

ing it are highly useful and represent something real in the world.

At present one can only speculate as to how far the complete atomicity of the elementary particle causes the partial atomicity one sees in biology, or for that matter in astronomy. If it is not a sufficient explanation, then we must look even deeper than the elementary particles for this principle of atomicity, which would make it very fundamental indeed.

I have tried here in a very discursive fashion to remind you of a few of the ways in which science has provided, and is providing, new ideas tied closely to experience, though often experience of a special character. These ideas constitute an achievement of which man may well be proud. It is surely something for beings, so utterly insignificant compared with the smallest of the stars that are scattered with reckless abandonment in the heavens, to be able to

understand some at least of the principles which control their existence and enable us to perceive them.

To see these principles as applying equally on Earth, as manifest in the most varied phenomena; in the motions of the tides, in the blue of the sky, in the lightning flash, and in the falling apple; to prove our understanding by creating, on however small a scale, compositions of our own which use these principles in new ways of our own devising; to be beginning to see some light on the nature of living matter and how living forms can transmit themselves to descendants; all these are worth while and worthy to rank with the achievement of sculpture, of music or of literature.

Science is not merely the control but also the understanding of Nature. Its two aspects must be held in equal honour.

SUMMARIES OF ADDRESSES OF PRESIDENTS OF SECTIONS

STELLAR MOTIONS

STELLAR motions relative to the Sun are resolved into tangential and radial components. The former appear as proper motions and are seen as displacements of the direction in which the stars are seen. These proper motions, as Dr. R. v. d. R. Woolley in his presidential address to Section A (Mathematics and Physics) points out, are measured by comparisons between new and old catalogues of star positions determined by meridian instruments, and by comparison of new and old photographic plates. They can only be converted into linear velocities in km. per sec. if the star's distance is known. The radial component of a star's motion is directly observed in km. per sec. through the Doppler shifts in the star's spectral lines. Only in the case of the nearest stars can the distance be measured by the direct trigonometric method. In the case of a moving star cluster such as the Hyades, an independent method exists, as the observations of proper motion and radial velocity are consistent within the errors of measurement with the hypothesis that the motion of the cluster stars is equal and parallel. The geometry of this motion permits a determination of each star's distance. Recent measures conducted at the Royal Greenwich Observatory indicate that the dispersion in the velocities of these cluster stars is less than 0.5 km./sec., the total motion relative to the Sun being about 44 km./sec. The permanence of this motion raises interesting questions.

When the velocities of the nearby stars are resolved into three components along rectangular axes, pointing towards the centre of the Galaxy, the pole of the galactic plane and a third axis (tangential to galactic rotation), it is found that the distribution of velocities in each co-ordinate is more or less Gaussian and

inferences may be drawn from the three velocity dispersions, which are unequal. Relaxation of the stellar velocities is incomplete. Discussion of the motion perpendicular to the galactic plane leads to a determination of the average density (due to stars, dust and gas) in the solar neighbourhood.

Stellar motions exhibit a number of cases in which stars apparently wide apart in the sky share a common motion. When this can be established, the distances of the stars concerned can be found, even if the stars are too far away for a reliable determination of trigonometric parallax. Some important cases occur, as has been shown recently by Dr. Eggen, of the Royal Greenwich Observatory. A further case of stellar motion is that of the Cepheid variables. These are all too far away to show measurable trigonometric parallaxes, but the average motion relative to the Sun and its dispersion can be found from radial velocities alone. The distances can be found from the period-luminosity relation, apart from a constant multiplier. This constant multiplier can be chosen to make the average proper motion agree with the average radial velocity. The result is a determination of the zero point of the period-luminosity relation among Cepheid variables. This determines the distance of the Large Magellanic Cloud and indeed of all objects including extra galactic nebulae which contain Cepheid variables.

CHEMISTRY IS NOT ENOUGH

DR. JAMES TAYLOR reminds us in his presidential address to Section B (Chemistry) that for better or for worse we are living in a society which is based physically on Western science and technology. This has inescapable consequences for the scientist.