is the tailor's swatch. Just as the cloth presents itself through the sample, so a painting by Josef Albers is said to exemplify the shapes and colors it possesses. This, however, is true only if the painting is used as a display for a paint manufacturer; just as a dance can be used to exemplify rhythms. As works of art, pictures or dances fulfill no such function. The artist is no more in the business of exhibiting swatches of nature than the scientist is. The sky of a painted landscape is, in the language of art, not a sample of sky-blue or any other blue. It represents within the medium of painting and in accordance with a color scheme determined by the artist's style an equivalent of what the sky's color stands for in the artist's view of nature. Nothing so complicated goes on in the tailor's shop.

But wait! Goodman makes it quite clear that art employs no ordinary exemplification. It possesses what it represents only metaphorically. A "sad" piece of music is not really sad; the sadness is only a figure of speech. This is a linguistic trap, still standard equipment in many philosophy departments. If, however, one looks at facts rather than words, one finds that certain dynamic properties are shared by colors, shapes, movements, and by states of the mind, and that they are often named after the latter because that is where they are talked about in daily practice. Freed of their names, they turn out to be entirely unmetaphorical properties of sensory percepts. And the "sad" quality of a melody or color scheme of a painting no more exemplifies what it represents than do its carriers, the pitches, rhythms, and hues. It does represent its subject by structural "resemblance"—a concept that can be called "naive" only if it is defined as literal imitation. But the so-called copy theory of human knowledge should be allowed by now to rest in peace.

To assert that "any picture can represent any object" is correct but unproductive. What the artist and the scientist need to know is what makes a representation appropriate, that is, under what conditions a sphere is better suited than a pyramid to depict the moon. Appropriateness, far from being an arbitrary habit or convention, is strictly controlled by the properties of the phenomenon to be described as well as by the purposes of the image and the cognitive level and outlook of its users. These determinants can be analyzed.

Anybody in sympathy with Goodman's endeavor to brush aside artificial distinctions between art and science will be pleased to find him impatient with certain theories of esthetics that draw the line between knowing and feeling, the cognitive and the emotive. Art strives for pleasure no more and no less than does science, and the so-called emotions are explored and described by both. Goodman sees the true difference in certain formal characteristics of the "symbols" employed. But this approach is not likely to succeed. Works of art, I said earlier, do not "exemplify." They are statements, not objects. Just as science does, art denotes what it represents by constructs of the mind that reflect selected features of perceived reality by structural resemblance. One can agree that esthetic products are "densely ordered," that is, consist of patterns whose dimensions allow infinite gradation—especially if one denies that scores are music and texts are literature. But this trait distinguishes art only from experimental, modern science, not from nonesthetic pursuits of knowledge more in general. To find the answer, it will be necessary, as usual, to go beyond formalities.

Perhaps one could begin by suggesting that science employs and consumes sensory data in order to arrive at the principles governing the operations of physical and mental forces. In art, the sensory data themselves are the ultimate statement because what we are made to see and hear lets us experience the play of forces that govern our existence.

RUDOLF ARNHEIM
Department of Visual and Environmental Studies, Harvard University, Cambridge, Massachusetts

Anthropology: The Working Out of an Idea

Race, Culture, and Evolution. Essays in the History of Anthropology. GEORGE W. STOCKING, JR. Free Press, New York; Collier-Macmillan, London, 1968. xx + 380 pp. $10.

This book consists of a collection of essays (seven are republished but expanded journal articles, three are sections of Stocking's doctoral dissertation, and one is original to this book) dealing with some of the major ideas in anthropology from approximately 1800 to 1930. The first essay and the introductions to each of the following essays deal with historical method. Two things tie the book together. One is the direct or indirect concern with Franz Boas in every essay. The other is Stocking's explicit concern with historiography, which provides continuity to the arguments developed throughout the book. The book is thus both a historical work and a treatise on the writing of intellectual history. Taken together the essays chart the abandonment of a belief in the existence of causal relationships between race and culture. Stocking presents the ideas of men who, via a theory of "evolution," thought there were such connections. Then, mainly by following the intellectual development of Boas, Stocking shows how a fundamental separation of the two concepts occurred.

It is Stocking's argument that the savage was still noble for 18th-century anthropologists and that race was not considered an explanation for cultural differences until the 19th century. Polygenesis provided the reason for the temporal coexistence of societies at different stages of cultural complexity. Each society was in effect frozen at a place on the chain from savagery to Western European civilization, organically incapable of reaching the next link. Evolution, rather than representing a process, was but a configuration used to order societies, each locked at some fixed distance from the bottom of the hierarchy. The modern theory of culture could not come from such a context, and Stocking argues that to identify Tylor as the originator of the present-day concept is erroneous. Nor can Tylor be considered a cultural Darwinist simply because he believed culture to exist at all "levels"—most crude in savagery, most evolved in civilization. Tylor not only applied a static, pre-Darwinian classification to societies, but he also, according to Stocking, was more concerned with cultural survivals than with cultural adaptations. After a review of the Victorian social evolutionists, Stocking concentrates on the American anthropological intellectual environment around the turn of the century. Here too, "the linkage of the polygenist hierarchy of races and the cultural hierarchy of the 18th Century was yet to be broken."

