ignored. The crude macroscopic indices considered by the scientist of science can be used to demonstrate that, so inexorably does the juggernaut of science roll forward, not even a genius can make a significant contribution to its momentum. But it is not easy to know whether Professor Price is mocking when he says that "Science is, so to speak, a much more regular thing in its behaviour than are people". This assumption, a necessary point of departure for the science of science as usually construed, is an absurdity which lies at the other extreme from the Cleopatra's Nose school of history. Can it seriously be supposed that if Archimedes, Newton and Einstein had never existed, the present state of science would be no different?

Granted that the individual is insignificant, Professor Price shows how several intriguing "laws" may be set up. The "First Law of Research on Research" is that the "size" of science increases exponentially, whether judged by the number of scientists, scientific journals or scientific papers. It follows that "87½ per cent of all the scientists who have ever been are alive now". This is an impressive figure indeed and doubtless deserves its place in the *Guinness Book of Records*, along, perhaps, with a note that a similar figure would probably have been valid in 450 B.C. But what does it show? Professor Price offers this, that "science runs so much faster than people, so much more rapidly than civilization". This would seem to cast the man at the bench in the position of the Red Queen, which may be Professor Price's way of saying that the size of science bears no relation to such wholly immeasurable aspects as its quality or rate of progress at any given time. Alas that the latter aspects, which alone are of significant interest, fall outside the crude scope of the science of science.

No first law is complete without a second, and Professor Price announces the Second Law of Research on Research which states that the distribution of quality among scientific institutions, men or journals follows the approximately inverse square law typical of the Pareto law of distribution of income. "For men as for institutions", Professor Price explains, "the chance of doubling the size of achievement is uniformly about one in four, no matter what the size already achieved." From this follows the premise implicit in the foundation of the argument, that in science (though not, apparently, in art) the individual counts for nothing. "If Beethoven had not existed, other men would have written quite different symphonies: Beethoven's private property is unmistakable. If Planck, however, had not made his particular discovery, somebody else would have to have made it and . . . rather quickly."

As the culmination of his essay, Professor Price produces statistics to show that the size of each country's research effort is proportional to its gross national product. Size is measured by the percentage of papers of each national origin indexed in *Physics Abstracts* and *Chemical Abstracts*. (He calls these "National Brownie Points", which is another reason for believing that he may not be entirely serious.) From this analysis it emerges that the Soviet Union, whose share of the world's GNP is 15·6 per cent, contributed 15·6 per cent of physics papers, while the equivalent figures for the United States are 32·8 and 31·6, respectively. This is a remarkable concurrence, but is it significant? Concurrences in historical and social phenomena have an unfortunate habit of being less meaningful than their counterparts in scientific experiments. George I, II, III and IV all died on a Saturday, but this does not by itself serve to establish the existence of a baneful influence between the Sabbath day and the House of Hanover. The science of science has far to go before it attains respectability. Only Professor Price can know whether his ingenious essay was written to help it on its way or as another obstacle in its path.

Mr R. Brightman

THE death of Mr R. Brightman at his home in Cheshire last week-end is a particularly sad blow for *Nature*, for he played an important part in its production for the whole of forty years. He was a chemist by trade, and served for many years in the Dyestuffs Division of ICI Ltd. He had a passion for books and for the scientific literature, which is why no doubt he spent much of his professional energy on the management of the literature. But he also had a great affection for his work for *Nature*, which began with book reviewing and quickly graduated to other tasks. In the years since the Second World War, when many men of his age would have settled back in their retirement, he found himself writing a great proportion of the leading articles which appeared in *Nature*. More recently, he took on the job of working through *Hansard* each week in search of parliamentary news, and he was at the same time hard at work on a volume intended to celebrate the centenary of *Nature* next year. He would have wished no better monument.

Gloomy Post Office

THE prospects of the General Post Office for its final year before being established as a public corporation are described in a Government White Paper, just published (HMSO, 1*s*. 9*d*.), and presented to Parliament last week by the Postmaster-General. A Bill for the establishment of the corporation will appear later in the year. For the past five years a financial target of 8 per cent was set for the Post Office as a whole, but this has not been achieved. The overall return is expected to be nearer 7·6 per cent, the return from telecommunications, which reached the target, compensating for comparative failures of the postal services. Under the current reorganization these two sections will be managed separately and, because of the different nature of their activities, will aim for different targets. A net return target of 8·5 per cent for telecommunications (after historic depreciation but before interest and supplementary depreciation) has been set, but for the postal service, which is less highly capitalized, a margin of 2 per cent on total expenditure is being attempted. At present prices, it is unlikely that these targets will be reached. In fact, the postal service expects to make a loss, and, faced with capital

expenditure for expansion and increased productivity over the next five years of £2,000 million, the Post Office says that charges must be brought into line with costs. The position is being reviewed by the Prices and Incomes Board.

