Review
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Source: *The Geographical Journal*, Vol. 57, No. 2 (Feb., 1921), pp. 141-142
Published by: geographicalj
Stable URL: http://www.jstor.org/stable/1781574
Accessed: 27-06-2016 14:11 UTC

and beans and a subsequent catch-crop of cassava, it is doubtful whether yams would repay cultivation. Possibly other products will be grown which will be more profitable and can be exchanged for imported foodstuffs. It is interesting to note that the self-sown oil palms go with the land when it is transferred by purchase, but coconut palms remain the property of those who planted them. In the chapter on trade and currency we read that in the south and east there was a strong demand for manillas and brass rods; in the north and west cowries were, and still are, the most popular form of currency. For facility of trade the introduction of a metal currency is a great boon to the white trader; but many natives refuse to sell at all except for cowries, and it will be a long time before they are finally displaced by a metal coinage unless forcible measures be taken. Mr. Basden points out that the whole political economy of the country is passing through a great transition stage. A. C. H.

AMERICA

In Lower Florida Wilds.— C. T. Simpson. Pp. 404 + xvi. *Illustrations and Maps.* New York: G. P. Putnam's Sons. 1920. $3.50.

Over twenty years of observation in Lower Florida have enabled Mr. Simpson to write a charming volume on the natural history and physical geography of that region, including the Florida Keys. The wild fauna is rapidly disappearing as the tide of population flows southward and the forests are cut down, the streams dredged, and the swamps drained.

MATHEMATICAL GEOGRAPHY

Mapping from Air Photographs.— [Lieut.-Col. M. N. MacLeod, D.S.O.] Issued under the authority of the General Staff, War Office, London: Published by His Majesty's Stationery Office. 1920. Foolscap Folio. Pp. 66. *With Plates. Price 4s. net.*

This excellent publication deals in detail with the methods of mapping from air photographs of which a summary was given by Colonel MacLeod in the *Geographical Journal*, 53, 382. It is stated rather inconspicuously on the second page of the cover that the work "has been compiled by Lieut.-Col. M. N. MacLeod, D.S.O., M.C., R.E.," but it seems to us that the word "compiled" hardly does justice to the merits of the author, who is not only responsible for devising the best procedure of any Field Survey Battalion on the Western Front, but was able in the comparative leisure of the Army of Occupation on the Rhine to ponder the theory, and devise the improved apparatus here first described.

The theory of the rectification of photographs that should have been taken vertically, but are really tilted several degrees in an unknown direction, involves propositions in the theory of perspective which are not readily accessible in convenient form. Colonel MacLeod has done excellent service by thinking them out and bringing them together in a style which is probably as clear as can be attained in this somewhat forbidding subject; forbidding at least until one begins to handle the apparatus and the photographs, when it soon becomes fascinating. Without a clear appreciation of these propositions it is impossible to make any progress either in method or design of instrument: either in development of the camera lucida, which has certain good points, though it is not likely to survive, or in the construction of the photographic "rectifier," which embodies some curious properties of the lens with a flat field that have only recently been brought to light. At least, we do not remember that it was

ever demonstrated in the textbooks of optics that two planes inclined at any considerable angle can be made optically conjugate, one the image of the other and in sharp focus, by suitably disposing a lens of any focal length ; yet the theory, developed on page 47, is quite simple, and the practical consequence is surprising. A photograph of flat country taken at any angle from the vertical can be re-photographed with any lens giving a good flat field, into a rectified photograph such as would have been obtained with a vertical camera. We believe that the proposition was first employed by the late Captain Scheimpflug of the Austrian army, but his exposition so obviously claimed too much for the application of his method that it rather bred suspicion, and did not at once obtain the attention it deserved.

The requirements of the design for a copying camera on this principle are lucidly stated by Colonel MacLeod. But we do not think that a complete apparatus has yet been constructed in England, while we should judge that the camera illustrated in Captain Scheimpflug's paper was not adapted for convenient working. We may hope that the newly appointed Air Survey Committee will make it their business to establish a small laboratory, where this and other apparatus required in air survey may be thoroughly tried, especially in regard to rapid and easy adjustment of the distorted photographs to the ruling points.

A quick way of finding approximately the direction and the amount of the tilt is the first requirement in this work. The methods given by Colonel MacLeod are confessedly rather long, and one or two others which the reviewer had the pleasure of discussing with him during a visit to Cologne require a good deal of development, and the construction of a special drawing instrument, before they could be considered more than geometrical curiosities. There is an opening here for the ingenious geometer.

The methods discussed in this paper are suitable for large-scale work, such as trench maps in flat country ; reconnaissance survey on a small scale in a country with few fixed points is treated very summarily ; while the real crux of the problem, the determination of heights and contours, is just touched upon without any working solution being found. One naturally hopes for success from some stereoscopic method, and it is reported that the Germans used a form of the Pulfrich stereocomparator, which is well known to astronomers, though they are not altogether enthusiastic about it. In view of the poor quality of German mapping on the Western Front we may conclude that the enemy did not as a matter of fact get very far with the employment of this instrument. The use of stereoscopic pictures requires that the photographs shall be perfectly matched in intensity, and that the man who works at them shall have a pair of well-matched eyes : astronomers have failed in the latter respect. Stereoscopic methods have been applied with success in the survey at rather close range of steep inaccessible faces photographed from a fixed and measured base ; but the conditions of air survey are so different that it would be rash to assume in advance the success of a method which must be thoroughly investigated.

The General Staff should be congratulated on the printing and production of their recent technical publications. The figures are good, the mathematical printing well done, and the plates excellent. Only the forbidding foolscap size of page remains to remind us of the old Government printer.

A. R. H.