WILEY

Notes on the Construction of a General Map of Africa, 1/Two Million

Author(s): Arthur R. Hinks

Source: *The Geographical Journal*, Vol. 52, No. 4 (Oct., 1918), pp. 218-233

Published by: geographicalj

Stable URL: <http://www.jstor.org/stable/1779889>

Accessed: 17-06-2016 12:52 UTC

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at
<http://about.jstor.org/terms>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Wiley, The Royal Geographical Society (with the Institute of British Geographers) are collaborating with JSTOR to digitize, preserve and extend access to The Geographical Journal

most efficient for a wave-length up to 2500 metres, with this regenerative Audion set, as it allows a large, loose coupling between the Primary and Secondary circuits, an aid to the elimination of "static." A small antenna accumulates less static than a large; an aerial of the foregoing size is comparatively easy to erect, and large trees at this distance apart are more readily found. At Sta. Isabel, on January 27, signals from Washington were received, using an antenna 100 feet in length, 50 feet high at one end, 15 feet at the other, with but little static. A large antenna with this receiver is not an advantage. The main thing to be remembered is that the antenna should give a large clearance in the direction of Arlington; for instance, on a river running east and west the antenna should invariably be erected on the south bank.

The best "earth" was obtained by driving a 5-foot steel rod into the clay bottom of the river. But at Sta. Isabel, while experimenting, I found that a spike driven into the roots of a tree makes a good earth. When there is doubt as to the efficiency of the earth, a counterpoise or artificial earth should be constructed by stretching twice the amount of wire in the antenna on the ground and directly under it, earthing each end of this wire.

A feature of the regenerative Audion receiver is its behaviour in bad static or atmospheric conditions. Its success is due to the fact that the receiver combines the characteristics of the two most effective static eliminators known; the balanced valve and the heterodyne receiver. The balanced valve shields the ear from the loud crashes which temporarily impair its sensitiveness; and when the Audion is generating it is possible by proper manipulation of the circuits to reduce the static considerably.

The receiver should be kept from rough handling and continuous vibration. Three out of six of my Audion bulbs broke from these causes. The bulbs should be carefully packed with cotton into a strong wooden box, and all the apparatus protected from damp. This type of receiver requires a skilled operator.

This report is made to help in perfecting the results in future expeditions. Possibly in the near future time signals will be transmitted on Arlington's undamped set; then their reception will be more simple and certain.

Arlington sends time signals on a wave-length of 2500 metres from 9.55 to 10 p.m. standard time, 75th meridian. During this interval every tick of the clock is transmitted except the twenty-ninth second of each minute, the last five seconds of each of the first four minutes, and finally the last ten seconds of the last minute. The 10 p.m. signal is a longer contact after this longer break.

NOTES ON THE CONSTRUCTION OF A GENERAL MAP OF AFRICA, 1/TWO MILLION

Arthur R. Hinks, M.A., F.R.S., Secretary R.G.S.

Read at the Afternoon Meeting of the Society, 6 May 1918.

DURING the past eighteen months we have, as opportunity offered, made preparations for the compilation of a General Map of Africa on the scale of 1/Two Million, being convinced that such a map would be required long enough before we were able to complete it. The enterprise has now reached the point at which three sheets have been

delivered to the Geographical Section, General Staff, and a dozen more are in a forward condition. It may therefore be an appropriate moment to put together some account of the more interesting points that have arisen in the course of the work.

The only existing General Map of Africa is the old French 1/Two Million, now many years out of date; the new German map on the same scale, which we illustrated recently (*Geo. Journ.*, March 1918, pp. 140 and 141), is to be restricted apparently to "Mittelafrika." The several series of African maps on different scales produced by the Geographical Section, General Staff, provide for considerable regions of the continent, but are not sufficiently advanced to make a comprehensive whole. The admirable sheets of the international series produced by them within the last few years deal with East Africa, British and German. To cover the whole continent requires 140 sheets of the standard 1/Million Map, six degrees by four, and its completion must be a work of many years. There seemed room in the interval for a general map on the scale of 1/Two Million—a scale which for a considerable part of Africa is adequate to represent existing material. Each sheet of the proposed map will cover four sheets of the International Map, and be therefore of the same linear dimensions. The Index Diagram shows that Africa cuts up very conveniently into sheets of this size, and that a fair number of the sheets cover natural regions satisfactorily, especially if one reserves the liberty of breaking the margins occasionally, while avoiding the temptation to alter the fundamental arrangement of the sheet lines.

The choice of a projection presented points of interest. Taking as first principles (*a*) that each sheet must be bounded by meridians and parallels; (*b*) that such boundary must be symmetrical; (*c*) that each sheet must fit the adjoining sheets accurately; and (*d*) that a block of at least four sheets must be capable of mounting without serious discontinuity, one turns naturally in the first instance to the projection of the International Map (modified polyconic) to see if this will serve for the larger sheets of the new map. It will be remembered (see paper on the 1/Million Map, *Geo. Journ.*, July 1915, vol. 46, p. 29) that the angles at the corners of sheets on this projection are all slightly less than right angles, and that consequently though each sheet will fit the adjoining sheet a block of four will not build up quite perfectly. In the 1/Million maps the defect is so small that it could be got over by slight squeezing of the paper in the process of mounting; but for the 1/Two Million maps the defect is larger, and there must be a slight want of continuity, not very serious upon this scale, but indicating that we have arrived here at the limit of usefulness of the International Map projection. The defect in question would become inconveniently large if one tried to use the same projection for, let us say, sheets of the same linear dimensions on a scale of 1/Four Million.

