

African Materials Science and Engineering Network (AMSEN) – A Carnegie-AIS RISE Network: Progress and Achievements

L.A. Cornish (Director)



Timelines for AMSEN

- Early 2008: Call for networks from Carnegie-IAS
- March 2008: Pre-proposal submitted
- June 2008: Final proposal submitted
- July 2008: Success!
- September 2008: Preliminary RISE Meeting in Nairobi
- January 2009: First students arrive!!
- September 2009: 1st RISE Meeting in Nairobi
- January 2010: First AMSEN Workshop in Namibia
- April – June 2010: more workshops
- October 2011: RISE Conference, Johannesburg



Nodes in AMSEN

DST/NRF Centre of Excellence in Strong Materials,
University of the Witwatersrand, South Africa
Prof. L.A. Cornish (Director)



University of Namibia, Namibia
Prof. F.P.L. Kavishe (Head of Secretariat)



University of Nairobi, Kenya
Prof. G.O. Rading (Deputy Director)



Federal University of Technology, Akure, Nigeria
Prof. J.O. Borode



University of Botswana, Botswana
Prof. P.K. Jain



Aims

- Build Faculty capacity → Build the next generation
- Research
- Training + mentoring (co-supervise students with more experienced staff within the Nodes)
- Exploit the respective strengths of individual partner institutions for the collective benefit to build capacity
- Encourage Intra-Africa cooperation among the five Universities and encourage sharing of both manpower and equipment
- Widen the exposure of the selected students via multiple supervision and regular travel within the Nodes



Key Performance Areas

1. Research
2. Education & Training
3. Networking



Research Plan

- Build strong Research Teams
- Access the expertise, experience and equipment in the network
- Identify overall research areas + members
- Set up individual projects
- Members complement each other
- Opportunity to bring less experienced members into the supervisory teams → they can be mentored while undertaking research
- Where possible, use post doctorate fellows to undertake research + help students + mentor
- Fundamental research will be supported + encourage industrial participation, both for additional funding, but also to ensure relevant projects for the students. A good balance will be attempted between fundamental and applied research.



PhD Training

- Students registered with one major supervisor (University rules!)
- E-mail + visits
- At least 3 reports annually: end May, September and December
- Presentations (internally and externally)
- Poster where possible
- Conferences:
Planned Discipline specific +
 - African Materials Research Society (AMRS) **Bi-annually**
(Nigeria 2009, Zimbabwe 2011)
 - Microscopy Society of Southern Africa (MSSA) **Annually**
- AMSEN Meeting alternately with AMRS: Namibia, January 2010
- Periodic workshops –
 - attached to AMRS and AMSEN or
 - ad hoc?



Networking

- Keep in contact with e-mail
- Visits
- **AMSEN Workshop – planned every alternate year?
(depending on funds)**
- Collaborations – build on each other's
- Web page – built and each node will have a link –
Been “live” since end June with the information
gleaned then, but cannot be updated until November
because Wits is currently upgrading their website.



Communication Plans

- Mostly e-mails
- Visits within Research Teams: mentoring & equipment access
- RISE Reports / Annual Report (to university): inputs and outputs, progress...
- Monthly updates to RISE website
- Short reports from the students
- Publications in journals are strongly encouraged, as well as making presentations at conferences



Contribution by All Nodes

- Recognised that some institutions have more facilities and expertise than others
- AMSEN will not be allowed to become one-sided
- Guarantee contributions from all nodes by ensuring that the personnel are part of at least some of the research teams
- Where limited expertise, researcher will be mentored
- Access to equipment not at the home university by visits
- Recommended, where possible, make applications for external (travel) grants to visit institutions with the necessary equipment
- All nodes encouraged to have active contacts with relevant local industries; will help the less experienced nodes to contribute to the AMSEN network



Academic Retention Strategy

Note poor remuneration!

