

INDEXED

# ENVIRONMENTAL DETERMINANTS OF COMMUNITY WELL-BEING



**PAN AMERICAN HEALTH ORGANIZATION**  
Pan American Sanitary Bureau, Regional Office of the  
**WORLD HEALTH ORGANIZATION**

**1965**

INDEXED

# ENVIRONMENTAL DETERMINANTS OF COMMUNITY WELL-BEING

**Proceedings of the Special Session  
held during the Third Meeting of the  
PAHO Advisory Committee  
on Medical Research  
17 June 1964**



Scientific Publication No. 123

December 1965

**PAN AMERICAN HEALTH ORGANIZATION**  
Pan American Sanitary Bureau, Regional Office of the  
**WORLD HEALTH ORGANIZATION**  
525 Twenty-third Street, N.W.  
Washington, D.C. 20037

## NOTE

*At each meeting of the Pan American Health Organization Advisory Committee on Medical Research, a special one-day session is held on a topic chosen by the Committee as being of particular interest. Experts in the field under discussion are invited to participate. At the Third Meeting, which convened in June 1964 in Washington, D.C., the session focused on the environment and its effect on human health, with special emphasis on the problems created by mass migrations toward the city. This volume records the papers presented and the accompanying discussions.*

## PAHO ADVISORY COMMITTEE ON MEDICAL RESEARCH

Dr. Hernán Alessandri  
Ex-Decano, Facultad de Medicina  
Universidad de Chile  
Santiago, Chile

Dr. Walsh McDermott  
Chairman, Department of Public Health  
Cornell University Medical College  
New York, New York

Dr. Gaylord W. Anderson  
Director, School of Public Health  
University of Minnesota  
Minneapolis, Minnesota

Dr. Horace W. Magoun  
Dean, Graduate Division  
University of California  
Los Angeles, California

Dr. Carlos Chagas  
Director, Instituto de Biofísica  
Universidade do Brasil  
Rio de Janeiro, Brasil

Dr. Karl F. Meyer  
Director Emeritus, The George Williams  
Hooper Foundation for Medical Research  
University of California Medical Center  
San Francisco, California

Dr. Ignacio Chávez  
Rector, Universidad Nacional Autónoma  
de México  
México, D.F., México

Dr. Anthony M.-M. Payne  
Chairman, Department of Epidemiology  
and Public Health  
Yale University School of Medicine  
New Haven, Connecticut

Dr. René Dubos  
Professor and Member  
The Rockefeller Institute  
New York, New York

Dr. Marcel Roche  
Director, Instituto Venezolano de  
Investigaciones Científicas  
Caracas, Venezuela

Dr. Bernardo A. Houssay  
Director, Instituto de Biología y  
Medicina Experimental  
Buenos Aires, Argentina

Dr. James A. Shannon  
Director, National Institutes of Health  
Bethesda, Maryland

Dr. Niels K. Jerne  
Chairman, Department of Microbiology  
School of Medicine  
University of Pittsburgh  
Pittsburgh, Pennsylvania

Professor Abel Wolman  
Emeritus Professor of Sanitary Engineer-  
ing and Water Resources  
The Johns Hopkins University  
Baltimore, Maryland

Dr. Samuel Z. Levine  
Emeritus Professor of Pediatrics  
Cornell University Medical College  
New York, New York

### SECRETARIAT

Dr. Raymond B. Allen  
*Chief*

Dr. Mauricio Martins da Silva  
*Deputy Chief*

Mr. Louis Munan  
*Research Scientist*

Office of Research Coordination  
PAN AMERICAN HEALTH ORGANIZATION  
Pan American Sanitary Bureau  
Dr. Abraham Horwitz  
*Director*

Special Session on

ENVIRONMENTAL DETERMINANTS OF  
COMMUNITY WELL-BEING

CHAIRMAN: Professor Abel Wolman

PARTICIPANTS

Dr. J. Ralph Audy  
Director, The George Williams Hooper  
Foundation for Medical Research  
University of California Medical Center  
San Francisco, California

Dr. William Mangin  
Acting Director for Peru  
U.S. Peace Corps  
Lima, Peru

Dr. John O. Buxell  
Associate Professor of Environmental  
Health  
School of Public Health  
University of Minnesota  
Minneapolis, Minnesota

Ing. Humberto Olivero, Jr.  
Department of Sanitary Engineering  
Faculty of Engineering  
University of San Carlos  
Guatemala City, Guatemala

Dr. Fausto Pereira Guimarães  
Institute of Sanitary Engineering  
Rio de Janeiro, Brazil

Dr. J. C. S. Paterson  
Chairman, Department of Tropical  
Medicine and Public Health  
Tulane University School of Medicine  
New Orleans, Louisiana

Mr. H. G. Hanson  
Assistant Surgeon General  
Bureau of State Services  
U.S. Department of Health, Education,  
and Welfare  
Washington, D.C.

Dr. Anthony M.-M. Payne (*Rapporteur*)  
Chairman, Department of Epidemiology  
and Public Health  
Yale University School of Medicine  
New Haven, Connecticut

Mr. Vernon G. MacKenzie  
Assistant Surgeon General  
Chief, Air Pollution Control  
U.S. Public Health Service  
Washington, D.C.

Dr. Humberto Rotondo  
Chief, Department of Psychiatry  
El Asesor Psychiatric Hospital  
Lima, Peru

## CONTENTS

Opening Statement <i>Abel Wolman, Chairman</i>	1
The Environment in Human Ecology	
General Considerations <i>Anthony M.-M. Payne</i>	3
Artifacts—The Significance of Modified Environment <i>J. Ralph Audy</i>	5
Epidemiological Methods in the Appraisal of Environmental Influences <i>J. C. S. Paterson</i>	16
Evaluation of Selected Environment Factors	
Water <i>H. G. Hanson</i>	24
Air <i>Vernon G. MacKenzie</i>	29
Adaptability of Human Behavior <i>Humberto Rotondo</i>	37
The Role of Social Organization in Improving the Environment <i>William Mangin</i>	41
Basic Housing Sanitation Services in Shanty Towns: Migration and Urbanization <i>Humberto Olivero, Jr.</i>	51
Comments: <i>John O. Buxell</i>	54
Summary	57

## OPENING STATEMENT

### Abel Wolman, Chairman

In calling this session to order, I want to make a few preliminary remarks, largely to establish what I hope will be the setting for today's discussions and formal papers.

Let me say first that we owe the title of today's session, "Environmental Determinants of Community Well-Being," primarily to Dr. Payne. Despite the real significance of this title, even he might be puzzled if called upon to define the terms he has chosen so felicitously. We hope that sometime during the day it may become clear how to go about diagnosing both environmental determinants and community well-being.

I think I am safe from attack if I initiate the session by going back twenty-five hundred years. Hippocrates crystallized the gropings of many observers of earlier centuries on the same topic that confronts us today. He described as an honor to his profession that physician "who has been led through the whole circle of the sciences; who has a due regard to the seasons of the year, and the diseases which they are observed to produce,—to the states of the wind peculiar to each country, and the qualities of its waters; who marks carefully the localities of towns, and of the surrounding country, whether they are low or high, hot or cold, wet or dry; who, moreover, neglects not to mark the diet and regimen of the inhabitants and, in a word,

all the causes which may produce disorder in the animal economy."<sup>1</sup>

I am sure that every physician in the room recognizes this as an accurate description of his own practice. Hippocrates does encompass all the realities that we ourselves may confront today.

In the course of time and with the advance of science and technology, this emphasis on the airs, the waters and the places has advanced to the philosophic concept of "holism" of General Smuts and the constellation of causes of disease of Dr. Dubos. The environment of man, embodying the biological, physical, chemical, and social components of his world, thus confronts us as a primary part of the ecosystem only partially envisaged, it is true, by Hippocrates and others.

Today we concern ourselves with the interaction of organism and environment. As Marston Bates pointed out in his recent Albright Lecture,<sup>2</sup> we no longer speak of organism versus environment or vice versa. Our concern is with the interaction of man and his environment, at once natural and man-made. And he reminds us, as today's discussions will undoubtedly re-

<sup>1</sup> *The General Works of Hippocrates*, translated by Francis Adams. London, Sydenham Society, 1844.

<sup>2</sup> Marston Bates, *The Human Environment*. The Horace M. Albright Conservation Lectureship, University of California, 1962.

iterate, that the old aphorism of Francis Bacon still applies: "You cannot command nature except by obeying her."

It might even be suggested that the theme for today's discussions is epitomized in Bates' last few sentences: "I find some grounds for hope—and they go back to that conceptual environment that governs so many of our activities. We made it. Surely, then, we can alter it and patch it—somehow develop a noösystem that is more just, more practical, and more beautiful than the one we have. At least it is our duty to try—without trying we are surely doomed."

In providing an "ecological slant," we must seek greater specificity than these general observations might suggest. The geographical setting is those countries for which the Pan American Health Organization has high responsibility. They are characterized by great diversity in almost all their attributes, except perhaps that they all suffer from diseases supposedly long laid low in the literature plus those dominant in more favored regions. They all wait upon the promises of the Charter of Punta del Este of 1961.

Can we at this session indicate the directions in which PAHO may best attack an environment that has the earmarks of 1890, enriched by the fruits of the science and technology of 1964? On what basis can we select actions requiring minimum expenditures of money, man, and materials for maximum returns in lives saved, in deaths and disabilities avoided, and in production increased?

What does existing knowledge offer for sound action? What areas of research hold out the utmost in immediate values and the best long-range promise? What are the sociocultural obstacles to success in any of the environmental control endeavors? How may these be hurdled most rapidly? In Latin America, as elsewhere, the impatience of people is high.

What is the "metabolism" of the institutions, present and prospective, that may best serve the purpose of these disparate issues and countries while we simultaneously explore the roots

of their ecological behavior?

Everything that engages us today is an extension of the issue posed half a century ago by Graham Wallace, the English political scientist and teacher. He asked, "How does human nature respond to the conditions of the complex urbanized life which industrial and mechanical civilization has created?"

In Central and South America, at least two centuries of cultural and political contrasts are spanned by millions of people living in rural and urban areas. One is confronted, therefore, with a wealth of problems and, too often, with no successful formulas for solution and action. Yet, while the search for the roots of human behavior proceeds, current action must proceed with what science and technology already have to offer—validated, supported, and guided, it is hoped, by social science.

In some areas of effort—excreta removal in rural populations is a striking example—there has been very little real success. The time seems long overdue to undertake deep inquiry into the human motivations that have prevented greater success. Urban water supply, on the other hand, seems for whatever reasons to have wider and prompter acceptance and use. This kind of cleanliness, in contrast to privy use, shows a minimum of cultural lag in general adoption.

In between these extremes of human behavior are the reactions to literally hundreds of other private and public facilities that people desire or should have. PAHO is driven again into decision-making and selection with its permanently limited resources—and with the "rising expectations of man" militantly at its heels.

Although delineation of the relative significance of environmental determinants of well-being is a first order of business, it is of equal importance to isolate areas of ignorance in which PAHO must press for prompt exploration. It is hoped that guideposts will be set up today that will facilitate the actions of tomorrow.

I now ask Dr. Payne to continue these preliminary comments before I call for the first paper.



# THE ENVIRONMENT IN HUMAN ECOLOGY: GENERAL CONSIDERATIONS

Anthony M.-M. Payne

Originally, I had planned to begin my introductory remarks with exactly the same quotation from Hippocrates as Dr. Wolman, but he has relieved me of having to go back more than two thousand years. So perhaps I can start with a hundred years ago in considering shanty towns.

Generally, the rural-urban migration problem is not a new one. In the last century the Industrial Revolution was accompanied by a similar movement and resulted in the creation of the slums in the great cities of the west. One has only to read Dickens to see that conditions then, in London and the other great cities in England, were nearly as bad physically and morally as those described by Carolina de Jesus in *Child of the Dark*.<sup>3</sup> I may be wrong, but I thought that as a classic description of social problems this book was almost on a par with those of Dickens.

The problems created by the Industrial Revolution about a hundred years ago in the most highly developed countries have not been solved yet. I think that this should be very clearly recognized. For instance, in Connecticut, a rich industrial state, the infant mortality rate among the Negro population of New Haven is 60 per thousand live births, which is the same as the over-all infant mortality rate in Uruguay. This is, frankly, quite appalling.

The infant mortality rate among whites of all classes in New Haven is around 20. In the lowest class of whites it is around 30, but even that is half the Negro rate.

Why is this? The Negroes live in the same areas and often in the same houses as the whites. They have the same conventional environmental facilities in the form of pure water supplies and

water-carried sewage. They buy their food in the same supermarkets. They may buy the wrong food but the food itself is at least clean.

The only clue that we have is that this excessive infant mortality results principally from prematurity, which is much more common among Negroes than among whites. I cannot explain why. It is tempting to ask whether the rate may not, in fact, be even higher than it appears, because fetal loss early in pregnancy among these underprivileged groups often does not get into the official records.

So that even in the most highly developed countries of the world, conventional sanitary measures have only partly overcome the evils that began in the Industrial Revolution. Earlier in the century, it was only the rising tide of prosperity, free education, enlightened legislation, and so forth, that made any real impact on them; yet today we are all aware how small this impact has been. It is shown by the increase in juvenile delinquency, crime, alcoholism, and mental diseases from which the great cities of the world are now suffering.

Why have we failed?

I submit that the reason is that we have not tackled the problem from an ecological viewpoint. We have tended to regard man simply as a biological animal with biological needs, which can be satisfied by the expenditure of enough dollars and the provision of a few relatively simple physical necessities. We have largely ignored the fact that he is a social animal and that it may be at least as important to his health to satisfy his social needs and behavioral urges as his purely biological ones.

Many simpler animals die if their behavioral urges are frustrated. Perhaps it would be better if man did, too—it would at least call attention to the problem! This is one of the fields of medical investigation that have been

<sup>3</sup> Carolina Maria de Jesus, *Child of the Dark*. New York, E. P. Dutton and Co., 1962. 190 pp. The book was distributed by the Secretariat to all Committee members.

grossly neglected. Dr. Audy's paper will clarify this point.

In other ways, the over-all situation has changed since the last century because political ideologies have emerged that superficially, at least, may seem to be better fitted to the solution of the immediate problems of underprivileged countries than the philosophies of the traditional conservative or liberal democracies. It is inevitable that underprivileged groups, because their needs are so desperate, will turn to them for the immediate benefits they seem to promise. This has made the solution of these problems more urgent than it ever was before.

This is not just a problem of Latin America—it is a world problem.

It is happening more quickly and on a larger scale than the Industrial Revolution, and in countries of many different backgrounds. These countries already know that some of the same problems have been faced before. The rising tide of expectations among the underprivileged demands early solutions. Ideological pressures on governments, for reasons of political expediency, interfere with logical planning (this has been a recurring theme in our discussions during the present meeting of PAHO/ACMR). And the world is shrinking. Local problems are no longer local. At the whim of the press or of political organizations, a minor incident or a minor injustice can become an international affair overnight.

So we must make haste.

These ideas were in my mind when I suggested the title "Environmental Determinants of Community Well-Being," because the traditional environmental factors that are regarded as the concern of the health authority—food, water, waste disposal, and housing—cannot be separated from the behavioral elements that play such an important role in determining the health of individuals in populations.

I use the word *well-being* rather than *health*, because *health* has tended more and more to connote the material, biological or physical determinants and, except when the results are frankly pathological, to ignore the behavioral.

I should like to submit that the success of a child's adaptation to civilization, which has to be achieved anew for every child in its upbringing, and the adaptation of communities to new circumstances are in fact much the same process and depend largely on behavioral elements. The adaptation is essentially behavioral or cultural rather than biological.

One of the difficulties here is that what is regarded as pathological behavior in one social situation may be acceptable in another one, and vice versa; what is regarded as disease in one situation may be regarded as being within normal limits of health in another; what is regarded as normal behavior in an infant would be regarded as psychotic in an adult, and behavior accepted in rural communities is often unacceptable in a metropolis.

These problems have been recognized by psychologists, psychiatrists, sociologists, anthropologists, and others, but their examination of the subject has suffered, first of all, from a lack of theory accounting for all the possible effects and, secondly, from the restricted viewpoint of all specialists.

I believe that the scientist who comes closest to a panoramic view of these problems, considering them always in relation to their total environment, is the epidemiologist adopting the ecological viewpoint. At Yale University we have developed the concept that epidemiology is so closely related to human ecology as to be indistinguishable from it except by the emphasis deriving from our primary interest in health.

Note that I identify our interest as being in health rather than disease, because of the difficulty of defining disease except in relation to the concepts of a particular society. There is no absolute distinction between health and disease.

We recognize that the determinants of health and disease lie in these three broad areas: the animate, biological environment; the inanimate, physical and chemical environment; and the behavioral, psychological and social environment.

We know much about the first two, but very little about the third. But ecological theory in-

cludes all three. It is not like that of the physician, preoccupied with the biological, or of the sociologist, preoccupied with the social. Therefore, we turn to the ecologist, who has started his studies with systems much simpler than man, for theory that may be extended or elaborated to the more complex ecosystem of man.

Perhaps in an extension of the ecologist's theory we can find a broad canvas on which a full picture of the story of human health and disease can be painted. It is for this that we turn to Dr. Audy, a physician who has found profound truths in the study of bioforms less complex than man.

## **THE ENVIRONMENT IN HUMAN ECOLOGY: ARTIFACTS—THE SIGNIFICANCE OF MODIFIED ENVIRONMENT**

**J. Ralph Audy**

So much talk about environment has been going on for so many years that before an audience like this it is extremely difficult to say anything novel. To be honest, I really do not like the word *environment*, and I am trying to work out a course of ours, which deals partly with what might be called human ecology (I do not like that term, either!), without using it at all. The physiologist, for example, has got along very well without it. He does not talk about the environment of the gland or the environment of a blood vessel because what he is concerned with is the system as a whole. Thinking of my surroundings as my environment tends to stop me from thinking in terms of ecosystems. To my mind, an ecologist is someone concerned with the system as a whole.

For example, if a person refers to smog as something in his external environment, he is not talking in ecological terms. If he refers to it as a metabolite in the ecosystem of a metropolis, he is looking at it in an ecological way.

Perhaps the most useful thing I can do is start with animal behavior in relationship to the things around it and then extend this discussion to the animal aspects of man. This is an extremely important area and a very neglected

one, because people tend to feel that nothing derived from animal behavior can really apply to a sophisticated creature like man. That, I think, is a great mistake. It is astonishing how again and again, if one asks oneself what this or that aspect of animal behavior has to do with man, it turns out to be something pertinent that has been neglected in the study of human behavior and human ecology.

Pediatricians, for example, might learn a great deal from such things as flight distance and alarm distance, which anyone familiar with animals in zoological parks would comprehend. The person who understands these will find that a child has the same characteristics as the animals in the social use of space; if he wants to approach an unknown child and not alarm him, he has to respect his particular boundaries.

Furthermore, though certain aspects of behavior among animals are genetically controlled, we tend to assume that nearly all human behavior is cultural. I think some of it is not.

May I start by giving an example, which I admit is very subjective and flowery.

Let each of us imagine he is a rat that is being introduced to some new terrain. To the rat, this is very much the sort of experience

that it would be to one of us to be dropped on Mars.

So long as the rat is in unfamiliar territory, it is ill at ease and it is driven to move. It is driven, also, to seek some sort of shelter that gives it relief. It therefore starts exploring. As it explores it takes some little path in the three-dimensional space around it, and bit by bit that path becomes rather familiar. Thus, if something alarms it—an unexpected noise or a strange new sight—as it turns the corner, it will tend to run back along the same path. By gradually extending itself, and venturing farther and farther, it finds shelter of various sorts. In due time, by its own exploration, this animal will have structured a world of its own, consisting of paths that are familiar. Because they are familiar, they will become beaten paths and can be recognized as runs. In casting around, it will also have picked out shelters, or refuges, of different grades. The best of these will be what might be called its home.

Another thing this animal does, through its own effort and with its own teeth and claws, is to alter the environment. (I used this word *environment* because I am talking about one rat.) It introduces something completely new, an element that was not there before but belongs to it. This it does in order to create an environment that suits itself: microclimate, shelter, protection, and so on. What we then have is something that not only belongs to it but is characteristic of it. Usually it is a nest, or burrow, and we can say, "This is the nest, or the burrow, or the so-and-so, made by such-and-such a species of animal." Each different species of burrowing rodent has its own particular kind of burrow. A porcupine burrow is different from the burrow of other large animals. A wood rat builds up a big pile of sticks and has its nest hidden inside; every year, it adds some sticks and produces another little apartment.

This structure, the modified environment, is my subject. It is an *artifact*, which I define as "a structural product of animal behavior." An artifact must be structural, and it must be the product of overt behavior of an animal or a man.

The sum of the artifacts of a group or population may be referred to as its *total* or *collective artifact*. My primary purpose is to draw particular attention to the artifact and especially the total artifact as a function of the organism rather than as a mere physical structure in the environment.

*Artifact* means different things to different people. The ideas that cling to established words often hobble fresh excursions of thought. In the present case, our thinking is colored by the fact that the word *artifact* so obviously and obstinately tends to mean a manufactured article. I think a new word is needed. I have been using the cumbersome term *specific artifact*; at times I have used *ethophane*, in the sense that behavior is "showing through" or is manifest in the structure concerned.

This is the most interesting aspect of an artifact: that it is made by the behavior of a creature and that on the whole, despite some learned aspects, the behavior is genetically controlled and is largely instinctive. What one finds in the artifact is virtually a crystallization of that animal's behavior. It can be seen or photographed. In other words, it is behavior that is shown morphologically. It may provide a means of learning how the animal behaves that is much easier and less time-consuming than watching the animal in all sorts of circumstances.

An artifact may be produced *de novo* or by modifying a pre-existing structure. A creature may become adapted to the specific artifact of another species, as fleas or bedbugs have done. Sometimes such a creature may make its own artifact within that of its host; for example, rats make nests within the nests (that is, houses) of men. A question arises whether such things as the clothing of human beings or the camouflage of lichens or the debris that certain larvae and other creatures plaster on their backs may be regarded as specific artifacts. As the term is here defined, with behavior—whether socioculturally or biologically determined—as the essential criterion, I suggest that they may indeed.

I first became aware of the value of the arti-

fact when I was collecting *Stenogaster* wasps in Malaya. Wherever there is a little bank on the roadside and small rootlets are sticking out, one may find nests of these wasps—they are sometimes very tiny, perhaps consisting of three little cells, some made of paper, some of mud. The variety is astonishing. To identify the wasps requires a lens and entomological skill. The various species are hard to distinguish, and I soon found that it is much easier to identify the species by the nest—it could sometimes be done at distances of about twenty feet—than by the very tiny differences between the wasps themselves. I am quite sure that a better scheme for studying the behavior of these creatures could be worked out from the morphology of their nests—their artifacts—than from that of the individuals.

