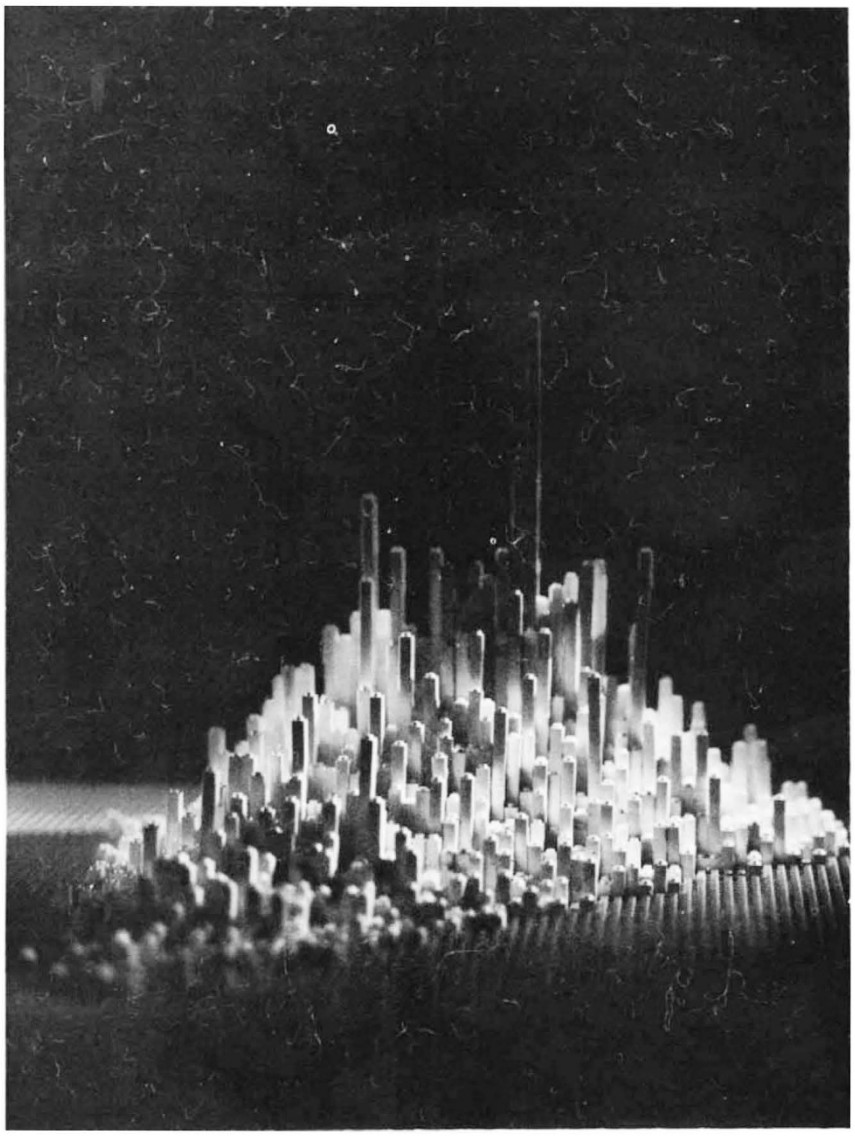
occurring placed a high nutrient demand upon the abiotic environment as the biomass was in a rapid growth phase.

A rather different approach to the problem of documenting the relationship between the stage of ecosystem development and its ability to retain nutrients has recently been made by Leak and Martin (*USDA For. Serv. Res. Note*, NE-211; 1975). They have examined six forested watersheds in the north-eastern United States and have attempted to determine the approximate time when they were last disturbed. Obviously this is a complex problem, since different stands of trees within a stream catchment will have had different histories. A number of stands (between 7 and 41) were sampled within each catchment and such characteristics as the evenness of age within the stand and the proportion of tree species normally favoured by disturbances were noted. In this way it was possible to rank the six sites according to their 'weighted average age'. The time which had passed since general disturbance within the study sites was found to vary between 65 and 200 years.

Streamwater concentrations of nitrate from these watersheds had previously been monitored and these bear an evident relationship to the age since cutting. The site with an average tree age of 65 yr had stream nitrate concentrations of 2.3 p.p.m. (compare recently clearcut areas with 10.3 p.p.m.). Sites with age 75–110 yr trees had 0.15 p.p.m. nitrate in the streamwater, those of 125 yr had 0.8 p.p.m. and those of 200 yr, 2.2–4.8 p.p.m. Similar results have apparently been obtained by Vitousek and Reiners (*Bioscience*, in the press) at Mt Moosilauke.

The evident implication of these data is that low nutrient discharge is a feature of relatively immature ecosystems and that these systems become more leaky on attaining maturity. Nitrogen is a particularly complex element to choose for this type of survey. Not only is its input to an ecosystem complicated by biological fixation, but its output occurs as denitrification and ammonia flux to the atmosphere (see Denmead, Simpson and Freney, *Science*, **185**, 609; 1974) as well as by stream discharge. It is reasonable to assume, however, that as the steady-state ecosystem is approached, the total inputs of the element should be equalled by outputs and this equilibration may well account for Leak and Martin's observed increase in stream nitrate discharge with stand maturity. We may have to wait for a couple of centuries before these suggestions can be confirmed by the controlled experimental techniques of the Hubbard Brook team. □



This Manhattan skyline is a three-dimensional representation of the data from a recent search for charmed particles. A 3.6 GeV/c antiproton beam was used to investigate the interaction $\bar{p}p \rightarrow \overline{K^0}K^+\pi^+\pi^-\pi^-\pi^0$ and blocks are mounted vertically to count mass values of $(\overline{K^0}\pi^+\pi^0)$ against the mass values of $(K^+\pi^-)$ of which there are two possible combinations giving the x and y horizontal axes. Peaks are evidence for the existence of charmed particles but those that are seen in these results do not tower sufficiently above their surroundings to be convincing—*CERN Courier* (**15**, 1975).

Solar flares and weather

from John Gribbin

In *Nature* recently Olson *et al.* (**257**, 113; 1975) summarised evidence for a link between solar flares and changes in both the geomagnetic index and atmospheric vorticity on Earth. They ended their paper by saying that "we should examine the position of the flare on the disk of the Sun as a factor" in determining the response of weather systems to specific solar events, and in this context a brief communication just published in *Astrophys. space Sci.*, **35**, L33–L34; 1975, is of topical interest.

In that paper J-T. Horng (Radio Physics Group, Telecommunications Laboratory, Chung-Li, Taiwan) reports a study of the association of geomagnetic events with complex sunspot groups, covering the period 1968–1972. Horng defines a complex sunspot group as one with two or more spots occurring in one penumbra, and has looked only at large geomagnetic disturbances (Ap $\geqslant$28). The data include 36 such disturbances associated with 62 visible complete spot groups, and three geomagnetic events for which bad weather prevented any sunspot observations being made. It emerges that there is a

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