

CNRS reflects with pleasure

CNRS, which is always evaluating other people, has recently been evaluating itself. But the result is not so much a critical appraisal of the largest single research programme in France, as a kind of guide-book to science in general. The report of the evaluation is dominated by the theme of the growth of interdisciplinary research requiring multidisciplinary teams.

The self-evaluation, the report of which has just been published as *Rapport de Conjoncture*, has been prepared by 22 commissions established to evaluate themes singled out by CNRS for study, and ranging from Earth and Solar System to order and chaos and the transformation of societies. Readers must be prepared to look between the lines for outright self-criticism.

But one general theme is the emergence of a number of interdisciplinary problems to which French science should pay attention. One singled out for discussion is that of global change, but the study also notes that the properties of neurons promise to be of great importance in computer sciences as well as in physics and mathematics.

This colours the report's opinion of present arrangements for the training and recruitment of young people into science. It argues that there is a need to improve and increase the training of doctoral students to ensure a sufficient supply of researchers and university teachers. But doctoral training should also prepare young researchers for working alongside people of other disciplines. The report asks that something should be done to improve the public image of certain disciplines, citing mathematics (surprisingly) and chemistry as being unpopular.

On interdisciplinary research, most conspicuously at present represented in

CNRS by four named research programmes (in materials science, energy, environment and technology at the workplace), the evaluation draws attention to some of the problems faced by those engaged on them, in particular by the risk that work on interdisciplinary problems may complicate the two-year evaluation of their research achievements by one or other of the 49 subcommissions, are responsible for this work. The report argues that people's willingness to work on interdisciplinary projects should be regarded, *a priori*, as favourable for their careers.

Of the international connections of French research, the evaluation acknowledges that English has now become the language of communication in international science, but says that there remains room for French on the national scene and in relations with francophone countries.

In general, the evaluation says, it has taken an optimistic view of the place of French science on the international stage, but it acknowledges that there may be a bias in the process of evaluation — research that is inherently good will be well spoken of, while that which is bad will leave little impression on outside critics.

The document acknowledges frankly that international collaboration entails the risk that researchers will be lost to France by means of a "brain drain" which is not confined to France. But it says that French collaboration in large international projects has an effect "at once dynamic and stabilizing". It says that the involvement of French researchers in overseas laboratories, and visits of overseas researchers to France, but particularly the exchange of scientists within Europe, "must be one of the keys to our successful development".

Living better by one's wits

THE Napoleonic centre, it appears, can be flexible enough when there is cash to be saved. That seems to be why every laboratory in the public service seems to have a freebooter's licence to strike a deal on research with some third party, within the limits of a framework agreement. So laboratory directors at CNRS and others of *grandes organismes* have become entrepreneurs of a kind.

The results have often been spectacular. In some CNRS divisions, external support may be as much as a third of the total. Other ministries and public agencies provide more than half of this extra money, for projects as different as the provision of special research equipment and for research projects with a bearing on some development by a still nationalized

industry — the High-Speed Train, for example. But particle and nuclear physics and the life sciences are almost exclusively financed out of CNRS funds.

It is also striking that France derives a substantial research support from international sources — in 1987, this amounted to 17.9 per cent of CNRS's disposable income, exactly the value of research contracts with industry. The European Community is a particularly important source of funds, both because participation in the major European research programmes carries public researchers into joint projects with industrial researchers and because the much smaller sums available for occasional travel from Community sources valuably supplement what CNRS can spend. □

Some rights and wrongs

AMONG the points made in CNRS's evaluation of itself are the following:

French groups have played an important part in the development of **particle detectors** at CERN and DESY since the success with Gargamelle in 1973, but steps should be taken to build on the experience of constructing the LEP injector at Orsay. Building a **4 GeV** electron accelerator, "no doubt in a European context", would allow important work with high-energy photons in **nuclear physics**. New instruments, in Hawaii and Chile will be followed by the Very Large Telescope (four linked 8-metre telescopes) being built by the European Southern Observatory, but French **astronomy** should be primarily concerned with the supply of theoreticians.

More generally, the subcommission on these topics expressed concern at the difficulty of preparing graduate students both theoretically and with a capacity to tackle unknown problems, with the "linear" careers of young researchers and with the continuing shortage of research funds.

The mathematics evaluation says the French **mathematics** school is "probably one of the best in the world" (which, by general consent, is fair). There are up to 2,500 mathematicians at universities, with only a tenth as many at CNRS. Now, the evaluation says, CNRS should be employing more mathematicians who are, it is said, less and less easily classified as "pure" and "applied". By way of proof, the evaluation draws attention to the invention, by engineer Jean Morlet, of the concept of wavelets (*ondelettes*, or convolutions of periodic and gaussian function as sets of elementary functions in which seismic signals can be expressed.)

Surface research is crucial in, for example, the electronics industry, and "France is now well-placed" by the provision of national facilities by collaboration between government agencies and industry. But the advantage could be in hazard because of the shortage of CNRS funds for medium sized equipment, while the immobility of people makes the development of effective research groups difficult.

In *informatique*, France is said to be strongest on the theoretical side and in the development of languages, while Japanese and US industrial laboratories dominate such fields as the development of an **optical computer**. Yet in both respects, the evaluation says that European collaborative programmes have a crucial role. CNRS is said not to have increased its numbers of specialists in these fields sufficiently. □