



Vol. I] NOVEMBER 1932 [No. 5

## CONTENTS

	PAGE
The Fiftyfive-Year Rule .. .. .	117
Nuclear Structure. By Prof. B. Venkatesachar, M.A., F.Inst.P., and T. S. Subbaraya, B.Sc. ..	120
The Concept of Causality .. .. .	124
Importance of Dialysis in the Study of Colloids. By Dr. B. N. Desai, M.Sc., Ph.D. ..	125
Present Position of the Problem of Spike Disease. By M. Sreenivasaya .. .. .	126
Letters to the Editor:	
Nomenclature of Shell Layers. By Baini Prashad ..	127
Indian Blepharoceridæ. By S. L. Hora ..	128
Life of the Liquid Drops on the Same Liquid Surface. By L. D. Mahajan .. .. .	128
The Alimentary Glands of the Earthworms of the Genus <i>Eutyphoeus</i> . By G. S. Thapar ..	129
Maintenance of Oscillations by a Triode with Filament Feed Cut Off. By R. L. Narasimhaiya ..	130
A Siluroid Fish from Afghanistan. By S. L. Hora ..	130
Gregarious Collembola. By Durgadas Mukerji ..	131
Some Studies in the Infra-Red. By A. P. Mathur ..	131
Thermo-Hardening of Shellac. By R. W. Aldis and S. Ranganathan .. .. .	133
Coronium Spectrum. By P. K. Kichlu and B. M. Anand .. .. .	133
The Affinities of Chætogonatha. By S. G. Manavala Ramanujam .. .. .	134
Studies in the Life-History of <i>Balanophora indica</i> . By L. N. Rao .. .. .	134
Research Notes .. .. .	135
A Scheme for Advancing Scientific Research in India. By P. W. Gideon .. .. .	138
A Marine Biological Station for India. By C. Amirthalingam, B.Sc., Ph.D. .. .. .	140
The British Association—York Meeting, 1932 ..	141
Two Convocation Addresses .. .. .	144
Science News .. .. .	146
Reviews .. .. .	147

[All rights reserved.]

## The Fiftyfive-Year Rule.

THE fundamental rules relating to the age of retirement of public servants are obviously empirical and operate unevenly within the limits of even a single branch of service. In the case of the higher posts in the judicial department and cabinet, the fiftyfive-year rule is relaxed, while it is more or less rigidly applied to the appointments in other branches of the administration. The age limit imposes practically no bar to the assumption of elective offices by retired government servants, and posts in the gift of the Crown are equally exempt from age restrictions. In all business concerns and industrial organizations, the directing authorities hold their offices virtually for life.

It is commonly argued that the age rule, though a purely arbitrary one, must be upheld in order to maintain in the services a uniformly high standard of efficiency which, it is feared, advancing age is apt to sterilize; and to secure for administrative problems that freshness and optimism of outlook which a comparatively youthful and more energetic mind may reasonably be supposed to possess. From an economic standpoint, the age rule scarcely appears to be a sound business proposition, and the consideration that the wastage due to retirement provides some measure of relief to unemployment seems to be its chief recommendation. Generally speaking it is true that the efficiency of a person depends not only on his protein metabolism but to a large extent also on the climatic conditions of the country in which he lives; and the influence of adverse environmental factors is likely to be more acute in the case of those who, born in more favourable situations, suddenly find themselves in different and more exacting circumstances, than in the case of races who through centuries have become perfectly inured to them. But this is not all. Of still more fundamental importance is the fact that the treatment accorded to the public servant has a direct influence on his official efficiency. It must be within the experience of all officials that if their career is not embittered by disappointments, and on the other hand, their hopes and ambitions are systematically and periodically fulfilled, their capacity for service is retained unimpaired till an advanced old age. The influence of mind on the discharge of duties is far more profound than is commonly recognized.

