

A large amount of routine work is necessary to determine the optimum concentrations for the seeds of different species. I have found that a 0.05 per cent solution has a profound influence on the seedlings of mustard after soaking the seed for four days. In the case of several gramineous species the seed of which had been treated in like manner, only a very small proportion of individuals was visibly affected. In the case of sweat peas, the seeds either failed to germinate or the distorted seedlings perished.

The main objection to seed treatment is that germination is either partially or completely checked, root development is restricted or absent for some considerable time and a great waste of material occurs. There is a characteristic swelling of the hypocotyl, more notable in some species than in others. Many odd distortions occur, each characteristic of a particular species.

The treatment of apical and axillary buds has produced tetraploid shoots. This is affected by painting on the solution, in combination with a wetting agent, by spraying or by immersion. A 0.4 per cent solution is recommended by American workers for the direct application method.

Spraying of the parts is the least desirable of methods from the operator's point of view. It is important to stress the fact that colchicine is a dangerous drug and that in the hands of irresponsible persons disastrous results may occur. The human mucous membranes are particularly sensitive and one reads of serious eye injuries.

I have employed the 'injection' method as elaborated, for other purposes, by the East Malling workers. A 0.05 per cent solution has been used, a vertical slit in the stem of the plant or a severed petiole being placed in a tube of the solution. Profound morphological changes take place, and, as the influence is localized, its intensity varies

throughout the affected part of the plant. In the case of *Vicia Faba*, the flowers were swollen at the base and were all abortive except two. These gave rise to pods showing *gigas* characters with an erect habit of growth. In *Fragaria* species, distorted fruits have been produced. A large amount of material has been treated by this method, but it is as yet too early to determine whether polyploidy has resulted.

Colchicine is an expensive commodity and investigations are proceeding to explore the possibilities of acenaphthene as a cheaper substitute. Kostoff has shown that the disintegrating fragments of the corm of *Colchicum* can produce polyploidy in germinating seedlings in close proximity.

Reviewing the whole of the work on induced polyploidy in a dispassionate manner, one must admit the remarkable nature of the achievements from the cytological point of view. Whether there will be much material gain accruing to the plant breeder remains to be seen.

In the case of garden plants there are distinct possibilities. Abnormal or distorted varieties with unusually large flowers have an economic value with a public displaying an insatiable appetite for novelty. Food plants are in a different category. Tetraploids are of frequent occurrence, but are not always of special merit; in fact, the reverse quite often obtains. Increased size is not always of importance, for with most of our arable crops there are varieties capable of producing plants just as large as the soil will grow them.

We do not, of course, know how the new tetraploid types will react to disease infection, how their cooking qualities may be affected for better or worse, or how altered morphological characters may be of benefit to the cultivator. For the present the chief possibility appears to be the production of fresh material upon which to build.

OBITUARIES

Dr. A. Harker, F.R.S.

THE death of Dr. Alfred Harker, emeritus reader of petrology in the University of Cambridge, on July 28 at the age of eighty years has removed from our midst an outstanding figure in British geology—one whose brilliant contributions in his own field over half a century placed him in the forefront of living petrologists.

Born in Hull on February 19, 1859, Harker entered St. John's College, Cambridge, in 1878 and graduated eighth wrangler in the Mathematical Tripos of 1882. He was placed in the first class of both parts of the

Natural Sciences Tripos with physics as his chief subject, and was elected to a fellowship in his college in 1885. Though not of the 'Bonney School', so much were his early geological interests strengthened at St. John's that he was eventually attracted to a demonstratorship under McKenny Hughes. He became University lecturer in 1904 and on the death of Hughes in 1917 was elected to a special readership in petrology.

Harker's earliest papers dealt with the cleavage structure of slates, an investigation for which his mathematical training peculiarly fitted him. These studies were based in part on his observations on the

slates of North Wales, where soon he became absorbed in a new interest—"the petrology of the igneous rocks associated with the Cambrian (*Sedgwick*) system of Carnarvonshire"—and endeavoured to trace the relationship of the igneous phenomena of the district and concurrently operating crustal stresses, a theme which he was greatly to amplify in his later writings. The results of this work were incorporated in the *Sedgwick Prize Essay* for 1888. During 1889-93 he was engaged in the Lake District where, in collaboration with J. E. Marr, he traced a varied group of lavas, ashes and sediments into the aureole of the Shap Fell granite. These papers form pioneer contributions on the nature and origin of metamorphic rocks and rank with Rosenbusch's classical studies on the *Steigerschiefer* of the Vosges.

