development of members such as Germany at one extreme and Portugal and Ireland at the other. Not only are these countries members of the Rio treaty in their own right, but they are also covered by the membership of the EU as a whole. But Spain has been especially resentful of the idea that the same percentage reductions of emissions should apply to all EU members. The result is that, even if several individual members states meet the obligation to emit no more greenhouse gases in 2000 than they did in 1990, the EU's overall target may be breached. The solution would be for the EU to take the lead in working out the principles of an equitable deal among its own members. The prize would be a demonstration to the rest of the world that the job can indeed be done. But even a demonstration that the task is not possible would be valuable. Then we should all know that we shall have to find some other instrument than the Rio treaty to keep global warming at bay. □

Patents for what genes?

HUGO cannot wring its hands on gene patents without declaring itself on the goals of research.

THE Human Genome Organization (HUGO) is properly concerned about the rewards the patent system offers to those who make discoveries in molecular genetics (see page 751), but it has not grasped the nettle it wishes to extirpate. HUGO's argument falls into two parts. First, it holds that fragments of genes should not be patentable if nothing is known of their function or even of the potential usefulness of a knowledge of that function or of their structure. Second, HUGO records an expression of its regret that the hard work of identifying the function of a tagged but otherwise unknown gene is likely, in present patent law, to be unpatentable. It would be "ironic and unfortunate", last week's statement says, if the patent system were to "reward the routine" investigators "while discouraging the innovators". The sentiments are impeccable, but the reality may be different from what HUGO implies.

On the first issue, though, there is no difficulty. The first application for patent protection for gene fragments was three years ago, when the US National Institutes of Health (NIH) applied for patent protection on behalf of a few hundred of J. Craig Venter's "expressed sequence tags" (ESTs), which are essentially copies in DNA sequence of the ends of the RNA molecules expressed as messengers in tissue cells. At the outset, nothing was said about the functions of the genes concerned, so the test of utility that patent applications must satisfy could not be sustained. In the end, the lawyers' argument that ESTs are indubitably artefacts, and that they are at least useful for fishing out of the genome the genes concerned, did not prevail with the patents examiners. The applications were refused the first time round, NIH withdrew its other pending application and there is now a general understanding that ESTs are not patentable.

The reasons why this state of affairs has arisen nevertheless deserve more attention than HUGO has given them. The use of an EST for fishing out the cognate gene from single-standard DNA is no different from techniques standard in molecular biology since the early 1970s. In patent examiners' language, it is "obvious". And otherwise, in the absence of further knowledge about the gene, it is useless. So there is logic underpinning the conclusion that ESTs as such do not qualify for patent protection. There is a case for asking that patent offices should be more rigorous in their application of these argument in the future. HUGO's statement should help to push them in that direction.

The second part of HUGO's argument is the one that really matters. Ever since excitement about human genome projects surfaced 15 years ago, it has been (or should have been) plain that the difficulty of constructing the sequence of the human genome would be dwarfed by that of telling what each of perhaps 100,000 genes do. Identifying the gene responsible for Huntington's disease, for example, took a decade, but success has unleashed a host of investigations into the link between mutations of the gene and the causation of the disease. Yet understanding, let alone prophylaxis or palliation, is a long way off.

HUGO's worry is that the patent system will reward those who happen to spot some stage, in a continuing investigation such as this, at which a drug or some other treatment can be developed, and that the people whose imagination and effort have guided the process will be, by comparison, neglected. But it has always been thus. It is unlikely that the inventor of the first mousetrap had a profound understanding of the biology of small mammals. The man who made a fortune by manufacturing the glass reflectors that mark out traffic lanes on British highways is unlikely to have been well versed in the theories of reflection and refraction. It is commonplace that the people who grab the patents on inventions arising from collaborative investigations are people who have had the wit to peel themselves off into separate corporations in good time or are companies far-sighted enough to have supported imaginative projects in return for a first-refusal undertaking.

So is there nothing to be done to assuage the sense of unfairness engendered by these happenings? On the face of things, very little. Some decades ago, it would have seemed only natural to people working in an academic environment that they should do the imaginative work and that others should reap the money rewards. There were even theories to rationalize this state of affairs as an effective spur to what is now called 'technology-transfer'. But times have changed. Many in the academic community have acquired, by the example of their peers, a vivid interest in becoming millionaires. External pressures on the academic community have also pushed people in that direction. Moreover, pharmaceutical companies (among others) are increasingly major supporters of some academic laboratories. If the pharmaceutical industry were the sole supporter of academic biomedical research, HUGO's second problem would melt away. The trouble, then, is that there would be no support for the academic investigations of the human genome that are, for many, its chief interest. □