This is exactly what has happened in the case of Emerson's studies of termites. In a paper entitled "The Phylogeny of Behavior," he has described in great detail the elaborate termitaria and the evolution of different ventilation systems in them. After reading this very vivid account, we suddenly realize that Emerson has not said a word about the termites themselves, only about the nests. But if we were to look at the termites themselves, we would find the subject of their evolution very difficult to elucidate.

De Witt has studied the spider web, an elaborate artifact that requires the maker to have all its faculties. If one gives a fly some LSD or other drug, lets the spider feed on the fly, and then watches the spider make a new web, one can see at once what sort of derangement the spider may be suffering from—in what way the drug affects its ordinary coordination or some other aspect of its behavior. At times, it just seems intoxicated, but after studying this artifact for a while, De Witt found different kinds of derangements. I do not think the study went very far because the investigators forgot that spiders tend to run out of silk if their webs are constantly being destroyed.

Students of rodent behavior know that a socially deranged female simply cannot make a proper nest for its litter. If provided with nest

materials it drags in an odd bit or two of excelsior, or whatever else it has been given, and leaves them scattered about the floor; usually the litter dies. From this faulty or deficient artifact, therefore, it can be inferred that the animal is socially deranged and unable to carry out the ordinary important aspects of its own behavior. We are currently studying the wood rat's nest, which is extraordinarily elaborate, hoping that we can then use it as an indicator in studying deranged behavior.

One can go further: the modified environment that an organism makes—its artifact, collectively—is really an extension of the organism itself. The best illustration of what I mean, I believe, is the bower birds in Australia.

The male builds an extraordinary bower of which he hopes the female will approve, so that he can entice her into it. Some of the bowers are extremely elaborate; they may have entrance archways carefully made and kept, fresh flowers changed as soon as they fade, colored objects such as fruits or seeds inside. The female makes her selection according to whether she likes the bower; she cares not at all about the male bird himself.

Wherever the ordinary pair bonding of birds breaks down, bachelor clans gather in groups and the females come up and take their pick. The bachelor birds attract the females by their behavior and also by their morphology. They may develop beautiful plumage, fancy tails and so forth that they can spread out and display. They also adopt very elaborate behavior patterns.

(I remember reading years ago of a small bird that does a sort of can-can dance, kicking up his legs, around the female. Sometimes he kicks so high that he falls flat on his back. I cannot think of anything more ridiculous than this. It is on the male's overt behavior that the female makes a sexual selection, which involves two things: the colored plumes and the way in which the male displays these plumes and prances about.)

In one genus of bower birds in which there are three species, only a bower bird can dis-

tinguish the species of the females. In one species the male has a big colored crest, in another he has a small crest, and in the third he has no crest at all but is about as drab and undistinguished as the females. The large-crested birds have quite ordinary bowers; those with the small crest have much more elaborate bowers; while the drab ones have by far the most elaborate bowers, with flowers that are changed every day. Obviously, the morphological characters are transferred from the body of the bird into the substance of the bower—into the artifact. This is genetically controlled, and in describing the bird the morphology of the bower cannot be separated from the morphology of the species. In other words, the artifact is a morphological expression of behavior and, as such, can be regarded as an extension of the organism.

When an attempt is made to apply this concept to the study of man, the subject becomes tremendously complex. I propose to discuss only a few points.

I mentioned earlier that some creatures become adapted to the specific artifacts of others. Man learned long ago that if he builds his house in a certain way, he will be attracting parasites, disease vectors, and other undesirables. He has therefore modified his artifact accordingly. Rat-proofing is practiced all over the world. In many parts of East Africa, tick-borne relapsing fever is endemic. The people know that the fever is transmitted by the ticks; they give them both the same name. To protect themselves, they build a double hut: an inner enclosure for the animals and an outer part for themselves. After a few months, when the tick population has become intolerable and the people begin to lose sleep, they move to the inner part and put the animals in the outer one to trample on and eat the ticks. Every few months the animals and the people change places, and the whole structure of the hut is intended to enable them to do this.

As compared with other creatures, man makes a very elaborate artifact. But an animal makes its artifact by itself, for itself, with a definite purpose (to make an environment to which it

is suited), and in a way that is genetically controlled. Only on rare occasions does urban man make anything for himself any more. He does not use his own beak, tooth, claw, and nail to create an environment that suits him—the artifacts he is obliged to live in are made for him by other people. All he can do is try to modify that environment. In addition, he is subjected to roads and telegraph poles and billboards constructed by other people. People's customs, demands, and fashions are decided for reasons that are socially, economically, and technically complex. They involve some degree of whimsicality and irrationality. They certainly involve a great many people who are concerned only with making money, not in the least with what they are developing and whether it will be the right sort of artifact for the people who are going to live in it.

Reasonably efficient planning of man's collective artifact, the growing metropolis, may be impossible for a great many reasons. Among them are the inheritance of outmoded or faulty artifacts of the past; lack of competent planners; lack of appropriate machinery to make planning effective; and, more than anything, in many places, the fragmentation of administrative units as the metropolis spreads over the countryside. Connery (1963) gives an example of this from the Philadelphia-Camden metropolitan area: Chester County, with a population of 210,000, has 144 government units (57 townships, 16 boroughs, and 71 school districts); Philadelphia County, with ten times the population of Chester, has a single combined city-county government and one school district.

The contrasts between these two places and the possibilities of their doing anything in an organized way with the community as a whole is tremendous. It is shameful that not until somewhere about 1947 was a housing act passed that, for the very first time, encouraged federal aid on a project basis—individual little projects, dealing with one small district in a town. Although its importance had been realized for a century or more, the general neighborhood-

renewal plan, under which people could do things on a slightly bigger scale than the project basis, was not approved until 1956. And it was not until 1959 that they could get federal aid to deal with the city as a whole—except that it may be impossible because of the governmental fragmentation.

It is appalling in what a higgledy-piggledy way our artifact has been growing up around us. The influences of one's immediate surroundings on one's feeling of well-being or one's behavior are usually very subtle, but they are definite and may be profound. They have not been studied enough.

As the good housewife knows without thinking about it, the arrangement of carpets and furniture in a room may make it easy or difficult and awkward for a group of people to become social. It can disrupt them or it can force them to come together. Also well known is that the inside of a home not only reflects the character and personalities of the occupants but also influences their moods. The changes an individual makes in a home, even if he makes an unholy mess of it, constitute an act of personal creativeness. It is a nice mess, one that he likes. As all creative actions do, it tends to make his home more an extension of himself—much as the artifact of the bower bird is an extension of that individual.

Furthermore, man must have recreation if he is to preserve his mental and social health. This is because he is under restraint, unlike the normal animal. Some recreation consists in just relaxing from responsibility or hard work. Some consists in achieving variety. More and more, however, recreation seems to consist in escape—in escape from human artifacts that have become insufferable without the occupants' realizing it. But people cannot always escape from an insufferable artifact; they are just as much prisoners as if chained in a dungeon.

The people responsible for the conservation of wilderness and wild-life resources are inevitably also concerned with outdoor recreation, because human depredations are tending to extinguish these resources. This makes it all the

more necessary to structure our artifacts so as to ensure a life full of warmth, interest, and variety. The supermarket may be very efficient, but in social function it cannot take the place of the small grocer's shop.

A human group does not function meaningfully unless it is integrated socially by shared activities—what might be called group possessions—to create what Erik Erikson has referred to as "group identification." The spatial element is an essential part of this pattern of integration, as is stressed by the students who describe it as a sense of spatial identity. This is exactly what is meant by the concept of *ecosystem*, which must include all artifacts and the media through which information is exchanged.

A study of relocation from the slums in the West End of Boston shows that the spatial component of a local ecosystem is much more important among the working classes than among the middle classes. The paradox is that working people, when relocated to very greatly improved quarters from what we regard as an appalling slum, find the experience much more traumatic than middle-class families find relocation to moderately improved quarters. One would imagine that the greater the improvement, the greater the benefit, but exactly the opposite obtains. This is very important to those concerned with rural-urban and inter-urban migrations.

What is sometimes referred to as "the social use of space," a growing field of study in animal and human ecology, is very relevant to human health. As we learn from comparative studies, different cultures will pattern living spaces differently.

Dr. Wolman, referred for example, to the search for the perfect privy. The word *privy* in itself means "private," and to some people this concept is by far the most important one involved. If they had a privy, what would they do there? They would eat there! People in some cultures must eat in private; eating with others or in front of others is considered utterly revolting. In such cultures a "filthy story"

might end with "And then he went and ate the whole meal in front of everybody."

Finally, we can learn something from the fact that, given a floor space and in it a sufficient number of rats to be subjected to psychogenic stress through interpersonal contacts, we can lessen the amount of stress by introducing other partitions or by adding corners and objects. From our point of view, we are making that environment more complex. From the rat's point of view, we are making it simpler.

In the case of man, a somewhat similar increase in complexity can also reduce stress, but more than mere avoidance of interpersonal coaction is needed. A window box of plants or an aquarium can have a considerable effect on people's social and physical claustrophobia. Imagine the difference it may make to a stenographer in the new, windowless laboratories and offices at the University of California Medical Center in San Francisco if she has an aquarium to give her a view. Such things add to the small-scale richness of one's spatial identification.

The Japanese have superbly developed the art of miniaturization. They say in effect: "If you cannot get out to the wide open spaces, then reduce the space, make your mind small, and explore in other ways." Examples are the Japanese garden, the structuring of the Japanese inn, and the *tokonoma*, a place set aside in even the poorest home to enshrine some simple decoration. All these represent space that is not really there but exists symbolically. This may be pertinent to us because as human beings we can gain satisfaction from symbolic things, but an animal cannot.

**Chairman:** We turn now to Dr. Payne to continue his discussion.

**Payne:** Dr. Audy has done exactly what I had hoped he would do—presented a model against which we can reconsider the human problem with which we are concerned. He has done more, because he has succeeded in extrapolating from his model into the human sphere.

The first question that I should like to ask him is, What would the importance of specific

artifacts or ethophanes be to a species whose survival was in doubt for any reason (emergency conditions, including the shortage of food, inclement weather, and so on)?

My reason for asking is that the book *Child of the Dark* left me with the impression that the greatest problem facing that population was lack of food and that everything else paled into insignificance alongside it. I think our Committee's discussion yesterday on the PAHO nutritional research program underlines this point, because of the profound long-term effects of such deficiencies.

**Chairman:** It is my recollection that the author of *Child of the Dark* commented, I believe many times, that the *two* things that took up most of her time and practically all of her energy were the search for food and the carrying of water for survival.

**Audy:** As I recall, she described the inside of her hovel and drew a distinction between it and the many other hovels nearby, which she despised because the persons concerned paid no attention to the inside at all. She had kept the place tidy, and she had the image of the Virgin Mary in one corner. Most of the other hovels seem to have been neglected and cluttered up with junk.

**Chairman:** She was a much tidier person than most in her surroundings.

**Audy:** Had she really been ill-nourished? Someone who has been ill-nourished or undernourished tends to be apathetic, and anyone who is apathetic tends to neglect everything around him. With an animal, at least, external parasites multiply, possibly because it no longer grooms itself. Much the same happens with human beings who neglect themselves.

The question that Dr. Payne asked was perhaps more than one question. It is mainly this: What is the significance of the specific artifact in relation to an animal that is being figuratively pushed into a corner by changes in environment?

**Payne:** Yes.

**Audy:** The specific artifact is a product of the animal's behavior in all sorts of circumstances. When the circumstances become un-



usual, its behavior also changes; if, for example, there is a climatic change, the animal, unless it is too ill, is likely to modify its artifact in order to keep its microclimate and other conditions as constant as possible.

There are examples in Africa of secular changes in climate to which animals have responded both by migrating and by modifying their artifacts. I believe this has obtained with porcupines, which have been driven up mountainsides by increasing dryness and then return to the lower levels when the climate becomes milder. Also, in difficult conditions an animal becomes more selective of the place in which it is going to live. It very often chooses what I call "fringe habitats" between one area and another, so that it can play off the advantages and the disadvantages of two types of environment.

Payne: The next point I should like to comment on is that the determinants of the behavior that results in specific artifacts are, as Dr. Audy pointed out, clearly genetic in many of the lower animals. There is no opportunity for educational or phenotypic transmission of relevant information from parent to offspring. These inherited patterns can be found at all levels of the animal kingdom, through the primates. It is inconceivable that man can differ in this respect. The problem is that man's greater complexity makes it much more difficult to detect genetically determined behavior. It tends to be obscured by the more obvious acquired characteristics. The determinants of acquired characteristics tend to be given what might be undue importance.

I should like to postulate the hypothesis—for which I have no evidence whatever—that behavior determined in two such radically different ways may well have different kinds of influence on the individual and that the stresses caused by frustrations in these two kinds of behavior may be of a different quality and may actually act through different biological mechanisms. For instance, one could postulate that abnormalities associated with genetically determined behavior might act through processes of

a more basic biological nature, whereas abnormalities of acquired behavior might tend to have more superficial emotional origins. I can only put this forward as a hypothesis.

I should like to elaborate a little on Dr. Audy's concept of a specific artifact, with respect to the behavioral aspects behind the artifact.

He points to the socially deranged rodent, unable to make a proper nest. If it survives (I am aware it does not often survive) and its offspring are also deranged, what happens to them? Can one separate the genetic element from the influence of being raised in the wrong kind of nest? This kind of study could, I think, be of interest to man.

An example will show somewhat more clearly what I mean. The city of New Haven is undergoing a radical redevelopment, and some of the former slum population has been resettled. One group was resettled in a suburban area, which was characterized by little houses on little plots of land. Another was resettled in large apartment blocks in an urban area. The domestic facilities inside are pretty much the same in both instances. Unfortunately, this was not studied from the start, so I cannot say whether the two populations were identical before their move. All I can say is that they came from the same area, in which there had been a high rate of juvenile delinquency and crime.

Since resettlement, there has apparently been a marked difference between the two groups. Among those who were resettled in the urban area the delinquency rate continued much the same; among those who settled in the suburb there was a considerable reduction. The most striking difference one sees between the two areas is that the suburb is filled with small gardens, with well-kept lawns and flowers and trees, each belonging to a family, whereas the apartments are surrounded by small, fenced grass plots on which the children are not allowed to play. These are very common patterns in so-called urban redevelopment.

In the course of a recent study carried out by my department on a quite different subject, we went into the houses and the apartments.

We found that the difference between the two groups extended inside their homes. The little houses were well kept and clean; the apartments, although only perhaps two or three years old, were already becoming soiled and slumlike inside. According to the socioeconomic standards (Hollingshead scale) that we used after resettlement, the two populations were comparable. Yet there was this difference in the "artifacts" that had been constructed for them.

Can we look to the differences in environment for an explanation of the differences in behavioral patterns? I think we can.

One of the ethophanes, or specific artifacts, of the American child is the baseball field or lot. This is an expression of growing children's physiological needs, at various stages, to compete with each other, run, hit things, fall out of trees, and so on.

They need this; it is part of their development, as we mentioned yesterday during Advisory Committee discussions. Just as a child needs essential nutrients in order to develop successfully biologically, so it needs certain physiological stimuli for the adequate development of these aspects of the phenotype.

I gave you an example yesterday of the chimpanzee that is kept in the dark for several months after its birth and never acquires full vision when finally exposed to light. If the chimpanzee is given a month in the light and then is put in the dark for the same period of time, its vision recovers rapidly after it is returned to light. It may well be that the human brain, the human psyche, must be exposed to challenges for successful development; that is, exposed to the appropriate social environment, which stimulates that development. The open-ended question is, What is appropriate? There is no agreement on this.

Opportunities for play may be more important to the child's psychological and social development than to its physical development, although it is obviously important in that respect too.

Now, in New Haven, the people resettled in the suburbs have space where the children can

throw balls; where they can find trees and fall out of them; and can find other ways of obtaining these essential stimuli during their development in a socially acceptable form. Those who were resettled in the apartments have nowhere to play except in the street or on the school ground half a mile away. In any case, school, by definition, is not a place to play. If they want to throw a ball and end up by breaking a window—well, breaking a window is fun for a child if he can get away with it. This sets a pattern, which may well lead to the delinquency with which we are so familiar in urban areas.

I should like to postulate that in the urban areas the specific artifacts or ethophanes that the children need are not available in a socially accepted form.

Let me elaborate further on the hypothesis. Assuming that there are two differently determined behavioral influences, one genetic and the other phenotypic, then it should make a difference whether they act harmoniously in the same direction or conflict with each other. A socially determined influence that frustrates a genetic urge would cause stress, which would be likely to show itself in abnormal behavior. On the other hand, if the two influences are compatible, then adaptation to the requirements of the particular social system should be smoother and easier.

Every civilization has developed ways of making this adaptation successful. While the basic genetic elements in the behavioral component may not differ very much between races, the requirements for successful adaptation certainly differ very greatly in each social system. This, I believe, is where the concepts we are considering are relevant to our problem.

Migrants from a wide variety of rural areas cannot be expected to adapt with equal ease to the same city. I believe that sociological studies of their own patterns of behavior in their original home setting might provide clues to the ethophanes or specific artifacts that would make their adaptation to urban life easier. I should like to urge support of the socio-anthropological research in this direction.

Chairman: Dr. Audy, would you like to respond? Then I shall ask the group for further questions or comments.

Audy: I think Dr. Payne raised more points than I can respond to. One thing that occurred to me in connection with his last remark was that my cat has just had kittens. When this event was obviously drawing near I prepared sanctuaries—in a closet, a cardboard box, newspapers she seemed to like, and so forth. In the end my cat had her kittens on my daughter's bed among her schoolbooks.

I also remember a bird in Malaya, the name of which I have forgotten. It is a bird that burrows in the sand, with the mouth of the burrow open to the air. One of these birds got caught in a nearby rat trap. I thought that if I put it back it would immediately disappear into its burrow at great speed. I tried to push it in, but it refused to go. It was obviously frightened, yet here was its sanctuary and it just would not enter. I got a bright idea: I put the backside in first! It instantly disappeared. This is the way the bird normally goes in or out. To try to push it in beak first is useless.

In other words, you have to know your bird and you have to know your cat. Yet we imagine that we know human beings. We don't. We judge other people by ourselves, by our own culture, and by the way we as individuals interrelate. We assume that some other person will like the same things we do and will be happy under the same circumstances. This is balderdash. We feel, for example, that people living in a shanty or a slum are automatically suffering because of the conditions there. This is frequently not so. If we demolish their slum and put them in a synthetic environment where no social structure has developed, there is nothing that can make these people happy. They were adapted to the slum, and we have destroyed their integration.

A neighborhood is kept together by various social foci—little grocery shops, pubs and other little centers, or even the stoop where people can sit and talk in front of their tenements. By putting the people into what I call clinical

surroundings, we may destroy this integrating element completely. They are much worse off socially than before, and will inevitably deteriorate.

The apartments that Dr. Payne mentioned are at best horrible buildings with long empty corridors and little cubicles. They are like prisons. If I were to be responsible for building such a tenement block, I think I would reproduce the grocery shop, the pub, and the other little centers of activity and scatter them around. The corridors would then be more like streets and this would tend to integrate the whole. The people would start communicating with each other instead of being isolated in cubicles.

The question of genetic versus phenotypic elements in human beings is complex because it may be almost impossible to detect the genetic elements in at least some behavior. But if we bring in for comparison what we know ecologically about animals, we can raise the questions we dare not ask otherwise. We may find clues to our own indistinguishable genetic elements, which we must either fight, go along with, make use of, or join.

In the case of stress mechanisms, we note among animals that the total animal population is kept under control by the availability of food, living space, nesting materials, and so forth. Predators and parasites are important also. But in addition each animal species may have its own built-in mechanisms for population control. There have been tremendous arguments, as we all know, among ecologists over whether populations are controlled by limitations in food supply or by built-in neurosecretory mechanisms. Ignoring this controversy, it seems that some species of animals are controlled much more than others by these built-in mechanisms. When the population becomes too dense the quality and quantity of social contact between individuals reaches some sort of threatening level at which neurosecretory mechanisms that alter behavior, such as mating routines, are set off; these at the same time probably increase liability to infectious diseases and reduce fecundity. The total resistance to insults is lowered and the life

expectancy with it. There is evidence that if the animals do produce litters they are smaller. The effect of all this is to bring the population down again. For each species these mechanisms must be completely geared to the rather subtle mutual responses that occur in social intercourse between individual members. Since these exchanges, like other aspects of the animal's life, are very different in type for each species, the triggering mechanism also must be different.

As an animal, man must have inherited the same sort of trigger control mechanism that primates have, which was geared in the past to some particular kind of social structure and social intercourse. We know enough about population genetics to know that there could have been considerable adaptation of those mechanisms to changing social structures among human beings.

Recently, however, social changes have been so rapid that our physiological controlling mechanisms must have lagged considerably behind in adaptation. Therefore we may assume that most of our populations have built-in control mechanisms adapted to some pre-existing social structure about which we may know very little but into which we can probe. We have to a great extent been able to override these mechanisms by our technological and social advances, and have achieved population densities that would have been impossible had we remained only animals. The present social changes that are being forced on us are so rapid and dramatic that they are no longer geared to the built-in neurosecretory mechanisms, which are therefore operating to our disadvantage in very subtle ways.

If this picture is a correct one, a more careful look into our specific artifacts, our social structure and intercourse, and our behavior toward each other may help us detect both the genetic and the learned elements involved and see what small changes would produce less stress response—and sometimes it takes only small changes in one's environment and social structure to make the difference. One of the obvious things, of

course, is a more generous spirit in social intercourse.

Jack Calhoun, in his experiments with rats, has shown fairly clearly that given a particular sort of structured environment there may be three social states.

One is simply a rat and its family: male, female, and litter. If one or two more rats are introduced, the males, at least, are killed off in no time, and very shortly there is just the family again—even though the mother may now be replaced by a harem.

In the next phase, with five to ten pairs of rats in the approximately one hundred square feet of space Calhoun was concerned with, the colony has a distinct social structure, which seems to be repeatable over and over again: the head man; the harem; the homosexual and pansexual males; and the rejected females, whose estrus cycles are greatly disturbed. If an attempt is made to increase the size of this colony, the excess appears to be rapidly destroyed, and the stable structure of up to about twenty rats is restored.

If, however, there are eighty rats or more in the same place something totally different happens—what Calhoun calls a state of "nirvana." Perhaps that is not the best way to describe it; it is a state in which there are so many rats that they simply cannot afford to be stressed by others. Every rat regards every other rat as a blade of grass or a pebble, and they walk all over each other. There is no co-action, no mating. As a colony it is dying, but for the time being it has achieved its own sort of stability.

I cannot help thinking of resemblances between this state and the way in which some part of our society is developing. Other people are of no more importance than blades of grass unless we can make use of them. We walk all over each other.

