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American and British Superannuation Systems.

THE fifteenth annual report of the president and of the treasurer of the Carnegie Foundation for the Advancement of Teaching provides some interesting reading, particularly with regard to the pension system in operation in the universities and colleges of the United States. The work of the Foundation falls into three parts: (1) the completion and liquidation of the old system of full-paid pensions; (2) the development of the contractual forms of insurance and of old-age annuities through the policies of the Teachers' Insurance and Annuity Association; and (3) the prosecution of significant studies and reports through the Division of Educational Inquiry. The last-named constitutes an important and active branch of the Foundation, with an income derived from the investment of a capital of one and a quarter million dollars. Its most recent inquiries relate to the subjects of legal education and the training of teachers. As a result, "A Study of the Training of Teachers for the Public Schools" has recently been published, and there is promised in the immediate future the first section of a "Study of Legal Education." Without doubt, such inquiries form an increasingly valuable feature of the work of the Foundation.

On the other hand, it is to be noted that the trustees administer a total sum of almost twenty-five million dollars, the income from which is at present mainly devoted to superannuation purposes. For the year ending June 30, 1920, the sum

of 875,514 dollars was granted in retiring allowances to administrative officers and teachers or their widows in certain of the colleges and universities in America. As is well known, the gift was intended primarily to establish retiring allowances for teachers in the higher institutions of learning in the United States, Canada, and Newfoundland. The income was, however, quite insufficient to provide for all these, and at present the pension obligations of the Foundation are confined to some five or six thousand teachers and administrative officers who were in the service of institutions associated with the Carnegie Foundation on November 17, 1915. As the income is released, it will be devoted to the advancement of teaching in American colleges and universities.

With regard to the officers and teachers who do not participate in these pensions—the large majority—the trustees have promoted a contractual plan of old-age annuities, and some fifty pages of the report give an account of its progress and development. In brief, it is a contributory system of deferred annuities which will gradually supersede the previous non-contributory pension scheme. It is intended that the teacher should contribute 5 per cent. of his salary, and the institutions a like sum, the combined premium to be paid to the Teachers' Insurance and Annuity Association and to become the property of the association. In exchange the teacher will receive an annuity policy—a contract which guarantees that in case he dies before the stated age a sum equal to the premiums with interest will be paid to his dependents, and that in case he lives to the stated age a selected annuity of equivalent value will be paid. It will be observed that insurance is considered a responsibility of the teacher alone. The success of the scheme so far may be measured by the fact that the association, which began the issuing of contracts in March, 1919, had, by July, 1920, issued policies representing more than two and a half million dollars insurance, and also annuities representing the payment at maturity of nearly half a million dollars annually.

It is instructive to compare this scheme with the Federated Superannuation System of British universities. In the first place, some five or six thousand American teachers who were in service in the associated institutions before November 17, 1915, are well provided for by the Foundation by means of a non-contributory scheme for which there is no parallel in the British scheme. The nearest approach to this splendid provision is the

recent Government grant of 500,000*l.*—a sum, however, which is less than half what is required to put the pensions of the senior members of the university staffs upon a satisfactory footing. In addition, the Carnegie Foundation will continue to provide retiring allowances on the same non-contributory basis to a certain number of old and distinguished teachers. Next, in the British system there is no specific provision for widows or orphans, nor is there provision for disability such as has been instituted by the Carnegie Foundation "for the teacher who, despite his own foresight and self-denial, finds himself and his family the victims of disease or of accident." The reserve accumulated to meet such claims is now 220,000 dollars.

Further, the American scheme is administered from within, as opposed to the Federated System, which is worked through insurance companies. In consequence, there is economy in administrative and other expenses. Insurance companies are not philanthropic institutions. Mr. Fisher, President of the Board of Education, on the second reading of the School Teachers (Superannuation) Bill, 1918, was aware of this when he stated that if the Act were worked through insurance companies there would be the objection that public money was going in dividends to the shareholders of these companies. This is precisely what is happening in the Federated Superannuation System to-day. The Teachers' Insurance and Annuity Association furnishes policies better suited to the teacher's needs, and at lower cost, than companies operating on a commercial basis.

The report contains a mass of interesting matter relating to pensions and pension schemes, including arguments, by no means convincing, in favour of contributory schemes as opposed to non-contributory.

Lord Rayleigh's Scientific Papers.

Scientific Papers. By Prof. John William Strutt. Vol. vi., 1911-19. Pp. xvi+718. (Cambridge: At the University Press, 1920.) 50*s.* net.

THE sixth¹ volume of Lord Rayleigh's collected works, just issued by the Cambridge University Press, contains his papers, nearly one hundred in number, published between 1911 and his death in 1919. In fact, the last two papers, Nos. 445 and 446, of the whole series were left ready for publication, but had not appeared when

¹ A notice of vol. v. appeared in *NATURE* for October 28, 1913. The other volumes were reviewed at an earlier date.

he died, while the concluding paragraphs of No. 444, on "The Travelling Cyclone," were dictated by him only five days before his death on June 30. He was happy in being able to continue his work until so near the end, and in his fifty years of active scientific life to achieve so much.

The papers in the volume range over a wide list of subjects, and while none of them have the importance of some of those appearing in earlier volumes—*e.g.* the series on the fundamental units of electrical measurements, or the publications describing his work on gases and the discovery of argon—they are marked, as ever, by his power of clear thinking, his grasp of first principles, and his ability to appreciate the essentials of any problem which appealed to him. Some three or four of the articles were contributed to the discussions of the Advisory Committee for Aeronautics, over which he presided for ten years. Among these may be specially mentioned No. 389, the note on the formula for the gradient wind, in which the formula connecting the velocity of the wind, the barometric pressure, the latitude, and the rotation of the earth, which had been employed by Gold and other meteorologists, is derived, assuming the motion in two dimensions, from hydrodynamical principles. The paper No. 444, already mentioned, on "The Travelling Cyclone," though not formally communicated to the Committee, arose out of its discussions.

There are also some notes and reviews communicated to *NATURE*, but most of the other articles appeared in the *Philosophical Magazine*. Hydrodynamics, optics, and acoustics form the subject-matter of many—problems of vibrations in the solution of which the methods developed in the theory of sound or in some of his earlier optical work are employed with success. Of recent years he returned to a number of optical problems which in earlier days had interested him, and advanced our knowledge by his work. Among these papers may be mentioned several on the scattering of light by small particles. The problem was discussed in the well-known paper on "The Blue of the Sky," published in 1871, and in 1918 Lord Rayleigh gave the complete solution for a sphere in which the structure is symmetrical, but periodically variable, along the radius, while a further paper—*Phil. Mag.*, vol. xxxv.—discussed the case of the scattering of light by a cloud of similar small particles of any shape oriented at random. He was led to investigate the question by the results of his eldest son's experiments on light scattered by carefully filtered gases.