The penultimate paper, "Taxis and instinctive behavior pattern in egg-rolling by the greylag goose" (1938), is the only one in the collection that would be likely to be called "scientific" by modern criteria—which is to say that nearly a third of it has to do with some actual experiments on behavior. The experiments, simple but clever, test hypotheses concerning the way in which external stimuli control (or fail to control) the egg-retrieving response of the greylag. Indeed, this paper is the only evidence I could find that after making an inference from observations Lorenz has proceeded to test the inference directly. In fact, the careful experimental approach of this paper seems distinctly "un-Lorenzian." The frequent use of "we" (in contrast to "I" in the other papers) sent me scurrying to the second volume of *Zeitschrift für Tierpsychologie*, where the paper first appeared. After discovering that Niko Tinbergen was joint author of this paper I searched in vain for some indication of this fact in the volume.

Lorenz says in the introduction that he hesitated to include the final paper, "Inductive and teleological psychology" (1942), since it had been written largely as a specific reply to criticisms of the vitalist Bierens de Haan. It is true that half the paper is only of passing historical interest. However, like no other paper of Lorenz's that I have read, this one documents his views on epistemological problems in the broadest sense. It is here that he argues against the antireductionistic behaviorism of some American psychologists, as well as the entelechy of a now-dead generation. But what is most striking is Lorenz's conception of scientific method. Lorenz is arguing against rampant armchair constructions of logical elegance that bear no relation to reality, and this historical context must be kept in mind. It would seem to me, though, that Lorenz goes only one step further in his own "inductive scientific method" or "inductive scientific research." Although he boldly classifies himself in the tradition of Galileo, Lorenz fails to convince one that he understands the cycle from observation through induction and prediction back to subsequent observation that lies, however vaguely and discursively, at the base of all science.

One cannot easily sum up a great man's collected works, or even the first of three volumes of them. One marvels at and envies Lorenz's empathic perception of the animals he knows and loves; one's mind spins at the breadth and depth of the analysis he attempts; one admires his steadfast achievements during an era of hostile and facile views of behavior; and one watches with anticipation the emergence of the concepts that formed the basis for modern ethology. But one also laments the vagueness of many of those concepts and the apparent lack of interest in operationally formulating and rigorously testing initial hypotheses, which tend instead to take on the aura of fact through the mere passage of time. Nothing summarizes Lorenz's epistemology so well as his own phrase "inductively-determined facts."

With these reservations voiced, however, it is incumbent upon the reader to remember the enormous impetus Lorenz's work has given the study of behavior compared with the contributions of equally brilliant but more operationally and experimentally inclined students such as Jacques Loeb. Perhaps the lesson is that the early phases of a science require the power of a broad, sweeping intellect that has a certain disregard for the formalisms and pedantic, creeping construction of the ultimate scientific edifice. Perhaps what is essential is a fountain of sensible, if vague, ideas and orienting attitudes—correct in their broadest sweep if not in their precise predictions. Lorenz provided to ethology those sparks of intuition, and this volume sets out the historical record in a way vital to the understanding of Lorenz's current controversial views on the behavior of man himself.

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Man and Anthropologists

The Emergence of Man. JOHN E. PFEIFFER. Harper and Row, New York, 1969. xxvi + 486 pp., illus. $10.

A number of popular books have appeared within the last few years which offer an interpretation of human nature based on recent discoveries in animal behavior, paleoanthropology, ethnography, stress biology, neurology, and other sciences not traditionally interrelated. These books, although differing in emphasis and style, are based upon a common theme (best stated in Pfeiffer's book):

The basic assumption is that much contemporary human behavior is based on patterns which became established during the last few million years of hominid evolution. Many current human problems result from radical changes in the human environment. Although these changes are largely results of human activity, our species has not had time to evolve adequate biological adaptations to the altered circumstances. It is argued that if we are to find rational rather than catastrophic solutions to these problems we will need to understand the consequences of the transformation, in but a few dozen millennia, of scattered groups of hunting and gathering peoples into crowded, industrialized city dwellers.

Human beings are biologically predacious and carnivorous, the argument continues, and our basic motivations and abilities are part of that habit. These characteristics became established as early hominids evolved in adaptation to conditions on the African savannahs between the Later Miocene and the Early Pleistocene. During this time our ancestors became more and more dependent upon a diet of animal protein, while by the combined use of bipedal agility and crafted weapons they avoided becoming animal protein for the ubiquitous Terrestrial Predator, the chief demon in the evolutionary pantheon.

By the Middle Pleistocene humans have developed means of hunting big game. Thereafter factors associated with communal killing of large mammals become the most significant selective agents in human evolution. Linguistic ability develops and by it men plan and coordinate their hunting forays. Food-sharing is necessitated by accentuated division of labor by sex. Rituals to enhance the hunt develop and religion enriches the lives of savages hunkering about their fires.

Following the end of the Pleistocene and the invention of agriculture, populations increase rapidly and factors that result from crowding replace big-game hunting as the most significant conditions to which humans must adapt. These factors, which include increased susceptibility to epidemic disease as well as accelerated interaction between and within human groups, are intensified by industrialization.

