

document. What, for example, is to be the relationship between the universities and the polytechnics on which, three years ago, the government falsely pinned a good deal of its hope? Will these institutions be encouraged (as they should be so long as they remain autonomous) to become so good that they resemble universities, will there instead be a foolish attempt to make them second-class institutions, or will the government (or its successor) confess the error of its ways and find some way of linking the two systems (with colleges of education included) into an integrated whole? Then what is to happen to the relationship between universities and the government? Will utter financial dependence continue to be the almost universal rule? The benefits of a broadening of the financial base consist not of mythical academic freedom but a built-in tendency towards the kind of academic diversity which is at present missing. Then there are questions of the financial relationship between universities and their students on the one hand and their teachers on the other. Is it right that British students should be financially dependent either on the local government or their parents? Is there not some halfway house in which the direct cost of university education would not be simply related to the size of its output? And is it not time that the present rigid

scales of pay for academics were softened by more than the tiny percentage which has survived from the recommendation of the Prices and Incomes Board that four per cent of the salary bill should be spent on special awards to hard-working teachers? To say that the neglect of these matters for the proper co-ordination of postgraduate courses is to fiddle while Rome burns would be to exaggerate—but not by very much.

RESEARCH ASSOCIATIONS

Strength in Unison

THE industrial research associations, long since accustomed to life on the edges of public munificence, seem to have embarked on a strategy that will allow them at least to complain about their lot more effectively. Earlier this week, the associations collaborated to form what is known as the Conference of Industrial Research Associations, evidently intended to serve as a more effective voice than the Committee of Directors of Research Associations has been able to be—in some eyes, at least, directors are lowly fellows because they are formally the employees of the autonomous councils which are formally the fountain-heads of policy. The director of the new body is the Earl of Shannon, and it is intended that there shall be a deliberate attempt to provide a solid base from which the case for the research associations can be advanced.

There seems no doubt that the publication of the Ministry of Technology Green Paper on the reorganization of civilian research within the government has fired the zeal of the research associations, which are almost conspicuously left untouched by the proposals for reorganization. For the past few years, the central government's contribution to the finances of the research associations has been fixed at £4 million a year, which works out at about a quarter of the total budget, the remainder of which is supplied by industrial contributions. Although this kind of treatment is familiar enough among the pensioners of governments who have fallen out of favour, it seems to be felt among the research associations that the Ministry of Technology has an influence over policy which is incommensurately great compared with its financial contribution. It will be interesting to see whether the new arrangements will tempt the research associations to make a dash for freedom and do without a subvention. It may be easier to tell which way the wind is blowing on February 11, when the Conference of Industrial Research Associations plans to hold a public meeting at which Dr E. A. Davies, Joint Parliamentary Secretary at the Ministry of Technology, will be one of the speakers.

TEACHER TRAINING

Comprehensive Degrees?

by our Education Correspondent

TEACHERS have very little opportunity to help formulate policy on teacher training. This claim was made by representatives of the National Union of Teachers when they met the Select Committee on Education and Science on January 27. The NUT does, however, have strong views about the way that teacher training

100 Years Ago



BOSTON

Society of Natural History, November 17.—The president in the chair. Prof. N. S. Shaler read a note on the occurrence of the remains of *Tarandus rangifer* Gray, at Big Bone Lick, in Kentucky. At a previous meeting was presented the evidence in support of the conclusion that one of the large mammals of North America, the buffalo, had recently changed its limits, and had only ranged in the Ohio valley within the past few centuries. The same locality supplies us with evidence that the caribou existed in abundance in this river basin at a time anterior to the coming of the buffalo, and probably not very long after the disappearance of the *Elephas primigenius*. Since the coming of civilised man into America, the caribou has been confined to a narrow area in the north-east part of the continent; it is questionable whether it has ever ranged during this time south of the southern limit of the State of Maine. The position in which these remains were found leaves the precise relationship in time of this species to the mammoths and mastodons a little questionable. There is, however, little doubt in my mind that, if not in existence during the later part of the time of these pachyderms, it came immediately after them. Its bones are always found below the line of the buffalo and the Virginia deer. The remains of this latter species are found only among the most recent deposits of the swamp. The disappearance from this region of this eminently boreal animal immediately after the passing away of the ancient elephants from the Mississippi valley, goes to confirm the conclusion that the climatic change which closed the period of the mammoths was from cold to warmth, and not an alteration of the opposite character.