Chairman: Dr. Audy, I want to come back to one of the points you have just made: that man has quite recently introduced another element, the political and social decision. Adding this to the total environment modifies to a great

extent what one can expect to accomplish, even with such strong feelings as were expressed earlier about urban renewal, which anyone interested in urban renewal would agree with. If we look at the barracks in New York City that are designated as new housing, we find them rather a dismal kind of social effort. I want to cite the definition of planning given by one of the wisest and most experienced planners in the United States—Dr. Luther Ullick, whose name some of you may recognize. He described quite clearly the dilemma in which all of us find ourselves: that planning is catching up with the inevitable. This, of course, is exactly the contrary of your hopes: you would be ahead of the design of society. Dr. Ullick is led to this cynical comment—perhaps not completely accurate, but sufficiently so—by a total experience that now spans almost fifty years. We are in the business of trying to undo—not too successfully—many of the things that we do or have done.

Dubos: I happened to be looking into an old essay on human nature written in French, with a title I wanted to quote. Immediately, I realized that the term *human nature* as used in English gives a very narrow view of human attributes. To convey all the meaning that the author tried to convey, it would be necessary to speak perhaps of "the nature of man" or of "man's nature." By this I mean that all the biological bases—genetic, ecological, biochemical—must be brought in, as the author implied in reporting all the knowledge of that time.

This is only another way of restating what Dr. Audy and Dr. Payne have been saying—that the greatest deficiency in our thinking about the problems we have been agitating is that nobody has really studied those aspects of the nature of man, of man's nature, that have genetic components.

Dr. Payne selected play as an example. As I understood him, he implied that play was essentially social, even though he began by quoting biological necessity. Without engaging in anthropological thought, I believe that play has a much more profound basis and that much of

it is biological necessity. Certainly, some forms of play are genetically determined. These have never been studied.

Another example is that certain biological rhythms are built in the human fabric and linked to cosmic cycles. I think it is no accident that Mardi Gras is celebrated at a certain time of the year. Marvelous studies have been made relating biochemical mechanisms to the months of the year. All this constitutes man's nature.

In this morning's newspaper, I found an article reporting that schools are going to be built underground without windows: one in Arizona, one in New Mexico, and one, I believe, in California. These schools may make for efficiency in teaching and be less expensive to heat and cleaner, but such a move should not be made without more scientific study of its consequences.

I think that all the problems mentioned here this morning can be converted into questions to be studied by orthodox scientific techniques, if only we formulate them.

Payne: Dr. Dubos is, of course, absolutely right in saying that play is a genetic necessity arising from the nature of man. My point about the social aspects of play was that the actual pattern of play may be determined socially—that is to say, the Americans play baseball, the British play cricket.

Chairman: I am sure we shall revert to your feeling and criticism many times during the day, Dr. Dubos. I might add that in most discussion of urban renewal in the past two or three years, there has been a dawning awareness that essentially urban renewal is for people and that people's behavior has been pretty well neglected. This recognition is beginning to appear in almost every city in the United States. It is salutary, in a sense, but delayed.

You will note that we are very anxious to have all the contributors present their material, but, of even greater importance, to have some general discussion. With that in mind, I am asking Dr. Paterson to take up the next subject matter.

Paterson: I think I should explain that my being here today is one of the accidents of human behavior. When I was first approached by Dr. Payne, I agreed in principle to accept

this assignment on behalf of my department. What has happened, of course, is that all my epidemiologists have gone to Latin America and only the department chairman is left to report.

## EPIDEMIOLOGICAL METHODS IN THE APPRAISAL OF ENVIRONMENTAL INFLUENCES

J. C. S. Paterson

I should like to describe part of what we have tried to do at the International Center in Cali, Colombia. The Center was organized jointly by ourselves and the Universidad del Valle, and our principal purpose is to study human ecology with special reference to health and disease.

I realize that in speaking of health I am not using the World Health Organization definition exactly as Dr. Payne would use it. The fact of the matter is, however, that because of technical limitations, we are better skilled at looking at diseases than at looking at health. So we include both in what we are trying to do.

The problem is whether or not epidemiological methods can be employed. This is not an easy question to answer, first of all because an epidemiologist must have denominators, and these denominators essentially are the numerators of the demographer. The demographic problem is thus a very real one. Let me try to illustrate.

As you know, demographic circumstances are changed either by population increase or decrease—which may be either natural or artificial—on the one hand or by migration on the other. Both of these phenomena are going on with enormous rapidity. In Colombia, the last census was in 1951. It has not been repeated yet. There is some hope that a new census may be taken during this coming year.<sup>4</sup> It is very

difficult under these circumstances to know best what to do when one is going out to look at a community.

It is made more difficult by the tremendous rural-urban migration that is going on. For example, at the time of the 1951 census there were 123,000 people in Cali; at present there are more than 700,000; <sup>5</sup> by 1970, it is anticipated, there will be 1.2 million.

The same thing is happening throughout Latin America with a rather frightening rapidity. People are coming into cities that cannot absorb them and one has to try to understand the reasons.

One might dismiss this by looking at the Cauca Valley and saying to oneself, "Well, this is a sociological problem; it is not a problem that concerns physicians." This is not the case. We cannot afford to treat it in this fashion.

The paradox remains that the Cauca Valley is a beautiful valley. It is at an altitude of three thousand feet. It has a tremendous depth of topsoil—up to ninety feet, with a mean depth of sixteen feet—a very stable climate, and plenty of water. It is capable of producing any amount of food. And yet the children are dying of kwashiorkor.

Again one could say, "This is a problem of social disorganization; it is not a medical prob-

<sup>5</sup> According to preliminary 1964 tabulations, the population is about 900,000.

<sup>4</sup> The census was carried out on July 15, 1964.

lem." We cannot leave it at that; this is going on and is a real problem.

Whether or not, under these circumstances, the epidemiologist's problem would be solved by a census I am not sure. A census reflects a moment in time, and these changes are going on with very great rapidity. The result is that we have tried to devise some other ways of dealing with the demographic problem.

What are the characteristics of the people in the community? To try to find out, we have used a sampling survey method. We carried out the survey in Buenaventura, on the Pacific coast of Colombia, choosing this city because its boundaries are fairly easily defined. It is a small island with some spread over to the mainland, as was confirmed by aerial photographs that we got from the Inter-American Geodetic Survey. We pieced the photographs together and then carried out a process of stratification. We tried to divide the city so that each stratum was internally homogeneous but differed as much as possible from the adjoining strata: for example, one stratum that was obviously industrial; another that was obviously a fishing community, in which most of the houses were built over the water; a third that was residential; and so forth.

Having done that, we then ran a ruler over the houses and in a regular fashion numbered them all. Then, by using a table of random numbers, we were able to select a 5-per-cent sample of the houses and, it was hoped, of the population.

This is basically a stratification-cluster sampling technique, the clusters being people inside the houses. We ran into some difficulty because we found that some of the houses were built on top of one another and could not be separated. Obviously, in such cases, the cluster is bigger; and in a stratum with bigger clusters, there is a bigger error.

Having done that, we enlisted students from the School of Economics, trained them, and proceeded to interview all the people. We made one mistake: our training of the interviewers was not thorough enough. They were

well trained to gather ordinary census data, which perhaps students in an economics school understand better. But they were not properly equipped to administer the health questionnaire, with which we were trying to find out something about how healthy the people were, how frequently they had been sick in the last year, and so on.

The results have been analyzed within the limits of a 90-per-cent confidence interval. We now know a good deal about the characteristics of this population. The information, I would say, is not highly sophisticated. Whether we can by this means develop sophisticated data, I do not know. Nor do I know how accurate our sample is. In other words, can it be extrapolated to the whole population? It needs to be validated by a full census and by repetition. If valid, however, it promises a rapid means of getting information of any particular kind one happens to want, on a repetitive sample of the people.

We learned a good deal from it. We asked questions such as where did you live five years ago? Where were you born? We realized for the first time how very mobile this population is. It changes with tremendous rapidity. We have also received some notion that there are pathways of migration, that it is happening not in a purely random way but along definite axes. For example, many of these people are obviously coming from the Department of Chocó, which is a tropical rain forest, with no type of employment. One means of getting away from there and into a city seems to be education. There are a great many children, and adults as well, going to high school in the Chocó region—many more than we ever realized. This is how they escape. Obviously, we must have data of this kind in order to conduct epidemiological studies of a more than purely qualitative kind.

Another type of information we have derived is that in Buenaventura so-called free unions are as common as marriages. This may be an important result of migration: traditional kinships are breaking up and new relations being devised or fallen into.

We shall probably continue this kind of study for some years to come. I think we will have to. At the same time, however, it is necessary to carry out a good deal of sociological research to find out what the causes of such migrations may be and what effects they have on the way of living. Of course, break-ups of traditional loyalties and kinships are occurring and new kinships, new ideas, and new cultural positions are being established. One cannot hope to question interviewees without knowing a good deal about how they live and knowing also that one will be acceptable to them.

One subject we have been studying is the method by which knowledge is acquired, in an attempt to substantiate Edmundson's theory that technological knowledge is picked up and transmitted in a relatively casual fashion. For example, a person might wander down to the docks and learn how to tie knots in a rope. This kind of technological knowledge is transmitted rather casually, whereas knowledge of belief—religious, political—is transmitted within a kinship or a family. To transmit this kind of knowledge requires much closer personal ties than to transmit purely technological knowledge.

Now, somewhere in between is the whole system of beliefs about health and about illness—they are partly magical, partly technological. This is reflected, of course, in one's behavior during illness or one's behavior in trying to remain well. Some persons may willingly go and consult a doctor; others will consult a *curandero*—again partly magical and partly technological.

A community in which many magical ideas about illnesses are held creates a personal problem for me because, for the simple reason that I have blue eyes, I cannot hope to be told much or to accomplish much. This limits severely the application of the epidemiological method, or at least limits the choice of person to conduct a study.

As I have said, we want to know a great deal more about both the causes and the effects of internal migrations. I think that most econo-

mists consider that migration occurs largely because of population pressure—a sort of *vis a tergo*—or wanderlust. On the other hand, there are attractions, in the development of industry, for example, that are pulling people in Colombia from the land. I believe that this was envisaged in the *Operación Colombia* plan drawn up by Lauchlin Currie, economist adviser to the Colombian Government, although to what extent the Government has accepted it I am not sure. I do think that part of the migration is deliberate government policy rather than pure happenstance. So we want first to know the causes; otherwise we cannot predict how it will go in the future.

Secondly, we want to know the attitudes of the people who migrate to shanty towns. Carolina de Jesus was referring to São Paulo. A study of the local names applied to shanty towns amounts almost to a whole book of human attitudes. In Santiago the community is called *callampa* (mushroom); in Colombia, a *barrio de cartón y lata* (cardboard-and-tin-can neighborhood). Much more ironically, in Lima it is a *ciudad de Dios* (city of God). In Argentina, it is *Villa Miseria*. Thus there is a tremendous amount of attitudinal information even in the local names that are given to these areas. Now, this being the problem—a demographic problem—one has to try to do things that are meaningful within the particular context.

First of all, one of the studies we have carried out involves the Cauca River, from which part of Cali's water supply is drawn. The population of Cali has multiplied by about five in a decade and will double in the next five years. What is happening to this river? Industries are being established, and at the moment something like forty million gallons of water are being used by industry every day. Some of the industries, such as paper mills, discharge a good deal of organic material into the river in addition to all the sewage that goes in. We carried out a sanitary survey of the river to determine points of maximum pollution at the low-water phase and then a study of the whole process of deoxi-



ation and re-aeration of the river. This extended thirty miles above Cali and fifty-three miles below. I can assure you that the oxygen content falls to practically zero in a number of areas, and fifty-three miles downriver there is not 100-per-cent re-aeration. This is where the population will double in five years' time. It is perhaps not surprising that our biggest problem hitherto in running the Center has been that our graduate students came down with hepatitis. This year we have given them all gamma globulin.

Since we lack denominators, obviously many of the epidemiological studies must be horizontal in type and therefore are designed entirely to give qualitative information.<sup>6</sup> We have, for example, conducted such studies at five altitudes—there being no climatic differences due to latitude in Colombia—to determine what fungal diseases are prevalent. The altitudes ranged from sea level to about eleven thousand feet—from very hot to very cold. The populations were chosen generally from among children. All we wanted to know was what percentage would react positively to skin testing. We used seven antigens in the tests; only two turned out to be prevalent. The most prevalent, especially at sea level and diminishing with altitude, is histoplasmosis. By the time sea-level children are ten years old, 80 per cent of them are positive reactors. (The other that we found to be prevalent, but much less so, is sporotrichosis.)

We found no comparable patterns in the domestic animals also tested. We attempted to get dogs, pigs, cows, and horses at each altitude, because it has been reported in the United States that animals react positively to histoplasmosis in proportions very similar to those for human beings. Our failure to find evidence of this was due, we believe, to the fact that we were unable to find domestic animals over three years old. They seem to die or be killed at less than three years, so that the experience of domestic ani-

mals, compared to human experience, is very much shorter.

We have similarly conducted investigations in five different areas in Colombia, studying bovine and porcine sera as the animals are slaughtered. We knew the places of origin of the animals, and we wanted to find out fairly quickly the potentials of zoonotic-disease transmission to man. The prevalence of antibodies to leptospirosis, to brucellosis, and to Q fever was enormously high among the bovine species, and about half as high among pigs. On the other hand, the pigs had a very large number of salmonella species, which were not present in the cows. Curiously enough, we found very few parasitic infections.

That again, however, was a qualitative study. All we wanted was to learn the prevailing conditions. We have done similar studies in skin testing of children for diphtheria and for tuberculosis.

A quantitative epidemiological study is much more difficult to make because it requires a denominator—a population base—and to ensure having it means actually enumerating the people. A number of studies have been done in this fashion. One is a longitudinal study of diarrheal disease in which we examined some 345 pregnant women. As their babies were born they were taken into the study. Nurses we have trained visit them once a week, or oftener if the children get gastroenteritis. Once a week feces have been taken to three laboratories—an enterovirus laboratory, a parasite laboratory, and an enterobacteriaceae laboratory. The object is to find out what the children acquire over a period of time and, having done this, to try to determine what is a cause of gastroenteritis. This is not nearly so easy to decide as might be thought. Very often an enterovirus or a parasite can be isolated and the assumption made that it is a cause of diarrhea; but if, on the other hand, it is isolated from an individual who has no diarrhea, then whether or not it is a pathogen is not easy to say.

Here, of course, one must call into question

<sup>6</sup> Copies of the protocol, the progress reports, and the final results are available from Dr. Paterson.

the definition of diarrhea. It might, we have thought, be merely a change in bowel habit. In this study, therefore, we have obtained daily records—almost 100 per cent complete—of every bowel movement of every child since it was born. I think that in the end, our information will be extremely good. We also have records of meals, weekly weights and lengths, and so on, from which we hope to learn a good deal about child development and growth as well. There are roughly a quarter of a million items of information tabulated at the moment. The first children will drop out of the study in July [1964], at the age of two years, and the rest of this year will be concerned largely with tabulation. Some interesting things are already apparent. Enteroviruses have been isolated in all the children—in some of them as early as the third day of life. There appear to be very definite seasonal infections, even though the Cauca Valley has not much in the way of seasons.

In one particular community, a study on *tetanus neonatorum* has been going on for two and a half years. We have been attempting to find out whether immunization of women would allow antibodies to be carried across the placenta, if they become pregnant, in sufficient quantity to protect the infant. It has been known for almost thirty years that tetanus antibodies do cross the placenta but not whether the infant is thereby protected. It so happens that this community had an 11-per-cent mortality rate from *tetanus neonatorum*. All I can say is that the protection of the study group after two and three inoculations has been 100 per cent complete for as long as a year and a half. If it lasts up to three years, we shall have a feasible program.

Lastly, I should like to mention the question of human behavior because I agree entirely that this is an area that we know little about and, as members of a different culture, have difficulty in studying. We are therefore having Dr. Carlos León, a distinguished Latin American psychiatrist, come to spend a year with us studying epidemiological methods. Eventually we hope

to be able to study this aspect of the total environment.

Chairman: Are there questions or comments on Dr. Paterson's presentation?

Payne: I should like to make one point that I think is exceedingly important because much of what Dr. Paterson says is applicable to a much wider context than the problem we are concerned with today.

There has been a tendency in many of the developing countries to try and imitate the pattern of collection of health data that has been established in highly developed countries with well-established health services. This cannot be done because it depends upon the presence of established health services on a country-wide basis. It may sometimes be possible in cities, for instance. In Brazil, I understand, good health data are available from certain big population centers but practically none from rural areas. I think that only by epidemiological techniques of the kind described by Dr. Paterson can data for health planning in rural areas be obtained.

Chairman: I am glad you point that out, Dr. Payne, because one of the stumbling blocks almost everywhere in the developing countries is that there are no data and a choice confronts us: to do nothing, because we have no data, or to devise for the purpose epidemiological approaches that have a good deal of validity. The second, I think, is the course that has to be taken.

Paterson: It is not merely health data, of course, but data about human characteristics as a whole.

Chairman: What led you into the study of migration? Is it because migration behavior, which in itself is intriguing, is so universal?

Paterson: I don't know, except that it is a critical paradox that the problem is assumed to be purely social. It is a medical problem as well; the two just cannot be separated. I think that if we are going to study the real effects we must take into account the entire ecology, the entire system.

**Chairman:** Was the correlation of histoplasmosis solely with type of topography? There were no other environmental determinants that you could detect?

**Paterson:** There was one. It so happens that the prevalence of histoplasmic sensitivity is very high outside Cali. It is rather low in the city itself. With skin testing we halved the distance each time, trying to find out whether or not there was a natural barrier. We thought that this barrier would occur at the Cauca River. Unfortunately, we have not been able to get a clear end point or a sharp fall-off, largely because of the number of people involved in the study. There are relatively few people in the middle as compared with the number at both ends. Once again we are up against a very basic epidemiological problem of interpretation, but I believe that other determinants will certainly be found.

**Chagas:** I should like to ask Dr. Paterson about the factor, which he mentioned, of government policy in population migration. I don't think it exists in Brazil. Its influence would be so small in relation to other important factors that it does not matter. Since this is an interesting point, could you elaborate a bit? What would you really consider "government policy"? Naturally, an industrial development program, for instance, is a government policy; but it is one that would affect migration indirectly.

**Paterson:** This, of course, is a very important point. I am not fully qualified to discuss it, but it seems to me that one of the significant things about Lauchlin Currie's plan is that along with industrial development it calls for modernization and mechanization of agricultural techniques, particularly as applied to primary production, thereby pushing the people off the land into urban areas.

What happened in the development of the Soviet Union, to take a pertinent example, was that industry was developed and nothing was done about developing agriculture. It was left to itself. In fact, nothing has been done about it yet.

**Audy:** I would appreciate Dr. Paterson's giving us more information on the question of migration and the reasons for it. There are elements of attraction to what may be a dream—a city paved with gold—and also a revulsion, a matter of being fed up with one's own lot. These differ in strength depending on the circumstances.

What I wanted to ask is, What sort of information is exchanged between people in the town and those who are then attracted to it? Do some of the people who have been successful in the town go back to the rural areas with stories of opportunities to make good, even if by picking pockets? Or do the rural people just manufacture the idea in their own minds? I should like to know of the different motivations that lead people to migrate.

**Paterson:** There are things, of course, that push people from behind—hunger, and so on. Then there are attractive things, and you know—

**Audy:** May I interrupt? Doesn't the equivalent of landlessness and hunger drive them out again? They may be even hungrier than they used to be.

**Paterson:** It drives them constantly from one part of the city to another. There is a lot of internal migration within a city.

**Chairman:** Not much is known about the fate of people who have moved to urban areas. I know of very few examples of a mass return. What is their fate, economically, in opportunity, in pleasures, even in disease?

**Chagas:** People don't go back because actually they have better social conditions in the enchanted land: medical care, social health, and so on, that are not found in the world they came from. But I do know of at least one reversible migratory movement. In Brazil, people from the Northeast are so attached to their home region that they quite frequently return to it.

**Kidd:**<sup>7</sup> I want to comment briefly on Dr.

<sup>7</sup> Dr. Charles V. Kidd of the Office of International Research, National Institutes of Health, U.S. Public Health Service, attended the session in place of Dr. Shannon, who was unable to be present.

Chagas' point about a national policy on migration. It seems to me that the most fundamental things that governments do in relation to migration have nothing directly to do with it. Most actions that stimulate migration have other purposes.

For example, the decision to build Brasília brought a lot of people from the Northeast of Brazil. Certain basic government acts have as a predictable consequence the movement of people, even though that is not the overt purpose of the action. A decision to industrialize or to erect tariff barriers in order to promote local industry will result in population shifts. Thus the policies, if they can be called that, are disguised policies, hard to recognize. This may be one of the major problems in dealing with migration.

**Paterson:** In Colombia, the Government is actually resettling people, flying them from one area to another. This is going on as a sort of forced migration and is by no means a small or negligible thing. It is quite large.

**Chairman:** It is rather interesting, Dr. Paterson, that in some countries—India is an example—there is, if not an announced policy, at least a silent one. They would like to reverse the migration. I am one of those who feel that that is not likely to happen, because it would depend on the provision of many of the amenities that go with urban life. It is a hope, but I think a rather forlorn hope.

**Roche:** It would be interesting to do some social research on the motivations for the migration of people from the countryside to city slums. I believe very little is known about it. The following is just a hypothesis: part of this motivation is similar to that of a lottery. In other words, only one in a million persons wins and the 999,999 others make nothing; but hope is enough to lead them to buy a ticket. In migration, the individual buys the ticket of living in a slum and looks forward thereby to the remote but real possibility of leaving that slum and making out in the city itself—a possibility that just does not exist in the country-

side. That may be one of the explanations.

**Payne:** Dr. Rotondo mentioned a point to me informally that has not been discussed so far: that is, the attraction to the cities of the relatives of people who have established themselves there. It is usually family members who guide the immigrants during the transitional period until they adjust themselves to life in a city. Other countrymen who have come to occupy good positions in the town also serve as intermediaries.

Now let us hear from Dr. Guimarães.

**Guimarães:** First I want to comment on the book by Carolina de Jesus. Of course, she described a situation that exists, but in denouncing it she stressed only the negative aspects. She cannot be considered a typical *favela* dweller because she was not a worker with a regular job; she used to pick up papers in the streets, and this may give a wrong idea of the composition of the *favela* population. For instance, in Rio de Janeiro more than 90 per cent of these people have regular jobs. They receive regular wages, and some of them have television sets, radios, and similar belongings.

Among the reasons for the mushrooming of *favelas* in Rio is that in Brazil, as in many other developing countries, there is a great difference in social and economic status between the urban and the rural worker. The former is protected by special labor laws, has social assistance and better pay, and so on. Laborers in the rural areas do not have these. They know what is going on in the cities because today the worker on a distant farm may have a transistor radio. If he comes to live in one of Rio's *favelas*, at least he will have some help and assistance that were not available to him in the interior. His shack in the *favela* will probably be no worse than his primitive rural abode. And he will pay no rent.

Another reason for the spreading of *favelas* in Rio de Janeiro is the deficient system of transportation. The mountain range makes Rio a very beautiful city, but not a very convenient one for public services such as transportation, water, and sewage, which are of necessity very

expensive to construct and maintain. A person who works in the better residential areas, such as Copacabana, might have to travel three, four, or five hours a day if he tried to live in the suburbs. It is much more convenient to live in a shack in a local favela and have just a ten-minute walk, with no fare to pay.