The essays up to this point have de-

veloped for the reader the intellectual environment in which Boas worked. Three essays follow which are devoted exclusively to Boas. The first of these, based largely on the Boas papers in the American Philosophical Society, deals with his intellectual development as a student, his change from geographer to ethnographer, his rejection of a materialist philosophy, and his growing emphasis on the role of historical phenomena in the development of given cultures. When Stocking deals with Boas' physical anthropology, he emphasizes its many analogues with the present-day activities in that subdiscipline. But though Boas' work in physical anthropology was effective in separating the biological from the cultural, and thus may be considered transitional in the formulation of the modern culture concept, I do not see how we can attribute the same role to him with regard to present-day views of race and biological evolution. Boas was rediscovered by physical anthropologists long after their theory and methods had developed from other roots. Stocking is particularly impressed with Boas' use of physical anthropology to elucidate historical problems, an approach not typical of later American physical anthropology. To further emphasize Boas' contribution to the final separation of race and culture as distinct concepts, Stocking includes an essay on the tenacity of Lamarckian social thinking, which continued to blur the distinction.

In the final essay Stocking proposes some reasons why Boas' importance is not generally recognized today: It is easy today to take Boas for granted; without an awareness of the intellectual environment in which he worked, it is difficult fully to appreciate his contribution. Moreover, the cultural-evolutionary thinking that has had a recent resurgence in anthropology is of course fundamentally contrary to Boas' historical approach. Yet it is Stocking's argument that during the professionalization of anthropology in America, at the turn of the century, the Boasian culture concept became established; it not only set the basis for modern anthropology, but also diffused into the other behavioral sciences.

Stocking's discussion of his own methodology as a historian should produce some appreciation of the complexity of historical interpretation and thus some apprehension about accepting simplistic attempts to use history to legitimize current points of view. Stocking chooses to write intellectual history in terms of the content of ideas. The problem is to understand what a man thought, why an idea, perhaps now rejected or irrelevant, once seemed reasonable to a given individual. Quite naturally, which ideas and what men the historian chooses to deal with is ultimately influenced by an interest in the present. For Stocking the challenge is to understand the development of the modern concept of culture, because in his opinion "much of the social sciences of the 20th century may be seen as a working out in detail of the implications of the culture idea." Although anthropology is, in Kuhnian terms, in a preparadigmatic state in which historical interpretations are easily determined by competing contemporary points of view, the closest thing the field has to a paradigm is the concept of culture.

But why should we trust Stocking's historical interpretation over that of historian X or anthropologist Y? Does Stocking validate his conclusions by the same rigorous means expected of the natural scientist? I think not. Initially he leads us to be hopeful by making explicit his concern for sampling and analytic procedure. Yet in writing these essays he found it necessary to revert to "an approach in more traditional intellectual historical terms." If Boas was responsible for something approaching a paradigm shift in anthropology, culminating perhaps in *The Mind of Primitive Man*, Stocking has not helped us to understand this break with traditional thought.

The question of methodology is important, for, as Stocking admits, part of the kinship of historians and anthropologists is based on their common concern with the evident impossibility of subsuming their subject matter within the framework of nomothetic explanation.

H. K. BLEIBTREU
Department of Anthropology, University of Arizona, Tucson

Explaining the Growth of Output

Industrial Research and Technological Innovation. An Econometric Analysis. EDWIN MANSFIELD. Published for the Cowles Foundation for Research in Economics at Yale University by Norton, New York, 1968. xx + 235 pp., illus. $7.50.

The Economics of Technological Change. EDWIN MANSFIELD. Norton, New York, 1968. x + 260 pp., illus. $6.95.

The economist's deepest concerns are with the evolution of output, especially in relation to the labor force and to population, its allocation in use between consumption and investment, and its distribution among the population. One central empirical fact is the rise over time in per capita output, at least in the countries that we like to think of as "advanced"; a second is the enormous disparity in per capita output among the nations of the world. Classically, economic theory has one general hypothesis that contributes to the explanation of these two phenomena. The output of a nation depends not only on its labor force but also on the material resources at its disposal, capital goods and natural resources; the American worker produces more because he has more tools. Probably most economists at any time would have agreed that, as technological knowledge expanded, the productivity contribution of a given quantity of capital goods was increasing; but the problem was first put into sharp quantitative perspective by the empirical work of Abramovitz and Solow (*1*) over a decade ago, which showed strikingly that on any reasonable assumption the growth of capital and labor as conventionally measured was totally inadequate to explain the growth in output in the United States. It appeared that there must have been an increase in the efficiency with which given resources (capital and labor) were being utilized in production. The measure of this efficiency is termed *total factor productivity* (*2*). Later studies made it similarly clear that total factor productivity differed very considerably from country to country, that is, that