

REVIEWS

MARTIN SCHWARZBACH. *Das Klima der Vorzeit: eine Einführung in die Paläoklimatologie. Zweite vollständig neubearbeitete und erweiterte Auflage.* Stuttgart, Ferdinand Enke Verlag, 1961. 275 p. DM. 53.50 (paper cover); DM. 57.00 (board cover).

This is a second edition of the book, revised and enlarged. It is a difficult and complex task to express our present conception of climate during the geological history of the earth for this includes an understanding of the means which have been available, the aims which have been pursued and the results obtained.

M. Schwarzbach, Professor of Geology at the University of Cologne, has accomplished this task admirably by reason of his mastery of the subject, his critical alertness and his clarity of expression.

This is not a popular book since it is intended for students at Universities. The ice ages play an important part in his account, because definite traces of these are more unmistakable with regard to their climatological evidence than other geological features.

The first part of the book deals with the principal climatological, oceanographical and general physical conditions which have to be considered. This is followed by an instructive account of the evidence we have today of hot, cold, dry and humid climates, of air-pressures, weather and seasons, as well as longer climatic changes. Schwarzbach then goes on to cite the palaeontological topography and stratigraphy as well as the flora and fauna then existing—evidence not only of the author's wide reading, but also of his extensive personal knowledge.

The book next deals with climatic conditions and change, the greatest attention being paid to the ice ages for the reason already mentioned. This is scarcely a question of glaciology, but for all those who are interested in present-day ice caps and local glaciers, or in former ice ages, this summary is of great value. The perspective is thus broadened, and this provides a better understanding of both present-day and past issues.

Supported by the time-determinations introduced by H. C. Urey with his $^{18}\text{O}/^{16}\text{O}$ method, Schwarzbach considers that the oldest ice age in South Africa is about a thousand million years old, in North America probably even older. After that the ice ages stand out as milestones along the long road of development of the earth. Of the three most definite periods, the first occurred in pre-Cambrian time about 500–600 million years ago, and the second, during the Carboniferous period, about 325 million years later. The beginning of the latest Quaternary Ice Age is estimated at about 1 million years before the start of our chronology and is supposed to have finished, climatologically speaking, 15,000 years ago. It is necessary, however, to remember that it took about another 10,000 years until the North European inland ice had melted away in the Scandinavian mountains.

The latest Ice Age is surely of particular interest because "it is most intimately connected with the origin and development of Man", as Schwarzbach expresses it. He considers that the present conditions are a phase of this Ice Age—a reasonable interpretation, taking into account the vastness of the present ice masses in the polar regions in comparison with past geological epochs.

Schwarzbach has not been able to include the latest very significant results of the Atlantic deep-sea sediment cores (Ericson and others, 1961), which have further confirmed the important part played by the investigations of these sediments for an understanding of the history of climate. Attention must also be paid to a recently published preliminary report by Manley (1961) of the weather conditions in the London area during the period 1680–1715. This shows that the climate up to the present has not been so favourable for the glaciers as it was around 1700. Since the glaciers in the Alps, in Iceland as in the Scandinavian peninsula during the first half of this century had a maximum extension obviously a causal connection exists. The conclusion can probably also be drawn that the glaciers during the latest thousand years in Europe have not had more favourable conditions than in about the year 1700.

The actual problem of the reasons both for the ice ages and the other climatic changes are treated in the third part of the book. No fewer than 50 theories have been advanced; discussions were liveliest during the turn of the last century when half of these were published. The presentation is as clear and instructive here as in the other parts. The author's own opinion on this problem is that the changes in climate have mainly been caused by a combination of changes in solar radiation and continental topography. To the oldest epochs are added both the changes in the earth's axis and continental drift. The latter is mainly applied to the change between the Carboniferous and the Permian periods, when Gondwanaland is said to have existed, covered with ice in different parts.

Finally what can be expected in the future? Is the earth at present in a milder period between the latest glacial period and a future one? Schwarzbach does not say much more about that problem than: *Qui vivra, verra*—provided that we survive the present time.

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REFERENCES

- Ericson, D. B., and others. 1961. Atlantic deep-sea sediment cores, by D. B. Ericson, M. Ewing, G. Wollin and B. C. Heezen. *Bulletin of the Geological Society of America*, Vol. 72, No. 2, p. 193-286.
- Manley, G. 1961. A preliminary note on early meteorological observations in the London region, 1680-1717, with estimates of the monthly mean temperatures 1680-1706. *Meteorological Magazine*, Vol. 90, No. 1072, p. 303-10.

AKADEMIYA NAUK KAZAKHSKOY SSR. OTDEL GEOGRAFIH. *Mezhdunarodnyy Geofizicheskiy God. Glyatsiologicheskiye issledovaniya v period MGG: Zailiyskiy i Dzhungarskiy Alatau* [International Geophysical Year. Glaciological research in the period of the I.G.Y.: Zailiyskiy and Dzhungarskiy Alatau]. Vyp. 1. Alma-Ata, Izdatel'stvo Akademii Nauk Kazakhskoy SSR [Publishing House of the Academy of Sciences of the Kazakh S.S.R.], 1961. 234 p.

THE little-known alpine glaciers of the Zailiyskiy and Dzhungarskiy Alatau of the Kazakhskaya S.S.R. were subjects of detailed glaciological study as a part of the I.G.Y. program. Field observations from July 1957 to December 1959 continued studies initiated by the Academy of Sciences of the Kazakhskaya S.S.R. in the Dzhungarskiy Alatau in 1947. Specialists from the Academy of Sciences of the U.S.S.R., from the University of Moscow, and from East Germany collaborated with those of the Academy of the Kazakhskaya S.S.R. to provide the broad coverage of disciplines related to the I.G.Y. glaciological program.

The recently published volume of results comprises 17 papers in Russian that deal largely with those studies centered on the Maloalmatinskiy and Tsentral'nyy Tuyuksuyskiy glaciers of the Zailiyskiy Alatau, along the southeast border of Kazakhstan. These papers cover a wide variety of subjects, such as the environment of the alpine zone as related to its meteorology and insolation and their effects on the alimentation of the glaciers, the conversion and changes in the physical properties of snow during its metamorphism to glacier ice, ablation, thermal gradient within the glaciers, and surficial glacier motion. Of special interest are reports on ice-boring techniques, methods for determining the thickness of glaciers, and the application of an electrical method to the study of recent moraines. Descriptions of older moraines and related river terraces of outwash and of bedrock benches along valley walls indicate glacier fluctuations in the Dzhungarskiy Alatau that are suggested to be possibly correlative with those of European glaciers during the Riss and Würm stages.

The extensive bibliographies of Russian reports that accompany each paper will prove a boon to specialists wishing for further information. Brief English summaries for each paper are helpful in determining their general content, but they range widely in the amount of informative data given. Those not familiar with the Russian language will wish that captions to the