

AMUCHMA-NEWSLETTER-10

Chairman: Paulus Gerdes (Mozambique)

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Higher Pedagogical Institute (ISP), Maputo (Mozambique), 25.5.1993

1. OBJECTIVES

The A.M.U. Commission on the History of Mathematics in Africa (AMUCHMA), formed in 1986, has the following objectives:

- a. to improve communication among those interested in the history of mathematics in Africa;
- b. to promote active cooperation between historians, mathematicians, archaeologists, ethnographers, sociologists, etc., doing research in, or related to, the history of mathematics in Africa;
- c. to promote research in the history of mathematics in Africa, and the publication of its results, in order to contribute to the demystification of the still-dominant Eurocentric bias in the historiography of mathematics;
- d. to cooperate with any and all organisations pursuing similar objectives.

The main forms of activity of AMUCHMA are as follows:

- a. publication of a newsletter;
- b. setting up a documentation centre;
- c. organisation of lectures on the history of mathematics at national, regional, continental and international congresses and conferences.

2. MEETINGS

2.1 First AMU Symposium on Mathematics Education in Africa for the 21st Century

William Ebeid, Chairman of the AMU Commission on Mathematics Education, presented at the First AMU Symposium on Mathematics Education in Africa for the 21st Century (Cairo, Egypt, 5-10 September, 1992) a paper entitled "Research in Mathematics Education in Egypt". He gave an overview on the 240 theses (171 M.Ed. and 69 Ph.D.) in Mathematics Education defended at Egyptian universities in the period 1954-1990.

2.2 Seminar "Mathematics, Philosophy, and Education"

Salimata Doumbia (Côte d'Ivoire) and Paulus Gerdes (Mozambique) conducted a workshop on 'Ethnomathematics / Mathematics in the African Cultural Environment' at the international seminar "Mathematics, Philosophy, and Education" (Yamoussoukro, Côte d'Ivoire, 25-29 January, 1993). In one of the plenary sessions of the same seminar, Gerdes presented a paper entitled 'Ethnomathematics as a new research area in Africa'.

2.3 Annual Meeting of the American Association for the Advancement of Science

A session on Ethnomathematics took place at the Annual Meeting of the American Association for the Advancement of Science (Boston, USA, 11-16 February, 1993). At this, Paulus Gerdes (Mozambique) presented a "Survey of current work on Ethnomathematics" with an emphasis on research in Africa. The session was honoured by the presence of Aderemi Kuku, President of the African Mathematical Union.

2.4 Series of lectures on ethnomathematics and the history of mathematics in Africa, at institutions in the USA

During his visit to the USA in February 1993, Paulus Gerdes (Mozambique) delivered a series of lectures related to ethnomathematics and the history of mathematics in Africa south of the Sahara. Among others: 'An anthropological view of mathematics: recent discoveries in Africa' (Rutgers University, Newark); 'Ethnomathematics: recent discoveries about mathematics in Africa' (Cornell University, Ithaca); 'Ethnomathematics: recent discoveries about indigenous African mathematics' (Educational Development Center, Newton); 'Culture, geometrical thinking, and mathematics education' (Brandeis University, Waltham); 'Ethnomathematics and mathematics education in Africa' (University of California, Berkeley). He also conducted a workshop on ethnomathematics and mathematics education (Exploratorium, San Francisco).

2.5 Second Conference on the Political Dimensions of Mathematics Education

At the 2nd Conference on the Political Dimensions of Mathematical Education (Broederstroom, South Africa, 2-6 April 1993) the following papers, related to ethnomathematics and the history of mathematics, were presented by the participants from Mozambique:

- * Marcos Cherinda: Children's mathematical activities stimulated by an analysis of African cultural elements;

- * Jan Draisma: The development of the mathematics education of teachers for primary schools in Mozambique;
- * Abdulcarimo Ismael: Changing pupils' motivation in the history of mathematics education in Mozambique.

3. CURRENT RESEARCH INTERESTS

- * E.Segujja-Munagisa is carrying out research on number and pattern in selected cultures in Uganda and implications to mathematics education.
- * D.Mtetwa (University of Zimbabwe) has started a research project on "Mathematical thought in aspects of Shona culture".