From *Nature*, 1, 369, February 3, 1870. Shaler was professor of palaeontology at Harvard.

should be run, and submitted these to the Select Committee in a detailed document setting out a number of radical proposals. Like the National Union of Students and the Association of University Teachers, the NUT wants to see an end to the binary system. The proposals call for a major restructuring of the whole sphere of higher education, the final result being a "comprehensive university". Colleges of education should be grouped together into schools of education, attached to a university, and the NUT argues that all education students should take a four year course leading eventually to a degree.

The NUT suggests that responsibility for financing all spheres of higher education should be vested in one body, on the lines suggested by the Select Committee itself in its report on student relations. Such a system would remove the present colleges of education from the financial control of the local authorities. If they were grouped together into schools of education and brought under the control of individual universities, the NUT argues that this would "avoid wasteful duplication of courses", and would facilitate coordination of entrance requirements for higher education to "relieve the pressures which result in unnecessary specialization in secondary schools".

As far as course content is concerned, the NUT argues that there should be no dichotomy between academic and professional matters. What matters is the nature of the knowledge acquired and the understanding of how to communicate this knowledge to different age groups. Placing the schools of education in a comprehensive university would give potential teachers the opportunity to mix with students from other disciplines and this would help them to gain maximum benefit from their education. But the NUT suggests that the best way to provide links between the academic and professional aspects of training would be to appoint teacher-tutors. These would be teachers on the staff of schools where teaching practice is carried out, who would be responsible for a few students, and would work closely with college tutors.

The NUT believes that the present three year courses are too short and that they should be lengthened to four years. The NUT also suggests that the "general recognition of the need for a four year course would be a major step towards the union's ultimate goal of an all-graduate profession". The union also suggests that schools of education could provide one year courses of education for students who are unable or do not wish to take a degree course in education. Such courses are at present virtually a monopoly of the universities.

DRAGON

Now We are Ten

AN opportune moment has been chosen for the publication of the tenth annual report of the Dragon high temperature reactor project, released last week, but the future probably bodes less well for the steam generating heavy water reactor which the UKAEA has on its books. Dragon is just across the way from the SGHWR at Winfrith, but the Dragon reactor is a joint effort of twelve European states and run by the European Nuclear Energy Agency. The point about Dragon is that the metal fuel cans have been done away with so that much higher temperatures can be allowed in the core—up to 1,500°C. One of the

by-products of the project has been a boom in the technology of graphite which is used for the structure of the core and moderator. The high temperatures mean a high conversion efficiency in a compact reactor. Cooling is by helium gas, and one possibility which people have been talking about for this type of reactor is to use the helium to drive the turbines directly, thus cutting out the mandatory intermediate steam cycle with a further gain in efficiency.

Since the encouraging remarks about high temperature reactors made by Sir Stanley Brown at a conference in Zurich last year, the outlook has been bright for projects such as Dragon. Prototype reactors working on similar principles are in operation in Germany and the United States. Sir Stanley is chairman of the Central Electricity Generating Board, and he said that high temperature systems show an advantage of about £10 per kW over the advanced gas-cooled reactors (AGRs) such as arc being built for the board at present. The point seems to have been taken by the participants in Dragon, who recently agreed to extend the project for a further three years to March 31, 1973, within a total budget for the period of £38 million.

The view of the CEGB is that an enquiry for a 1,300 MW HTR station with two reactors is likely to be issued toward the end of 1970, with the first reactor intended to come into service in 1976. But there is not going to be a rapid transfer to HTR systems and the board is probably going to continue with AGR stations to the end of the decade. Instead, the first HTR will be what is being called a "leader" station, and its performance will be watched carefully before the board goes further. The way the 20 MW Dragon project has gone seems to have persuaded the board that there is no need for a bigger prototype reactor before the leader station.

One of the charms of HTR systems as far as the CEGB is concerned seems to be that they are likely to be better than AGRs at coping with the large daily fluctuations in demand which are a feature of the British power scene. Meanwhile, with Winfrith's Dragon in a happy state, negotiations are still going on with Greece to barter an SGHWR for a consignment of tobacco.

CB WEAPONS

More Shocks from WHO

THE latest contribution of the World Health Organization to the debate about chemical and biological weapons is the most alarming so far (*Health Aspects of Chemical and Biological Weapons*, WHO agencies, £1.20). Together with a catalogue of the properties of some hitherto obscure agents, the document contains a detailed calculation of the potential effects of chemical and biological agents directed at hypothetical targets—mostly densely populated cities. The document is a by-product of the work of the eighteen member advisory committee which drafted the WHO advice to the United States, later embodied in the UN report on the subject published last year.

One of the most vivid of the examples of the effects of chemical and biological weapons assumes that the agent would be the bacterium responsible for tularaemia. Although human beings do not often come into contact with the insect vectors of the disease, it is