

## THE NATURE OF THE PROGRAM ETHNOMATHEMATICS

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Ubiratan D'Ambrosio: Etnomatematica, (Prefazione di Bruno D'Amore, traduzione di Giovanni G. Nicosia e Maria Cristina Bonomi Baruffi), Pitagora Editrice, Bologna, 2002; xi+187 pp. ISBN 88-371-1352-8.

Ubiratan D'Ambrosio: Etnomatematica. Elo entre as tradições e a modernidade, Autêntica Editora, Belo Horizonte, 2001; 107 pp.

Ubiratan D'Ambrosio: Mathematics and Peace: A Reflection on the Basis of Western Civilization, LEONARDO, vol.34,nº4, 2001; pp.327-332.

Ubiratan D'Ambrosio: A Historiographical Proposal for Non-western Mathematics. Mathematics Across Cultures. The History of Non-Western Mathematics, ed. Helaine Selin, Kluwer Academic Publishers, Dordrecht, 2000; pp.79-92.

**Abstract:** *The Program Ethnomathematics is a Transdisciplinary and Transcultural approach to knowledge. It focuses the encounter of traditions and modernity. It draws on Sciences, Arts, Religion, hence, particularly on symmetry. Every tradition reveals a mystical attitude with respect to symmetry or to the lack of symmetry. Indeed, symmetry has been a central issue in the emergence of modernity, understood as the reliance on Modern Science, as established after the Renaissance. Equally, symmetry was a central issue in Art. The prototype of Leonardo's Vitruvian Man synthesizes the central role of symmetry in development of methodological and theoretical instruments in both arts and sciences. Consequently, both Ethnomathematics and symmetry can bridge different branches of science, art and religion, as well as different human cultures. This means, both are Transdisciplinary and Transcultural.*

I have been closely involved with the International Society for the Interdisciplinary Study of Symmetry/ISIS since it was founded, in 1989. I remember the when the International Congress of Mathematics Education/ICME 6 met in Budapest, in 1988, I visited with colleagues in Hungary, particularly with Denes Nagy, who were planning an international association dealing with several aspects of symmetry.

It was clear to me that Symmetry and Ethnomathematics were in very close relation. One of my inspiring ideas in developing Ethnomathematics was D'Arcy Thompson's "On Growth and Form". I was also very impressed by my visits to communities all over World, where I could observe traditions. The forum of Science and Culture of UNESCO, held in 1986 on Venice, had set the bases for enlarging the scope of Ethnomathematics to a Transdisciplinary and Transcultural approach to knowledge, which focuses the encounter of traditions and modernity. Every tradition reveals a mystical attitude with respect to symmetry or to the lack of symmetry. Indeed, symmetry has been a central issue in the emergence of modernity, understood as the reliance on Modern Science, as established after the Renaissance. Equally, symmetry was a central issue in Art. The prototype of Leonardo's Vitruvian Man synthesizes the central role of symmetry in development of methodological and theoretical instruments in both arts and sciences. Consequently, symmetry can bridge different branches of science, art and religion, as well as different human cultures. This means, symmetry is Transdisciplinary and Transcultural. The Program Ethnomathematics is a realization of the Transdisciplinary and Transcultural approach to knowledge.

I begin by addressing an important question, frequently asked. Is Ethnomathematics research or practice? There is even a completely mistaken confusion of Ethnomathematics with Ethnic-mathematics. Please, note that ethno and ethnic, even if related, are different concepts.

My current concerns about research and practice in the History and Philosophy of Mathematics and its pedagogical implications, fit into my broad interest in the human condition as related to the history of natural evolution (from the Cosmos to the future of the human species) and to the history of ideas. Particularly, I analyse the history of explanations of life and of natural evolution in different cultures

In the last years my motivation has been the pursuit of PEACE, in all its four dimensions: individual, social, environmental and military. I attribute the violations of peace, in all these four dimensions, to the mistaken course taken by Western Civilization.

