

countries' votes would not favour such a concentration on general problems. For another, Unesco is probably ill-equipped to do the work. But there is a case for saying that the organization's terms of reference (and those of the other agencies as well) should be made more specific, and stated in such terms that the important issues cannot be neglected. If the British government (as seems likely) says "No, not yet!" to Mayor, his near namesake, Mr John Major, might raise with him the question of more specific terms of reference. Mayor may say that Major is merely moving the goalposts. Major can fairly reply that some steps of this kind are the way forward for all the agencies of the United Nations. □

## Go fish for patents

**An academic group has protested against gene patenting by putting a nucleotide sequence on the Internet.**

FROM time to time, people throw spanners in the conventional works with good effect. That is what the collaboration hunting for the presumed second breast-cancer gene have now done (see page 425). Those concerned, from the Washington University, St Louis, and the Sanger Centre at Cambridge, England, have published a large stretch of the nucleotide sequence of human chromosome 13, allowing the world at large to hunt for the presumed tumour suppressor gene (mutations of which are supposed to lead to breast cancer). The lucky winner will be able to claim the patent that goes with a definition of the gene and an account of the mutations therein linked with actual cases. "What philanthropy!", it may be said.

Or is it? This little stratagem vividly illustrates the frustration that has built up among researchers at the way prudent concern for patent rights impedes serious work. Admittedly, it will not be child's play to find the gene concerned in the 900,000 base-pair sequence now made public, but that is a lot better than simply knowing that it is somewhere on chromosome 13. Yet there are many laboratories in which all else would have been abandoned for a search for this potentially valuable (or at least money-spinning) gene. What the Cambridge-St Louis team has said is that they, personally, cannot be bothered.

The group has also made a general point of some importance. Having defined the sequence that incorporates the gene, and on the assumption that its eventual discovery will be of some medical benefit, the group is seeking to make the point that sequence data as such is 'pre-competitive' and that it should be quickly made available. It will be interesting to see how many other groups follow suit. If there are none, or only a few, that will give molecular genetics a bad name, for there is no question that delays of this kind will impede therapeutic benefits, not to mention the equally important goal of knowing the whole sequence of the human genome. Unless, that is, the group is really looking for the gene and has distributed 900,000 base pairs of irrelevant sequence in the hoping of throwing others off the scent. □

## So God plays dice!

**Professor Stephen Hawking's announcement that the Universe is unpredictable is a little premature.**

PROFESSOR Stephen Hawking, who holds what was Isaac Newton's chair at the University of Cambridge, filled the Albert Hall in London last week. That is an achievement in itself; the event was a lecture on physics. The box-office money will go to a charity for those with motor-neuron (or Lou Gehrig's) disease, from which Hawking has suffered for more than twenty years. He is also the author of the now-famous best-seller, *A Brief History of Time*. Personally, he is a brave man. Although confined to a wheelchair and able to speak only with a voice-synthesizer, he travels indefatigably in pursuit of his academic interests and as a public speaker.

Hawking was talking to a general audience on the theme that people have come to identify with him — the Universe and all that. He argued against the Cartesian view that the Universe is a machine whose behaviour is essentially predictable. It is not just that there is quantum mechanics and the Uncertainty Principle. More recently, there has emerged from post-Newtonian limbo the concept of deterministic chaos, already a headache for those who would predict the movement of objects in the Solar System. But Hawking has his own particular contribution to the alleged unpredictability of the Universe — black holes.

The argument goes back to Hawking's own work, which showed that the vacuum in the neighbourhood of a black hole would be polarized and would become the source of pairs of fundamental particles, electrons and quarks (see *Nature* **248**, 30–31; 1974). Because some of these material particles would escape the gravitational field that created them, there would be a net loss of material from the system, the black hole would steadily lose mass by means of radiation, more quickly as its mass decreased, until it eventually evaporated. Some have speculated that this process may account for the puzzling  $\gamma$ -ray bursts seen sporadically in the sky.

There are other odd features of this process. Because the matter that enters a black hole is more structured than that which eventually escapes, black holes are devices for getting rid of information and thus of creating entropy, presumably at the expense of the entropy of other parts of the Universe. This, Hawking said last week, is where the unpredictability of the Universe comes from: Einstein's exasperated observation that "God does not play dice!" does not apply.

The message will have comforted many of those present. Descartes and Laplace never struck a chord in Britain. But it is also a misleading message, and will remain so while the Hawkings of this world have not succeeded in their serious quest for a unification of quantum theory and gravitation. It seems inevitable that there are massive objects which, by virtue of their mass, are more dense even than neutron stars, but whether they are the literal mathematical singularities must still be an open question. Whether a general audience will have been helped by Hawking's account is another. □