species of the tundra vegetation, but Greller's conclusion that succession plays only a minor part in these situations cannot be justified from his data. Fifty years is a relatively short time in the history of most successions and under the extreme climatic stress of alpine habitats one might expect even slower developmental rates. The current lack of vegetation can hardly be construed as proving a lack of successional development. Natural periglacial soil processes must surely act in an equivalent fashion to produce similarly denuded slopes.

Greller's suggestion that succession may be curtailed by soil dryness on the artificially steepened slopes of the banks is not likely to be correct. Many alpine species have xeromorphic adaptations, and Teeri (*Science*, **179**, 496; 1973) has found that *Saxifraga oppositifolia* can withstand water deficits as great as −55 bar. Drought is unlikely to prove a serious hindrance to the growth of alpine communities. Soil instability may slow down or even divert the course of succession, but one cannot assume that this is the case after only 50 years.

Nevertheless, one is faced with the fact that habitat disturbance caused by road building leaves scars upon the tundra landscape which may take many generations to heal and which, indeed, may never heal at all. This consideration should occupy a position of importance in the minds of those responsible for the routing of such highways. An additional problem is that of trampling pressures by those who gain access to the tundra along the highways. Alpine vegetation is particularly susceptible to this additional stress, as has been demonstrated in the Cairngorm mountains of Scotland, where the provision of easy access to the public (by roads and a ski lift) has led to ever-widening paths and trampled soils (see Watson in, *The Biotic Effects of Public Pressures on the Environment*, edit. by E. Duffey, Natural Environment Research Council, London; 1967). It may be that the instability of roadside slopes in the tundra areas of Rocky Mountains National Park will be one of the least concerns of its conservators.

Blastokinin induction by steroids

from our
Steroid Biochemistry Correspondent

SINCE the identification in rabbit uterine fluid of a specific protein blastokinin or uteroglobin, much research has been carried out to define the precise physiological role of this compound. It appears in uterine fluid after ovulation and its concentration is high at the time of implantation. One of the effects of the protein is to stimulate the transition of the morula to the blastocyst, a transition, however, which will also occur *in vitro* without blastokinin provided some other protein which will bind progesterone is present. Addition of progesterone to culture media containing blastokinin stimulates RNA and protein synthesis by the embryo and blastokinin may function as a binding protein for steroids which may be needed by the embryo. Blastokinin will not only bind progesterone but also seems to be controlled by progesterone.

The control of this protein by progesterone and related compounds has been investigated by Arthur and Chang (*Fert. Steril.*, **25**, 217–221; 1974). Steroids were administered to rabbits daily for 5 d post-oestrus; 24 h later the animals were killed and the uterine fluid was examined by Sephadex column chromatography for the presence of blastokinin. The protein was detected in rabbits treated with progesterone and the 17α-acetoxyprogestogens, chlormadinone acetate and medroxyprogesterone acetate. The amount of blastokinin in uterine fluid was similar after treatment for 5 d with these steroids to that found on the fifth day of pregnancy. These progestogens are known to have a spectrum of biological activity similar to progesterone whereas the other group of orally active progestational compounds related to 19-nortestosterone have a different spectrum of activity; these latter compounds, as well as oestrogens, were ineffective in inducing blastokinin.

The relation between steroid structure and blastokinin induction merits further investigation because the inducing effect of some of these steroids may be related to their contraceptive action. It is now recognised that the hormonal contraceptives owe their high efficacy to effects at a number of sites in the reproductive process and contraceptive efficacy can be obtained with doses of synthetic steroids which do not inhibit ovulation. Arthur and Chang suggest that administration of steroids during the pre-ovulatory phase of the cycle may change the uterine environment by induction of specific uterine proteins so that it will no longer support embryonic development and/or implantation. Furthermore it might be possible to develop compounds which have this effect but which would be without the adverse side effects associated with some of the hormonal contraceptives currently used. The idea is attractive but so far blastokinin has not been demonstrated in human uterine fluid.

The topologist meets the biologist

from a Correspondent

A MEETING on May 21-24 organised by the Mathematics Institute of the University of Warwick and sponsored by the Science Research Council was intended to initiate a dialogue between biologists, mainly in embryology and neurophysiology, and specialists in differential topology and dynamical systems.

The possibility of such a dialogue owes much to the efforts of C. H. Waddington (University of Edinburgh), R. Thom (Institute des Hautes Etudes Scientifiques, Paris) and E. C. Zeeman (University of Warwick). Waddington has for many years stressed that topology is a natural language for developmental biology. Thom sees his catastrophe theory as an essay towards an algebra of morphology, enriching the range of our ways of describing and classifying forms. His talk at the Warwick meeting was euphoric, aphoristic, enthralling and exasperating in turns.

Zeeman has taken on the task of convincing biologists, by means of concrete applications to problems they see as important, that catastrophe theory can be predictive. The reaction to his talk on amphibian gastrulation suggested that a fruitful dialogue has begun. A sequence of talks on development—by P. D. Nieuwkoop (State University of Utrecht), D. Ede (University of Glasgow), J. Cooke (National Institute for Medical Research, Mill Hill), J. Lewis (Middlesex Hospital Medical School, London) and P. Shelton (University of Leicester)—could have left the mathematicians in no doubt about the fascination and complexity of the regions into which they are venturing.

At other points the meeting turned more to debate between biologists, notably in a marathon session on hardware and software in perception, involving principally D. Marr (University of Cambridge), W. R. Adey (University of California, Los Angeles) and D. Sunday (California State University). It seemed that the brain is not ready for the topologists or that they are not ready for the brain.

One session was devoted to problems in which differential equation models have traditionally been used. Handling solutions of coupled ordinary differential equations as trajectories is an essentially topological procedure. So it seems very likely that the power and scope of models for interacting animal species, chemical oscillators and circadian rhythms can be greatly extended. In this session A. Winfree (Purdue University) revealed how illuminating it can be to apply topological reasoning to circadian rhythms and to travelling waves in chemical reactions.