70 to 80 per cent., indicating a temperature of about -70°C. , as was to be expected with winter on this hemisphere.

On the other hand, the water-cell transmissions of the radiation from the south polar region decreased from the high value observed in the early part of September to 30 per cent., or even lower, in November and December, indicating a temperature of 10° to 15°C. , or even higher. Granting that some ice still remained at the pole, there would be a temperature gradient for which a correction should be made. On this basis, the water-cell transmissions would be still lower and the temperature of the south polar region would be higher than indicated by these measurements.

The observed high surface temperatures on Mars

may be accounted for on the assumption that these dark areas contain vegetation having the properties of the tuft-forming grasses of our high prairies, and the tussock mosses and lichens of our dry tundras, which have a high absorptivity for solar radiation and a low thermal conductivity. The assumption of the presence of such a type of vegetation is in harmony with the visual observations, which show changes in the colouring of the dark areas with changes in the seasons, and it is in agreement with the lower intensity of insolation on Mars. The radiometric observations indicate that during the summer season on Mars, temperature conditions at noonday are not unlike the bright cool days on this earth, with temperatures ranging from 5° to 15°C. or 40° to 60°F.

Sir William Thiselton-Dyer and the "Flora Capensis."

THE publication in the *Kew Bulletin* (No. 7, 1925, pp. 289-293) of an account, by Sir W. T. Thiselton-Dyer, of the commencement, progress, and completion of the "Flora Capensis," affords a fitting opportunity of recalling Sir William Thiselton-Dyer's work at the Royal Botanic Gardens, Kew, and more especially the work he has done for the British Empire in advancing the knowledge of its botanical riches in the domain both of economic and systematic botany. With regard to the systematic study of the Colonial floras, the two works which are especially associated with his many years of office at Kew are the "Flora Capensis" and the "Flora of Tropical Africa." Proposals for both these works were made by Sir William Hooker, so long ago as 1863, when *inter alia* he put forward a proposal for a flora of the "South African Colonies" in ten volumes and a flora of the "West African Colonies" in two volumes. Out of the former proposal has come the now completed "Flora Capensis" and from the latter the "Flora of Tropical Africa," which, when finished, will occupy eleven or twelve volumes.

The "Flora Capensis," as Sir William Thiselton-Dyer states, had, however, actually been commenced at the suggestion of Sir William Hooker. It was undertaken by Dr. Harvey, "sometime Treasurer of Cape Colony," the professor of botany in the University of Dublin. He "undertook to print and publish the Flora at his own risk and cost, trusting chiefly to colonial subscriptions for a repayment of the outlay." Dr. Sonder, of Hamburg, "gladly accepted Dr. Harvey's offer to share the authorship." Volume 1, dedicated to Sir George Grey, K.C.B., "Governor and Commander-in-Chief of the Colony of the Cape of Good Hope," bears the publication date 1859-60. Volume 2 was published in 1862, and Volume 3 in 1865. The following year Prof. Harvey died, and Dr. Sonder, who took no further part in the work, died in 1881.

Sir Henry Barkly, Governor of the Cape of Good Hope from 1870-77, himself an ardent naturalist and fellow of the Royal Society, urged upon Sir Joseph Hooker, who had succeeded his father as director of Kew, the completion of the work of Harvey and Sonder, and Sir Joseph Hooker suggested to Mr. Dyer, as he then was, that he should undertake the completion of the work of the Cape Flora. As, however, he was at that time assisting Sir Joseph in sub-editing the

"Flora of British India," he was unable to entertain the proposal; and later, being appointed to the post of assistant director of Kew in 1875, he was again precluded from taking up any particular part of the Flora himself. Sir William, however, was able to enlist the aid of numerous contributors in carrying on the work; but the general task of supervising and editing a work which was part of a project initiated by Kew, appeared to him to fall naturally within the scope of his official duty, and so after a long interval the "Flora Capensis" was again started.

Sir William points out as a striking fact, that in the volumes published by Harvey a very large number of the species are only represented by a single collection. It was highly desirable to have more copious material to work upon, if only to supply more ample data for geographical distribution, and thanks to Sir William Thiselton-Dyer a numerous body of contributors was marshalled, and they rendered valuable service in sending home material for the adequate working out of the Flora. Among these Peter MacOwan and Dr. Harry Bolus deserve particular mention.

Sir William, in his article, refers to the fact that upwards of ten thousand specimens have been named and catalogued for South African botanists and collectors in connexion with the work of the Flora, and that during twenty years, from 1877, the time of one member of the Kew staff, Mr. N. E. Brown, was almost exclusively occupied with the determination of these fresh accessions of South African plants. Sir William bears eloquent testimony to Mr. Brown's work, pointing out that from his complete mastery of the features of the flora and of South African topography "he has been the invaluable mainstay of my own share in the undertaking."

It was in 1877 that Sir William was able to start the work on the Flora on an effective basis, and he was fortunate in being able to secure the co-operation of South African contributors, including Dr. Harry Bolus, who undertook the Ericaceæ; Dr. E. P. Phillips, who worked out the Proteaceæ; and Miss E. L. Stephens, who worked out the Penæaceæ. The Orchids, which should have been worked out by Dr. Harry Bolus, could not be carried out by him and were undertaken by the late Mr. R. A. Rolfe of the Kew Herbarium staff. Other contributors of whom Sir William makes special mention were Mr. J. G. Baker, who elaborated

the "Cape Bulbs," and Mr. C. H. Wright, assistant in the Herbarium, Royal Botanic Gardens, Kew, who sub-edited the whole of the contributors' manuscript.

