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Earth reflections

Geological education of the future

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Abstract

Several developments cause that field practice of students becomes minimized in most countries. The most important reasons are, direct or indirect, financial short-sightedness, an ever increasing population pressure, vandalism, and counterproductive legislature. The diminishing field experience forms a threat for the capability of future generations of earth scientists to optimize exploration of all kinds of natural resources, thus also threatening society. As it is unlikely that the present-day tendency of diminishing availability of excursion points and areas for field work will come to an end, measures should be taken timely to preserve sites that are of educational (or scientific) value. National measures and international cooperation aimed at preserving our geological heritage, like realized already in, for instance, the US by the National Park Service and in Europe by ProGeo, form a step in the good direction. Dependency on such preserves will, however, change the education of earth scientists fundamentally. However unfortunate such a development may be, it is better than a future where geological education becomes impossible because essential parts of our geological heritage have been lost forever.

Keywords: geological heritage; education; preservation; exposures; geovandalism

1. Introduction

The earth sciences form part of the natural sciences, which are characterized by the fact that processes and phenomena are ruled by “laws” that have – at least for a significant part – been recognized by Man. The discovery of these laws and the understanding of their results as expressed in the world around us make it possible to predict features and phenomena (e.g. the occurrence of a hydrocarbons reservoir) with significant reliability. This is why the natural sciences are – in contrast to other disciplines – also called the “hard sciences”.

The increasing insight into the laws that determine processes and features have greatly helped to understand that phenomena that are, at first sight, entirely different, can have much in common: a glacier and clouds, for instance, have the same chemical composition. The knowledge of laws in the various natural disciplines can also help to provide a context for phenomena. Meteorites are a good example: astronomers, physicists, chemists, biologists and earth scientist jointly have been able to explain their origin, the resemblances and differences between individual specimens, and the occurrence of specific features such as the so-called Widmanstätten structures (Fig. 1) that become visible in some types after polishing.

Within the natural sciences, the earth sciences take a special position, as all processes that contribute to geological phenomena belong, essentially, to one or more of the other natural sciences: thus, the earth sciences

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Fig. 1. Polished iron meteorite with Widmanstätten structures. From Korotev (2007).

have, much more than the other hard sciences, a synthetic nature. In addition, almost all geological features result from a wide variety of processes and, consequently, most geological features are complex. As the relative influence of the many processes that underlie most of the geological features may vary greatly, the resulting individual geological features also show countless variations: no two mountain ranges or delta architectures are identical, and even a simple rock type like halite can have different appearances due to, for instance, impurities, diapiric or other deformations, or exposure to ionizing radiation resulting in a blue colour (Fig. 2).

Consequently, geology is less easily learned from textbooks than the other natural sciences. Education of students in the field is therefore essential. Without extensive field activities, the earth sciences – and thus also the earth scientists – have no future.

2. Threats to field activities

Whereas field work and excursions used to be a major part of geological education, it was, unfortunately, greatly diminished in the past few decades; certainly in Western Europe, but a similar development is noticeable almost worldwide. Thus, the earth-science education of our future professionals is severely threatened (cf. Gray, 2004). The reasons for the decrease in time spent by students in the field are numerous; the most important are lack of money due to short-sightedness, population pressure, vandalism and legislation.

2.1. Short-sightedness

It can only be regretted that the prime cause of decreased field education in most countries is a lack of money due to short-sightedness of both governments and universities. In The Netherlands, for instance, the percentage of the gross national product spent to education is declining already for many years, in spite of statements by the government that education is the base for future prosperity. Moreover, the distribution of the relatively diminishing amount of money over the various types of education is changing, and universities tend to get a steadily decreasing percentage of the available money. It may be true that the absolute amount of money for universities shows a slight annual increase, but this is insufficient to compensate for the inflation. And, what is worse, the increase in money for universities is not spent to better education of students, but rather it is used (and commonly even for more than 100%!) for the employment of ever more managers. This short-sightedness implies that earth-science students can obtain their degree nowadays with only a very limited amount of field experience.

2.2. Population pressure

A second reason for the diminishing field activities of earth-science students is the ongoing increase in

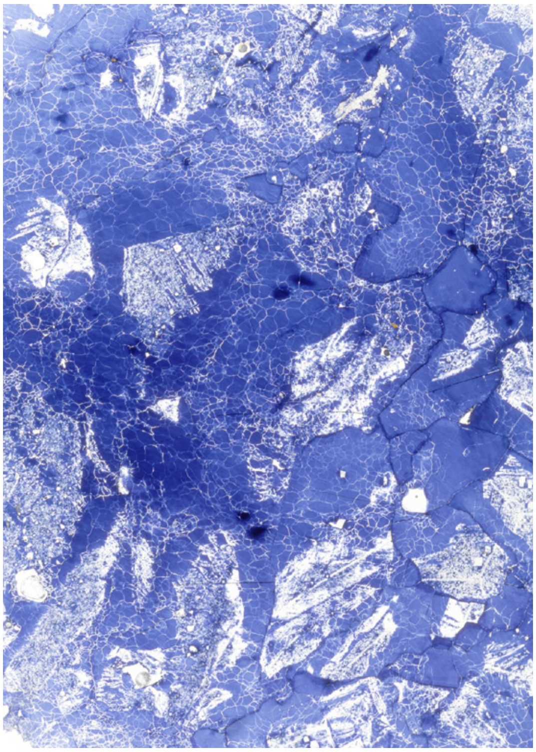

Fig. 2. Thin section of a Middle Triassic salt sample from a core near Hengelo (The Netherlands), photographed in transmitted light. The sample was gamma-irradiated at 100 °C, which is responsible for the blue colour. A few new, recrystallized, strain-free grains or grain regions are visible. Image width is 4 cm. From Schléder and Urai (2005). Image courtesy of Zsolt Schléder and Janos Urai,www.geol.rwth-aachen.de.