bacteria "which do not exchange information naturally" and between bacteria and eukaryotic organisms "which cannot naturally occur".

The patent says that the techniques can be used with genes to form other bacterial cells, mammalian cells, plant cells and so on. The cloning of multiple genes is mentioned and the production of multiple copies of peptide hormones said to be of especial importance in the cases of parathyroid hormone, growth hormone, gonadotropin, insulin, ACTH, somatostatin and prolactin. Other useful products of genetic manipulation listed

include serum proteins, ferritin, myoglobin, interferin (*sic*), kinins and transcortin.

While illustrating the claims made with specific examples, the patent says that "it is obvious that certain changes and modifications may be practised" within its scope. Among the specific claims are for the ligation both of blunt-ended and "staggered" DNA molecules, to form recombinant plasmids.

On the face of things, the patent would seem not to cover the use of vehicles other than plasmids for the cloning of DNA, so that techniques of genetic manipulation involving the use of animal virus grown on susceptible cells in tissue culture would seem not to be protected. Nor is the development of cloning vectors able to switch between eukaryotic and prokaryotic cells. Yeasts are, however, mentioned.

The patent makes no claim to protection for organisms or plasmids with particular properties, presumably because it was not known whether organisms could be patented until the Supreme Court decided earlier this year in favour of a patent application on behalf of Dr A.M. Chakrabarty by the General Electric Company for a strain of *Pseudomonas* designed for digesting oil spills. Stanford is apparently waiting to hear whether its applications for protection for specific bacterial cloning strains will be successful.

Soviet biotechnology

Further resolve

Soviet progress in biotechnology is being hampered by shortages of reagents and apparatus, and delays in the construction of new facilities. Experiments are limited in scale, and too little is being done to implement theoretical results.

This is the tenor of last month's resolution of the Central Committee of the Party and the Council of Ministers on the further development of biotechnology. The official Soviet commitment to biotechnology began suddenly in May 1974 with a similar resolution, which in effect gave biotechnology priority status and funding from then rather than from the start of the succeeding five-year plan.

Reviewing progress in the past seven years, the Central Committee and Council of Ministers last month noted that the 1974 resolution had introduced "radical changes" in the biological sciences, especially in molecular biology, bio-organic chemistry, molecular genetics and immunology. Research cadres had been trained within a very short time, and in several fields Soviet scientists had attained a "leading position in world science". Despite high hopes, a flourishing biotechnology industry had not materialized.

The resolution suggests, however, that this is not simply because of the difficulty of turning research results into practice. The resolution charges the Academy of

Sciences, the State Committee for Science and Technology, the State Planning Committee (Gosplan) and the governments of the union republics with the task of ensuring the conditions for these results to be introduced in agriculture, medicine and industry. But it also calls for intensified fundamental research both directly within the framework of the Academy of Sciences, and the ministries.

The State Committee for Science and Technology, the Academy of Sciences and Gosplan are to adopt a special target-orientated research programme in biotechnology, which will be coordinated by the State Committee's special council on biotechnology and the academy.

The supply problem remains. The resolution merely says that means of ensuring supplies of equipment, reagents, "biochemical preparations", computer technology and an information base in biology and biotechnology have been "noted", but makes no suggestion of what form these measures are to take. **Vera Rich**

US air pollution

Reagan retreats

Washington

Unexpectedly strong opposition has forced the Reagan Administration to retreat from plans to seek sweeping changes in US air pollution legislation. Initially Mr Reagan had announced his intention to demand a substantial weakening of the Clean Air Act when it comes up for renewal by Congress next month; but following objections not only from environmentalist groups and Democratic congressmen, but also from several leading members of the Republican-dominated Senate, the Administration said last week that it was looking for more modest amendments.

One of the most significant shifts in the Administration's position has been its decision to continue to use health standards and "sound scientific data", rather than economic costs, as the basic principle for determining how air pollution should be regulated. Mr Reagan's budget director, Mr David Stockman, as well as members of his Council of Economic Advisors and outside industrial groups, had strongly urged that cost-benefit techniques be added to the statutory requirements of the Clean Air Act, first passed by Congress in 1970.