It is interesting to note that Sir William Hooker estimated both the number of volumes and the financial support that would be needed to carry out the work with remarkable accuracy. He fixed the number of volumes at ten, which is the number now published, and he also estimated that ten thousand would be the number of species to be dealt with. The actual number, however, is 11,705, and of these 2016 are described for the first time.

The "Flora of Tropical Africa," like the "Flora Capensis," though it owes so much to the energy and sagacity of Sir William Thiselton-Dyer, was commenced before he was able to assume any control over its preparation. Originally it was intended to be the joint work of Sir William Hooker and Prof. Daniel Oliver, Keeper of the Kew Herbarium; but the work was handed over to Prof. Oliver, and the first three volumes appeared in 1886, 1871, and 1877 respectively. Then, as with the "Flora Capensis," came a long break, and it was not until Sir William Thiselton-Dyer was able to take the matter in hand that the preparation of this flora could be resumed. As an outcome of his activities a new volume of the Flora appeared in 1898 devoted to the petaloid monocotyledons, Volume 7 of the entire work, this being the first volume to be produced under Sir William's editorship. This was followed in due course by Volume 4, published in two sections, Volume 5, Volume 8 and Volume 6, Section 1, the latter, which was published in 1913, being the last to appear under his editorship. The Flora has been continued under the editorship of Sir David Prain, and only some two parts, dealing with the grasses, now remain to be published.

The work entailed in arranging for the collection and naming of the material for these two great works would, it might well be thought, be sufficient to have occupied the full attention of the director of Kew, upon whose time there are so many calls with regard to botanical problems both at home and abroad; nevertheless, Sir William found time to initiate yet another work, *The Kew Bulletin of Miscellaneous Information*, for the purpose, more especially, of disseminating knowledge about the economic botanical

products of the Empire. The *Bulletin* was started in 1887 and is still in a flourishing condition, despite one or two times of difficulty—one of which was during the War, when an attempt was made to suppress it on the mistaken idea of economy.

Sir William's preface, which we quote, fully explains the scope and purpose of the work:

"It is proposed to issue from time to time, as an occasional publication, notes too detailed for the Annual Report on economic products and plants, to which the attention of the Staff of the Royal Gardens has been drawn in the course of ordinary correspondence, or which have been made the subject of particular study at Kew. It is hoped that while these notes will serve the purpose of an expeditious mode of communication to the numerous correspondents of Kew in distant parts of the Empire, they may also be of service to members of the general public interested in planting or agricultural business in India and the Colonies.

"W. T. THISELTON-DYER,
"Director.

"1st January 1887."

The present condition of the Kew Museums is also largely due to Sir William Thiselton-Dyer. Originally started by Sir William Hooker, the collections grew apace and fortunately they came under Dyer's purging hand, with the result that much encumbering dross was removed and the economic products were displayed to the best possible advantage. At the same time the Museum guides were produced and put on sale, in order that the public might be provided with accurate information on the wealth of the vegetable kingdom and the economic products derived therefrom.

These, with the two African floras and the *Kew Bulletin*, are a record of service which is of the highest importance, not only in the development of our knowledge of the botanical resources of the Empire but also because of the impetus this gives to scientific research in botany.

Such services as these, and many other activities displayed by Sir William Thiselton-Dyer in various botanical enterprises, have rarely been surpassed in value and importance by the labours of any other public servants to whom the British Empire owes so much.

Obituary.

PROF. FELIX KLEIN, FOR. MEM. R.S.

FELIX KLEIN, who was born at Düsseldorf on April 25, 1849, died on June 22, 1925. He had been professor at Göttingen since Easter 1886, having previously been at Erlangen (1872-1875), Munich (1875-1886), and Leipzig (1886-1886). With a trenchant expository style, revealing a forceful genial character, he wrote on almost every branch of mathematics; he was editor of the *Mathem. Annal.* from the time of the death of Clebsch (1872), originator of the "Enzyklopädie" for mathematics and mathematical physics (from 1895), and, in his own country, worked incessantly for a living co-operation of physics, engineering, and mathematics, and (since 1908) to bring the teaching in the schools into touch with current scientific problems. He was also a constant traveller and lecturer; was

twice in America and many times in England, since 1873. His exceptional personality appeared at once after his student days at Bonn; he took his doctor's degree at the age of nineteen; issued the second part of Plücker's book on line-geometry at the age of twenty; by the end of 1871, when he was twenty-two, had published eighteen original papers (some of these with Lie); by the end of 1875 he had published forty. Many of these are still mines of suggestiveness; his Erlanger Programm (1872) has been translated into English, French, Italian, Polish, Russian, and Hungarian.

Klein's mathematical papers were published, under his own supervision, in three volumes, in 1921-1923, containing more than two thousand beautifully printed pages; in these is inserted a running personal commentary; in effect, a detailed account of his scientific