PRESENTATION OF THE ROEBLING MEDAL OF THE MINERALOGICAL SOCIETY OF AMERICA TO CECIL EDGAR TILLEY

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Mr. President, Fellows and Members of the Mineralogical Society of America and Guests:

The Roebling medal is for meritorious achievement in the fields of the Mineralogical Sciences. Recalling the interest of Colonel Roebling in acquiring specimens of all new minerals for addition to his comprehensive collections, I am sure that were he now alive our medalist of today would be *well* and *most favorably* known to him. For not only does the medalist have a mineral, *tilleyite*, named in his honor but he is himself the discoverer and describer of 7 new minerals.

Professor Tilley is the third medalist to be chosen from Great Britain, the other two being L. J. Spencer and Sir Lawrence Bragg. Also, peculiarly enough, like Sir Lawrence Bragg, he was born in Adelaide, South Australia. His undergraduate education was received at the Universities of Adelaide and Sydney. He served as Demonstrator in Geology and Mineralogy at the University of Sydney in 1916 and as chemist to the Department of Explosives Supply, Queensferry, 1917–1918. Later he attended Cambridge University, England, and received the Ph.D. in 1923. From 1928 to 1931 he was Lecturer in Petrology at the University of Cambridge. Alfred Harker who was Reader in Petrology in the Geology Department of the Sedgewick Museum, retired in 1931. At this time Petrology was combined with the Department of Mineralogy and Tilley became the first Professor of the Department of Mineralogy and Petrology at Cambridge, a post he still holds.

Professor Tilley's publications, around 60 in all, from the very first to the very last are characterized by a percipient application of the data and principles of physical chemistry and of integrated geologic knowledge to the interpretation of the phenomena of mineral associations and of rocks. He is the first recipient of the Roebling medal who has made a study of the minerals and mineral assemblages of metamorphism a major part of his researches.

One of his earliest publications (1920) dealt with metamorphism, reconstitution and decarbonation of Precambrian dolomites of the Southern Eyre Peninsula, South Australia. Two of his major series of researches subsequently have dealt with related phenomena, the contact metamorphic zones between dolerite and limestone at Scawt Hill, An-

trim, Ireland, and at Camas Mor, Muck, and between granite and limestone near Broadford in Skye, Scotland. The extent to which Tilley has been able to develop new data and principles of general significance from intensely detailed studies of rocks, some of which many of us would have passed up as hardly worth a second look, is amazing. Besides his discovery of 5 new minerals of Scawt Hill and one new mineral at Broadford he extended the stages represented in thermal metamorphism by three, showing that talc belongs at the earliest stage, that tilleyite belongs between åkermanite and spurrite, and rankinite between spurrite and merwinite as the temperature is raised. He also demonstrated that on a small scale basic feldspathoidal rocks were formed by reaction of basaltic igneous magma with carbonate sediments and that mildly alkali assemblages and even some desilication were produced by reaction of granite magma with limestone.

The name of the island, Muck, which was the site of one of Tilley's studies, reminds me of a joke which he told. There are three islands grouped together and known locally as the Hebridean cocktail: Eigg, Muck, and Rum. I do not wish, however, to imply in any degree whatever that Tilley's imaginative and creative ideas were stimulated by such a concoction. I have seen him maintain his normal warm good nature and make his usual sly humorous pithy comments in wind, rain and chill without benefit of the cup that cheers.

Professor Tilley has been one of the pioneers in and major contributors to the development of our ideas, understanding and classification of metamorphic rocks in the light of the "Facies concept" as now developed. The fundamental physico-chemical basis was suggested by Goldschmidt in 1911. The idea was amplified and applied in general by Eskola in 1920. Beginning in 1923 we have a long series of papers by Tilley dealing with specific examples of the variation of mineral assemblages where on the one hand the range of physical conditions is similar, or to use his term, is isograde, and the bulk chemical composition varies; and on the other hand where the bulk chemical composition remains similar and the range of physical conditions varies. For the latter he was able to suggest particular chemical reactions by which one mineral assemblage was transformed to another as the temperature changed. He also integrated geology with laboratory studies in his researches on progressive regional metamorphism. The mapping of metamorphic zones originally begun by Barrow in the southern and eastern Scottish Highlands was greatly extended by Tilley (1925) and by Elles and Tilley (1930). In these classic papers the hypothesis was developed that the isograd surfaces of metamorphism may be discordant with the stratigraphic layers of the folded rocks and that the superposed zones of metamorphism might themselves

be folded so that rocks reconstituted at a higher temperature came to overlie those formed at a lower temperature.

Nearly every petrologist sooner or later engages in a study of the alkalic rocks, a group so insignificant in volume, so enigmatic in origin and so attractive to one's curiosity. Tilley is no exception. He spent a year at the Geophysical Laboratory in Washington undertaking experimental studies in the ternary system, Na_2SiO_3-$Na_2Si_2O_5$-$NaAlSiO_4$ and published the results in 1933. In recent years he has renewed his interest in the subject and after a review of the variation of the chemical composition of nepheline with variation of composition of the system in which it formed, concluded that the composition of magmatic nepheline solid solutions is primarily conditioned by chemical composition of the environment, but that nepheline of metasomatic origin may involve a different story. He is now completing studies of the nepheline syenites of Eastern Canada based on field studies in 1950.

In 1921 Tilley published a paper on an Australian tholeitic basalt. Nothing further by him on this subject appeared for years, but it is obvious that it was not forgotten. In 1950, after a period of 29 years of incubation and growth in the depths of his mind, there blossomed forth as a presidential address a fully matured exposition of the role of tholeitic basalt type of lava as the closest approach to the primary magma of the Hawaiian alkali magma series in particular and the ocean basins in general. The reverberations from this hypothesis are still going on in the petrological world.

Professor Tilley has received many honors for his professional accomplishments and distinguished recognition for his high capacity in human affairs. He was Exhibition Scholar at Cambridge, 1920–1924, recipient of the Sedgwick Prize (1931) and Bigsby Medal (1937), elected to the Royal Society of London (1938), an honorary member of the Royal Geological Society of Cornwall and Foreign Correspondent of the Geological Societies of America, of Sweden and of our own Mineralogical Society of America. He has served as President of the Mineralogical Society of London, (1948–1951), President of the Geological Society of London (1949–1950), Vice-President of the Royal Society of London (1949–1950), and has recently been elected Vice-Master of Emmanuel College, Cambridge.

Mr. President, it is a privilege to present Cecil Edgar Tilley as the recipient of the Washington A. Roebling Medal of The Mineralogical Society of America.