to the formation of latent images, however, the theory is incomplete: one has to explain how the positive holes are prevented from recombining with the electrons and how the first electrons are trapped if no silver is initially present. What is lacking is evidently a theory of sensitization, and the question arises: Do the sensitizers mentioned function as electron traps, or positive hole traps, or both?

In a lecture given on November 20 before the Scientific and Technical Group of the Royal Photographic Society, Dr. J. W. Mitchell described a series of elegant experiments on the point carried out by himself and collaborators in the University of Bristol. The complications of photographic emulsion work were avoided by using pure dry monocrystalline plates of silver bromide and applying the sensitizer (silver, gold or a metallic sulphide) directly in a very thin uniform surface-layer by vacuum evaporation. The plates were about 1 cm. square and 0·01 cm. thick, with the crystallographic [100] axis approximately perpendicular to the square face. An ordinary metol-hydroquinone developer was used, with a little gelatine added to prevent excessive fog. Unexposed unsensitized specimens gave only a slight irreducible fog in the form of small oriented silver crystals scattered over the surface, as observed in previous single-crystal work by Dankov[5] and Boissonnas[6]. Exposure to light produced no further developable effect, even when sufficient to produce visible (internal) separation of silver. A developable latent image was produced, however, by exposure under a solution containing a bromine acceptor.

By means of slits and masks, the deposition of sensitizing substances and the exposure to light were restricted to well-defined circular or rectangular areas of the specimen. Areas bearing 10^{15} silver atoms per sq. cm. (about one monolayer) were blackened by development without exposure, the edges appearing well defined. Specimens bearing 10^{14} silver atoms per sq. cm. gave only the normal irreducible fog without exposure, but were blackened in certain areas by development after exposure—that is, they were sensitized but not fogged by the deposited silver. This blackening or latent-image formation was expected to occur only in the areas both silvered and exposed to light, but the result was quite different. The blackening appeared only in the unexposed areas, and spread beyond the silvered areas, the spreading being greater at a greater distance from the exposed area: with sufficient exposure the entire unexposed area became blackened. Essentially the same phenomena were observed with gold and with arsenious, antimony and thallous sulphides (silver sulphide, not being stable enough for evaporation, was not tried).

If the sensitizers in these experiments acted mainly as electron traps, the blackening would presumably have been confined to the sensitized areas. It seems that the phenomena can only be explained by supposing that they act as positive-hole traps, that is, they react with the bromine, which is quite reasonable from a chemical point of view. If some of the bromine is removed in this way, a surplus of electrons remains, and apparently no special electron traps are then needed to ensure the formation of latent-image silver specks, for the latent image appears mainly on the naked silver bromide surface. The mobility of the electron being about twice that of the positive hole explains why the image is produced far from the exposed area, in which a surplus of positive holes will be left. The space charge produced by the electrons travelling faster than the holes would produce a field urging interstitial silver ions into the electron-rich regions. Dr. Mitchell did not, however, attempt to give a complete theory of the phenomena.

It appears then that silver, gold and metallic sulphides all sensitize by the same mechanism, that the function of each is to react with halogen, and that no special electron traps are needed for sensitivity. In the case of silver sensitization, the capture of positive holes by the silver permits the formation of new silver elsewhere by the electrons and interstitial ions, and one might say that in effect the latent image is formed by redistributing the silver initially present. These tentative conclusions, though they may not be directly applicable to the sensitization of ordinary emulsions, are of obvious interest to the photographic chemist and represent a radical revision of earlier thought on the subject.

