West, R.: **Plant Life of the Quaternary Cold Stages. Evidence from the British Isles.** Cambridge University Press, Cambridge - London 2000. 320 pp. CD ROM. ISBN 0-5212-9397-2.

The Quaternary period is in the book characterized by glaciations of the Northern hemisphere separated by shorter warmer periods. For Britain and Ireland the vegetation history of these temperate stages is relatively explored, but flora of the cold stages has not been studied so far in great detail despite the facts provided by findings of pollen grains and macro-remains. The author is Professor Emeritus of Botany and a senior lecturer at Cambridge University and his scientific career has lasted full five decades. During it he wrote a number of significant contributions in the field of Quaternary research, *e.g.*: Pleistocene Geology and Biology (1968, 1977), The Ice Age in Britain (1972 with B.W. Sparks), Preglacial Pleistocene of the Norfolk and Suffolk Coasts (1980), Pleistocene Palaeoecology of Central Norfolk (1991). In this book the information on the cold stages flora from 80 places in Britain and Ireland is published for the first time as well as the complex information on the Quaternary cold stages from fossil records. This interesting publication is trying to show how as much information on vegetation, climate and their metamorphoses in the Quaternary chronological order as possible can be gained from the pollen and macro-remain record of flora.

The book contains altogether 16 chapters with sub-chapters and 2 appendixes: (Appendixes: I - Works consulted in the identification of macroscopic remains; II - Taxa recorded in cold stage sediments, Index and Plates I to VIII). In the Preface there is an emphatic appeal of a biologist how at the study of biota to involve geomorphology, stratigraphy, sedimentology and chronology into the research. Mainly geologists are summoned to include a plant component of ecosystems into their study. The study of the Quaternary cold stages used to be underestimated (very little evidence on character of these phases and their existence is usually found). In the Introduction the information necessary for understanding of the study complexity is given. Many ecological books are giving a view on the life on the Earth only from the present days; this study is trying to cover also its past. The Quaternary period is characterized by alteration of cyclic climatic changes in the contrast with the Tertiary. The cold glacials alternated with temperature more favourable interglacials. Palynology got into people's subconsciousness on the British Isles at the beginning of the 20th century and became the basis for the Holocene stratigraphy (Flandrian) and the Late Glacial (Devensian). Changes of vegetation distribution and taxons studied by pollen analysis are used for reconstruction of climatic changes in the past; these changes are more difficult to interpret in the plant pollen spectra. Exactly these ones are the main part of pollen diagrams of the cold stages and locally are of variable character. Definition of cryophylic vegetation in comparison with today's situation is being broadly discussed here. Interstadial evolution of climate is compared with interglacial one.

In the chapter Geological setting the Quaternary cover covering contemporary geological period, in which the above-mentioned climatic changes are reflected, is characterized. Pleistocene covers the whole Quaternary except the last *ca.* 10 000 years (Holocene to the present). The detailed stratigraphic scheme of the cold stages used on the British Isles, which is correlated with Holland, is given in the book as well as the general map of their glaciations. In the part of the book dealing with Sedimentary environments and taphonomy the types of sediments in which "cold" flora occurs are described as well as geological actions enabling their preservation. The chapter The data tables assemblies the plant macro-remains, pollen grains and spores of the cold stages from individual places. They are stored into the database enclosed in CD ROM. Places with cold vegetation on the above-mentioned territory are distinctly marked in the map in the chapter The sites. A list of localities with determined age is stated here. The chapter Identification of the flora is devoted to the fossil records (pollen grains, spores and macro-remains) of the cold stages of vegetation evolution. All results are gathered here so that it would be possible to read out as much data on natural environment and ecological characteristics of cold, predominantly plant flora as possible. Also problems of taxonomic character are being explained here. The chapter The flora is one of the most important and the most extensive part of the book. It systematically classifies fossil remains and describes the plant taxons that are characteristic for the cold stages. It is also trying to express the fact in which periods and in what forms these taxons are being preserved. The important part of the book is the chapter Representation of taxa in the fossil record. It deals with the statistical evaluation of taxons on all levels of systematic classification in comparison with their stratigraphic classification. In the Biological aspects of the cold stage flora the author pays attention to the life forms of plants in the cold stages and their occurrence in the stratigraphically given periods. It deals with significance of plants and their phenophases. In the chapter Habitats of the cold stage he compares conditions of landscape development in the past and in the present. During the cold stages in the extraglacial area

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not covered with ice during the glacier advancement, the terrain must have been in the periglacial area very similar to the present one. Processes were controlled by the same geological forces that are acting nowadays. In the chapter the attention is devoted to the determining factors: character of landscape and soil, salinity, type of sediments, locality with vegetation categories, behaviour of plants, water, etc. In the synoptic table the taxons with individual localities and concrete requirements for their growth are stated. The study of contemporary distribution of the flora individual representatives in Britain and the other Europe must have had objective decisive origin in the flora of definite geological ages (The present distribution of taxa found fossil). Each type of a specific group has partly its own history. Methods of evaluation of individual communities given geographically are presented here and methods of their studies are compared. The very significant chapter deals with the study of vegetation from the palynological and paleontological point of view (The vegetation: types and their flora). Comparison of the individual cold stages of the British stratigraphic system is given here as well as importance of the most significant types of plants for individual ecosystems in relation to other landscapes. The necessary chapter is Evidence of climate, where its evolution in relation to plant communities as well as to individual "leading" plant elements of the given stratigraphic period is interpreted. Interpretation of climatic conditions on the basis of plant remains is very uneasy. Besides a plant component of ecosystem, the author in the A wider view of cold stage biota pays marginal attention to the representation of animal kingdom and a mutual link of both biota. The chapter Origin and fate of the cold stage stadial flora indicates and solves very complicated relations of plant originality. With onset of the Quaternary stages with massive glaciation in the Northern centres the border of forest stepped back to the South. Advancing flora contained species from the extraglacial areas of the North, species from the surrounding mountains and plant species that prefer bare soils. The view described here shows the cold stage of stadial flora, which had long and complex history and actually the origin in the Late Tertiary, but mainly in the course of the whole Quaternary with the short periods of forest dominance in the time of climatic improvement.

In the A final word evaluation of paleobotanic research is carried out and the short prognosis into the future is added. The publication demonstrates the author's broad knowledge of the problems. References to other literature are inserted directly in the text. Appendix I: other works concerning the study and determination of macro-remains are stated. Appendix II: taxonomic classification of the plant taxons in sediments of the cold stages. The text of the book is accompanied by synoptic diagrams, graphs, quality photographs (both black-white and coloured), and plant descriptions. Quality of the reviewed work is indisputable and it would be undoubtedly very good to have similar research for the Czech Republic. The publication is bringing a new view on the study of vegetation and climate evolution of the specific territories in the cold stages in the evolution of the Earth.

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