species: Chenopodiaceæ 94, Papilionaceæ 85, Cruciferæ 51, Gramineæ 44, Boraginaceæ 42. Interesting comparisons are drawn between the Transcaspian flora and the floras of various other regions, desert and otherwise, with reference to the proportional representation of the families and also of the biological types. The memoir concludes with detailed notes on the structure and biological adaptations of various Transcaspian species investigated by the author.

F. C.

THE "AEROSCOPE" KINEMATOGRAPH HAND CAMERA.

AN interesting demonstration of the greatly extended adaptability of kinematographic apparatus was given by Mr. Kasimir Proszynski at a meeting of the Royal Photographic Society on Tuesday, February 18. In introducing the "Aeroscope" hand camera, the lecturer made some general remarks dealing with the problem of flicker, the presence of which, more or less pronounced, has been of considerable trouble to producers of moving pictures. He stated that up to the present time it had been generally understood that the suppression of flicker was in some manner due to the phenomenon of persistence of vision, which, according to the experiments of Helmholtz and other investigators, continues about one-seventh of a second after the light impression has ceased.

Mr. Proszynski considers this idea a mistaken one, and by means of a series of diagrams and demonstrations with the lantern he made out a strong case for his view that flicker is due to the slightly varying lengths of time during which the light from each picture is transmitted to the screen through the openings in the sector shutter. If the opaque portions of the shutter are not all exactly equal, the eye, being extremely sensitive to slight *variations* of illumination, receives the impression of alternating light and darkness corresponding to the difference between the angular size of the blades of the shutter sectors. From this point of view the flicker should be completely eliminated by using any simple shutter with four, three, or even two wings, the essential feature being that the wings must all be very accurately made of the same size. Various forms were shown in the lantern projector; in practice the three-bladed sector shutter is found most suitable.

Another feature embodied in the "Aeroscope" camera is its adaptability for use without a tripod stand, thereby greatly extending the scope of its usefulness to the portraying of scenes quite inaccessible to the ordinary camera requiring a steady support. The camera is fitted with self-contained mechanism for driving the film, consisting of a small air motor, driven by compressed air stored in four steel reservoirs held in the camera body. These cylinders can be recharged by means of a cycle pump to a pressure of 400 lb. per sq. in. The motor is fitted with a governor for keeping the motion of the mechanism uniform, and a lever control on the exhaust for securing different values of this motion to suit different subjects.

The chances of injurious vibration during the exposure of the film are very neatly minimised by the introduction of a heavy gyrostat wheel in the end of the camera box; this is also driven from the air motor.

A series of beautiful pictures of scenery, including animals and moving water, taken by Mr. Cherry Kearton in North America, was sufficiently convincing as to the efficiency of this novel method of animated picture photography.

C. P. B.

THE NATIONAL PHYSICAL LABORATORY.

WITH the view of raising funds to complete the additions now in progress at the laboratory, the executive committee of the laboratory last autumn appointed a funds committee, with Sir W. H. White as chairman, and entrusted it with the task of appealing for support to persons interested in their national work.

This work was commenced at Teddington in the year 1901; the great need of an institution such as the laboratory and the importance of its work have been amply demonstrated by its rapid growth. The original buildings comprised Bushy House, granted by the Crown, and an additional building for the engineering department. The wide scope of the work at the present time will be sufficiently indicated by an enumeration of the various buildings, and a brief indication of the purposes for which they are intended.

(1) Bushy House, providing accommodation for administration offices and for divisions dealing with electrical units and standards, general electrical measurements, thermometry, optics, and tide-prediction.

(2) Engineering building, for general engineering research and tests, with additional accommodation for aeronautical investigation, and for the examination of road materials (Road Board Laboratory).

(3) Metallurgy building, for investigations into the properties of metals and alloys.

(4) Electrotechnics building, equipped for researches connected with electricity, and for the testing of alternating- and direct-current instruments of all kinds, as well as of material for electrical purposes; also for photometric work, especially the standardisation of sources of light.

(5) Metrology building, for measurements of length, end gauges, cylindrical gauges, screw gauges, tapes and wires for survey work, &c., the standardisation of weights, and the testing of measures of area and volume, glass vessels, &c.

(6) William Froude National Tank, for experiments on models of ships.

(7) Observatory Department. This section of the work has been housed at Kew Observatory, and includes the testing of thermometers, optical instruments such as telescopes, binoculars, sextants, theodolites, &c., watches, chronometers, and many other types of instruments.

To provide for the research work which is continuously in progress, and occupies perhaps two-thirds of the time of the scientific staff, generous assistance has been afforded by many private individuals, by the City companies, and by all the great technical institutions, some of which have made annual grants for this purpose for many years past.

Some three years ago it was evident that further buildings were needed at Teddington. The accommodation for the metallurgical work was then quite inadequate, while the office and administration rooms were entirely unsuited to their purposes. The library had long overflowed the small room allotted for its use ten years ago. The arrangements for the receipt and dispatch of goods remained much as at the beginning, and it had become increasingly difficult to deal with the apparatus and material sent for test.

Moreover, the optical and thermometric test work at Kew has quite outgrown the opportunities for test at the old observatory, and modern demands require a revision of the methods and appliances available for the work. In addition, a scheme has been approved by the Royal Society and the Government for setting free the observatory for meteorological observations

and research by the removal of the test work to Teddington. The Office of Works has arranged to make certain alterations at Kew for this purpose, while the laboratory committee provides the necessary accommodation for tests.

