Star wars

Pre-election Congress turning sour

Washington

THE militarization of space may yet become a significant issue in November's presidential election in the United States. For the first time, Mr Walter Mondale, the Democratic front-runner, last week promised to order a freeze on space weapons if he is elected President. In Congress, meanwhile, even the Republican Senate is alarmed about President Reagan's desire to press ahead with deployment of anti-satellite weapons and research on a "star wars" defence against nuclear missiles. Dr George Keyworth, the President's science adviser, was given a frosty reception when he told the Senate Foreign Relations Committee that he opposed negotiating a ban on space weapons lest it blocked the star wars programme.

Congressional anxiety can only have been heightened by the publication of a report by its own research arm, the Office of Technology Assessment (OTA), concluding that the prospect of creating a near-perfect defence is "so remote that it should not serve as the basis of public expectation or national policy". Although detailed criticisms of the star wars plan have been published before — most recently by the Union of Concerned Scientists — the new OTA study is the first to be published by a neutral body with full access to classified information. Its pessimistic conclusions are likely to have considerable influence on the mood of Congress.

The report, prepared by Dr Ashton Carter of the Massachusetts Institute of Technology, covers largely familiar territory by drawing attention to the difficulties of propagating directed energy weapons with the range and accuracy to knock out a large-scale nuclear attack, and pointing out that for every defence concept proposed so far, simpler and usually cheaper countermeasures have already been identified. One of the most forthright parts of the report, however, points to four common "misapprehensions" about the prospect for a perfect defence. They are:

- Confusing the successful development of single devices — lasers, mirrors, aiming mechanisms and the like — with the creation of a successful system. Multiplying by even a million some directed energy weapon will not necessarily give a perfect defence.
- Equating star wars with past technological challenges, such as the Moon landing or the Manhattan Project. The report notes a "vital difference" between working around constraints imposed by nature and competing, in the case of star wars, with a hostile intelligence bent on sabotaging the effort.
- Hoping for a technological development that will dispel all difficulties; when perfection of the X-ray laser for example, might turn out to benefit offence more than defence.
- Expecting to know with reasonable confidence how a complex defensive system would perform in reality. Unlike defences used in previous wars, this one would have no chance to learn or adapt.

OTA concedes that it might make sense to construct a star wars system even if it is less than perfect, in order, for example, to protect missile silos or simply to protect as many lives as possible. But it complains that, despite the fanfare with which President Reagan's star wars proposal was announced, its precise aims remain unclear. For that reason, explicit standards against which its technical feasibility can be measured have proved elusive.

Peter David

Genetic engineering

Genentech claims factor VIII

ONE of genetic engineering's glittering prizes was claimed last week by Genentech Inc., the San Francisco-based biotechnology company, working in collaboration with the Haemophilia Centre at the Royal Free Hospital Medical School, London, and Speywood Laboratories in Wales. The human blood protein known as factor VIII, which is lacking in haemophiliacs and essential for their treatment, has now been cloned and expressed in biologically active form in a mammalian cell culture. The availability of a completely sequenced cDNA clone for factor VIII, the largest protein ever produced through recombinant DNA technology, is an essential first step towards a source of the factor that is independent of supplies of human blood plasma and so not susceptible to contamination by viruses.

Most factor VIII used in Britain is prepared from concentrates that may contain the pooled plasma of up to 20,000 blood donors. All such concentrates are infected with hepatitis viruses and many haemophiliacs suffer from liver dysfunction caused by non-A and non-B hepatitis. Existing alternative production methods may lead to a lower risk of contamination but have their own disadvantages. Haemophiliacs are also a high risk group for acquired immune deficiency syndrome (AIDS), almost certainly because an AIDS virus can contaminate factor VIII produced from plasma. It has been clear for the past three years that any replacement of comparable efficacy would be assured of a huge market.

The Haemophilia Centre in London developed a method of obtaining factor VIII in high purity using monoclonal antibodies to the protein and established the gross structure. At Genentech, a genetic probe derived from a factor VIII subunit was used to test genomic libraries until a clone was identified that matched one possible predicted DNA sequence. The factor VIII gene turns out, as expected, to be located on the X chromosome. Eventually a clone of the complete gene was obtained (190 kilobases long) and a cDNA clone of factor VIII produced. After transfection of the clone into a mammalian cell line (Genentech will not say what type), human factor VIII was detected in the culture medium and measured by a purified enzyme system. The activity of the material is quenched by monoclonal antibodies to human factor VIII — further evidence that factor VIII is being produced.

Genentech is at pains to point out that there are several years' more work ahead before factor VIII will be produced by genetic engineering on a commercial scale, though it hopes to produce enough factor VIII for clinical trials of the product (probably around 100 mg) within 2 years. The aim now will be to obtain a cell line able to sustain high output of the protein and which can also be cultured on a relatively large scale. Last week's announcement preceded any publication of the genetic discoveries in a refereed scientific journal, but both Genentech and the team at the Haemophilia Centre in London say that papers are planned.

Naturally, nothing is as yet known of the economics of factor VIII production by genetic manipulation. There are, however, about 20,000 users of factor VIII in the United States, and as many again in Western Europe. Supplying known needs would be worth sales of at least $100 million a year. Knowing how to manipulate large molecules such as the components of the blood-clotting system will be worth much more to the company which first succeeds in making such materials.

The announcement last week will be a blow for several other biotechnology companies working on factor VIII. Previously, only parts of the gene had been sequenced. Genentech says it intends to protect fully the processes it has developed by patents, and a spokeswoman added ominously that the company had recently expanded its patent staff. But the usefulness of patents in protecting biotechnology processes generally is not yet established, and one disgruntled competitor summed up his feelings by saying "better late than never".

Tim Beardsley