



FIG. 1. Outline map of Mexico showing location (x) of Pleistocene deposits of San Josecito Cave in the southern part of the State of Nuevo Leon.

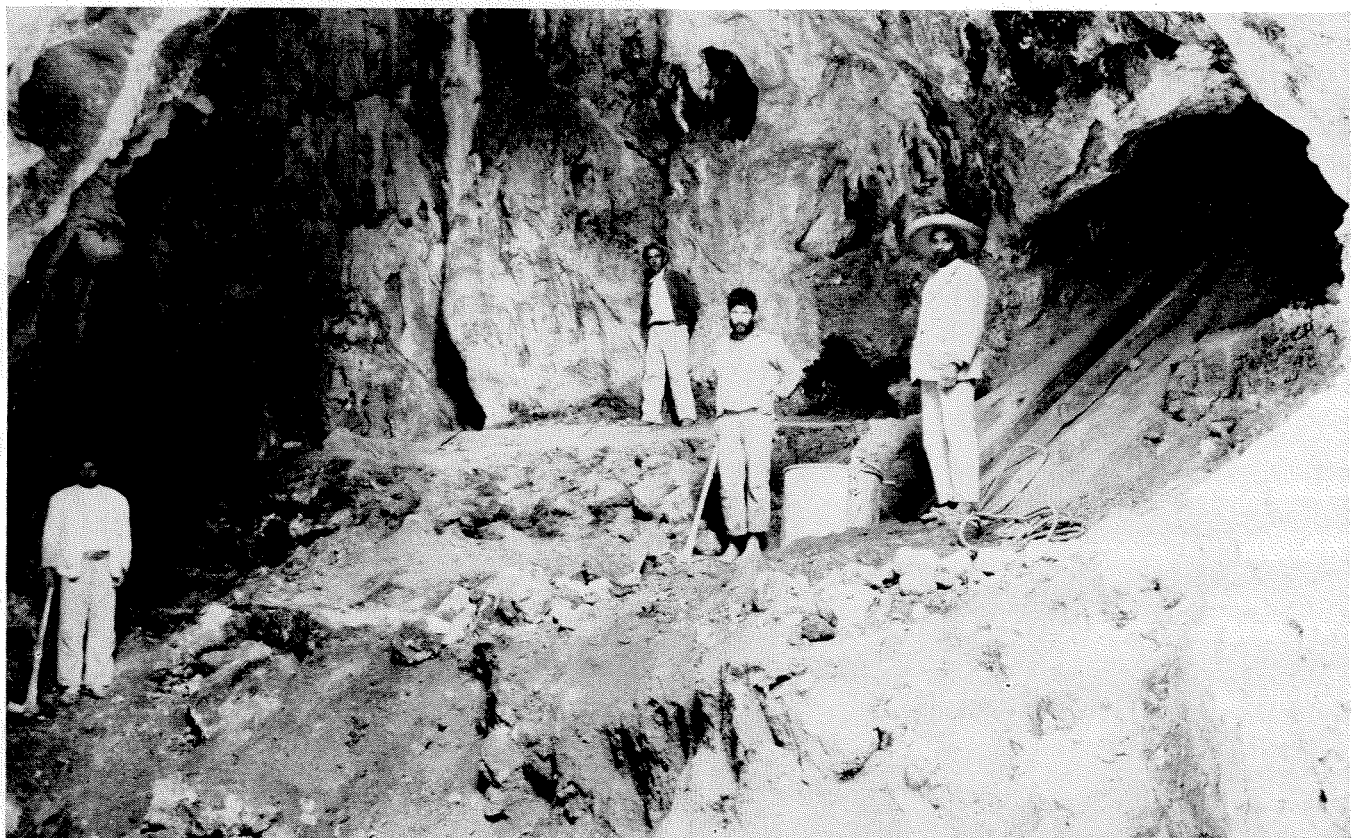


FIG. 2. View taken during an early stage in the excavation of the deposits at the north end of cave. San Josecito Cave, Nuevo Leon, Mexico.

