symmetry, by Wodehouse and others, which sought to find underlying laws of pollen and spore organisation, and the impact of concepts from colloidal behaviour and self-assembly. We are now very much closer to being able to relate new findings on patterns of gene expression to the particulars of exine development and to place this in a functional and evolutionary context. Exine development remains of profound importance in plant reproductive biology and the field has an exciting future as the prospect of an experimental approach integrating ideas from models of self assembly, with a developmental genetic approach visualised through electron microscopy.

**Keywords:** pollen and spore ontogeny, sporopollenin, pattern formation, self assembly.

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**038**

**Correlation of vegetation, climatic, and archaeological events in the Western Sayan Mountains according to pollen data from the mire Lugove (Southern Siberia, Russia)**

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Changes of vegetation and climate on the Western Sayan Mountains (Southern Siberia) and in surrounding plains located in the middle of Eurasian continent (Russia) since 6000 yr BP have been reconstructed on the base of spore-pollen analyses and radiocarbon dates from mire Lugove. This data have been correlated with data about development of archeological cultures in this region as well as with published palaeoclimatic reconstructions for forest-steppe zone of Western Siberia. Three stages in the development of vegetation (Abies, Betula, and Pinus) have been revealed in the pollen diagram Lugove. The first penetration of ancient hunting-fishing tribes of people into this area happened during the "Abies stage" in the development of vegetation. Bronze Age archaeological cultures practiced agriculture and cattle-breeding mostly during the "Betula stage". Blooming of archaeological cultures of Iron Age started on the back ground of expanding of *Pinus sylvestris* forests. According to archeological data the origin of all local cultures in studied area of southern Siberia was connected with migrations of people from the southwestern and southeastern areas of Eurasia. By correlation of palaeoecological and archeological data for south of central Siberia we concluded that one of the important reason of these migrations were dry climatic intervals of the global climatic rhythms, which influenced especially strongly the more southerly areas from where the ancient tribes migrated to Siberia.

**Keywords:** pollen data, archaeology, climatic change.

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**039**

**Postglacial change in the vegetation and climate of western Siberia and mountains of southern Siberia based on palaeopollenological data**

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Using 97 published pollen diagrams, supplied by radiocarbon dates (including 22 diagrams of author) a spatial variations in areas with the main tree species of Siberia (and the genus Artemisia) for each 1000-year time slice were reconstructed. A total of 99 maps were produced for thirteen 1000-year time slices from the Late Glacial to the present. In addition, pollen records along the central and eastern longitudinal transects in western Siberia were compared. This revealed 5 relatively stable vegetation-climate periods during last 13,000 years and showed that the first closed forest, of *Pinus sibirica* and *Abies sibirica*, formed in the mountains of southern Siberia 1200 years earlier than closed forests of *Betula pendula* and *Pinus sylvestris* developed on the plains of western Siberia. Only later in the middle Holocene did *Pinus sibirica* and *Abies sibirica* spread onto the western Siberian plains. It was found that during Holocene optimums at 9 and at 6 thousands yr. BP in western Siberia increased role of dark-coniferous tree species (*Picea obovata* and *Abies sibirica*) and northern boundary of forests shifted to the north. Reconstructed spatial-temporal dynamic of areas of main tree species in western Siberian and in the mountains of southern Siberia showed that synchronous change in vegetation in the northern and southern boundaries of forest zone were triggered, most possibly, by global change of climate. Using known ecological tolerances of the main tree species of Siberia, variations in areas allowed vegetation and climatic changes to be documented in details at 1000-year intervals from termination of the last Glacial period. Spatial peculiarities of these changes in western Siberia were documented for Late Glacial time, for the two Holocene optimums and for the deterioration of climate in the late Holocene. The resulting maps of spatial variations in vegetation in Siberia over time can be used to create paleoclimatic models, including numerical models for future global environmental and climatic changes.

**Keywords:** pollen diagram, vegetation, change of climate, Siberia.