The tables for the projection were very kindly computed for us by

Mr. A. E. Young, to whom we have been indebted in the past two years for much valuable assistance in such matters.

Tables for the Projection of Maps on the Scale of 1/Two Million, by an extension of the Projection for the International Map of the World.

TABLE A.

Natural and Corrected Lengths on the Central Meridian.

<i>Latitude.</i>		<i>Natural length of 8° on scale 1/2M: inches.</i>	<i>Correction.*</i>	<i>Corrected lengths for plotting: inches.</i>
From -4° to + 4°		17'413	- '048	17'365
0	± 8	'414	48	'366
±4	±12	'416	47	'369
8	16	'420	46	'374
12	20	'426	44	'382
16	24	'433	42	'391
20	28	'442	40	'402
24	32	'451	37	'414
28	36	'462	34	'428
32	40	'474	31	'443
36	44	'486	28	'458
40	48	'498	25	'473
44	52	'510	21	'489
48	56	'523	18	'505
52	60	'535	15	'520
56	64	17'545	12	17'533

* This correction to the central meridian is $-.048 \cos^2 \phi$, where ϕ is the mean latitude of the sheet. The meridians 4° on each side of the centre are thus made of their true length, and the error of the bounding meridians 6° from the centre is numerically equal, but of opposite sign, to that of the central meridian.

TABLE B.

Co-ordinates in inches of the Intersections of the Meridians with the Top and Bottom parallels.

Longitude from the Central Meridian.

<i>Latitude</i>		<i>1°</i>	<i>2°</i>	<i>3°</i>	<i>4°</i>	<i>5°</i>	<i>6°</i>
0°	x	2'192	4'383	6'574	8'766	10'957	13'149
	y	'000	'000	'000	'000	'000	'000
4	x	2'186	4'372	6'558	8'744	10'930	13'116
	y	'001	'005	'012	'021	'033	'048
8	x	2'170	4'340	6'510	8'680	10'850	13'020
	y	'002	'010	'023	'042	'066	'095
12	x	2'144	4'288	6'432	8'575	10'718	12'862
	y	'004	'015	'035	'062	'097	'140
16	x	2'107	4'214	6'321	8'427	10'534	12'640
	y	'005	'020	'045	'081	'126	'182
20	x	2'060	4'120	6'180	8'239	10'298	12'357
	y	'006	'024	'055	'098	'153	'221
24	x	2'003	4'006	6'008	8'011	10'013	12'015
	y	'007	'028	'064	'114	'178	'256
28	x	1'936	3'872	5'808	7'744	9'679	11'613
	y	'008	'031	'071	'127	'198	'285
32	x	1'860	3'720	5'580	7'439	9'297	11'155
	y	'008	'034	'077	'137	'215	'309
36	x	1'775	3'550	5'324	7'098	8'871	10'643
	y	'009	'036	'082	'145	'227	'327

40	<i>x</i>	1'681	3'362	5'042	6'721	8'401	10'079
	<i>y</i>	'009	'037	'085	'151	'235	'339
44	<i>x</i>	1'579	3'158	4'736	6'313	7'890	9'465
	<i>y</i>	'009	'038	'086	'153	'239	'344
48	<i>x</i>	1'469	2'938	4'406	5'873	7'340	8'805
	<i>y</i>	'009	'038	'085	'152	'238	'343
52	<i>x</i>	1'352	2'704	4'055	5'405	6'754	8'103
	<i>y</i>	'009	'037	'083	'149	'232	'335
56	<i>x</i>	1'238	2'456	3'684	4'910	6'136	7'360
	<i>y</i>	'008	'035	'080	'142	'222	'319
60	<i>x</i>	1'098	2'196	3'294	4'391	5'487	6'582
	<i>y</i>	'008	'033	'074	'133	'207	'299

To construct the projection, plot the top and bottom parallels only from the co-ordinates of Table B, with distance apart on the central meridian from the last column of Table A. Join corresponding points by straight lines for the meridians, and divide the meridians equally to obtain points on the intermediate parallels. The table is computed for each four degrees of latitude, to provide for series of sheets bounded by $\pm 4^\circ$, $\pm 12^\circ$, $\pm 20^\circ$, . . . (the series under construction); or alternatively 0° , $\pm 8^\circ$, $\pm 16^\circ$, $\pm 24^\circ$, . . . , which might be more desirable in other continents. Note that the middle parallel is not plotted from the tables, but constructed as above.