# The Cave of San Josecito, Mexico

## New Discoveries of the Vertebrate Life of the Ice Age

By CHESTER STOCK

SOME of the more noteworthy fossil assemblages of birds and mammals known from the North American continent come from the Ice Age. It is perhaps not surprising that this should be the case, since in geologic history the Pleistocene occurs immediately before the Recent and is, relatively speaking, not far removed from the present in terms of years. One would normally expect to find the paleontological records for this next to last stage better preserved than those of earlier periods, since time and a changing earth are some of the factors responsible for an unsatisfactory preservation of fossil material. As a matter of fact, varied and well preserved representations of the vertebrate life of the Glacial Period, exclusive of those of man, are not uncommon in brea deposits, cavern accumulations, and in certain alluvial, lacustrine and fluvial deposits of the United States, as well as in the frozen muck and gravels of Alaska.

Remains of Pleistocene animals are likewise known from many places in Mexico, but the types that have been identified at any one locality on the basis of such materials are often numerically few. Occurrences of different kinds of fossil mammals in the alluvial and lacustrine deposits of the Valley of Mexico were described many years ago and these supply most of the available information regarding Mexican Pleistocene life. Naturally the skeletal remains of large prehistoric animals, that come to view as a fossiliferous formation erodes away, are among the first to attract notice and

attention. In the popular mind today the "huesos fosiles" refer more often than not to the bones of large animals like mastodons or elephants. Paleontologists, however, in their search through the past do not discriminate between large and small forms found fossil. Indeed, their concern is rather with the fragmentary state of the remains and with an absence of diversity among the creatures represented. For on the basis of faunal information often depends the more important conclusions that are drawn with regard to the evolution of individual kinds of animals, their habits and habitats, as well as their age relationships.

Furnishing probably the best and as yet most satisfactory information regarding the vertebrate life of the Ice Age in Mexico is a fauna recently obtained from San Josecito Cave. This cavern occurs in the Sierra Madre Oriental of southern Nuevo Leon (figure 1) at an elevation of approximately 7,400 feet. The name is derived from a mountain village near which the cave is located. This village is situated some 15 or 18 miles from Aramberri and a shorter distance from Zaragoza; travel between either place and San Josecito is made on mule back. The cave or inclined fissure occurs in folded, late Jurassic limestones and is of exceptional size, having a length of more than 80 feet and an average width of 35 feet. The chamber contains a considerable thickness of sediments (figure 2). From the level where digging started, the fossiliferous strata continued downward to a depth of more than 60 feet. The cavern extends above

