



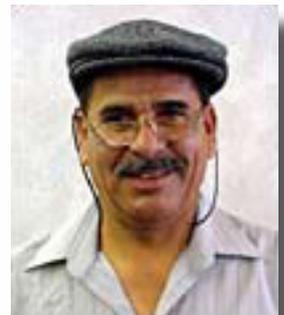
NASGEM NEWS

All the latest from the North American Study Group on Ethnomathematics

Volume 2, Issue 2
April 2008

NASGEM President's Report Fredrick L. "Rick" Silverman

My previous column indicated that months of work, particularly in collaboration with Miriam Leiva, President of TODOS-Mathematics for All, on behalf of Equity in Mathematics Education had resulted the scheduling of a Mathematics Education Equity Summit at NCTM Headquarters, Reston, VA, for February, 2008. That meeting took place February 20-22, 2008, and representatives from the following entities attended: AMTE, Benjamin Banneker Association, Key Curriculum Press, NASGEM, NCSM, NCTM Board of Directors and Headquarters personnel, TODOS – Mathematics for All, and WME. The meeting was productive in that it gave opportunity for attendees to share in depth perspectives they represent on this important topic, Equity and High Quality Mathematics Education for All. There is follow-up work that NASGEM will complete in its contribution to the good work we began. NCTM's commitment to Equity and High Quality Mathematics Education for All is evident, and NCTM will convene and host a meeting on Equity and Mathematics Education again in 2009. I extend NASGEM's thanks to NCTM President Skip Fennell, President Elect Hank Kepner, and Executive Director Jim Rubillo. Kay Gilliland, NASGEM's Equity Leader, summarizes the details of this meeting in her report elsewhere in this issue of NASGEM News.



Tod Shockey (top) assumes the office of Vice President and Luis Ortiz-Franco (bottom) assumes the office of Board Member At-Large for TODOS - Mathematics for All.

Two of NASGEM's leaders have been elected to positions of trust and responsibility in TODOS-Mathematics for All. Tod Shockey assumes the office of Vice President and Luis Ortiz-Franco assumes the office of Board Member At-Large. Congratulations to both of them, and I expect their participation in NASGEM and TODOS will be enormously beneficial for both organizations and for the goal of Equity in Mathematics Education, more generally. (cont'd on page 3)

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Ethnomathematics: Perspectives

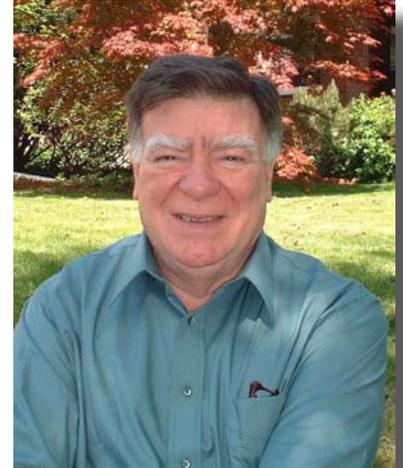
Ubiratan D'Ambrosio

Another question related to the future is “How Globalization and Technology affect Ethnomathematics?” In other words, “Does Ethnomathematics makes sense in the Global World?” and “Does Ethnomathematics makes sense in the Digital Society?” I see both, Globalization and Digital Society, as strongly favoring the Program of Ethnomathematics.

It is clear that traditional school mathematics is fading way. In spite of so much material and intellectual resources injected in education aimed at improving achievement in mathematics, the results of tests are typical of a freefall. It is a great mistake to put the blame in the lack of interest of students, low support of families, the ill preparation of teachers, bad books, poor school buildings, and other factors. The problem may be that the mathematics we try to teach is seen as obsolete, uninteresting and useless. It is dominated by formal presentation, with the very limited use of technology and no space for fantasy and creativity. Our efforts go into trying to remedy this situation, insisting in sameness with different words and theories. The downfall will not be stopped with sameness. We need a New Thinking in Education.

A New Thinking in Education encompasses the digital culture and conveys the awareness of being part of the Global World and at the same time of having distinguishable specific cultural roots. We deal with individuals that reach school with their personal memories, with their personal background, knowledge and behavior. Schools and social environments, in general, expose the individual to others, with different personal memories and different personal background, knowledge and behavior. The crux of education is to manage the dynamics of the encounter of one individual and other individuals. In this encounter, the individual is, and must be, proud of her/his cultural roots and, at the same time, respectful of the cultural roots of the other individual. This encounter, having mutual respect, is the essential ingredient to live in peace with the different. The only possibility of survival of civilization with dignity for all, is the mutual respect of individuals in the encounters. This the most relevant objective of ethnomathematics, which is the recognition that we are all part of the same species, which in different regions of the planet, developed distinct ways of surviving and transcending space and time. But, indeed, this is also the objective of a non-biased history of academic mathematics. There is no incompatibility of ethnomathematics and academic mathematics.

Technology, particularly, although not exclusively, through digital means, provides an essential element to reach and recognize hitherto inaccessible cultural environments. A basic component of the Program of Ethnomathematics is to recover and compare traditions, and to understand that all mathematical knowledge and behavior, throughout history and nowadays, is the result of the dynamics of the encounters of different cultures.





(cont'd from page 1) The Annual Meetings for NCSM and NCTM convene in Salt Lake City, UT, on April 6 and April 9, 2008, respectively, and I know a number of us will be attending and looking forward to being with each other again face to face. I want to bring to your attention the following two sessions:

Wednesday, April 9, 2:45 – 4:15 PM

Rm 208 Ethnomathematics Special Interest Session
Ethnomathematics Insights: Math, Culture, Access, and Equity

Participants at this session are Jim Barta, Claudette Engblom-Bradley, Barbara Garii, Jenni Harding-DeKam, Mia Kalish, Luis Ortiz-Franco, Jenni Rodin, Tod Shockey, Rick Silverman, and Holly Wenger

Thursday, April 10, 7:00-9:00 PM

Topaz Room at Hilton Salt Lake City Center
Annual Meeting of North American Study Group on Ethnomathematics (NASGEM)

There are, of course, other sessions that feature ethnomathematics, mathematics and culture, equity, and other topics of particular interest to us members of NASGEM. Programs are online for both annual meetings at www.nctm.org and also at www.ncsmonline.org. Please visit these sites to identify other sessions of interest to you, and perhaps you would like to pack some flyers to share with prospective NASGEM members. A NASGEM membership flyer accompanies this issue of NASGEM News.