Possible remedies:

- **Scheme for supplementation** + from industry
- Allow staff to be seconded to industry for short periods of time
- Allow staff to undertake consulting work
- **Reward researchers for papers published and students graduated**
- Give academic staff sufficient time to undertake research
- **Support to go to conferences and undertake academic visits**
- **Funds: equipment, visits and training of the academics involved**
- **Exposure to other workers...**



Progress to date 1

- 19 students on board, one more was identified
- At least 20 faculty members nominated
- 1 student has been made a staff member (UoN)
- 2 staff members promoted (UoN)
- Projects well under way: most students are performing well: submitting reports, presenting and writing up their work
- At least 7 conference presentations made in 2009, + presentations at external student seminars
- At least 6 more conference presentations planned for 2010, and one for 2011 (international)



Progress to date 2

- A. Apata won 2nd Prize for Postgraduate Poster at the School of Chemical and Metallurgical Engineering Poster Day, Wits, November 2009
- One provisional patent has been lodged
- AMSEN Workshops have been run and well-received
- At least three students are to upgrade to PhD
- Women in Science Prize
- 1st journal paper: I.O. Oladele, J.A. Omotoyinbo and J.O.T. Adewara, Investigating the Effect of Chemical Treatment on the Constituents and Tensile Properties of Sisal Fibre, *J. Minerals & Materials Characterization & Engineering*, 9 (6), 2010, 569-582
- More equipment coming for UNAM and FUTA



Woman in Science Prize: TATA Fellowship, 13th August 2010

Adenike Olesiende, FUTA, studying at Wits





Courses/workshops attended by AMSEN/UNAM students at Wits in 2009

- E- Resources for Engineering Workshop, 25th March 2009
- Abstract writing, 6th May 2009
- Writing a Technical Report for Engineers, 12th March 2009
- Project Proposal, 9th March 2009
- Supervision Practices and Entitlements, 18th March 2009
- Atomic Force Microscopy, 25th – 26th March 2009
- Thermodynamics of Phase Equilibria of Materials, 1st – 5th June 2009



Research Team	Research Team Members	Research Team	Research Team Members
Corrosion	Prof. F.P.L. Kavishe (UNAM)	Ceramics	Prof. I. Sigalas (Wits)
	Mr J. Van der Merwe (Wits)		Prof. J.O. Borode (FUTA)
	Dr P.A. Olubambi (FUTA)		Dr J.O.T. Adewara (FUTA)
	Prof. L.A. Cornish (Wits)		Dr P.A. Olubambi (FUTA)
	Prof Archbong (UNAM)		Dr B.O. Adewuvi (FUTA)
Alloy Development	Prof. G.O. Rading (UoNi)		Prof. P.K. Jain (UB)
	Prof. L.A. Cornish (Wits)	Polymers	Dr V. Ochieng (UoN)
	<i>Dr N. Sacks</i> (Wits)		Prof. G.O. Rading (UoN)
	Prof. F.P.L. Kavishe (UNAM)		Prof. F. Kavishe (UNAM)
	Prof. J.O. Borode (FUTA)	Concrete / clays	Dr S. Ekolu (Wits)
	Dr B.O. Adewuvi (FUTA)		Prof. F. Kavishe (UNAM)
	Prof. J. Kihiu (UoN)		Prof. G.O. Rading (UoN)
	Mr S. Coetzee (UB)		Dr S.O. Abuodha (UoN)
Phase Diagram Research	Prof. L.A. Cornish (Wits)		Dr S.W. Mumenya (UoN)
	Prof. P.K. Jain (UB)	Computational Physics	Prof. T.E. Lowther (Wits)
	Prof. M.J. Witcomb (Wits)	Solar cells and Thin Films	Prof. B. Aduda (UoN)
	Mr S.H. Coetzee(UB)		Dr T.S. Sathiaj (UB)
Composites Research	Dr J.A. Omotovinbo (FUTA)		Prof. J.M. Mwabora (UoN)
	Dr K.K. Alaneme (FUTA)	Nanotechnology	Prof. S. Iyuke (Wits)
	Prof. R. Paskaramoorthy (Wits)		Prof. F. Kavishe (UNAM)
	Prof. G.O. Rading (UoN)		Prof. J.O. Borode (FUTA)
	Prof. F. Kavishe (UNAM)		Dr B.O. Adewuvi (FUTA)
	Prof S. Singh (UNAM)		

