geological exploration and exploitation. The opportunities in geological research of this type are as a clay mineral detective. The general principles of geological correlation utilize the distribution of clay minerals to determine the position of a sample in the geological formation.

The problems in recovery of petroleum from reservoirs concern fluid flow in porous media where the liquid phase is oil and water and the gaseous phase is natural gas. This is the realm of soil physics and the techniques and problems are very similar.

The role of microbiology in the petroleum industry is essentially twofold. One is the control of pipe corrosion through inhibiting agents on the microbiological population, and the other to the microbiology of the transformation of organic residues to petroleum.

The fundamentals of geochemistry are taught in most good graduate soil chemistry courses. The actual knowledge available in geochemistry is meager and trained geochemists are scarce. The advances in isotopic chemistry, mass spectrometry, X-ray, age-dating, etc. have made available a number of new tools for research in this area. With the more precise measurements additional knowledge of element distribution in relationship to petroleum and ore exploration and genesis, geography, ecology, mineralogy, and sedimentation has become available.

Medical research and pharmaceuticals—One of the products familiar to most Soil Scientists is Kaopectate, a combination of pectin and kaolinite used as an intestinal toxin-absorbent and pH regulatory drug for the retardation of diarrhea. Some of the newer products which are being developed in the pharmaceutical industry deal with the combination of biological materials with clays. The surface of the clay is used as a carrier-absorbent of drug-toxin or as carrier of material for controlled release of drugs in the digestive tract. One of the opportunities which is a new field which one might call clay biomedical applications cited here, and the isolation of microorganisms and elements found in soils throughout the world are indications of soil microbiology in medical research. There are many other areas within this field which we can exploit the medical-clay twilight zone.

Paper industry—Kaolinite is used in the surfacing of paper products to enhance the opacity of paper and as fillers or sizing for various paper problems deal with the particle-size distribution and chemical properties of the clays, and the properties of the applied materials. The relationship of the different types, viscosities, properties, etc. to the type of problem.

SUMMARY

Many unexploited areas of research are available within the field of Agriculture. Interdisciplinary research is the area of potential maximum contributions to Soil Scientists. Imagination and ingenuity will lead to new discoveries as young fundamental scientists question some of the accepted, axiomatic, scientific premises that have resulted in precise measurements and theories of the past.

The opportunities in non-agricultural as well as agricultural applications for well-trained Soil Scientists are related to the kind of undergraduate training and the amount of specialization in basic sciences at all levels of education in a specialized field.

Research in the twilight zone will continue interesting and productive, whether in soils or in other scientific fields.

IN THIS Centennial year for land-grant colleges and universities we are evaluating our past and charting our future. We, in agriculture, can be proud of our role, "To serve all," because this land-grant philosophy has been best expressed through the accomplishments of our colleges of agriculture.

As a provider of food and fiber, American agriculture is dynamic, is successful, and is the most productively efficient industry that civilization has known. In no other country, and at no other time in the history of the world, have people been so well provided with abundance and variety at such a low real cost. And, because of our dramatic successes in agriculture, American Agriculture is recognized as the mightiest weapon in our democratic arsenal.

In this total agricultural picture we, as agriculturists, are obviously right or wrong, we in agriculture have inherited or created certain images, not all of which are favorable. In reality, the majority of images of agriculture probably do discredit.

An image, in the sense in which we are using it, is a very complex social and psychological phenomenon. Images help us to see order in a confusing, complicated world. Understanding these images helps us to communicate with those who share, or who do not share, the same image. Images—mental images—or mental pictures are the result of accumulative evaluations of the way in which the word agriculture is used with adjectives and adverbs. To explore this concept, let us consider the sentence, "Agriculture is efficient." To you,