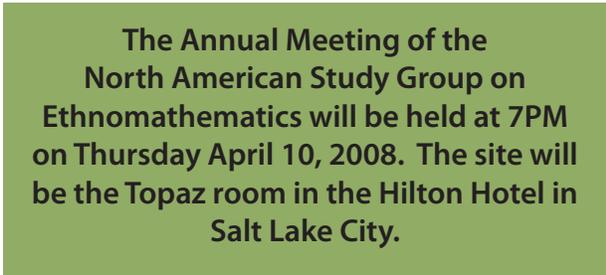
As some of you know, I am a member of the ICME-11, DG-18 Organizing Team for the Ethnomathematics session at Monterrey, MX, July 6 – 13, 2008. By time you read this issue of NASGEM News, I expect the Team will have sent notices about the disposition of proposals for presentation. I'm waiting for notification, along with others who

submitted proposals, and of course, to avoid any conflict of interest I did not screen the proposal on which my name appeared. I will be there as a member of the Organizing Team, and I'm certainly excited. A number of recipients of NASGEM News have been at previous ICME's and have reported the exhilarating experience you have had in attending this quadrennial international mathematics education meeting.

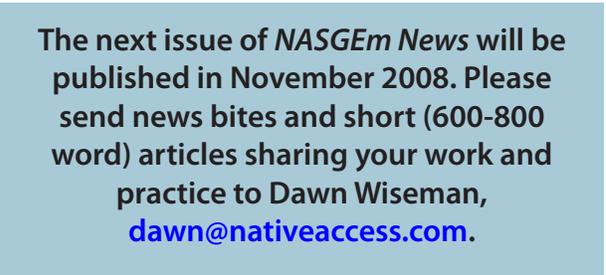
I report that NASGEM is growing, and I expect energetic membership efforts will take place during the upcoming 12 months. I look forward to NASGEM's collaboration with other organizations whose focus, like ours, relates to Equity, Access, and Social Justice in the context of mathematics education.

My thanks go to the members of the Executive Board of NASGEM collectively for a good year. It's seen The Journal of Mathematics and Culture continue to flourish under the steady, dedicated leadership of Tod Shockey, whose efforts have made "our" journal one that attracts submissions from all over the world and which has an Editorial Review Panel whose membership is international and whose expertise is highly respected. Thanks to Bill Collins for making arrangements for our Annual Meeting. Thanks to Kay Gilliland for her leadership of NASGEM's commitment and actions for Equity and High Quality Mathematics Education. I also want mention that Jim Barta, NCSM Director; Tod Shockey, Chair of NCSM's Equity Committee; and Kay Gilliland, NCSM Past President and current NCSM Newsletter editor, keep the importance of mathematics and culture alive within NCSM, and this trio assure that NASGEM has visibility within that important organization. Thanks to our editors Dawn Wiseman and Claudette Engblom-Bradley for their efforts that make NASGEM News a reality. And thanks to those members who are candidates for office in NASGEM.

I look forward to seeing many of you in Salt Lake City, and here's to a fine 12 months ahead!



The Annual Meeting of the North American Study Group on Ethnomathematics will be held at 7PM on Thursday April 10, 2008. The site will be the Topaz room in the Hilton Hotel in Salt Lake City.



The next issue of *NASGEM News* will be published in November 2008. Please send news bites and short (600-800 word) articles sharing your work and practice to Dawn Wiseman, dawn@nativeaccess.com.



Upcoming events

Atlantic Native Teachers Education Conference (ANTEC)

Membertou Trade and Convention Centre

Sydney, Nova Scotia

May 14 – 16, 2008

<http://antec.ca>

11th International Congress On Mathematical Education

The Role of Ethnomathematics in Mathematics Education

Monterrey, Mexico

July 6-13, 2008

<http://icme11.org/>

Information about contributions for Topic Study Groups, Discussion Groups, Workshops, Sharing Experience Groups, Poster Exhibitions and roundtables can be found at <http://icme11.org/node/16>. Further information about submitting papers can be found in Callings.

2008 Northwest Mathematics Conference

Portland, Oregon

October 9-11, 2008

<http://www.northwestmathconf.org>

TODOS has been invited to organize a strand, please see Callings for more details.

National Association for Multicultural Education

New Orleans, LA

November 12-16, 2008

<http://www.nameorg.org/>

Callings

Archaeoastronomy: The Journal of Astronomy in Culture

<http://www.utexas.edu/utpress/journals/jarch.html>

Please direct papers to:

Thomas Hockey

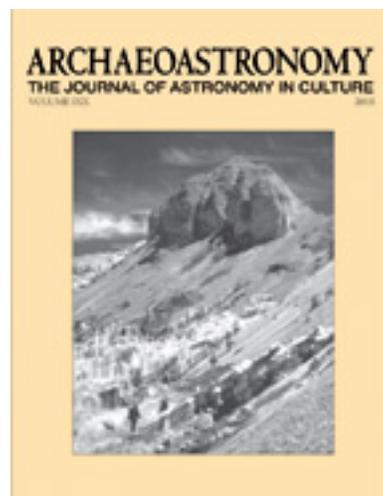
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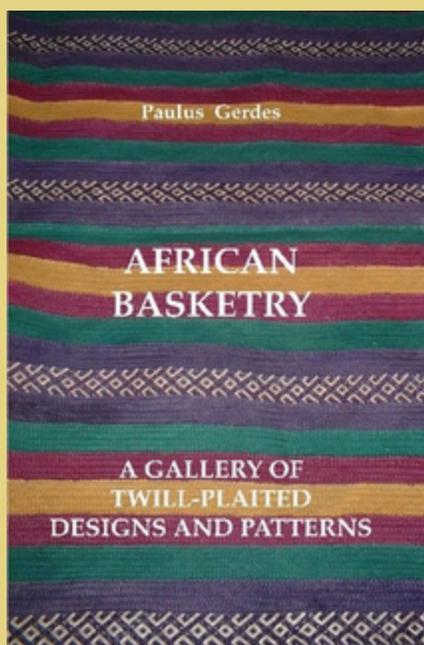
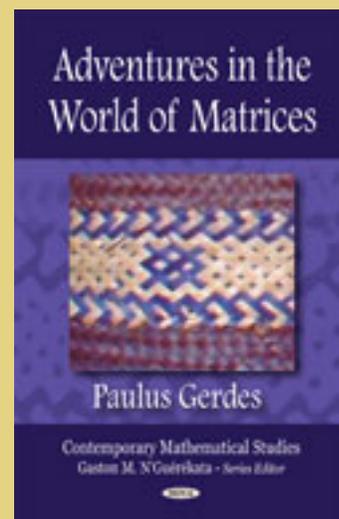
Publications

