modern forms of the distinct classes of vacuum pump—the mechanical and the vapour pump. The requirements governing the choice of a particular pump are considered and, in particular, the capacity, ultimate pressure (in the case of the vapour pump also the backing pressure) and characteristics are discussed. The paper concludes with the remark that, though the construction of modern pumps is extremely simple, many seem to be designed on a hit-or-miss basis and that more investigation is needed to elucidate the mechanism of the pumping action. Most physicists will, undoubtedly, heartily agree with this conclusion.

The two other papers in this first section are by T. S. Miller on the design of industrial vacuum systems, and by W. Steckelmacher on vacuum gauges. The latter is a brief but comprehensive review of methods of measuring pressures below 10 mm. of mercury in which the limitations of the conventional gauges for accurate measurement are carefully examined.

In the second section the general principles of leak detection are reviewed by J. Blears and J. H. Leck. Emphasis is placed on the simpler methods. The mass-spectrometer leak detector which has been extensively developed both in the United States and in Great Britain is now an extremely sensitive and efficient leak detector, and the cold-cathode instrument described by C. J. Milner, of the British Thomson-Houston Co., Ltd., has the advantages of robustness, long life and the avoidance of refrigerated traps. The use of the mass spectrometer, not as a leak detector but for analysing the residual gases in normal dynamic systems, is discussed by J. Blears in a separate article.

The third section, dealing with modern applications of vacuum processes, contains papers on large-scale vacuum dehydration, freeze drying, vacuum coating plant and techniques, the vacuum melting and sintering of metals and a description of the vacuum system of the Birmingham proton synchrotron. These illustrate the many and varied industrial and research developments made possible by improvements in vacuum technique.

Altogether the supplement describing the symposium forms an excellent report on the progress made during the past ten years, and should help considerably to stimulate further research on the basic problems of creating and measuring vacua, in addition to bridging the gap between the standard text-books and recent publications in the specialized periodicals.

S. Weintroub

BRITISH GUIANA FOREST DEPARTMENT

REPORT FOR 1948

THE annual report for 1948 of the British Guiana Forest Department* has only been recently received and is in consequence rather out of date; but it discloses a curious position for a Forest Department to be in. From the introductory notes it is difficult to gather the real forest policy of the Colony; for the different parties who appear to be organizing the forest policy seem to have conflicting aims. In any event, the report commences with the remark of the Conservator: "I regret to have to report that during the whole of 1948 the work of the Department has been paralysed owing to the failure to fill staff vacancies. At such a critical period in the development of our forest resources, this state of affairs has been doubly unfortunate".

From this report it is seen that the Evans Commission visited the Colony in the latter part of 1947 with the view of assessing the possibility of settlement of the under-populated areas of the Colony. Particular attention was paid to the development of timber resources. Experts were brought in, and the Colonial Development Corporation suggested the formation of a British Guiana Forestry Corporation, which was set up under the leadership of a former chief conservator of forests of Burma. The Colonial Development Corporation has acquired important forest concessions in the Colony, and a short-term option has been also given over a large area of forest in the north-west district to Canadian interests. Considerable building development is being considered in the Colony, and this will require large amounts of timber.

At a time when the world demand for timber is so great, it seems a great pity that the development of this very important resource of the Colony was not done years ago. The Forest Department was formed in British Guiana in 1925, but it never had more than a handful of staff. Yet there was all this work waiting to be done by professionally trained foresters, who were available to be taken on to the staff at the time of formation and during the following fifteen-year period prior to the outbreak of the Second World War.

* British Guiana Forest Department. Annual Report for 1948. (Georgetown: Forest Department, 1951.)

ORGANIZATION OF ATOMIC ENERGY WORK IN BRITAIN

THE January issue of *Atomic Scientists News* contains a symposium of the views of some leading scientific men on the organization of work on atomic energy in the United Kingdom. The remarks are based on Lord Cherwell's speech in the House of Lords, on July 5, 1951, in which he advocated transfer of the responsibility for work on this subject from the Ministry of Supply to a special organization more flexible than the normal Civil Service system.

The main points of Lord Cherwell's speech are given, and in commenting on them Prof. M. W. B. Skinner and Sir George Thomson agree with Lord Cherwell so far as production is concerned. While, however, he agrees that it was a mistake to put atomic energy under Civil Service control in 1946, Prof. Skinner is dubious as to whether it would now be advantageous to take atomic energy out of the Civil Service and place it under some other organization; he believes that considerable thought should be given to the best form of organization for obtaining clear decisions on technical policy and for the most efficient implementation of the work. Sir George Thomson also doubts whether Civil Service restrictions are now such a serious matter for a going concern as they were in early days at Harwell, and in his tribute to the good work at Harwell in spite of such handicaps, he supports what has recently been said by Sir John Cockcroft elsewhere. Neither believes that scientific freedom in Britain is imperilled by State planning; but Sir George considers that, so far as security is concerned, a large firm, with the assistance of the relevant government services, would be at least as safe as the present organization. He thinks that security troubles have come rather from failures in detection than from not being ruthless enough in acting on evidence less than legal proof.

