and food value. From Fauresmith Sir Arthur Hill proceeded eastwards over the Drakensberg Range via Van Reenen's Pass and Ladysmith to Pietermaritzburg, from which place he travelled to Durban. From Durban he went to Pretoria and, after spending ten days there, travelled north to the Woodbush Mountains, and this completed his tour in the Union.

Before Sir Arthur left Pretoria, the Union Government gave a reception in his honour at the botanical laboratories attached to the Division of Plant Industry. At this reception Col. G. N. Williams, Secretary for Agriculture, welcomed him on behalf of the Union Government. In doing so, he spoke of the long and close association which Kew had had with the South African Departments of Agriculture, and also mentioned the many botanical expeditions with which Sir Arthur had been connected in different parts of the world.

Mr. C. E. Legat, Chief Conservator of Forests, welcomed Sir Arthur on behalf of the Forest Department. He mentioned the assistance which the Department of Forests had received from Kew, and stressed the fact that South Africa had to depend upon the introduction of exotic trees because the native timbers took between 150 and 200 years to mature.

Dr. I. B. Pole Evans, Chief of the Division of Plant Industry and Director of the Botanical Survey of South Africa, welcomed Sir Arthur on behalf of the botanists of South Africa. He described the great benefits which Kew had rendered to South Africa, and referred to the publication of the "Flora Capensis" and the assistance which the South African Governments had given in the matter. He referred to the close association between the Botanical Survey of South Africa and Kew, whereby the Survey had maintained at Kew for some years past a South African botanist to assist with critical determinations, etc. Dr. Pole Evans mentioned the botanical areas, institutions, and problems which Sir Arthur had seen, and expressed the hope that he would realise that botanical science had made considerable strides in the country during the past twenty-five years, and that South Africa must in the future endeavour to help herself much more than she had in the past.

Sir Arthur, in returning thanks to the Government for its invitation, referred to the great importance and educational value of botanic gardens. He stated that he would like to see three great botanical gardens flourishing in the Union. There were the Kirstenbosch Gardens, but in addition he would like to see one in Natal and one in Pretoria. He spoke of the excellent work which was being done at Fauresmith and at Pretoria on the pasture plants of the country, and also stressed the importance of the work that was being done by the Botanical Survey. Regarding forestry matters, Sir Arthur expressed high appreciation of the work for the preservation of native forests in the Knysna area. In concluding, he hoped that means would be found for subsidising post-graduate research work in botany, since he thought South Africa would derive considerable benefit from work of this nature.

General Smuts moved a vote of thanks to Sir Arthur Hill, the British Government, and the Union Government, and pointed out that Sir Arthur was the first of Kew's great directors to undertake a tour of the Dominions—and in this connexion General Smuts paid a great tribute to the foresight of the Empire Marketing Board in making this possible. He referred to the valuable gift which Sir Arthur had made, through Kew, to the National Herbarium at Pretoria by donating type specimens of many of the older collections, and pointed out that the National Herbarium at Pretoria would now be able to do a very large part of the work which Kew originally did. He expressed the view that the time would probably come when South Africa might well become one of the great pasture countries of the world, and for this reason every effort should be made to develop the country's natural resources. This might in time become a question for the whole of Africa, and they would see not only one institution, not only one country such as the Union, but all the African Governments collaborating and trying to solve common problems. Science would have to be applied more and more to the economic situation. General Smuts referred to the great spaces in South Africa and the difficulties which isolated workers had to contend with, and he felt that Sir Arthur's visit would be a great inspiration to these people.

After the speeches of welcome, Dr. A. C. Leemann spoke on "Plant Immunity and the Aims of Modern Plant Pathology". He gave his audience the benefit of his researches in his own entirely new line of work in the realm of plant immunity, in which, by reinforcing soil conditions, he has found it possible to effect a marked change in the immunity of plants to certain fungus diseases. Dr. Leemann supplemented his remarks by giving a demonstration of plants which had been inoculated under these conditions.

Guests were then given the opportunity of inspecting a very interesting and instructive series of exhibits illustrating the work of the Division of Plant Industry. These included amongst others:—(1) Photographs of much of the vegetation of those parts of the country which Sir Arthur Hill had not been able to visit. (2) A collection of old type specimens presented to the National Herbarium by Kew and Berlin. (3) A collection of living pasture grasses recently collected on a tour from Pretoria to Lake Tanganyika. (4) A trap specially designed by Mr. H. Harris, as a result of his work in Zululand, for catching tsetse flies. The success already achieved by the use of this trap opens up considerable possibilities with regard to tsetse fly control (NATURE, Nov. 22, p. 817).

This visit of Sir Arthur Hill to the Union of South Africa is of outstanding significance, and much of botanical interest should accrue from it, for there is probably no part of the British Empire which has contributed more towards the pure and economic branches of botanical science, and it is scarcely possible to encounter a flora which could excel that of South Africa in beauty and scientific interest.

Scotland's Testimony to the March of Evolution.

THIS subject formed the main part of Prof. James Ritchie's inaugural address (reprinted in part in the *Scottish Naturalist*, Nov.-Dec. 1930) on his induction to the Regius chair of natural history in the University of Aberdeen.

