

Preface

WHAT IS AT STAKE IN THE STUDY OF STRING FIGURES?

As children, I assume we all learned from friends how to make half a dozen string figures. In some parts of the world, however, for example, in the Trobriand Islands and in the Chaco region of Paraguay, on which Eric Vandendriessche concentrates in this book, some expert actors are able to produce hundreds of such figures. This difference in the order of magnitude is not insignificant. It goes along with a striking sophistication of the figures described with a loop of string. It also clearly entails a qualitative difference in the processes of memorization and production of string figures. Unlike the rest of us, these expert actors seem to have practiced this activity throughout their lives and on different occasions. What is the nature of the knowledge they put into play to generate and memorize these huge sets of string figures? This is one of the key issues Vandendriessche addresses in this book.

Needless to say, there is no single, simple answer to such a question. Yet, the importance of the issue cannot be overestimated and demands that we do not leave it unattended. Investigating string figures in various contexts will widen our understanding of the nature of knowledge systems that human collectives have shaped by giving us a better grasp of the variety of these systems. Further, this exploration of a little-understood activity will help us appreciate the subtlety of cognitive processes that are foreign to us. Indeed, Vandendriessche's inquiry into this practice yields insights into manifest and unusual competences of these expert actors. The reader will make their acquaintance in the pages of this book and will learn to understand their amazing skills. Vandendriessche's contribution constitutes a significant step and will hopefully raise awareness that action must be taken to preserve this important part of mankind's heritage, which is threatened with disappearance.

But there is more. What I learned in the school playground in Paris suggests that there are local elements in any body of knowledge of string figures. To be sure, not everybody on earth learns how to make an Eiffel Tower with a loop of string. Vandendriessche's analyses in this book yield deep insights into the diversity of forms that activities with string figures have taken in different contexts around the world. He shows how this diversity is not merely a matter of what name the actors

give to the figures and what forms they recognize in them. More deeply, the diversity appears in the various sets of elementary operations and types of procedures that actors bring into play in their production of the set of string figures they know. Perhaps, as Vandendriessche's analysis seems to suggest, the general organization of the various explorations of patterns that can be achieved over time with a loop of string displays a striking similarity, everywhere showing the establishment of intermediary positions and the dissection of a procedure into subprocedures that lead from a certain position to another. Whatever the case, however, one of the important results Vandendriessche establishes in this book is that in different contexts, the distribution of operations that actors use systematically to make string figures differs. Diversity thus lies at the heart of these different practices in that the different tools different collectives have shaped to carry out their activity.

This result, which sheds light on the texture of such practices, is one of the side benefits that derive from the core questions addressed in the book. The questions can be formulated as follows: In what respects can we understand these string figure activities as mathematical? And what does this tell us about the nature of mathematics? It is important here not to misinterpret the questions. The point is not to start from the a priori assumption that this activity is simply mathematical and then freely project the resources of modern mathematics onto it to prove the fact. Put in these terms, it is clear that had Vandendriessche followed such an approach, his method would be flawed. It would unjustifiably deny the "motley" facets that characterize activities with string figures. Moreover, such a way of proceeding would uniformize the mathematical features of these activities, aligning them with modern mathematics. It would thus deprive us of the important insight that they could possibly offer on the nature of mathematics. Instead, Vandendriessche is much more careful, as his introduction makes it clear. His starting point is historical.

The fact is that anthropologists have been interested in string figure making from virtually the beginning of professional anthropology. Cambridge ethnologist Alfred Cort Haddon (1855–1940) appears to have been the first to have focused systematically on this type of activity. Essential for Vandendriessche is the fact that through discussions with Haddon, Cambridge mathematician Walter William Rouse Ball began working on and practicing with string figures. In other words, mathematicians' attention was drawn to string figures almost as early as anthropologists became interested in the activity. The results of Rouse Ball's work were included in the fifth edition of his *Mathematical Recreations and Essays*, published in 1911. We can interpret this choice of a venue for publication as a way for Rouse Ball to assert the mathematical dimension he perceived in the activity while not being able to associate it clearly with a specific mathematical subdiscipline at the time. After all, this should not surprise us: The fact recurs in the history of mathematics. For instance, the same can be said of Euler's explorations of the Königsberg bridge problem: It was only much later that a mathematical subdiscipline to the problem could be attached, that is, graph theory took shape.