However, Mrs Anne M. Gorsuch, the new administrator of the Environmental Agency, announced last week that the Administration did not intend to go far down this particular path. Listing the basic principles to be followed in developing legislation to extend the act, she said that "cost-benefit analysis should not be included as statutory criteria in setting these standards", but that standards "should be based on sound scientific data demonstrating where air quality represents

Europe waits to see

European pharmaceutical companies have reacted cautiously to the announcement by Stanford University that licences on the Boyer-Cohen patent are now for sale. But many of them are huddled with their patent lawyers.

Under the terms of US patent law, companies outside the United States will be obliged to apply for licences only if they intend to market within the United States products made with techniques covered by the patent. Because most European companies are anxious not to foreclose future markets, however, they face the same dilemma as US companies in deciding whether to pay the licence fee and subsequent royalties.

Most companies this week were unwilling to guess what they may in the end decide to do, although it seems that some of them have already been consulted (through their American subsidiaries) by Stanford. Some point out that Stanford's advertised terms are reasonable, but also say that the university has been well advised in fixing a low fee and royalty rate for a non-exclusive licence to exploit a patent as general as Boyer-Cohen. Larger proprietary costs will accrue, they say, when the time comes to buy an exclusive licence to use a more specialized technique from one of the companies set up in the past few years to carry out research and development in genetic engineering.

Some legal anomalies stand out. Will, for example, a European manufacturer that seeks to market in the United States a product made by a process developed by a non-American genetic engineering company itself be required to pay a royalty, or will the legal obligation fall on the company that carried out the research and development?

In the circumstances, three options are being considered: to ignore the licence and face Stanford when products are placed on the US market; to challenge the patent; or simply to pay up. European companies, however, are unlikely to initiate direct challenges, preferring to wait and see what happens in the United States.

Judy Redfearn

real health risks".

Both supporters and critics of the Administration agree that the concept of "real health risks" will now become the central focus of debate over new regulations — and that the decision may reflect recent rulings by the US Supreme Court which, while denying that cost-benefit calculations need be used in setting standards, have also emphasized the legal importance of scientific or epidemiological evidence of existing levels of risks.

Several of the principals announced by Mrs Gorsuch have pleased industry. For example, emission restrictions for nitrous oxides on new cars will be eased. Under present legislation, all cars produced from this year onwards are allowed to produce only one gramme of nitrous oxide for every mile travelled. The Environmental Protection Agency intends to raise this limit to two grammes, the level at which it stood between 1977 and 1980 and a move which it is claimed could save \$100 on the price of a family car.

There will also be a relaxation in a particularly controversial section of the present legislation aimed at preventing the "significant deterioration" of air quality, even in areas where present levels of pollution are relatively low. This provision stems from a legal interpretation of the 1970 Act following court cases brought up by several large environmental groups; it has been bitterly contested by industry on the grounds that it restricts the growth of new industries outside existing urban areas.

Mrs Gorsuch said last week that the present programme for the prevention of significant air quality deterioration "should be maintained for the protection of park and wilderness areas". She said that protection in other areas should be based on uniform technology requirements for pollution control.

The Environmental Protection Agency has also committed itself to asking for more funds from Congress for acid rain research. This has recently become a major source of conflict between the United States and Canada, which has accused Washington of failing to comply with an agreement signed last August to reduce air pollution from automobiles and large coal-burning facilities. The Administration, with the utilities industry, is now arguing that considerably more research is required before the need for clear action is demonstrated, a position which is unlikely to be warmly greeted in Ottawa.

Critics of the Administration's earlier proposals, contained in draft legislation leaked to the press by congressional Democrats in May, have been given other concessions. Senator Robert T. Stafford of Vermont, for example, insisted that no change should be made to the principle that the young, the elderly and other high-risk groups should be given an extra margin of protection from the effects of polluted air. Furthermore, pollution standards will continue to be set at the federal level and

not, as industrial groups hoping for a more sympathetic hearing had asked, by individual states.

