Tethys' Mountainous Mysteries

Photography by
Jakub Ostałowski

To find out what affected sea level fluctuations in the past, researchers have to turn to the mountains. In ancient geological epochs, today's Alps and Tatras were actually once on the ocean floor.

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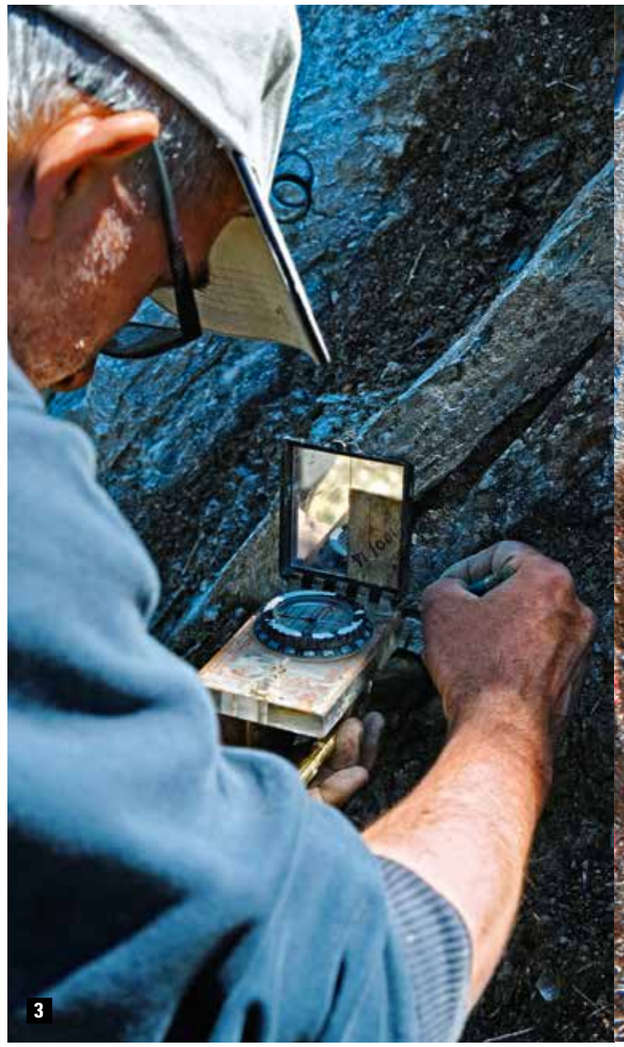

Fig. 1–7.
The first stage of research: fieldwork in the Lejowa Valley (Western Tatras).

Fig. 2.
Tadeusz Sztyrak, geological technician, collecting samples from a rock section – drilling cores with a hand-held drill.

Figs. 3, 6, 7, 11.
For paleomagnetic research, core samples must be be oriented using a geological compass. Here, samples are being marked and carefully packed by Jacek Grabowski (project leader).

Figs. 4, 5.
Collected rock samples are very carefully situated in a profile, each layer has a number ascribed and its thickness measured. Here, Jolanta Iwańczuk numbering and describing layers.


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Figs. 8–10.
Preparing for field work: geology student Artur Teodorski, Jolanta Iwańczuk (also Fig. 10) and Jacek Grabowski (also Fig. 9).

There are many theories about the causes of short (< 1 My) and long term (10 – 100 Myr scale) sea level fluctuations. The former include the growth and decay of ice caps in polar regions, or the differing thermal expansion of seawater during warm and cold periods. Climatic conditions on the landmasses can also have an impact on the world's oceans: during greenhouse periods, increased groundwater storage during times of greater humidity may be linked with a short term sea level fall. Long term sea level changes are largely controlled by regional tectonics (mountain building) and the activity of oceanic ridges.

In our project, we attempt to read the record of geological events that took place in the late Jurassic and early Cretaceous in the western part of the ancient Tethys Ocean, and to identify their contribution to climate change during that time. For the study, we first selected suitable rock sections in the Tatra Mountains, the Calcareous Alps of Austria, and the Mecsek Mountains of southern Hungary. In the first step, the age of the deposits was determined based on microfossils and the record of geomagnetic field inversions (magnetostratigraphy). Palaeoenvironmental changes were studied by measuring the magnetic susceptibility of the rocks, geochemical analyses (ascertaining the content levels of main and trace elements), mineralogical and sedimentological studies. Interpreting the entire dataset makes it possible to characterize components of the paleoclimate (arid – humid modes), the palaeoceanographic conditions (oxygen availability, productivity, burial of organic carbon) and intensity of erosion from the surrounding landmasses, as well as to ascertain whether changes in sedimentation may have been controlled by the accumulation or melting of glaciers in the polar regions.

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