Prof. H. S. W. Massey concurs in these views. Most physicists think that Harwell has succeeded to a remarkable extent, but that development would best be carried out by a body of the corporation type retaining the maximum possible freedom and initiative. It is a very different matter, however, to change an established system which is working well, and Prof. Massey thinks that suggestions that a corporation could tighten up security by decreasing security of tenure or restricting civil rights, such as travel, are particularly ill-advised.

A statement made by Prof. M. H. L. Pryce represents the views of scientific men directly concerned with atomic energy work. There appears to be general agreement in the atomic energy establishments that certain features of the present organization, such as the rigid staffing system, are frustrating and should be changed ; but a strong body of opinion holds that the situation can be remedied within the Civil Service by giving greater autonomy to the various establishments. This view is particularly strong in the production establishments, whereas those more closely concerned with the research side tend to share the general outside view of the unalterable inflexibility of Civil Service organization. The popular view that the Civil Service is inefficient is not strongly held at Harwell, and it was forcibly put to Prof. Pryce that this view is ill-informed and made by those without experience of the essential structure of large organizations. Prof. Pryce, moreover, makes an important point about the publicity policy of the Ministry of Supply. Few people know of the real achievements at Harwell, of which many sections of the Establishment should justifiably feel proud. Not only is there, accordingly, no feeling of pride in the Establishment, but also potential recruits into the atomic energy field are not attracted ; and the belief, fostered by the Ministry's attitude, that most of the work at Harwell is secret, deters others from joining. Opinion, however, in the establishments appears to be crystallizing in favour of remaining in the Civil Service, and this tendency has been strengthened by Lord Swinton's comments in the House of Lords on security conditions and the possible loss of civil rights and fears of arbitrary dismissal under a new system.

COMETS AND THEIR ORIGIN

THE presidential address to the British Astronomical Association[1], delivered by Dr. G. Merton on October 31, was on the subject of "Comets and their Origin". Dr. Merton gave a short historical survey of the subject, followed by a description of the different parts of these bodies, their composition, their appearances more particularly as they approach perihelion, the diversity in their orbits and the peculiarities exhibited by certain comets regarding sudden increases in brightness, etc., and then he proceeded to his main thesis on the origin of comets. Before considering some of the older theories, he referred to two modern ones which depend upon the passage of the sun through a cloud of interstellar dust, or upon the debris of an exploded planet, this debris—or a very small fraction of it—afterwards becoming a cloud of comets. Neither theory is really new, but important details have been worked out within the past few years and differ from many of those previously suggested ; there are differences in other ways as well. The first of these, by R. A. Lyttleton, has already been mentioned in *Nature*[2], and so in this article it is only necessary to refer to the other that appeared a little later, namely, that due to J. H. Oort[3].

Oort's theory postulates the explosion of a planet between the orbits of Mars and Jupiter, the fragments with approximately circular orbits around the sun becoming minor planets and meteors. Portions with elliptical orbits which approached Jupiter or other planets were subjected to perturbations which, taken on the whole, increased the major axes of their orbits, and by far the greater part of the debris, thrown into hyperbolic orbits, was lost to the solar system. About 3 per cent of the debris moved in elliptical orbits with very large major axes—from about 25,000 to 200,000 astronomical units—and this portion formed the outer clouds of comets which have supplied the solar system with these bodies since the explosion took place, and will continue to do so for a long time, as the estimated number of comets is of the order of two hundred thousand million. On the assumption that the exploded planet had a mass about that of the earth and also that 3 per cent of it formed the outer cloud, the average mass of a comet would be about ten thousand million tons ; but the above figures merely denote the order of number and mass.

Assuming that the cloud had a random distribution of directions with respect to the sun, a small proportion of the comets would cross a sphere of radius about two astronomical units, the sun being at its centre ; and van Woerkom, an associate of Oort at Leyden Observatory, has shown that such comets would be forced into hyperbolic orbits and ejected from the solar system or converted into short-period comets. Perturbations by the stars are responsible for supplying new comets to this small inner sphere.

The details of the theory are very fully dealt with in Oort's original paper, but in the limited space allotted for Dr. Merton's address it was impossible to explain all these. (It may be remarked that the explosion of a planet with the subsequent production of minor planets and meteorites have been dealt with by W. H. Ramsey and M. J. Lighthill in some papers which appeared in the *Monthly Notices of the Royal Astronomical Society*, references to which have been made in *Nature*[4], though it is admitted that the complexity of the problem prevents a complete quantitative treatment.) Towards the end of his address Dr. Merton referred to some of the theories of the origin of the periodic comets : the capture theory, which postulates a close approach of long-period comets to some of the giant planets the perturbations of which turned them into relatively short-period comets ; and the theory that they were ejected by the planets or even by the sun. As he pointed out, the great difficulty about all ejection theories is the absence of any positive evidence to support them, especially as the processes of ejection are supposed to be still going on.

[1] *J. Brit. Astro. Assoc.*, **62**, 1 (1951).
[2] *Nature*, **164**, 119 (1950).
[3] *Bull. Astro. Inst. Netherlands*, **11**, No. 408 (1950) ; an abbreviated account appeared in *Sky and Telescope*, **9**, No. 4 (1950).
[4] *Nature*, **163**, 814 (1940) ; **165**, 217 (1950) ; **167**, 936 (1951) ; and **168**, 676 (1951).