

## **ANNUAL REPORT FOR THE PERIOD 1 January 2007 to 31 December 2007**

### **1. Executive Summary**

South African National Committee for the International Mathematical Union is a committee consisting of members from two national societies representing interests of mathematical community of South Africa. These societies are the Association for Mathematics Education of in South Africa (AMESA), mainly representing interests of Mathematics Educators at all levels, and the South African Mathematical Society (SAMS), which mainly represents mathematical researchers, but also educators of tertiary institutions. The interests, activities and membership of both these societies are complementary, overlapping, but also differing, in a significant way. However we tried to produce a combined report. This report highlights activities and achievements important to the whole entire mathematics community of South Africa.

- A. The year 2007 was the second full year of activities of the South African Mathematical Foundation (SAMF) under directorship Dr Mathume Bopape. However, his contract has come to an end. SAMF has acted as a co-ordinating body for joint activities of AMESA and SAMS and has provided support for activities related to the development of mathematics in South Africa, such as coordination of Maths Olympiads and related activities as well as of the Maths Week. Related activities of SAMF are: DST Educator Development Camps for STEM Olympiads and Competitions, Harmony Educator Development Project, DST Educator Support Project for the NSI
- B. There was a wide-ranging discussion with DST about ways to improve mathematics research in South Africa. A National Workshop was held in August 2006 at which the Review Oversight Committee was established and appointment of the International Review Panel has been underway. Unfortunately, lack of action from the side of DST has stalled the process and numerous attempts from the side of SAMS to reactivate it have been so far futile.
- C. There has been an increased collaboration between AMESA and SAMS. Representatives of the respective societies have been invited to give plenary talks at congresses of the others. AMESA, on behalf of the South African Committee for the IMU, submitted an initial bid to host the 12<sup>th</sup> International Congress on Mathematical Education (ICME-12) in 2012. This bid was supported by SAMS, SAMF, DST and the DoE. AMESA, with participation of members of SAMS, has prepared a very elaborate and well executed bid and hosted the assessment panel from ICME. Unfortunately, our bid has been unsuccessful – the winner was South Korea (who, by the way, lost the bid last time).
- D. Unfortunately, contacts with the regional sister organization SAMSA (Southern African Mathematical Sciences Association) hasn't developed further.
- E. Prof H. Siweya has been a Vice-president of the African Mathematical Union, Prof J. Adler is the vice-president of the International Commission for Mathematical Instruction, Prof. M. Setati is a member of the executive committee of the International Group for the Psychology of Mathematics Education and also a member of the International Programme Committee of the 11<sup>th</sup> International Congress on

Mathematical Education (ICME-11), to be held in Mexico in 2008 Prof Banasiak and Prof Makinde are on the Editorial Board of the journal Afrika Matematika, published by the African Mathematical Union, Prof. Renuka Vithal is a member of the International Programme committee of the ICMI centenary conference which will be held in Rome, Italy in 2008 and Prof J. Webb is the Secretary of the Advisory Board of the International Mathematics Olympiad and the African Mathematical Union Commission on the Pan-African Mathematics Olympiad.

- F. South African team of 4 learners took part in the 17<sup>th</sup> Pan African Maths Olympiad in Abuja (Nigeria). The South African team came first, with 2 South African learners receiving gold medals and tied for 2<sup>nd</sup> place and two receiving silver medals and tied for the 6<sup>th</sup>. South African team of 6 young mathematicians took part in 48<sup>th</sup> International Mathematical Olympiad in Hanoi (Vietnam). South African team ranked 68<sup>nd</sup> with 4 members having won Honourable mentions.
- G. South African Mathematical Society [SAMS] workshop was initiated by the South African Mathematical Society and the South African Mathematics Foundation to support the delivery of the Mathematics Literacy Curriculum Statements. The workshop took place on 19-20 July 2007 and focused on: information regarding the number of learners currently taking mathematics on HG/SG in 2007 compared with the learners who are expected to write the subjects Mathematics and Mathematics Literacy in grade 12 in 2008, Higher Education entry requirements, outline of National Benchmark Test project, trends in matric result.
- H. The 7th National Mathematics Week from the 2nd to the 7th September 2007 at the Old Mutual sports centre in KwaZulu Natal. The main purpose is to highlight the beauty, utility and applicability of mathematics and also dispel the myth that this subject is difficult, abstract and only accessible to a few super-intelligent human beings. The South African Committee for the International Mathematical Union through its member's organisation, the Association for Mathematics Education of South Africa (AMESA) and the South African Mathematical Society (SAMS), thus declared the second week of every year as National Mathematics Week. In 2007, over 6500 learners participated in a series of mathematical activities.