In print

Gerdes, P. (2008). *Adventures in the World of Matrices*. Contemporary Mathematical Studies series. Morgan State University: Baltimore. ISBN: 1-60021-718-4

https://www.novapublishers.com/catalog/product_info.php?products_id=5709

The purpose of the book is to give the reader a feeling for the beauty and the surprises of mathematical research by building up step by step a theory of cycle matrices. The notions of matrix and cycle are presented for those readers who do not yet know the concepts. Then, starting and experimenting with cycle matrices of low dimensions and engaging the readers in various activities, beautiful results are obtained with attractive geometrical interpretation. Gradually the results are extended to cycle matrices of higher dimensions and then generalized. A note is included for those readers who would like to use a computer in exploring cycle matrices. Two appendices give the possibility to further use the computer by exploring inverse matrices and determinants.



Online

African Basketry: A Gallery of Twill-Plaited Designs and Patterns (220 pp.)

Over the years, Paulus Gerdes has established himself as the pre-eminent expert on patterns in African weaving and basketry, and the broader implications of these patterns. This new book is a broad gallery of plaited African designs. These range over much of the continent while concentrating in those parts of Africa that are closest to his Mozambique center, including Kongo, Mbole and Mangbetu from Congo, Cokwe and Lunda from Angola, Digo from Kenya, Soga from Uganda, Zulu from South Africa, and Makhuwa in Mozambique itself, but including such distant peoples as Bamileke in Cameroon. As well as careful illustrations of details that might easily be overlooked by a casual observer, there is enlightening information about the cultural meaning of particular designs and their symmetries, both local and global.

Available as download and in print from <http://stores.lulu.com/pgerdes> or from <http://www.lulu.com> by searching 'basketry' or 'paulus gerdes.'



Establishing Communities of Effective Practice in Native American Schools

Jim Barta, Rebecca Monhardt, Kurt Becker, Vessela Ilieva, Fabian Jenks, May Mountain and Treya Sayad

“Our language, traditions, and culture go very deep. We have mathematics we use when we work with our cattle and horses, when we do beadwork or build our traditional houses but it is different than what the non-Indian uses. I want to teach our Indian and non-Indian children about that,” explained Ute Elder, Fabian Jenks as he addressed teachers involved in a professional development project on the Northern Ute Reservation.

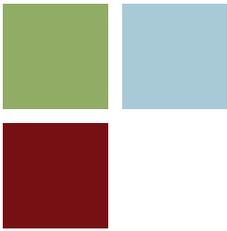
Fabian Jenks, May Mountain, and others Elders comprise a Community Advisory Panel who share their knowledge of the Ute language and culture to help local teachers enhance their science, technology, engineering, and technology (STEM) instruction. The teachers in Grades 4, 5, and 6 are participating in a three-year, NSF – funded project collaborating with colleagues at Utah State University and are focused on developing culturally responsive curriculum and expanding their pedagogic capabilities.

Certainly, STEM professional development projects are not uncommon. What is unique about this project is that teachers are also learning to infuse Ute content and ways of effectively teaching their Native American students as they are gaining knowledge of research-based strategies for improving STEM teaching.

The teachers are learning the technique of lesson study where groups of teachers collaborate to create an optimal lesson based on themes suggested in the Utah State Core Curriculum. Currently the themes are weather, the earth’s surface, and the solar system. Once co-constructed, the lesson is taught and videotaped for later analysis by the group. The analysis provides insight into what appears to work and what needs to be added or changed to improve teacher effectiveness and ultimately increase student achievement. Then the process begins again with another cycle of lesson construction and evaluation. Throughout, Elders assist in helping teachers infuse Ute culture and ways of instruction that many Native children experience within their families and community. The goal is not to design “perfect” lessons but to help teachers enhance their ability to create effective instruction and expand their own understandings of vital STEM concepts children are expected to master.

Elders are also helping to define a visual model to illustrate what they believe is an effective way of expressing a traditional process of learning that many of the students already may have learned within their families. Through this project, these traditional techniques are being introduced into the public school classroom. Fabian describes the “medicine wheel” as an appropriate model for this project with its four distinct sections where the sections represent mental, physical, emotional, and spiritual aspects of learning. A lesson plan format based on this cultural illustration is being created and its usefulness and impact evaluated.

The educators meet during scheduled inservices provided by university content and curricular experts who also have substantial experience in working with Native American students and communities. Given the substantial distance between the community schools and university colleagues, technologies are being implemented and their usefulness evaluated to virtually communicate to provide more frequent interaction and dialogue. One technology, for instance, uses synchronous visual and audio communication for group meetings and observational discussions that take place between the scheduled inservices.



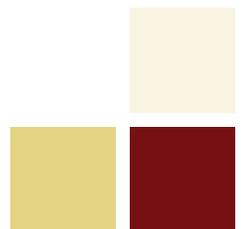
All of the educators agree that they feel this is exciting work and they appreciate learning more about Ute culture and traditions. These educators are all capable teachers with significant content and instructional knowledge but admit they previously knew very little about the culture of the children they teach.

Fabian concludes, “Our Elders are passing on. The areas where we collected our sacred herbs and plants are being forgotten. I am so thankful I was born into this world at the time when I was because I have one foot in the old traditional ways; I have seen the beadwork and learned the language. I have been around the medicine people. The children seem fascinated by this and that is what I want to teach them.”

