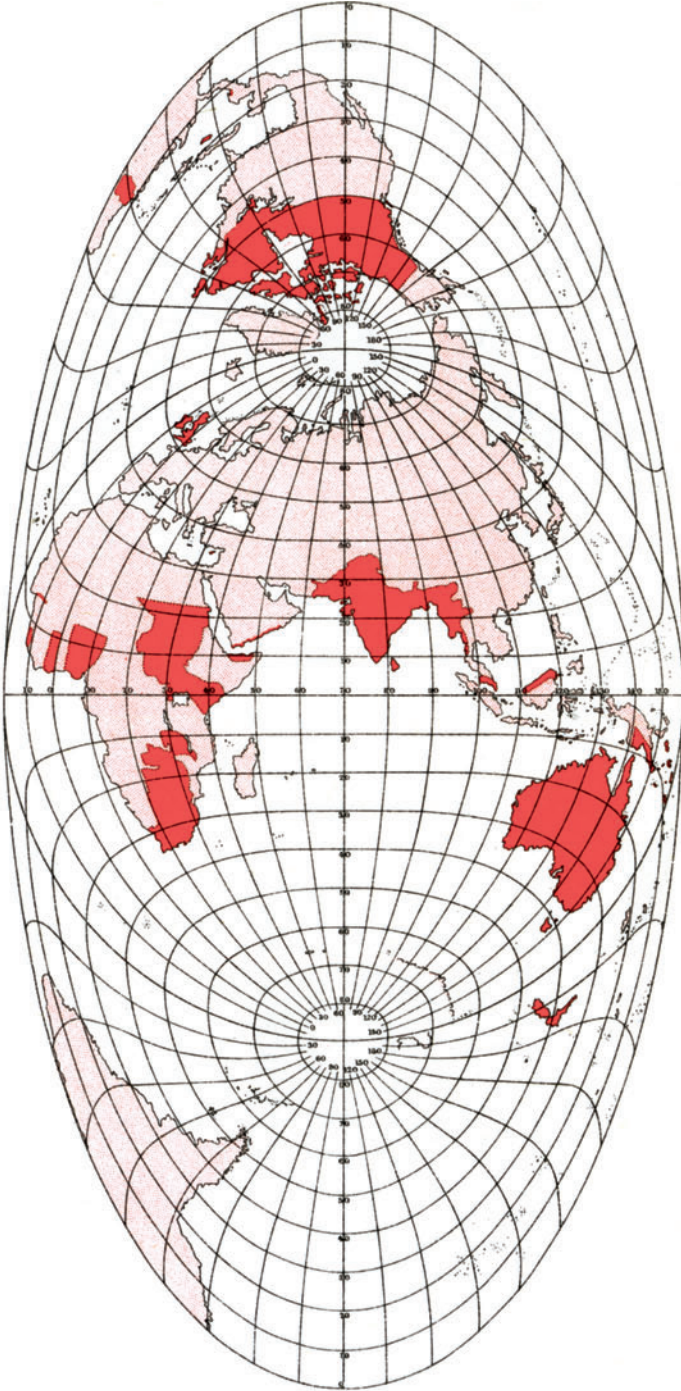


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MAP PROJECTIONS



TRANSVERSE MOLLWEIDE'S EQUAL-AREA PROJECTION (CLOSE)

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MAP PROJECTIONS

BY

ARTHUR R. HINKS, C.B.E., M.A., F.R.S.

SECRETARY OF THE ROYAL GEOGRAPHICAL SOCIETY

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PREFACE TO FIRST EDITION

THE subject of Map Projections has become over complicated because it has interested many mathematicians. The parts of the subject which are of mathematical interest are embodied in theorems of great elegance and considerable difficulty; in particular, the theory of the conformal representation of one surface upon another leads to developments which, from the mathematical standpoint, are of the highest importance, and possess an extensive literature. Yet we shall find that the property of orthomorphism, which plays such a large and difficult part in the theory of Map Projections, is not in most cases of any great advantage or importance in actual mapmaking. [A*]

In writing a book on Map Projections, the usual course has been to present the general mathematical theory first, and to discuss the practical questions involved at a later stage. The result is that the geographer sometimes finds himself unable to follow the bearing of the mathematics, and arrives at the consideration of the practical side of the subject in a very unformed state of mind.