With a reputation now thoroughly established, Harker, at the instance of Sir Archibald Geikie, was seconded in 1895 to the Geological Survey of Scotland for summer field work in Skye. The mapping of the mountainous groups of the Cuillins and the Red Hills of central Skye which followed, was completed in 1901, and will ever remain as a monument to his skill and ardour as a field geologist, and disposed finally of the embittered controversies of Judd and Geikie on the igneous succession of that island.

The outcome of his researches in Skye, and later in Rum, appeared in two Survey memoirs—"The Tertiary Igneous Rocks of Skye" (1904) and "The Geology of the Small Isles of Inverness-shire" (1908)—and at once attracted wide attention. Considering the time of their execution, and as the work of one individual, these researches will always rank as one of the greatest achievements in igneous geology.

The way was now prepared for Harker to present to a wider audience his long-considered views on the broad aspects of magmatic descent and the controlling influence of tectonic environment. These problems, among others, he unfolded in his "Natural History of Igneous Rocks" (1909). Written in an extremely lucid style and with a rare power of philosophical generalization, this volume has come to exert a deep influence on petrologic thought. If some of his conclusions have needed amendment, in its broad lines, his achievement has been none the less fundamental.

The same philosophic outlook characterized Harker's presidential addresses to the Geological Society. In the last of these he returned once more to the subject of metamorphism, a field which became his dominant interest in later years. His final work appeared in 1932 under the title "Metamorphism", a treatise which has been appraised in the words of an acknowledged authority as filling "an important place in the literature of petrology, and in lucidity, balance and breadth of view can serve as a model to all future writers on the anatomy and history of rocks".

Harker was elected a fellow of the Royal Society in 1902 and awarded a Royal Medal in 1935. From the Geological Society of London he received in succession the Murchison and Wollaston Medals. Honorary doctorates were conferred upon him by the University of Edinburgh and McGill University, while he was honorary or corresponding member of

many scientific societies, British and foreign. These honours he accepted with such extraordinary modesty that many of them remained hidden and unsuspected by even those most intimate with him.

Harker's elementary lectures made little appeal to the average Tripos man, but he excelled in contact with senior students, and his advanced courses became the source of inspiration to many generations of students.

After his retirement in 1931, and to within a few weeks of his death, he continued to devote much time to the care of the petrological collections of the University. In the Harker Collection of rock slices numbering now some 40,000 slides neatly labelled in his own handwriting and representative of research material drawn from all quarters of the globe, he has endowed his department with a unique monument.

At St. John's College, where he had been for some years the senior fellow in residence, he was rather a lone figure, though on his retirement he seemed to cast off some of his natural reserve. By his old pupils he was held in affectionate regard, and the expression of this esteem was signally evoked at the dinner held in his honour at Cambridge on the occasion of his eightieth birthday. Those who were privileged to have his confidence and companionship will retain a lasting memory of the generosity and humility of a truly great man.

C. E. T.

Mr. W. Scoresby Routledge

WE regret to record the death of Mr. W. Scoresby Routledge, traveller and anthropologist, which took place suddenly at Paddington on July 31 in his eightieth year.

William Scoresby Routledge was born at Melbourne in 1859 and was educated privately and at Christ Church, Oxford, graduating in 1882. He then entered University College Hospital, London, where he was Erichsen prizeman in operative surgery. He was, however, at heart an explorer, and for many years lived among primitive peoples. With the Micmacs of central Newfoundland, primitive tribes at that time still living mainly by hunting and fishing, he became proficient in woodcraft and learned to endure conditions which to the ordinary civilized individual would appear to border on privation. This early training served him to good purpose in his later travels, more especially during his stay among the Akikuyu of East Africa Colony, now Kenya, with whom he lived at a time when there was little exaggeration in terming them a 'prehistoric' people—the title he gave them in the valuable study of their manners and customs in "With a Prehistoric People" (1910), of which he was the joint author with his wife, Katherine, the daughter of the late Gurney Pease of Darlington, whom he married in 1906.

Mrs. Routledge, who had read history at Oxford, guided by the influence of Dr. R. R. Marett, was no less a keen anthropologist than her husband, and even while their joint book on the Kikuyu was in the making they were already planning their next and most important expedition. This was a journey