4. BIBLIOGRAPHY ON ASTRONOMY IN AFRICA SOUTH OF THE SAHARA

L.Peynson (University of Montreal) is interested in the study of the development of astronomy south of the Sahara. In cooperation with the editors of the AMUCHMA-Newsletter, the following provisional bibliography on astronomy in Africa south of the Sahara has been prepared. Further contributions are welcome.

- Adams III, Hunter Havelin (1983): African Observers of the Universe: the Sirius Question, in: Blacks in Science; Transaction Books, New Brunswick NJ and London, 27-46
- Adams III, Hunter Havelin (1983): New light on the Dogon and Sirius, in: Blacks in Science; Transaction Books, New Brunswick NJ and London, 47-49
- Beidelman, T.O. (1963): Kaguru time reckoning: an aspect of the cosmology of an East African people, in: Southwestern Journal of Anthropology, Vol.19, 9-20
- Bruel, Georges (1932): Noms donnés par des populations de l'Oubangui et du Chari à des planètes, à des étoiles et à des constellations, in: Journal de la Société des Africanistes, Paris, Vol.II, fasc.I, 49-53
- Dundas, Charles (1926): Chagga Time-Reckoning, in: Man, London, Vol.87-88, 140-143
- Evans-Pritchard, E. (1940): The Nuer, Oxford University Press, Oxford
- Griaule, M. (1949): L'image du monde au Soudan, in: Journal de la Société des Africanistes, Paris, Vol.XIX, 81-88
- Griaule, Marcel & Dieterlen, Germaine (1950): Un système soudanais de Sirius, in: Journal de la Société des Africanistes, Paris, Vol.XX, 273-294

- Griaule, Marcel (1951): Systèmes graphiques des Dogon, in: Griaule, Marcel & Dieterlen, Germaine: Signes graphiques soudanais, Hermann, Paris, 7-30 (pp.9-13 on astronomy)
- Junod, Henri (1974): O mundo celeste (astronomia tonga), in: Usos e costumes dos Bantos, Imprensa Nacional de Moçambique, Lourenço Marques, Vol.2, 268-274
- Keller, J. (1902): Astronomische Ansichten der Isubu in Kamerun, in: Zeitschrift für Afrikanische und Ozeanische Sprachen, Vol.6
- Lacroix, Pierre-François (1972): L'expression du temps dans quelques langues de l'Ouest africain, Selafr, Paris
- Legesse, Asmarom (1973): The Calendar, in: Gada. Three approaches to the study of African society, The Free Press, New York, 180-188
- Lynch, B.M. and L.Robbins (1983): Namoratunga: the first archaeological evidence in sub-Saharan Africa, in: Blacks in Science; Transaction Books, New Brunswick NJ and London, 51-56
- Obenga, Théophile (1982): Temps et Astronomie chez les Mbochi de l'Alima, in: Cahiers Congolais d'Anthropologie et d'Histoire, Vol. 7, p.7ff
- Obenga, Théophile (1987): Notes sur les connaissances astronomiques bantu, in: MUNTU, revue scientifique et culturelle du CICIBA, Libreville (Gabon), Vol.6, 63-78
- Obenga, Théophile (1991): La philosophie africaine, Présence Africaine, Paris
- Turton, D. & Ruggles, C. (1978): Agreeing to disagree: the measurement of duration in a Southwestern Ethiopian Community, in: Current Anthropology, Vol.19, 585-600
- Vergiat, A.M. (1937): Légendes sur les astres, in: Mœurs et coutumes des Manjas, Payot, Paris, 295-313
- Zahan, Dominique (1951): Études sur la cosmologie des Dogon et des Bambara du Soudan français - I. La notion d'écliptique, in: Africa, London, Vol.XXI, no.1, p.18ff

5. NOTES AND QUERIES

This section is reserved for readers' questions; these are the 'queries'. The answers will be the 'notes'. If you have questions or answers about sources, dates, names, titles, facts, or other such matters related to the history of mathematics in Africa, frame them in clear and concise language and send them to the Editors. If you are answering a question, make clear reference to the question. All readers may send both questions and answers. Each will be published with the name of the sender.

6. HAVE YOU READ?

- #106 Doumbia, S. & Pil, J.C.: **Les jeux de cauris**, CEDA & Institut de Recherches Mathématiques d'Abidjan, Abidjan (Côte d'Ivoire), 1992, 74 pp.