For sheets 12° by 8° the angle between an extreme and the central meridian is given in the following table C; the difference θ between these angles on successive sheets measures the bend of the extreme meridian at the junction of two sheets fitted along a parallel; 2θ is the angle shown in the figure between the inner margins of two sheets of the top row; and $2 \times 17.5 \sin \theta$, approximately 0.01θ (where θ is in minutes of arc), is the separation in inches at the top inner corner. Finally, the last columns of the table show the shortening of the middle parallel due to making the extreme meridians straight, and the consequent error of scale along this central parallel.

TABLE C.

<i>Lat.</i>	<i>Inclin. of extreme meridian.</i>	<i>Diff. = θ.</i>	<i>Separation.</i>	<i>Shortening of central parallel.</i>	<i>Scale error.</i>
4° to 12°	51'·2			0'062 in.	'0024
12 20	98'·5	47'·3	0'48 in.	'061	'0024
20 28	147'·4	48'·9	0'50	'060	'0025
28 36	191'·1	43'·7	0'45	'054	'0025
36 44	232'·5	41'·4	0'42	'050	'0025
44 52	267'·3	34'·8	0'35	'042	'0024
52 60	299'·0	31'·7	0'32	'035	'0024

The figure shows the assemblage of four sheets plotted from these tables. Sheet I, between meridians 18° and 30° E. and parallels 12° and 20° N. has length on central meridian 17'382 inches from Table A. The co-ords. of A with respect to M are $u = 12'357$, $y = +0'221$ inch; and of A' with respect to M' are $u = 12'862$, $y = +0'140$. Other points on the top and bottom parallels, at each degree of longitude, are plotted similarly from Table B. Corresponding points are joined by straight lines, and subdivided equally to obtain the other parallels. The meridian BB' 8° from the central meridian is its true length. Meridians AA' and MM' are respectively long and short

R

by 0.044 inch (Table A). The meridian AA' is inclined $98^{\circ}5'$ to AA'; it makes an angle $48^{\circ}9'$ with the prolongation of the same meridian on the sheet above. The extremity C of the central parallel OC is 0.061 inch nearer O than it would have been if each parallel had been plotted independently on the polyconic projection (and the meridians therefore curved). The consequent error of scale on the middle parallel is 0.0024, the extreme parallels being correct. Finally, the separation at the top inner corner of sheets of the top row (near III) is 0.50 inch. All the latter figures are from Table C.

The problem of compiling a General Map of Africa is of course very different from that of the 1/Million maps of Europe, where there was—at any rate in most parts—a superabundance of precise material, and the difficulty was largely in selection. For Africa the material is naturally very heterogeneous. One passes in a few miles from good triangulation and first-class topographical survey to districts hardly explored, where the outline is more than doubtful, and determinations of height altogether inadequate for the construction even of the roughest contours. Scattered all about the continent are patches of good official survey, and there is much material due to private enterprise, as surveys of railways and mining concessions, to the owners of which we are in many cases indebted for the communication of valuable information. The great geodetic arc of the 30th meridian provides a strong backbone from the south to near the southern end of Tanganyika, along the Uganda-Congo boundary, and for some distance up the Nile. The greater part of the remaining framework of the map is provided by the various boundary surveys. Hard things have been said of diplomatists who, in advance of any geographical knowledge of a country, agree to the delimitation of boundaries by meridians,

parallels, and other arbitrary lines. Such boundaries are detestable in principle, and work out badly in practice; but they do, at any rate, require for their demarcation costly triangulations, which would not have been so imperatively necessary had the boundary been defined by well-marked natural features: and these triangulations come in remarkably useful as framework on which to hang inferior material. The essential framework of our map would have been sensibly less rigid had the boundary surveyors not been required to spend so much time on locating the 30th meridian, the meridian of Panta, and other lines famous in the political geography of Africa.

We may illustrate the condition of the material for constructing a General Map of Africa by considering a few cases of important corrections recently made, and of points which remain in dispute. Take first the position of the head of Lake Tanganyika. The foot of the lake was fixed by a boundary commission triangulating from Nyasa in 1898; the head of the lake remained on our maps (German) about $3\frac{1}{2}$ miles wrong in position, until in 1912 the Belgians carried a chain of triangles south and west from the junction of the Anglo-Belgian-German boundary on the summit of Sabinio to the head of Tanganyika and along its western shore, thus rectifying what must surely be the last remaining error of importance on the line of the Great Lakes, and incidentally showing that the accuracy of the German map of their former possession in East Africa, on the scale of 1/300,000, is by no means so great as its frequently detailed appearance should presuppose. A more striking instance is of later date. When the Belgians occupied Tabora they acquired a set of blue prints of a railway survey from Tabora to the bend of the Kagera, to illustrate the line projected by Dr. Schnee, the former governor. This careful survey on the scale of 1/100,000, with heights and form lines, bears little relation to the representation of the country on the 1/300,000 map, which is thus shown to be exceedingly unreliable in its delineation of the complex water system on this ill-defined water-parting between the Nile and the eastern affluents of Tanganyika.

