

of Devonshire until the Court was out of mourning, whereas the message announcing the death of Queen Victoria outstripped the sun. It has been well said that the extent of the unit of government is determined by the facility of communication, so that in the age of electricity all former notions in this respect have to be recast.

Nature may therefore be said to be still in the first chapter or Genesis in regard to social evolution. Probably with abundant provision for autonomy the social organism may eventually be found to be capable of world-wide extension, and the poet's dream of the parliament of man and the federation of the world may at some remote epoch be realised. But this far off event will not be hastened, but rather retarded, by any premature attempt to snatch attainment. A pebble dropped into a pond stirs in ever widening waves the whole surface of the water, but the extension depends on the orderly progression of each succeeding circle. There are no sudden leaps in evolution. "From lower to the higher next, not to the top is Nature's text." It is by timely limitation that the due furtherance of the process is ensured.

The evolution of empire is of intense interest to all, and is of vital importance to the British race, because it has stretched further afield and covers a greater and more diverse area than has ever been previously attempted. The idea which possessed many well disposed people at the advent of the International Exhibition epoch that the future rivalry of nations would take place in a fair field of industrial emulation, that fiscal barriers would be abolished, and that war would soon become an anachronism, must now, to say the least, be pronounced as premature. It is true that the nation, which was formerly regarded as the finished social product, has become the raw material out of which empires are constructed. The areas of government have consequently been extended, but it is only what may be regarded as division fences that have been removed. The ring fences are higher than ever. The international nexus is still of the feeblest texture, and organisation must for a long period continue to be intra- and not inter-imperial. Those are the best cosmopolitans, and best advance the destined solidarity, who pay due regard to the definite problems of the present. It is quite certain that the future will be attained by a continuance of the recognised methods of natural selection, namely, cooperation within the circle and competition without. It is well constantly to bear in mind the invariable biological rule that organisation must increase with size. Mere bulk without adequate organisation only serves to increase vulnerability. The view that the British Empire, the most extensive of all, can afford to remain less organised than any is a dangerous heresy. Not further aggregation but integration is the pressing need of the age, and the success which has in recent years attended the bringing of large areas under the federal form of government indicates that in federation will be found the best means of uniting the widely extended territories of Greater Britain. This indication is also supported by theoretical considerations, for federation affords the fullest scope for the variation and the adaptation to local conditions so indispensable to progress; while at the same time it provides sufficient integrating power to coordinate the diversified elements for defence and mutual advancement. It combines firmness with flexibility, and reconciles empire and liberty.

In the middle of last century the government of the colonies from Downing Street was found to be impracticable, and such centralisation would be doubly impossible now that both area and diversity have so greatly increased. To the preceding generation of statesmen the only alternative to the old colonial system appeared to be separation, and most assiduously they set to work to loosen the bonds and to facilitate the severance of the colonies from the Mother Country, and it was in order to pave the way to this desired dissolution that autonomy was granted. In adopting this course they were, however, all unconsciously ministering to the evolutionary requirements of a combined and not of a disintegrated empire. For at that stage the prime necessity for higher organisation was to provide free play for the variation which the diverse circumstances of the widely scattered colonies demanded. The result has been the unfettered development of nations such as Canada and Australia, which have attained an individuality of their own

without any diminution, but rather with an increase, of attachment to the Mother Country. They are still daughters in their mother's house, though mistress of their own.

The requirement to-day is for sufficient integrating force to bring the diversified elements into organic union, so as to present a united front to the world and compete on equal terms with highly organised rivals. The harmonious evolution of the empire will then appear as an orderly sequence from the unity of the old colonial system, through the diversity engendered by the "beneficent neglect" and apathy of fifty years ago up to the coordination of individual but component nations in imperial federation. From the scientific standpoint the subject is fascinating, but the question that presents itself to the practical British mind is whether it is possible from a study of the mode of operation of the laws of evolution not only to comprehend the past, but to derive guidance for the future.

The withdrawal of British troops from the colonies, although at the time the step was greatly regretted, enabled the local defences, by a partial elimination of red tape, to be organised on lines better adapted to actual requirements; and we have seen with what advantage the different contingents cooperated on the veldt. Imperial countenance instead of discouragement to the development of similar individuality in naval affairs might be expected to yield equally good results. Many statesmen, both at home and in the colonies, have expressed the opinion that a mistake was made in granting fiscal autonomy to the colonies. This is probably an erroneous view; uniformity would have hindered the requisite variation. But that is no reason why, under an integrating influence, some form of coordination of tariffs might not now with advantage be effected.