I. Member organisations:

South African Mathematical Society (SAMS):

Council of the South African Mathematical Society (November 2007-October 2009)

President: Hlengani Siweya (UL), Vice-president: Jamshid Moori (UKZN), Secretary: Abdul Kara (Wits), Financial Manager: Shiu-Ah Ng (UKZN), Education: Carol Bohlmann (UP), Liaison: Partha Gosh (UKZN), Development and Public Relations: Inderasan Naidoo (Wits), Scientific Activities: Kerstin Jordaan (Wits), Co-opted (Editor of QM): Barry Green (US), Co-opted (Editor of the Notices): Louis Labuschagne (UNI SA), Co-opted (SANCI MU): Jacek Banasiak (UKZN)

Main activities:

- publication of the research journal *Quaestiones Mathematicae*

- publication of a regular newsletter *Notices of the SAMS*
- publication of intermittent *e-Notices of SAMS*
- organisation of an annual congress
- co-organisation (with AMESA and SAMF) of the South African Mathematics Olympiad
- organisation (with AMESA and SAMF) of the South African participation in the International Mathematics Olympiad and Pan-african Mathematics Olympiad,
- organisation of the annual Interprovincial Mathematics Olympiad
- representing (with AMESA) the interests of the mathematics community of the country national and international structures

## Association for Mathematics Education of South Africa (AMESA)

AMESA National Council (July 2006 – July 2008)

Ray Duba (president); Prince Jaca (Vice president); Mokgoko Sebela (secretary); Neil Eddy (Treasurer); Vishnu Naidoo (KZN rep); Matladi Khembo (Gauteng rep); Lorraine Burgess (WC rep); Joseph Mongwe (Lim); Siphon Shabalala (Mpu), Lawrence van Heerden (NC); Ian Schlekter (FS); Prince Jaca (EC) and Siphon Vilakazi (NW).

### Main activities

- Organises an annual congress with international and local speakers
- Publishes
  - Pythagoras - a journal addressing current research and developments in Mathematics Education
  - Learning and Teaching Mathematics - a journal addressing mathematics teaching and learning from the perspective of the practitioner
  - AMESA NEWS - keeping Mathematics educators abreast of events Publishes
- Co-organises with SAMS (under the auspices of SAMF) the
  - South African Mathematics Olympiad
- Coordinates activities for the National Mathematics Week
- Represents the interests of the Mathematics Education community through representation on various committees, including
  - South African Mathematics Olympiad (SAMO) Committee
  - South African International Mathematical Olympiad Committee
  - South African National Committee for the International Mathematical Union (IMU)
  - National Standards Body (NSB10) of SAQA
  - South African National Commission for UNESCO
- Provides a forum for members to voice their opinions and concerns through various interest groups and committees, including:
  - AMESA Curriculum Committee
  - National Primary Mathematics Working Group
  - AMESA-Master Maths regional development programme
  - Olympiad Forum