There was until recently much uncertainty in the heights of Tanganyika and Nyasa. The discrepant results for Tanganyika obtained by the hypsometer were used in the 'Text-book of Topographical Surveying' (Close and Cox, 2nd edit., 1913), to illustrate the uncertainty of this method; see page 130, and the comment "It is not known what the true value is." Since that time two good determinations have become available: the railway levels of the Zentralbahn, which make rail-level at Kigoma 773 metres; and the connection with the heights of the geodetic arc, made by the Rhodesia-Congo Boundary Commission, 1913 (Major Walker and Lieut. Gwynn), giving the same number 773 metres for the lake surface. The height of rail at Kigoma above the lake being unknown to us, but probably only a few metres, we adopt the Boundary Commission figure as it stands.

The difference of height between Tanganyika and Nyasa was determined by Close and Boileau in 1898 as 299 metres, which with the above figure for Tanganyika makes Nyasa 474 metres. But the Portuguese Nyasaland Railway levels, kindly communicated by Messrs. Pauling, give 468 metres. We adopt the mean of the two, 471 metres, for the height of Nyasa.

A question which has given us much trouble has been settled recently in a way which leaves it still mysterious. In 1882 Mr. Last was sent on an expedition at the expense of the Society to proceed through Nyasaland to Blantyre. The first article of his instructions was to determine the position of the confluence of the Ruvuma and the Lujenda, its principal affluent on the right bank. He obtained a longitude $38^{\circ} 1'$. This longitude was quoted many years afterwards by Moisel among the somewhat infrequent astronomical determinations of position available as the foundation for the map of German East Africa on the scale of 1/Million; but the longitude in question was plotted upon the map as $38^{\circ} 30'$, without any indication of reason for rejecting the quantity which had been cited in the list of materials. This discordance was of course noted in the compilation of our map, and Last's original observations were examined. They form a very satisfactory set of astronomical positions, based upon a longitude of Lindi on the coast which was in accordance with modern determinations, and ending with a longitude of Blantyre which is equally good. There were two independent determinations of the longitude of the confluence, one of which had not been worked up; it gave results precisely in accordance with that which had been used. It seemed impossible to reject Last's longitude, and one was reduced to such an hypothesis as that the German draughtsman had plotted the value adopted by Moisel with an error of $30'$ and adjusted other things to suit. To carry out the necessary readjustment would have made considerable distortions in the existing maps, but it is illustrative of the bad state of survey in those parts that nothing could be found which absolutely negatived the possibility of moving the confluence. It was clearly a case of asking for a redetermination at the earliest possible moment; Colonel Hedley therefore very kindly sent instructions to a field-survey company on service there, and a traverse was run from Lindi to Ngomano at this confluence. The result was to put the confluence a mile still further east than the German map had made it. It appears therefore that the German draughtsman was right in neglecting Last's position, which had been actually inserted in his list of material; but it remains unknown why Moisel printed and published a position which he believed to be so much in error, and it is still more mysterious how Last's observation can be explained. One might suppose that he mistook some other river for the Lujenda, and determined the position of the wrong confluence, were this not negatived by the fact that he afterwards proceeded right up the Lujenda. The whole thing remains very inexplicable.

A difficulty of a somewhat different kind remains in the geography of the western rift valley between Lakes Kivu and Edward, where comparatively recent volcanic activity has thrown up the remarkable volcanoes of the Mfumbiro Mountains, and has, according to geologists, diverted Lake Kivu from the basin of the Nile to that of the Congo. The principal highway between the two lakes runs from the northern end of Kivu between the volcanoes Ninagongo and Karisimbi, and thence north-east to the Belgian post of Ruchuru. On the saddle between the volcanoes the path reaches a height little less than 7000 feet. The question, which is of considerable importance from the point of possible railway construction, is whether an alternative route near the western wall of the rift does not run at a considerably lower level. The region between the western volcano Nyamlagira and the western wall of the rift is very little known. It is just off the maps on the scale of 1/100,000 of the German Lake Kivu Boundary Expedition, and is equally just outside the limits of the map by Oberleutnant Weiss of the volcanic district, published in the scientific results of the Duke of Mecklenburg's Central Africa Expedition, 1907-8: a pretty map, which is however described by a Belgian authority as "une fantaisie." A line of levels run in 1903 by M. Adam, chief engineer of the Congo railways, and reproduced in the *Journal* for November 1908, p. 493, shows a line which seems to run near the western edge of the rift, and its summit level is 7578 feet. On the other hand, Sir Alfred Sharpe, who in 1912 was travelling in this region with Mr. Elphinstone, gives a very different account. He speaks of the lava plain west of Nyamlagira stretching to the foot of the steep mountain slopes bordering the western side of the rift valley, and only 5900 feet above sea. He climbed to a village, Nkule, 1200 feet higher, on the edge overlooking the rift valley, and descended to the Mokoto Lakes, which are at an average of 5800 feet (the only height for these lakes which appears to have been given). Returning again through Nkule and thence down to the rift valley, he steadily descended as he went north towards Lake Edward. Before reaching the Ruchuru he crossed a small river issuing from lava rocks which forms a series of marshes on the western side of the rift valley and enters Lake Edward near its south-west corner. This river does not appear on most of the maps. Sir Alfred Sharpe has kindly gone into the matter with us, and is strongly of the opinion that his observations show a way from Lake Kivu to Lake Edward along the western edge of the rift which does not rise above 5900 feet. Yet the earlier railway survey through the same country took the line 1600 feet higher. The difference between the two accounts is so great that it affects very materially one's idea of the profile of the rift valley and the completeness or otherwise of the volcanic bar across it.