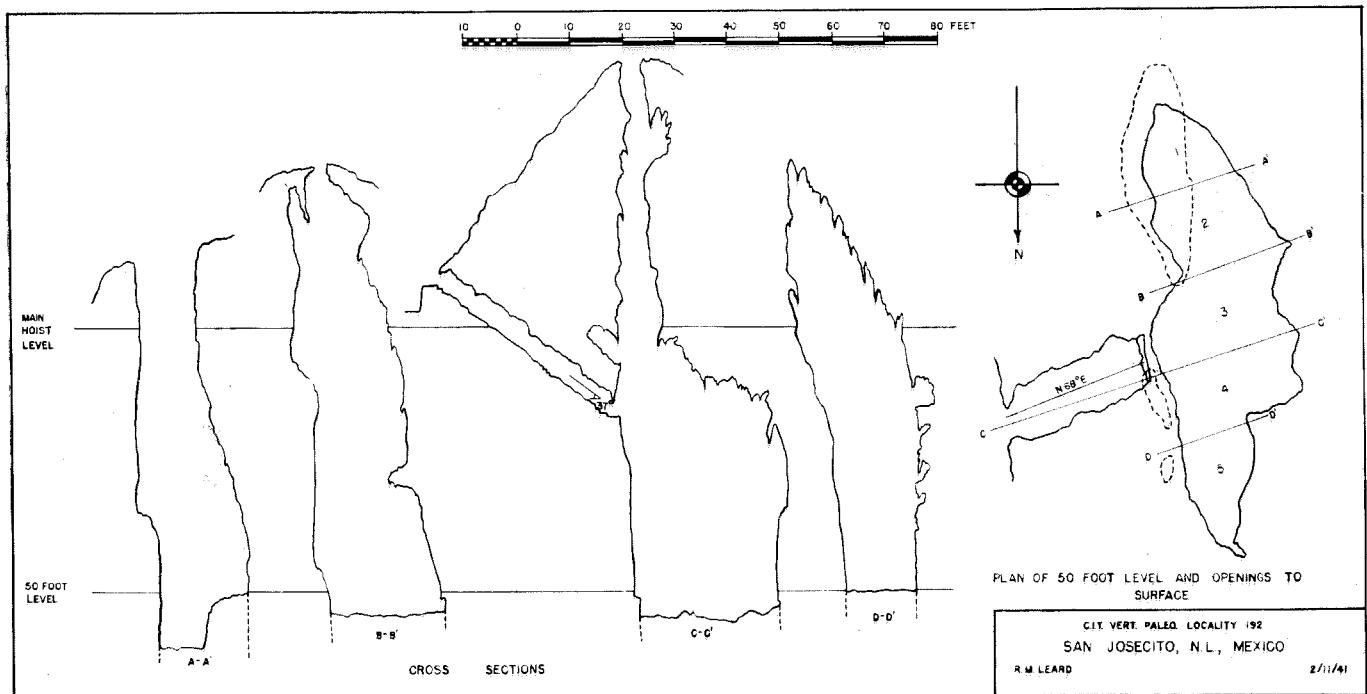


FIG. 3. Plan and vertical cross-sections of cave when the excavations had reached below the 50-foot level. San Josecito Cave, Nuevo Leon, Mexico.

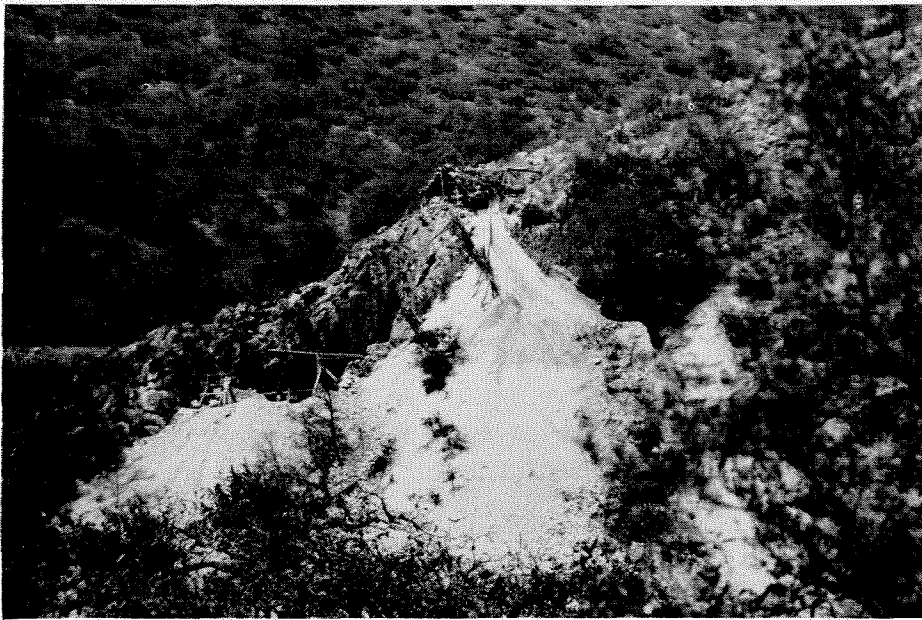


FIG. 4. View from the east showing upper hoist house, winch and headframe at main opening below. Note type of vegetation on the mountain slope. San Josecito Cave, Nuevo Leon, Mexico.

this original level of the cave fill, reaching a height in places of more than 40 feet. Several openings to the outer mountain slope occur in the roof, and a larger exit, which was subsequently enlarged in the progress of excavations, is present in the south wall of the cave (figure 3). Existence of these openings has significance since through them or through comparable entrances have come probably many of the animals whose remains are preserved in the cave deposits.

The sediments consist for the most part of unconsolidated, grayish cave dirt, generally of a fine consistency. These deposits came from outside the cavern, and were either washed in or accumulated through aeolian action. Often thickly interspersed in these beds are fragments of limestone, varying greatly in size, that have fallen from the walls and ceiling. Charcoal is also found in the cave dirt and may be a product of forest fires that occurred from time to time on the outer mountain slope (figure 4). The attitude of the cave deposits as seen at certain levels during the progress of the excavations suggests that periodic subsidence of the sediments occurred. Perhaps this was due to further leaching of the limestone at the bottom of the chamber, thereby lowering the level of the fill material and affording opportunity for still greater thicknesses of deposits to accumulate.