In a federation many matters which are ordinarily under central control devolve upon the component States and municipalities, and thereby congestion of the central Government is avoided and autonomy is fostered. Thus the integrating influence in no way checks the working out of their own problems by the people on the spot who have the most intimate knowledge of local requirements. The time is far distant yet when a federal legislature can be established, but the sooner a permanent council of advice is erected the better for the avoidance of blunders in colonial administration. The integrating process must in no way be permitted to stunt colonial individuality and initiative; these should be treasured as the qualities which have led to the pre-eminence of the race. The refusal to crystallise into system is the characteristic of the Anglo-Saxon as compared with the Latin races, and from this capacity for variation springs the genius of the British race for successful colonisation and world-wide empire building.

JOHN A. COCKBURN.

A BOTANICAL LABORATORY IN THE DESERT.¹

THE great impetus given to physiological and ecological botany by the foundation of research laboratories within the tropics gives some indication of the latent possibilities of the new laboratory established in the desert, where the botanical problems awaiting solution are many and varied. While numerous observations have been made upon the morphology of desert-plants, only a few detached physiological experiments have been conducted on them; yet the desert, with its sharply marked and exaggerated characters, offers a favourable field for research into manifold phases of physiological activity, and such research cannot fail to bring to light truths having a general application to plants of all climes.

Again, inquiries into the details of the geographical distribution should yield much valuable information. Of the flora of a desert tract it is known that many constituent species are descendants of outcasts from the adjoining more fertile lands, but that others belong to a few widespread orders or genera which reappear in deserts far apart, and thus show their antiquity of possession, and finally that

¹ "Desert Botanical Laboratory of the Carnegie Institution." By F. V. Coville and D. T. MacDougal. (Washington, U.S.A.: Published by the Carnegie Institution, 1903.)

still other constituents—few though they be—like *Acanthosicyos horrida* and *Welwitschia mirabilis*, are

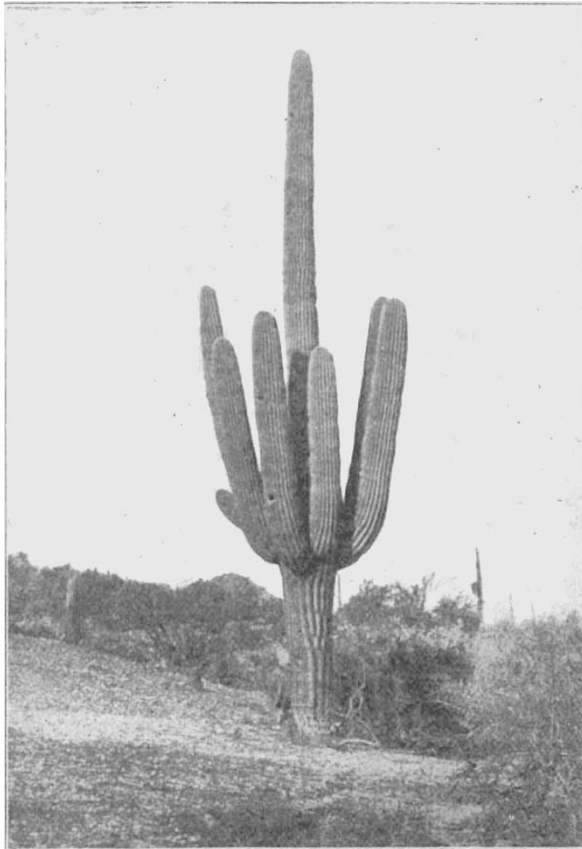


FIG. 1.—Saguaro or giant cactus (*Cereus giganteus*) near Tucson, Arizona. About 40 feet high.

