

THURSDAY, FEBRUARY 17, 1916.

*SCIENCE IN THE PUBLIC SCHOOLS AND  
THE CIVIL SERVICE.*

FROM the welter of the billows which have recently beaten about the place of science in education, in the columns of the periodical Press, two main points stand out, namely, those of the dominance of classical and literary teaching in our great Public Schools, and its influence upon the older universities and the public Services. Our political leaders and administrators of State departments are in the main trained in these schools, where vested interests preserve the prime places in the curriculum for ancient learning, and scientific subjects are discouraged for students who hope to obtain university scholarships or appointments in the highest ranks of the Civil Service.

The position of affairs has been stated clearly in correspondence published in the *Observer* during the past few weeks, particularly with reference to the undue proportion of open scholarships allotted to classics at the older universities. There is no question as to the facts, but Dr. A. E. Shipley and Mr. H. A. Roberts attempt to justify, or rather to explain, them by standards of attainment. They point out that the award of scholarships depends upon the ability of the candidates presenting themselves, and assert that real ability is found much more rarely among those who offer scientific subjects than among the candidates who have selected classics. "No candidate," they say, "in natural science who reaches the necessary standard of ability is likely to be rejected. But the supply of candidates of sufficient ability is not so great as it should be."

This is especially true of candidates from the great Public Schools, and it is with this deplorable condition of things that we are at the moment most concerned. In a recent year, according to Dr. Shipley and Mr. Roberts, in one of the greatest of such schools, excellently equipped for scientific studies, less than 2 per cent. of the boys in the higher forms were giving special attention to science, and only one or two of these were of sufficient ability even to appear as competitors in any scholarship examination at the universities, so that "the contribution of this great school to the scientific ability of the country was less than one-fifth of 1 per cent. of the total numbers of the school."

We should have supposed that such facts as these would be sufficient to condemn the present

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system, and to induce advocates of reform to make the most strenuous efforts to alter it. The "Converted Classic," to whose remarks the letter by Dr. Shipley and Mr. Roberts was intended as a reply, asks pertinently why the universities thus submit to the dictation of the Public Schools as to the relative value of science and classics instead of themselves prescribing subjects, and by limiting the awards to classics to induce the headmasters to give adequate attention to science.

"The study of classics," he adds, "is a luxury, and should be treated as such; the study of science is a real and present necessity. Classical training tends to produce the official; scientific training tends to produce the man of initiative and action—the creator. Which of the two types is the more necessary at the present time? Let, then, higher education take the initiative; let the 'Varsities force the schools, for in their hands, to a great extent, lies the remedy."

It is not at all certain that the headmasters of the Public Schools would adopt a new attitude towards science even if the universities limited the number of classical scholarships in the manner suggested; for most of the pupils sent up are not scholarship candidates. The result of the action would, however, encourage the development of scientific work in the State secondary schools, and the end would be that these schools would secure the science scholarships, while as regards the current of modern needs the Public Schools would be in a backwater. They may be content to occupy that position, but there is no reason why a premium should be placed upon their unprogressive methods. What we have to get rid of is the idea, naïvely expressed by a correspondent in the *Westminster Gazette* a few days ago, that the classical studies of the ancient schools and universities should be reserved for men who are to occupy the highest branches of the public Services. The assumption that classical languages and literature are essential to the education of people who are to control our affairs, and that a knowledge of science is not needed in this capacity, is responsible for the chief defects which have to be remedied if we are to compete successfully in peace or war with other leading nations. A truer view is that no one should be entrusted with the administration of affairs of State who has not received a scientific education, and that classical learning should be considered as an intellectual hobby.

As things are at present, it pays far better to study classics than science, if a post of importance in the Civil Service is the proximate or ultimate end. The examinations for Clerkships (Class I.)

bear much the same relationship to the older universities that the universities bear to the Public Schools. Candidates for appointments in the Home and Indian Civil Services, and for Eastern Cadetships, are at liberty to select any of thirty-eight subjects, provided that the total number of marks carried by the subjects does not exceed six thousand. At least ten or twelve subjects must be taken, and a high standard reached in them, in order that a candidate may have a reasonable chance of success. The majority of the successful candidates select Greek and Latin, English history, language and literature, mental and moral science, and political economy. Occasionally, a brilliant mathematician will secure a good total of marks, but candidates who specialise in science rarely obtain a high place.

The considerations which determine largely the nature of the subjects selected are the relative number of marks obtainable and the attention given to different branches of study at the Public Schools and the older universities. Greek and Latin languages and literature have each eleven hundred marks, and five hundred each in addition for Greek and Roman history. The only subjects which compare with these as regards allocation of marks are included in the groups Lower and Higher Mathematics, each of which has a maximum of twelve hundred. Chemistry, physics, geology, botany, zoology, animal physiology, and geography carry six hundred marks each, but not more than four science subjects can be offered—the candidate who will present himself for examination in more should certainly not be encouraged—or three if both Lower and Higher Mathematics are taken.

A fairly high standard of attainment is thus required in four separate branches of science in order to hope for the same number of marks as can be obtained for a knowledge of Greek and Latin language and literature. This fact, and the predominance of classical studies and interests in the educational institutions most favoured by the wealthier classes, is responsible for the selection of subjects by candidates who present themselves for examination. At the examination held just before the war began there were 206 candidates for 78 appointments. Of those who were successful only four offered science subjects without mathematics or classics, and seventeen owed their position to marks from mathematics with science. Forty-five specialised in Greek and Latin, and the remainder presented themselves in other literary subjects, with or without mathematics.

