ein beträchtlich hohes Datum ist. Wichtig wird die Bestimmung des Rassentypus der Überreste sein, denn die frühbovidianischen Malereien aus Tassili zeigen sowohl negroide als auch europoide Typen auf, während die spätbovidianischen Malereien bislang ausschließlich europoide aufzeigen. Man kann voraussetzen, daß die älteste bovidianische und vorbovidianische Saharakunst in beträchtlichen Maße das Werk von Negroiden war, welche in jener Zeit die Sahara besiedelten. Gerade für die Lösung von Fragen, wer die vollkommenen Saharafelsenmalerein gemalt sowie wer das Hirtentum und die Viehzucht in der Sahara eingeführt hat, wird die Entdeckung von menschlichen Überresten sowie deren Studium ein wichtiger Schlüssel sein.

Jan Jelínek

THE INTERNATIONAL SYMPOSIUM EVOLUTION AND ENVIRONMENT, BRNO, 17.–22. 8. 1981

What is the role of the environment in evolution? Are neo-Darwinists right to see it only as the selector, moulding adaptations out of small, randomly occurring variations, or is it involved in the origin of the variations themselves? And if the latter, how does it act?

These were some of the questions which were discussed at the recent Brno symposium on Evolution and the Environment. The tone was set by Novak (Prague) in his opening address, in which he maintained that it is impossible to be satisfied with the present state of evolutionary theory. In particular, he urged that what he called the 'dogma of the non-heritability of acquired characters' is not to be accepted uncritically. This may sound heretical, but, as he pointed out, there is really very little direct evidence one way or the other. And as the meeting progressed it became clear that nearly all of those attending also took the view that the relation between the environment and evolution is much subtle and complex than neo-Darwinists suppose.

A recurring theme was that between genome and phenotype there is a long chain of interactions and that this provides many openings for influence from the outside world. As Wolsky (New York) reminded the meeting, even the beginning of the chain, the gene itself, is no longer the bead-like conceptual entity that it was in the 1930's. It is now a real and dynamic thing, interacting with other genes and with the environment, and consequently susceptible to influence from both. One form that this influence might take was suggested by Ruvinskij (Novosibirsk), whose studies on foxes and mice have led him to the hypothesis that 'dormant' genes may be activated by appropriate environmental stimuli.

Hašek (Prague) described his group's attempts to reproduce the findings of Gorczynski & Steele (e.g., *Nature 289;* 678, 1981) on the inheritance of acquired immunological tolerance. So far they have not succeeded, but they are not themselves convinced that their work constitutes a refutation and are continuing their experiments. As Hašek pointed out, if Steele's suggested mechanism for the effect is correct then everything may depend on whether or not the necessary endogenous virus is present in the particular strain of animals that is being used.

The discussion on epigenetics was introduced by Løvtrup (Umeå, Sweden), who strongly opposed the commonly held view that we do not know enough about the subject to use it in evolutionary theory. He argued that our present knowledge is sufficient to establish that large innovations cannot have occurred through the accumulation of small changes, but must have arisen in large single steps, through macromutations.

Several speakers discussed how the environment influences development. Vasilyeva (Novosibirsk) reported that properly timed temperature changes have been found to affect the formation of the radial wing vein in *Drosophila* and that the resulting variation was inherited for at least another 35 generations in the absence of the stimulus. The importance of the environment in neoteny was outlined by Přivratsky (Prague) with special reference to hominization. Ho (Open University, UK) described experiments designed to extend Waddington's famous work on genetic assimilation in *Drosophila*. Her results suggest that cytoplasmic inheritance may be implicated in canalization.

Of course the environment is not an independent external force directing evolution. It too evolves. In fact, at the present time parts of it are evolving uncomfortably rapidly, on account of human intervention. So the study of evolution has an applied aspect, conservation, and one of the sections of the symposium was devoted to this topic. The discussions were lively and fruitful, and among the main points on which there was agreement was that conservation must be an integral part of overall planning, not simply the setting up of isolated nature reserves and national parks. There was also general concern that tentative scientific theories should not be used as the bases for major management decisions.

A concrete example of what the members of the section had in mind was provided by the critical account by Sternberg (Bekeley) of 'refugial theory'. According to this theory, certain tracts of the Amazon forest have, during past periods of decreased rainfall, remained as forest areas and so served to preserve genetic stocks. If it is correct, then at least so far as preserving gene pools is concerned, it can be argued that only the refuges need be kept in their natural state. If it is wrong, or if the refuges have not been accurately identified, then even on this limited criterion such a policy would be disastrous.

The references to Marxism in the recent controversy about evolution in *Nature* and othres journals might lead one to expect that the approach to the subject is not the same in Eastern Europe as in the West. On the evidence of this meeting there are some differences, although there was nothing to support the idea that those who have been educated in socialist countries are predisposed to favour explanations in terms of sudden (i.e. revolutionary) changes.

There is, on the other hand, more concert with structure and organization, which contrasts with the neo-Darwinist emphasis on function. Populations genetics appears to play a considerably reduced role; it was striking how seldom the word 'allele' was mentioned. There is also far more interest in theory, and philosophy is seen as having much more immediate relevance to the study of evolution than it does in countries with a more empiricist tradition. It would be wrong, however, to exaggerate these differences; for example, it is interesting that the most ambitious attempt to provide a broad theoretical framework for biology and the social sciences was the Grand Unified Theory of Baldia (Southern Methodist University, Texas).

No one at Brno appeared to doubt that natural selection is at least one of the mechanisms of evolution; indeed there were some interesting papers on the topic. But the symposium demonstrated how rich the study of evolution can be when it is not totally dominated by the attempt to interpret all phenomena in terms of the natural selection of random mutations. It also showed that there is a great deal of work going on in Eastern Europe which is not receiving in the West the attention it deserves.

P. T. Saunders, London