[1] Loening, E. E., in "Fundamental Mechanisms of Photographic Sensitivity", 149, ed. J. W. Mitchell (London: Butterworths Scientific Publications, 1951); *Phot. J.*, **92B**, 126 (1952).
[2] Lowe, W. G., Jones, J. E., and Roberts, H. E., in "Fundamental Mechanisms", 112.
[3] Gurney, R. W., and Mott, N. F., *Proc. Roy. Soc.*, A, **164**, 151 (1938).
[4] Mitchell, J. W., *Sci. Indust. Phot.*, **19**, 361 (1948); *Phil. Mag.*, **40**, 249, 667 (1949); "Fundamental Mechanisms", 242.
[5] Dankov, P. D., and Kochetkov, A. A., *C.R. Acad. Sci., U.R.S.S.*, **26**, 785 (1946).
[6] Boissonnas, C. G., *Sci. Indust. Phot.*, **20**, 361 (1949); *Experientia*, **5**, 282 (1949); "Fundamental Mechanisms", 36.

THE FORESTRY COMMISSION

REPORT FOR THE YEAR 1950–51

THE thirty-second annual report of the Forestry Commission records the activities of the Commission for the year ending September 30, 1951*. During this time the passing of the Forestry Act 1951 took place, and the year also marked the end of the first post-war quinquennium. The progress of private forestry, and the dedication schemes and the acquisition of land during the year are worthy of notice.

The Forestry Act 1951 was passed during August 1951, and its main provisions, which relate to the maintenance of reserves of growing trees in Great Britain, came into force two months later. Since the beginning of the Second World War, fellings had been controlled by statutory instruments under Defence Regulation 68. This was not intended to be permanent; nevertheless, the timber resources of Great Britain in both conifers and hardwoods were alarmingly small, and unchecked felling could not be countenanced. The Forestry Commission is therefore charged by the Act with "the general duty of promoting the establishment and maintenance in Great Britain of adequate reserves of growing trees". To carry this out the Commission is required to consult with the Home Grown Timber Advisory Committee, consisting among others of those appointed on the advice of woodland owners and the timber trade. The Act also provides for the maintenance in each conservancy of a regional advisory committee, "certain members of which are appointed after consultation with the above organizations and with the forestry societies, for the purpose of advising the Commissioners as to the performance of their functions under the provisions of the Act relating to licensing and compulsory felling". The Act prohibits the felling

* Forestry Commission: Thirty-second Annual Report of the Forestry Commissioners for the Year ending September 30th, 1951. Pp. 82. (London: H.M.S.O., 1952.) 3*s.* net.

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of any growing tree (apart from certain exceptions such as trees less than a given diameter, garden and orchard trees and a licence-free allowance of 825 cu. ft. per quarter) unless a licence has been granted by the Commissioners.

Apart from the Forestry Commissioners and the staff of the Forest Department proper, there are no less than three National Committees (England, Scotland and Wales), eleven Regional Advisory Committees (five for England, four for Scotland and two for Wales) and a Home Grown Advisory Committee—a total of fifteen committees to assist in carrying out the forestry work of a comparatively small island.

One important provision of the Act is that the Commissioners have now the power to add replanting of the area to a felling licence. By establishing the principle that it is contrary to the public interest that forest land should be cleared and then allowed to lie derelict, the Act will check the further accumulation of unproductive woodland areas.

The area of forest planted during the year was 57,164 acres, of which 17,491 were in England, 26,960 in Scotland and 12,713 in Wales. The total area of land acquired during the year was 113,200 acres, of which 56,000 were classed as plantable. Of the latter, 16,000 were in England, 33,000 in Scotland and 7,000 in Wales.

It is estimated that private owners planted 12,300 acres, of which 6,300 acres were planted with the aid of grants. Under the dedication scheme deeds were completed with seventy-nine owners in respect of 37,010 acres of woodland. The planting and maintenance grants have been revised and increased. During the quinquennium a total area of 138,000 acres of the woods planted since 1921 has been thinned, and it is estimated that during the same period 38 million cu. ft. of poles and timber (roughly a million trees) have been extracted from these new public forests, and a small return on the capital outlay is being obtained.

An additional national forest park, named Loch Ard, was set up in the lovely Trossachs district of the Scottish Highlands. This must be one of the most beautiful of all the national forest parks so far established.