Mammal and bird bones are abundantly distributed in the sediments. Land and freshwater shells are present. While a number of

complete skeletal elements were obtained, much of the osseous material is scattered, crushed or broken. Doubtless, the great number of limestone blocks and spalls that dropped to the floor contributed the principal damage (figure 5). Trampling of the organic material by large animals that had floundered in the cave may also account for some of

the breakage. On the other hand, the amazingly good preservation of remains of fossil birds suggests that destructive forces were not always at work. Although the bones are friable, no great difficulty is experienced in removing them from the surrounding matrix. When, however, the latter becomes wet as during the rainy season, the lighter and more fragile bones and teeth are likely to crumble and disintegrate.

The San Josecito deposits are remarkable for the evidence they furnish of former presence in this region of Mexico of a large and varied avian and mammalian life. The birds alone form the largest and most diversified assemblage of living and extinct types ever recorded from a Pleistocene cave. Forty or more species are represented; 11 of these are extinct. Prominent among the latter are raptorial birds like the western black vulture, Merriam's teratorn with a wing spread greater than that of the California condor, and the curious Daggett "walking" eagle, these and others being specifically identical with birds found fossil in the breia deposits of California.



FIG. 5. Detailed view of cave deposits showing mixture of fossil bones and rocks. San Josecito Cave, Nuevo Leon, Mexico.

A great-footed turkey, a swimming rail, and an ancient curlew, all extinct, are recorded for the first time. An extinct road-runner, previously known from a Pleistocene cave in New Mexico, is likewise present.

Among the fossils, yet belonging to species still living, are the California condor, hawks, eagles, a thick-billed parrot, the first of its breed ever found fossil, bandtailed pigeon, mourning dove, owls, raven, and small perching birds. On the basis of this information ornithologists are able to extend considerably the geographic range of many extinct birds that were characteristic of the Ice Age. It is evident that the areal distribution of many living species, represented by fossils in the cave, has undergone contraction since the Pleistocene. The California condor is a noteworthy example of this. Study of the osseous material clearly indicates that certain birds nested or roosted in the cave, while the bodies of others were probably brought in by predatory animals. The common occurrence in the deposits of bones of the raven in all stages of development points unmistakably to the fact that this bird frequented the locality in large numbers.

The fossil mammalian assemblage is nearly as large and varied as the avifauna, for approximately 40 species are represented. Man is not included in the present list since his bones were found only in the uppermost, disturbed portion of the deposits. As might be expected, rodent remains are very abundant and their identification demonstrates the presence of the marmot, squirrels, a porcupine, gophers, mice, rats and lemming. Dwarf rabbits and cottontails occur. Hoofed mammals are also present in numbers. The most common type among these is a four-horned antelope. This creature differs from the modern pronghorn in the structure of its horns. Its skeleton is like that of the living antelope, but the limbs are slightly heavier, the body as long but not so tall as in the latter. Sufficient material is available to construct a mounted skeleton, on the basis of which a restoration has been made (figure 6). Next in abundance is an extinct species of deer, having a size more like that of a dwarf elk, and thus is distinctly larger than the largest mule deer of today. Much less in evidence is the true deer. Of much interest because of possible climatic implications, are several individuals of a bovid related to