Through this project, communities of effective practice are developing in a circle of support, cultural understanding, knowledge, and trust. In a predominantly Navajo community in southern Utah, a similar project is underway. Their activities and efforts are being documented and compared with insights gained with those on the Ute Reservation. It is hoped that these collaborative efforts will result in the creation of a flexible model of culturally relevant professional development that can be used in other diverse Native American Nations and communities to benefit teachers and students alike.



Standing (L-R): LeeAnn Baker, Marilyn Betts, Lin Richardson, Fabian Jenks, Mae Mountain. Seated (L-R): Kristy Fulton, Darci Mock



ICEM-4 in Baltimore

Lawrence Shirley

Plans are to be made to hold the fourth International Conference on Ethnomathematics (ICEM-4) in Towson, Maryland (near Baltimore) in the last week of July of 2010.

The ICEMs are conferences of the International Study Group on Ethnomathematics (ISGEM), the parent body of NASGEM. They allow ISGEM--and NASGEM--members to gather to exchange ideas formally in papers, less formally in demonstrations and field trips, and socially in conference events. The first ICEM was held in 1998 in Granada, Spain, followed in 2002 by ICEM-2 in Ouro Preto, Brazil. Auckland, New Zealand hosted ICEM-3 in February 2006. At that time, the ISGEM Board announced that ICEM-4 would come to the United States--thus holding our fourth conference in our fourth continent! Also, 2010 will be the twenty-fifth anniversary of the founding of ISGEM.

The ICEM-4 will be held on the campus of Towson University. We have already begun to make arrangements for meeting rooms, a hall for plenary events, and a limited number of dorm rooms on campus. There are also hotels nearby and more in downtown Baltimore.

We are beginning to plan conference events and possible field trips to nearby sites of ethnomathematical interest, maybe including sites in Washington DC. Details will be announced as the arrangements are made at <http://pages.towson.edu/shirley/ICEM-4.htm>.

On the web

For the first time ever, the 2007 Winter Solstice illumination of the passage and chamber at Newgrange was streamed live on the internet.

On the 21st of December the 5000 year old technology worked beautifully, with the winter solstice sunrise beam of golden light filling the Newgrange passage and chamber, however the 21st century webcast streaming technology struggled to cope when the maximum expected number of viewers exceeded 300,000.

The Archive is just over one hour in duration, it starts with a brief overview of the Winter Solstice at Newgrange which includes still photographs and footage from previous years. For the next 20 minutes the commentary team build the atmosphere for the actual sunrise, the illumination of the passage and chamber lasts for just 17 minutes.

<http://newgrange.com/webcast.htm>



News from members

From Ron Eglash (Rensselaer Polytechnic Institute):

Ron will be giving 2 lectures in April.

African Fractals: The Intersections of Math and Culture

<http://www.artbma.org/calendar/adults.html#wrapper>

Saturday, April 26

1–2 p.m.

For more information and to register, call 443-573-1832.

Teacher Workshop:

Teaching Math and Culture

Saturday, April 26

2:30–3:30 p.m.

For more information and to register, call Joan Weber at joan@baltimorepartners.org or 410-685-1172.

Also, a video fo Ron’s talk at the TED (Technology, Entertainment, Design) confrence in Arusha, Tanzania can be seen at <http://www.ted.com/talks/view/id/198> .

From James Rauff (Millikin University):

This semester I am teaching two sections of a seminar in ethnomathematics for honors students who are primarily theatre, art, and music majors. I’m using *Ethnomathematics* by Marcia Ascher (Chapman & Hall/CRC; 1994) as the main text with several supplementary readings. The course will fulfill their University quantitative reasoning requirement. The students haven’t had much mathematics beyond high school algebra, but have been quite willing to tackle graph theory and group theory. So far, it seems that the cultural connections work well with these students. The dynamic syllabus for this course is online at <http://faculty.millikin.edu/~jrauff/IN207Spring2008.htm> .

From Daniel Clark Orey (California State University, Sacramento):

On February 29 and March 1, Daniel Played a vital role in a workshop of mathematicians and mathematics educators at the University of Haifa and the Israel Institute of Technology (Technion). The event brought together 28 leading scholars and educators from 14 countries to explore the connections between culture, creativity, and the learning and teaching of mathematics.



DC Orey in Israel.

Become a NASGEM member!

Dues for membership in NASGEM are \$20.00 per year and may be paid up to three years. A year’s membership is from April through the following April. Dues are used to cover costs related to maintaining the NASGEM organization, paying affiliate dues to related math organizations, and producing the NASGEM Journal, *The Journal of Mathematics and Culture*. To join or renew a membership please send your name and contact information with a check to: Jim Barta, UMC 2805, Old Main Hill, Utah State University, Logan, UT 84322. Make checks payable to NASGEM.

Please briefly describe any projects in which you are involved that may be related to ethnomathematics.

Ethics, Epistemology, and Ethnomathematics

Ron Eglash

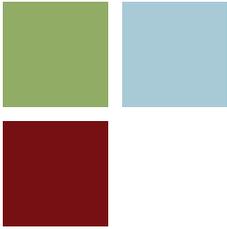
Epistemology—the study of knowledge—is always intertwined with ethics, the study of moral values. Philosopher Michel Foucault coined a single word, “power/knowledge,” to represent his view that the two are inseparable. Foucault was not only critical of right-wing authoritarians; he was also quite cynical about humanism, which he felt was often a covert means of social control. In his book Discipline and Punish, for example, he notes that the change from old forms of punishment—torture etc.—to the idea that prison should serve the purpose of “reforming” criminals into good citizens is typically read as the story of enlightened progress. But his history of ideas reveals that these reformers were deeply invested in forms of social control: there was little difference between the benevolent prison warden reforming his prisoners and the benevolent colonial officer reforming his “savages.” Foucault was particularly critical of the way that power works by formalizing things: a formal system telling prisoners when to eat and what to wear; a formal system to regulate the behavior of citizens in schools and factories; and formal systems of knowledge—like ethnomathematics.