It is impossible to assume that the age of a person at fiftyfive in itself impairs his mind to the extent of disqualifying him for the performance of public functions. The constant vigilance and tireless energy so necessary for a successful business organization in which the directing authorities have to keep all their fingers on the pulse of the market, finance and labour, do not appear to be foreign to them though they may have crossed the official age limit. The official duties of the Prime Minister and of his colleagues in the Cabinet must be certainly of a very arduous character yet in their assumption, consideration of age plays little or no part. Really we are dealing with two classes of offices in public affairs where an anomalous position is created. Those which are in the gift of the government are regulated by age rules and others virtually in the gift of the electorate are independent of them, though in both the nature and volume of work to be transacted are almost the same, and if there is any difference at all the incidence is certainly heavier in the case of elective appointments. In the reformed constitution in India the ministerial posts are in the majority of cases occupied by retired government officers and others who, according to the fundamental rules, are not permitted to hold any office under government. Further it may be observed that in committees and commissions appointed by Government, officers who have relinquished their posts are also included in large numbers. It seems to us therefore that it is impossible to maintain that the service rules regulating the tenure of offices are based purely on considerations of the efficiency of their incumbents. In any case we have no standard scientifically determined for the measurement of such efficiency, and, this standard, if one is discovered, is unlikely to be suitable for uniform application to all persons in all branches of public administration: for the nature and intensity of the duties and the consequent wear and tear on the individual must differ widely between department and department and also in their effects on individual persons. Obviously, there can be little scientific justification either for fixing fiftyfive years as the general retiring age or for arbitrarily raising this to sixty years only in a few cases. It seems to us that in the interests of both economy and of efficiency, this rule is in need of immediate revision and in support of our view we may adduce

the fact that most of the pensioned officers who seek engagements in quasi-public services or who apply for commutation of their pensions are declared to be sound in body and mind by the medical boards. The cost of pension for which the Indian Governments provide in their budgets is excessively heavy and fresh recruitment, on account of retirement under the existing rules, must materially add to the cost of administration.

We are concerned here more with the teaching profession than with any other. In missionary and other aided institutions, the fiftyfive-year rule is not as a matter of principle strictly followed, and in respect of certain endowed chairs in Indian universities their occupants are permitted to continue in office till sixty years of age. In Europe and America the practice varies. German professors, as is well known, are permitted to hold their appointments for life and are State servants. Similarly, the occupants of endowed chairs in English universities are not disturbed so long as they choose to continue to work and even secondary school teachers enjoy their tenure of office till their sixtieth year. Practically in all the progressive countries the European practice is adopted. The case is not materially different in institutions where engagements are entered into on the basis of short-term contract. In them the renewal of engagements has absolutely nothing to do with the age of the person, but is determined solely with reference to his efficiency. In India, however, the teaching posts in government service to whatever grade they may belong, generally terminate at the age of fiftyfive, the Government reserving to themselves the right of granting extensions sometimes even upto sixty years. There can be obviously no magic in the rule and the existing practice which is full of anomalies is capable of being based on some well-recognized psychological and physiological principle. One of the outstanding features of the great moral and material progress of India is the distinct improvement of the sanitary conditions of towns, where a generous supply of wholesome water, pure air, parks and playgrounds and other amenities which secure health and prolong life are available for all and consequently the outlook of life of an average citizen in Indian cities is favourably comparable with that of one in European towns living in similar conditions. What really depresses the soul of the teaching

profession is stagnation and utter lack of variety of work from which the other branches of service do not suffer. To some extent this may be compensated for by the daily contact of the professor with the bubbling enthusiasm of youthful minds, and by the exhilaration that comes from a joyous and unstinted devotion to original investigation that must tend to keep him young and hopeful. We are aware that the conditions of service in the different grades of the teaching profession differ radically and we shall deal here mainly with the members of a university staff.

