references to the original papers given at the end.

The author has also attempted to describe in his own language and from his own point of view the various theoretical contributions to the understanding of the many aspects of the metal-insulator transition. The various theories are here presented with a rather personal approach, characterized by the absence of complicated mathematics, an emphasis on physical ideas, and a rather broad scope and perspective. This translation into "Mott language" goes in a very uneven way: it improves the presentation in some cases, it destroys the internal mathematical beauty in others. In a few instances, it leads to conceptual inconsistencies and errors.

Considered as a state-of-the-art review, the book is very successful. It is not, however, the final word on a field which is still developing at a very rapid rate and in which many ideas as well as experimental data are still in a rather unsettled state.

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Quantum Physics

Renormalization and Invariance in Quantum Field Theory. Papers from a NATO Advanced Study Institute, Capri, Italy, July 1973. EDUARDO R. CAIANIELLO, Ed. Plenum, New York, 1974. vii, 404 pp. $28.

Renormalization theory is one of the hard parts of the quantum theory of fields. Decades of work by a large number of talented people have provided some intellectual order for the subject, but there is still much to be done. By the same standards, invariance looks much easier. However, nature seems to be a bit reluctant to divulge which invariance group she is using, so things are not so easy there either. These two subjects in various forms are the themes of this book. Among its 20-some authors are both seasoned veterans and younger colleagues.

Readers with a little preparation in the subject will find quite a few useful nuggets in the volume. Here is a selection.

At the most elementary level is a discussion by B. W. Lee of the quantization of Hamiltonian systems using the Feynman path integral formulation of quantum mechanics. This leads up to the quantization of gauge theories. That subject is itself treated in a variety of forms. J. Lowenstein, A. Rouet, R. Stora, and W. Zimmermann write about the renormalization of models with broken symmetries, a class including a variety of gauge theories. The basic problem here is the working out of a renormalization procedure that is compatible with the surviving symmetries. B. Zumino offers two subjects, one super gauges and the quantization of relativistic strings, the other the application of gauge theories to the weak and electromagnetic interactions. G. 't Hooft treats quantum gravity as a gauge field theory.

The theory of renormalization is treated by several authors. Dimensional renormalization, one of the most important recent technical developments, is discussed by one of its originators, 't Hooft, as well as by P. Butera, G. Cicuta, and E. Montaldi. More conventional problems of renormalization theory treated from somewhat novel points of view are to be found in papers by E. Caianiello and M. Marinaro and by M. Marinaro, L. Mercaldo, and G. Vilasi.

If one were asked to assess the state of the subjects represented in this volume on the basis of the volume's contents, I think one would have to say that there is much complication and confusion accompanied by fascinating regularities, extraordinary insights, and baffling problems, a normal state of affairs for a hard subject still not under mathematical and physical control.

Graduate students starting work in the subject will probably find the book a suitable place to start reading before plunging into the periodical literature. Others who want an idea of the state of the art as of 1973 will probably also find it useful.

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Arctic Geology

Marine Geology and Oceanography of the Arctic Seas. YVONNE HERMAN, Ed. Springer-Verlag, New York, 1974. x, 398 pp., illus. $34.80.

This book is a compilation of 15 articles having to do with the Arctic region. The subjects included are physical oceanography, topography, tectonic fabric (two articles), shelf and slope sedimentation (six articles), the Pleistocene molluscan fauna, the Neogene of the subarctic section of the Pacific, deep-sea sediments of the Arctic basin, atmospheric circulation during the Wisconsin, and the possible causes of glaciation.

The chapter on physical oceanography, by Coachman and Aagaard, in which the physical features, advection boundaries, precipitation, water masses, circulation, and waves of the Arctic and subarctic seas are discussed, is probably the best in the book. Included in it is a short section describing the results of research in the region in the last two years. The topography chapter is disappointing because it does not include a topographic chart of the region, and the physiographic province map included is the one compiled by Dietz and Shumway over a decade ago. Discussion of the tectonic history of the region in a chapter by Vogt and Avery is based solely on deep-sea geophysical measurements, mainly magnetics. There is no discussion of the tectonic fabric of the surrounding land masses or whether this tectonic fabric verifies the evolutionary history described by the authors. Description of the shallow structure of the region as determined by continuous seismic profiles is limited to the Bering Sea. The discussion of shelf sedimentation is limited to the Bering shelf, the shelf off northern Alaska, and the shelves of the East Siberian and Laptev seas. No data are presented from the Barents Sea shelf, the widest segment in the region.

On the basis of examination of cores, Herman, in the chapter on deep-sea sedimentation, demonstrates that the onset of glaciation in the region occurred prior to 3 million years ago. She recognizes three sediment units in the region. Unit I was deposited in the last 700,000 years during the Donau-to-Würm glacial and interglacials; unit II was deposited 2.4 to 2.7 million years ago when the Arctic was free of permanent pack ice; unit III was deposited earlier than 2.4 million years ago under conditions similar to those under which unit I was deposited. These climatic changes during the last 3 million years appear to correlate with geomagnetic polarity periods, unit I with the Brunhes normal polarity period, unit II with Natuyama reversed period, and unit III with the Gauss normal polarity period. In the chapter on the possible causes of glaciation van den Heuvel and Buurman suggest that glaciation in the region began 7 million years ago (in the Pliocene) and was due to continental uplift and thermal isolation, as has been suggested by Ewing and Donn. Variations in mid-latitudes they ascribe to insolation variations.

As a whole I found the book disappointing, not for what is included but for what is left out. This is not the book for the reader interested in a comprehensive book on the Arctic Sea. It is a book limited in scope for a limited audience.

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