To the cynical eye of a Foucaultian, ethnomath might be just another way to bring potentially unknown knowledge under the regulation and control of authority. Rather than follow our instincts and simply reject such an interpretation out of hand, we need to acknowledge that there are indeed connections. Ethnomath has roots in anthropology, and much anthropology began during the colonial era, when there was a need to gain knowledge of indigenous societies to further colonial control. In my own study of the mathematics of native American smoke signals, for example (see <http://www.rpi.edu/~eglash/eglash.dir/nacyb.dir/nacomplx.htm>) I drew on such colonial-era literature. Even in our present “post-colonial” era, security agencies like the CIA make use of anthropology to further their covert operations, and no doubt mathematics arises in their examination of practices such as “Hawala” (a monetary exchange system used in many Arabic societies).

Other ethical issues in ethnomath are less overtly political, but equally important: to what extent does ethnomathematics participate in a kind of cultural voyeurism, making certain groups of people “exotic” while enforcing a self-image of normalcy? Who “owns” these indigenous designs and knowledge systems? Who can decide when the use is appropriate and when it is not? Can I carry out a mathematical analysis of the Sundance ceremony without asking permission, and if not, to whom do I ask? How much of the original context do I need to include in order to be making respectful use of this cultural material? Many native Americans have expressed strong objections to “plastic medicine people” – non-natives (usually white) who adopt a false Indian identity, and claim to have sacred knowledge (see for example <http://www.sonomacountyfreepress.com/features/spirg-hagan.html>). To what extent is ethnomathematics able to clearly distinguish itself from the activities of such posers?

And why bring ethnomath into the classroom? I strongly object to replacing biology lessons on evolution with Christian myths about Creationism. If I am going to insist on keeping right-wing politics out of biology class, how can I champion left-wing politics in a math class?



Ethnomathematics as active ethical engagement

I am of course not cynical about ethnomathematics; I only raise these issues because I see exciting potential for the field of ethnomath to tackle these problems and more. Here are a few suggestions for how we might try to keep ethical issues at the forefront of our work.

- 1) **Include all social groups in ethnomath:** by including ethnomath studies of white people and professional classes, and not just indigenous groups and lay activities, we can help to oppose the tendency towards cultural voyeurism. Seeing that professional mathematicians and accountants and others have a cultural content to their work helps to dispel the myths of primitivism.
- 2) **Open and maintain dialogs with indigenous groups:** even if you are studying materials from the ancient past, there is still much value in asking their contemporary descendents if you “got it right.” Often contemporary groups can add valuable insight, provide a sense of cultural permission, and advise in the proper use or framing of the materials, preferred terminology, etc. Colonial land grabs were aided by denying the connection between ancient sites and contemporary peoples; ethnomath can help to reinforce traditional land claims.
- 3) **Promote native artists:** millions of dollars in faux indigenous designs are sold each year. Help to discourage these violations of indigenous intellectual property rights, and promote the sale of items from real native groups.
- 4) **Encourage critical thinking and active intellectual engagement:** While the political right has a tradition of covering up the human rights violations of capitalism, the political left has been guilty of avoiding critique of human rights violations of socialism. Ethnomath research provides an exciting opportunity to introduce students to [Mertonian norms](#), [Popperian falsifiability](#), and other aspects of scientific thinking, and show them how such critical thinking can be applied to any system. We need not worry about imparting some particular political line in order to convey social justice; it is enough to provide students with the tools of thought and the information about the world that will allow them to make their own decisions.
- 5) **Use mathematics as a bridge, not a barrier:** One of the beauties of ethnomath is its ability to show the connections between disparate domains. For example, Paulus Gerdes has studied the relation between [hexagonal weaves](#) in African and other indigenous societies, and hexagonal arrays of carbon atoms in graphite and other materials such as buckyballs and nanotubes. Just as mathematical modeling goes beyond the more literal minded version of ethnomath, which was primarily focused on counting and arithmetic operations, Gerdes’ extensions of indigenous knowledge goes beyond modeling. Such creative use of ethnomath opposes the ethical trap of a “museumification” of culture, trapping indigenous knowledge in a static, dead past, and showing how it can be used as a bridge to the future.

Additions to Editorial Team

The following people have joined Tod Shockey and Rick Silverman on the editorial team for the *Journal of Mathematics and Culture*:

Jim Barta, Executive Associate Editor
Larry Lesser, Associate Editor
Sue Staats, Associate Editor

The expanded team will greatly facilitate the review process, and allow for the addition of special focus issues and book reviews.

Ethnomodeling as a Pedagogical Action for the Ethnomathematics Program

Milton Rosa & Daniel Clark Orey

Introduction

There are hundreds of reasons for teaching mathematics. One of the most relevant, involves the consideration of mathematics as an expression of human development, culture and thought, that is, how it plays an integral part of the cultural heritage of humankind.

Mathematical thinking has been influenced by the diversity of human contexts such as language, gender and orientation, religion, moral, and economical-social-political-environmental activities. Human beings have developed unique logical processes related to *quantification*, *measure*, and *modeling* in order to understand and explain, and to explore their socio-cultural-historical contexts (Rosa, 2000). These processes allow each cultural group to develop its own way to *mathematize*¹ their own realities.

We agree with Bassanezi (2002) who stated that these particularities should not be ignored and should be respected when individuals attend school because this aspect will build confidence and dignity in students when previous experience is acknowledged in mathematics classrooms. In so doing, a search for new methodological approaches is necessary to record historical forms of mathematical ideas that occur in different cultural contexts.

Ethnomathematics and Modeling

Historically, models that arise from reality have been the first paths towards providing abstraction of mathematical concepts. The manipulations of models taken from reality through the application of modeling may be considered as a tool of the pedagogical action of the ethnomathematics program (Orey, 2000). Within this context, mathematical modeling is a methodology closer to an ethnomathematics program (D'Ambrosio, 1993, Bassanezi, 2002; Monteiro, 2004; Rosa & Orey, 2003).