This analysis is typical of results of examination

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for Clerkships (Class I.), and it shows that the great majority of the men appointed to the highest positions in the Civil Service, and by whom national affairs are to be administered, are specialists in classics without an elementary knowledge of science, and with no conception, therefore, of the meaning of scientific method. It follows almost naturally that nearly all the successful candidates are from the universities of Oxford and Cambridge, and especially from Oxford. It is possible that the Civil Service Commissioners believe that their system of marking gives an open field to all students—whether classical, scientific, or linguistic—but the result is the same as that from the selection of scholarship candidates, namely, the appointment of few men of scientific attainments; and the cause of it all is the neglect of science, and the predominance of classics, in the curriculum of the Public Schools.

In 1914 the Royal Commission on the Civil Service recommended the Government to appoint a committee with the object of ascertaining whether there is any substantial foundation for the view which certainly prevails that the scheme for examination for Class I. unduly favours the curricula of the older universities and handicaps those of the newer. It was suggested that, should it be found any change is desirable, the committee, while maintaining the high standard necessary for the examination, should revise and rearrange the syllabus, weighing the educational value of classical learning against those of modern and scientific studies. The committee has not, so far as we know, yet been appointed, and we are not very sanguine as to the effect of any changes which it might recommend, while the work of our Public Schools remains almost entirely in the hands of classical headmasters. They and the parents trained on the Chinese method seem to be incapable of understanding why the needs of the present day differ from those of past centuries.

Latin and Greek were first introduced into our schools as a means of acquiring new knowledge, and not because of their supposed formative influence upon character. When Augustine established the first grammar school in England, at the end of the sixth century, Latin was taught in order that the native priests, and converts of the upper classes, might understand the rudiments of the new religion. From that time to the Renaissance and onward, the learning of Latin was the whole aim and end of education in schools; because the language was the living tongue of scholars. For, as the late Mr. A. F. Leach points out in his "Schools of Medieval England," people wanted to

know Latin, not to write Latin verses in imitation of Vergil, but to speak it or to read the latest work on theology or tactics or geography. The introduction of Greek into the curriculum of schools came with the Renaissance, but was not, as is often suggested, responsible for the birth of the new learning. Greek was introduced into Winchester and Eton, New College and Magdalen, in the fifteenth century, because these schools and colleges were the advanced institutions of the day, and their scholars the leading humanists of their age, eager for new light. Humanism then meant the substitution of new teaching for old, and its followers aimed at moulding "the nature of man as a citizen, an active member of the State," rather than at continuing the studies of doctrines relating to the next world upon which the attention of educated mankind had been concentrated for a thousand years.

We want to see a like recognition of the need of scientific knowledge on the part of the humanists of to-day, in the place of that attitude of obscurantism which they present to it. We want to make science the keynote of our Public School and University system, as Humboldt and others did in Prussia at the beginning of the nineteenth century, when Germany was under the heel of Napoleon; for to it are due the position and power gained by that country since then. The lesson which the French learnt from their disaster in 1870 was that attention must be given to education at every stage, and more especially to higher education, in order to secure their position most effectively. Are we to await like defeat before taking the necessary steps to ensure that our legislators, governing officials, and others who exert the highest influence in the State receive the scientific education which modern life demands?

#### CATALYSIS.

*Text-books of Chemical Research and Engineering. Catalysis and its Industrial Applications.* By E. Jobling. Reprinted from *The Chemical World*. Pp. viii+120. (London: J. and A. Churchill, 1916.) Price 2s. 6d. net.

THIS little book consists of a series of articles originally contributed to *The Chemical World*, and deals with a class of phenomena which have attracted special attention of late years owing to their growing importance in many operations of chemical technology. The fact that certain chemical processes can be initiated or greatly accelerated by the presence of some foreign material which *apparently* remains unchanged was recognised in the early part of

the last century and denoted by the term *catalysis*, first applied by Berzelius in 1835. One of the earliest facts which is brought to the knowledge of the chemical tyro is the influence of manganese dioxide in promoting the disengagement of oxygen from potassium chlorate, and if he ponders at all upon the circumstance one of his earliest impressions must be of the inadequacy or unsatisfactory nature of the explanation of the cause of the phenomenon. But as his knowledge increases he learns to recognise that the influence of extraneous substances in promoting chemical change is in reality a very common phenomenon. At the same time, comparatively little is known of the mechanism of these catalytic actions. In a few cases it has been definitely ascertained that the catalytic agent does experience a series of changes. During the course of a reaction it is being continually decomposed and recomposed, and by suitable means the presence of the intermediate product can be detected. Hence it is reasonable to suppose that all catalytic phenomena depend upon the alternate decomposition and recombination of the catalytic agent. Another curious fact brought to light by the industrial application of catalysis is that the activity of a catalytic agent may be wholly inhibited by the presence of another foreign body or, in the language of the technologist, of a so-called *poison*.

In Mr. Jobling's book much that is known of a rapidly developing subject has been brought together and described in a clear and interesting manner. In an introductory chapter he deals with the purely scientific aspects of catalysis and the characteristics of catalytic reactions, autocatalysis, pseudo-catalysis, etc. The rest of the book is concerned with the industrial applications of catalytic agents, as, for example, in the manufacture of sulphuric acid by so-called contact processes; of chlorine and salt-cake by Deacon and Hasenclever's process and the methods of Hargreaves and Robinson; of sulphur recovery by the Claus-Chance and Gossage processes; of the fixation of atmospheric nitrogen by the Haber and Ostwald's processes, etc.; of surface actions as illustrated by the work of Bone and his co-workers on surface combustion; incandescent gas-mantles, etc.; of hydrogenation, the work of Sabatier and Senderens and its application to the "hardening" of oils—a phenomenon of the greatest practical utility. Lastly, we have two short chapters on dehydrogenation and oxidation; and on dehydration, hydrolysis, etc., interesting as serving to throw light upon a variety of complex reactions depending apparently upon catalytic agencies, and as suggesting their applications in technical processes.