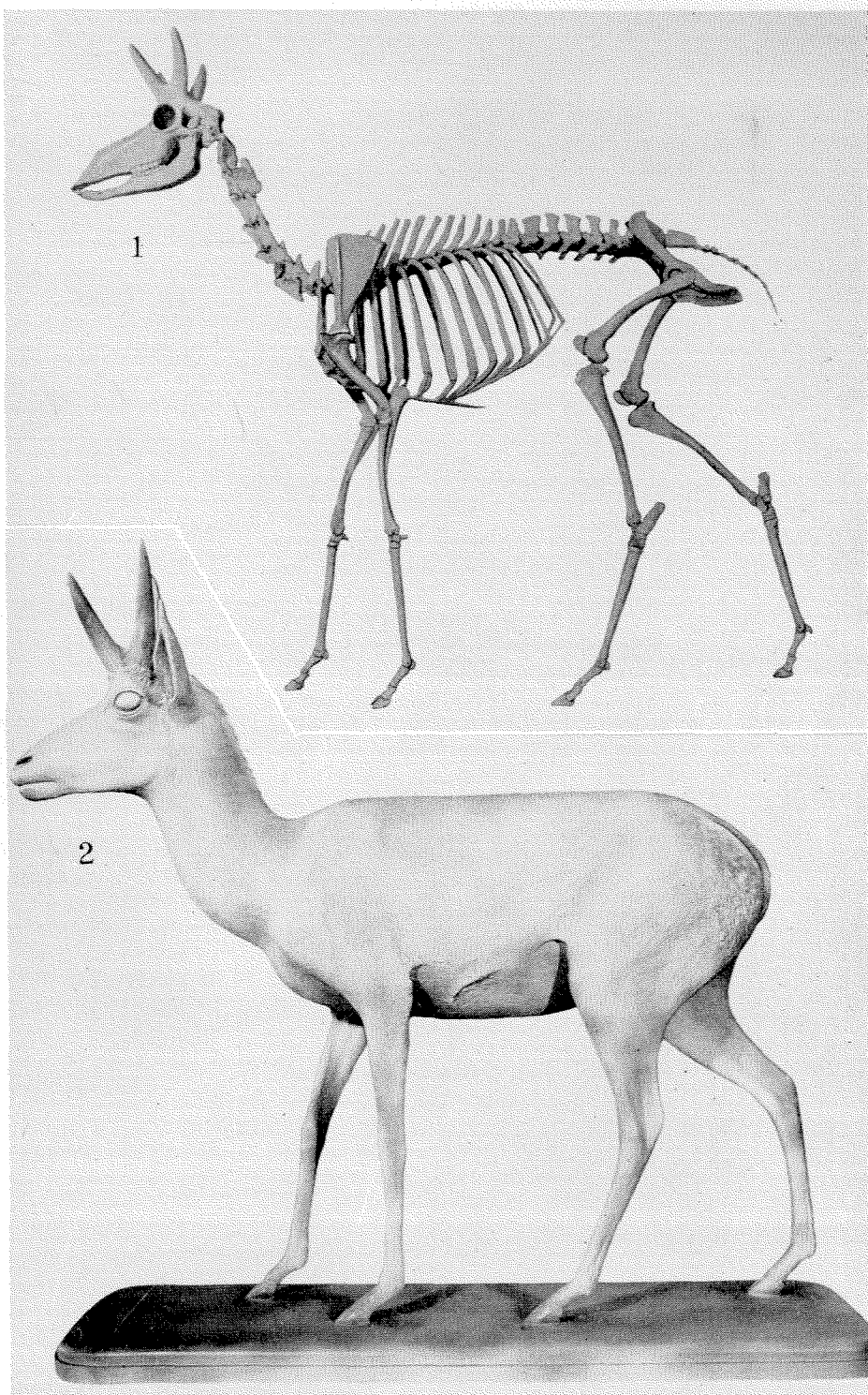


FIG. 6. An extinct four-horned antelope (*Stockoceros conklingi* [Stock]), one of the more common mammals found fossil in the cave deposits. (1) Skeleton by Fischer, (2) restoration by Otto; after Furlong. Size greatly reduced.

the muskoxen. Another type, rather rare and unusual in its presence, since its nearest relative has a much more northerly range today, is a small mountain goat. Curiously, only two or three bones of llama-like camels were found.

Additional herbivores include the ground sloths *Nothrotherium* and *Megalonyx*. The former is much

more abundant than the latter. Another common herbivore is the horse. This animal is smaller than most of the horses of the North American Pleistocene. Evidently sufficient verdure was present in the vicinity of the cave to sustain both grazing and browsing mammals. Apparently individuals of these larger animals floundered into the cave or their bodies were dragged in by carnivores.

Remains of an extraordinarily diversified assemblage of flesh-eaters are found in the San Josecito deposits. The cats include the sabre-tooth, the jaguar, the giant jaguar or great lion, pumas and lynx. The canid family is represented by foxes, coyotes and the extinct dire wolves. A black bear and an extinct short-faced bear are recorded. Among the smaller carnivores are the weasels and skunks, including the hog-nosed skunk. Insectivores and bats have been found fossil, and among the latter the vampire bat is perhaps the most interesting.

