

The Need of Mathematics in Geography

LUIS FREILE, Department of Geography, University of Oklahoma

The existence of the world is a natural phenomenon which is difficult to define in terms of four dimensions. The investigation of the nature of our planet is a human attempt, which is expressed in many different criteria, one of which is geography.

To the geographer, his field is the descriptive science of space area. Such a definition gives room for both qualitative and quantitative aspects which are combined necessarily, by nature of the geographer's quest.

The intensity with which the quantitative aspect, that is to say, the scientific method as used in geography, is limited to a level far below that of the qualitative intensity.

The author agrees with the contemporary Italian and German schools of geography, which stress rightfully the importance of science in geographical investigations and teachings.

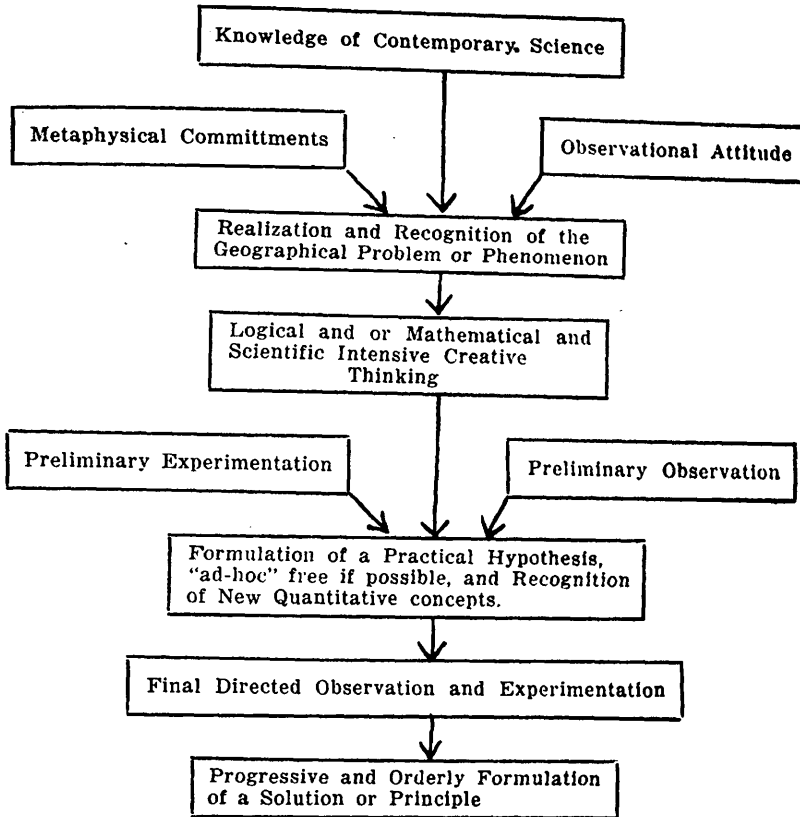
Considering the method of investigation, the science fields in geography are three:

- (1.) The science of the planet,
- (2.) The science of relationships, (nature to nature, nature to man, and man to nature),
- (3.) The science of distributions (phenomena in cultural or natural occurrence).

In these three levels, science has mathematics as a common language because it has a spontaneous response from the physical world that is studied. As is for all sciences, mathematics is needed by the geographer to help coordinate those experiences which the qualitative criteria is unable to bring to a complete logical system. For it is mathematics, the technique par excellence, that implements a comprehensive order in the knowledge of some fields in geography.

Upon assuming a quantitative attitude, the geographer realizes that human scientists are operating in a three dimensional space and therefore must apply themselves to some system of scientific induction, deduction and conclusion, all of which are performed mathematically.

To insure the geographer's scientific success a simple procedure is here presented, namely the order of scientific procedure in geography:



This sequence of procedure insures the investigator that the related principles of scientific success are always subject to application; namely: continuity, individual variability, multiplicity of effort and selective development.

For geographers there must be an answer to the **What, How, Why and the How Much**. To coordinate all of the desired answers in its entirety, a geographer has to be a systematic and an intuitive thinker. This mixture is definitely not in the way of the application of mathematics in systematic thinking.

So many values are passed over in geographical research because of a lack of emphasis in a more quantitative study.* The earth and its simple mathematical relations are not sufficiently well understood by geographers. Literature about the subject is scarce and far too dispersed in subject matter of non-geographic fields of study.

Generally it is accepted, that mathematics is the most difficult division of geography, but it is becoming a very indispensable discipline. Qualitative analysis alone cannot answer all the questions posed by a modern society with a modern industry and a dynamic activism.

* Without disturbing the conventional qualitative analysis procedure of present use.

More needs to be written about mathematics in geography. More needs to be taught and disseminated. The lack of applied mathematics in geography and the progressive complexity of the problems posed, may in the future overwhelm the geographers ability to deal with people interested in the world he studies.

A passive knowledge of mathematics is not enough, it must be activated and brought up to date and in accordance with the modern contemporary scientific concepts of the physical world. Let it be clear that this is not an attempt to make a mathematical science out of geography, for it can not be done as it is obvious to any geographer.

The mathematical ability of a geographer should include:

(a.) Algebra

(b.) Geometry	}	Theoretical	}	Plane
				spherical
		Applied	}	Solid
				Stereometry

(c.) Curve Analysis and Determinants

(d.) Trigonometry	}	Plane
		Spherical

(e.) Analytical Geometry

(f.) Infinitesimal Arithmetic

(g.) Probabilities.

The divisions or portions of geography that need a mathematical background to insure an orderly comprehension are:

(a.) Form and Shape of the Earth

(b.) Movements of the Earth and its immediate gravitational and electromagnetic relations.

(c.) Elements of longitude and variables of time determination.

(d.) Cartography and Map interpretation

(e.) Climatology

(f.) Physiography.

Any science that generates new ideas and theories will make felt its influence on the other sciences, eventually. Geography is entering a period where it will revise its entire system of study and investigation and a greater emphasis in mathematics is bound to be one of the points of interest in this revision.