Describes games with cowrie shells: nigné (as played by the Alladian, Côte d'Ivoire), nigné (as played by the Godié, Côte d'Ivoire), ediprè (Ebrié, Côte d'Ivoire), tiatia (Bambara, Mali), koue (Gourounsis, Burkina Faso), kar (Dogon, Mali), tcha-tcha djirokémé (Benin), kô (Wès, Côte d'Ivoire), and equivalent games of chance like nama and piaf (Mali), horbido (Lébous, Senegal), sonrai and bozo (Mali), paradis (Mali), abbia (Gabon, Cameroon). Also analyses the mathematical aspects of these games and shows how the rules of some of the games like nigné (Alladian) give all participants equal opportunity (chance) to win, i.e. they reflect an empirical knowledge of the involved probabilities. The book presents computer simulations of some games and argues for the uses of these games in mathematics education. It constitutes the first volume of the collection "Mathematics in the African Socio-Cultural Environment".

- #107 Euclid of Alexandria: **Les éléments** (translated from the Heiberg text), Presses Universitaires de France, Paris, 1990, Vol.1, 531 pp.

Contains a general introduction by Maurice Caveing (p.13-148) and a translation and commentaries by Bernard Vitrac on the first four books on plane geometry (p.149-519)

- #108 Gerdes, Paulus: **Cultura e o despertar do pensamento geométrico** [Culture and the Awakening of Geometrical Thinking], Higher Pedagogical Institute, Maputo (Mozambique), 1991, 146 pp.

Studies the historical relationship between (the development of) geometrical knowledge and socially important activities in Africa, such as mat and basket weaving, pot making and house building. In the second part of the book hypotheses on the early development of geometrical thinking are formulated, e.g. on the discovery of the 'Pythagoras' Theorem' and of the ancient Egyptian formula for the volume of a truncated pyramid.

- #108 Gerdes, Paulus: **Pitágoras Africano: Um estudo em cultura e educação matemática** [African Pythagoras: A study in Culture and Mathematics Education], Higher Pedagogical Institute, Maputo (Mozambique), 1992, 102 pp.
Includes two chapters related to the history of mathematics in Africa: 'Did Egyptian artesans know how to construct a square equal in area to the sum of the areas of two given squares?' (p.6-14) and 'A new proof related to a Ancient Egyptian decoration technique' (p.97-99).
- #109 Gerdes, Paulus: **Geometria SONA: Reflexões sobre uma tradição de desenho em povos da África ao Sul do Equador** [SONA Geometry: Reflections on a Drawing Tradition among Peoples of Africa South of the Equator], Higher Pedagogical Institute, Maputo (Mozambique), 1993, Vol.1, 200 pp.
Volume 1 is dedicated to the analysis and reconstruction of mathematical elements in the sand drawing tradition of the Tchokwe and neighbouring peoples in Angola, Zaire and Zambia. Symmetries, classes and algorithms for the execution of the drawings (called SONA), and rules for the systematic construction of monolinear SONA are among the themes analysed (cf. AMUCHMA-8, # 96, 97 and 98).
- #110 Hitchcock, Gavin: **The "Grand Entertainment": Dramatising the birth and development of mathematical concepts**, in: For the Learning of Mathematics, Montreal (Canada), 1992, Vol.12, No.1, 21-27
Proposes dramatic replays of the mathematical journeys of the past as a tool and an art form worth exploring in mathematics education.
- #111 Kani, Ahmad Mohammad: **Arithmetic in the Pre-Colonial Central Sudan**, in: Thomas-Emeagwali, G. (ed.): **Science and technology in African history with case studies from Nigeria, Sierra Leone, Zimbabwe, and Zambia**, 1992, 33-39 (cf. #116)
Considers *ʿIlm al-Hisab* (arithmetic) as part of the Islamic sciences introduced some time after the 11th century in Nigeria, first in Kanem-Borno and later, probably 15th century in Hausaland. Arithmetic being taught in both 'secular' and *Islamiyya* schools, was used in the courts (calculation of inheritance), collecting and distributing *zakat* (poordues), business and land surveying. Scholars of Hausaland and Borno consulted coptic Solar

Calendars in determining their economic activities, especially agricultural ones. The author concludes his paper with the following remarks: "Despite the availability of a great deal of literature on medicine, astrology, arithmetic and other related sciences, written in Arabic, Fulfulde, Hausa and other languages, little effort has been made to systematically study these sciences within the historical perspective. The intellectual output of the *Ulama* (scholars) in this area has been wrongly classified by our contemporary historians and social scientists under the rubric of 'mysticism'. A serious investigation into the literary output of the scholars of the Western and central Sudan, however, may reveal the fact that these scholars had explored agricultural, medicinal, astronomical and mathematical sciences long before the advent of colonial rule" (p.38).