Prof. Ritchie reminded his audience that bears were once common in the Caledonian forest, and that he, with his collaborators, had found in caves near Inchnadamph, in Sutherland, bones of bears, remains of wolves, lynxes, Arctic foxes, and lemmings, and more than nine hundred antlers of reindeer. All these animals, and more besides, have disappeared from Scotland; they have been swamped in the struggle for existence. Red deer, once common throughout Scotland, are now restricted to the Highlands; wild cats, pine martens, and polecats are dying out; and the white-tailed eagle, the kite, and the osprey have disappeared. On the other hand, many species of wild ducks are now nesting where they never bred before; and the fulmar petrel, for centuries confined

to St. Kilda and its islands, has in a generation colonised the north coast and the east coast to Flamborough Head. These and other changes in the balance of life illustrate the accommodation of living things to changing conditions and hence successful colonisation; and, on the other hand. the failure to accommodate and consequent elimination.

In his second line of evidence, Prof. Ritchie referred to examples of the plasticity of living forms. "Put broadly, Creationism emphasises the immobility of living forms, Evolution emphasises their plasticity." He pointed out that in a relatively short time Scotland has impressed its mark upon domestic animals: among horses it has bred the Clydesdale, among cattle Aberdeen-Angus, Ayrshires, Galloways and Kyloes, among dogs Skye terriers and others, among sheep Cheviots and Highland blackfaces—surely sufficient evidence of the plasticity of living forms that evolution demands. Granted that this plasticity can be made apparent by man's efforts, what evidence is there that it plays a part in natural processes? Prof. Ritchie believes that Scotland demonstrates better than almost any other country the evolution of life in progress. The former fauna was entirely obliterated in the ice age, and the new fauna flocked into the country from Europe. But all the animals are not exactly as they were; changes have been taking place, revealed by the intense examination of modern zoologists. The red grouse of Scotland is clearly different from the willow grouse of the Continent; it is a different species. Of the one hundred and fifty-nine different species of birds which breed in Scotland, thirty-two show characters which distinguish them from their closest relatives on the Continent. Others—and thirty-one of these are named—are distinct geographical races which, although differing from their continental relatives, are not different enough to be regarded as distinct species. Of the fifty-six different species and races of mammals which breed in Scotland, thirty are different from the most closely related continental forms; and of these, specialists have regarded eight as distinct species and twenty-two as geographical races.

Prof. Ritchie illustrated his argument by particular reference to the St. Kilda house-mouse and the St. Kilda field-mouse, both regarded as distinct species, and remarked that it is reasonable to suppose that these are the direct descendants, slightly modified, of the original migrants from the common fauna of Europe.

"In the fauna of St. Kilda and in the thirty-two distinctive birds and thirty distinctive mammals of Scotland we are looking upon the modelling from old species of new species and of geographical races, which we regard as the incipient stages of new species.

"In the changes taking place in the balance of life, in the plasticity of animal form, and in the formation of new races and species, not in the distant past of geologists, but in recent times, we are looking in Scotland upon evolution in its course."

The Mechanics of Mountains.*

THE earth's upper crust in the continents appears from seismology to consist of three layers, an upper one of granitic constitution, about 10 km. thick; an intermediate one about 20 km. thick, the properties of which fit tachylyte; and a lower one probably of dunite, extending half-way to the centre of the earth. Above the granitic layer is the sedimentary layer, with an average thickness of probably about 2 km., but considerably thicker in special regions. The outflow or inflow involved in maintaining isostatic compensation is in the lower layer, but at a smaller depth than 50 km.

The mechanical properties of the outer crust indicate that the crustal shortening in a major epoch of mountain formation should be of the order of 40 km. The actual height and extent of the great ranges correspond to a shortening of about 60 km. This estimate is arrived at by considering what elevation would be produced if the light upper layers were compressed by a given fraction of their original length and enough outflow in the dense lower layer took place to restore isostasy.

This estimate is much less than the horizontal movement observed in the field, and the only possible explanation is that the horizontal movement is a surface phenomenon almost confined to the sedimentary layer, and caused by the crustal shortening, but not equivalent to it.

Prolonged deposition of sediments leads to an obstruction of the normal outflow of heat from the earth, and hence to an increase of temperature and a reduction of strength through a depth of the order of 100 km., thereby localising the yield when the stresses due to contraction of the interior become too great for the strength of the outer crust to withstand. The immediate result of a local failure would be a local elevation so high that the heated sediments would proceed, as a secondary effect, to flow out horizontally under gravity and give a series of flat folds closely resembling the observed nappes. Explanations of 'back-folding' and of the gneissic core of a great mountain system appear to follow naturally.

Emphasis is laid on the importance of recognising the intermediate layer in discussions of the mechanics of geological processes. Isostatic readjustment can take place by horizontal outflow in this layer as in the lower layer, though much more slowly, and this process may play an important part in the formation of geosynclines and the levelling of old mountain systems.

* Substance of a lecture by Dr. H. Jeffreys, F.R.S., on "The Mechanics of Mountains", at the Geological Society of London, on Dec. 31, 1930.

Sinkage of Logs.

THE sinkage of logs during the river journey to the pulp-wood mills is a matter of considerable importance owing to the loss thereby incurred. The question has formed the subject of research by Prof. G. W. Scarth, Botanical Department, McGill University, and Mr. E. C. Jahn, associate professor of chemistry, School of Forestry, University of Idaho, the work being assisted by funds contributed by the Canadian Pulp and Paper Association. A paper on "Sinkage Studies—I." has now been published (*Can. Jour. Research*, vol. 2, June 1930). Experiments were made with logs of jack pine, spruce, poplar, balsam, and birch.

The distribution of water in floating logs (in a lake) was found to be similar to that in living trees. It was noted that the sapwood of these species became wet all round whilst the heartwood was relatively dry, becoming wetter in the order of the species given above; the heartwood in birch became as wet as the sapwood. The rate of radial penetration of water into logs of these species increased in the order, birch, jack pine, spruce, balsam, poplar; the penetration