E. P. Stebbing

COMMONWEALTH OBSERVATORY, CANBERRA

REPORT FOR 1951

THE report of the Commonwealth Astronomer for the year 1951* covers the activity of the Commonwealth Observatory, Canberra, during the twelve months up to December 31, 1951. During this period sunspot sketches were obtained on 294 days, and solar radio-noise observations on a frequency of 200 Mc./s. were continued. Transit observations with the small reversible transit instrument gave 251 determinations of clock error obtained on 216 nights. Random errors from the sidereal pendulum clock have been eliminated by determining the error directly of one of the mean-time quartz-crystal clocks. Time services were originated four times each day, and some preliminary work has been carried out with the view of supplying a time service for South Australia.

* Commonwealth Observatory, Canberra. Report of the Commonwealth Astronomer for the Year 1951. Pp. 5. (Canberra: Commonwealth Government Printer, 1952.)

Dr. G. E. Kron, of the Lick Observatory, assisted by Dr. S. C. B. Gascoigne, using the Reynolds 30-in. reflector, carried out a programme of red and infra-red measurements, utilizing a refrigerated cæsium oxide cell, and determined the magnitudes at effective wave-lengths 8250 A. and 6300 A. of stars in standard regions *D*2, *C*4, *C*6, *D*6, *C*8, *D*10, *C*12; of all nearer stars within about 12 parsecs (and this part of the programme included accurate photometric observations of Proxima Centauri); and of certain bright stars included in previous Mt. Stromlo programmes. In addition to this, they worked for eighteen nights on various objects in the Magellanic Cloud, using a refrigerated 1P21 multiplier. The magnitude limit was about 15·5, and all nine Cepheids examined were appreciably bluer than galactic Cepheids of similar period. Dr. O. J. Eggen, using an 1P21 multiplier on the Oddie telescope, measured colours and magnitudes of stars of known parallax brighter than photographic magnitude 11·0 and also of Cepheids brighter than magnitude 10·0. Objects of some interest were also observed, and *HD*223045 showed a light variation of 0·75 mag. with a period of only 80 min.

The contractors for the 74-in. reflector informed the director of the Commonwealth Observatory that the mounting was ready for dispatch from London, where it had been on exhibition during the Festival of Britain, and the mirror, which has been lightly polished, shows a good figure. Notable progress has been made with the building for the 50-in. (the old Melbourne 48-in.) reflector, and the mirror, by the firm of Cox, Hargreaves and Thomson, has arrived in Canberra. It is proposed that this instrument be initially set up in a Schmidt–Gregorian form prior to the completion of the Schmidt correcting plate and the construction of the plate-holder and tube for the Schmidt telescope. A 40-in. aluminizing tank is in use, and all the larger astronomical mirrors have been coated with aluminium.

The issue of regular monthly publications of the Ionospheric Prediction Service has been maintained. In addition to the analysis of data from Macquarie Island, some results have been obtained from the Townsville Station, which has been re-occupied. The new building for the Hobart Station has been completed, and power lines and aerials were in course of erection. Attempts are being made, in collaboration with the Overseas Telecommunications Commission, to re-introduce the system of storm warnings.

A supplement to the report for 1950*, which marks the twenty-fifth anniversary of the commencement of the observational work of the Commonwealth Observatory, takes the form of a history of the Observatory to the end of 1950. Originally known as the Commonwealth Solar Observatory, which started on January 1, 1924, with the appointment of Dr. W. G. Duffield as first director, actual observations commenced at Canberra in the following year and at Mt. Stromlo in 1926. The history of the foundation extends back nearly twenty years from the latter date, and the details connected with this are very fully set out in the supplement in a review of about seven thousand words. At the end of this there are several illustrations and photographs, the former showing various details of the Observatory, and the latter giving general views of the Observatory, of the Reynolds 30-in. reflector arranged for photo-electric work, and of a corner of the machine shop. This supplement forms very interesting reading.

* Supplement to the Report of the Commonwealth Astronomer for the Year 1950. Pp. 11+7 plates. (Canberra: Commonwealth Government Printer, 1951.)

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