I propose to adopt the principle of a very distinguished topographer, that in a book on Map Projections intended for the mapmaker and the map user, "one should draw the line at the root of minus one." If one follows this course, one often finds it impossible to show how some of the more elegant projections may be arrived at by a deduction from general principles. When, however, the formula of the projection is once given, it is

always easy to work backwards and to demonstrate its properties. The amount of mathematics required in the two cases is very different.

It will be seen, therefore, that this book has no pretensions to consideration as a treatment of the theory of projections from the mathematical point of view. On the contrary, its object may be stated very briefly as follows: There are some thirty map projections of importance, of which about half are in more or less general use. All of them have certain valuable properties, and equally serious defects. It is important to have a clear graphical or numerical idea of the merits and defects of each; to be able to decide at once on its suitability for a given map; or when one finds it actually employed on a map, to recognise what a map so constructed will do, and what it will not do.

I shall try in this book to make clear the relations between the various projections; the extent to which they possess the qualifications which a good map projection should possess; the methods by which they can be constructed; and the way in which maps so constructed can be used. The last matter is of considerable present importance. Relatively few people have to make maps, but very many have to use them, and it is necessary to learn to guard against fatal mistakes. The introduction of Map Projections into the schedule of Geography for the examination for First Class appointments in the Home and Indian Civil Service is a welcome recognition of this fact. In preparing this slight account of a large and diffuse subject I have had the advantage of many discussions with Colonel Close, C.M.G., R.E., Director-General of the Ordnance Survey, to whom I am indebted for my first acquaintance with its beauties. In making the calculations of the numerical properties of the various projections in use I have had the help of several pupils in the Cambridge Geography School; and in particular I have to

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thank Mr F. M. Deighton, B.A., of Trinity College, and Mr T. W. Glare, B.A., of Sidney Sussex College, Cambridge, for the great assistance they have given me.

I have not tried to give a set of drawings of all the projections treated in this book. Only very small scale diagrams would have been possible, and these cannot do justice to the projections that are most suitable for topographical and for Atlas maps. In their useful central regions these are very similar to one another until they are measured up, and the eye can hardly distinguish between them; when they are constructed as world-maps, for which most of them are entirely unsuitable, they become easily distinguishable and at the same time absurd. Thus, to represent the whole sphere upon a conical or polyconic projection is to obscure the real merits and the proper uses of the projection. I have therefore been content to give references to the places where these projections may be seen in actual use and studied on an adequate scale; and have confined myself here to plates of the two or three projections that make good small scale diagrams of the sphere; and to a few explanatory figures. The transverse Mollweide's projection is a new and interesting world-map; I have to thank its inventor, Colonel Close, for permission to include it as the frontispiece of this book. The plate was printed in the Geographical Section of the General Staff, by kind permission of Colonel Hedley, R.E.

A. R. H.

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PREFACE TO SECOND EDITION

WHEN this book was written in 1912, for the use of my pupils in Geography in the University of Cambridge, my knowledge of Map Projections was academic. During the intervening years I have learned much by experience at the Royal Geographical Society, especially during the years of war; and I cannot in 1920 endorse quite all the confident judgments of 1912. For instance, the requirements of the artillery in modern war have brought into great prominence the advantages of an orthomorphic projection for the large scale tactical maps used in stationary warfare; and what I said of orthomorphism in 1912 needs modification.

A few mistakes have been corrected; but otherwise the body of the book stands as it was in the first edition, save for references to notes in modification of judgment, or in amplification of treatment. These notes (indicated in the text thus: A*, B* and so forth) are collected in a new Chapter XI. Other new Chapters deal with the projections for topographical maps on a large scale, which were quite inadequately treated in the first edition; with the calculation of rectangular coordinates and grids for tactical maps; with the history of Map Projections; and with some additional tables.

I am especially indebted to Mr A. E. Young, A.M.I.C.E., formerly Deputy Surveyor General of the Federated Malay States, for much help during the last four years. His investigation of various points which arose during the war led to his writing a work on Map Projections containing original and valuable ideas, which has been recently published by the Royal Geographical Society. I owe to him much of the information given in my additional chapters. The frontispiece, due to Colonel Sir Charles Close, K.B.E., F.R.S., now Director General of the Ordnance Survey, has been reprinted from the War Office stores by kind permission of Colonel E. M. Jack, C.M.G., D.S.O., Chief of the Geographical Section, General Staff.

A. R. H.

LONDON,
January 1921.

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