enigmatic and isolated species the presence of which defies explanation. On the geographical distribution of species in deserts questions present themselves in numbers. For instance, why are certain species limited to specific areas of a large continuous desert? Competition among the component plants is practically eliminated, save, perhaps, in the seedling stage. Is the restriction of area a consequence of temperature, and therefore indirectly one of lineage, or of the chemical or physical nature of the soil, or of a number of factors? The vast North American desert district affords admirable opportunity for answering these and other questions, as it stretches, with small interruptions, from Mexico northward to the heart of the United States, and its different areas display differences in their floras. The Mexican deserts, for instance, give blurred impressions of an enfeebled tropical flora, inasmuch as they include *Hæmatoxylon* and *Guaiacum*, which are absent farther north. The Sonora desert in Mexico shows a somewhat exceptional feature in the marked presence of climbers, including malpighiaceae lianes and two other remarkable plants, a tuber-rooted straggling *Cereus* and the tendrilled cucurbitaceous *Ibervillea sonorae*, which in form recalls *Testudinaria*. Yet in this same desert there is not want-

the desert give rise to self-supporting descendants, for *Ipomoea arborescens* is a tree thirty feet in height. Another remarkable assemblage of plants is to be seen in the same desert at the harbour of Guaymas, in the salt waters of which tropical mangrove plants (*Avicennia* and *Rhizophora*) are growing side by side with typical desert plants, including two species of *Cereus*.

Quite apart from a desert climate, waste tracts can be induced by physiologically dry substrata, such as rocks, shifting sand, gravel, saline or alkaline soils, and these soils, or high winds, may accentuate the sterility of climatic deserts. All these conditions are to be met with within relatively easy reach of Tucson, Arizona, the site of the laboratory, as is shown by the present report, written by Messrs. F. V. Coville and D. T. MacDougal. Desert tracts occur varying from the most forbidding and bare areas with meagre floras to richer ones like that near Tucson, the desert flora of which in an eastward direction gradually gives way to the luxuriant subtropical flora of eastern Texas.

The following particulars culled from the report serve to illustrate the great variety in the deserts within reasonable distance of Tucson laboratory.

South of Tucson lies the desert of Chihuahua, "with a long stretch of sand dunes." Here the sand is siliceous, and *Yucca radiosa*, with its immensely long horizontal roots, plays a great rôle as a sand-binder.

The Tularosa desert, on the other hand, exhibits a remarkable area of white shifting sand, mainly composed of calcium sulphate. On these soluble "white sands" *Rhus triloba*, forming hemispherical bushes, fixes the sand, and *Populus fremontii* lives.

Lying farther north than Tucson, the Colorado desert includes gravel-hills, sand-dunes, alkali-flats, as well as wet saline and alkaline spots. Here occur unique groves of a fan-leaved palm, *Neowashingtonia filifera*, growing on alkali-encrusted soil above a moist clay subsoil. Over portions of this desert "the vegetation is subject to a veritable sand-blast," which threatens to sever the telegraph poles at a height of two feet, and has carved the creosote bushes (Covillea) into "most fantastic shapes."

The report includes a record of a few preliminary observations made by Dr. MacDougal, and a bibliography compiled by Dr. W. A. Cannon, the resident investigator. Its value and interest are enhanced by twenty-nine excellent photographs of vegetation in the deserts.

For the establishment of this laboratory botany owes a debt not only to the munificent founder, Mr. Carnegie,

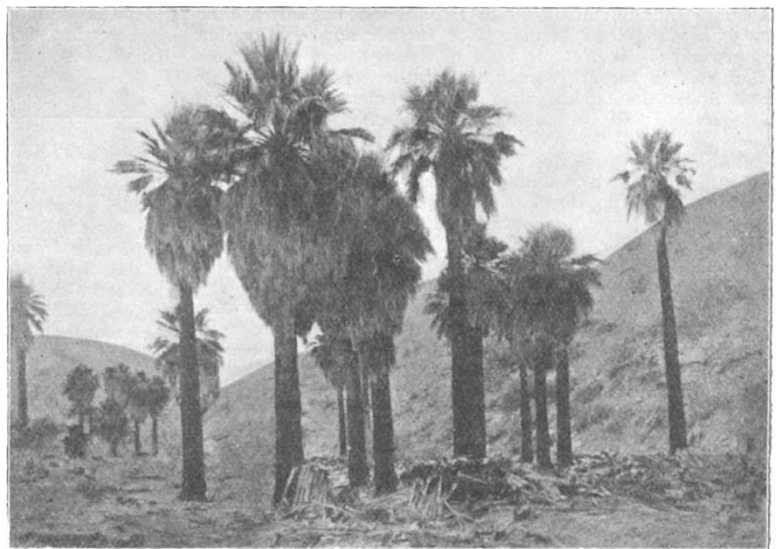


FIG. 2.—Group of Palms (*Neowashingtonia filifera*) in the Colorado desert, California.

but also to the suggester of the scheme, Mr. F. V. Coville.

PERCY GROOM.