Headings	Activities completed- January to December 2007		Activities planned- January to December 2008
<p>2. Background &amp; Composition of National Committee</p> <p>3. (Please indicate if any of the members of the committees have previously been capacity building candidates)</p>	<p>SAMS representatives:            Prof J. Banasiak (UKZN, Chairperson)            Prof Sizwe Mabizela, (Rhodes University)            Prof Jamshid Moori, (UKZN)            Dr Marcia Moremedi, (UNISA)</p>	<p>AMESA representatives:            Prof. Mamokgethi Setati (Wits, Vice-chairperson),            Prof. Renuka Vithal (UKZN),            Mr. Alwyn Olivier (Stellenbosch Univ)            Capacity building candidate: Ms. Busi Goba (UKZN)</p>	<p>Currently there are no former capacity building candidates serving on the Committee. However, in 2008 two new members from SAMS will be elected and there are plans to include Dr I. Naidoo, who represented SA at the 2006 World Congress of Mathematicians as the capacity building candidate, as a member of the Committee. Unfortunately, Professor Sethole passed away in 2007 and there will be a new member of the Committee coming from the AMESA side.</p>
<p>4. Participation by South Africans in Union activities</p>	<p>The second Congress of the Africa Chapter of the International Commission for Mathematical Instruction (AFRICME-2) took place in Nairobi, Kenya from 23 to 27 May 2007. Prof. Adler was instrumental in the organisation of this conference.</p> <p>South Africa presented a bid for hosting the 12<sup>th</sup> International Congress on Mathematical and hosted the international panel both in Pretoria and in Durban. Unfortunately, despite very positive feedback the bid was lost to South Korea (who applied for the second time)</p> <p>South African team of 4 learners took part in the 17<sup>th</sup> Pan African Maths Olympiad in Abuja (Nigeria). The South African team came first, with 2 South African learners receiving gold medals and tied for 2<sup>nd</sup> place and two receiving silver medals and tied for the 6<sup>th</sup>. South African team of 6 young mathematicians took part in 48<sup>th</sup> International Mathematical Olympiad in Hanoi (Vietnam). South African team ranked 68<sup>nd</sup> with 4 members having won Honourable mentions.</p>		<p>ICME-11, the International Congress on Mathematical Education, is to be held in Monterrey, Mexico, July 6 - 13, 2008 and is expected to gather between 3000 and 4000 professionals from 100 countries in the mathematics education area, including researchers, educators and teachers.</p> <p>7<sup>th</sup> Pan African Congress of Mathematics (PACOM 2008) in Egypt, 27-31 August 2008-01-31</p> <p>IMO 2008 will be hosted by Spain in Madrid on 10-22 July, <b>2008</b></p> <p>The place of PAMO 2008 has not been announced yet.</p> <p>High level delegation of IMU chaired by the Vice-president C. Procesi together with Marcelo Viana and Manuel de Leon will visit SA after the ICSU workshop in Maputo</p>
<p>3.1. Size of local community</p>	<p>There are over 260 South African mathematicians registered with South African Mathematical Society, which represent over 50% of professional mathematicians working in tertiary institutions.</p>		<p>These numbers are expected to remain at this level.</p>

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	<p>AMESA currently has 1980 members, which includes school mathematics teachers, mathematics teacher educators, researchers, policy makers and publishers of school mathematics textbooks. While AMESA is currently remains the largest mathematics association in South Africa, this membership is very low when we consider the number of mathematics teachers available in the country at the moment.</p>	
<p>3.2 South Africans serving on Unions or its subsidiary bodies</p>	<p>Chris Breen (UCT) – president of the International Group for the Psychology of Mathematics Education (PME)</p> <p>Jill Adler (Wits) is a Vice-president of ICMI</p> <p>Hlengani Siweya (UL) – Vice-president of the African Mathematical Union (Southern African Union)</p> <p>John Webb (UCT) - Secretary of the Advisory Board of the International Mathematical Olympiad and African Mathematical Union's Commission on the Pan African Mathematics Olympiad</p> <p>Mamokgethi Setati - member of the international Committee of the International Group for the Psychology of Mathematics Education (PME).</p> <p>J. Banasiak &amp; O. Makinde are on the Editorial Board of Africa Mathematica (the journal of African Mathematical Union)</p>	<p>This is difficult to predict but we hope to increase participation after the ICME-11 and PACOM meetings</p>
<p>3.3 Attendance of International Congresses/Workshops</p> <ul style="list-style-type: none"> <li>• Number of conferences attended</li> <li>• Number of South African delegates</li> <li>• Number of papers presented by South Africans (indicate any special invitations, e.g.</li> </ul>	<p>SAMS does not have any data about this. Any research-active mathematician attends 2-3 international conferences per year to present a paper which makes around 300 appearances at international conferences. However, it is worthwhile to mention a successful organization of the CIMPA-UNESCO-South Africa School on Multi scale Problems, partly funded by NRF, which was held at AIMS in Muizenberg in August 2007 at which M. Sango (UP) and J. Banasiak (UKZN) were invited to give lectures.</p>	<p>It is expected that this activities will continue at approximately the same level.</p>

