

African Basketry: Interweaving Art and Mathematics in Mozambique

Paulus Gerdes
Mozambican Ethnomathematics Research Centre
C.P. 915
Maputo, Mozambique
(March-July 2011, CAPES Visiting Professor, University of São Paulo, Brazil)
E-mail: paulus.gerdes@gmail.com

Abstract

The paper presents instances of mathematical ideas interwoven in the artistic decoration of handbags, hats, mats, and other products of basketry from several regions of Mozambique. In particular, examples of female basketry from the Tonga in the Southeast and the Makwe in the extreme Northeast of the country are given and analysed. Further examples from the Makuwa population in the Northeast and from circular tray weavers in the South are briefly presented.

Introduction

In 1999 I opened my book *Geometry from Africa* [2] with the following sentence “The peoples of Africa south of the Sahara desert constitute a vibrant cultural mosaic, extremely rich in its diversity. Among the peoples of the sub-Saharan region, interest in imagining, creating and exploring forms and shapes has blossomed in diverse cultural and social contexts with such an intensity that with reason, to paraphrase Claudia Zaslavsky’s *Africa Counts* [17], it may be said that “Africa geometrizes”.” It may be added that frequently geometrical imagination and ideas are interwoven with artistic-aesthetic ideas and imagination, as shown, for instance, in the books *Women, Art and Geometry in Southern Africa* [1, 14], and *African Basketry: A Gallery of Twill-Plaited Designs and Patterns* [4]. In the same vein, the mathematician Njock from Cameroon stresses that “Pure mathematics is the art of creating and imagining. In this sense black art is mathematics” [16, p. 8]. For an annotated bibliography of mathematical ideas in African cultures and history, see [15].

In this paper I will present examples of the interweaving art and geometry in basketry from Mozambique in the Southeast of Africa. I will start with the weaving of *Sipatsi* handbags, made by Tonga women in Inhambane Province, which I have been collecting almost since the independence of Mozambique in 1975.

Sipatsi

The woven handbags from the Inhambane Province, home of the (Gi)Tonga language, are called *gipatsi* (singular) and *sipatsi* (plural). Because of their utility and beauty they are among the most widely appreciated products of Mozambican basketry, nationally as well as by visitors from abroad. The *sipatsi* are almost exclusively made by women. Figure 1 presents an example of a *gipatsi*, decorated with two ornamental bands. Figure 2 shows two distinct strip patterns on a *gipatsi*.



Figure 1: *Example of a Gipatsi.*



Figure 2: *Two strip patterns on a Gipatsi.*

The first edition of my book on *Sipatsi* was realised shortly after the end of the war in Mozambique in 1992. The post-war period has witnessed an explosion of female creativity. Peace seems to have contributed to the liberation of the creativity and inventiveness of the women basket weavers. Since the war, hundreds of new patterns have been invented. In the latest edition of my book on *sipatsi* [5], 708 distinct strip patterns invented over the years by the Tonga women are included. Throughout this period, the seven symmetry classes of strip patterns are observable in the *sipatsi* I have collected. Figure 3 presents two strip patterns belonging to distinct symmetry classes. In the last ten years, several new phenomena have been observed, ranging from color transformation (see the examples in Figures 4 and 5), introduction of plane patterns (see the examples in Figures 5, 6 and 7), to decoration of a new type of objects, like hats (example in Figure 7) and the implicit use of codes.



Figure 3: *Two examples of strip patterns with different symmetries*

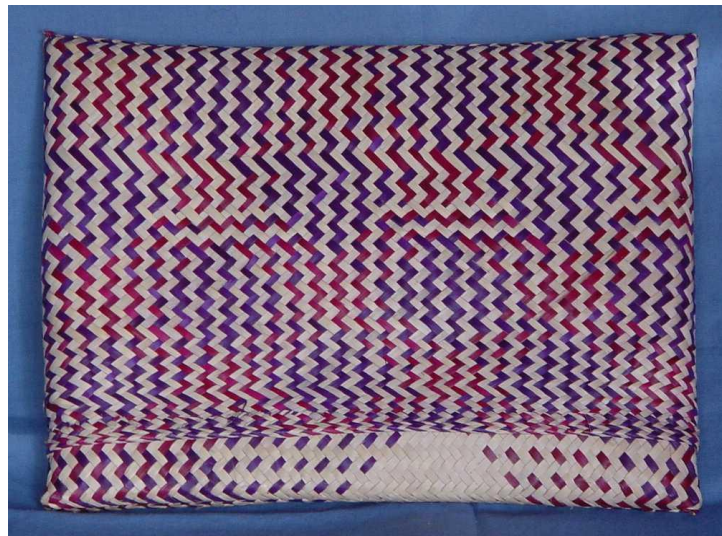


Figure 4: *Gipatsi characterized by color transformation*

Tonga women have invented a color transformation of plaited strip patterns whereby they use alternating colors in both weaving directions. To weave such a strip, the basket weaver has to think and work in the manner of the original strip pattern in order to achieve the new pattern: thinking only in terms of the new pattern would complicate the execution of the weaving. Tonga women have also invented a class of plane patterns. Recently, they have made twill-plaited baskets, where artificially dyed strands alternate with groups of natural-colored strands in both weaving directions. Taking all the variables and symmetries into account, the basket weavers have discovered all possible mathematical ‘solutions.’ Sometimes the basket weaver interweaves two different plane patterns into the same bag, thus teaching the observer that there are two patterns belonging to the same class: a clear example of cultural didactics.