The decision of the Government to terminate the services of professors at fifty-five years is one of those rules which in their very nature must operate unequally. It is perfectly true that some professors are too old at fifty or even forty, especially such as have neither a hobby nor vital interests beyond absolute routine; it is equally true that others are quite young at sixty-five or even seventy. It seems to us that in the higher branches of education, a living mind endowed with a wide and varied experience, a ripe and unfaltering judgment, a real enthusiasm and power to initiate and conduct research and a judicious temper and discernment must be a more valuable and indispensable asset than buoyance and vigour whether to universities or governments. Such a mind confers prestige and creates tradition. The two-fold nature of the work devolving on a professor demands at once a power and readiness on his part to put himself on a level with young and inexperienced men and a faculty to seek and establish variety in his own work. Age is commonly believed to produce in mind, a warped and embittered view of life, a total lack of sympathy with the overflow of youth, a dogmatic assertiveness "and an idealized memory of the greatness of past time". These effects, it must be remembered, are more pronounced in other walks of life than in teaching and so long as the professor maintains an inquisitive spirit towards learning and research, he is practically immune from the mental disease of old age. There are numerous cases of professors old according to government rules but young enough to retain their original freshness and mobility of mind to be able "to share in the enthusiasm of the young and to travel with them along the same road". The truth is that old age is not due to years but depends largely on circumstances and temperament "and the remedy therefore lies less in general

rules than in the treatment accorded to the professor during his career." Compulsory retirement at fifty-five years, we are convinced, is not a satisfactory remedial measure for a sickness which may have had its origin almost at the commencement of the service or even before. Subsequent conditions may either allay or aggravate the malady.

The first step is to prevent stagnation and routine from bearing unduly upon members of the university staff. For instance, the system of interchange of professors in the early stages of their career, study leave with deputation allowance in addition to usual emoluments and compulsory attendance at scientific and other conferences and congresses must help to keep the professor always alert and efficient. These suggestions may be supposed to be expensive and therefore may not commend themselves to the authorities, but the existing system of retiring the professors is equally exposed to this criticism. The scheme we here suggest has, however, the obvious advantage of securing for the institution concerned the foundations of prestige and tradition which cannot be measured in terms of money. At present Indian universities are labouring under a serious handicap in this respect though in spite of it some have already built up their own reputation, chiefly through the efforts of those who do not come under the fifty-five-year rule. The absence of tradition is largely due to the operation of the fundamental rules which deprive our institutions of their professors precisely at the time when they are in a position to create it. The plan that we have put forward of releasing the professors for a definite period at regular intervals and of requiring them to spend these intervals in some way beneficial to the institution to which they belong, deserves immediate consideration.

In emphasizing the need and the urgency of revision of the fifty-five-year rule, we are not asking for the establishment of a new procedure whose effects cannot be foretold. The system of making university posts life-time appointments has proved an advantage and an eminent success in Europe and other countries. In India the fifty-five-year rule is not applicable to certain class of offices and there is practically no age limit except the disinclination of the person himself for elective offices and those connected with industries. We have no well-tested and absolute standards for measuring

the worth and efficiency of public servants and the vague apprehension that at fifty-five an officer has ordinarily well-nigh exhausted his capacity for usefulness in public affairs will not stand close scrutiny. As we have pointed out that old age in the teaching profession is less due to advancing years than to circumstances and treatment, we should certainly have no hesitation in advocating the extension of the age limit to sixty years in the first instance, in the case of professors, and if the results are satisfactory,

as we are confident that they will prove to be, occasion will not be wanting for a general and more comprehensive review of the rule in its bearing on other branches of educational service as well. The importance of research in our universities and of its power to create a tradition for the country is just beginning to be recognized by the public and the only tangible way of appreciating and encouraging it is to prolong the period of the usefulness of the professors in the universities upto at least sixty years.

### Nuclear Structure.

By Prof. B. Venkatesachar, M.A., F.Inst.P., and T. S. Subbaraya, B.Sc.