The Reagan Administration's decision to limit its proposed changes seems largely based on a realization that, unlike the cuts in public spending and taxation, there is no national consensus on the need for a major retreat on environmental protection. White House officials are said to have been concerned about the impact of recent aggressive anti-environmentalist statements by Interior Secretary James Watt, and have asked him to adopt a more conciliatory attitude.

But if the battle over the Clean Air Act extension is not going to be as fierce as once promised, it will still be heated. The National Clean Air Coalition claim that even the Administration's more limited proposals are a "blueprint for destruction" of the present laws. Mrs Gorsuch says that, even with the suggested changes, the quality of the nation's air will improve, but "at a more reasoned pace". Congressional hearings will begin next month.

David Dickson

Science jobs famine

Bangalore

Nearly three million scientists in India are unemployed and an equal number are working in posts requiring much lower qualifications, for lower pay than a government clerk receives. These were among the worrying facts which came to light at a recent meeting of the Science Advisory Committee of the Union Cabinet, headed by Planning Commission member and agricultural scientist Dr M. S. Swaminathan, and held to discuss ways of making the best use of the country's science and technology personnel, particularly those unemployed.

For instance, more than 50 per cent of scientists and engineers employed at the prestigious Bhabha Atomic Research Centre draw a monthly salary of less than \$75. And nearly 25 per cent of the personnel working in government-sponsored research and development institutions have a monthly pay packet of less than \$120. However, people working in science and technology in the private sector are better off, seven per cent of them earning \$200 a month.

According to a note circulated to members of the committee, unless the annual rate of industrial growth rises to four per cent there is little prospect of speeding up the absorption of unemployed science and technology personnel into jobs.

The note further recommends regulation of intake of such personnel for training, more informal education, facilities for improving qualifications while on the job and greater interaction between industrial and academic scientists.

B. Radhakrishna Rao

Industrial noise

Let them hear

Britain's Health and Safety Commission is tackling the difficult business of regulating noise at work. Last week it published draft regulations in a consultative document intended to pave the way for legislation which will place a statutory obligation on employers to protect workers from noise. A voluntary code of practice, drawn up in 1972, is being widely ignored, according to the commission.

Devising effective legislation is, however, proving controversial — noise regulations are notoriously difficult to enforce and statutory levels of noise are fiercely disputed. The consultative document proposes limits of no more than 90 decibels(A) — a weighted decibel unit discounting inaudible frequencies — averaged over an eight-hour day and no more than 600 pascals of peak sound pressure. But the trades unions, in particular, argue that as hearing damage can occur at lower levels, the daily average limit should be set initially at 85 dB(A) and later lowered to 80 dB(A).

The number of British workers exposed to high noise levels is considerable. The commission estimates that 50 per cent of production workers (about 2.5 million people) are exposed to more than 80 dB(A) and 10 per cent (500,000 people) to more than 90 dB(A). Nobody seems to have disputed the effect of noise on hearing since the late 1960s. Using the work of Burns and Robinson, the commission estimates that roughly 32 per cent of people exposed to 100 dB(A) over a working lifetime will suffer a 50 dB hearing loss by the age of 65.

The commission has settled for the 90 dB(A) limit on the basis that the hearing of 21 per cent of workers previously exposed to more than 100 dB(A) will be protected. Reducing the limit to 80 dB(A) would save the hearing of only a further 8 per cent. Clearly acknowledging the problems of reducing noise, it argues that a 90 dB(A) limit will give greater benefit for cost.

Under the commission's proposals, however, employers would not be freed from obligations even at lower noise levels. The draft regulations require that they reduce any noise likely to damage hearing to the "lowest level reasonably practicable", which they would have to work out for themselves. Employers fear that this general but unspecific obligation may expose them to civil suits from all those who suffer from hearing loss.

The draft regulations require that at noise levels above 90 dB(A) employers must survey noise, train staff, keep exposure records and appoint a qualified noise adviser. Workers exposed to 105 dB(A) would have to receive regular hearing checks. The proposed regulations also oblige employees to make full use of noise control measures and manufacturers to reduce noise levels of industrial