The cultural phenomenon of *sipatsi* presents a concrete example of how mathematics and art, of how tradition and innovation may be interwoven. Experimentation, exploring possibilities and systematic variation are characteristics of the *sipatsi* mathematic-artistic weaving activity. The weavers themselves say that they ‘weave music’ into their designs and patterns.



Figure 5: *Plane pattern generated by color transformation*



Figure 6: *Gipatsi with a plane pattern*



Figure 7: *Hat decorated with plane patterns*

Luanvi

Makwe is a language spoken in the coastal Palma District of Cabo Delgado Province in the extreme Northeast of Mozambique. Makwe women make rectangular mats called *luanvi* by sewing long plaited bands of brightly dyed palm fibre together (see [4], [14]). Bright yellow, green, and purple plain bands alternate with decorated black-and-white decorated bands from each other (see the example in Figure 8).

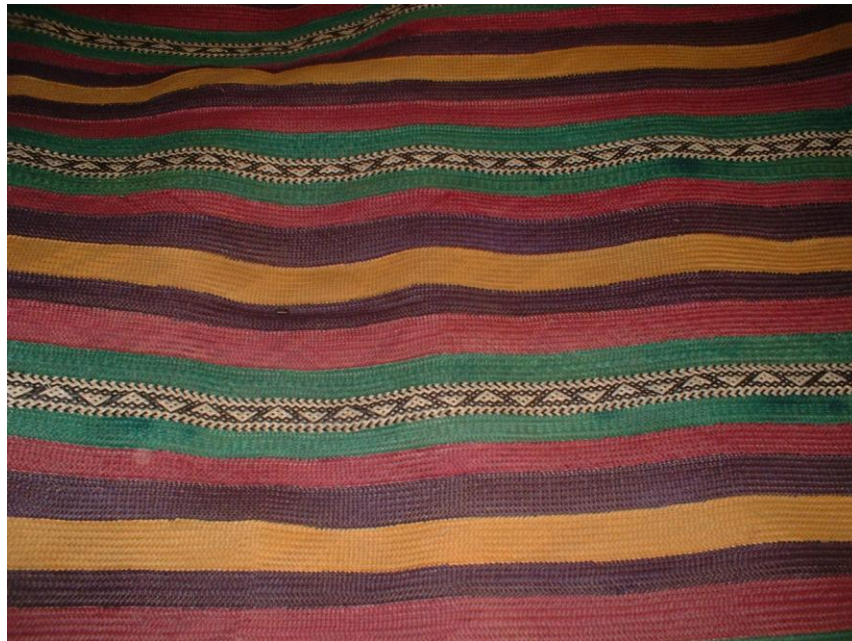


Figure 8: *Detail of a 'luanvi' mat*



Figure 9: *Front- and back-side of a black-and-white band*

Generally, as a consequence of the diagonal weaving process and alternating black and white strands, the front-side and back-side of a black-and-white strip pattern are neither the same nor the photographic negative of each other, as the example in Figure 9 illustrates.

Makwe women have invented and used the seven symmetry classes of strip patterns. Some of them invented very particular strip patterns, for instance, whereby the back-side of the mat is the photographic negative of the front-side (example in Figure 10)

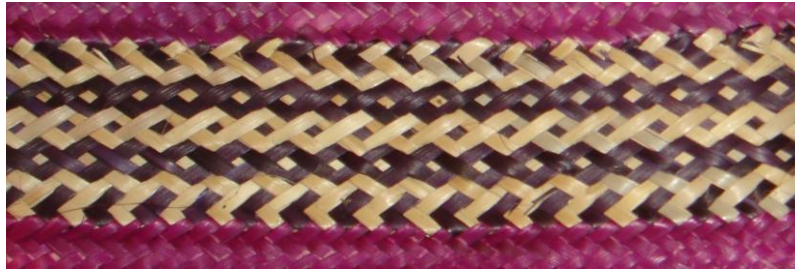


Figure 10: *Special two-color band*

The example of the chicken's eye motif in Figure 11 is another carefully constructed and well calculated strip pattern: on both sides the motif is the same, being the direction interchanged and the motif slightly displaced. It is a creative solution of an artistic-mathematical problem, invented sometime by a female mat weaver from the east coast of Africa.



Figure 11: *Both side of twill-plaited band with the chicken's eye motif*

Further examples

During the plenary presentation further examples from Mozambican basketry will be presented, in particular, from the Makuwa population in the Northeast of the country (see the example in Figure 12) (see [9], [10], and [11]), and from basket trays from the South (see the example in Figure 13) (see [12], and the comparative study [3] of twill-plaited basket trays of other parts of Africa, Asia, Oceania, and the

Americas (see also [7] and [8]). Among other studies, [2], [5], [9], and [13] present examples of exploring the interweaving of African art and mathematics in mathematics education.



Figure 12: *A Makuwa hat*



Figure 13: *A basket tray made by Bendzane*

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