[Since this was written I have had the advantage of discussing the question with Commandant Maury, of the Belgian Colonial Service, who spent some years in the Kivu country. His explanation of the triangulation

chart attached to his publication: 'Les régions voisines de la frontière orientale du Congo belge' (1912), makes it clear that the western wall of the rift is broken very much in the way shown on the *Carte de l'Etat Indépendant du Congo*, 1/M, 1907, and that Sir Alfred Sharpe's way lies along the face of the eastern spur. It is possible that the railway survey was taken over this spur and down to the valley lying between it and the continuation southward of the main western wall. The relation of the Mokoto Lakes to the rift valley is very obscure, and a particularly interesting piece of country, now no longer very inaccessible, awaits topographical reconnaissance.]

The navigability of rivers is an important and a difficult thing to show on a map of Africa. Excluding canoe navigation, and restricting the term "navigable" to rivers which are available for transport under power, by steamer or motor launch, we are faced with seasonal variations, which can be covered by a warning that navigation may be suspended in the dry season; but we cannot cope with the fluctuations of longer period such as that which has in recent years stopped navigation on the Shire. (See the paper by Sir Alfred Sharpe in the last number, p. 143.) Conventional signs showing navigability must therefore be inserted with caution and interpreted with reserve.

Difficulties of a different kind arise from the mutability of things in Africa. The maps are full of names derived from the journeys of travellers that are no longer recognized by those best acquainted with the country. During the course of our work we have, whenever possible, asked district officers, directors of public works, and other officials, to look over our compilations and advise us as to their adequacy. The result is often disturbing. "Oh yes, that is a wash-out; we used to have a post there, but it was given up as unhealthy ten years ago, and there is nothing there now," is the all too frequent comment. In a small area of the Marsabit sheet (Africa, 1/Million, North A37 and part 38), we learn from the District Commissioner that Lake Karoli is a mere salt-pan, never full; that Daran Kraal is no longer there; that Tumepona means "We are saved," and was the name given to a camp where water was found in the nick of time by a certain traveller; that Pullo does not exist as a name, nor Horr as a place-name, though there is a Horr Valley, and so on. In such cases it is very hard to strike a proper balance between tradition and present local knowledge.

The classification of place-names also offers many problems. The population classification designed for Europe is evidently inapplicable. We may start with a scheme such as Class I., capitals and any towns over 100,000; Class II., capitals of provinces or districts, and any towns over 50,000; Class III., other Government posts, telegraph stations, principal missions; Class IV., smaller mission stations, larger native towns, native markets, etc.; and Class V., smaller native towns; but such a scheme

leaves many problems unsolved.* Lado, for instance, is one of the best-known names in Africa. The seat of administration has been moved to Mongalla, and the place is reported to be quite deserted; how shall the name be classed? Or take Marsabit, the administrative post of the northern province of British East Africa, established some years ago on a forest-covered mountain at the edge of a crater lake. The place has given its name to a sheet of the International Map; but we learn that it was found cold, damp, and disappointing; camels died in the fog of the forest, and the natives hated going there; so the last occupant of the commissioner's house burned it down and the place is deserted, the seat of administration being removed elsewhere; how shall we class the name Marsabit upon the 1/Two Million Map? Such are the mutabilities of the more important names. The changes in native names are infinite, and it is probably near the mark to say that half the native names upon maps no longer represent any centre of native population, and are no longer locally recognized in the country. The map illustrating Joseph Thomson's celebrated journey from Dar-es-Salaam to Nyasa in 1878 shows forty-eight names on his route between the coast and the lake. Of these only nineteen (and two of those doubtful) are on the German 1/300,000 map; and three of the six names in larger type, as chief places of the districts, are not to be found. This is a good reason for being moderate in the use of native names on the map.

If the map is to have a good appearance the names should be distributed in their classes so that the series of numbers in each class makes something like a geometrical progression. A well-classified map of a settled country will be found to follow this rule more or less, though special circumstances may intervene: a tendency to aggregation in a limited number of large towns, as in Australia and Eastern Siberia: an extreme development of an industrial region, producing so many considerable towns that there is no room on the map for the appropriate number of smaller towns and villages: historical importance of places no longer active; and so on. In Africa the criterion of population is secondary

* On this classification Colonel Hedley remarks, in a recent letter, that "references to population are put so high that they do not apply to East Africa at all," and suggests alternatively: Class I., capitals of countries and towns of great importance; Class II., capitals of provinces or large districts, principal military stations, and important towns; Class III., other centres of European population, important mission stations, etc.; Class IV., small European settlements and important native towns; Class V., other native towns.