- #112 Mfika, Mubumbila: **Sur le sentier mystérieux des nombres noirs** [On the mysterious sense of black numbers], L'Harmattan, Paris (France), 1988, 187 pp.

The first part analyses oral and possible graphic numeration systems from Zaire. The second part deals with the symbolic expression of numbers in Luba cosmogeny (Zaire), e.g. the significance of even and odd, the use of 'numbers of peace': 4 and 12, 24, 48, 96... The author stresses that "the explanation of the origin of life by numbers [is] practically equal to that of Pythagoras" (p.153).

- #113 Niangoran-Bouah, N.: **L'univers Akan des poids a peser l'or**, Vol.1: **Les poids non figuratifs / The Akan world of gold weights**, Vol. 1: **Abstract design weights** (bilingual edition), Les Nouvelles Editions Africaines, Abidjan (Côte d'Ivoire), 1984, 311 pp.

Two chapters of the first volume of this beautifully edited trilogy deal explicitly with mathematics of the Akans (Ghana, Côte d'Ivoire):

- * L'écriture mathématique Akan / Akan mathematical writing (pp.250-269)

The author explains how numbers, addition, multiplication and division are symbolically represented on the weights. He also analyses two series of monetary values. The first is decimal; the second has a binary structure (7 units, from 12 *ba*, 24 *ba*, .. to 384 *ba*).

- * Les poids et les applications pratiques de la géométrie / Weights and the practical applications of

geometry (pp.270-277)

The Akans constructed certain figurines in such a way that they represent signs, symbols and ideograms whether seen from in front or in profile.

- #114 Obenga, Théophile: **La Philosophie africaine de la période pharaonique, 2780-330 avant notre ère**, L'Harmattan, Paris (France), 1990, 567 pp.

Chapter 11 of 'The African philosophy in the pharaonic period' deals with mathematics (pp. 355-427). It includes the following sections:

Egyptian conception of mathematics (p.357);

Knowledge of the technique of algebraic reckoning (p.367);

The notion of pharaonic mathematical logic (p.373);

Metrology (p.383);

Calculation of the area of a triangle (p.397);

Calculation of the area of a circle (p.401);

Surface of a semi-sphere (p.405);

Calculation of the volume of the cylinder (p.409);

Volume of a truncated pyramid (p.413);

Calculation of the angle of inclination of a pyramid (p.417);

Proof of the calculation of the angle of inclination of a pyramid (p.423).

Each section contains the reproduction of an Egyptian text, Obenga's translation and his commentaries. The section on metrology includes a comparison with the measures and numeration used by the Duala (Cameroon), Fang (Cameroon, Equitorial Guinee, Gabon), Yoruba (Nigeria), Ganda, BaNgongo (Congo) among others. Also of interest to the history of Mathematics is the chapter on Astronomy (pp. 265-301), with the following sections:

Astronomical and geometrical orientation of buildings (p.267);

Egyptian calendars (p.275).

The last section includes a comparative description of Ancient Egyptian, Fang, Mbochi (Congo), Borana (Ethiopia) and Dogon (Mali) Astronomy.

- #115 Thomas-Emeagwali, Gloria (ed.): **The historical development of science and technology in Nigeria**, Edwin Mellen Press, P.O.Box 450, Lewiston, NY 14092 (USA), 1992, 192 pp.

Analyses traditional methods of food processing, cassava-processing technology, textile technology, and

pedagogy and science teaching in Nigeria. The text concentrates on the historical dimension but approaches the subject in the context of multidisciplinary interpretation.

