Plagioclase Determination.

R. C. EMMONS of the University of Wisconsin has published a very important paper on 'Plagioclase Determination by the Modified Universal Stage' in the latest number of the *American Mineralogist* (June 1934, **19**, No. 6). The paper describes a modification of Federov's Universal Stage which both simplifies and speeds up the procedure for the determination of plagioclase felspars and their twin laws. The actual technique of this work is explained in detail and amply illustrated in the paper. It is also suggested that the same procedure may be extended to an intensive examination of all minerals in which optic orientation is a good diagnostic criterion.

Marchese Marconi.

(Born 1874.)

IN the history of engineering endeavour of recent times, the name of no worker is so widely known as that of the distinguished Italian whose sixtieth birthday on April 25th was the occasion for tributes from every part of the globe wherever radio communication and broadcasting affects the daily life of the community. In contrast to those among scientists who insist that the pursuit of science is a form of self-expression and therefore an end in itself, Marconi has steadfastly adhered to the view that all scientific work has for its fundamental aim the promotion of human welfare and prosperity. His is the unswerving devotion of a life-time to the pursuit of the great objective of developing radio methods for the communication of intelligence between men and nations the world over. If his field of activity has been a small patch in the vast expanse of scientific and engineering endeavour, he has, nevertheless, been an intensive worker and a remarkably successful one. With the vision and courage of the pioneer, Marconi has worked persistently at his ideas undismayed by the scepticism of contemporary scientists and undeterred by the inevitable obstacles of vested interests.

His contributions to the development of radio communication are remarkably impressive in both volume and quality. They began in 1895 in early youth with his experiments in his father's garden, at a time when hertzien waves were yet a newly discovered scientific toy of the laboratory. But after Marconi entered the field, each year saw an increase in the distance bridged across, culminating in communication across the English Channel in 1895 and the wonderful and spectacular success two years later in bridging the Atlantic between Cornwall and Newfoundland. That great achievement of Marconi formed the starting point for the gigantic progress of the later years in the spread of world-wide radio communication, in which Marconi and his famous company have played so great and distinguished a part.

We owe him the earthed antenna, the improved and extensive use of the principle of tuning, the use of parabolic reflectors for directional working, and many others. The world does not now remember the rôle played by Marconi's improved coherers, his magnetic detector, the disc discharger, the timed spark and so on. Subsequent to the advent of that wonderfully versatile engineering instrument, the thermionic vacuum tube, Marconi and his able engineers have been responsible for the conception, development and inauguration of the first short wave directive system of radio telephony and telegraphy, which by its spectacular success has revolutionised long distance radio communication over the earth.

At sixty, Marconi is still active and has obtained during the last few years, interesting results in the use of extremely short waves of the order of a small fraction of a metre. It falls to the lot of few men to contribute so greatly to the growth of a world industry of such fundamental importance and to witness its phenomenal growth from a mere scientific toy to a dominating influence in the daily life of the world within the short period of four decades in their lives.

If honours from governments, honorary degrees from universities, membership of learned bodies in different lands and prizes and medals are any indication of a man's worth, Marconi has them in abundant measure. The Mussolini regime has elevated him to a hereditary Italian marquis, and he is the first president of the newly formed Italian National Academy, the highest

scientific body in Italy. Great Britain has given him sympathy and encouragement in his work in generous measure and on her hospitable soil Marconi achieved many of his striking successes; the Government of Great Britain created him a G.C.V.O. Equally abundant is the measure of publicity that his work and movements obtain in the popular press of many lands.

The increasing activities and prosperity of his company and its associates are alone sufficient to justify the hope that the years to come will witness further additions to his notable achievements and the wider spread of his fame as one who by his work as scientist and engineer has served humanity truly and well.

R. E.

Molecular Spectra.

A SYMPOSIUM on the subject of "Molecular Spectra" was held in the chemistry hall of the Indian Institute of Science. All contributions to the symposium were received in full in advance, prominent among them being those from Prof. R. Samuel of Aligarh, Prof. Venkatesachar of Bangalore, Prof. K. S. Krishnan of Calcutta, Dr. Ganesan of Nagpur, etc.