Western Civilization plays a crucial role in the History of our species, since the Great Navigations of the 16th century. My reflections on the History of Humanity are based in the analysis of the founding myths of different cultures. For Western Civilization, I locate its founding myths on the history of monotheistic religions (Judaism, Christianity, Islamism), as well as on the history of techniques, the history of arts, the history of science and on how mathematics permeates all this. A necessary support for these reflections comes from comparison with non-Western cultures.

I base my research on established forms of knowledge (communications, languages, religions, arts, techniques, sciences, mathematics) and in a theory of knowledge and behavior which I call the "cycle of knowledge". This theoretical approach recognizes the cultural dynamics of the encounters, based on what I call the "basin metaphor". All this links to the historical and epistemological dimensions of the Program Ethnomathematics, which can bring new light into our understanding of how mathematical ideas are generated and how they evolved through the history of mankind. It is fundamental to recognize the contributions of other cultures and the importance of the dynamics of

Culture is understood in its widest form, and includes art, history, languages, literature, medicine, music, philosophy, religion and science. Research in ethnomathematics is, necessarily, transcultural and transdisciplinary. The encounters are examined in its widest form, to permit exploration of more indirect interactions and influences, and to permit examination of subjects on a comparative basis. Although academic mathematics developed in the Mediterranean basin, expanded to Northern Europe and later to other parts of the World, it is difficult to deny that the codes and techniques to express and communicate the reflections on space, time, classifying, comparing, which are proper to the human species, are contextual. Among these codes are measuring, quantifying, inferring and the emergence of abstract thinking.

What we call mathematics in the academia is a Western construct. As I said above, deals with space, time, classifying, comparing, which are is proper to the human species, and the codes and techniques to express and communicate the reflections on these categories are undeniably contextual. I got an insight into this general approach while visiting other cultural environments, during my work in Africa, in practically all the countries of America and the Caribbean, and in some European environments. Later, I tried to understand the situation in Asia and Oceania, although I did not do field work. Thus came my approach to Cultural Anthropology.

To express this research, which I call the Program Ethnomathematics (maybe inspired by Lakatos?), I created a neologism, ethno-mathematics, from the Greek roots ethno, mathema and techné. Indeed, the root mathema has little to do with the current word “mathematics” (which is a neologism introduced in the 14th century). The root mathema means learning, understanding, explaining. Tics is a modification of techné, which is the root for arts and techniques.

The root ethno refers to cultural environments, I contemplate not only indigenous populations, but also labour and artisan groups, periphery communities in urban environment, farms, professional groups, etc. They develop their own practices, have specific jargons and theorize on their ideas. This is an important element for the development of the Program Ethnomathematics, as important as the cycle of knowledge and the recognition of the cultural encounters.

I consider a special role of technology in the evolution of human species and the implications of this for science and mathematics. Thus I focus history of science (and, of course, of mathematics) trying to understand the role of technology as a consequence of science, but also as an essential element for furthering scientific ideas and theories. Basically, I guide much of my investigation on three basic questions:

1. How are ad hoc practices and solution of problems developed into methods?
2. How are methods developed into theories?
3. How are theories developed into scientific invention?

Reflections about the presence of technology in modern civilization, leads, naturally, to

question about the future of our species. My growing interest in the emerging fields of Primatology and Artificial Intelligence, lead to a reflection about the future of the human species. Cybernetics and human consciousness lead, naturally, to reflections about fyborgs (a kind of “new” species, i.e., humans with enormous inbuilt technological dependence). Our children will be fyborgs when, around 2025, they become decision makers and take charge of all societal affairs. Educating these future fyborgs calls, necessarily, for much broader concepts of learning and teaching. The role of mathematics in the future is undeniable. But what kind of mathematics? Once again, I look for explanations in history.

To understand how, historically, societies absorb innovation, is greatly aided by understanding the World fiction literature (from iconography to written fiction, music and cinema). I feel it is important to understand the way material and intellectual innovation permeates the thinking and the myths, and the ways of knowing and doing of non-initiated people. In a sense, how new ideas vulgarise, understanding vulgarise as making abstruse theories and artifacts easier to understand in a popular way. The contribution of the common man to academic knowledge is basic in the Program Ethnomathematics.