THE isotopic constitution of a large number of elements is now known, while the study of band spectra and hyperfine-structure of line spectra has, in a considerable number of cases, led to the determination of nuclear spins with more or less certainty. There have been a number of attempts<sup>1</sup> to explain the isotopic constitution. The problem of explaining the observed nuclear spin has also been attacked: S. Bryden<sup>2</sup> and H. E. White<sup>3</sup> have attempted a solution on the hypothesis that nuclear spin is due to the spin and orbital motion of the protons while the electrons in the nucleus are supposed to have lost their spin. But, as Iwanenko<sup>4</sup> suggested and particularly as Heisenberg<sup>5</sup> has shown, it is unnecessary to postulate the separate existence of electrons in the nucleus; we may assume that the nucleus consists of protons and neutrons only. Now Heisenberg has deduced that the system of two protons and two neutrons, namely, an  $\alpha$ -particle, is very stable. Hence we are led to postulate that pairs of protons and neutrons within the nucleus combine into as many  $\alpha$ -particles as possible, an  $\alpha$ -particle having, of course, no spin. When this is done the number of  $\alpha$ -particles, protons and neutrons that compose a nucleus of atomic weight  $N$  and atomic number  $Z$  can be uniquely determined. The number of  $\alpha$ -particles is the integral part of  $Z/2$ , and when  $Z$  is odd there is one proton. The number of neutrons is  $N-2Z$  or  $N-2Z+1$

according as  $Z$  is even or odd. To take an example,  $O_{17}$ ,  $Z=8$  contains 4  $\alpha$ -particles, no proton and 1 neutron, while  $Cl_{37}$ ,  $Z=17$  contains 8  $\alpha$ -particles, 1 proton and 4 neutrons. That Pauli's principle should apply to neutrons also has been pointed out by Heisenberg<sup>5</sup>. Considerations of the statistics of nitrogen nuclei have led him to postulate that every neutron has a spin of  $\frac{1}{2} h/2\pi$ . The occurrence of a large nuclear spin like  $9/2$  in the case of a few elements while in many other cases it is small, suggests that shells of neutrons which possess orbital motion must contribute to the nuclear spin. Accordingly, we have in this work assumed that the nucleus consists of  $Z/2$   $\alpha$ -particles, and 1 proton when  $Z$  is odd, with  $N-2Z$  or  $N-2Z+1$  neutrons. The  $\alpha$ -particles have no spin, and the contribution of the neutrons to the nuclear spin is the resultant of their spin and orbital moments while the resultant moment of the nucleus is equal to that of the neutrons together with that of the single proton if present. The resultant moment of the neutrons can then be calculated exactly as the resultant  $j$ -value in the case of extranuclear electrons. We may expect that the observed spin will be that corresponding to the  $j$ -value of the deepest term. Table I shows how far this procedure leads to the observed spins.

The above table shows that in the majority of cases the observed spin corresponds to the  $j$ -value of the deepest term. In the case of V, Mn, Cu, Ga, Cd, Sb, I, Cs,  $Ba_{137}$ , La, Pr and Pb the observed  $i$ -value (nuclear spin) does not correspond to the  $j$ -value of the theoretically deepest term, but to that of one of the other

<sup>1</sup> W. D. Harkins, *Phys. Rev.*, **38**, 1270, 1931.  
H. C. Urey, *J. Am. Chem. Soc.*, **53**, 2872, 1931.  
J. H. Bartlett, *Nature*, **130**, 165, 1932.  
<sup>2</sup> S. D. Bryden, Jr., *Phys. Rev.*, **38**, 1989, 1931.  
<sup>3</sup> H. E. White, *Phys. Rev.*, **38**, 2078, 1931.  
<sup>4</sup> D. Iwanenko, *Nature*, **129**, 798, 1932.  
<sup>5</sup> W. Heisenberg, *Zs. f. Phys.*, **77**, 1, 1932.

<sup>6</sup> W. Heisenberg, *Zs. f. Phys.*, **78**, 159, 1932.