This is a neatly told tale, but how good is the evidence upon which it rests?

Pfeiffer does not overtly evaluate the evidence behind the conclusions he repeats, but here and there are passages that hint obliquely at problems in the proof and interpretation of conclusions that are stated elsewhere in the book. It is as if the author wished not to detract from the excitement of the story he is telling by too obviously dissecting the overenthusiasms of its chief characters, the anthropologists who have pieced together this story. Nevertheless, the book reveals much about the state of the science, and this may indeed be its main value for the professional reader: that it reveals the weaknesses of the field.

Unlike the emotional and darkly foreboding works of Robert Ardrey, or the glibly assertive essays by Desmond Morris, Pfeiffer's book is no personal sermon. Rather it is an embellished inventory of opinions, approaches, and topics deemed relevant in the study of human origins by a number of current scholars, some of whom Pfeiffer—an experienced science reporter—seems to have interviewed at their work. The subject matter falls roughly into three sections, which deal respectively with paleontology, prehistory, and "living pre-history," by which Pfeiffer means the lives of extant hunter-gatherers, nonhuman primates, elephants, and carnivores and the behavioral development of human infants. Pfeiffer's style is easy to read and would be appropriate to a subject which had a high degree of coherence. This is not, unfortunately, the case in anthropology. The author attempts at the same time to give a coherent account of human origins and to present honestly the contradictions and controversies in the interpretations of the evidence given by his various sources. These two purposes are in conflict. Pfeiffer's tone mimics that of his sources: he is assertive and uncritical when reporting the findings of fields such as primate behavior in which a rigorous methodology has not developed, and he takes a precisely logical and empirical approach toward deciding between multiple hypotheses when he discusses progressive archeology, in which at least an elementary scientific sophistication is emerging.

In discussing Neanderthal burials Pfeiffer says that "ritual expresses the belief or hope that a connection exists between repetition and truth, the notion that if a possibility is stated often enough it becomes a certainty." Such rituals are performed often enough by anthropologists. No single speculation has been repeated as often as that which relates predation by terrestrial carnivores to morphology (canine size), to manipulation of the environment (weapon making), and to social organization and sexual dimorphism (males defend females and young). This speculation persists in spite of the lack of even a single study of the relation of predation to the population dynamics of any primate species, and in spite of the findings of many studies on populations of other mammals which show that the relations between predation, population regulation, social organization, and selection are complex rather than intuitively obvious.

Elsewhere Pfeiffer notes that "unless a speculation suggests what [researchers] could possibly find by way of evidence, unless it suggests specific procedures for its own proof or disproof, it has very little value in stimulating new studies." These remarks, made in regard to the planning of archeological research, could stand as a criticism of much anthropological speculation.

The discoveries which Pfeiffer has chosen to relate to the public reflect anthropology's preoccupation with the spectacular to the neglect of systematic investigation of process. The baboon's "spectacular canine," the use of tools by chimpanzees, remains of the slaughter of large numbers of big game animals at several Middle Pleistocene sites, and other startling items are chosen as conceptual nodes around which the above-outlined model of human evolution is constructed. Fortunately a trend toward a more sober analysis of a more representative sample of evidence is also indicated, particularly among cultural ecologists and progressive prehistorians.

Anthropologists are portrayed by Pfeiffer as human beings, one might almost say as higher primates. The best parts of the book are the descriptions of investigators at work: Leakey running down antelope, Bordes knapping flint, Breuil shouting down his critics. Pfeiffer does not hide the violent and bitter disagreement in the field, the emotional attachment of investigators to their special theories. Yet by the end of the book the present state of understanding of human origins is not clearly revealed to the reader: the book is not a review of knowledge. Rather Pfeiffer has created a Michener-like overview of anthropology's search for human origins, a literary breccia of anecdotes, artifacts, and personalities in a matrix of sometimes mystical speculation on the causes of anthropogenesis.

Pfeiffer's work reveals a great excitement and a feeling of wild adventure in the discovery of human origins. This excitement has spread to the public, perhaps to an extent which has not been equaled since Darwin's time. Whereas before World War II there was scattered evidence and much speculation, today there is much speculation and much unassimilated evidence. The likelihood is that we stand upon the threshold of discoveries which will reveal the sources of human evolution in detail which was unimaginable not long ago. Pfeiffer's book shows anthropologists upon that threshold, an unruly, lusty throng, crowding at the door.

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Symbolic Behavior

The Ritual Process. Structure and Anti-Structure. VICTOR W. TURNER. Aldine, Chicago, 1969. x + 214 pp., illus. $6.50. Lewis Henry Morgan Lectures, University of Rochester, 1966.

The ability to create highly complex and flexible symbolic systems distinguishes human behavior from that of other species. From antiquity to the present day, scholars have seized upon this fact to justify making an absolute distinction between man and nature. While modern evolutionary theory rejects this dichotomy, seeing biological and cultural evolution as reciprocal processes of adaptation based upon genetic abilities to learn and invent behavioral repertories, symbolic systems in human communities are often analyzed as if they were entirely unique phenomena.

In recent years, however, ethological