THE SCIENCE TEACHERS' ASSOCIATION AND THE COMMISSION.

TEACHERS of Science in New South Wales who were unable to attend the two meetings of the Science Teachers' Association at which the matters were discussed, have asked for information as to the recommendations which were made by the Association to the Educational Commission in New South Wales at the close of 1933.

At the earlier meeting, in September, the views of the members were obtained with regard to opinions to be expressed before the Commission (as being those of the Association), and the resolutions adopted were then embodied in a document submitted to the Commissioners. Subsequently, the secretary (Mr. T. R. Mason) being unable to attend at the stipulated time, he was represented before the Commission by Mr. Willmott, a member of the Council.

The opinions and suggestions presented before the Commission were:—

(*a*) The Science Teachers' Association of New South Wales, in discussing the importance of the teaching of quantitative science in schools, emphasises the fact that it is the course of study in High Schools (or their equivalents) that is in question, and not preliminary courses in general science in schools and classes of lower grades. We agree that a general Science course—including (1) the elements of physics, giving simple explanations in terms of fundamental principles of science, of phenomena noticed every day; (2) an elementary idea of chemical reactions; (3) a rudimentary discussion of geology and biology—might well be introduced into junior classes, the standard being suited to the children taught, and the knowledge disseminated being merely sufficient to avoid committing the crime of permitting any children to leave school without sufficient scientific knowledge to enable them to understand something of their relations to the world in which they live, and to protect them from acquiring wrong ideas.

(*b*) We recognise the value of the addition of some teaching of biological sciences to senior students; but we feel strongly that in the present course in Elementary Science, the subject of Physics is not taken to a

sufficiently advanced standard, and that too much is omitted. We feel that the value of a sound training in the elements of that subject requires to be emphasised. Apart from any application of physics—and the quantitative teaching of any other science presupposes a knowledge of elementary physics—it is pre-eminent as a training in observation, quantitative measurement, and inductive reasoning. It is invaluable in the teaching of orderly thought; it would be difficult to over-estimate the cultural value of the subject.

(*c*) At present the subject of Elementary Science is divided into two sections, Physics and Chemistry, to each of which is allotted the same time in teaching. We would regret to see any lowering of the standard of the chemistry teaching by reduction of the time available for that purpose, though the syllabus might be revised to cover a more general course, including some elements of organic chemistry.

With regard to Physics, we would point out that of the four sections at present included in the Intermediate course in Physics, even now candidates are only required to study two sections. It is certainly regrettable that students can pass through a High School course and have no knowledge of the elementary principles of sound and light; many, moreover, have no knowledge of the elements of heat, or omit the study of the elements of mechanics. We feel that we are training citizens to take their places in the scientific world in which they find themselves, and which probably for the rest of their lives will be making more and more economic use of the principles of Physics.

(*d*) At present, for the full course in Physics to the Intermediate Certificate standard, sections I to IV may be taught. For the Elementary Science course, two sections only, from sections I to III, are prescribed, though in many schools sections I, II, and III are taught. Time certainly does not avail for the teaching of section V, which is an elementary treatment of electricity and magnetism; but many boys who are interested in the applications of electricity, continue by themselves the study of this section. We would certainly like to see sections I to IV, inclusive, included in any general science course; we believe that, by omitting some subject not of much importance to-day, more time might be made

available for the teaching of Science. If this is not possible, we would certainly press for the allotment of at least the present time to Physics, the extension of the course to cover one or two extra sections of Physics in the Elementary Science course being offset by the omission of certain sub-sections of a more difficult nature (*e.g.,* the nature and use of the spherometer, area of surface of cone and sphere, precision balance work, corrections to barometer readings, certain more mathematical subsections in the section on mechanics, quantitative experiments with the sonometer, quantitative work on organ pipes and resonance, quantitative work on photometry). We emphasise strongly the necessity for teaching Science with the aid of numerical values, not on account of the mathematics, which can be kept simple, but because this does ensure an understanding of the principles, and also enables students to apply their knowledge. If a "school certificate course" of four years is in question, we would like to see the elements of electricity and magnetism added to the above in any general Science course, to the same elementary standard as covered by the prescribed text-book.

(*e*) We recognise that cramming for examinations is an evil to be avoided; but we feel that the competitive effect of a general examination, which is a rational test of a good course conscientiously performed, is of value to school and scholar. The same damage is likely to arise from competitive sport if it is not guarded against; but properly directed it is of great value.

Much of the difficulty in examinations is overcome by giving a wide choice of questions, and ample time to reply to them, so that the candidate is given an opportunity to do himself justice. Much must necessarily depend on the Chief Examiner, as to whether the candidate is given full credit for what he does know, so that the examination is a true test of his knowledge. The solution of that difficulty appears to lie in a suitable choice of examiners.

(*f*) So far as the syllabus in Biology is concerned, we think that the standard covered by the first and second years of the Agricultural Science course should be a minimum, if the subject is to be of value. This course naturally would require modification, as it is intended for a special class of student as set out in the existing syllabus.

(*g*) To cover the syllabus required for a General Science course in the first three years of secondary education, we consider that the allotment of periods should be as follows:—

Physics	3 periods (minimum)
Chemistry	2 periods
Biology	2 periods

We further suggest that the Biology periods be equally divided between zoological and botanical science.

(*h*) These four sections of Science (Physics, itself of many sections; Chemistry, Zoology, and Botany) are surely as important as, and are worthy of as much time for study as a single language, which is now allotted six or seven periods a week, or mathematics, which is allotted seven or eight periods a week.

Ten copies of the document embodying these resolutions were sent to the Secretary of the Commission, and, subsequently, at his request, ten further copies were made available for distribution to committees.

X-RAYS AND THEIR BIOLOGICAL EFFECTS.

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(*Continued from last issue.*)

General Biological Effects.

Before proceeding to a consideration of the more precise apects of quantitative radio-biology we will note a few general results, selected from the extensive literature, which may be of some interest and serve to convey some idea of the general effects of radiations on living organisms. Some of the earliest systematic observations of the effects of X-rays upon developing forms of animal life were made and recorded by Perthes in 1908. He exposed the eggs of ascaris under certain conditions (which he described), and found that the general appearances of the irradiated eggs fell into two divisions accordingly as they were more or less severely damaged by the exposure. In the more severely damaged class are those eggs which do not proceed to the formation of a recognizable embryo, but remain