Accordingly a scheme of new buildings at Teddington was prepared at an estimated cost of about 30,000*l.*, or, if scientific equipment is included, 35,000*l.* Towards this the Lords Commissioners of H.M. Treasury agreed to contribute 15,000*l.* in three instalments if the scheme could be completed without further application to the Government. Thus, it was left to the committee to raise, for the buildings alone, about 15,000*l.*

This sum has now been obtained; the metallurgy building, erected through the generosity of the late Sir Julius Wernher, is complete and occupied, but much additional equipment is required. The other buildings are in course of erection, and funds are urgently needed towards their equipment. The minimum estimate for this is 5000*l.*, of which about 3000*l.* has been contributed. Thus, apart from the special equipment for metallurgy, at least 2000*l.* more is needed to complete the scheme, and it is for this that support is being asked.

The following are the present members of the committee:—Sir William H. White, K.C.B., F.R.S. (chairman), Lord Rayleigh, O.M., F.R.S., Sir A. B. Kempe (treasurer R.S.), Prof. A. Schuster (secretary R.S.), Mr. J. A. F. Aspinall, Sir J. Wolfe Barry, K.C.B., F.R.S., Dr. G. T. Beilby, F.R.S., Sir Hugh Bell, Bart., Dr. Horace T. Brown, F.R.S., Colonel Crompton, R.E., C.B., Mr. J. M. Gledhill, Mr. R. Kaye Gray, Sir R. A. Hadfield, F.R.S., Mr. D. Howard, Sir J. Larmor, M.P., F.R.S., Dr. W. H. Maw, Mr. R. L. Mond, Sir A. Noble, Bart., K.C.B., F.R.S., Hon. Sir C. A. Parsons, K.C.B., F.R.S., Sir Boverton Redwood, Bart., Mr. Alex. Siemens, Mr. T. Tyrer, and Prof. W. C. Unwin, F.R.S.

PROGRESS IN AGRICULTURAL EDUCATION.

THE Board of Agriculture and Fisheries has issued its annual report on the distribution of grants for agricultural education and research in the year 1911–12 (Cd. 6601). Bound up with the report are statements respecting the several colleges aided, and a summary of the agricultural instruction provided by county councils in 1910–11.

The classes and courses of instruction which the Board of Agriculture and Fisheries aids are those intended for persons of sixteen years of age or more, who have finished their school education, and are either pursuing technical studies with the view of becoming agriculturists, or are already engaged in agriculture and desire to improve their knowledge of the subject. The list of grants awarded in aid of educational institutions in the year 1911–12 shows that the total amount of the grant was 18,840*l.*, the same as in 1910–11. The interim grants in aid of agricultural research paid by the Board from the Development Fund during 1911–12 amounted to 9263*l.*, and the special grants for experiments and research to 250*l.*

The accounts sent to the Board by local education authorities show that they are spending in round figures 80,000*l.* per annum on agricultural education. The Board's grants for work in universities and colleges, not included in this sum, would bring the total public expenditure on agricultural education, apart from the Development Fund, to about 90,000*l.* per annum.

We reprint below a part of Prof. T. H. Middleton's introduction to the report, referring to research institutes for agriculture:—

The State has now placed, for the first time, a large sum for research at the disposal of British agriculture, and it is clearly the duty both of the central and local authorities to devise means for applying to practical farming the knowledge provided by workers in research institutes. The purpose of the grants made for research is not in this instance to subsidise scientific workers, but to develop agriculture by scientific means, and until the knowledge of the laboratory has been translated into practice in the field the work is incomplete. When reconsidering their educational methods, local education authorities should understand that their aid is expected in securing from the expenditure and labour incurred in agricultural research results of real value. The research institutes endowed by the Development Fund are national, not local institutions. The primary duty of the persons engaged in these institutes is to advance knowledge, and the needs of local agriculture, if they are considered at all, can only be considered incidentally. The result is that if any locality wishes to make use of the research institutes it must take steps to adapt scientific discoveries to its own conditions.

It should further be remembered by those responsible for the education of agriculturists that not only are the results of the work of all the new research institutes to be available for agriculturists in any county, but as a consequence of the establishment of research institutes in England this country may now draw upon the results obtained by the investigators of all other countries in a way that was formerly impossible. There has thus been created a system for bringing within reach of English agriculture the knowledge resulting from the vast amount of work now undertaken in the research laboratories of all civilised countries. But all this knowledge will be valueless to any particular locality until it has been applied by farmers to the cultivation of their land. How is this application of scientific discoveries to the commercial questions of the ordinary farm to be accomplished? Can farmers be expected to study scientific treatises? If farmers did study and understand the publications of research stations, could they afford the time and the cost involved by the adaptation of the applications of new principles to the particular circumstances of their own farms?

If answers to such questions as the foregoing are attempted it will be agreed that the Development and Road Improvement Funds Acts have added new responsibility to the work of local education authorities, or at least that a duty which was formerly inconsiderable has now become important. The only important task of a local committee charged with agricultural education has hitherto been to provide for the instruction of young persons up to the time when they leave school or college, or to supply itinerant teachers capable, as a rule, of instructing novices only; they are now expected to make the provision required for advising experienced farmers on the means to be adopted in applying scientific discoveries to practice—a difficult and responsible task.

It is sometimes contended that the only satisfactory way of applying science to agriculture is to give the young farmer a sound scientific training, and leave him to apply the discoveries of scientific men which come before him in his later years. This, it is assumed, he can do for himself after he has gained experience. The usefulness of a proper early training cannot be questioned, and the work of the research institutes will make its usefulness even greater in