

by means of rigid surfaces, the stability asked for being somewhat similar to that of a Canadian canoe, which allows rolling up to a certain inclination for very small movements of the occupant, but offers great resistance to any motion beyond that limit. Such stability, if realisable, would leave the aeroplane sensitive to the pilot's control except in cases of emergency, when the aeroplane had departed considerably from its position of equilibrium, when it would assist the pilot to regain control. If, alternatively, it should ultimately be decided that the pilot must be assisted automatically, then some such device as the Clarke Johnson gyroscopic control exhibited might be used.

SCIENCE AT RECENT EDUCATIONAL CONFERENCES.

IN a previous article (January 23) reference was made to the teaching of physiology and hygiene in schools. At the London County Council Conference of Teachers a considerable portion of the programme was concerned, directly or indirectly, with these subjects. Prof. Starling presided at the fourth session, and referred to the training in physiology of the teacher and the training in physiology or hygiene of the child. It was sufficient if the child was brought up with the knowledge of the rules of right living, but these rules were founded on physiology, and the teacher must have reason for the faith that was in him. On that ground the Physiological Society had appealed to the Board of Education to provide additional facilities for the study of physiology by teachers, and to make such study compulsory.

At the same meeting Prof. Leonard Hill gave an address on open-air and exercise, Mrs. Truelove read a paper on instruction in infant care in girls' schools, and Mr. A. J. Green discussed the value of the open-air school. It is further to be noted that, at each of the three preceding sessions of this conference, subjects bearing closely on the health of the children were brought forward, and the medical profession figured prominently in the discussions. As we are all aware, the tendency to pay regard to the physical welfare of school children is prominent in the programmes of other educational meetings—e.g. British Association, Section L. Why this exceptional solicitude at the present time?

It may be granted that administrative and political factors have given much strength to this movement, but there are perhaps somewhat deeper reasons for the ready response of teachers to the call now made upon them to regard their work as one of the agents in determining the health of the nation in years to come. One of these deeper reasons is that biology, with her handmaiden evolution, is come into her own. The child is viewed as an organism; teachers and administrators are thinking biologically. The old platform tag, *mens sana in corpore sano*, implied a duality of mind and body, whereas to-day we recognise that the *mens* and *corpus* are educationally inseparable. The psychology of McDougall and the newer school is the offspring of a union of the old psychology with biology—it is not a mere change of the old, but a new-born science. And of this new source of inspiration teachers are drinking in increasing numbers.

The papers of the third session of the L.C.C. Conference were devoted entirely to an exposition of the modern teachings of psychology on the subject of attention. Prof. Spearman, who presided, stated the relations between psychology and education as those

of "equal allies who had a joint mission—perhaps the greatest national mission—the making of the nation itself." The words just quoted give the clue to the other great influence which, side by side with psychology—the thinking biologically of the individual—is now influencing the trend of educational ideals and progress. This second influence is to be found in the growing sense of social and economic interdependence—the thinking biologically of communities—the viewing of the State as an organism, and even of world-commerce as an organism. Hence the feeling that an education lacks an important essential which neglects that promising avenue of human progress—the study of economics. There also flows from this sense of social solidarity an increased sense of responsibility for the economic conditions affecting the lives of the poorer classes.

These trends of thought and feeling found respective expression in the educational conferences in the discussions on economics for schoolboys at the L.C.C. Conference, when secondary education was being discussed, and in those on household economics of the poor, at the meeting of Teachers of Domestic Subjects. At this meeting Mr. J. Wilson proposed to weave the two threads of State and domestic economics when he suggested that, in the allocation of the State Development grants, the claims of investigation into possible improvements of methods or appliances used in household work should receive consideration.

That thousands of teachers assembled during their Christmas holidays in twenty conferences in order to "talk shop" shows to every thoughtful person that the teaching profession is spiritually sound. This article fails if it does not indicate, however imperfectly, that the profession is studying its calling with the methods of science, and is no longer satisfied with empiricism. The growth of a body of educational workers thus animated with scientific purpose is the best warrant, if not of the present existence, at least of the imminent development, of a science of education.

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MODERN MICROSCOPICAL OPTICS WITH SPECIAL REFERENCE TO FLUORITE OBJECTIVES.

GAUSS'S theory of lenses and other optical systems, which was published in 1840 in his "Dioptrische Untersuchungen," and subsequently largely extended by many other investigators, rendered it possible to apply the cardinal theorems relating to the formation of optical images to the most complicated systems of lenses, of which already in Gauss's time the microscope objectives furnished a good example. This theory paved the way for the computation of microscopic objectives and furnished a means of studying the optical principles of the microscope as a whole and the objective and eyepiece considered separately.

Even before Gauss, Fraunhofer in 1820 had succeeded in devising a complete system, enabling him to compute telescope lenses, and a little later Seidel and Steinheil evolved a similarly complete system for the computation of photographic lenses.

Prof. E. Abbe, who in 1866 became associated with the optical establishment of Carl Zeiss in Jena, was the first to venture upon a complete calculation of the microscope objective by applying the theory of Gauss. After a series of futile attempts, he established a system by which a microscope objective could be computed in every detail. The methods by which