The only reason for inserting the population figures in our provisional scheme was to provide for such cases as Johannesburg, Alexandria, Durban, which have large populations but are not of high administrative rank, yet are entitled to Class I. The principal requisite in classification is a rule which will promote to higher classes, especially to Class II., places of small population but real importance; and if, in accordance with Colonel Hedley's suggestion, we add "principal military stations" to the schedule for Class II., we shall probably find that few if any places of importance have failed to secure due prominence on the map.

The names which are wanted, and which must be made to stand out, are the centres of administration and of civilized development. The mutability of native villages will be a reason for restricting the number of names assigned to the lowest class. But the principle of a geometric progression offers at any rate a method of comparing and discussing a first classification which will be found useful. We will test it by examining the names on our first compilation of the Zanzibar sheet 1/2M, and compare it with that on the four sheets of a 1/M map covering the same area, compiled to a great extent independently and nearly simultaneously.

The 1/2M map has five classes of names, and the 1/M has six. The names common to the two are distributed thus :

	1/M Class	1	2	3	4	5	6	Total.
1/2M Class	1	3	—	—	—	—	—	3
	2	4	9	6	3	—	—	22
	3	—	1	20	43	30	7	101
	4	—	—	5	95	52	24	176
	5	—	—	1	38	116	89	244
Total		7	10	32	179	198	120	546

Such a table forms an excellent check upon the first attempts at compilation. We notice at once (*a*) that Class 3, 1/2M, is unduly big : too many smaller mission stations had been included ; (*b*) that Class 5 is disproportionately small : smaller native villages had been somewhat neglected, owing to difficulty of choice ; (*c*) that three places classed 4 in 1/M were classed 2 in 1/2M : they were provincial capitals recently elevated, and not hitherto given due rank on the maps ; (*d*) that first-class towns were rather common on 1/M ; two of them proved to have been promoted unduly as the largest town on the sheet, though not first class.

To control the uniformity of method in selection we may compare the total numbers in each class on adjacent sheets. Thus, taking the four 1/M sheets above, we have the following numbers :

	Sheet I.	II.	III.	IV.
Class 1	5	1	1	0
2	3	4	2	1
3	11	4	7	11
4	36	17	124	56
5	297	164	254	125
6	479	651	635	922
Total	831	841	1023	1115

We note the deficiencies of Classes 3 and 4 on Sheet II. : the excesses of Class 4 on Sheet III. and of Class 6 on Sheet IV. If there are no evident local circumstances (as there very well may be) to justify these departures from a rough geometrical progression, we must reconsider the classification. Such elementary statistics form a valuable means of control, and should not be neglected.

The spelling of native names offers problems which have not, I think, yet received all the discussion which they deserve. The well-known general rules for the spelling of native names published by this Society have obtained wide acceptance, and there is a most valuable little work based upon them ('Rules for the Transliteration of Place-Names occurring on Foreign Maps.' 1906. Official. 1s.) by the late Mr. Knox, Map Curator to the G.S.G.S., which is of great value and perhaps hardly sufficiently recognized outside the War Office and those who work for it. The problem which Mr. Knox set himself to solve was this: Native names will be written in different ways by different nations of Europe. Assuming that their methods are consistent, and that they are based upon the normal use of letters to represent sounds occurring in the home languages, it should be possible to construct transliteration tables by which, say, the Portuguese version of a Bantu name may be changed into the English version. A study of the rules given by Mr. Knox will show that he has realized the difficulties and discovered many complexities due to inconsistencies in practice. His work forms an inestimable foundation upon which to build. We have found, however, that the rules given in this work cannot always be trusted to produce the right result automatically. Take, for example, the frontiers of Rhodesia and Mozambique. A strict application of the rules produces a whole crop of names in Portuguese territory beginning with *sh*, which contrasts markedly with an equally numerous crop beginning with *ch* in British territory. The names on the Portuguese side had been written *ch* by the Portuguese; but in accordance with Mr. Knox's rule the *ch* had been changed to *sh*. We consulted Sir Harry Johnston, who replied that "the Portuguese *ch* in African names nearly always stands for our *ch*, even if the perverse Portuguese pronounce it *sh*. As a rule, when very anxious to secure an *sh* pronunciation, they use their *x*, which always connotes *sh*, except when it stands for the *x* in the Latin *ex* prefix. The Bantu, however, wobble very much over the *ch* and *sh*, even in the same tribe or district." And in another place Sir Harry Johnston writes to us: "With great inconsistency the Portuguese *ch* (normally pronounced *sh*) and the Portuguese *i* (*zh*) more usually stand for *ch* and *j* in English. *j* never answers to *y*." Many doubtful points of the kind have been referred to Sir Harry Johnston, and on his authority we are able to propose the following as samples of additions and corrections to Knox's rules for treatment of Portuguese African maps:

1. "*u* before a vowel = *w*" (Knox); but *u* after *l* or *r* and before a vowel should be retained, as in Lualua and Ruenya. Luuia should be transliterated Luwia. There are also certain Bantu county names, like Uamba, Uimbi, in which the *U* stands for an older *Bu*, and is much accented. These *u*'s should be retained.