The favela, of course, is not a healthy social environment, but the delinquency there has been much exaggerated, and there is a popular misconception that almost all favela dwellers are delinquents. The fact is that most of the inhabitants are law-abiding people. What happens is that the topography of the favelas, especially those on hillsides, offers good shelter for delinquents, and the other residents tolerate them for fear of reprisal. The majority, however, would prefer the favelas without criminals.

Carolina de Jesus stressed the problem of hunger, but a more common problem is under-nutrition or malnutrition. Many people do not know the right food to buy and adhere to the prejudices they were brought up with. Some people would rather spend their money on gadgets—status symbols—than on proper food.

I should like to comment on the relocation of people from the favelas. There are two policies on favelas. One is to improve the conditions of the people living there. The other is relocation to special housing developments. Sometimes the news of this relocation spreads to the interior. There was a religious foundation in Rio that built blocks of apartments for favela people, and word went around in the interior that an archbishop was giving houses away, if only they moved to town. Every attempt to improve conditions acts as an attraction to more and more people, because, they say, "If I go there, I will get a better place."

Roche: There was a migration in Venezuela that resulted from an emergency plan whereby workers on relief were given fourteen bolivars a day. That was the very moment when most of the *ranchos*, as favelas are called in Venezuela, arose in Caracas. The motivation was precise.

Chairman: A political motivation?

Roche: Yes. Incidentally, I cannot resist telling a joke of the time. There was said to be one man who was making sixteen bolivars per day. He shifted to relief at fourteen bolivars per day, and when somebody asked him why, he said, "I would not work for two bolivars a day."

Chairman: It is certainly true, as Dr. Payne said, that a lot of people have contacts in the city and go back and forth. One pertinent point is, I think, that studies clearly show that people are considerably better off in the favelas than in the central city. No matter how often this is demonstrated, the idea seems very difficult to get across to the engineers and architects and other people dealing with the problem, mainly because of a conflict of cultures. The people who are motivated to change things have a very vague idea of what the rest of the population likes. People are better off in the city, but that they are better off in the favela than in the central city is very difficult to prove to planners. I don't know what manipulation of the social organization would be needed to do that. It is certainly a political problem of a fairly high level.

Paterson: There is just one other thing. In Colombia an important force for migrating is the *violencia* in the country.

Chairman: I want to make one comment about the favelas. I know that for the past two or three years the Economic Commission for Latin America has been collecting information on this problem. That collection is of the narrative type, with emphasis on physical conditions. I believe that very little is being done on human behavior, as we are discussing it today. It would be worth while to look into those studies and perhaps see how they could be complemented from the subjects discussed here.

We now move on to item 3 of our agenda, in which an effort has been made to select one or two functions that have to be performed for society as it is, with all the complications that go with it.

Both the provision of water and the hope of control of the atmosphere are matters not so much of technological adjustment as of correction of social disorganization, as I think will be illustrated by our two speakers. The efforts in both cases have less to do with ecology than with finding the devices or the machinery by which society can gear itself to providing the control and the amenities.

I ask Mr. Hanson to begin with the case of water.

Hanson: I wish you had explained, Dr. Wolman, that Dr. Fair was originally to have made the main presentation this afternoon and that two of us are in effect substituting for him.

Chairman: I am glad you mentioned that. I neglected to inform the session that Dr. Fair was to make this presentation, which illustrates a failure of preventive medicine. He has had a mild coronary attack. I wish to suggest to the medical group present that this is one of the difficulties we have not quite solved yet.

## **EVALUATION OF SELECTED ENVIRONMENTAL FACTORS: WATER**

### **H. G. Hanson**

The preceding discussions have been most germane to sound long-range solutions to many problems that affect the quality of our environment. On the other hand, they emphasize how long is our list of ignorances and raise the disconcerting question of what to do until research has shortened it.

What do we do, for example, about the 90 per cent of the rural population of Latin America and the 64 per cent of the urban population that are without satisfactory water supply? To the engineer—and I am an engineer—the impulse for immediate action with whatever expedient is practical is great, and to the population, I believe, it is greater. This creates real pressure for us.

In this kind of pragmatic situation, I am compelled to draw a distinction between the scientist and the engineer. To differentiate the two, one places a very attractive girl on one end of a couch and says to the scientist and to the engineer: "You may sit at the other end of the couch, and by successive moves toward the girl,

covering half the distance each time, you may approach her." The scientist, recognizing that there is a question of infinity involved, does not even sit down. The engineer does, knowing that within a few moves he will be close enough for all practical purposes.

What I have to say this afternoon is, I am sure, much more along the line of the engineer's thinking than the scientist's. In essence, what I propose to do is to present a brief review of current conditions, as they relate to drinking water supplies in the United States.

My examples refer mostly to situations in this country, but they are likely to be similar to what has been or will be experienced in other countries. I feel that problems are basically much the same everywhere. We would not need to go very far from this room to duplicate the environmental problems experienced in almost any of the other countries with which our discussions deal. Therefore, while I cannot speak from direct experience in the Latin American

countries, I feel that the illustrations will be pertinent.

The United States has about 190 million people. Three quarters of them derive their water from supplies that are 30 per cent ground, 50 per cent surface, and 20 per cent combined; these people use water at a daily rate of about 160 gallons per capita. The remaining 50 million of the population derive their water from individual or semipublic supplies consisting of 99 per cent ground water and 1 per cent surface water; they use about 40 gallons per capita per day, or roughly one fourth as much as people in the other areas do.

For convenience in describing them, the major water supply problems of interest in the present and the immediately foreseeable future might be grouped under seven headings:

1. Producing and distributing adequate amounts of potable water.
2. Producing finished drinking water that is entirely or satisfactorily free from chemical pollutants.
3. Curtailing communicable disease attributable to drinking water.
4. Improving existing works and systems that provide public water supplies.
5. Providing adequately trained "certified" waterworks operators.
6. Arriving at a proper balance between the use of individual and public water supplies in the urban fringes.
7. Accelerating the amount and refining the quality of research in the area of our drinking water supplies.

The first of these subjects, the production and distribution of adequate amounts of potable water, presents problems that are largely economic. For the most part, the supply of water is adequate—certainly adequate for our municipal purposes, since only a very small percentage of the total is used for this vital purpose. If we had to, we could go to considerable lengths to provide it.

For example, in the coastal cities that are supplied by fixed yields or dwindling yields of water, it would be technically feasible to go to

a sea-water-distillation plan if necessary, even though it is not competitive in price. In other words, technical problems are not the greatest of our difficulties. As with probably most countries in this hemisphere, the great current need is to supply the many towns that have no public water supplies. It is interesting, and I think most of you will find it rather unbelievable, that in 1958 there were estimated to be thirteen thousand communities in this country with a population of seven hundred or more that did not have public water supplies. Recent efforts to verify these figures leave us with the feeling that they are still quite valid. There have also been indications that some individual water systems in towns are not producing good, safe water.

McCabe *et al.* report that from 1946 to 1960 there were 228 outbreaks of water-borne disease. Of these, 69 per cent occurred where the supplies were private or semipublic. A review of the occurrences shows that several were in smaller communities.

A dramatic incident was the outbreak, in 1959, of 164 cases of infectious hepatitis, from individual wells in Pollston, Michigan, a town of about 350 inhabitants. This is simply an illustration of how an overwhelming dose of infectious material can cause even supplies that are relatively well designed, built, and operated to be overwhelmed.

A program for encouraging and financing small-community water supply construction is needed. One suggested plan calls for contributions of one third each, from local, state, and federal resources. Certainly, a nation in which thirteen thousand communities depend upon individual wells or springs needs an improved water supply program, and it needs research to determine why public water supplies have not been developed in these communities and how they can be.

The second subject, producing drinking water relatively free from chemical pollutants, brings to mind some illustrations that you have probably read about in the press or heard discussed.

First, the Long Island well supplies which foamed when the water was drawn from the tap. Next, the similar occurrence in thousands of homes in the Twin Cities area of Minnesota. More recently, pesticides have been recovered from drinking water in New Orleans in about the same concentrations that are believed to have caused large-scale fish kills. This last case, of course, raises the issue of how applicable animal data are to human beings, but it arouses some degree of apprehension with respect to the human population. And there are a host of other examples of chemicals finding their way into drinking water.

It should not be forgotten that a little over a decade ago at Chester and Philadelphia, Pennsylvania, a million-dollar bottled-water industry flourished because the people would not drink water that was foul in taste and appearance. Relief was provided only when Chester went inland for good water and Philadelphia spent about sixty million dollars on improved treatment.

These examples are evidence that chemical contamination of the nation's individual and public water supply should be dealt with more effectively.

The nature of chemical pollution generally has been such that acute effects upon health are not usually involved. However, the chronic, long-term results are not known. They may at least be assumed to be worthy of intensive study—more study than they have received to date.

The hazard of an acute threat to health through accidental spills of chemicals into finished drinking water supplies was deemed serious enough to warrant the establishment, in April 1963, of an emergency service for waterworks operators. At any time of the day or night, they may call a Washington, D.C., number and get advice on what to do in the event of an accidental chemical spill believed to be a threat to health.

The future would appear to hold two certain events that bear on this problem.

One is the continuing appearance in the environment of ever-increasing numbers of chemi-

cals; the other is an expanding population, which will require more water. Hence, we may mix chemical wastes and our supplies of water more intimately as time goes on. The ingenuity of professionals in water supply and related fields will be taxed to supply sufficient potable water reasonably free from chemical agents. We need new methods for the detection and measurement of chemical agents in drinking water, and we need improved treatment procedures. I am happy to report that both these areas are receiving substantially increased research attention.

Besides the problem of direct, man-made chemical pollution there is the almost universal problem of tastes and odors from "natural" processes in surface waters. These have not yielded very substantially to research, and in some metropolitan communities of a million or more the water may have a strong taste and odor for periods of four, six, or eight weeks. This, of course, is not quite the image of the twentieth century in the Western world that we would like to create.

The matter of curtailing water-borne diseases is probably something that has not engaged the attention of most of us, particularly lately, because in most Western countries the death rate from typhoid fever is extremely low. Cholera is relatively unknown, and protozoan infections from drinking water supplies are rarely encountered, certainly in this country. These facts attest to the effectiveness of water supply public health provisions. These same facts, however, are probably lulling us into a state of unwarranted assurance, because while there is room for improvement, there is no room for relaxation of the safeguards we have placed on the nation's water supplies.

In the period 1945–1960, 228 outbreaks associated with drinking water caused about twenty-six thousand cases of reported illness in the U.S.A. At Keene, New Hampshire, in 1959, and at Ravina, New York, in 1960, fourteen typhoid and fourteen hundred dysentery cases, respectively, occurred from inadequate or poorly operated water treatment. Infectious



hepatitis is known to be water-borne, although usually only where the pollution has been overwhelming, as in New Delhi. Throughout the world there have been twenty-three such instances recorded since 1945, and there is evidence that in the increasing spread of the disease—more than seventy thousand cases in the United States in 1961—it may be caused in part by live virus particles reaching the person through drinking water.

I think this simply underlines the fact that we cannot be as confident about the effectiveness of water treatment processes that were designed to remove suspended material down through and including bacteria in size when we are dealing with virus particles.

Chronic noninfectious illnesses, such as cancer and heart disease, may be related to drinking water, but the possible mechanisms are not established at the present time. Some investigators have suggested that water hardness, or some factor associated with it, is related to certain forms of heart disease. Sodium in drinking water needs to be taken into account in relation to the established limits for certain heart-disease patients. Public information programs can be useful in this area.

Now a word about improving our existing waterworks and systems, because we have a large industry that needs to be maintained in satisfactory operating condition.

In 1961, when we began an intensified program of surveying our municipal water supplies, we found that the condition of many was not what it ought to be. It was evident in many places that the waterworks had not competed successfully with other community departments for the funds necessary to provide or maintain adequate and modern facilities. Plants that were new twenty to thirty years ago showed signs of deterioration and had obsolete equipment. In some instances the diligence and pride of the operator had kept the premises sparkling, but these were not in the majority; not all were like the widow's children, whose clothes were always clean and neatly patched.

Waterworks have long had the problem of

getting back from city treasuries the moneys they put in. Water revenues continue to find their way into general funds, where they are used to finance other activities or other public works. The profession has long battled this condition. The efforts in this country of the American Water Works Association have been quite effective in reducing such diversion, but there must be continued effort to see that waterworks revenues are used to maintain and expand as needed the water supply structures and that water rates are commensurate with waterworks expenses.

With respect to waterworks operation, two rather frightening cases were noted recently. In one instance it was routine practice to flood the plant pipe gallery from the clear well, return the water to the clear well, then distribute it to the community. In another location, it was found that a large surface water supply operator uses his judgment as to when to chlorinate. He bases his decision on the appearance of coliform organisms in the distribution system.

The matter of training and certification of operators is important. As Dr. Parran, I believe, pointed out many years ago, there is perhaps no individual in a community who holds more lives in his hands than the waterworks operator. The training is still not all it should be. Some health departments have attempted to fill the gap by offering a two- or three-day training session once a year. Four years ago, the first resident training school in this country for waterworks and sewage-works operators was established in Neosho, Missouri. Since then, twelve hundred persons have graduated, many of whom have found better employment and advancement and all of whom have benefited. It was recently estimated by the National Manpower Redevelopment Program that there are some ten thousand job opportunities for trained operators. The school has accordingly been contracted to give thirty-two-week training courses for personnel displaced from other occupations. The need for this kind of training is so acute that the American Water Works

Association and the school are now planning to establish three more schools in other regions.

Certification, on the other hand, goes hand in hand with training, and is a means of letting the public, the city officials, and others know what quality of operation they are purchasing. Yet a recent survey showed that only eleven states require certification of waterworks operators. Twenty-four have a voluntary plan. Thus only thirty-five of the fifty states have measures for certification. Sewage-works operation is evidently considered more important, judging by the fact that 41 states have mandatory or voluntary certification programs for operators of sewage treatment plants.

Another problem that I think comes close to all of our hearts is that of water supply in urban fringes. This is that dynamic area between city and country where water supply problems are compounded by social, economic, political, and almost any other admixture of problems that one cares to identify. The expanding urban populations of this country are seldom provided with a water system at a rate commensurate with needs.

The whole set of problems in the urban fringe cries for research—not, generally, research to solve the technical problems. Involved here are all of the things that were discussed this morning: legal, social, economic, political, administrative, and financial problems; behavioral aspects concerning the adaptation, motivation, or orientation of the population group involved. These are things that we apparently do not understand very well, if at all. The speaker this morning might have asked: "What is there in the genes that makes the former rural dweller want to vote for a bond issue for a public water supply? or will make him not want that? or will make him not care?"

Finally, what are we putting into research? At the present time, it is estimated that of the many millions of grant, contract, and in-house research dollars spent on water in this country, less than 10 per cent is used to solve current potable water supply problems and to produce new ideas for waterworks construction and op-

eration. A review of priorities for water supply should be made within the pollution-research grants.

The U.S. Public Health Service in fiscal 1962 had 159 grants, totaling more than two million dollars, outstanding for research into problems of water supply and water pollution. Of these, sixteen were directly related to drinking water production and utilization. In dollar value they totaled only \$215,000, or 8 per cent of the total. Apparently what goes out of us is more important than what comes into us.

Time does not permit the detailing of the many administrative and research needs and opportunities. Drinking water will remain, certainly, the foremost physical need of all mankind, and the waterworks and public health professions must not stand still in meeting the problem.

Finally, I should like to suggest that there is much to be gained by closer association between the public agencies—the public health and water agencies—and the universities in this country. Such closer association would achieve, first, a greater understanding and, second, better support for the needed research that can be done in these academic institutions. Out of it may also come new institutions, centers of ingenuity and innovation in the practical application of research to the pressing problems at hand. I urgently suggest that we pursue the potential of these closer associations.

Chairman: With the permission of the group, I shall move first to the subject of air and then to the formal discussions, and afterward, I hope, to informal comments and discussion.

As a matter of fact, I am a little disturbed that a proceeding so closely knit as this one should not give us the benefit of comments from the floor, which I think is one of our major purposes. After the talk on air pollution is presented, I may change the decision of Dr. Chagas and ask for comments from everyone, as well as from the formal discussants. They, after all, are practitioners in a field al-

ready familiar to them, and I think it would be good to have the comments of those who do not dwell with this problem every day of the week.

I shall ask Mr. MacKenzie to talk on air, and then I shall open the subject for general discussion, with Dr. Buxell and Mr. Olivero participating.

## **EVALUATION OF SELECTED ENVIRONMENTAL FACTORS: AIR**

**Vernon G. MacKenzie**

Because of the complex array of environmental health problems that have already become an important part of public health in highly industrialized and urbanized nations, it is certainly prudent to project our thoughts into the future, to contemplate the form and scope of environmental hazards in the years ahead and try to plan effective ways of meeting these challenges. This is, of course, a logical and important pursuit, for the problems of environmental health will surely increase unless measures are taken to arrest and prevent them.

But hindsight, too, is a priceless tool. We would be foolish indeed to negate the value of experience, good and bad, by failing to apply it to the tasks we face. The problem of air pollution in the Pan American community affords a real opportunity to plan for the future by drawing on the past. I want to elaborate upon this idea. To do so meaningfully, let me first briefly review the extent and effects of air pollution in the United States today.

The contemporary air pollution problem in the United States is a product of the interaction of forces that dominate life in the most advanced nations of the world. These forces, or trends, are industrialization and the growth of urban populations. Together they have created huge metropolitan centers in which are found the greatest concentrations both of sources of air pollution and of people who feel its effects. In the United States, as in Western Europe, the

Industrial Revolution which began a century and a half ago has transformed a once rural, agricultural society into a highly industrialized complex with constantly rising levels of production and consumption of goods. To be sure, these trends have been seen by some as not un-mixed blessings for humanity. Many decades ago in the United States and in Europe, the billowing plumes of smoke rising above factory stacks were seen to be at least an objectionable nuisance and perhaps even a health hazard. The efforts made by cities such as Pittsburgh, St. Louis, London, and some others to control atmospheric smoke pollution are well known. But these efforts did not signal the end of the community air pollution problem, for they were too limited in number and in scope.

We in the United States, through inadequate understanding of the problem and inadequate attention to it, have allowed air pollution to reach such proportions that effective control will require almost a crash effort to reverse the trends. The problem has got away from us, and we are only now, at this late hour, beginning to take the steps necessary to catch up.

The technological boom of the last quarter century has compounded the air pollution problem in a way and to a degree that pioneer smoke abatement workers did not anticipate. The development of new industrial processes has added many new contaminants to the atmosphere. The millions of motor vehicles that travel our streets

and highways are yet another source of air pollution, the full import of which is only now being appreciated. Added to these are the ever-increasing demands for power and for disposal of refuse, which can give rise to serious air pollution problems in urban areas of every size—regardless of their degree of industrialization.

In short, air pollution is now a national problem in the United States, not because the air everywhere is polluted, but because the population and the sources of pollution are so concentrated that more than 60 per cent of all Americans live and work in polluted air, because more than seven thousand urban places have air pollution problems, and most of all because air pollution has received inadequate attention to keep it under control.

In both nature and extent, the problem has changed radically in the last twenty-five years. So too has knowledge and recognition of the effects of air pollution on human health and welfare. In terms of economics, polluted air is now seen as far more than a nuisance. Atmospheric contaminants, in addition to spreading a pall of filth over many American cities, inflict costly damage upon structural and other materials. They add greatly to the cleaning costs in homes and whole communities; they destroy hundreds of millions of dollars' worth of agricultural crops each year from New Jersey to California; they endanger both air and ground traffic; and they reduce property values. Estimates of the total national cost of air pollution run as high as seven to eleven billion dollars a year. These estimates are likely to be conservative.

Such figures, of course, do not attempt to include the cost of injury to human health for which polluted air is believed responsible. Extensive medical research in the laboratory and in the field continues to amass an impressive body of knowledge linking air pollution with chronic respiratory diseases such as asthma, bronchitis, emphysema, and lung cancer. The burden of these illnesses in human suffering, lost earning capacity, and increased expenses for health care is heavy and, in any human scale of

values, must certainly outweigh the strictly economic burden of polluted air.

When the total of economic and health damage caused by air pollution is weighed against the cost of clean air, there can be no doubt that pollution control is a bargain. In Los Angeles County, California, where the most extensive and comprehensive control program in history has been in operation for the past fifteen years, it has been calculated that some 175 million dollars has been spent for air-pollution control by public agencies, private industry, and other sources. This represents an annual expenditure of about two dollars per person, which is small indeed compared with the national average of sixty-five dollars or more per capita that living in polluted air costs annually.

The picture of a serious and worsening air pollution problem in the United States is unfortunately not matched by a control effort that even approaches adequacy. Most states and the vast majority of cities do not have effective programs. The federal program, now in its ninth year, has contributed substantially to better understanding of the national air pollution problem. With the passage of the new Federal Clean Air Act, it will be in a position to offer considerably more direct assistance and support to the national control effort through grants, enforcement powers, and increased research activities. But it must be admitted that we in the United States have a long way to go before we overcome the disadvantages produced by years of neglect.

The history of the problem and the efforts to cope with it in the United States is still being written. The end of the story is not in sight. But this experience can be of considerable value and guidance to countries, especially those of Latin America, that are now experiencing the same trends to urbanized industrialization that have given rise to the contemporary air pollution problems of North America.

In August 1963, in a paper presented to a World Health Organization symposium on air pollution in Geneva, Ricardo Haddad of the National Health Service of Chile and John

Bloomfield of the Pan American Health Organization reviewed the current status of air pollution in Latin America. A most significant point was their observation that Latin America is now experiencing trends in industrial and population growth that seem surely destined to produce serious problems of atmospheric contamination. According to their report, major population centers such as São Paulo (Brazil), Santiago (Chile), and Mexico City already have serious air pollution problems, and several other Latin America cities are clearly headed in the same direction. The efforts at methodical control of sources of pollution have been few, with the result that more and more sources are coming into existence each year, without adequate consideration of the potentially hazardous effects on the environment and on the people who live in it.

The Latin American countries have an opportunity to gain control of the problem now, while the conditions are still relatively well defined and not unmanageable. I would suggest that the greatest immediate need is for surveillance, air-quality sampling, and inventories of pollution sources—in short, investigations to provide a constant watch. The knowledge gathered in this way will be invaluable in developing control programs based on sound, detailed information. These activities are not expensive, because practical, low-cost methods of air sampling and analysis have been developed in the United States and Europe. Here, then, is a real opportunity for the countries of Latin America to draw on the experience of others, to avoid the mistakes that have been made elsewhere, and to prepare in advance for effective control of their air pollution problems as no other part of the world has been able to do. The assistance of the Pan American Health Organization in preparing for and carrying on these surveillance activities can be significant—by such means as collecting and distributing appropriate technical information and supporting the training of technical officials in the various countries.