- #116 Thomas-Emeagwali, Gloria (ed.): **Science and technology in African history with case studies from Nigeria, Sierra Leone, Zimbabwe, and Zambia**, Edwin Mellen Press, P.O.Box 450, Lewiston, NY 14092 (USA), 1992, 204 pp. (cf. #111)

In science, the areas of focus include mathematics, medicine, and the sociology of medicine, as well as biologically-based warfare. In technology, iron, gold, diamond, and glass-making technologies dominate. Three of the cases of metallurgical development are centered on the pre-colonial periods.

- #117 Tro, Gueyes: **Étude de quelques systèmes de numération en Côte d'Ivoire**, Author's edition, Abidjan (Côte d'Ivoire), 1980, 192 pp.

Analyses the following numeration systems: Akan (Anyi, Baoule, Aboure, Attie, Ebrie, Aladian), Bete, Dida, Dan, Gouro, Kroumen, Koulango, Djan (Lobi), Malinke (Dioula), Senoufo, Tagwana, Wes. Discusses the characteristics of these numeration systems (base twenty, base ten, mixed twenty-ten, base five) and proposes a numerical map of the country dividing it in four regions according to the characteristics of the systems.

7. ANNOUNCEMENTS

7.1 Symposium on Ethnomathematics, Ethnoscience and the Recovery of World History Science

A Symposium on Ethnomathematics, Ethnoscience and the Recovery of World History Science will be held during the XIXth International Congress of History of Science (Zaragoza, Spain, 22-29 August 1993). From Africa, Abdoulaye Kane (Senegal), Théophile Obenga (Congo), Salimata Doumbia (Côte d'Ivoire) and Abdulcarimo Ismael (Mozambique) will present papers. The organizers of the Symposium are U.D'Ambrosio (Brazil) and P.Gerdes (Mozambique).

7.2 AMUCHMA Journal in Portuguese

In 1992 AMUCHMA started the publication of a journal in Portuguese: *AMUCHMA, Revista sobre a História da Matemática em África*. The first volume (48 pp.) contains the following two papers: "On the History of Mathematics South of the Sahara" (cf. AMUCHMA-Newsletter, no.9) and "African Slave and Calculating Prodigy: Bicentenary of the Death of Thomas Fuller".

Readers who like to receive the journal should contact the editors, P.O.Box 915, Maputo, Mozambique.



7.3 Who's Who in Mathematics and Mathematics Education in Southern Africa

The Southern Africa Mathematical Sciences Association (**SAMSA**) published the first edition of "Who's Who in Mathematics and Mathematics Education in Southern Africa". The aim of this directory is to present to researchers, in a concise way, with a facility that will enable them to identify other scientists and educators in similar fields in the region. For more information, please contact P.Gerdes, the Secretary of SAMSA, P.O.Box 915, Maputo, Mozambique

7.4 SAMSA Special Conference on the Mathematics Education of Children in Southern Africa

From September 15 to 19 Mozambique's Higher Pedagogical Institute will host the Southern Africa Mathematical Sciences Association Special Conference on "The Mathematics Education of Children in Southern Africa" at its Beira branch. Among the subthemes are: "Ethno-mathematics - Cultural aspects of teaching and learning mathematics" and "The history of teaching of mathematics in primary schools". For more information, please contact J.Draisma, Coordinator SAMSA Special Conference, Beira Branch ISP, P.O.Box 2025, Beira, Mozambique (Fax: 258-3-325110).

7.5 African systems of numeration

P.Gerdes and M.Cherrinda (Mozambique) have prepared a survey paper on 'African systems of numeration' (South of the Sahara) for the UNESCO Courier.

7.6 International Catalog of Sources for the History of Physics and Allied Sciences

The American Institute for Physics' (AIP) Center for History of Physics maintains an International Catalog of Sources for the History of Physics and Allied Sciences (ICOS) with information on the location and contents of manuscript and archival collections. Mário Baloi (Mozambique) has been asked by AIP to initiate a survey of repositories in Africa south of the Sahara (with the exception of South Africa). For more information, please contact Mário Baloi, Department of Physics, Mozambique's Higher Pedagogical Institute, C.P.3276, Maputo, Mozambique [Fax: 258-1-422113].

If you are interested to receive the AIP History Newsletter, please contact AIP Center for History of Physics, 335 East 45th Street, New York, NY 10017-3483, USA.

