

Space science and Astronomy have received fairly extensive treatment over the last ten years, as indicated by the Times Index, and the U.K. continues to make important contributions in all aspects of these subjects. Yet, during this same period there has been less than one article per year listed on Astronomy in U.K. schools. This reflects the sad fact that astronomy is not yet considered a part of the curriculum and many pupils leave school with little or no knowledge of the subject.

In 1973, to mark the 500th anniversary of the birth of Copernicus, T.E.S. carried an article by John Ebdon, Director of the London Planetarium, in which he argued a convincing case for including astronomy in the curriculum. In 1978 T.E.S. carried a report on a survey of students entering colleges of education, to find out how well they were being prepared and educated for life. This survey was based on an earlier one conducted by the Association for Education in Citizenship in 1950. Both surveys showed that 92% of students received no instruction in astronomy. The reasons given for including astronomy in the questionnaire were that, "A valid contemporary outlook is not possible without a general understanding of the cosmos in which we are living, and there can be few better antidotes to base materialism, ... than an appreciation of the vastness and wonder of the universe as revealed by astronomy.

How did such a situation arise? Why has astronomy in schools not developed over the last few years? Are there valid contemporary educational reasons for including astronomy in any revision of the secondary science curriculum?

Astronomy teaching started in the 19th century in the major public schools, but soon became part of teaching in elementary schools, various public educational institutions, and teacher training colleges. From 1870 onwards there was a rapid decline in astronomy teaching in schools. Biology, chemistry and physics were being incorporated into the curriculum - a historian suggests these subjects were considered relevant to the needs of medicine, agriculture and industry - and the code of practice for teacher training was revised, leaving out astronomy. The aspects of astronomy that were relevant to navigation were confined to nautical schools and colleges. The subject was, however, still taught in some schools by dedicated teachers with an enthusiastic interest.

The real revival of interest in astrology occurred with the coming of the Space Age. The establishment of a number of planetaria in various parts of the country in the 'sixties and 'seventies did much to promote interest in the subject among school children and their teachers. Astronomy was also included in several physics, general and environmental science syllabi that were developed at this time. Planetaria had a great influence on astronomy teaching in primary schools, but all the factors mentioned above had much less effect on secondary education.

In 1979 representatives from the D.E.S. and several astronomical societies met to discuss astronomy teaching in schools and these discussions led to the setting up of an ad hoc Working Party on the subject. As a result, partly of the activities of this Working Party, but more directly through the initiative of three planetarium directors and a C.F.E. lecturer, the Association for Astronomy Education (A.A.E.) was set up at a meeting at the Merseyside County Museum on 16 May, 1981. Mr D. J. Gold agreed to become its first President, and Professor F. G. Smith, now Astronomer Royal, agreed to be its first Patron. The general aim of the A.A.E. is to promote astronomy teaching at all levels of the education system, but an important specific aim is to promote the inclusion of astronomy in the curriculum.

A great deal of interest has recently been focussed on the curriculum in general and the science curriculum in particular. Much of this has followed from publications by the D.E.S., the Association for Science Education and the Royal Society, and the setting up of the Secondary Science Curriculum Review (S.S.C.R.). The opportunity now exists to include astronomy in any revised models of the curriculum. A recent issue of T.E.S. reported that staff of the S.S.C.R. felt that such subjects as "astronomy and geology" ought to be included in the revision of the curriculum, and on behalf of the A.A.E. the author initiated discussions with Dr R. West, Director of the S.S.C.R., in this respect.

There are compelling reasons for including astronomy in any school curriculum.

Western culture bases its overall view of the structure, evolution and origin of the universe on astronomical observations interpreted in terms of the known laws of physics. This standpoint influences our social and cultural values. Thomas Kuhn, in 'The Copernican Revolution', says, "Every civilization and culture of which we have records has had an answer for the question: 'What is the structure of the universe?'. But only the Western civilizations which descend from Hellenic Greece have paid much attention to the appearance of the heavens in arriving at that answer. Yet our view of the universe has affected our religious belief, our philosophy,

our art and our literature." In his book, 'Civilization', Sir Kenneth Clarke drew attention to the relationship between cosmology and art: "... Artists, who have been very little influenced by social systems, have always responded instinctively to latent assumptions about the shape of the universe." The influence of astronomical thought on literature is evident in the works of Chaucer, Donne and Thomas Hardy. The trial of Galileo illustrates the effect of cosmological theories on religious belief.

Another very important reason for including astronomy in the curriculum is that the external universe does affect our terrestrial environment in several ways. It is, of course, well known that radiation from the Sun, modulated by the movements of the Earth, is responsible for day and night and the seasons. The tides are caused by the combined gravitational pull of the Sun and Moon on the oceans. The Earth is also continually bombarded by sub-atomic particles from the Sun; from the Galaxy; and from violent events in distant galaxies. These particles in turn are affected by magnetic storms on the Sun and magnetic fields between the stars. Since an important part of science is concerned with the physical factors that affect Earth, it is important to include a study of the forces, fields, radiation and particles that link the geophysical environment to the extra-terrestrial environment.

Physics is fundamental to all science and technology, but no physics course is complete without some discussion of astronomy. Physical discoveries made in an astronomical context have influenced the history of the subject. Furthermore, the universe provides an extension of our terrestrial laboratories which allows physicists to investigate the behaviour of matter and the laws of physics under conditions that cannot obtain on Earth. Astronomy also allows physicists to test the spatial and temporal validity of physical law. To limit the teaching of physics to terrestrial situations is to reduce the universal grandeur of physical concepts to a parochial set of rules.

Astronomy also makes vital contributions to other sciences. Time plays an important part in all science, and astronomy has made fundamental contributions to an understanding of this subject. The short period cycles of day and night, the seasons and the tides are important to Earth sciences and biology. The age and evolution of the universe and the Solar System provide the setting for any discussion of the origin and evolution of the chemical elements; the formation of Earth; and life in the biosphere. The scope of the terrestrial science is being further extended as space probes gather information from the other planets, and studies of these environments are leading to a better understanding of our own planet.

The document published by the Association for Science Education entitled, 'Alternatives for Science Education', states that one of the aims of a science education should be, "To gain a perspective or way of looking at the world that complements and contrasts with other perspectives or methods of organising knowledge and inquiry, and without which the individual cannot achieve a balanced general education". Such an aim clearly implies a need for astronomical content in a science curriculum. Astronomy develops students' appreciation of space and time; it deepens their understanding of the character of scientific laws; and it enhances their knowledge of the unity and scope of science. Surely this important aspect of our children's education should not be left to Mr Spock, E.T. or the Jedi?