There have been few other occasions in history when people have had so clear an oppor-

tunity to prepare for a challenge that they are certain to face. The nations of Latin America, as they rapidly advance toward a new era of industrialization and urbanization, can demonstrate to the other emerging nations of the world that the problem of air pollution need not be permitted, through neglect, to endanger the health and welfare of millions more persons each year.

**Chairman:** I am now ready for comments from the floor.

**Mangin:** A short comment on both papers. It strikes me that the technical problem is not the critical one in water pollution; it is the political problem that has to be dealt with. This seems to me to apply not only to water and air pollution, but also to the problem of rural-urban migration in Latin America. The state of Louisiana, for example, would clear up the pollution problem by itself, without the intervention of the Federal Government.

**Chairman:** I suppose there may be somewhat more of a technical problem in the air pollution field. Is that so, Mr. MacKenzie?

**MacKenzie:** I think air pollution poses not only a social problem but also a technical problem and perhaps, above all, a problem of information—getting the information and making it available to the technical and professional people and also to the public generally. I myself am convinced that our technical community has not prepared itself to really advise the public and the political leaders about what needs to be done in connection with the pollution problem.

**Chairman:** I would suspect that.

**Chagas:** In São Paulo, you say, there is still a technological issue to be resolved as to how and what to do. Is this wholly aside from the industrial contribution to the problem?

**MacKenzie:** There are, of course, unsolved technical problems of air pollution control. Primary among such unsolved problems are pollution from the automotive vehicle and from sulphur-containing fuels.

With respect to the first, the automobile industry in the United States has recently an-

nounced that effective with the 1967 models, which will go on sale in the fall of 1966, the engines will be designed to meet the standards that have been established for pollutant emissions from automotive vehicles by the State of California.

They will do this without added accessories in the way of afterburners. The improvement will be effected by redesigning the engine itself to consume the fuel more efficiently. Basically, of course, this is the approach that we engineers look on most favorably.

**Chairman:** What would be your assessment at the moment of the relationship between air pollution and disease?

**MacKenzie:** At the last national conference on air pollution, held about a year ago, there was quite an extensive review of this question. The conclusion was that the relationship is unmistakable and has been fully demonstrated qualitatively. The problem has not been sufficiently quantified for specific effects on health to be effectually related to quantitative concentrations of and exposures to pollutants in the atmosphere.

I do not think, however, that any of us in the health field should hold back on this account and wait for further evidence. I think we need more effective control action now. We cannot wait until all of the evidence and scientific information is available.

**Chagas:** Mr. Chairman, I believe that on the subject of air pollution there is a lot of educating to be done, as Mr. MacKenzie said. I would say that a large sector of the medical profession is unaware of the dangers involved in air pollution, perhaps because the causal relationships, as Mr. MacKenzie has just mentioned, have not been established.

**Dubos:** I am referring to your question concerning what kind of air pollution in our cities is not likely to be reflected in obvious disabilities that can be measured. The epidemiological evidence, as it accumulates, will in the course of time bring other kinds of information, but let's not wait for it. Physiological tests can provide information that, even if not immediately rele-

vant to epidemiological problems, is more convincing.

People are worried about air pollution chiefly because there is soot in the air and because their shirts get dirty. I was told by one of Mr. MacKenzie's associates that what people worry most about is how often they have to wash their cars. It is very important to show them, as can be done by objective tests, that what is important is not so much the soot and dirt in the air as all those volatile pollutants that one does not see—the nitrogens, the oxides, sulphur, and toxic substances that have an effect on neurological function.

To create public awareness that will make for some positive action in this field, public health officers will have to be presented with the kind of physiological evidence that they have been trained to recognize and pay attention to. During the past two years, I have taken it upon myself to preach, if I may say, in this field. Physicians are not interested; until they are, the only thing that will be done is to make sure that the air is not full of soot, so that the car doesn't have to be washed every day.

**Chairman:** Mr. MacKenzie, I am sure that you support Dr. Dubos. I emphasize it because, as you say, there is great difficulty in carrying the public with you without medical commitment, and the physicians, in turn, have not accepted, either intuitively or scientifically, the facts of life.

**Dubos:** I think that the guilty institution is the medical school, which does not recognize the topic.

**MacKenzie:** I must say I agree fully with Dr. Dubos. This is what I had in mind when I said there was a great need for dissemination of information to the technical and professional audience.

I have been encouraged, to some extent, by the progress that is being made in this direction. The National Tuberculosis Association has recently adopted as one of its objectives the dissemination to the public and to professional people of information on problems of air pollution and of chest diseases generally.

Now, the NTA has both a broad publicly oriented organization and a professional branch, the American Thoracic Society. In addition, the American Medical Association, through its recently organized Environmental Health Division, has been giving somewhat greater attention to air pollution. Thus there are a few people who are beginning to see the need, and I hope that efforts to satisfy the information requirement can snowball in the future.

Dr. Dubos can tell you better than I of the efforts of the scientific group associated with the American Association for the Advancement of Science that has become interested in the problem. This is the Scientists' Institute for Public Information. I think that such a group can very definitely make a contribution to the educational effort required in this field.

Dubos: Are you familiar with its activities?

Chairman: Yes, but I wish you would tell us about them.

Dubos: In a few words, some of us—not many of us at the beginning—became convinced that one of our social responsibilities was to learn to present to the public factual information about the dangers created for society by modern technology. To start with, the organization of the Institute was facilitated by its being focused entirely on the dangers of radiation fallout, which naturally had a large public appeal. From interest in radiation, we have spread into other areas. We are becoming involved in the study of pollution, including the use of insecticides and pesticides.

It is not easy, but it is at least possible, to reach the public—public-minded citizens, the churches, the labor organizations, the parent-teacher organizations, and so on—through such organizations.

I realize that what we are doing would be much more difficult under other social structures, but there are also some local problems to be met. To our great surprise, however, there has been an enormous public demand for people to talk about such scientific problems. The interest is not so much in science *per se* as in the implications of scientific technology for the pub-

lic and I strongly suspect that, in the long run, this will have to be the way to put pressure on the medical school. My personal conviction is that the culprit is the medical school, where the medical student must be alerted to these problems.

Chairman: I suspect that many medical schools in this country have assumed over the years that most environmental problems have been solved. In talking to medical-school groups, as I do here quite often, I find that the students not only do not believe such problems exist but are not interested in hearing about them. As a matter of fact, they are quite hostile.

Do you subscribe to this, Dr. Anderson, or do you contest it?

Anderson: I am inclined to do both, having been teaching medical students for more than twenty-seven years—probably about as long as many of the professors of preventive medicine. I believe that what Dr. Dubos is saying is a very just indictment of the professor of preventive medicine. I think it fair to say—as I have told the group on more than one occasion—that we are rather a motley crowd; we have come to this from such diverse backgrounds that there is absolutely no uniformity of point of view. Some come from clinical practice, some from the bacteriological laboratory, and so on. The result is that it is very hard to generalize about what is being taught in medical schools.

While we ourselves have nothing to do with the state-board examinations, we find that students coming to Minnesota looking for licenses—there are a great many coming to the Mayo Clinic—are having a terrible time with the preventive-medicine part of the examination. It is not that they have not studied it but that what is being presented in the medical schools is so diverse.

To come right down to home, I do not recall any time in the past ten years when our final examination to students has not contained a good many questions on the very subject we are discussing now—air pollution one year, radiological health the next, and later, perhaps, water pollution. Yet I know very well that

Dr. Dubos is perfectly right: this is being badly neglected in a great many of our schools.

What he is saying is essentially, as I said at the outset, an indictment of the way preventive medicine and public health is being taught; largely, I am afraid, because too often we have been so concerned with the clinical aspects of medicine that we have viewed preventive medicine as nothing more than a slight modification of clinical practice and have wished the job on to a clinician, competent—extremely competent—but nonetheless not prepared.

I recall only too well, as a member of the board of trustees of the American Board of Preventive Medicine, one professor of preventive medicine who became highly indignant at not being given a grandfather-clause certification because, he said, he was giving his full time to preventive medicine, when all the time we knew he was running a private practice of medicine and bringing out a monograph on hematology. The so-called preventive medicine that we were getting from that particular school came from a person who had no concept of the community and of the hazards we are talking about today.

**Payne:** First of all, I agree with a great deal of what Dr. Anderson has said, and the solution is far from easy.

Dr. Dubos brought forward one point that we can echo: in my view, the place to tackle the air pollution problem is at the physiological level. This is where preventive action should begin. Before a disease is apparent some physiological property is first impaired.

At Yale, we are particularly fortunate in having developed a close relationship with the Pierce Foundation. This is a small foundation that many of you will not have heard of, but it is intensely interested in industrial physiology. Foundation staff members are appointed to our faculty—some in the department of physiology and some in my department. That brings a new dimension to the preventive-medicine approach that I think has been grossly neglected in many schools of medicine, where preventive medicine is taught too late and at the clinical

level. It is not preventive if it is clinical. We want to get at it first.

Another point I want to make is this: one of the greatest difficulties in our medical school, and I suspect in many others, is not that of convincing the senior faculty, the full professor or the chairman, but of convincing the residents, because it is the residents that the medical student worships.

**MacKenzie:** On the over-all problem of air pollution, I think it is highly desirable and necessary in the long run that we pursue diligently, and in much greater detail, the physiological and epidemiological types of research that will correlate, more definitely and quantitatively, air pollution exposure and actual effects on the health of people. I should like to maintain, however, that at the same time we must keep air pollution under control. Unlike polluted water, which can be purified for personal use, the air environments have to be taken as we find them. We are in the same position with respect to air that fish are with respect to water. The fish has to take the water as it comes to him; if it is unhealthful, he suffers the consequences. The same thing is true of people and pollution in the air. We cannot purify the air for our own consumption. Shouldn't we, therefore, have a heavier responsibility in watching this element of the environment, and ensuring that it does not become unhealthful to us?

**Guimarães:** Mr. Hanson, how can we assess the possible cumulative toxicity of water pollutants if we know that each year the chemical industry puts out hundreds of new products (pesticides, insecticides), if the assessment of their toxicity is a long procedure, and if the chemicals change frequently?

**Hanson:** So far as I know, there is today no practical means of making such a determination.

This is one of our most critical ignorances. I am encouraged by Dr. Dubos' saying that there are a substantial number of physiological-measurement techniques that can be applied to determine, earlier than classical toxicology does, the effect of some environmental exposures—to



chemicals, for example. But many of us feel that the most critical area of environmental-health considerations is the need for more sensitive, more economical, more rapid means of determining biological significance. Toward this end, we have been interested in supporting work beyond conventional toxicology, work that goes into such areas as tissue-cell-culture techniques. With an environment carefully controlled by automation, we hope, a high percentage of normal cells of a given kind can be produced. This in turn would give us a means of ascertaining, through exposure of these cultures to environmental contaminants, effects at lower than organ or system levels much more quickly, much more sensitively, than our present toxicological or epidemiological techniques permit. I think that, until our knowledge is enlarged beyond what it is now, we shall find ourselves in continuous controversies, as we are in the pesticide field today. We are under tremendous economic pressures to use certain substances against the apprehension of people that they may be harmful. We simply do not know the physiological consequences of given dosages of given substances or combinations of them, over given periods of time. Hence it becomes a question of one man's opinion against another's.

**Chairman:** Mr. Olivero, do you want to comment on either the water or the air discussions?

**Olivero:** With respect to the main problems of environmental sanitation, we must recall the position taken by the Pan American Sanitary Bureau some six or seven years ago, when it established priorities on the basis of epidemiological data and according to the needs. Water supply was given the highest priority.

It is my impression, looking at the general situation six years afterward—and I am speaking of the problem in its entirety, not of part of it—that the provision of potable water for Latin America is still important. On a practical rather than a specifically scientific level, mention might be made of the enormous investments being made to try and change the situa-

tion. It would be advisable at this time for the Pan American Sanitary Bureau to support and continue to uphold the criteria giving emphasis to water supply. Perhaps afterward greater emphasis could be directed toward water pollution.

It has been said here that the water supply problems are similar in Latin America. They may be similar as regards technical solutions, but administrative, financial, or organizational solutions are dissimilar and are basic. Although these problems are not a matter for pure research, I should like to say that much applied research is needed to find practical solutions.

In some U.S. cities, it has been said, the whole quota was not used and consequently was diverted to other purposes. The problem in Latin America is that during the past two decades the trend has been toward establishing water supplies based on government grants allotted for the operation of the systems. So we cannot say that the funds are diverted. On the contrary, it is necessary to instill new attitudes into the leading politicians so that all these problems can be resolved successfully through the Pan American Sanitary Bureau.

**Chairman:** Before we go on to the next item, I want to ask Dr. Horwitz whether he would comment on the creation in Santiago of an institute interested in air pollution.

**Horwitz:** The Latin American Institute of Occupational Health and Air Pollution Research was created about the middle of last year with financing from the Government of Chile and the United Nations Special Fund—1½ million dollars, if I recall correctly. We believe that we now have available all the basic equipment and experience necessary for tackling these problems. Thus the questions on which we have requested your kind advice today are even more relevant. The lines of research that may be mapped out today will be extremely useful to the group at the Institute.

May I add another comment, Mr. Chairman? I am puzzled by Dr. Dubos' underestimation of epidemiology. It is true, I agree, that through physiological studies we might recognize the

beginning of tissue impairment, but well-conducted epidemiological studies could render a tremendous service toward getting industry to apply appropriate measures. I am not speaking so much of air contamination as such as of steps to avoid further damage. If I may say so, I think that what we should do is combine the two disciplines and not depend too much on one alone.

From the educational standpoint, certainly the emphasis should be at the medical school. We have talked a lot about how to teach preventive medicine and have done so little throughout the world.

A good example is the discussions of the World Health Assembly about two years ago, where the old story was repeated once again for the benefit of people from all over the world. Each blames the other.

**Chairman:** Dr. Dubos, I suspect you may want to say something, if only in self-defense.

**Dubos:** Yes. By the very nature of the delayed effects of environmental pollution—whether water or air pollution—it will take at best ten, fifteen, twenty years to know. It seems to me we cannot afford to wait ten, fifteen, or twenty years. We have to begin taking action right now. So if I question the epidemiological approach, it is not through any failure to recognize its usefulness but because it is too slow in providing the kinds of information that are needed. Moreover, it can be so distorted.

Allow me to mention something that perhaps Mr. MacKenzie may not know, even though he knows everything about air pollution.

About six months ago, I attended a meeting with the person in charge of air pollution control in Los Angeles County. I cannot remember his name. He was saying that there was no evidence of increased mortality in Los Angeles County due to air pollution, and he presented the most convincing kinds of statistical analyses. I asked him, "Do you know how many people have moved out of Los Angeles County because they did not feel well?" This is the kind of information that they did not have and that is always difficult to obtain. More epidemio-

logical evidence relating chronic pulmonary disease to pollution certainly will build up, but the relationship will be so hard to demonstrate that it will be difficult to establish a program on that basis. Whereas if there were four or five objective tests that showed impairment of function, people—and especially medical students—would become interested.

**Audy:** I agree. Mr. MacKenzie mentioned the quantitative aspects. One of the quantitative aspects that would concern us in the case of air pollution, first of all, is the conditions that existed before any air pollution was present. The second, the sort of datum one tries but fails to get by epidemiological studies, is how much damage can be ascribed to air pollution in the particular place. This, more than anything else, is often not worth looking for because it is terribly expensive, terribly time consuming to get. The third quantitative datum is the known dangerous levels of each pollutant for immediate damage and also for long-term damage. The greatest gap in our knowledge, of course, has to do with the long-term damage. The fourth quantitative element we require is, What is air like at the moment? What are the levels? How many of the ingredients have reached dangerous levels at the present moment? With that goes the study of air currents and so forth. For example, in San Francisco there are air currents that carry pollution a long way down the valley and cause agricultural damage; and there are local climatic conditions, such as the well-known Bay Area inversion layer, that clamp the condition down. In each different area, too, the ingredients are different. London fog cannot be compared with Los Angeles smog.

A lot is already known in many countries—which Latin America can take advantage of—about the dangerous and permissible levels of various toxic agents in the air. Those studies are becoming still more precise. It seems to me that an institute for the general study of environmental toxicology as a whole, with a part being epidemiological studies, to find out what is happening and try to anticipate what

may happen with industrial and other developments—with that kind of epidemiological approach, it might be possible to anticipate some future troubles. There would be a danger, as always, of people's making broad epidemiological studies that after ten years tell us what

we already know, or give imprecise information about something that is precisely known in physiology.

**Chairman:** If there are no further observations I shall ask Dr. Rotondo to present his discussion.

## ADAPTABILITY OF HUMAN BEHAVIOR

### Humberto Rotondo

The purpose of my paper is to present a series of queries that arose when a review was made of the various modes of personal and interpersonal adaptation to urban life in Latin America. Peru has been cited for the purpose of illustration. Although other countries are mentioned, no attempt is made to generalize.

Adaptation is the achievement of mastery of external reality through solution of the problems it poses to a person or group. According to O. H. Mowrer and Clyde Kluckhohn, it should be distinguished from adjustment, which is merely the removal of tensions and stimuli without any effective solution of problems or true satisfaction of basic needs. Adaptation is a relationship between an organism and the environment such that it ensures survival. That relationship, when effective, ensures the future development of the organism through the mobilization of its potentialities. In many cases it leads to true creation and to the emergence of new forms of behavior that put on new bases the individual and the group to which he belongs.

Yet man, who is the most educable of the animal species, is all too often the victim of inertia or of the fixity of old habits, customs, and attitudes. Many of the problems faced by migrants to large cities are traceable to attitudes that enabled them to function suitably in the stable environment of rural communities or

within a pattern of family relationships or of a paternalistic system.

Any changes in the environment in which man lives (whether major or minor, sudden or gradual) or any changes that occur when he migrates (whether of his own accord or involuntarily) demand an uninterrupted effort at adaptation or an attempt to dominate this new or changing reality so that he can survive and develop.

He will deceive himself if he uses adjustment techniques that prevent him from mobilizing his potentialities and from solving the problems posed by the various situations of city living. Such techniques, which are usually evasive and self-deluding, will eventually reduce his ability to face the various demands that urban living makes on him.

The two main forms of adaptation are the alloplastic and the autoplasic. *Alloplastic* refers to changes in the environment effected by the individual or group, as in the many self-help projects in the shanty towns on the fringe of large cities in Latin America. Here the inhabitants, with technical assistance and mutual aid, change an environment that is unhealthy and, in so doing, increase their chances of survival and development. Such changes could be increased by making intelligent use of the population's traditional forms of mutual aid,

as practiced in the villages and communities from which they came.

In this connection, a study should be made of ways of orienting these traditional patterns in accordance with community organization techniques. Traditional forms of self-help or mutual aid are thus used to confront the exigencies of urban life in certain shanty towns in Lima and are even revitalized with technical assistance in the very rural areas from which they sprang.

In the urban environment, relationships within the extended family (relatives, friends, godparents) continue to take the same form they had in the rural village or community. The primary relationships are widened by means of a broad network of "clubs" of persons from the same province, which provide support, security, and guidance in the new environment and thus act more or less effectively as shock absorbers against the great uncertainties of city life. William P. Mangin, who has made a thorough study of these relationships, pointed out their integrating aspects and the role they play as an intermediary for new customs. We believe that the retaining of a traditional identity for at least some time offers reassurance against the anxiety and insecurity caused by fear of not being accepted by the city dweller.

Changes wrought in the person himself—for example an increase in his skill—will strengthen his self-confidence and thus serve as an effective means of autoplasmic adaptation. Among the migrants from the provinces, both from rural areas and from cities, there is widespread appreciation of education. They are participating increasingly in the adult education programs offered to them. Even persons who failed to realize their own aspirations in this regard still hold them for their children.

Can the city culture of an underdeveloped country be compared with the city culture of a highly industrialized or developed country? What are the similarities or differences between the inhabitants of the classical slums in the developed countries and those of the so-called shanty towns on the fringe of Latin American cities? The answer will require spe-

cial studies, especially in view of what Oscar Lewis calls "the culture of poverty."

Most large cities in Latin America are experiencing rapid urban growth due to internal migration, unaccompanied by industrialization. Underemployment and slow economic development create problems for the migrants, most of whom arrive with high hopes—if not for themselves, then at least for their children. In some shanty towns there are areas of great apathy and dire poverty, but in others there is a hopeful trend toward improvement for the children, even in the midst of great poverty. It can be said that attitudes of hope exist side by side with attitudes of frustration, and that such hope is obviously the foundation of integration and support. The increasing expectations fostered by the mass communication media give rise to problems whose positive and negative repercussions should be studied, particularly when such aspirations bear no relation to the opportunities available and to personal ability.

Even in the classical slum areas, in the city centers, there are certain sectors where social disorganization is minimal. A study of these sectors focused particularly on stable families with a minimum of disintegration is rare. We should learn what gives them support and what integrates them. Latin America has few studies comparable to those Oscar Lewis made in Mexico City. He followed the rural families on their migration to the city and found that in the urban environment they continued to maintain their family cohesion, neighborliness, and ties with the extended family.

Delia Zamalloa made a study in Lima, under our direction, on the informal aid offered by a center-city neighborhood inhabited by persons who had arrived from the provinces ten to fifteen years earlier. They were found to have kept close ties with their relatives, to help each other in cases of need, and to continue to visit each other frequently. Nor had they broken their ties with their native villages; they were exchanging services with family members physically far removed.

Migrants from the provinces install them-

selves in the slums or shanty towns of large cities because the rents in better neighborhoods are too high for them. Side by side with this negative motivation there is a positive motivation, an attitude of hope among all those who participate in these so-called invasions of the vacant lots that surround large cities. There they build their huts, gradually improve them, and feel satisfied because they have a home of their own for themselves and their children. Come what may, they better their condition. Little by little an improvement is seen in the quality of the materials they use for their houses, and they readily accept any technical assistance offered to them.

Hugo Neira, a newspaperman and student of social anthropology, has pointed to the optimism of these shanty-town dwellers just settling on the vacant lots close to Lima, which are called Hermit Plains: "To speak with the men and women of Ermitaño is to learn the language of hope anew. This shanty town has sprung up recently, and that is perhaps why as yet it has no electric light, water, or schools. But the drive behind its organization and the order kept in this incipient city dispel the ghost of discouragement from the visitor's mind. After all, one should remember that each of those men is now a home owner."

William Mangin, in studying the natural history of the shanty towns of Lima, found great cohesion and social integration among the initial settlers. Added to solidarity is the sense of satisfaction in the achievement and of reward for the effort. However, a second stage sets in at which time this phenomenon decreases (although it remains in some areas), and later tensions and rivalries arise about the management of the so-called settlers' associations.

A study of the leadership of these groups is absolutely essential. Some observations made by Elías Flores, contained in the Report to the Committee on Agrarian Reform and Housing, Part Four, Group Dynamics, highlight the attitudes of some of these leaders. In certain other cases a true process of community organization and development had continued. There are no

studies on the various forms of management or on the psychological, cultural, and social characteristics of the shanty-town leaders. Because of their constructive or destructive influence on the activities of the group they merit a special study.