In presenting his paper on "The Raman Spectra of Selenates and Selenic Acid", *Dr. Ganesan* discussed the dynamics of the AX_4 model representing the SeO_4-ion. In the state of solution the lines observed were 342, 415, 835 and 875, while for the crystalline state the same lines occurred sharper but with slightly displaced frequencies. From the data for the solution state and applying Dennison's formulas, the force constants for Se—O and O—O were calculated as 4·72 and 0·59 respectively. The heat of dissociation for Se—O was found to be 86 K. cal. while the corresponding value calculated from thermo-chemical and band spectra data came out as 95 K. cal. The spectrum of selenic acid differed from that of selenates, just as in the case of sulphuric acid and sulphates, there being a greater number of lines which relate now to the molecule H_2SeO_4.

An interesting discussion followed: *Prof R. Samuel* pointed out that the heat of dissociation cannot be entirely calculated from the Raman frequency alone, but a factor of anharmonicity in the vibrations must also be considered. The Raman effect at higher temperatures should show the presence of such an anharmonic factor. He also wanted to know whether there was any evidence for the existence of different kinds of Se—O linkages. *Dr. Krishnan* suggested that some of the discrepancies between the two dissociation values might disappear if due corrections were applied for the ionisation energy, etc., in the calculation of the thermal dissociation energy. *Prof. C. V. Raman* opined that the existence of only four lines indicated that the four bonds Se—O were identical, perhaps in particular for such slow infra-red oscillations. He referred to some earlier investigation by Bhagavantam on the Raman effect of benzene and carbon disulphide at higher temperatures, where no definite results were obtained. The lines should broaden out and any small shifts in the frequency will be particularly informative. *Prof. Venkatesachar* pointed out that he and Sibaiya had observed a shift of the centre of gravity of Raman bands to one side with rise in temperature. *Dr. P. Krishnamurti* remarked how the SeO_4 lines occur as two pairs, while the SO_4 lines are uniformly spread out. This is due to the heavier Se atom, and the phenomenon is similar in character to that observed with the heavier tetrachlorides as $SiCl_4$ and $TiCl_4$.

Dr. K. R. Ramanathan and *Dr. L. A. Ramdas* then presented a paper on the further extension of the ultra-violet spectrum of the sun. The present limitations due to the ultra-violet absorption band of ozone and of oxygen were analysed in detail, and it was shown that the heights accessible with pilot balloons must be sufficient for the object in view. Accounts of the spectroscopic methods of estimating the amount of ozone present in the atmosphere, and of calculating the height of ozone layer were also given.

A keen discussion followed in which *Prof. Raman* emphasised that generally in fitting a dispersion formula, the possible existence of bands in the extreme ultra-violet should never be neglected. *Dr. Ramdas* referred to the methods of determining the temperature of the ozone layer as being about 500°. *Dr. Ramanathan* in concluding the discussion complained that most reports about absorption spectra did not include sufficient details such as vapour pressure, temperature, etc., required to estimate the amount of substance employed, and consequently the published results could not be used for meteorological purposes.

Prof. R. Samuel presented a lucid account of the present state of knowledge regarding band spectra in general, and explained how a complete analysis of band spectra of diatomic molecules with the help of Franck-Condon diagrams, gives values of the dissociation energy in both the excited and unexcited states, and the harmonic and the anharmonic factors of inter-atomic forces. The anomalous cases where the energy of dissociation increases with the excitation state, and indeed so that the molecule in its ground state might consist of excited atoms, correspond to molecules with free valencies: the usual normal cases correspond to saturated compounds. The dissociation of molecules and their absorption spectra were then discussed and illustrated with the cases of I_2, CO, CO_2 and the silver halides, and it was particularly shown how AgCl in the vapour state must be a co-valent molecule, and not made up of ions like HCl. The absorption spectra of the alkali halides and of BeO and ZnO and the anomalous cases with free electron valencies such as NO, CaF, CdF, were described in detail, with their Franck-Condon diagrams. It was postulated in this connection that in crystals also, there are co-valent links between