2. "*Gua* = *gwa* and *gue* = *ge*" (Knox). The Portuguese are very inconsistent. *Gue* may stand for *ge*, but it may also stand for *gwe*.

Punctilious Portuguese spell *gue* or *gwe* as *güe*, but this is rare. Missongue should be Misonge ; but Rungue should be transliterated Rungwe.

3. "*dj* = *j* and *j* = *y*, but *j* (initial) = *hy*" (Knox). As above, Portuguese *j* more usually stands for English *j* in African names. The Bantu passes abruptly from English *j* to *y*, and seldom halts at the French *j*: thus Ujiji varies locally from Ujdjidi to Uyi*y*i, the former being the better rendering.

4. "*ch* = *sh* and *tch* = *ch*" (Knox). As above *ch* more usually generally remains *ch*, and the Portuguese rarely use *tch* to represent this sound.

Such are some of the preliminary results of working through the Portuguese Bantu names. It is clear that Mr. Knox's rules, though most valuable, are not water-tight, and cannot be applied mechanically with safety. Probably they represent very accurately what, on the analogy of their speech at home, the Portuguese ought to do with Bantu names if they are consistent.

A curious complication arises in certain cases where the Portuguese have applied to districts names compounded of Bantu and Portuguese, as "Maganja da Costa" and "Maganja aquem Shire," meaning "Coast M." and "M. on this side of Shire." The Portuguese must of course be allowed to stand. If the Portuguese version of Bantu is also allowed to stand, it becomes inconsistent with other names on the map, and very possibly with the same name used as a place-name. The only solution appears to be to transliterate the Bantu parts of these names in the same way as the others.

A somewhat analogous difficulty arises in the treatment of geographical terms. The War Office rule, following that of the R.G.S., is that geographical terms will be translated either into English or into the recognized local language. Thus, Bahia de Msimboa and Bahia da Fernão Velloso would become Mzimbwa Bay and Fernão Velloso Bay. The rules of the International Map, London Conference, 1909, provide that "The spelling of every place-name in a colony, protectorate, or possession shall be that adopted by the country governing the colony, protectorate, or possession, if that country uses the Latin alphabet, or publishes other maps in which the place-names are printed in the Latin alphabet." This would not only seem to require that geographical terms should be left in the language of the governing power, but also would prohibit the transliteration of which we have been speaking above. The East African sheets published by the War Office break the rules in both respects. It seems absolutely necessary to break it on the question of the transliteration of native names, but it is not so clear that the geographical terms should be translated into English. It is not done, for example, in the Istambul sheet, where we have capes as Burun, bays as Keurfezi, etc., and there are certain advantages in leaving these terms in the language of the ruling power. A curious feature of this Portuguese East African

coast is that most of the capes are called "Ras," retaining apparently their Arab names. Arabic words corrupted by Bantu and transliterated *viâ* German or Portuguese need some discrimination.

Somewhat analogous difficulties arise in the treatment of German Bantu names, especially since the Germans have no letter corresponding to the English *w*, which is so common in African names. The consequence is that they are apt to use the *w* indiscriminately for the sound of *v* and of *w*, and it is impossible without local knowledge to be certain that the names are correctly represented on our maps. Some further complication is caused by the fact that on the maps of the Usambara region the Germans deliberately broke further away from their own methods and adopted the English system, but not always with success. If a draughtsman working by rule inadvertently applies to these names a second reduction to the English system, the result may be disastrous.

Mr. Knox has written a long and valuable note on these problems of the German African maps, which we may supplement by a more tabular examination of the subject. The principal maps of German Africa are, with our abbreviations :

Karte von Deutsch-Oostafrika, 1/300,000	...	...	G/3
Grosser Deutscher Kolonialatlas : Sprigade and Moisel			Gdk.
Kiepert's Deutscher Kolonialatlas	...	...	K.
Perthes' Deutscher Kolonialatlas	...	...	P.
Usambara und Küstengebiet (Govt. of G.E.A.)	...		U.

The following examples are arranged in groups to show how some of the principal sounds in which there is difficulty are treated by the various German authorities. The spellings adopted on our 1/2M map have been submitted to Sir Harry Johnston, and on his authority we have made the doubtful distinctions between *w* and *u*.

1. *Sound of English v.*

Gdk.	Kiwu	Kiwintangao	Rowuma	Kiwindsche
K.	Kivo	Kivumangao	Rovuma	Kivindje
G/3	Kivu	Kiwintangao	Rowuma	Kiwindje
P.	Kiwu	Kifmangao	Ruwuma	Kiwindsche
1/2M	Kivu	Kivmangao	Rovuma	Kivinje

2. *Sound of English w.*

Gdk.	Mpapua	Muansa	Tschwaka	Bwaua	Kilwa
K.	Mpwapwa	Mwansa	Tshuaka	—	Kilwa
G/3	Mpapwa	Mwansa	Tshuaka	Bwaua	Kilwa
P.	Mpapua	Muansa	Tschuaka	—	Kilwa
1/2M	Mpwapwa	Mwanza	Chwaka	Bwawa	Kilwa

These examples show that the German *w* is used somewhat indiscriminately for *v* and *w*, and that Kiepert and Perthes are perhaps more

consistent than Gdk. or G/3. In the *w* sound there must be room for difference of opinion whether the *u* is really consonantal = *w* or is a distinct but very short vowel. When it is apparently distinct German maps often show the distinction by putting the diaeresis over the second vowel, or by accenting the *u*; and one would expect that in such cases the *u* is not transliterated *w*. We have, however, Usambara : Lwengera, but Gdk. Luëngesa, so that even this is not a safe guide.