In this perspective ethnomathematics is defined as the intersection between cultural anthropology and institutional mathematics, that utilizes mathematical modeling to interpret, analyze, explain and solve real world problems (D'Ambrosio, 1993; Rosa, 2000, Rosa & Orey, 2003).

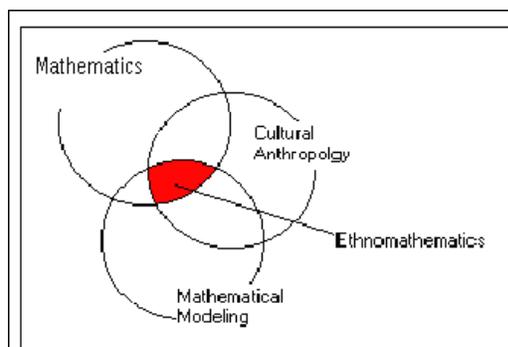


Figure 1: Ethnomathematics

The focus of this perspective essentially forms a critical analysis of the generation and production of knowledge through creativity, and forms the intellectual process for its production, that is, the social mechanisms of institutionalization of knowledge through academia, and its transmission through education. According to D'Ambrosio (2000), "this process is modeling" (p. 142). This holistic context is characterized by Bassanezi (2002) as "ethnomodeling" (p. 208) because the elaboration of hypothesis grows from any real situation known as a system, which forms an image of an idealized version of the "mathema" of a specific cultural group. Bassanezi (2002) defines ethnomathematics as "the mathematics practiced and elaborated by different cultural groups, and involves the mathematical practices that are present in diverse situations in the daily lives of members of these diverse groups" (p. 208). This interpretation is based on D'Ambrosio's (1990) trinomial *Reality – Individual – Action*.

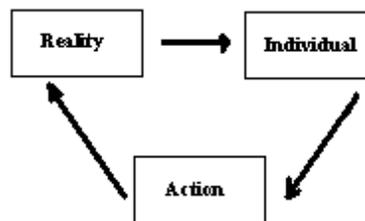
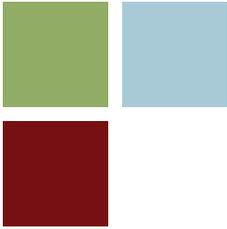


Figure 2: D'Ambrosio's Trinomial



In the perspective of using ethnomodeling, the act of teaching is considered more than the transference of knowledge because it becomes an activity that introduces the creation of knowledge (Freire, 1998). This approach in mathematics education is the antithesis of turning students into containers to be filled with information (Freire, 1970). In our point of view, the ethnomodeling process can be considered an academic counterpoint to the “banking education” approach because it engages students in critical thinking and requires them to play active roles in the learning process in order to create their “...critical consciousness which would result from their intervention in the world as transformers of that world” (Freire, 1970, p.55), and thereby serving the purposes of their liberation. An ethnomodeling pedagogy helps students to develop their power to critically perceive the world as a reality in process, in transformation. Teacher-students and students-teacher are continually reflecting on themselves and the world, establishing “an authentic form of thought and action” (Freire, 1970, p. 65).

Investigations connecting modeling and ethnomathematics have been found to be useful in the translation of ethnomathematical contexts by numerous scholars in Latin America (Bassanezi, 2002; Biembengut, 2000; D’Ambrosio, 2002; Ferreira, 2004; Monteiro, 2004; Rios, 2000; Rosa & Orey, 2003) in order to document and study the mathematical practices and ideas found in many diverse traditions. It is necessary for school curriculum, to translate the interpretations and contributions of ethnomathematical knowledge into systemized mathematics because students will be able to analyze the connection between both traditional and non-traditional learning settings.

Final Considerations

Any study using processes of ethnomodeling represents a powerful means for validating a student’s real life experiences and gives them the tools to become critical participants in society. In so doing, educators should be empowered to analyze the role of what Borba (1990) refers to as a student’s ethnoknowledge³ in the mathematics classroom. They need to give a new role of mathematics instruction that empowers students to understand power and oppression more critically by considering the effect that culture has on the development of the mathematical knowledge. The use of Freire’s (1970) dialogical methodology is seen as essential in developing the curricular praxis of ethnomodeling by investigating the

ethnomathematics of different cultural groups.

Seen in this context, we would encourage a broader discussion related to the possibilities and concrete applications of the ethnomodeling perspective in school curricula because this process acknowledges the social-cultural diversity of all students and guarantees a consecutive acquaintance of differences through dialogue and reciprocal respect. This is how, in our perspective, ethnomodeling empowers students against all forms of domination and oppression.

Notes:

1. Mathematization is a process in which individuals from different cultural groups come up with different mathematical tools that can help them to organize, analyze, comprehend, understand, and solve specific problems located in the context of their real-life situation. These tools allow them to identify and describe a specific mathematical idea or practice in a general context by schematizing, formulating, and visualizing a problem in different ways, discovering relations, discovering regularities, and transferring a real world problem to a mathematical idea through mathematization.
2. Freire describes “banking education” as a didactic situation that is very common in today’s classes. In this process, teachers deposit information that are received, memorized, and repeated by the students. The transmission of knowledge is authoritarian from the knowledgeable to the unknowledgeable.
3. According to Borba (1990) ethnoknowledge is the starting point for the pedagogical process in which students’ knowledge is compared with the knowledge developed by the academic disciplines in a way that this academic knowledge can be seen as culturally bounded. He also states that this action can be accomplished by students and teachers by discussing the efficiency and relevance of different kinds of knowledge in different social-cultural contexts.