The telecommunications section is aiming to increase the size of the system by 50 per cent without increasing overall manpower, by using more machinery. Improvement of service for the existing 7·7 million subscribers will be the most important task in the coming year, and a net increase of half a million subscribers is expected. The various local, trunk and overseas lines are all being increased, as are exchanges and the number of telex lines. By March 1969 it is expected that 98 per cent of customers will be on automatic exchanges. Automation is progressing in such fields as international telex and telegrams; data transmission services are being expanded, and additional submarine cable links with various European countries are being laid. Aluminium conductors have been successfully used instead of copper in telephone cables, and further use of aluminium is expected to benefit the economy because of the high price of imported copper.

The postal section will see two important developments in the coming year—the two-tier post system in the autumn with lowest rates of postage being open only to mail in "post office preferred" envelopes, and the inauguration of the National Giro Service at its Lancashire headquarters. Modern techniques of management and marketing are being examined for staff and stamps, respectively, and post codes will be allocated to parts of London and twenty-five other towns and cities. During the year, twenty mechanized sorting offices will be brought into service.

New Units for Industry

THE process of changing all Britain's units from the old imperial system to the metric system is a messy business. Colonel J. S. Vickers, chairman of the Planning Group of the British Standards Institution, which is planning the change, calls it "an agony". But at least everyone agrees that the medicine, once taken, will do the patient good. The arguments are about who should take the medicine first. In most countries which have made the change, the retail trade, which includes packaging, has adopted the new units first, but in Britain the opposite will happen. The plans for the retail trade will depend on the recommendations of the Joint Committee on Metrication, a Ministry of Technology body whose chairman is Mr Arthur Wynne. The committee is widely expected to accept a recommendation made to it by the CBI (see *Nature*, **216**, 1157; 1967) and propose the formation of a Metrication Board.

Last week the BSI was able to announce its plans for the engineering industry. After consultation with industry which seems to have been somewhat one-sided (of 1,600 firms to which the BSI sent its original questionnaire, only 250 replied), the BSI has prepared a draft programme which it is circulating to industry through trade associations. The period of transition has been set at 1970–75. The terminal date was fixed by a Board of Trade decree, so all that really needed deciding was the starting date. 1970 seems to have been the overwhelming favourite. The first industry to go metric, chosen because its problems were likely to be the greatest, will be the engineering equipment manufacturers, who use the basic engineering materials to produce equipment which is then used by the process industries. This time-scale will, the BSI says, fit in with the plans of the construction industry, which is on the way to metrication already. Some 20,000 copies of the draft programme have been sent to engineering companies through their trade associations, and they have been invited to send comments to the BSI by March 29. Companies not members of any trade association can get copies from the BSI.

Another New Reactor

DESPITE its great cost, which might be expected to dictate caution, nuclear reactor design remains astonishingly diverse. Almost every conceivable combination of coolant, moderator and fuel has been studied, on paper if not in actual hardware, although most of these systems are unlikely to evolve into commercial power reactors. Although Britain has so far tended to favour gas cooling for thermal reactors, the United Kingdom Atomic Energy Authority last week invited the Duke of Edinburgh down to Winfrith to open its latest reactor, which is water cooled. In the event, the considerable skill of the authority at public relations had to be directed at those who thought the royal visit had cost a great deal too much, but the virtues of the reactor were not entirely forgotten. It had, after all, cost £16 million itself.

The reactor is called, somewhat inelegantly, the steam generating heavy water reactor, abbreviated to SGHWR. It is a system in which moderation by heavy water is combined with cooling by ordinary water, which boils and drives the turbine generators in a direct cycle. The design uses a number of pressure tubes, rather than a single pressure vessel, an arrangement with several important advantages. The fuel, slightly enriched uranium dioxide, is contained in thin tubes made of zirconium alloy; 36 such tubes go to make up each fuel element. Cooling water passes up the tubes, which are surrounded by an aluminium calandria (vessel) containing heavy water moderator.

The electrical output of the station is 100 MW, which is fed into the National Grid. The reactor can be refuelled either on-load or off-load, although the advantages of on-load refuelling seem much overrated. If the reactor is refuelled off-load, the whole job can be done in a weekend so that most customers are likely to choose this option. The pressure tube design allows much of the fabrication work to be done in the workshop instead of on-site, which is a valuable advantage in places where welding technology is less advanced than it is in the United States. The authority is tentative about quoting costs, but says that capital costs should work out at about £60 per kilowatt, with generating costs of 0·50 pence a kWh or less. The reactor is a good plutonium producer, very much better than the advanced gas cooled reactor, and about the same as a boiling water reactor. The design can also be adapted for natural, rather than enriched uranium. The authority says that there would be no difficulty in building an SGHWR as big as 1,000 MW.

So far, however, the whole contracting position is a mystery. The authority firmly says that "the team which built this reactor will take on contracts anywhere". Under these circumstances, the AEA would