8. ADDRESSES OF SCHOLARS AND INSTITUTIONS MENTIONED IN THIS NEWSLETTER

- * Baloi, Mário Suarte: Department of Physics, Mozambique's Higher Pedagogical Institute, C.P.3276, Maputo, Mozambique [Fax: 258-1-422113]
- * Caveing, Maurice: 13 Bd. Beaumarchais, 75004 Paris, France
- * Cherrinda, Marcos: Department of Mathematics, Mozambique's Higher Pedagogical Institute, C.P.2923, Maputo, Mozambique [Fax: 258-1-422113]
- * D'Ambrosio, Ubiratan: Rua Peixoto Gomide 1772/83, 01409-002 São Paulo SP, Brazil [Fax: 55-11-280.0266]
- * Djebbar, Ahmed: Minister of National Education, Algiers, Algeria [Fax: 213-2-393658]
- * Doumbia, Salimata: Institut de Recherches Mathématiques, 08 B.P. 2030, Abidjan 08, Côte d'Ivoire
- * Draisma, Jan: Department of Mathematics, Mozambique's Higher Pedagogical Institute, C.P.2025, Beira, Mozambique [Fax: 258-3-325110]
- * Ebeid, William: Faculty of Education, Ain Shams University, Cairo, Egypt
- * Gerdes, Paulus: Higher Pedagogical Institute, P.O.Box 3276, Maputo, Mozambique [Fax: 258-1-422113]
- * Hitchcock, Gavin: Department of Mathematics, University of

Zimbabwe, P.O.Box MP 167, Mount Pleasant, Harare, Zimbabwe

- * Ismael, Abdulcarimo: Mozambique's Higher Pedagogical Institute, C.P.2923, Maputo, Mozambique [Fax: 258-1-422113]
- * Kane, Abdoulaye Elimane: Le Conseiller Technique, Présidence de la République, Dakar, Senegal [Fax: 23.28.40/21.86.60]
- * Kani, Ahmad Mohammad: Dean Faculty of Arts, Usman Dan Fodio University, Sokoto, Nigeria
- * Mtetwa, David: Faculty of Education, University of Zimbabwe, P.O.Box MP 167, Mount Pleasant, Harare, Zimbabwe
- * Mfika, Mubumbila: 17 rue de Loraine, 67100 Strasbourg, France
- * Niangoran-Bouah, N.: Faculté des Lettres et Sciences Humaines, Université d'Abidjan, Côte d'Ivoire
- * Obenga, Théophile: Département de Philosophie, Université Nationale de Congo, Brazzaville, Congo
- * Pyenson, Lewis: Département d'Histoire, Faculté des Arts et des Sciences, Université de Montréal, C.P.6128, succursale A, Montréal, Quebec H3C 3J7, Canada
- * Segajja-Munagisa, E.: Physical Science and Mathematics Education, Faculty of Science, Institute of Teacher Education Kyambogo, P.O.Box 1 Kyambogo, Kampala, Uganda (doing postgraduate studies in the U.K.: 115 Queen's Road, Bristol, BS 8 1LL)
- * Thomas-Emeagwali, Gloria: History Department, Central Connecticut State University, P.O.Box 4010, New Britain, CT 06050-4010, USA
- * Vitrac, Bernard: Université de Paris VIII, Paris, France

9. SUGGESTIONS

What are your suggestions for improving the AMUCHMA Newsletter?

What are your suggestions for other activities of AMUCHMA?

Send your suggestions, comments, information, questions and any other contributions to the chairman or secretary of AMUCHMA.

Send articles, books and manuscripts for the AMUCHMA documentation centre to the chairman or secretary.

10. DO YOU WANT TO RECEIVE THE NEXT AMUCHMA-NEWSLETTER?

The AMUCHMA Newsletter published in Arabic, English and French is available free of charge upon request.

Send requests to the Chairman

Paulus Gerdes
P.O.Box.915, Maputo, Mozambique,

for the English version, or to the Secretary

Ahmed Djebbar
Ministry of National Education, Algiers, Algeria

for the French version, or to

Mahdi Abdeljaoud,
I.S.E.F.C., 43 rue de la Liberté, 2019 Le Bardo, Tunis, Tunisia,

for the Arabic version.

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