not possess the power necessary to make the Cantel factory worker an adjunct in the private search for profit or a statistical cog in some giant plan for rapid economic development, the old social system continued to be the chief means of achieving prestige and social control. No new social class arose, to try to make over Cantel in its own image, and outsiders could not treat the Cantelenses as so many units of manpower.

To judge from developments in Cantel, a people's ability to accommodate to new cultural forms is intimately related to the degree of control that they possess—or feel they possess—over their social circumstances. Their sense of control seems to stem from freedom to choose how they will combine the new elements, freedom to discard or accept innovations as their consequences become clear. The Cantelenses did not begin to accept the factory until threats of force had been withdrawn. When the factory stopped using national police to round up workers, and when the jailing of objectors had ceased, the people came to the factory, realizing that it afforded a means of implementing some of their goals.

Fourth, the new industry did not compete with established ways of making a living (Fig. 4). No significant part of the labor force was removed from farm work and artisan production. The economic depression due to decrease in native production, and the economic boom due to the introduction of new ways of production, that often follow industrialization of a native community, did not occur.

Fifth, the culture and social structure of Cantel contained many elements favorable to industrialization. The Cantelenses were used to handling money, used to appraising the economic advantages of various courses of action. The conditions of their work as farmers had disciplined them and accustomed them to continuous physical effort and regular work habits. The community as a whole valued industry, thrift, and work, and wealth was considered good. The culture was a receptive one, which for centuries had been selectively incorporating elements from national

Guatemalan culture and world society.

Sixth, that the differences are not greater or that the occupational role is not more disruptive appears to stem from the evolution of restraining mechanisms within the family relative to the disposal of income. Younger sons and daughters turn over their income to their fathers, in either farm or factory families. Parents are able to insist on this because of shortage of houses—there is no place for a child to go unless he builds a house, and this requires parental aid. The tradition of duty to the parents and of the subordination of the child while he lives under his parents' roof, is strong.

### Conclusion

The story of Cantel does not mean that the lid is off and that any kind of productive system and any kind of institutional setting may coexist anywhere, nor does it mean that the introduction and operation of industrial technology can always be a relatively painless process in preindustrial societies. There were special circumstances in Cantel, as compared to those that existed during the industrialization of England or to those found in most contemporary situations where an effort is made to industrialize peasant and primitive societies.

Cantel is not the same society it was before the introduction of the factory. But it is still a going concern—a community with a distinctive way of life, rich in local meanings and in patterns of social relations very different from those of the societies which have invented and spread machine technology. Cantel's experience in adjusting to a new economic form means at least this: Factories may be introduced into peasant societies without the drastic chain of social, cultural, and psychological consequences implied in the concept of "revolution."

With Cantelenses working in the factory, the community's relation to surrounding communities has not been much altered. There has been no inrush of a foreign population, and there has been no great swell in traffic, in commerce, and in movement. The community still has its place in the regional marketing system, and it still exports wheat and corn (1).

Recent studies in Pakistan (2), in India (3), and in Japan (4) indicate that this is not an isolated, unique occurrence, but that industrialization of

peasants and primitives can be a creative social process. Cantel teaches the general lesson that the upheavals in people's lives that often go along with industrialization are not built into the process itself. They are probably the result of an image of man in social change which delineates him as the passive agent mechanically responding to

immutable forces, or as the pawn in a political chess game, or as expendable material in an economic plan.

#### References and Notes

1. M. Nash, *Machine Age Maya* (Free Press, Glencoe, Ill., 1958) (contains a fuller description of Cantel); S. Tax, *Am. Anthropologist* 39, 423 (1937) (describes the general pattern of the region); M. Nash, *Human Organization* 13, 26 (1955).

2. A. F. A. Husain, *Human and Social Impact of Technological Change in Pakistan* (Oxford Univ. Press, Dacca, E. Pakistan, 1956).
3. M. Orans, "A tribal people in an industrial setting," *J. Am. Folklore* 71 (1958).
4. J. C. Abegglen, *The Japanese Factory* (Free Press, Glencoe, Ill., 1958).
5. The photographs are reproduced from F. W. McBryde, *Cultural and Historical Geography of Southwest Guatemala* (Smithsonian Institution, Institute of Social Anthropology Publ. No. 4, Washington, D.C., 1947), with permission.

## Science in the News

### American Group Studies Soviet Programs for Disseminating Scientific Information

During a recent trip to Moscow, a group of American information-processing specialists had an opportunity to learn about the Soviet Union's two principal programs for disseminating scientific and technical information, one conducted by the All-Union Institute of Scientific and Technical Information and the other, by a division of the State Scientific and Technical Committee. Five representatives of the National Federation of Science Abstracting and Indexing Services spent a week visiting the All-Union Institute, which is headed by I. A. Mikhailov. The institute's primary function is abstracting scientific and technical publications, both domestic and foreign. It operates under the U.S.S.R. Academy of Sciences; however, in some ways, not clearly defined, it is also related to the State Scientific and Technical Committee.

The American mission included Dale B. Baker, director of the Chemical Abstracts Service; G. Miles Conrad, director of Biological Abstracts; John C. Green, director of the Office of Technical Services, U.S. Department of Commerce; Mordecai Hoseh, Washington editor for the Chemical Abstracts Service; and Raymond A. Jensen, executive secretary of the federation.

The group started its study tour on

22 October with a general discussion session that was followed by a visit to the institute's systematization department, where about 15,000 periodicals are scanned for pertinent material and cataloged. Separate articles are distributed to the various editorial offices for more detailed examination. About 2500 to 3000 articles a day are received, in 65 languages, from 95 countries.

The group divided up in accordance with the special interests of its members to visit the different editorial offices, which assign papers to abstractors (usually professional scientists and engineers outside the organization), edit abstracts, compile indexes, and perform other routine editorial work. The institute has about 2000 employees and publishes some 14 abstracting journals.

#### Machines and Express Service Explained

In a session presided over by S. M. Lisitchkin, first deputy director of the institute, the group met with machine searching and retrieval experts. Professor L. I. Gutenmakher and Dr. Sofer explained the construction and operation of an electronic logical machine that they are developing for use in retrieving chemical information. Later Mr. Rakov discussed and demonstrated the application of punched-card data-processing equipment to the institute's fiscal and statistical work.

The methods systems and machine research at the All-Union Institute are

just getting organized. A. D. Cherny of the institute and the staff of Gutenmakher's laboratories, with the various editors cooperating, are in charge of this work. One of the visitors reports that an institute spokesman expressed the opinion that the claims made for electronic equipment have exceeded actual results.

In another session, led by Lisitchkin, the operation of the Express Information Services was explained. This activity is responsible for producing about 50 series of publications on various subjects of interest to workers in industry. So far the express service has functioned separately, but soon the work will be carried out by the staffs of the various abstracting journals. About 2100 foreign journals, mostly English-language publications, are selectively examined for articles to be summarized. The issues appear every 10 days.

Members of the group also met with Madame I. A. Lunacharskaya, head of the institute's acquisition and exchange department, to discuss mutual exchange problems and prospects for increasing the two-way flow of material.

#### Cooperation Achieved

Throughout the visit, the U.S. group was especially impressed by the warm and friendly atmosphere in which the meetings were conducted. At the outset the visitors were invited to select whatever institute activities they most wanted to see. Questions were freely asked and freely answered, and detailed inspection of equipment and procedures was permitted. Team members believe that they are the first Americans to have been afforded such opportunities for examination of equipment and exchange of views.

Besides gaining insight into the operation of the institute and its component parts, the group reached an understanding on ways of obtaining closer cooperation in furthering the exchange of