Andrew Pearse has pointed to the problems arising from attitudes of dependency that rural emigrants bring to the cities of Brazil. These persons have little faith that ability and perseverance are more effective for progress than personal influence. "Their pastimes and religious practices reflect their concern with improving and even ensuring their luck, and the activities of their families reflect the usual hope that a good boss, or political leader, or powerful saint will intercede and protect them. At the same time, even though they have not yet reached the point of regarding urban society as an open one in which accomplishments and talents count for more than privileges and rank, they do derive great satisfaction from systems of 'chance' in which the skill and ability of the individual bring success and good luck may favor anyone, regardless of his status."

Similar attitudes among certain mestizo groups in Peru have been described both by us and by William Mangin. These attitudes are evidenced by a tendency to foist the responsibility on some paternalistic figure "through a tremendous dependence on either Government, church, or some power outside themselves" (Mangin). Possibly such dependency attitudes are related to circumstances of extreme poverty or need, or to certain fixed attitudes, or perhaps to some basic personality type. Is this attitude related to the familism so frequently found in these sectors? On the other hand, some truly conflicting attitudes may be observed which are perhaps related to a situation of transition or to a cultural or social change. The mestizo groups studied by us seem almost to expect support and direction from a paternal figure and at the same time, as we have verified in the cities, to feel that they cannot expect anything from anybody. "Dependency attitudes show themselves as a need for guidance and orientation, for having

someone tell them what to do." Nevertheless, such dependency attitudes are not necessarily negative in those cases, because they can be used for purposes of education toward self-help and, together with a slightly paternalistic assistance, may be a useful tool for adaptation.

One negative attitude that can hamper local promotion programs is mistrust. It is true that such an attitude is typical of the settler who comes from a small and isolated village, and that the attitude will perhaps persist in the urban environment, disguised as a stable attitude or disposition. Mistrust of others was found, for example, in the studies made by William F. Whyte among students in Lima and the provinces and by ourselves in slums and shanty towns (Mendocita, Mariscal Castilla) around Lima.

A fatalistic or pessimistic attitude is frequent in mestizo migrants and in the rural areas. The belief in good or bad luck provides an explanation for success or failure and thus shows its basic function to be adjustment or the simple reduction of tensions through rationalization. The belief that "success in life depends more on luck than on true ability" is therefore found in shanty towns. Such beliefs do not favor the mobilization of the many potentialities needed to meet the competitive demands that may arise in large cities. We thus have many cultural attitudes that are negative to good personal or interpersonal adaptation.

However, not all the migrants who arrive in the large cities come from rural areas. A study made by Joseph Stycos and Cara Richards de Dobyns on the origins of the migrants to greater Lima showed that half of them were urban by birth and had had the cultural advantages of urban living, a better education, and compara-

tively greater financial success than migrants from rural areas.

Many rural migrant families bring stabilizing factors with them. In Rio de Janeiro, Andrew Pearce found that many of the inhabitants of the shanty towns obviously had a good family organization, despite the unfavorable conditions, and thus a source of security. "In all these cases, there had been a close and intimate friendship between the families of the couple before they married; out of the marriage there arose a group of relatives whose relationships were strengthened through 'godparentage.' . . . Most of the rural families covered by the study had several groups of relatives living in the same shanty town or in another part of the city and they exchanged visits with them alone. . . ."

José M. Arguedas and Gabriel Escobar in Peru have called attention to what they observed in Ayacucho, Cuzco, and Puno, where the new type of mestizo who gives up his traditional way of life, the so-called "emerging *cholo*," shows an individualistic and pragmatic tendency that may favor his adaptation to the competitive urban environment. Joan Snyder in her study of Recauyhuanca, up in the Ancash mountains, pointed out that many members of the community had as their reference group the coastal society, with which they identified themselves. The regional development programs and the social changes that may occur in the agricultural area will no doubt bring about special problems that will also have to be studied in relation to the processes of adaptation and pre-adaptation to urban living.

Chairman: Before I open the discussion, I shall call on Dr. Mangin to make his presentation.

# THE ROLE OF SOCIAL ORGANIZATION IN IMPROVING THE ENVIRONMENT

William Mangin

I would like to talk to you about the role of social organization in improving the environment of the city of Lima, Peru. Specifically, I will discuss social factors in the improvement of a desert area a few miles northeast of Lima by some eighty thousand squatters who have occupied it in the last five years.

This area is called Pampa de Comas and is about ten kilometers from the center of the city, on the road from Lima to Canta. There was no one there in 1958, and there are anywhere from eighty to a hundred thousand people along the road now. It is probably the greatest example of popular initiative and achievement in Latin America.

The area is composed of about twenty-five invasion-formed settlements called *barriadas*. In all but one of the invasions, some of the invaders were injured by the police; at least seven people were killed. In spite of the opposition, the invaders returned each time. Now there exists an orderly suburban city with extra-official local elections and effective self-government. There are very few public services; until recently there were none. Fewer than half of the people have access to public water taps, and fewer than 10 per cent have sewer connections. There are only seven policemen for the area and they seldom stray more than fifty yards from the highway. Comas extends up the hill-sides and gullies as far as two miles from the road in some parts.

I shall refer to Comas and other *barriadas* as I go along, but I should also like to focus on the general problem of technical assistance and the relationships between the educated, politically effective, upper- and middle-class population of Peru and the rest of the people, particularly the rural migrants who make up the *barriadas*. I shall mention some cultural as well

as social factors, although I must admit I find it hard to distinguish between them at times. In my six years in Peru—two with a community organization study in Vicos sponsored by Cornell University, two in Lima squatter settlements, and, more recently, two as Peace Corps administrator—I have seen, as many of you surely have in public health programs, many spectacular failures and a few successes in technical assistance. In each case a knowledge or lack of knowledge of sociocultural factors played a part.

In the early fifties in Ica, a city on the south coast of Peru, an anthropologist named Edward Wellin was employed by the Pan American Sanitary Bureau in a health center that was then under private auspices. The center was experimenting with new ways of bringing health education and better health practices to the city. One of the ideas was to use "public health visitors," nonprofessional people from the client population who had been given a short training course. Ideally, these visitors should have had more understanding of the people than trained nurses would, and also more acceptance in the homes. Besides, there were not enough professionals. A group of women were selected, trained, and sent out to work. Some of them were successful, but a large number identified so strongly with the middle-class professionals that they no longer wanted to go into "those dirty houses" and had more conflicts with local people than the professionals did.

A group of men of much the same category were trained for the task of sanitary education. Their status was higher and there was a chance for advancement, so job satisfaction was high enough, but most of them were not successful. One man, however, was having remarkable success in convincing people to build latrines,

one of the favorite activities of U.S. and European health teams. The anthropologist wondered why. On investigation, he found that the man was threatening the people with bodily harm. Since he was considerably larger than most of them and was known as a violent man, many people did as he said. There is no reason to suspect that anyone used the latrines, since no one had threatened them about that. It is probably just as well that they did not, because in sunny Ica the fecal matter dries up and/or is eaten by dogs and pigs. This does not constitute the ideal situation but is probably better than concentrating it in a damp, dark, untreated latrine.

We had a Peace Corps volunteer who organized a latrine-building campaign in a mountain Indian village in 1963. The area was one of great political agitation, with rivalries running between local leaders for the control of villages. The volunteer, the only permanent staff member of a medical post in the area, threatened that if the people did not build the latrines he would leave. We had repeatedly counseled volunteers to avoid such situations, and he seemed to have violated all the principles of community organization. To our and his surprise, twenty-five families built latrines, which were inaugurated and blessed by dignitaries from the Ministry of Health and the departmental capital. It was subsequently learned that the local peasant-syndicate leader had ordered the people to build the latrines—he wanted the volunteer to remain, because having the medical post in his village reflected favorably upon him. One night about a month later, a Peace Corps physician and the volunteer inspected the latrines and found that many had holes two or three inches deep and many were unused. So much for latrine building. Not being a unilinear evolutionist, I do not feel that the latrine stage is one that every society has to pass through.

A more serious, and more successful, attempt to introduce a new custom in Ica was the training of local midwives in sanitary and safe ways of delivering children. The group dealt with

was a secure, confident group with fairly large local practices. Some of the physicians in the health center assisted, and the midwives were eager to learn. Local valley doctors and others in the center disapproved, however, and could not bring themselves to recognize the lower-class women as peers in any way.

Another frequently encountered problem in Peru was the difference between class and sub-cultural groupings as to categories of disease. The hot- and cold-food distinctions play a large role, at least in *ex post facto* explanations of sickness. The folk categories of serious illness do not conform to those of modern medicine. In a questionnaire administered in Lima, *barriada* mothers were asked to list their children's illnesses on a scale read to them in direct translation of a form written in English, and the children appeared to have very few troubles. But the women reported differently when we added local categories such as *susto*, *empacho*, and *ojo*. We encountered a similar situation when we added local categories at the conclusion of the Cornell Medical Index. The respondents answered to many of the items on the Cornell Index anyway, since they deal largely with specific symptoms, but a large number also answered affirmatively on the local categories.

Still another problem in Ica and throughout Peru and probably the rest of the Western world is the role of social class and sex in the doctor-nurse relationship. This is intensified in Peru because the class lines are extremely rigid and almost invariably nurses are recruited from lower social strata than doctors. Social class also enters into the nurse-patient relationship in clinics, particularly when the patients are Indians or lower class. The problem is one of cultural differences and involves extremely complex communications between the clients and the practitioners, whether doctors, nurses, or anyone else engaged in service or in technical assistance.

It is quite difficult for professionals to divorce their technical knowledge from their cultural attitudes. Nutritionists are rarely con-



tent to impart their knowledge about what available foods could be better used to improve health standards. Instead they carry a middle-class cultural package around with their technical knowledge; they tell clients that they should eat three times a day, with tablecloths, knives and forks, and napkins. I have heard such statements as "You don't know how to eat. You eat like animals." Similarly, the teacher who tells a Quechua-speaking child, a child whose parents speak nothing else, that it is not really a language but only a "dialect" and that "Your family sleeps like pigs. Why don't you have a bed?" is going far beyond the bounds of teaching the child to read and write. In both cases they are making their message completely unacceptable.

It seems to me that people need favorable self-concepts in order to accept new things. If they are constantly being told that their own customs are brutish, stupid, and bad—terms frequently used in Peru to describe Indian and general lower-class patterns—either they will resent the speaker and refuse his knowledge or they will believe him and feel so unsure of themselves they will be unable to accept his knowledge.

Many situations encountered in working with people attempting to change situations can be described in terms of what David Riesman refers to as "counter-cycles." For example, a medical doctor trained in the most modern techniques of twentieth-century medicine in the United States, where emphasis is put on the "whole man" as patient and on psychological and social factors involved in surgery, hospital care, and so on, may find he has more in common with witches and *curanderos* in Peru than with many of the medical people who are still fighting battles long won in most parts of the States—battles with staff and bureaucrats over routines, sanitation, sterilization of instruments, keeping animals out of hospitals, and, above all, adequate budgets for minimal care. He is coming around the cycle, and in a sense Peruvian physicians may very well feel betrayed by

his apparent lack of interest in their immediate problems.

Dr. Thomas Szasz, a psychiatrist at the New York State Medical College and a liberal humanitarian, finds that by taking the position that there is no mental illness he comes into conflict with many who are trying to convince state legislatures that there is a need for budget to treat mentally sick people. His unsought allies are often Orphan-Annie-inspired Birch Society members afraid of being poisoned with fluoride and then put away in mental hospitals.

Earlier today I noticed another example of a counter-cyclical situation. Dr. Audy was critical of the multiplicity of governmental entities around Chester, Pennsylvania. His points were well taken, and Chester, at its present point in the cycle of urban development, could benefit from more centralization. Lima, on the other hand, is at a stage where the healthiest thing that could happen would be the emergence of many local entities with decision-making power to counteract the extreme centralization. It is too bad we cannot export some of Chester's institutions.

In addition to the cultural and class problems and the counter-cyclical problems, another area of trouble in changing environments is the strong tendency on the part of the agents of change associated with private foundations, with organizations of "the West" such as the U.S. Government, or with the UN to stress the need for "technical" assistance in the solution of what are essentially social and political problems.

It was something of a surprise to us in the Peace Corps in Peru to find that many of our most successful volunteers had no particular technical skill and that many of our most discontented volunteers were highly skilled technically. Many Americans have a talent for organization. We come from a highly organized society, and practically everyone has belonged to clubs, Scouts, block organizations, church groups, or something else. Even the anti-organization people in the United States are well organized. There is a tremendous need

for organization among lower-class Peruvians. Many of the volunteers found themselves meeting this need without even being aware of it.

One fellow, a liberal-arts graduate with no special skill beyond a fair knowledge of Spanish, said after about seven months in the country that he thought he was not doing enough. So I went around to the urban squatter settlement where he worked to find out what was going on. I discovered from his contacts there that he was very popular and sought-after. In Peru, there are many government ministries and departments that have services available but also have overly bureaucratic methods (certainly not peculiar to Peru) and many gatekeepers to exclude Indians and dirty, short, dark, or poorly dressed people. The *barriada* residents consequently had trouble finding the right offices at the right time. The volunteer had become an expert in locating where to get the sewer connected, where to complain about garbage collection, where to ask about land titles, and so on. This special knowledge plus his ability as a foreigner to get past the gatekeepers made him a most valuable man.

In many cases we found that volunteers with minimal skills were useful to Peruvian communities as bag holders. In many places, community members had the potential, the skill, and the motivation to form a mutual-aid construction group or a credit cooperative but, because of a high level of mistrust, were constantly bickering over organization and money. The arrival of the U.S. volunteer provided a person of trust and a "witness," and this became the first function of many volunteers. From this position they were then able to organize other things, such as parents' clubs, nursery schools, and defense committees. They were also then in a position to introduce to the community other Peace Corps volunteers with specialized skills whenever they were needed. After residing in a *barriada* or a small town for a year, the volunteer became progressively more effective during the second. The accumulated knowledge and trust paid off and organizational work became easier.

We found—and it is certainly no great surprise—that respect for the local culture and knowledge of the local social organization were essential for effective work irrespective of technical skill. I am not disparaging skills. The best of all possible conditions is a combination of skill and empathy. But so often professionally trained people were less effective than they could have been because of a lack of awareness of the political and social nature of many community problems. A nurse or volunteer who organizes a group of women to request training as midwives or to staff a clinic during weekly visits of a Ministry doctor or to assist in locating TB cases and to administer injections under the direction of Ministry personnel (all of which happened in Peru) is more useful to Peru in the long run than a trained nurse who works twelve hours a day in a hospital (which also happened). I am not disparaging the latter in any way. I am trying to point out that social organizational changes can be more important than technical changes. In most actual situations both are necessary.

We had a highly skilled bricklayer working as a Peace Corps volunteer in a Lima *barriada*. He earned over ten thousand dollars a year in the United States, where the premium is on speed and a craftsman who can do a good job fast can make a lot of money. It takes practice, and any investment in good tools and an expensive cement mixer is worth it. He tried to transfer this technique to Lima and at first was quite critical of the Peruvian technique. After a while he began to see that, because of the different economic conditions, speed was not the essential factor. There were many good bricklayers in the *barriada*; in fact, such skills as bricklaying, cement work, and electrical work are fairly common among *barriada* residents. But few had enough cash to buy more than a few hundred bricks at a time, and few had time to work during the week. They worked on their houses, converting them from straw to brick, on Sundays and occasionally at night. They often worked with friends or relatives and could generally dispose of a load of brick long

before they could afford another. The hard steel trowels used for shaping U.S. bricks were also unsuitable for the softer Peruvian bricks. The volunteer in this case actually did teach a lot about bricklaying; but it was mainly two inventions of his, in addition to his engaging personality, that gave him his entrée into the community. He was from an Italian family and, by modifying a wine press and a noodle-making device he had seen, he developed two cheap and very useful machines made from easily available materials.

The major obstacles to construction in *barriadas* are not technical. They are economic to an extent but, even more, they are political. The main question is how to get a clear land title. Here is where organizational and political skills come into play. One thing we noted in Peru was a tremendous amount of energy and ability in the *barriada* population, much of which was wasted so far as any development of the country was concerned.

Peru is a country with considerable resources and a highly talented population. One of the obstacles to the efficient employment of the *barriada* population is lack of knowledge (and a large number of mistaken and often prejudiced ideas) of the power groups and the general middle class of Lima about the nature of *barriada* residents. I should like to devote the last half of this talk to *barriadas* and suggest some possibilities for using social organization to improve the environment.

There are many local political organizations in *barriadas*. One of the stereotypes is that they are relatively lawless, unorganized, chaotic places. In fact, they have had local elections since at least 1946, while the nation of Peru held its first local elections in fifty years in 1963. Local mayors and councils are elected each year, by secret ballot, on the basis of one vote per household. Most people are familiar with such elections because of the proliferation in Peru of regional and social clubs that hold elections. There is activity by national political parties, and some candidates also run independently. In one place where I worked a candidate was

murdered during a campaign, probably by the followers of another, but this was a very rare occurrence. Generally the campaigns are quite orderly and the results are respected. Since the elections are unofficial the mayors cannot back up their decisions with any police power, so it is all the more remarkable that their authority is respected and that *barriadas* are as orderly as they are.

In addition to the political organizations there are many clubs based on such matters as region of birth, football, volleyball, sewing, and singing. There are also many people who belong to fairly strong organizations based on region but extending beyond the *barriada*. In addition, many are members of unions—labor-union organization has provided the model for many *barriada* organizations. Significantly, the first two officials named following the mayor or president of the *barriada* are the secretary of defense and the women's secretary of defense. The frequent use in *barriada* rhetoric of the word *defense* and the ubiquitous phrase "You have to defend yourself" are not out of place, because in most cases *barriadas* are or have been under attack. They were formed by highly organized invasions carried out during one night after months of planning with hundreds of people gathering from all parts of the city in hired taxis, trucks, and buses to set up straw houses on prearranged sites on a hillside or river bank owned by the state. In almost every case there has been opposition, and the people have been driven off at least once by the police. Often there have been injuries, and in January 1963, for example, invaders have been killed. *Barriadas* represent courageous and ingenious responses to a crowded urban situation.

Another myth about *barriadas* is that they contain large numbers of Indians direct from the mountains. This myth is widely circulated; I am sure that those of you who have been in Lima have heard it and have read it in magazines and newspapers. There are frequent cartoons depicting *barriadas* as populated by mountain Indians directly from the slopes of Huascarán. A census taken by José Matos Mar, a

Peruvian anthropologist, shows that many *barriada* residents come from the coast. In a smaller census of one typical *barriada* in 1959, I found that the vast majority of the residents had been born in the provinces, mostly mountain areas, but that practically all had spent a while, sometimes years, in a town or hacienda after leaving their communities and that with almost no exceptions they had spent some time in the central city before coming to the *barriada*. Many of the heads of families had been in Lima for over ten years before they came. *Barriadas* are an urban phenomenon. They represent a sophisticated urban response to high rent in overcrowded city slums.

The language information also casts doubt on the stereotype. It is only fair to point out, however, that there is a tendency on the part of many *cholos* and mestizos to underreport knowledge of Quechua and exaggerate skill in Spanish, so that the following figures are probably slightly distorted. The following results were obtained in response to a question on languages spoken: 302 said Spanish only, 3 said Quechua only, 40 said Spanish and Quechua but did not indicate which was primary, 168 said Quechua was their first language and Spanish second, and 1 said Spanish first and Aymara second. Four gave no information. In spite of the presence of several families from the Tupe area, no one claimed to speak Kauke. A few said they spoke some English.

In response to a question on parents' language, 255 said Spanish only, 54 said Spanish as a first language plus Quechua, 81 said Quechua only, 135 said Quechua first and Spanish, 15 said Spanish and Quechua with no indication of a primary language, 4 said one parent Spanish and the other Quechua, and 1 said one parent Aymara and the other Spanish. The rest gave no information.

I realize I am repeating myself, but I think it extremely important to emphasize the orderly nature of *barriada* communities. The myth prevails that *barriadas* are dangerous, lawless centers of vice and political agitation. In fact, there is little crime in *barriadas* beyond petty

thievery and assaults against wives and children by husbands (the most frequent complaint to the city police is by wives against husbands). The only danger to a visitor is from the numerous dogs, who, especially at night, run in packs and bite walkers. The majority of the families live in peace with each other, and many of the adults feel they have achieved much of what they wanted by acquiring a house and lot and entering their children in school.

In the *barriadas*, there is a naïve faith in the educational system that does not seem to me to be justified. There is also a strong belief among many adults that their children will succeed in professional jobs. No respondent to our questions aspired to skilled work for his child; all wanted professional or business posts. The subsequent disillusion of the children who are being socialized to be upwardly mobile will certainly provide a much stronger pressure on the political leaders for reform and opportunity than the present adult group is exerting.

I do not mean to say that everyone is happy in *barriadas*. I was once lampooned in the Lima newspapers *La Prensa* and *Ultima Hora* for suggesting that *barriada* residents did not constitute the most depressed group and that, in fact, they represented initiative and hope for Peru. Naturally many residents, if not all, would like to better their lot. There is constant demand for sewage disposal, light, water, bus service, police protection, clinics, schools, and other facilities.

The political fears of the upper and middle-class people are reflected in their attitudes toward *barriadas*. In January 1963 a Catholic paper published quite seriously a story that *barriadas* had planned to attack two upper-class sections of Lima on New Year's Eve and been prevented from doing so by the police. That, it was said, was why so many police officers were missing from New Year's parties. Sounds fantastic. But it does reflect a kind of paranoia and guilt present among many *limeños*.

There is political activity among *barriada* people, but so far there is no strong inter-*barriada* organization in Lima. Odría tried to

begin one but it has never been strong. In Arequipa, a large southern city, there is quite a strong central organization of all *barriada* residents. The Peace Corps was able to work much more effectively because of its presence. It adheres to no political party, which is probably the main reason it is as strong as it is. In 1962 the city officials were not concerned with the organization, but by mid-1964 the mayor was meeting frequently with its officials and the *barriadas* had become a political force to reckon with in the city.

Unemployment in Lima *barriadas* is not as high as elsewhere in the city. True, much of the employment is marginal, but often there are two or three marginally employed people in one family so there is some income. The lack of rent is also a great advantage; it allows people to sink what surplus they can acquire into construction costs. *Barriada* people work at many things—there are garbage men, gardeners, waiters, market workers, taxi drivers, police, soldiers, a few bank tellers, several university students, many construction workers, and some factory workers. Many own small properties in their home provinces and most maintain ties with their original homes.