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<p>keynote/ plenary talks)</p> <p>3.4 Capacity Building with regard to Membership of National Committee and involvement of young scientists in International Meetings</p>	<p>The current composition of the SAMS representation to SANCIMU reflects much better demographic profile of South Africa than the previous one. However, we are constrained by the profile of professional mathematicians in SA, which, in turn, is related to the pool of matriculants with HG mathematics willing to pursue academic career in mathematics, which is not economically rewarding. However, it is worthwhile to note that the President of SAMS is Professor Hlengani Siweya (UL) and the Council includes 4 other members of designated groups.</p> <p>Since the only income of SAMS is received through the membership fees, we do not have financial means to support participation of young mathematicians in international meetings. This depends entirely on availability of funding from NRF and their home Universities. However, acting through the South African Mathematics Foundation, SAMS takes active part in Talent Search, Mathematical Challenge, Maths Camps, South African Maths Olympiads etc to increase mathematical awareness among young learners from previously disadvantaged groups. In particular, SAMF has initiated project that equips educators in skills necessary to handle Olympiads.</p>	<p>This is expected to remain the same until the next election of SANCIMU members</p>
<p>3.5 Organisation of Union related Conferences in South Africa</p>	<p>The 13<sup>th</sup> Annual Congress of AMESA was held at Uplands College in Mpumalanga from 2<sup>nd</sup> to 6<sup>th</sup> July 2007.</p> <p>50<sup>th</sup> Congress of the South African Mathematical Society, University of Cape Town, November 2007</p> <p>SAMS Regional Conference: Mathematics for Industry Study Group, University of Witwatersrand, January 2007</p> <p>Mathematics for Industry Study Group, University of Witwatersrand, January 2006.</p> <p>CIMPA-UNESCO-South Africa School Multiple scale problems in Biomathematics, Mechanics, Physics and Numerics, Muizenberg,</p>	<p>The 14th Annual National Congress of AMESA will be held from 30 June to 4 July 2008 at <b>the</b> Nelson Mandela Metropolitan University.</p> <p>51<sup>th</sup> Congress of the South African Mathematical Society, University of KwaZulu-Natal, November 2008</p> <p>Mathematics for Industry Study Group, University of Witwatersrand, January 2007.</p>

Headings	Activities completed- January to December 2007	Activities planned- January to December 2008
	August	
3.6 Contribution by members to key documents and publications (please indicate why they are regarded as key)	<p>On 19 and 20 July, a workshop focussing on HEI mathematics entry issues was arranged by the Foundation and SAMS, funded by DST. There was a general consensus that teacher education should contain more mathematics, and that it should be taught by mathematicians. A formal motion concerning this matter is on the agenda of this meeting. A further outcome of the workshop concerned Study Mate that DoE has been placing as a supplement in all newspapers. Lessons prepared at the Workshop have been included in Study Mate, as have a number of past Olympiad questions. Members of SAMS has been actively participating in assessing new NSC exams and tests and advising the Universities with respect to the admission criteria.</p>	<p>These activities will continue. Many Universities plan to organize regular workshops and discussion groups with teachers to prepare themselves for the new intake of students.</p>
3.7 Report back on recommendations made during the in depth review (indicate what were the recommendations and what progress has been made to attend to them.)	<p>SACIMU attended to the recommendation from the in depth review regarding mathematics education development by working together on teacher education projects through SAMF e.g., co-organizing the workshop on new NSC and math literacy programme.</p> <p>SAMS has taken the recommendation very seriously which is reflected in the composition of the new representation to SANCIMU and the composition of the Council. Also, well over 100 members of SAMS (that is, close to 50%) comes from previously disadvantaged groups.</p>	<p>There have been no new recommendations fro the review and SANCIMU, AMESA and SAMS will continue working towards the goals outlined in the previous in depth review.</p>
4. Value to the Community and Benefit to South Africa	<p>The South African Mathematical Society serves the community through:</p> <ul style="list-style-type: none"> <li>• Stimulating and encouraging pursuit of high quality research at the frontiers of the discipline,</li> <li>• Promoting mathematics as a profession, through close and active co-operation with disciplines that utilize the efficacy and power of mathematical techniques and forging closer links with business and Industry,</li> <li>• Identifying, stimulating and nurturing students with mathematical ability to realize their full potential, irrespective of their social, economic and cultural background,</li> <li>• Encouraging and providing opportunities to members of all groups, especially black South Africans and women, that are</li> </ul>	

