5-1969

The Beginnings of Mathematics

Gail Ray
Ouachita Baptist University

NATURAL SCIENCE DIVISION

HONORS SPECIAL STUDIES

May 23,1969

Gail Ray

THE BEGINNINGS OF MATHEMATICS

Our first conceptions of number and form date back to times as far removed as the Old Stone Age. Little progress was made in understanding numerical values and space relations until the transition occurred from the mere gathering of food to its actual production, from hunting and fishing to agriculture. With this fundamental change, a revolution in which the passive attitude of man toward nature turned into an active one, we enter the New Stone Age. The tempo of technical improvement was enormously accelerated.

Between the villages a considerable trade existed, which so expanded that connections can be traced between places hundreds of miles apart. The discovery of the arts of smelting and manufacturing, first copper then bronze tools and weapons, strongly stimulated the commercial activity. This again promoted the further formation of languages. The words of these languages expressed very concrete things and very few abstractions, but there was already some room for simple numerical terms and for some form relations.

Numerical terms--expressing some of "the most abstract ideas which the human mind is capable of forming," as Adam Smith has said--came only slowly into use. Their first occurrence was qualitative rather than quantitative, making a distinction only between one and two and many. The ancient qualitative origin of numerical conceptions can still be detected in the special dual terms existing in certain languages such as Greek or Celtic. When the number concept was extended higher numbers were first formed by addition: 3 by adding 2 and 1, 4 by adding 2 and 2, 5 by adding 2 and 3.

The development of the crafts and of commerce stimulated this crystallization of the number concept. Numbers were arranged and bundled into larger units, usually by the use of the fingers of the hand or of both hands, a natural procedure in trading. This led to numeration first with five, later with ten as a base, completed by addition and sometimes by subtraction, so that twelve was conceived as 10 plus 2, or 9 as 10 minus one. Sometimes 20, the number of fingers and toes, was selecred as a base. Of 307 number systems of primitive American peoples investigated by W.C. Eels, 146 were decimal, 106 quinary and quinary decimal, vigesimal and quinary vigesimal.

Numerical records were kept by means of bundling, strokes on a stick, knots on a string, pebbles or shells arranged in heaps of fives. From this method to the introduction of special symbols for 5, 10, 20, etc. was only a

step, and we find exactly such symbols in use at the beginning of written history.

These few illustrations of the beginnings of mathematics show that the historical growth of a science does not necessarily pass through the stages in which we now develop it in our instruction. Some of the oldest geometrical forms known to mankind, such as knots ans patterns, only received full scientific attention in recent years. On the other hand some of our more elementary branches of mathematics, such as the graphical representation or elementary statistics, date back to comparatively modern times. As A. Speiser has remarked with some asperity: "Already the pronounced tendency toward tediousness, which seems to be inherent in elementary mathematics, might plead for its late origin, since the creative mathematician would prefer to pay his attention to the interesting and beautiful problems."