The major success goals of the society are attainable in Lima, so probably the migrants are a select group of alert, ambitious people to begin with. In many cases the real estate they now own is highly desirable, close to downtown and often on elevated land. Most of them know they have done something worth while and try to improve their property. Some individuals live in situations similar to that of Carolina de Jesus in *Child of the Dark*, but I suspect that most favelas resemble the *barriadas* I have described more than they do *Child of the Dark*. Even in that book one can see evidence of much more community life than the writer would have us believe exists. There are many areas of the central city much more disorganized and depressed than *barriadas* (see Rotondo and Caravedo's excellent book on Mendocita, an urban slum in Lima). *Barriadas* are more spacious and healthier.

*Barriadas* are not, as many folklorists and romantics claim, Indian communities reconstituted in Lima. True, one sees women in Indian clothes, guinea pigs and chickens are raised in kitchens, some Quechua is spoken, there are many mountain-style fiestas and religious patterns; but the organization is politically modern and urban. There is a growing Quechua nationalism in Peru, and it is particularly noticeable in the South and in Junín with the growth of peasant syndicates and land invasions. It is also seen in Lima. Ten years ago I noticed, among Indian migrants to Lima, a reluctance to speak Quechua and a shame about Indian origins, but I seem to see much less of that now. There is much more pride in being Indian and much more consciousness of Indians as a group. Formerly Indians identified as men from a particular region or community but now the general identification of Indian or *cholo* is more common.

There is a tendency on the part of many whites to regard any Indianist movement or any attempt to use Quechua as a national language as divisive and "left wing." So far this is not true, but it may be part of a self-fulfilling prophecy. The increase in communication through the use of transistor radios, improved roads, better schools, and other media is making Indians more aware of the outside and their place in it. In 1951 many Vicos people had never heard of Odría, then President, and many were not clear about what "Peru" was. Today many of them not only know about Peru but also know about the United States, Bolivia, Cuba, China, and the UN.

Paradoxically, considering that they have created something out of nothing, the residents of *barriadas* frequently say that they can do nothing; in one *barriada*, asked in a questionnaire how their problems could be solved, no respondent suggested that they might solve their own. All said it would require some outside agency, usually "the government." True, such large-scale problems as sewer systems, water supplies, central electric power, and education have to be solved largely outside the *barriadas*.

But if organizers can work with *barriadas* from the beginning—and the early stages are the best for organizational work—many other jobs can be done and skillful petitioning can be done to get help with the larger tasks. As Dr. Rotondo said earlier and as many other writers have noted, there is probably a stronger dependency need in the Peruvian population than in many others, but, in spite of that, many problems have been handled through popular initiative.

To conclude, I should like to make a few suggestions on ways to use social organization more effectively. First, to belabor a point, all organizers have to be trained in the culture and language of the people they work with. It does seem to be true that foreigners have certain advantages over local middle- and upper-class people in organizing lower-class communities, but only if they have the language skill. Parenthetically, I have noticed that Europeans have more initial acceptance in Peru than Americans. A British anthropologist noted that Americans have more acceptance in Africa than Europeans. Maybe. In any case, the fewer preconceptions the local people have and the more language and cultural knowledge the organizers have, the better.

Another obvious but important suggestion is to become aware of racial, cultural, and class prejudice and try to eliminate it from situations involving technical assistance. Increased understanding of Indians by non-Indians is essential. There is probably too much of the *we-should-have-killed-them-all-the-way-you-did* attitude. Technical assistants have to learn to separate their technical knowledge from their cultural and social knowledge.

We also have to try to counteract the idea, long established in the whole Western world, that cities are somehow bad places and that rural people live a good life and are corrupted in cities. The opportunities of at least the near future are in cities, and no amount of condemnation of city life will slow down the migration—nor should it.

Changes in local communities will come about by local initiative and the role of the

outsider, whether foreigner or member of the national middle or upper class, should be that of facilitator or organizer.

Chagas: I should like to have elucidated a point that I see mentioned in Dr. Rotondo's paper.

I believe that what happened in Brazil was that the immigrant families from Portugal kept to themselves at least for four generations. This was true not only of those of very low economic levels but also of those of higher stations. There may be a genetic pattern for this behavior, which protects them against a new social environment. On the other hand, it may be just a state of social evolution. One sees it in immigrants from Europe—from any place in Europe—but it is especially characteristic of the Portuguese people. I think this has been expressed in the examples Dr. Rotondo gave and in some books.

My second point concerns Dr. Mangin's presentation. This is a very difficult problem to deal with because one may be accused of defending the favela. The favela belongs to those social levels in which, I believe, the greatest illiteracy is found. But what Dr. Mangin said about the favela is exactly what we know about it: a rather organized society at specific economic levels.

I believe that many of the people in the favela are most generous. I know they have a sense of fraternity. For instance, adoption is not very common in our society except at the social level of the favela. You may say—and that would be the Marxist way of looking at it—that the people adopt children because it means one additional person to work; but I believe that it results from a sense of human fraternity. I see the good care they take of six or seven children. I would say that this aspect of primitive sociological conditions enhances human nature. In my opinion, the best solution for the favela in Rio is most probably to leave it where it is. If we do not, we will be disrupting it completely. As to the élite who protest against it, this does not matter at all.

I am extremely pleased to hear what Dr.

Mangin said, and I shall be keeping in touch with the Peace Corps. Many Latin Americans are a bit skeptical about the Peace Corps; but seeing what has been done is very heartening. When I was in Geneva for a conference on development, I was told the same things in exactly the same words, about the difficulties with technical assistants, as he calls them, in Africa. His presentation is therefore of great importance to the Pan American Health Organization.

Roche: I think it was really a remarkable and instructive presentation. I am sure that the data can also be extrapolated to the ranchos in Caracas. It is a positive way of looking at things. We tend to be pessimistic in Venezuela—and perhaps in Latin America as a whole. This is not good.

On the other hand, Dr. Mangin may have gone a little far in his—I would not call it optimism, but positive thinking. One may become so optimistic that things seem not so bad at all. Fears are allayed and one wonders what the problem really is.

The people in the ranchos are in the very best part of the city—in a way overlooking the city. They have wonderful land, and they are well organized. And, of course, I am comparing the situation to the book by Carolina de Jesus. Could you also comment on some of the negative points, Dr. Mangin?

There is one particular point you have not touched on. I admit very humbly that I am quite ignorant about it because, like most Latin Americans, I have seen very little indeed of those sections. I am full of myths in consequence, although perhaps less so than most people. The problem I mean is that of the fatherless child. It is very common, I believe, though not limited to the favela; it is also seen in rural areas. There are no statistics. A man lives with a woman, or a woman with him, and leaves her with child, and quite often, as you probably know, the mothers' behavior is admirable. They treat the children very well, but they are without fathers and without authority. This creates many problems, I think.

Mangin: I am sure Dr. Rotondo has a lot of

information on this. It certainly is a big problem among the lower classes in Peru. I think it is slightly minimized in the *barriadas* by the fact that the local organizations screen the original invaders and the people who come in and accept only families that have a resident father.

The father deserts at probably about the same rate as in the city, but at least the community starts with complete families and the incidence of complete families is probably higher.

If the picture seems entirely positive, I do not mean it to be. I am not a defender of this kind of living. For people who are living without water and sewage disposal, what they have done is remarkable. There is not a lot that can be done. It is part of the counter-cyclical situation, in which I find myself allied with people who say, "Let them stay where they are."

I am sure Dr. Rotondo has more information on the effect of not having fathers in the family.

Rotondo: I confirm what Dr. Mangin said, that the frequency of complete families is very high in shanty towns. We have studied the modal personality characteristics in the slum areas. We see a form of basic personality which would be typified as depressive. We found it in their backgrounds following the absence of a father in the most important phases of their development. In families organized with the mother as the head, the mother was respected. She would implement discipline. We found, besides depressive traits, a trend toward dependency and a very curious way of manifesting aggression—not openly and directly, but covertly and indirectly.

There is a cluster of personality traits associated with a particular family background and a lack of respect towards authority in general, as we could see from a special study on their morale.

Payne: I want to call attention to the fact that the situation with respect to the family structure—which I might refer to as a matriarchal, almost "fatherless" society—is absolutely identical in the lowest socioeconomic group of Negroes in New Haven, Connecticut.

We first discovered this when we were doing a study on the effects of hospital staphylococci introduced into the family by newborns. When a child was born, we went to the family and swabbed all members, including the father. We swabbed once a week for a month and once a month for a year. After a few months, the nurses reported that the "father" was not always the same. The man in the house—he changed at irregular intervals—would offer himself for swabbing as if he were the father. I suppose that about 20 per cent of the families showed this pattern of a completely matriarchal family. The mother was the person in the family who was permanent, the man being the transient.

**Chairman:** This is also true in Ghana, as I recall—the mother is the person who keeps the family together. There may be any number of illegitimate children. The fathers are temporary, though they may be there for fairly long periods of time. It is a very happy kind of association. The whole group lives in one compound. The mother sees to it that all the children, regardless of who the father is, are absorbed into the family. It is just an adjustment that we are not quite accustomed to but that I think ought to be recognized.

**Magoun:** I agree. There is however, a very interesting distinction in the Los Angeles report about the two minority-group communities there, one of which is Negro and the other Mexican-American. This relates to the lack of tendency to local organization beyond the family in the Mexican-American community in contrast to the ready tendency of the Negro community to organize into groups. In the latter there are many social and professional groups: the Men of Tomorrow, the Saturday Morning Women's Breakfast Club, Mid-City Principles, the American Friends of Africa. There are civic and political organizations such as CORE and the NAACP; there are the Muslims; in particular, there are church groups. Most of the churches are Negro branches of the white Protestant and religious groups. Indeed, I think all of us would recognize the role played by the minister or the church figure in the whole centennial

program of the past year and in the civil-rights program.

A problem with the Mexican-American group in Los Angeles, however, is the difficulty of reaching any significant number of people through group organizations, which seemingly are lacking beyond the immediate family or its relations. This seemed to me to be in striking contrast to the many clubs, the innovation and defense organizations, and the other kinds of group activities you encountered in your program.

I wonder if you have any explanation to offer, for the ethnic backgrounds of these two are perhaps similar. I would not imagine them to be identical, but the difference in the two situations seems to be environmental.

**Rotondo:** It would seem to me, looking at most of the literature on migrants (of course, Mexicans are not recent migrants) that organization seems to be the rule rather than the exception. This is an exceptional case, but I have no explanation.

**Chairman:** One hears people referred to as the deserving poor and as the undeserving poor. I prefer to divide them into the deserving poor people who, if given an opportunity, will succeed—all they need is an opportunity—and the handicapped poor, including those for whom nothing can be done and those who are sick and for whom something might be done medically. There is always a proportion of immigrants of this latter sort who are handicapped in this way. In a growing community—and the favelas and other similar communities are constantly increasing in size—this situation can take care of itself because the deserving poor are given opportunities and because with good matriarchal integration everybody is in better circumstances than before. It is when growth begins to slow down that the proportion of "undeserving" or handicapped poor starts to rise too high.

Have you any comments on the possibility or the risk of a thing of this sort happening in which the situation deteriorates?

**Mangin:** To a certain extent, that situation



exists in Lima. It is more common in the slum areas than in the *barriadas*, partly because of the screening process in the *barriada*. I certainly agree, it is a very serious problem.

**Buxell:** Part of what I had intended to say later about housing improvement through urban studies might be brought in here, Mr. Chairman. I understand in this connection that the Organization of American States established in 1960 the Inter-American Program for Urban and Regional Planning (PIAPUR) at the National Engineering University at Lima, and of course we know of CINVA, the Inter-American Housing and Planning Center at Bogotá, Colombia. I understand that both institutions are interested in the Lima situation and have made relevant investigations there.

Dr. Mangin, you implied in your presentation that there is a certain amount of conflict between the local housing authority and the people in the slum areas. This may indicate some problems in the public relations area. Has anything been published in the Lima area indicating long-range plans for dealing with this situation, from

the standpoint of either housing improvement or community planning?

**Mangin:** Yes. There are quite a few publications put out by the Institute and by the Housing Authority that are available to the public.

**Chairman Wolman:** I think it should be reassuring to Dr. Mangin and Dr. Payne that the hostility shown by certain parts of the U.S. population to the housing authority could hardly be exceeded in any favela. Public meetings in this field are as close to murder as you would want to see. This seems to be a rather universal characteristic. As I said this morning, people seem to behave about the same way everywhere.

I now turn to Dr. Olivero, hoping that he will be so good as to summarize his paper—the subject matter is among the most important of the day—rather than read it in full. Dr. Buxell could then discuss it and comment upon it, with, I again hope, the participation of the group. I am extremely anxious to have discussion. The entire group has probably read the paper, or will do so tomorrow or the next day.

## **BASIC SANITARY SERVICES IN SHANTY TOWNS: MIGRATION AND URBANIZATION**

**Humberto Olivero, Jr.**

In accordance with your suggestion, Mr. Chairman, I shall be brief. I shall touch on a few of the more important points on basic sanitation services in slums and their relationship to migration and urbanization.

The first part is a general account of the population problem in Latin America and of population growth in urban and in rural areas. The high rate of population growth in urban as compared with rural areas is well known. I have

attempted, however, to direct attention to the great variety in the criteria used by the Latin American countries for defining *urban* and *rural*, which often leads to a wrong assessment of the situation.

Statistics show that, even though the natural growth rate is higher in rural areas, growth in the urban sector is two or three times greater, and that there is an enormous concentration of population in the principal towns and capitals

of our countries. I should like to mention a few of the reasons for the disparity in these rates of growth.

The unbalanced growth of the capital cities, as compared with medium-sized and small towns and with the rural sector, is primarily the consequence of the excessive centralization of governmental activities. This, in turn, leads to the centralization of commercial, industrial, cultural, educational, and recreational facilities and activities.

I am convinced that until the development programs make provision for radical changes aimed at decentralization and, in consequence, at strengthening the provinces and the municipi-

TABLE 1. *Population Distribution by Size of Community, Guatemala*

Number of inhabitants	Number of communities	Percentage of urban population
100,000-500,000	1	32.8
10,000- 99,999	4	7.5
5,000- 9,999	19	14.9
2,000- 4,999	63	22.2
1,000- 1,999	86	13.6
200- 999	142	9.0

Source: Censo de Población 1950, Dirección General de Estadística, República de Guatemala. The total population in 1950 was 2,790,868. The population in this table is 866,139.

TABLE 2. *Total Growth of the Urban Population Due to Natural Increase and to Migration in Some Latin American Countries (Per cent)*

Country	Census period	Approximate growth (per cent)	
		Natural increase	Migration
Venezuela	1941-1950	29	71
Colombia	1938-1951	32	68
Dominican Republic	1935-1950	35	65
Nicaragua	1940-1950	35	65
Paraguay	1937-1950	45	55
El Salvador	1930-1950	46	54
Brazil	1940-1950	51	49
Chile	1940-1952	53	47
Mexico	1940-1950	58	42

palities, it will be of little or no use seeking remedies that will provide more balanced growth in Latin American countries.

Table 1 shows the distribution of the urban population in Guatemala by cities grouped according to number of inhabitants. Only one city, the capital, has half a million inhabitants—that is, 33 per cent of the total population—and the remaining population is distributed in 314 small towns that are dwarfed by the capital.

The situation in Guatemala is similar to that in other Central American countries and in some South American countries. These have rightly been called "one-city countries."

The second section of the paper deals with migration from rural to urban areas. Table 2 shows for nine Latin American countries the percentages of urban growth due to natural increase and to migration.

This point was mentioned this morning, but unfortunately very little information is available about internal migration in the Latin American countries. It seems to me, however, that more important than the figures for migratory movements are the causes or motivations that give rise to them, and on this aspect very few studies have been made.

The preceding speaker mentioned the work done in Peru by Dr. José Matos Mar on migration and urbanization. Table 3 is in fact based on Dr. Matos' survey of seventeen thousand families on their motivations for moving from the countryside to Lima. The table shows very clearly that the main motivations for migration are first, economic, and second, social. These two account for about 80 per cent of the answers. Other reasons are connected with housing and with hygiene and sanitation, but these occupy a secondary place compared with economic and social causes.

In Guatemala there is a rather peculiar situation with respect to migrations. It results from the very high percentage of Indians in the population. Indians tend to migrate less and for shorter distances and in the same directions, as compared to the non-Indian population.

In general, the initial migratory movement is

TABLE 3. *Reasons Given for Migration to City (Lima)*

Reason	Number of families	Per cent
Total replies	22,461 *	100.00
Economic	13,713	61.05
Social	5,133	22.85
Educational	1,936	8.62
Military (compulsory service)	766	3.41
Health	595	2.65
Housing	179	0.80
Other	139	0.62

\* The survey covered 17,426 heads of household; some gave more than one reason.

from the rural area to the nearest population center; then, at a second stage, toward a larger town, which is usually the chief town of the district or department; and finally, at a third stage, toward the capital of the country. This points to the importance in Latin American countries of strengthening and developing the chief towns of districts and departments.

With respect to the basic housing services, which is the main subject of this meeting, we consider them to be *water* and *sanitary* services. In the Census of the Americas and in the Statistical Indicators of Housing Conditions of the United Nations, basic services are defined as water service, sanitary service, and lighting.

I should point out that data on water service, drainage, and sewage disposal in Latin America are rather deficient and incomplete. Furthermore, such data as are available are not uniform,

since no criteria for collecting them have been established.

Table 4 contains information about basic services in five countries in the Americas, both in the urban and in the rural sectors and in the country as a whole. Although these figures give only an approximate idea of the situation—because of the limitations mentioned above—they do show that lighting services, though paid for on firmer bases, are more advanced than water services. Another interesting fact about the table is that even in the countries considered to be developed, the percentage of water services and sanitary services for the rural sector is somewhat lower than the targets set in the Charter of Punta del Este.

In the slums in the capitals and large towns, water services are provided free by the municipalities through standpipes and public fountains. It is interesting to note that, as these areas increase in size, groups of persons organize a system for carrying and distributing water in jars and tin cans and charge for the service a daily rate that is proportionately much heavier than the usual water rates.

Most of the houses in these slum areas have electrical service and the inhabitants pay for it. There is probably no logical explanation why people who pay for electricity should not be required to pay for water.

The organizers of this meeting asked me to give some information about the cost of basic water supply and sewage disposal services in

TABLE 4. *Housing and Its Basic Services in Selected Countries of the Americas (Per cent)*

Country	Year	Piped water			Excreta disposal			Electric lighting		
		Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Brazil	1950	15.6	39.5	1.4	33.0 <sup>a</sup>	71.3 <sup>b</sup>	10.4 <sup>a</sup>	24.6	60	3.6
Colombia	1951	26	63.1	5.1	32.4 <sup>a</sup>	70.2 <sup>a</sup>	11.3 <sup>a</sup>	25.8	64.3	4.2
Venezuela	1950	31.1	53.2	6.1	46.8 <sup>a</sup>	74.3 <sup>b</sup>	12.9 <sup>a</sup>	42.5	72.0	9.1
Canada	1951	74	94.1	39.5	68.3 <sup>b</sup>	91.7 <sup>b</sup>	28.2 <sup>b</sup>	87	99.3	65.9
United States	1950	85.2	91.5	45.5	75.5 <sup>c</sup>	83.1 <sup>c</sup>	28 <sup>c</sup>	94	96.7	77.7

Source: "Private Dwellings According to Availability of Services," in *The Housing Situation in America*. Massachusetts Institute of Technology, School of Engineering, February 1964.

<sup>a</sup> Any type

<sup>b</sup> Flush toilet

<sup>c</sup> Inside dwelling

low-cost housing programs. The figures given in my paper are for the programs being carried out by the Housing Institute of Guatemala.

In presenting costs, the total cost of a house has been taken as 100 per cent and divided into construction of the house proper (76 per cent) and installation of facilities (24 per cent). The latter figure is then broken down for water, sewage disposal, electricity, and excavation and paving, both for the house itself and for the urban development. The conclusion reached is that the cost of basic sanitation services in housing is relatively low compared with the total cost.

In housing programs and their basic services, the trend should be toward finding more economical solutions in order to cover more and more of the low-income groups. It must be recognized that no major effort has been made to reduce costs by using cheaper materials, appropriate standards of design, and simple solutions or by improving the efficiency of work.

The final conclusions mentioned in the paper are as follows:

1. The crowding of the population into a few towns has created sanitation problems the solution of which is difficult and complex.

2. Slums, with their housing and sanitation problems, are external manifestations of a much more complex problem connected with the economic and social development of the country.
3. The solution to water supply and sewage disposal problems in the slum areas of large towns is to be found in the systems that serve the towns themselves. It is only rarely that an independent solution is justified. Because of this, the importance and priority of water supply and sewerage systems in towns becomes even more marked.
4. Apart from the economic and social problems involved, slum areas are a result of the lack of a firm attitude on the part of national and municipal authorities, since sometimes political factors have helped to create disorderly and overcrowded conditions.

Chairman: Thank you very much for your cooperation and for the brief and rather conclusive statement in conjunction with your paper.

I now ask Dr. Buxell to comment on this paper and will then open it for discussion from the floor.

## COMMENTS

### John O. Buxell

Mr. Chairman, my comments are particularly in support of the idea that much more research is necessary on housing improvement and community development and on community planning generally, if we are to be able, in a reasonable period of time, to solve the problems we have been discussing here.

I use the word *housing* in the same broad

sense as the late Dr. C.-E. A. Winslow. When his committee drew up the "Basic Principles of Healthful Housing" of the American Public Health Association, it dealt with physiological needs, psychological needs, protection against communicable diseases, and protection against accidents. Also considered were many of the environmental subjects we have been discussing

today, including water supply, sewerage, solid-waste disposal, and even air-pollution control. This particular administrative approach—or, as it might be called, this programmed approach—to improving the housing situation through extended research and study should be no threat to the priority that this organization and the World Health Organization have given to medical research and to community water supplies.

What we all want is a high priority for both of these programs—community water supplies in the urban areas and, concurrently, the improvement of housing and community planning in general.

I should like to call your attention to the papers (published in March 1963) presented by various housing and planning experts before the United States Senate Subcommittee on Housing of the Committee on Banking and Currency at a series of hearings called "The Study of International Housing." The theme throughout many of these statements is that a much higher priority should be given to the research and study approach to the problem of better urban housing. This does not necessarily mean redevelopment or complete demolition of slum or shanty-town areas. As Dr. Chagas mentioned, however, the upgrading of these areas could be included as a reasonable part of a long-term community improvement program.

The statements in the U.S. Senate study, the purpose of which was to try to suggest policies for the bilateral foreign-aid program of the United States, with particular reference to Alliance for Progress assistance, stressed the importance of relating such programs to economic, social, and hygienic factors and of incorporating in each of the country programs appropriate measures for meeting the specific problems involved.

It is too late to go into much detail, but I should like to quote from the statement of Francis Violich, professor of city planning at the University of California. He says: "The housing problem is in actuality only a symptom of a retinue of urban problems which are inter-

dependent and which, if resolved, would contribute to the housing problem solving itself. Underlying the housing problem . . . stands the stark reality of shockingly high rates of illiteracy, low levels of education, high rates of infectious diseases and infant mortality which, together with meager opportunities for employment, contribute to maintaining motivation for improvement at a standstill. The cumulative effect of these urban problems, centered around housing as a community need, is such that an atmosphere of urgency exists, expressly designed for each situation from country to country and from cultural area to cultural area."