To return to Rouse Ball the mathematician, he thus appears to have been the first to have raised the issue of the mathematical dimension of the practice of producing string figures. He did so by bringing a procedural approach and geometric ideas

into play to present some figures and analyze them. As Vandendriessche shows, Rouse Ball was followed by numerous other mathematicians whose publications explored string figures from different mathematical perspectives. Perhaps the most striking figure of them all is Thomas Storer, the first Native American to become an academic mathematician in the United States, who devoted impressive writings to string figures. He too approached string figures from a mathematical viewpoint shaping a topologicoprocedural approach to them. In this context, he was able to design a specific symbolism allowing practitioners to work on sequences of characters rather than motions of loops and thereby introduce a concept that proved essential for Vandendriessche: that of the heart sequence.

It is as a historian of mathematics that Vandendriessche analyzes the ways in which past mathematicians have approached string figures. He draws two main sets of conclusions from this research. This history can be read as a regularly reasserted statement whereby mathematicians expressed their perception that this activity clearly had a mathematical facet. This in and of itself justifies the project of inquiring into the ways in which the making of string figures relates to mathematics. At the very least, the mathematicians' contribution sheds light on how they understand the mathematical dimensions in the activity. In fact, these mathematicians' explorations provide a wealth of ideas and concepts with which to analyze string figures as a practice and as a body of knowledge offering a guide in the survey of this *terra incognita*.

This is the point where the research carried out by Vandendriessche the historian of mathematics meshes with the task Vandendriessche the anthropologist set himself. To explore the mathematical dimensions of the making of string figures, he draws inspiration from these previous publications while at the same time developing his own anthropological approach. It is to be noted how important Vandendriessche's own practice of producing string figures proves to be in this respect. This is essential, for instance, in enabling Vandendriessche to formulate criticisms of some features of Storer's symbolism that pass over important aspects of the actual process of making string figures. On this basis, Vandendriessche can thus plead for a transformation of this first symbolism, which better accounts for these aspects of the string figures under study. More generally, the actual practice of forming figures with a loop of string provides the basis on which Vandendriessche offers a new conceptualization of the process of bringing about a string figure, which is essential for the unfolding of his analyses. Two main threads of results follow.

Vandendriessche forcefully establishes how the mathematical approach he has designed yields tools for analyzing string figures and the procedures shaped to produce them. This approach gives amazing insights into the various corpora of string figures, whether one is interested in the structure of these corpora or the properties of the sets of procedures yielding them. To mention but one example of his results, this is precisely how, as underlined above, Vandendriessche is able to demonstrate a quite unexpected conclusion: the diversity among the various corpora and sets of procedures. Interestingly enough, this example illustrates how Vandendriessche parts from Rouse Ball in the type of analysis deployed. Much in the way in which a mathematician usually reads an ancient text, Rouse Ball

decontextualized string figures and dealt with them altogether without keeping track of the different contexts from which they originated. Such a method inevitably hampers the discovery of disparity among different corpora. By contrast, by paying both historical and anthropological attention to contextualization, Vandendriessche is able to perceive the diversity among corpora.

Until now, mathematical concepts and ideas have been observers' tools used to carry out the analysis of data. If we except the attention given to operations and procedures, actors remain in the shadow. However, these observers' tools have borne fruit, allowing Vandendriessche to capture structural features of the corpora and immediately leading him to raise a key question: that of determining whether in fact these observers' tools grasp the features of actors' own concepts of what they are doing. The observers' tools again prove useful in addressing this question, helping the anthropologist formulate specific questions about the actors' operations and focus on specific features of the actors' terminology and procedures. It is then through a subtle and convincing argument that Vandendriessche is able to move from the observers' categories to the actors' perceptions of their own practice and operations, establishing how some mathematical properties of corpora and procedures that he brought to light actually correspond to the actors' own understanding of their activity.

In conclusion, Vandendriessche thus opens a new chapter in the anthropological exploration of mathematical ideas. This page documents the exploration of a new range of mathematical ideas in oral societies by people who operate outside the academic world. What can this new type of evidence of mathematical activity bring to a general reflection on the nature and practice of mathematics in the past as well as in the present day? How will our understanding of it change through the advancement of mathematics? These are questions that Vandendriessche's book, exemplary for its interdisciplinary character, compels us now to address.

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