Headings	Activities completed- January to December 2007	Activities planned- January to December 2008
	<p>disproportionately under-represented in the various facets of mathematics,</p> <ul style="list-style-type: none"> <li>• Promoting an appreciation and public understanding of mathematics, its impact and applications in everyday life,</li> <li>• Establishing links and promote co-operation between itself and similar societies in Southern Africa, the rest of the continent and throughout the world.</li> </ul> <p>AMESA serves the community through:</p> <ul style="list-style-type: none"> <li>• promoting Mathematics education and, in particular, to enhance the quality of the teaching and learning of Mathematics in South Africa.</li> <li>• providing a forum for all concerned with the teaching of Mathematics at all levels of education.</li> <li>• encouraging research related to Mathematics education and bringing the results of such research to the attention of its members;</li> <li>• formulating policy statements on matters regarding Mathematics education and promoting such perspectives among its members, policy-making bodies and organs in civil society involved in education;</li> <li>• actively engaging in mathematics education projects which will result in the social, economic, political and cultural development of society.</li> <li>• encouraging mathematics teachers to strive towards a high standard of professionalism in the exercise of their profession.</li> </ul>	
<p>5. Public Society Interfaces and Outreach Programmes – self initiated or facilitated by ICSU</p>	<p>SAMS interacts with the public through its representatives on various bodies: South African National Council for Natural Scientific Professionals (Prof Hlengani Siweya), SANCIMU and the South African Mathematical Foundation. Both SAMS and AMESA are members of the National Science and Technology Forum.</p> <p>Outreach programmes for students are mainly realized by the Talent</p>	<p>These activities will continue.</p> <p>There is however a desperate need to provide sustainable funding for these activities at all levels.</p>

Headings	Activities completed- January to December 2007	Activities planned- January to December 2008
	<p>Search and other activities related to Mathematics Olympiad at various levels (from Inter-provincial to International) and Mathematical Challenges When Old Mutual announced that it will stop sponsoring IMO from 2006, 2006 bridging funds have been provided by SAASTA, 2007 funding by SAMF but a long term solution is desperately needed. SAMS took active part in the debate on introduction of the new matriculation system and new math curricula. In particular, the workshop on the NCS was jointly organized by SAMS, DST, DoE, AMESA and SAMF.</p>	
<p>6. Research Highlights/ New Initiatives in South Africa (indicate what benefits will these bring for SA)</p>	<p>The African Institute of Mathematical Sciences continued providing excellent mathematical graduate education for students from Africa and expanded its activities to cater for a larger amount of South African students. Many AIMS students continue their education in SA tertiary institutions.</p> <p>SAMS continued engaging the DST about ways to improve mathematics research in South Africa. A National Workshop took place in August with essential resolution being establishment and terms of reference of the Review Oversight Committee. ROC will appoint an international review panel from nominations received from scientific community of South Africa. Nominations were received in September 2007. However, no further action came from DST.</p> <p>Apart from this, South African mathematicians published over 250 papers in recognized international mathematical journals. A few that appeared in journals considered to be the best in the field are listed below:</p> <p>Gutev, Valentin Weak orderability of second countable spaces. Fund. Math. 196 (2007), no. 3, 275--287.</p> <p>Faierman, M.; Möller, M. Eigenvalue asymptotics for an elliptic boundary problem. Proc. Roy. Soc. Edinburgh Sect. A 137 (2007), no. 2, 281--302.</p>	<p>These activities will be continued.</p>