A survey of the entire mammalian assemblage makes the conclusion inevitable that the life of the Ice Age in this region of Mexico was far more abundant and more diversified than that of the present. Definite impoverishment of the bird and mammal assemblages has come with the passing of the Pleistocene and the advent of Recent time. It appears logical to conclude that the richness of this past life developed under optimum climatic conditions, furnishing for the herbivores even greater opportunities to obtain food than prevail in the area today. It should be mentioned in this connection that the cave occurs now in an elevated region supporting a pine and oak plant association. More extensive grasslands interspersed with forests, and existing under at least a slightly cooler climate with greater rainfall than the present, may comprise some of the major features of the environment in which these organisms lived.

Thus, from San Josecito Cave comes a tangible link with the life of the immediate geologic past. The kinds of creatures that once lived in and about the locality are, for the most part, readily identified by the "dry bones" entombed in the strata laid down in the cavern. The facts of occurrence and association of the fossils furnish likewise a basis for an interpretation of the conditions under which the birds and mammals existed. This material record of an episode in later geologic history not only adds many new facts to paleontology, but also extends geographically the picture of the Pleistocene life of the North American continent.

## Manpower Dynamics

(Continued from Page 9)

standards, a minimum of administration is required and the success of voluntary control is assured.

Any control, however, impinges on individual rights and privileges. Unless it is accepted that certain individual rights and privileges must be restricted in time of war, voluntary restrictions cannot be developed and compulsory ones might be imperative. This is another "dynamic factor" in dealing with the manpower problem.

The mechanism has been established by which management and labor can agree to the restrictions upon freedom of movement to which they will both submit themselves. This mechanism is known as War Manpower Commission voluntary stabilization agreements. The National Management-Labor Committee of the War Manpower Commission has referred to these agreements as

types of voluntary compulsion. That may sound a bit facetious but it is extremely fundamental. If we are willing to write our own rules and are willing to abide by those rules it is a much more pleasant form of self-denial than rules which are promulgated by others and forced upon us. The only enforcement behind such rules is honor and loyalty and, after all, what greater form of enforcement is there? This is another "dynamic factor" in dealing with the manpower problem which can only be realized to the extent that the people of this country accept the implications of this basic principle.

The handling of the manpower problem starts and should be handled almost entirely within the employer's individual establishment. In dealing with manpower the employer must give ample consideration to the type of management practices which exist in his establishment, the caliber of the supervision, the nature of the labor relations, the personnel program, policies, and practices that exist.

For decades an educational process has been going on toward the creation of better employer-employee relationships. Particularly since the last war there has been a rapid development in this field. Those employers who will review the constructive proposals that have been made since the last war will soon solve their own manpower problems. They will immediately give personal and diligent attention to turn-over, absenteeism, the use of types of workers not qualified for military service, and the extent to which the full capacities of workers are being utilized.

Since the manpower situation in time of war requires individual sacrifices, there are no exceptions. If it is appreciated, therefore, that there must be restrictions upon both management and labor, it will likewise be appreciated that the nature of those restrictions and how they will be administered should be worked out jointly by all parties affected. This is a "manpower dynamic" of the greatest import. How much longer will some of us fail to accept it?

### SUMMARY

This has been a rather general presentation of specific principles. There is nothing in it which makes news or startling headlines. To some it may even be dull and boring. It may, to others, be disappointing since it does not answer their own specific problems.

This presentation is a sincere attempt on my part to introduce into this discussion certain basic factors which must become dynamic in the consciousness of those who hope to contribute tangibly to the mobilization and utilization of the nation's human resources. Anyone who does not accept the fact that wartime economy is different from peacetime economy, that manpower plans cannot be definite predictions, that there is one correct answer to manpower arithmetic, that the problem is now allocation and distribution of manpower, that controls are necessary, that the extent to which the controls are voluntary is dependent upon the amount of administration required, and that in the last analysis the manpower problem has to be solved in the establishments in which the work is being done by the workers and the employers who are held responsible for getting it done, will find that adequate handling of the manpower problems facing him is impossible.

It is a great satisfaction to realize that there is a growing understanding of these manpower dynamics. There is increasing indication of the willingness of local communities and establishments to solve these problems at the source. This is a hopeful sign.