Valuable features not present in the original edition include an enlarged section of photographs, a "synoptic calendar" of events, and an index. But the bibliography of Hahn's papers and the section of biographical sketches of other scientists are defective. The former omits many papers published prior to the 1930's and leaves the reader uninformed of its incompleteness, and the latter contains far too many errors of fact and of omission. Additionally, one senses a lack of care in assembling the book: some "Germanisms" appear in the translation; there are several misprints; and some of the numerous references which Hahn placed in footnotes have been raised into the text in an incomplete form, while others have been omitted.

Nevertheless, we are indeed fortunate to have such an account of Hahn's work from his own pen. Its publication is particularly timely, for Hahn shared the 1966 Fermi Award with his two eminent colleagues Lise Meitner and Fritz Strassmann.

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Signals and Receivers

Information Theory and Esthetic Perception. ABRAHAM MOLES. Translated from the French edition (1958) by Joel E. Cohen. University of Illinois Press, Urbana, 1966. 227 pp., illus. $7.50.

It is an old idea to suppose that each department of sense—vision, hearing, touch, smell, and taste—is analogous to a telegraph line over which electrical signals can be sent and messages thereby transmitted. It is obvious to compare the sensory nerves (or their fibers) with wires, and there is a vague similarity between the impulses in neurones and the electrical pulses of the Morse code. The sense organ is analogous to the transmitting apparatus and the brain to the receiving apparatus. Sense-perception, then, is supposed to be a matter of decoding the nerve signals. Since the message comes from the environment, the *sender* of the message is comparable to an object in the world. What is comparable to the *receiver* of the message? In human communication there is always an operator who has learned the code or (with a teletypewriter) a person who reads the telegram. In sensory communication it would seem that a little man in the brain, a homunculus, is required by the logic of the analogy, but this is an unwelcome implication. Some psychologists believe that this difficulty destroys the whole analogy.

This way of thinking about perception was given a new impetus, however, when Shannon published his mathematical theory of communication some 20 years ago. He could define a channel in general terms and show how coded information could be treated as a quantity. It seemed that the analogy between a human channel of communication and a sensory channel could be tested. There were other applications of the theory of information transmission, but this was one.

Information Theory and Esthetic Perception is primarily a book about sense perception, as indeed it has to be if the author is going to discuss music and art, which he does in the second half. It was written in the full flush of enthusiasm for Shannon's mathematics by a man who had studied electrical engineering, physics, psychology, philosophy, and music. The author is an academic at the University of Strasbourg but, like the other standard-bearers of information theory, he wanted to cut across the academic disciplines and found a new branch of knowledge. There is boldness and imagination in this book but also much oversimplification and looseness of thought. The author was impatient with the existing theories of language, music, painting, and esthetics generally. He sat down to write a book, trusting to insight, intuition, and his explorations into "concrete music." This consists of experiments with recordings, electronic "clipping" of waves, tape-splicing, running a tape backwards, and the like.

The translation appears to have been carefully done, and there is an excellent translator's preface. This English edition is useful mostly in showing what a certain intellectual movement was like nine years ago, not what it is like today. Although communications engineering has made orderly progress, general information theory has not. Many of its pioneers have turned to other methods, and there is no assurance that Moles himself would subscribe now to what he wrote then.

The chapters on esthetic perception are plagued by the same obscurity that characterizes other writings on esthetics. Information theory has not made the subject any easier to understand.

The chapters on visual and auditory perception represent one form of the theory of the sense organs as transmitters of elementary sensations and the brain as a receiver of these signals. Moles thinks of the brain as storing memories, creating symbols, and having a priori knowledge. These concepts of what the brain does are not new. The newest way to think of the brain is as a computer, and this conception is not found in Moles's book. Computer models of perception are now proliferating.

So long, however, as the brain is likened to any instrument that simply receives coded signals the theorist is faced with a paradox. Optic or acoustic signals must be seen or heard. If what the brain gets is signals from its eyes and ears it must have internal eyes to see them with and internal ears to hear them with. So the theorist is right back where he started.

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Unifying Theory for Solids

Pseudopotentials in the Theory of Metals. WALTER A. HARRISON. Benjamin, New York, 1966. 352 pp., illus. Paper, $7.95; cloth, $13.

The general reader may well be surprised by the title of this book. In nuclear physics constructed potentials (pseudopotentials) are often used to describe the results of scattering experiments, because of our inability to calculate nucleon-nucleon forces. In metals, however, all the forces of interest are of Coulombic origin, and there appears to be no need for an artificial potential. Nevertheless a large technical literature concerning pseudopotentials in solids has grown up.

Pseudopotentials have proved useful in solids because they represent, as indicated by the author in his preface, "a single point of view from which virtually all the properties of simple metals [and, one may add, semiconductors also] may be studied." The pseudopotential represents an abstraction of the actual atomic potential which describes scattering of valence electrons near the Fermi energy. The pseudopotential is weak, so that it can be treated by perturbation theory, and the complicated behavior of the real