I conclude that comparison of the rift locations shown in Figs. 1 and 2 shows that the $n = 5$ degree convection pattern explains most closely the observations. This is especially interesting in the light of the harmonic analysis of topography by Prey and Vening Meinesz, the theoretical work of Vening Meinesz and Chandrasekhar and the continental drift arguments of Runcorn, all which show the strong possibility of a mantle convection pattern of the same degree.

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OBITUARIES

Prof. E. C. Titchmarsh, F.R.S.

By the death on January 18 of Prof. Edward Charles Titchmarsh, British mathematics has lost an analyst of internationally recognized eminence, who has contributed more than any other man to the continuation of the traditions of the British school of classical analysis established by Hardy and Littlewood.

Titchmarsh was born in Newbury, Berkshire, on June 1, 1899, and was the eldest son of Edward Harper Titchmarsh, a Congregational minister. He was educated at King Edward VII School, Sheffield, from 1908 until 1917; at first he was on the classical side, but moved to mathematics, and won an open mathematical scholarship at Balliol College, Oxford, in 1916. After one term at Balliol, he was away for two years as a lieutenant in the Royal Engineers (Signals). In 1919 he returned to Oxford and was much influenced by G. H. Hardy; his last year in Oxford was spent on research under Hardy's supervision.

In 1923 he was appointed as a lecturer at University College, London, and at the same time became a Fellow of Magdalen College, Oxford. In 1925 he married Kathleen Blomfield, by whom he had three daughters. In 1929 he became professor of pure mathematics at Liverpool and in 1931 Savilian professor of geometry at Oxford in succession to Hardy, a post which he held for the rest of his life together with a professorial fellowship of New College; in the same year he was elected a Fellow of the Royal Society.

Throughout his working life, Titchmarsh showed a single-minded devotion to classical analysis: he accepted his chair at Oxford on condition that he should not lecture on geometry. His earliest research work was devoted to problems concerning the expression of functions in series or integrals in terms of given functions, an interest which lasted throughout his life. His most important work at this time was on Fourier transforms, particularly the extension of Plancherel's theorem to the L^p classes of functions, and soon after he made important contributions to the theory of conjugate functions. His contributions to this field, together with his work on general integral transforms, and on the applications of Fourier integrals to the solution of differential and integral equations, laid the basis of his *Introduction to the Theory of Fourier Integrals* (1937).

In the meantime, Titchmarsh's interests had extended to cover the theory of integral functions, and in particular of the zeta function. A series of his papers were devoted to the study of the properties of the zeta functions, particularly to the still unsolved problem of the location of its zeros. This work was brought together in a Cambridge Tract, *The Zeta Function of Riemann*, in 1930 and later treated more fully in *The Theory of the Riemann Zeta-Function*, published in 1951. His book on *The Theory of Functions* (1932) grew out of this interest in complex variable theory; like his book on Fourier integrals, it is internationally recognized as a

leading text on both real and complex function theory and has been translated into several languages.

From 1939 onwards Titchmarsh devoted himself in the main to the theory of expansions of functions in eigenfunctions of differential equations, a subject which he treated in a large number of papers, including four published this year, and in Part 1 (1946) and Part 2 (1958) of his book on *Eigenfunction Expansions associated with second order Differential Equations*. This is a subject which is vital to quantum theory; before his work there was a considerable gap between the general theory and the methods used by physicists to solve particular problems. Titchmarsh's theory combines a general theory for second order differential equations with techniques useful for the study of the spectrum in particular cases. After working on ordinary differential equations he moved to partial differential equations. He interested himself in problems of importance in physics; his last published papers, for example, dealt with completeness problems for eigenfunctions of equations of relativistic quantum theory. He concentrated on those aspects of these problems with which he was supremely fitted to deal: he never commented on the physical aspect of the problems, an attitude typified by the dry humour of the preface of his book on Fourier integrals which states that though problems of physics are dealt with, the reader need not know that such things exist. This work has led to important developments by mathematicians in many countries.

Titchmarsh was of a retiring nature but had a capacity for dry humour in conversation and in his social duties. To his research students he was always approachable and guided many towards important contributions to mathematics. He took an active part in the administration of New College and of the London Mathematical Society in his term as president during 1945-47. During the Second World War he worked assiduously on the provision of books for prisoners of war. Gardening and cricket were among his other interests.

His distinction was recognized by the award of the de Morgan Medal of the London Mathematical Society in 1953, and of the Sylvester Medal of the Royal Society in 1955.

J. L. B. COOPER

Mr. James Macdonald, C.B.E.

JAMES MACDONALD, formerly deputy director-general of the Forestry Commission, died on April 28 at the age of sixty-four. He had been in failing health for the past year and retired on that account in January of this year.

Macdonald was educated at Blairgowrie High School, and then after a period of Army service went to the University of Edinburgh, where he graduated B.Sc. in forestry in 1923. He studied forest pathology under Dr. Malcolm Wilson for a further year, when he was appointed to the research staff of the Forestry Commission.

His first spell as a research officer lasted for twelve years. At that time one of the Commission's urgent tasks was to collect data on the rate of growth and timber production that could be effected under different site conditions of the species they were planting on a large scale. For some years this was Macdonald's main work. His publication, "Growth and Yield of Conifers in Great Britain" (*Forestry Comm. Bull.*, No. 10; 1928) and other papers which followed, for example, "Sample Plot Methods in Great Britain" (1931), "The Form of the Stem of Coniferous Trees" (three papers, 1932-34), brought him wide recognition as an authority in this field of work. In 1931 he also wrote a bulletin on forest gardens (*Forestry Comm. Bull.*, No. 12), and his sphere of activity was further widened in 1932 when he was moved south to Oxford, where by special arrangement his duties included lecturing at the Imperial Forestry Institute.