Headings	Activities completed- January to December 2007	Activities planned- January to December 2008
	<p>Moori, Jamshid; Rodrigues, B. G. Some designs and codes invariant under the simple group <math>Co_2</math>. <i>J. Algebra</i> 316 (2007), no. 2, 649--661.</p> <p>Mason, D. P.; Chung, M. Y. Group invariant solution for axisymmetric spreading of a thin fluid film with slip at the fluid-base interface. <i>Math. Methods Appl. Sci.</i> 30 (2007),</p> <p>Panholzer, Alois; Prodinger, Helmut Level of nodes in increasing trees revisited. <i>Random Structures Algorithms</i> 31 (2007), no. 2, 203--226.</p> <p>Djoko, J. K.; Ebobisse, F.; McBride, A. T.; Reddy, B. D. A discontinuous Galerkin formulation for classical and gradient plasticity. I. Formulation and analysis. <i>Comput. Methods Appl. Mech. Engrg.</i> 196 (2007), no. 37-40, 3881--3897.</p> <p>Olson, Jeffrey S.; Raftery, James G. Positive Sugihara monoids. <i>Algebra Universalis</i> 57 (2007), no. 1, 75—99</p> <p>Dube, Themba; Matutu, Phethiwe Pointfree pseudocompactness revisited. <i>Topology Appl.</i> 154 (2007), no. 10, 2056--2062.</p> <p>Raftery, J. G. Representable idempotent commutative residuated lattices. <i>Trans. Amer. Math. Soc.</i> 359 (2007), no. 9, 4405—4427</p> <p>Komathiraj, K.; Maharaj, S. D. Tikekar superdense stars in electric fields. <i>J. Math. Phys.</i> 48 (2007), no. 4, 042501, 12 pp.</p> <p>Banasiak, Jacek; Lachowicz, Mirosław; Moszynski, Marcin Chaotic behavior of semigroups related to the process of gene amplification-deamplification with cell proliferation. <i>Math. Biosci.</i> 206 (2007), no. 2, 200--215.</p> <p>Sango, M. Weak solutions for a doubly degenerate quasilinear parabolic equation with random forcing. <i>Discrete Contin. Dyn. Syst. Ser. B</i> 7 (2007), no. 4, 885—905</p>	

Headings	Activities completed- January to December 2007	Activities planned- January to December 2008
	Zelenyuk, Yevhen Almost maximal spaces. Topology Appl. 154 (2007), no. 2, 339—357	
7. Science Education (Any activities involving teachers, students, school curriculum development, graduate student development)	<p>On 19 and 20 July, a workshop focussing on HEI mathematics entry issues was arranged by the Foundation and SAMS, funded by DST.</p> <p>The 7th National Mathematics Week from the 2nd to the 7th September 2007 at the Old Mutual sports centre in KwaZulu Natal with over 6500 learners participating in a series of mathematical activities</p> <p>Input through SAMF to participation in IMO, PAMO. Organization of Talent Search, Interprovincial Mathematics Olympiad, Math Challenge.</p>	Continuation of these activities.
8. Financial assistance received by South Africans direct from ICSU bodies during 200	R20000 for the airfare of Prof Webb.	<p>Airfare of Prof Webb ----- R20000</p> <p>IMU/ICSU delegation of 3 visiting selected South African Universities for 1 week (travel, accommodation and subsistence) -----R21000</p> <p>Participation of 1 voting delegate at PACOM meeting in Egypt. -----R15000</p> <p>Participation of 2 delegates in ICME 11----R50000</p> <p><b>TOTAL</b> <span style="float: right;"><b>R106000</b></span></p>