3. *Sound of English y.*

Gdk.	Tanganjika	Ejassi	Bagamojo	Jassin
K.	Tanganyika	Eiaši	Bagamoyo	—
G/3	Tanganjika	Eyassi	Bagamoyo	—
P.	Tanganjika	—	Bagamojo	Jassin
1/2M	Tanganyika	Eyasi	Bagamoyo	Yasin

In the last, an Arabic name, Usambara has Jasin, contrary to its principles.

4. *Sound of English j.*

Gdk.	Udjidji	Kissidju	Mawudji	Kilimandscharo
K.	Udjidji	Kišiyu	Mavudji	Kilima-Ndjaro
G/3	Udjidji	Kissidyu	Mawudyi	Kilimandscharo
P.	Udschidschi	Kissidschu	Mawudschi	Kilima-Ndscharo
1/2 M	Ujiji	Kisiju	Mavuji	Kilimanjaro

The second and third examples show the tendency for this sound to vary from English *j* to *y* (as recorded by Sir Harry Johnston), but this does not explain the *dy*. On the 1/2M map we use the English *j* (as in the R.G.S. rules) for Bantu names, though this is not consistent with the rule we adopted on the 1/M map for the same sound in Arabic. The sound of French *j* or *zh* being unknown in Bantu, and the English *j* very common and thoroughly established in the English spelling of such names as Ujiji, it seemed difficult to insist on a rendering which would have given a very German appearance to the map.

5. *Sound of English ch.*

Gdk.	Tschaki	Tschole	Kondutschi	Tschurui
K.	Tshaka (Tshak-tsachak)	Shole	Kondutshi	
G/3	Chaki	Tshole	Kondutshi	Tschurui
P.	Tschaki	Tschole	Kondutshi	[U. Churui]
1/2M	Chake	Chole	Konduchi	Churui

6. *Sound of English sh.*

Gdk.	Moschi	Aruscha	Maschëui
K.	Modji	Arusha	—
G/3	Moschi	Aruscha	Mshihui
P.	Moschi	Aruscha	[U. Mshihui]
1/2M	Moshi	Arusha	Mshihui

7. *Sound of English s* (as in set).

Gdk.	Njassa	Kissegesse	Kisserawe	Sakare	
K.	Nyaša	Kiṣigeṣi	Kiserawa	—	
G/3	Njassa	Kissegesse	Kisserawe	Sakare	Msassa
P.	Njassa	—	Kisserawe	[U. Sakarre]	[U. Msasa]
1/2M	Nyasa	Kisegese	Kiserawe	Sakarre	Msasa

8. *Sound of English z*

Gdk	Sansibar	Msimbasi	Russisi	Masinde
K.	Sansibar	—	—	—
G/3	Sansibar	—	Russisi	Masinde
P.	Sansibar	[U. Msembazi]	Russisi	[U. Mazinde]
1/2M	Zanzibar	Msimbazi	Rusizi	Mazinde

These examples show that though as a general rule

German tsch	= English ch
sch	sh
ss	s
s	z

there are many inconsistencies in the hearing or representation of sounds, and transliteration by rule is a balance of probabilities. The publication by the Government of G. E. A. of the Usambara map marked a considerable step in advance, recognizing the unsuitability of the usual German equivalents for sounds in the Bantu languages, as in the name Mtschorotschogoro; unfortunately the principle was not extended to the rest of the country.

Such are some of the difficulties which must arise from the divergence of tongues in which African names have been written. We cannot hope to avoid mistakes, but we do look forward to the time when there shall be a Board of Geographic Names for Africa, which shall standardize them to some extent before inconsistencies have become "conventional" and therefore sacred: *e.g.* Khartoum and Sudan.

To all who have helped and are helping in the preparation of this map our grateful acknowledgments are due. Much unpublished material has been placed in our hands, both from official and non-official sources, which will be acknowledged as far as possible in the list of Authorities for each sheet. The ladies and gentlemen who form our special war-staff have worked enthusiastically; we are especially indebted to those who have been able to volunteer their services, and scarcely less to those who have worked devotedly on a minimum of pay.

Before the paper the PRESIDENT said: Our Secretary has devoted much time and attention to our compilation of a new map of Africa. Nobody could be more competent than he to tell us the methods which he has followed, and I trust that, amongst other things, he will tell us with all due candour exactly what he thinks of the value of the material on which he worked.