This period was brought to an end by his promotion in 1936 to divisional officer and transfer to Cambridge to take control of the East England Division. He soon found this totally different work congenial, and when war broke out he was voluntarily transferred to the Home Grown Timber Production Department of the Ministry of Supply, which he served in Cambridge, Nottingham and Aberdeen.

For about two years after the War he was a conservator on the headquarters staff of the Director of Forestry for Scotland, but when the newly formed Directorate of Research and Education became vacant in 1948 his selection was a foregone conclusion. He retained responsibility for this Directorate until he retired, although during the past three years he was also deputy director-general. This was a period of great development in forest research in Britain: a much enlarged and vigorous young staff was available; a new Research Station was established at Alice Holt. The success which has undoubtedly followed is clear evidence of Macdonald's wise, experienced direction.

He was awarded the C.B.E. in 1953 and was elected Fellow of the Royal Society of Edinburgh in 1957. During 1957-61 he was president of the International Union of Forest Research Organizations, and was chairman of its Congress in Vienna in 1961.

Macdonald seldom enjoyed lecturing; on the other hand, he took pleasure in writing, which he did with ease. His style was pleasant—the clarity and logic of his presentation admirable. During the fourteen years he

was director of research he was also responsible for the publications of the Forestry Commission, and the high standard maintained owes much to his influence.

Macdonald was inevitably on a multitude of committees. Though he could express himself forcibly if he found it unavoidable, he much preferred the path of quiet, cautious discussion and persuasion. He was wont at times to lighten the occasion with a touch of humour of rare and charming quality which was one of the notable characteristics of a most attractive personality. His colleagues will feel the loss of a real friend as well as an outstanding forester.

A. H. GOSLING

Mr. W. D. George

WILLIAM D. GEORGE, a member of the Radio Standards Laboratory at the Boulder (Colorado) Laboratories of the National Bureau of Standards, U.S. Department of Commerce, was killed in a car accident in Geneva, Switzerland, on February 12. Mr. George was in Geneva as a U.S. delegate to a meeting of the Radio Consultative Committee of the International Telecommunications Union.

Mr. George's research work was particularly concerned with standards and measurements in use at high frequencies. He investigated the calibration and testing of radio apparatus and materials and the improvement of national primary radio standards. He also extended the accuracy and services of broadcasts from the National Bureau of Standards radio stations WWV and WWVH.

At the time of his death, Mr. George was consultant to the Chief of the Radio Physics Division at the Boulder Laboratories. He had joined the staff of the National Bureau in Washington in 1929 as a junior radio engineer. Born in Spartanburg, South Carolina, in 1907, Mr. George took his B.S. in electrical engineering from Georgia Institute of Technology in 1929.

Mr. George was active in international and national scientific conferences on radio propagation and standards. He was a senior member of the Institute of Radio Engineers, a study group chairman and U.S. State Department Adviser of the International Radio Consultative Committee, and a member of the U.S. National Committee of the International Scientific Radio Union. He was also a member of the Research Society of America and the American Ordnance Association.

NEWS and VIEWS

Forestry and Natural Resources at Edinburgh:

Prof. J. N. Black

DR. J. N. BLACK, at present reader in crop ecology in the University of Adelaide, has been appointed to the chair of forestry and natural resources at the University of Edinburgh. The chair was formerly that of forestry; since the death of Prof. M. L. Anderson in 1961 (see *Nature*, 192, 502; 1961) the University has had under consideration a re-orientation of the interests and activities of the Department to include general ecology and the utilization of biological natural resources. Dr. Black was born in Birmingham and educated at Rugby School; he served in the Royal Air Force from 1942 until 1946. In 1946 he entered Exeter College, Oxford, and was awarded honours in the Final Honours School of Agriculture in 1949; appointed to an Agricultural Research Council studentship, he continued his studies in Oxford, and in 1952 gained a D.Phil. Since April 1952 until the present time, Dr. Black has been on the staff of the Waite Agricultural Research Institute, in the University of Adelaide. His research interests have been concerned with the growth of plant communities, particularly pasture swards, in relation to their environment, and in the utilization of

solar energy by plants. In 1958 Dr. Black was awarded the Andre Mayer research fellowship to study problems in crop ecology at the Royal Agricultural College, Uppsala, Sweden. Six years ago, Dr. Black, who has always been interested in music, founded a semi-professional symphony orchestra in Adelaide, consisting of some seventy members, which has given many concerts under his direction.

The Diamond Power Specialty Corporation

MR. W. H. JACKSON has been appointed to the newly created position of vice-president in charge of operations of the Diamond Power Specialty Corporation. He will be responsible for engineering, manufacturing, sales and analysis for all Diamond Power products. Mr. F. I. Hatcher has been appointed to the newly created position of vice-president in charge of administration. He will be in charge of accounting, purchasing, data processing, personnel and office management. Diamond Power Specialty Corporation is a subsidiary of the Babcock and Wilcox Co., Ltd., and has its main offices and manufacturing facilities in Lancaster, Ohio. It operates in Great Britain through Diamond Blower Co., Ltd., Southampton. The Corporation is concerned with boiler cleaning equip-