can sound as fabulous as Graustark, Sidi-bel-Abbès, or Kashmir. The history of dinosaurs is, indeed, a romantic story. Perhaps most vertebrate paleontologists of today were led to their profession by true or fictional accounts of the search for large fossils.

The history of science is of scientific importance and has a bearing on how we think about supposedly "purely objective" aspects of that science, and to the extent that a scientist does not know the history of his own field he is an ignorant man. Colbert has written a complete and balanced treatment which fills a scientific need in its field and makes fascinating reading far beyond the confines of paleontology.

The subject is treated from the work of Mantell and Buckland in England in the 1820's to the Mongolian-Polish Expedition of 1964. The famous explorations in western North America, the important work in 19th-century Europe, the Tendagaru excavations in German East Africa, and the Central Asiatic Expeditions of the American Museum of Natural History all receive their deserved attention. Accounts of lesser-known localities are also provided. Especially helpful are comments on the Upper Triassic dinosaurs.

The numerous and meaningful photographs not only illustrate, but tell a significant story of their own. There is a photograph taken at Tendagaru around 1910 showing Dr. Werner Janensch standing in a pleated shirt, long coat, and wide-brim hat with his fingers curled in a gentlemanly manner around a long, authoritarian knobbed stick. He stands erect behind seven black natives seated in back of a dinosaur leg bone. The picture is its own comment on colonialism and a world that is as extinct as a dinosaur.

Men and Dinosaurs is a book of science as well as a book of history. In presenting the history of the ideas about dinosaurs the author has necessarily provided us with the information that guided earlier and present workers. The reader, whether a paleontologist or not, is led painlessly through a considerable quantity of technical data about the morphology, classification, and paleoecology of dinosaurs.

The only salient omission from the book is a discussion of the important contributions of the author himself.

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An Extraordinary Gift

The Mind of a Mnemonist. A Little Book about a Vast Memory. A. R. LURIA. Translated from the Russian by Lynn Solotaroff. Basic Books, New York, 1968. xvi + 160 pp., illus. $4.95.

From time to time, through decades of a rich professional life, Aleksandr R. Luria, of the University of Moscow, found time to gather interview material and well-planned experimental data from a professional mnemonist, that is, an exhibitor of extraordinary feats of memory. The man, though reasonably intelligent, had been a misfit in many tasks because of his very capacity to rely quite successfully upon visualized details—a self-manufactured pictorial world—rather than upon meanings, rationally derived symbols, to assist in organizing such recall. Now Luria gives us, from "some old yellowed notes," a vivid description of this remarkable gift.

The man, S., has extraordinary synesthesia, apparently of all sensory modalities. The words of a Hebrew prayer, he tells Luria, "settled in my mind as puffs of steam or splashes." Often his visual impressions are synesthetically accompanied by auditory, or vice versa. Taste, smell, and touch synesthesias are likewise prominent. These synesthetic impressions are often useful in bringing back whole scenes. But simply because they are "irrelevant"—the visual impression, for example, being given a gustatory quality—they are at times distracting and actually work against rapid and accurate recall. Of someone's voice he says: "Listening to him, it was as though a flame with fibers protruding from it was advancing right toward me. I got so interested in his voice, I couldn't follow what he was saying. . . ." Along with this synesthesia we are not surprised to learn that he has an eidetic intensity of imagery. Although Luria does not here conduct the types of studies of eidetic phenomena which used to be known in the West (Jaensch, Klüver), the record is reasonably clear that rich visual eidetic imagery of a virtually hallucinatory intensity frequently accompanies the synesthesia. Affective qualities are likewise frequently joined with either or both of these. We see manifested the type of rather undifferentiated perceptual recording that Heinz Werner called "physiognomic."

Luria describes dozens of instances in which S. reproduces almost without error very complex materials, including numbers and letters dating from a few months or from many years back. Despite the occasional confusion from synesthesias, most of these examples suggest simply an extreme form of careful attending and visualizing, with unusual recall. At times, however, the mnemonist goes to extraordinary extremes. Confronted by the first four lines of *The Divine Comedy* (beginning *"Nel mezzo . . ."*), he brings up secondary associations for the words: "(*Nel*)—I was paying my membership dues when there, in the corridor, I caught sight of the ballerina Nel'skaya. (*mezzo*)—I myself am a violinist; what I do is to set up an image of a man . . . playing the violin." This superfluous baggage seems to complicate the task, but actually, in view of Luria's evidence of long-term success in reproduction, it seems apparent that the subject has worked his way toward a method of attending and a method of recalling which are usually adequate for his own purposes. Both before and after becoming a professional mnemonist, he had to master thousands of tables of digits and other essentially nonsensical types of material. They all come back as the setting, the place, the time, the names of the people around him present themselves. He uses all these cues (which most of us would rapidly forget) as a practically unerring framework for recall.

If we try to define more sharply the difference between this man and the rest of us in memory performances, it will appear first that he emphasizes extraordinary concreteness, sticking to what he saw rather than what it meant. The results are occasionally bizarre. Luria writes: "I read him a simple rule such as the following, which any schoolboy could easily understand: 'If carbon dioxide is present above a vessel, the greater its pressure, the faster it dissolves in water.' " The subject visualizes gas above the vessel, then visualizes a heavy black line below the gas, which is, for him, the "pressure," so the gas, which is described as dissolving in the water, comes up against his (imagined) pressure, and cannot be absorbed!