References

- Bassanezi, R. C. (2002). *Ensino-aprendizagem com modelagem matemática* [Teaching and learning with mathematical modeling]. São Paulo: Editora Contexto.
- Biembengut, M. S. (2000). Modelagem & etnomatemática: Pontos (in)comuns [Modeling & ethnomathematics: (Un)common points]. In Domite, M. C. (Ed.). *Anais do Primeiro Congresso Brasileiro de Etnomatemática – CBEm-1*. São Paulo: FE-USP, 132 -141.
- Borba, M. C. (1990). Ethnomathematics and education. *For the Learning of Mathematics*, 10(1), 39-43.
- D’Ambrosio, U. (1990). *Etnomatemática* [Ethnomathematics]. São Paulo, Brazil: Editora Ática.
- D’Ambrosio, U. (1993). Etnomatemática: Um Programa [Ethnomathematics: A program]. *A Educação Matemática em Revista*, 1(1), 5-11
- D’Ambrosio, U. (2000). Etnomatemática e modelagem [Ethnomathematics and modeling]. In Domite, M. C. (Ed.). *Anais do Primeiro Congresso Brasileiro de Etnomatemática – CBEm-1*. São Paulo: FE-USP, 142.
- D’Ambrosio, U. (2002). Prefácio [Forward]. In Bassanezi, R. C. *Ensino-aprendizagem com modelagem matemática*. [Teaching and learning with mathematical modeling]. São Paulo: Editora Contexto.
- Freire, P. (1970). *Pedagogia do Oprimido* [Pedagogy of the oppressed]. Rio de Janeiro, Brazil: Paz e Terra.
- Freire, P. (1998). *Pedagogy of freedom: Ethics, democracy, and civic courage*. New York: Rowman and Littlefield.
- Monteiro, A. (2004). Etnomatemática: papel, valor e significado [Ethnomathematics: role, value, and meaning]. In Ribeiro, J. P., Domite, M. C. S., & Ferreira, R. (Eds.). *Etnomatemática: papel, valor e significado*. São Paulo: Zouk.
- Orey, D. C. (2000). The ethnomathematics of the Sioux tipi and cone. In Selin, H. (Ed.). *Mathematics Across Culture: the History of Non-Western Mathematics*. Dordrecht, Netherlands: Kulwer Academic Publishers, 239 – 252.
- Rios, D. P. (2000). *Primerio etno geometria para seguir con etnomatemática*. In Domite, M. C. (Ed.). *Anais do Primeiro Congresso Brasileiro de Etnomatemática – CBEm-1*. São Paulo, SP: FE-USP, 367 - 375.
- Rosa, M. (2000). *From reality to mathematical modeling: A Proposal for using ethnomathematical knowledge*. Unpublished master thesis. California State University, Sacramento.
- Rosa, M. & Orey, D. C. (2003). Vinho e queijo: Etnomatemática e modelagem! [Wine and cheese: Ethnomathematics and modeling!] *BOLEMA*, 16(20), 1-16.



Textual Space in Archaic Thought: The Book of Changes

Scott Davis

Analysis of the *Book of Changes* (*Yi jing*, *IChing*) has often been the occasion for failed studies in inappropriate mathematics. Yet, I have devoted my scholarly life to acquiring the necessary linguistic, cultural and historical knowledge to situate it in its proper Bronze Age context, eventually at the head of Chinese classical literature.

Although I believe purely formal analyses of the linear sequence (in binary notation) of this archaic divination text err, and further believe any adequate analysis must treat both the textual symbolism and the formal structures simultaneously and with the same method, still I am convinced ethnomathematics is the proper vehicle for understanding the earliest composition of the *Classic of Changes*, 3000 years ago.

Thus the problem not only bears significantly upon correct comprehension of early Chinese cultural formation, but also upon the goals and capacities of ethnomathematics. For the best method of analyzing this archaic text is similar to structural myth analysis developed by Claude Lévi-Strauss; actually, the binary format of the lines, each with short textual entries conveying symbolism, means preliminary assignments of structural features to these symbolic data are already included, and need not be undertaken by analysts. Lévi-Strauss's achievements show structural analysis as a way to bridge the distance between calculating and writing, "pure" mathematical analysis and functional-symbolic analysis of cultural systems. The central place of a divination system like the *Book of Changes* in Chinese culture, particularly as divination directly gave rise to writing during the Shang dynasty, likewise indicates the project of a *mathesis*—cosmological experience as a medium for a universal, intermediary, formal science.

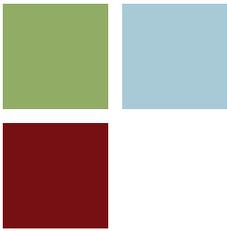
The usual approach to mathematical analysis of this binary sequence, with 384 positions (32 paired, six-line linear structures), is to attempt to uncover algorithms capable of generating it (as well, there are studies of the algebraic properties of such a system, which do not address problems of the received sequence). This approach is unlikely to work. There does not seem to be any unifying principle behind the sequence. However, the text certainly has been designed in modules, and its mosaic composition continually inspires hope that "the" overarching formula

will be discovered. Here, there is space only for a few considerations about whether a mosaic design can still be addressed with mathematical interest.

Let's just set a few parameters for examination of the sequential order, keeping in mind that symbolic meanings must get structural demonstration along with the formal aspects to be reviewed. The opening hexagrams of the text are: 111111 and 000000, the maximally differentiated forms. Cosmologically conceived, the concluding hexagrams define triangular space by mixing *yin* (even) and *yang* (odd) lines: 101010 and 010101. Sites featuring equal numbers of *yin-yang* line types, or doubling of certain forms, are strategically situated. The question is: how might this apparent integration at the terminus obtain?

Ethnographical considerations point strongly to the existence of age sets in this society. It is likely the sequential numbers of the hexagrams, rich in other numerological symbolism, also involve age group criteria and initiations. In other words, this apparatus models some aspects of social structure. This archaic, indigenous forerunner of our own work should be intensively interesting to anthropologists. Arithmetic aspects of number are occluded in this text; instead, topological properties, symmetries and symmetry-breaking operations, are primary. So, instances where *yin* lines form "holes" in the encompassing *yang*, e.g. 100001, can be disturbed as: 101001. Textual "elements" are really "push-pop" *actants*: the eccentric *yang* line changes, jumping back to the symmetrical form. This operation is then *sited* and used to model a kind of exchange process: meat prestation and an initiate's passage through a tiger's mouth, on the occasion of a coming-of-age ordeal.

The mathematical problems have to do with symmetry or other formal resources available, given various choices of patterns for loci modeling various social features. For instance, the perfectly integrated final pair, transforming line-by-line, produces a segment in the center (#35-40), itself transformed from symmetrical trigrams neatly deployed in the forties decade of the sequence (111, 000, 010, 101). A modular approach invites consideration of degree of over-determination in the organization of any one



module. The sequence is a kind of systematic array of various symmetries, their disruptions and transformations, melded together to solicit an overall design.

