of the apparent discs of the component stars. In addition to this important work, some measures of the light of the spectroscopic binaries, and thus "suspect" eclipse variable stars θ Aquilæ and σ Scorpii are given. In spite of the very short period of the latter star, 0·2468 day according to Father M. Selga, the evidence points to a slight variation.

THE MOTION OF THE SIDEREAL UNIVERSE.—The view that the galactic system is but a model of many has been supported by additional evidence since the "white" nebulæ were identified with remote galaxies. Such evidence is found in the very high line-of-sight motions, and the dark-line spectra of the spiral nebulæ, the probable finite dimensions, spiral structure, and integrated spectrum of the Milky Way itself. Quite lately this idea has inspired some researches necessarily of a tentative character. Messrs. R. K. Young and W. E. Harper have, in fact, made a determination from the data at present available concerning the radial velocities of some sixteen nebulæ, of the direction and magnitude of the translational motion of the solar subuniverse (Journal of the Royal Astronomical Society of Canada, No. 3). The deduced velocity is 598 km./sec. ($2\frac{1}{2}\times$p.e.) towards R.A. 20h. 24m., and declination $-12°$. Very nearly the same results have been obtained independently. According to the *Observatory* (March) Mr. Truman finds that our nebula is moving towards R.A. 20h., declination $-20°$, with a speed of 670 kilometres per second.

THE WAVE-LENGTHS OF THE CHIEF NEBULAR LINES.—An extensive series of measures of the two chief nebular lines has been made at the Lick Observatory (Bulletin 279). Nineteen spectrograms of the three nebulæ, N.G.C. 6572, 7027, and Orion, were measured by each of three observers, the resulting wave-lengths being 5006·847 and 4958·902 I.A. The method of reduction is not fully described, but the use of a reduction curve connecting micrometer measures and wave-lengths showed that Runge and Paschen's wave-length 5015·73 Å. for this helium line is 0·12 Å. too small. Corrections for radial velocity were calculated from the displacements of $H\beta$. Combined with Keeler's, Hartmann's, and Wright's (recalculated) the rounded, weighted means are:—

5007·02	4959·09 A. (Rowland).
5006·84	4958·91 I.A.

ENGINEERING AND SCIENTIFIC RESEARCH.

IN a paper before the Society of Engineers on May 1 Prof. J. A. Fleming emphasised the necessity of bringing scientific discovery and research to bear upon our national industries. It is estimated, he said, that not less than 1,000,000,000*l.* is invested in material and plant used in the mechanical and electrical engineering industries in this country.

Progress is hampered by want of co-ordination between the various learned and technical societies and by the conservative element in our universities and public schools. We have to consider (1) improvements in training men who will become engineers; (2) the best means by which science can be brought to bear on engineering problems; and (3) scientific methods in relation to the business side of engineering.

In our present educational system, Prof. Fleming added, too much attention is devoted to the cultivation of memory and words, and too little study is devoted to the facts of nature and the power to draw correct inferences from observation. One barrier in the way of industrial progress has been the imperfect scientific training of foremen, managers, and young heads of departments in engineering works. A much-needed educational reform is the compulsory attendance of lads after leaving the elementary school at a technical continuation school. Certificates issued by such schools should have an important determining influence on a boy's future, and should be valued accordingly.

Students at technical colleges should avoid undue specialisation and should be encouraged to acquire a broad knowledge of the principles of chemistry, mechanics, physics, mathematics, and metallurgy.

Research work may be divided into three departments:—(1) Those which aim at determining physical constants; (2) those providing new methods of examination and tests of material and structures; and (3) those leading to the discovery of some new process, material, or machine. In the first two departments there is great scope for further work. As instances of recent valuable work of this character, Prof. Fleming mentioned metallography, the development of high-temperature thermometry, and the recent application by Prof. E. G. Coker of polarised light in studying the stresses in celluloid models of beams, struts, riveted plates, etc.

A good instance of the third branch of research work was the simultaneous discovery in France and the United States of the electrical treatment of fused cryolite to produce aluminium in bulk. This third section of research work calls for special gifts, and it is important to study the conditions which give rise to this originative power. While natural ability plays a great part, effort should be made to utilise the power of inspiration possessed by some great investigators like Lord Kelvin and Clerk Maxwell. The existing centres of research, such as the Cavendish Laboratory at Cambridge, the Royal Institution, and the National Physical Laboratory, should be more fully supported. An important step has been the establishment of the Advisory Council on the Development of Scientific and Industrial Research, and it is satisfactory to find that its aid is being given largely through the intermediation of established professional and technical institutions and societies. In dealing with new problems it is highly desirable to utilise, so far as possible, existing channels of information and inquiry.

Abroad much technical research work is carried out on behalf of private associations of manufacturers in particular industries, and it is to be hoped that British firms will develop this co-operative method of stimulating and utilising research. The same applies to the collection and dissemination of information of industrial value, and to the general scientific organisation of the business side of engineering. The subsidisation of private or national research work by Government funds is but a small part of the whole problem.

In the ensuing discussion Col. R. E. Crompton contended that the British mind possesses the originative powers in a high degree. He recalled that much of the pioneering work in electrical matters was done in this country, and the later advance in Germany was due to better organisation, more general appreciation of the benefits of applied science, and the support of the industrial banks. Scientific and technical education on a far greater scale is needed. Other speakers agreed in advocating more systematic education in scientific matters, and fuller co-operation between the manufacturers and those engaged in scientific work, and a number of instances of valuable research work, initiated since the outbreak of war, were mentioned.

The view was expressed that the co-operation of scientific and technical societies and journals should be more fully utilised with a view of bringing the benefits of scientific method and research to the notice of manufacturers in this country.