But there are many other odd effects at the time of the original presentation. Objects perceived are "distributed" freely through the surroundings, and to be recalled must be captured from the places where they have been stowed away. "I put the image of the *pencil*

near a fence . . . the one down the street, you know. But what happened was that the image fused with that of the fence and I walked right on past without noticing it. . . . *Banner*, of course, means the Red Banner. But, you know, the building which houses the Moscow City Soviet of Workers' Deputies is also red, and since I'd put the banner close to one of the walls of the building I just walked on without seeing it."

We can well imagine that while with many people the problem is how to remember, S.'s problem is how to forget. He suddenly discovers one day that if he *wishes* the accumulated pile of irrelevant nonsensical material to disappear, it will disappear, blow away, without any sign of direct effort. "What explanation was there for the fact that the hundreds and thousands of series he recalled did not have the effect of inhibiting one another, but that S. could select at will any series ten, twelve, or even seventeen years after he had originally memorized it?"

Luria describes tests that show some voluntary control of pulse and body temperature. S. simply imagines himself running or slowing down, and his pulse goes from 70–72 to 80–96 and finally to 100, and then slows down to 64–66. He imagines he is holding a piece of ice in his left hand, and the hand becomes measurably colder. He reports voluntary control likewise over pain: "I'm going to the dentist. . . . when the pain starts I feel it . . . it's a tiny, orange-red thread . . . So I cut the thread, make it smaller and smaller, until it's just a tiny point. And the pain disappears."

Luria makes the case that there is much more here than extraordinary memory, that there is a wide variety of curious perceptual, imaginative, and what appear to be autonomic effects as well. He believes not only that S. was gifted with unusual powers, but that his personality was profoundly molded by these capacities. The book is essentially a rich, ingenious documentation of a very extraordinary gift, which, along with real satisfaction, brought some strange consequences upon its possessor.

Jerome Bruner, who writes a vivid foreword to the book, comments wisely upon Luria's experimental and clinical skill.

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Lavas from the Earth's Mantle

Basalts. The Poldervaart Treatise on Rocks of Basaltic Composition. H. H. HESS and ARIE POLDERVAART, Eds. Interscience (Wiley), New York, 1967–68. Vol. 1, xvi + 495 pp., illus.; vol. 2, viii + 400 pp., illus. $22 each.

Experimental laboratory studies on silicate systems at high pressures and temperatures, hydrous and anhydrous, have increasingly in the last two decades come to provide critical data in the field of petrogenesis. This new experimental approach has been especially fruitful in tackling the genetic problems of the more common rock types. The decade of the 1950's saw the rise and decline of the "granite controversy," a debate eventually much resolved by the impact of experimental studies. In the present decade attention in research and discussion has turned particularly to basalts, the most widespread of superficial volcanic rocks. Experimental studies both at atmospheric and at high pressures have played and continue to play an even more significant part in genetic studies of lavas and their melts.

The volumes now under review purport to give a modern account of basaltic rocks, their nature, their physical and chemical properties, and the source and mode of generation of their magmas. The symposium project was conceived and organized by Arie Poldervaart, who invited manuscripts from contributors and acted as editor until his untimely death in 1964. The project was taken over and completed under the editorship of H. H. Hess.

The two volumes consist of 20 chapters contributed by 21 authors, the first volume being prefaced by a biographical memoir of Poldervaart contributed by the late Walter Bucher. Almost every aspect of the study of basalts is represented. Their geologic setting, their mineralogy and petrography, their classification and differentiation, their trace elements and isotope geochemistry—all are systematically treated.

Many experimental data are incorporated in the articles. There are four chapters devoted almost wholly to pressure-temperature laboratory studies—of the effects of water and oxygen pressure on the crystallization of basalts, silicate systems related to basaltic rocks, and the generation of melts at high pressures comparable to those prevalent in the earth's upper mantle.

Missing is a description of anhydrous low-pressure experiments on the melting behavior of basalts in the laboratory. The rich harvest of results on the field measurement of temperatures and crystallization of lava lakes at Kilauea (particularly of 1959–1960) made available by the U.S. Geological Survey in 1966 possibly came too late for insertion.

The scope of the whole project has been very liberally interpreted, for the survey includes chapters on the recrystallization of basalts under graded metamorphic conditions and on their eclogitic representatives. A place has even been found for a chapter on rhythmic and cryptic layering in mafic and ultramafic layered intrusions.

The wide coverage of these volumes, the clear, factual, and well-illustrated presentation of individual chapters, and the welcome emphasis given to the results of experimental laboratory studies serve to provide an authoritative modern survey which should prove indispensable to specialist researcher and student alike. The editors are to be congratulated on the selection and marshaling of the collective contributions.

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Detectors

Bubble and Spark Chambers. Principles and Use. R. P. SHUTT, Ed. Academic Press, New York, 1967. Vol. 1, xiv + 425 pp., illus., $18.50; vol. 2, xii + 319 pp., illus. $16.

The use of the bubble chamber as a detector in high-energy physics experiments has had a momentous impact in this field of research. Even though bubble chambers have been in use only for a decade, their construction and operation involve a large effort; the analysis and digestion of the data collected on bubble-chamber film involve an equally large effort. As a consequence, a new and separate discipline has evolved to the point that an experimentalist in high-energy physics is characterized as a "bubble-chamber man" or a "counter man" and only seldom as both. A spark chamber is easier to construct and operate, and even though it has, as a detector, topological similarities to the bubble chamber, it is a quite different instrument.

It is therefore fitting and most welcome that R. P. Shutt has collected in