Present histories of mathematics begin in China only with Han efforts, reflecting expectations that metric operations be primary, whereas these Neolithic contributions are based on an idiosyncratic number theory involving *siting* (e.g. centering, flanking). Similarly, Chinese texts seem odd to literary historians because, instead of narrative, discursive or syllogistic continuities, they present discrete, matrix-like arrays; my research shows how these constituted classification systems. So far, anthropologists have been sidelined by sinologists insisting on philological and literary treatment of classical texts, but more adequate, anthropological approaches to early writing show their incredible logico-mathematical and sociological sophistication.

Elections results

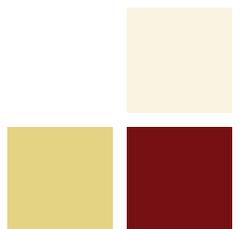
Lawrence Shirley, Chair, NASGEm Election Committee

I am pleased to report the results of the elections of members of the Board of the North American Study Group on Ethnomathematics.

The board members will take office effective April 10, 2008, at the Annual Meeting of NASGEm in Salt Lake City.

President	Rick Silverman
1st Vice President—Programs	Jim Barta
2nd Vice President—Membership	Blidi Stemm
3rd Vice President—Special Interest Groups	Luis Ortiz Franco
Member At-Large -- USA	Swapna Mukhopadayay
Member At-Large -- Mexico	vacant (no candidate)
Member At-Large -- Canada	Dawn Wiseman
Treasurer	Thomas Gilsdorf
Secretary	Claudette Engblom-Bradley

I thank those who made nominations and the members of the Election Committee for making this a smooth election.





Notes on the Equity Summit

Kay Gilliland, Equity Chair, NASGEM

The Equity Summit was “*a critically important (even historic!) first step for all of us,*” stated Francis “Skip” Fennell, NCTM President, following a meeting that brought together several of the NCTM national affiliates to discuss actions we could all take to strengthen our efforts toward equity. The meeting of NASGEM, NCSM, NCTM, WME, BBA, TODOS, and AMTE was structured so everyone could be heard, so each organization’s position could be stated and then clarified, and so a solid basis for understanding could be developed. We learned a lot about hearing each other and working effectively together.

The Equity Summit agenda was designed so each organization contributed valuable input, starting with hearing from each other and then from Kati Haycock of Education Trust. The meeting plan gave us the opportunity, as a whole group including NCTM, to be totally open to make decisions. All of the organizations provided paper submissions that gave us a window into their current work and thinking concerning the issue of equity. Each organization provided insights that were very helpful and no group dominated the conversation or the decisions.

I was delighted with the ideas representatives contributed, the way each organization’s particular vision complemented the others, and the power of having everyone state their needs and issues. I looked back at the notes I made before the Equity Summit, especially when talking with Rick Silverman and Miriam Leiva and Carey Bolster, and found that we had covered nearly all of the items. The list generated at the Equity Summit includes the concerns and hopes of each group and enables us to work together toward implementation of many of the ideas.

I was strongly motivated to improve the ways in which NASGEM gives each organization visibility. I will work to make sure all of our offerings make clear that we are an affiliate of NCTM and we want our individual members to be members of NCTM. Rick Silverman urged the organizations to help each other with membership logistics, and real movement was made in this direction. Each organization agreed to appoint a contact person to make sure the organization’s offerings are shared in a timely manner. This will help us provide information to our members about what other groups are doing. Gay Dillin and Dave Shayka took pictures to be used in the organization newsletters. It is clear to me that each organization will be stronger because of the Equity Summit effort.

Steve Rasmussen spoke of the problem of organizing math content for “small school” situations. Others asked for examples of cultural relevance, both effective and ineffective. Terri Belcher and others want educators to look at cases, enabling them to approach the same situation from many points of view. Judith Jacobs pointed out that issues around mathematics and girls were being ignored, not because the problems were solved, but because NCLB did not mention this important equity issue. Both Carey Bolster (through his letter to the group) and Steve Rasmussen spoke of designing a common framework for action in five areas of equity work: classroom, leadership, policy, the mathematics organizations, and targeted areas. I believe we will be able to work with these ideas, developing action items, as we continue to meet.

The three organizing concepts Lou Mathews suggested helped us to sort through the myriad ideas on our list and make a plan for implementation. I met with the infrastructure group and was delighted with the way Skip was able to help us find the words that expressed our ideas. I was saying we needed a way to go back to our individual organizations and explain the coalition concept, but my words were fuzzy and others objected. Skip said, “Oh, we need a rationale.” Exactly what I meant but couldn’t find the right words, and we proceeded, again with clarifying phrases from Skip, to write the rationale.

I am glad we are going to have an on-going presence in Inter-American conferences and activities. I will contribute to the Cientec *Fiesta Matemática* in Costa Rica in May and will certainly make it clear that NASGEM and the Equity Coalition want to be increasingly involved in these conferences.

I am especially excited about our plans to make a really dramatic effort in 2009 in Washington D.C., our nation’s capitol. I am glad we are going to start work on this immediately. Kati Haycock pointed out that among a large number of U.S. cities, the District of Columbia had the lowest reading scores and the next

to lowest math scores in the nation. The score represented life-changing differences; D.C. students are two to three grade levels below students in other large cities. I believe each organization will make a specific contribution toward improvement of math education in D.C. and the point will be made that the mathematics education community cares about students and about students' opportunities to take advantage of the power that the knowledge of mathematics can bring to them. I would hope we would continue to make our nation's capitol a priority in succeeding years.

The Equity Summit enabled us to begin to establish a coalition of organizations working for equity. As Tim Kanold said, "We must make measurable commitments," and we did. Probably the most motivating of all was the agreement to meet again to examine our progress, evaluate our results, and make new commitments to continue the work of equity. Special thanks go to Skip and to NCTM for providing the resources and bringing together the people with expertise and commitment to make progress in mathematics education equity possible.



Participants at the Equity Summit pose at NCTM headquarters.

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