I feel that this is strong support for a high priority for research, study, and local experimentation on housing improvement and community planning.

I know that this Committee is not the one to decide any such question of priority and certainly not to determine what relationship the Pan American Health Organization should have to those programs, but I think the Committee is interested in ensuring that the research program it proposes reflects the needs of growing environmental health programs, such as the community water supply program, the housing and urban planning program, and others supported by the Organization. Any research program endorsed by this Committee must be adequate; not too little or too late! These research needs are enormous and complex, and a great deal of expansion of research facilities and related training facilities will be necessary in the countries involved if good, sound programs of improvement are to be developed.

I myself am still very much interested in learning what actually has been proposed, for example, by some of the more competent agencies that have been studying the Lima situation. I admit that I was a bit disconcerted by the rather favorable picture given us of life in the *barriadas* of Lima, which made it seem "acceptable." Is this truly a socially acceptable situation?

**Chairman:** The question has of course been raised many times, Dr. Buxell, whether the

housing is the key issue. You may be disconcerted by what Dr. Mangin says, but—let me phrase it this way—it may be true. This is an area for investigation.

Before I proceed with discussion from the floor, I should like to point out that what Dr. Buxell is saying about research is much the same as what every person in this room has also said in many connections, because all have served at one time on an expert committee for some international organization.

As I would define an expert committee, it is a group of highly specialized people who want to be sure that none of their objectives are left out of the ideal universe. I turn again to the administrative officer—in this case, Dr. Hollis.<sup>8</sup> If the President of Brazil said, "What would you like me to do within the next ten years?" and was then confronted with any expert committee's recommendations—our own, say, in the environmental field—one cannot help but feel that he would be lost. What I want done in Latin America would make for the finest community since Sir Thomas More's *Utopia*. Dr. Hollis, let us have a sentence or two from your long experience in the field.

Hollis: If I may, Mr. Chairman, I will use this opportunity for a brief comment on our approach to the engineering phase of environmental research in Latin America. By this I mean research on problems of water supply, waste disposal, air and water pollution, and the like. For an organized research effort to be successful, we believe, it must be soundly based at educational institutions—especially engineering schools. Generally speaking, one finds there the necessary physical facilities and the potential engineering and scientific competence to undertake research. A number of actions are now under way to strengthen research facilities at educational institutions and to stimulate interest in research. For example, the Organization has promoted and helped to secure UN Special Fund project grants for engineering schools and scientific centers in Venezuela, Brazil, and Chile. I believe the Committee is familiar with the

<sup>8</sup> Dr. Mark Hollis, Chief, Environmental Sanitation Branch, PAHO.

status and objectives of these three projects. A highly successful and expanding program is the stimulation of short-term training programs at engineering schools throughout Latin America. There will be some thirty training courses carried out during this calendar year. About forty or fifty are planned for next year. It is quite significant, we believe, that about 80 per cent of the cost is being borne by the universities and interested ministries.

We believe that these preliminary actions are essential to the development of a research program and that they are in line with the Committee's suggestions of last year. We hope to strengthen the liaison among universities in this network of collaborating institutions, to promote an exchange of ideas and technical papers, and to stimulate an acceleration of applied research. We believe that the problems of engineering research, education, and training are inseparable. We plan to approach the three on a closely coordinated basis.

I recognize, Mr. Chairman, that this has not replied to your specific question on housing research. However, I thought it might be well to comment on the foundation for research that we are attempting to build.

Chairman: I want to reassure Dr. Hollis that when such proposals as he has made come before this group, under Dr. Chagas' chairmanship, it is the right group for them—a group interested in carving out areas of research.

Before closing the meeting I want to propose to Dr. Mangin that he assess the significance of the favela house in relation to the people's total behavior or to their health, or to both. This is an impromptu request, I know, but I am very curious to have your reaction.

Mangin: It relates to one of the important issues in Peru right now. There is friction between the group of Government architects that wants to build apartment buildings in Lima and another group that wants to provide services such as sewage disposal and water and legal work for the land title on the assumption that the people can build their own houses. But there are many substandard houses. Clearly,

if it rained in Lima there would be disaster and they would all go; fortunately it does not rain in Lima. I am really a more evolutionary man than I seem to be, I have seen innovations and pressures to get better things without violence. The housing in the *barriadas* is more adequate than a lot of central city housing.

I would say that the major problems are land titles and opportunities for employment and training. These seem to be much more important than housing. The people are quite skillful at building their own houses.

Chairman: I see Dr. Rotondo nodding in agreement.

I might remind the group of the demonstration offered by Asunción of providing service to *favelas*. I think the *favela* residents taught the public and local officials a great many things they should have known in the first place. They not only wanted service but were willing to pay for it, which nobody had previously been willing to believe.

Rotondo: In view of the scarcity of capital in Peru, a sensible question might be what pro-

portion of capital can be invested in home building and what proportion in industrial development and work opportunities.

Chairman: Housing for the *favela* is important, but the inhabitant can build the house or shack somehow or other and then, of course, try to improve it. The water system, however, he cannot build; water has priority number one and electricity priority number two.

It is noteworthy that in almost every country in the world the purveyors of electricity have been much more successful than the purveyors of water. In Ceylon, for example, there is hardly a village in the remotest area that does not have electricity. It is low-voltage current, but everyone has it and pays for it.

I shall close on that note. May I say for Dr. Chagas and for Dr. Horwitz, and certainly for myself, that we appreciate the tremendous amount of attention and preparation you have given to today's session; your patience with the insults of the Chairman; and the vast amount of interesting material that has been presented.

## SUMMARY<sup>9</sup>

Professor Wolman opened the proceedings by pointing out that the ideas of Hippocrates, expressed twenty-five hundred years ago in his treatise *Airs, Waters, and Places*, have been developed through the advances of science and technology into Smuts' concept of "holism" and Dubos' concept of the "constellation of causes of disease." The environment of man, embodying biological, physical, chemical, and social components, confronts us as a primary part of the ecosystem shared by man with other living organisms. Our concern is with the inter-

action of man and his environment, both natural and man-made.

In adopting an ecological approach to the problems of community well-being, we must seek to ask specific questions. What, for instance, does existing knowledge offer for sound action? What are the areas of research most pressing for immediate maximum values and for the best long-range promise? What are the sociocultural obstacles to success in any of the endeavors at environmental control? How may these be hurdled most rapidly? In Latin America, as elsewhere, the impatience of people is high. Half a century ago, Wallace asked, "How does human nature respond to the con-

<sup>9</sup> Prepared by A.M.-M. Payne as part of the Report to the Director of the PAHO Advisory Committee on Medical Research (RES 3/8, 19 June 1964).

ditions of the complex urbanized life which industrial and mechanical civilization has created?" We do not yet have the answers.

In Latin America millions of people span, in effect, two centuries of cultural and political contrasts. How can these gulfs be bridged in terms of the provision and acceptance of modern sanitary measures? What are the priorities in the face of limited resources and rising expectations? And, finally, what are the areas of ignorance that must be illuminated to facilitate the actions of tomorrow?

In introducing the topic "The Environment in Human Ecology," Dr. A. M.-M. Payne pointed out that the problem of rural-urban migration was not a new one, that it had occurred in the most highly developed countries during the Industrial Revolution in the last century. While some solutions have been found, especially in the form of environmental control, many problems still cry for answers, as exemplified by the plight of underprivileged groups, whose state is comparable with that found in many less-developed countries, and by the increase of juvenile delinquency, crime, alcoholism, and mental disease. The reason seems to lie in the failure to adopt an ecological approach, to see man not just as a biological animal but equally as a social animal whose behavioral and social needs may be at least as important as those that are purely biological. The complexity of the human community makes the identification and characterization of these needs exceedingly difficult. Therefore, we turn to the ecologist, who has started his studies with systems much less complex than those of man, for the elements of theory which may be elaborated or extended to man.

Dr. J. R. Audy presented his paper on "Artifacts: The Significance of Modified Environment," pointing out that the separation of organisms from environment is artificial and encourages confused thinking about the integrity of an ecosystem. Environmental structures are modified by animal behavior, and in this sense an artifact may be regarded as the product of the behavior of an animal that is

produced *de novo* or by modifying a pre-existing structure. The most conspicuous artifacts are nests and burrows. Others are the cases of certain larvae, the camouflage of arthropods, and the clothing of man.

The word *artifact* has proved unsatisfactory because of its sense of "something manufactured," the physical article being thus separated from the behavior that initiated its development and dictated its use. The term *ethophane* is suggested as indicating that the animal's behavior "shows through" or is manifest in the structure concerned. It is a function of the organism rather than a mere physical structure in the environment. Dr. Audy provided a number of illustrations of this concept, including those in which differences between species could be determined more readily by examination of their ethophanes than by the biological structure of the animal.

Changes in the characteristic ethophane may also be an expression of deranged behavior—for instance, socially deranged female rats are unable to make proper nests. Changes in a spider's web have been used as an indicator of the effect of certain drugs on the spider.

The specific artifact or ethophane may be regarded as an extension of the organism itself. This was illustrated by the evolution of the bower birds, in which the elaborate display plumage of the male is replaced through genetic change by the display of colorful objects, flowers, berries, and so on, collected in the environment, the male losing its colorful plumage *pari passu* with the increasing complexity of the ethophane. In man, decoration of his body, his clothes, and his environment are obvious analogies.

Studies of a wide variety of species have shown that ethophanes are almost always the result of genetically determined behavior, and it is inconceivable that man differs in this respect, although cultural modifications of its expression are overwhelming and tend to obscure the common genetic pattern. Such complications make the application of these ideas to man much more difficult. For instance, ex-



cept in primitive societies man no longer builds his own "nest," his home. Especially in urban areas, he has to accept the patterns decided by a wide variety of social, economic, and technical influences, whether rational or irrational. Yet the influence of immediate surroundings—which are susceptible of individual modification—on one's feeling of well-being or behavior, while subtle, is definite and may be profound. The personal changes introduced make the home, or part of it, an extension of oneself. The same may apply even to collective artifacts such as a city or an urban district and may profoundly influence behavioral patterns.

Man must have some form of recreation if he is to preserve his mental and social health. This may take the form of relaxation from responsibility, but increasingly it seems to be an attempt to escape from human artifacts that without conscious realization have become insufferable.

The need to construct artifacts or ethophanes ensuring a life of warmth, interest, and variety is evident. The supermarket may be very efficient, but it cannot replace the social function of the small grocer's shop. Relocation from slums to greatly improved but unfamiliar circumstances has proved much more traumatic than relocation to only moderately improved conditions. This is particularly relevant to rural-urban migration.

The "social use of space" is a growing field of study. Crowding, companionship, and privacy are all involved, and the devices adopted to attain the desired objective or to give the feeling or symbolism of its attainment are many and varied. A window box or an aquarium can reduce claustrophobia. The Japanese have superbly developed such arts.

In applying these ideas, it is essential to acquire greater understanding of social systems and to recognize that one can seriously damage a system by imposing too advanced "sterile" conditions. New stresses created by technological advances may act through neurosecretory mechanisms that alter behavior, mating hab-

its, and resistance to disease and cause increased fetal loss.

In the ensuing discussion a question was asked about the importance of the ethophane to a species whose survival was in doubt for reasons such as shortage of food or inclement conditions. Dr. Audy indicated that the artifact might indeed be modified but that in some circumstances it might acquire increased importance as a protection against whatever was causing the stress. Dr. Payne underscored the importance of the fact that certain forms of behavior are genetically determined and postulated that stresses arising from frustration of behavior so determined might act through paths (hormonal systems, for instance) that are not those of more superficial psychological origin. He cited experience in New Haven, where the resettlement of a slum population in small suburban houses on the one hand and in large apartment blocks on the other apparently resulted in a decrease in juvenile delinquency in the former but not in the latter. He suggested that this was due directly to the environmental conditions: the former had space for socially acceptable play, whereas the latter did not. He indicated that play falls into the category of genetically determined behavior and that aberrant behavioral reactions, juvenile delinquency, and the like were less likely to arise where it could take place in harmony with the social system. Migrants from a wide variety of rural settings could not be expected to adapt with equal ease to the same urban setting, and adaptation of the urban setting to individual groups might greatly improve matters. He proposed socio-anthropological studies of various groups to determine the patterns of behavior in their home setting that might provide clues to the ethophane that could make their adaptation to city life easier.

In the course of further discussion other examples of the importance of an understanding of these concepts were cited, such as the absurdity of building schools underground or without windows on the thesis that it improves educational efficiency. It was pointed out that

urban renewal and urban development should be designed for *people* and not for the benefit of architects or city planners.

In presenting "Epidemiological Methods in the Appraisal of Environmental Influences," Dr. J. C. S. Paterson pointed out that, if epidemiological studies are to be quantitative, denominators are essential and equivalent to the numerators of the demographers. Unless a population can be defined numerically and demographically, with information on population dynamics, whether due to natural increase or to population movements such as migration, only qualitative epidemiological studies are possible, except in very limited groups. He pointed out that the population of Cali, Colombia, had increased about fivefold during a period of ten years and would probably increase tenfold over the nineteen-year period from 1951, the date of the last census, to 1970. Special methods are needed for epidemiological studies in such circumstances. He illustrated these by describing a sampling survey conducted by the International Center for Medical Research and Training (NIH/USPHS) based on an initial aerial survey followed by stratification of communities, numbering of houses, and finally investigation of a 5-per-cent sample of randomly selected houses. In the discussion it was suggested that such methods might be the only way in which valid health data can be obtained for large areas in Latin America where there are inadequate health services. In particular, it was emphasized that in such areas it is impossible to rely on the conventional "case counting" methods used in the more highly developed countries.

However, even with the use of such methods, difficulties were experienced owing to the extreme mobility of the populations. There appeared to be definite patterns of migration, possibly stimulated and facilitated by the degree of education of the migrants. As a result of such movements, social customs changed, free unions being as common as marriages. Traditional kinships appeared to be broken up and new cultural patterns emerged. Dr. Paterson emphasized that sociological research is ur-

gently needed for a fuller understanding of what is happening and of what the effects might be on human health. He stressed the difficulty of such studies and the importance of meticulous design. He illustrated the problems that may be encountered by accounts of the research programs in progress under the auspices of the ICMRT.

In the discussion, great interest was expressed in why these extensive rural-urban migrations were taking place. Several factors were suggested, including the image of the "city paved with gold," dissatisfaction with local failure to develop, and, sometimes, direct or indirect government policy. The question of the exchange of information between the city and the country was raised as possibly an important factor, especially in influencing the attraction of kin by those who had succeeded in establishing themselves in the city. However, one view was expressed that the motivation for rural-urban migration was rather a lottery, in which one in a million wins, but wins so much that the others are prepared to have a try and take the chance.

The PAHO/ACMR felt that regardless of whether or not such population movements are regarded as desirable, it is most important to undertake research to determine the motivations or causes behind them.

Dr. Humberto Rotondo discussed the "Adaptability of Human Behavior" by pointing out that adaptation is a standard way in which an organism adjusts to an environment that it cannot alter. It might involve an individual or a group and result in the emergence of a new behavioral pattern.

Inertia or conservatism handicaps adaptation. Cultural and physical resources that are culturally acceptable are needed for success. In some societies the inhabitants may undertake modification of the environment by traditional methods of mutual assistance—for example, intra- and interfamilial relations, group support and guidance, and integration resulting from such things as clubs that may owe their formation to a wide variety of superficial motives. In other societies competition may be the

rule. Sometimes this is successful, resulting in an educational drive that includes adults. Sometimes it fails because of "warfare." The importance of violence as a health problem in some Latin American countries was stressed.

On the question of "preadjustment" and its possible influence on rural-urban migration, it was pointed out that many residents of *barriadas* did not come directly from rural areas; often they had been residents of city slums for some time before moving to the *barriada*. However, when a migrant direct from a rural area brought stabilizing factors such as family structures with him, or when he had kin in the city, his adaptation might pass smoothly. On the other hand, some individualistic migrants might abandon traditional life and as a result be able to adjust more rapidly and completely to urban life.

It was pointed out that there are differences between the "classic" slums and the *barriadas* that need sociological study. Cross-cultural studies—as, for instance, comparisons between Midtown Manhattan and Lima, Peru—show surprising similarities in attitudes such as mistrust and suspicion of authority. Further study is needed.

Urbanization without industrialization may exaggerate poverty, contrary to the expectations of the immigrant. This may produce serious social difficulties. The importance of being able to sustain an attitude of hope and rising expectations in the migrant and the dangers of being unable to do so were stressed.

One point of particular importance is that an attitude of fatalism seems to be common. Essentially, this seems to reflect an attitude of dependency, a wish to rely on a "father figure" that may be lacking. Whatever the cause, this attitude may sometimes be used to promote self-help and development, if the right person is found to act as the father figure. In the absence of such a figure, the results may be disastrous.

In general, it was concluded that, in the situations created by rural-urban migration, attitudes must be determined by sociological studies.

Dr. William Mangin, in a most stimulating

report on "The Role of Social Organization in Improving the Environment," presented an immense amount of information that must be read in full to be appreciated. Perhaps the most important point was that many of the concepts about *barriadas* are incorrect. Often the inhabitants have lived in city slums for a long time and only moved to the *barriadas* recently, the *barriada* being regarded as a privileged place to which admission is rigorously restricted by a local organization. Other concepts, such as that the people are primitive Indians, unproductive, incompetent, politically united (Communists), or economically destitute, are apparently largely untrue, although it was not clear how generally the observations could be applied to similar situations in other Latin American countries. The consensus seemed to be that they might indeed be more generally applicable than is realized. Studies to determine the real situation were strongly recommended. Without the results of such studies, no logical solution can be devised.

The PAHO/ACMR concluded that common ideas about the *barriadas* are based mostly on ideas and hearsay and that there is an urgent need for facts. These studies should include investigations not only of the actual sociological and health situation in the *barriadas* but also of the sociological determinants of rural-urban migration and the factors that lead to success or failure.

In evaluating one of the environmental factors affecting community well-being, Mr. H. G. Hanson reviewed some of the present-day problems of providing a satisfactory supply of drinking water in the United States. Comparable problems could be expected in any program for providing community water supplies to the 63 per cent of the urban population and the 90 per cent of the rural population in Latin America that are now estimated to lack a satisfactory water supply. In the United States, thirteen thousand communities with an average population of seven hundred do not have a public water supply and must rely generally on individual wells and springs. Maintaining mu-

nicipal water supplies free of chemical pollution is an increasing problem, with such pollutants as detergents, pesticides, and natural sources of bad odors and tastes posing particular subjects for further investigations. Likewise, keeping water supplies free from infectious organisms still requires constant watchfulness. In this respect, viral diseases raise some special questions. Many municipal systems will require modernization and expansion to meet the demands of increasing numbers of consumers, especially in suburban areas where individual supplies can no longer be used with safety, and of increasing per capita and industrial water uses. Efficient and safe operational procedures must be maintained. To help ensure this, many states have voluntary or compulsory training programs for water operators. Some specific studies relating to the U.S. program were cited. It was reasoned that the research needed to support a program of community water supply in Latin America would be socioeconomic rather than technological in nature but that research in various directions would be necessary to attain both the objectives of the Charter of Punta del Este on water supplies and those of the environmental health activities of PAHO.

In discussing "Air Pollution," Mr. Vernon MacKenzie, reasoning from the contemporary problems arising out of industrialization and urban population growth in the United States, pointed out the opportunity to plan for the future in Latin America by drawing on past and present experience. In the United States, as in Europe, the air-pollution problem tends to exist in the larger communities where the Industrial Revolution has transformed a once predominantly rural, agricultural society into a highly industrialized and urbanized complex. Early limited efforts to control smoke did not completely solve the community air-pollution problem. Technological advances in industrial processes, automobile traffic, power plants, and refuse disposal compound the problem. Through lack of understanding or attention, many communities have neglected to face a problem that is now difficult to overcome. Economic damage

from air pollution is very great. Health studies continue to add to the body of knowledge linking air pollution with chronic respiratory disease, including asthma, bronchitis, emphysema, and lung cancer. Air-pollution control is found to be worth while and, even in areas where control efforts are the most extensive, a bargain.

Studies in Latin America indicate that trends in industrial and urban growth are destined to produce serious air-pollution problems. Major population centers are already affected, but conditions are not yet generally unmanageable. The greatest immediate need is study and surveillance, air-quality sampling, inventories of sources, and a watchfulness that can provide information on which to base sound control measures. PAHO could participate especially by facilitating the exchange of technical information and by arranging for the training of technicians needed in such programs.

The discussion stressed the political and social nature of the problem, but many research questions remain to be answered from a technological viewpoint. Generally, it was pointed out that physiological disturbances from air pollution are likely to be more immediately productive of evidence of health damage than epidemiological studies, although these also hold promise of long-term worth-while results.

It was thought that effective support would be forthcoming for the prevention of both water and air pollution if physicians could be convinced of the health significance of these matters, through training introduced at the proper stage in medical schools.

The PAHO/ACMR noted that the Institute of Occupational Health and Air Pollution Research at Santiago, sponsored by the Government of Chile, WHO, and PAHO, has recently been established and could serve as a basis for research in this field.

Professor Humberto Olivero, Jr., reviewed some of the information available on rural-urban migration and its relation to the provision of "Basic Sanitary Services," principally water and sewerage, in shanty towns. The ac-

celerated urbanization in Latin America that concentrates population in a limited number of cities, particularly capital cities, has created difficult and complex sanitation problems.

One of these is the impossibility, for many low-income families, of finding housing with facilities that meet certain minimum standards. Thus the resulting shanty towns or self-built dwellings, generally on public lands in the outskirts of the cities, appear at first to be the most important problem. Actually, this problem is only an external manifestation of a larger and more complicated one—the economic and social development of the country. The attitude of national and municipal authorities may influence the growth of shanty towns. It is thought that the main problems of shanty towns would be solved by the extension of the city's water and possibly sewerage systems. In exceptional cases, and for economic reasons, privies and leaching pits may be continued in use for wastes.

Professor J. D. Buxell, in his discussion, raised the possibility of a high priority for programs of housing improvement through Alliance for Progress funds and PAHO support, and for greater use of urban planning and development techniques. Minimal housing re-

quirements, locally determined and applied through education, enforcement, and the extension of essential sanitary services, including water supplies, sewerage, and waste removal, cautiously and even selectively applied, might serve to rehabilitate the shanty towns and near-slum areas. New construction of dwellings should be controlled through such well-known urban planning techniques as land-subdivision regulation, zoning, and capital budgeting. These may help prevent the development of substandard housing areas. In any case, great possibilities exist for worth-while socioeconomic, administrative, and technological research, on which more effective methods of securing housing improvements and preventive urban planning could be based.

PAHO might undertake to support or encourage such research efforts, in relation to Latin American universities where possible, and to cooperate with regional and ultimately national research and training centers for urban planning. The Committee raised the question of the availability of funds for these purposes and recommended a high priority for community water supplies.