a common 5' terminus but varied in their 3' terminus because of asynchronous synthesis) by the homochromotographic methods exploited so well by Sanger and his colleagues. Further cleavage of these oligonucleotides with pancreatic or ribonuclease T₁, followed by fractionation of the products and analysis of them by partial exonuclease digestion (to give further products that could be identified from their behaviour on two-dimensional fractionation systems), finally led to the proposal of a sequence of 59 nucleotides from the HindII site in *O_L*, which extends into the region of *N* gene transcription. Since this sequence originated at the HindII site within *O_L* which is protected by RNA polymerase binding, it limits the distance separating bound RNA polymerase from the T-A-G with which *N* gene transcription begins to 33 base pairs and so reinforces the challenge to the suggestion made two years ago that the left promoter and start of transcription are appreciably separated.

Within this region of 33 base pairs to the left of the HindII site are three axes of two-fold rotational symmetry each involving hyphenated distribution of the symmetrically arranged 14 to 16 bases. All three blocks of symmetrical sequence seem to lie within the region covered by the repressor and it is intriguing to contemplate that these interdigitating symmetries are the recognition sequences for different regulatory proteins (including the *tof* (or *cro*) gene product to regulate leftward transcription). One can only agree with the authors that analysis of the structure of the remaining sites in the operators and localisation of regulatory mutations should provide a clearer understanding of the significance of these symmetries.

Of no less interest will be the elucidation of the structure of other promoters (in addition to that of the phage fd promoters determined recently by Seeburg and Schaller),

because Allet Roberts Gesteland and Solem (*Nature* **429**, 217; 1974) have shown that the HindII recognition sequence occurs in several, but not all, promoters in phages λ and T7 as well as in the mammalian viruses SV40 and adeno2. Extension of the work on the *lac* operator (Gilbert, Maizels and Maxam, *Cold Spring Harb. Symp. quant. Biol.*, **38**, 845; 1973) has now identified the position of several mutations in this sequence and these occur in both symmetrical and non-symmetrically arranged bases. With this system (and others) analyses of the regions of the enzyme involved in the interaction will also be relevant to the meaning of symmetry and here, production of active *lac* repressors that are covalently fused to β -galactosidase (Müller-Hill and Kania, *Nature*, **249**, 561; 1974) will help to define necessary regions of the repressor. Detailed analysis of the L-arabinose operon, which is under positive control, is also in prospect following the recent studies of *araC* protein binding to the *ara* operator by Wilcox, Clemenston, Cleary and Englesberg (*J. molec. Biol.*, **85**, 589; 1974). Much remains to interest those who do not believe that prokaryotic molecular biology is finished.

From a correspondent

Russian cosmology

It has been a recurring preoccupation among cosmologists to establish connections between the microscopic and macroscopic of the Universe. Eddington attempted to discover a fundamental relationship between atomic and cosmological systems, and other workers still continue to pursue this possibility. Among these workers is the nuclear physicist Andrei Sakharov, the same individual who has recently achieved world renown as a leading Soviet dissident. Sakharov and his colleagues, notably the eminent astro-

Sitting in a hot seat

THE spectacular nature of volcanic eruptions has long attracted scientific observers. As far back as 79 AD Pliny documented the eruption of Vesuvius and the accompanying destruction of Pompeii and Herculaneum, and by the beginning of this century, when Frank Perret was travelling the world compiling a chronicle of volcanic eruptions, volcanology had become well established as a science.

Today, there are volcanic observatories in a large number of places throughout the world. Many, including those on Vesuvius, and in Japan, Hawaii and Soufrière in the West Indies, use extremely sophisticated techniques. Seismic networks record tell-tale cycles of seismic activity, and geodetic measurements involve the use of lasers to detect the dilations of a volcano, which presage serious eruptions.

Volcanologists are not confined to predicting the onset of eruptions. By taking records during eruptions they can determine the source and nature of a lava, which often enables them to anticipate how a particular volcano is likely to behave during future periods of activity. The prognosis may be of use to communities who wish to prepare as best they can for likely contingencies. In that respect, the measurement of such parameters as the viscosity, effusion rates and temperature of a lava, and the detailed chemical and mineralogical analyses are all important. On page 385 of this edition of *Nature* an Anglo-Italian team of volcanologists report their observations of a recent eruption of Mount Etna in Sicily.

Most volcanologists are quick to admit that, unfortunately, there is very little that can be done to safeguard livelihoods and property. On Hawaii, always threatened by mobile basaltic magmas, there have been attempts to

chill advancing lavas, but these measures usually prove to be ineffective. The Hawaiians have, however, successfully diverted lava from its course with bombs; but elsewhere, in densely populated areas, that action may be a palliative which merely shifts the problem from one community to another.

There are few precautions that can be taken against the threat of ash falls, as evidenced on Heimaey in Iceland in 1973. Then, during the eruption of Eldfell, homes and land were completely blanketed by vast volumes of ash within a few days. And against the worst type of volcanic hazard—*nuées ardentes*—there is absolutely nothing that can be done. *Nuées ardentes* are hot avalanches of loose, explosive lava lubricated by constantly expanding gases and vapours. Because of their internal energy, they sweep down the flanks of volcanoes with tremendous speed, often flowing uphill and across barriers, burning all in their paths. In 1902 a *nuée ardente* swept down Mont Pele, on Martinique, and, within the space of a few minutes, annihilated the 30,000 inhabitants of the port of St Pierre.

Inevitably, volcanoes still retain many unknown characteristics, and continue to behave unpredictably. Volcanologists on Vesuvius are becoming "very worried". That volcano has a long history of particularly unpleasant eruptions, and all of the indications are that it should have erupted at least twice during the past 30 years or so. Geodetic measurements show that the flanks of Vesuvius are bulging to an alarming degree. Evidently, the Vesuvian volcanologists could do worse than consider their own counsel. They might also be wise to bear in mind recent events on Etna—in 1971 the volcanic observatory on that mountain was among the first obstacles to be swept away before the advancing lava.

ALLAN PIPER