

BOOK REVIEWS

ALAN LAW

Geometry from Africa — Mathematical and Educational Explorations

by Paulus Gerdes,

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The thesis of this book is that the African peoples are actually doing mathematics in their art. The author has a prestigious and prolific teaching and research career. This book is a continuation of his inquiry into an emerging field known as *ethnomathematics*. Particular formulations of mathematical ideas develop from cultural activities. The aim of ethnomathematics is to uncover the common cognitive concepts underlying different cultures.

The book is divided into four parts which can be read independently from each other. The first part is entitled "*On geometrical ideas in Africa South of the Sahara*". The peoples of this area have been particularly active in geometrical thinking expressed in diverse cultural and social artifacts that exhibit a high degree of symmetry. Examples include rock paintings found in Northern Mozambique, petroglyphs from extreme East Angola, Adinkra stamp motifs, archaeological finds of carved or wooden patterns from the Republic of Mali and the geometrical structure of the Great Hall of King Munza. This part of the book is filled with photographs and sketches to illustrate the geometrical accents of African culture. The illustrations are annotated with their area of origin and sometimes time period (e.g., design from royal cloth from Northwest Cameroon, design from Nigeria embroidery, body painting on wooden sculpture collected in Niangara in 1910). The sketch of a roof structure of a Fulani house in Cameroon is mesmerizing, reminiscent of today's test pattern for astigmatism. Beautifully illustrated decorative designs on drums, facial tattoos from South Africa, semi-spherical basket fish traps, and the hexagonally woven bottom of a conical quail basket leave the reader with a graphic realization of what Cameroon mathematician George Njock said: that "*Black art is mathematics*". The pictures reveal vividly the geometry evident in every sphere of African life.

It is interesting to note Africa's connection with Egypt in terms of their similarity in originating mathematical ideas. For example, the Pythagorean proposition can be proved from designs derived from Mozambican decoration. Part 2 of the book, like Part 1, is filled with graphics, but in Part 2 the graphics are used to illustrate the steps in the production of the proof of the Pythagorean theorem. The theorem is proved again in a different way, this time starting with Chokwe sand drawings with fourfold symmetry which are easily transformed into Pythagorean designs. Part 2 is concluded with coverage of other connections between African art and variations of the

Theorem of Pythagoras. For example, the theorem can also be discovered in mat weaving patterns.

Part 3 explores the uses of African art forms for teaching notions of symmetry. This part of the book provides a careful enumeration and organization of many examples to further illustrate the appearance of geometrical ideas in African artifacts. Alternative ways are developed for rectangle constructions and for the determination of areas of circles and volumes of spatial figures.

Part 4 provides a summary of the author's previous books *Sona Geometry* (first published 1993/94 with several later versions and translations), *Luscona: Geometrical Recreations of Africa* (published 1991, translated 1997), and *Lunda Geometry* (1995). As such, it provides an educational exploration of geometry focusing on the sona sand drawing tradition among the Chokwe people in Southern Central Africa. This part of the book, like the others, is well illustrated with visual representations.

The pictorials that appear abundantly throughout all four parts convey African art as mathematical symmetry. The educational uses of African art forms teach geometrical notions in a very effective way. A research methodology for advancing the field of ethnomathematics is evident from this text. Paraphrasing Gerdes himself: If one tries to vary the geometrical forms and patterns of traditional objects, a sub-optimal solution is reached which disallows many practical advantages. This is to say that the traditional form is never arbitrary but embodies mathematical knowledge that expresses itself as accumulated knowledge and wisdom (1997; 1986).

I highly recommend this book both from the mathematical and artistic points of view.

References

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