Student Composition

NB: Development & retention of faculty members

- **FUTA:** own staff
- **UB:** 1 own staff + 2 “prospectives” + 1 vacancy (own staff!)
- **UNAM:** 2 “prospectives” + 2 “others”
- **UoN:** 1 own staff + 2 “prospectives” + 1 staff member from Jomo Kenyatta University of Agriculture
- **Wits:** 2 FUTA staff + 1 UoN staff + 1 for an Nigerian educational institution



Visits

- Usually try and arrange with other occurrences to save money!
- Visits from RISE
- Visits from other nodes
- Visits to industry and other universities
- AMSEN students to UB (2 Workshops)
- UB students to Wits (1 Workshop – to be repeated at FUTA)
- UoN student to visit Wits in October 2010



Student conferences 2009

- 2 students presented at Advanced Metals Initiative in July 2009
- 3 students presented at the Microscopy Society in Southern Africa Conference, Durban, South Africa, December 2009
- 5 students presented at the 5th African Materials Research Society, Abuja, Nigeria, December 2009



Student conferences 2010

- 1st AMSEN Workshop , Namibia,
27th - 29th January, 2010: all research students
- 1 student presented at International Symposium on
Modernising Local Sustainable Technologies,
Nairobi, Kenya, 25th – 26th February 2010
- 5 students to present at the Microscopy Society in
Southern Africa Conference, Bela Bela, South
Africa, October 2010
- 1 student to present at a conference in Egypt,
February 2011



Networking Meetings

- RISE meetings, Nairobi, September 2008 and September 2009
- “Africa Networking Meeting”, Stellenbosch, October 2008
- Regional and Interregional Cooperation to Strengthen Basic Sciences in Developing Countries Conference, 1st - 4th September 2009, Addis Ababa, Ethiopia
- TWAS, Durban, South Africa, October 2009
- Africa University Day, November 2009
- IESA Conference Wits, August 2010



Other exposure

- AMSEN Launch:
 - U. Botswana
 - FUTA: December 2009
- AMSEN pamphlets
- Wits DVC included AMSEN in presentation in Ghana November / December 2009 at VC's Meeting
- AMSEN affiliation on papers where possible
- Wits' African Footprint
- Own university news bulletins



1st AMSEN Workshop: 27th – 29th January 2010, Windhoek, Namibia

- All AMSEN-sponsored students presented their work to date + meetings of AMSEN researchers
- Workshop ran as a conference, formally with chairing + conference bag
- Prizes given to the three best presentations
- Supervisors interacted and shared experiences
- Presentations by Director & Node Co-ordinators
- Formal dinners for experience
- Meetings of Research Teams, Node Co-ordinators, Students
- Plans: equipment access, more Workshops!
- Proceedings (subsequently) – much editing (format)



1st AMSEN Workshop: 27th – 29th January 2010, Windhoek, Namibia



UB Training Workshop: Materials Research, Phase Diagrams and SEM/ EDX, 13th – 16th April 2010

- Theoretical aspects of phase diagram research
- Use of SEM and EDX as tools of research and analysis
- Attended by 10 delegates from:
 - UB (5), UNAM (1), UoN (1), Wits (1), and FUTA (2)
 - Academics
 - MPhil/ PhD students
- First day: student delegates presented their research work
- Afterwards: tutorials and lectures, presented by Prof. P.K. Jain (UB), Prof. L.A. Cornish (Wits) and Stephan H. Coetzee (UB)





UNIVERSITY OF BOTSWANA



UB Training Workshop: SEM and EDX Demonstration and Practice from 19th – 23rd April 2010

- Facilitated by Stephan H. Coetzee
- Operation, use and application of SEM and
- EDX techniques in materials research
- Participation was restricted to 8 trainees (5 visiting and 3 UB students) because of the space limitation in the EM lab
- Studied some research samples



Wits Training Workshop: X-Ray Diffraction

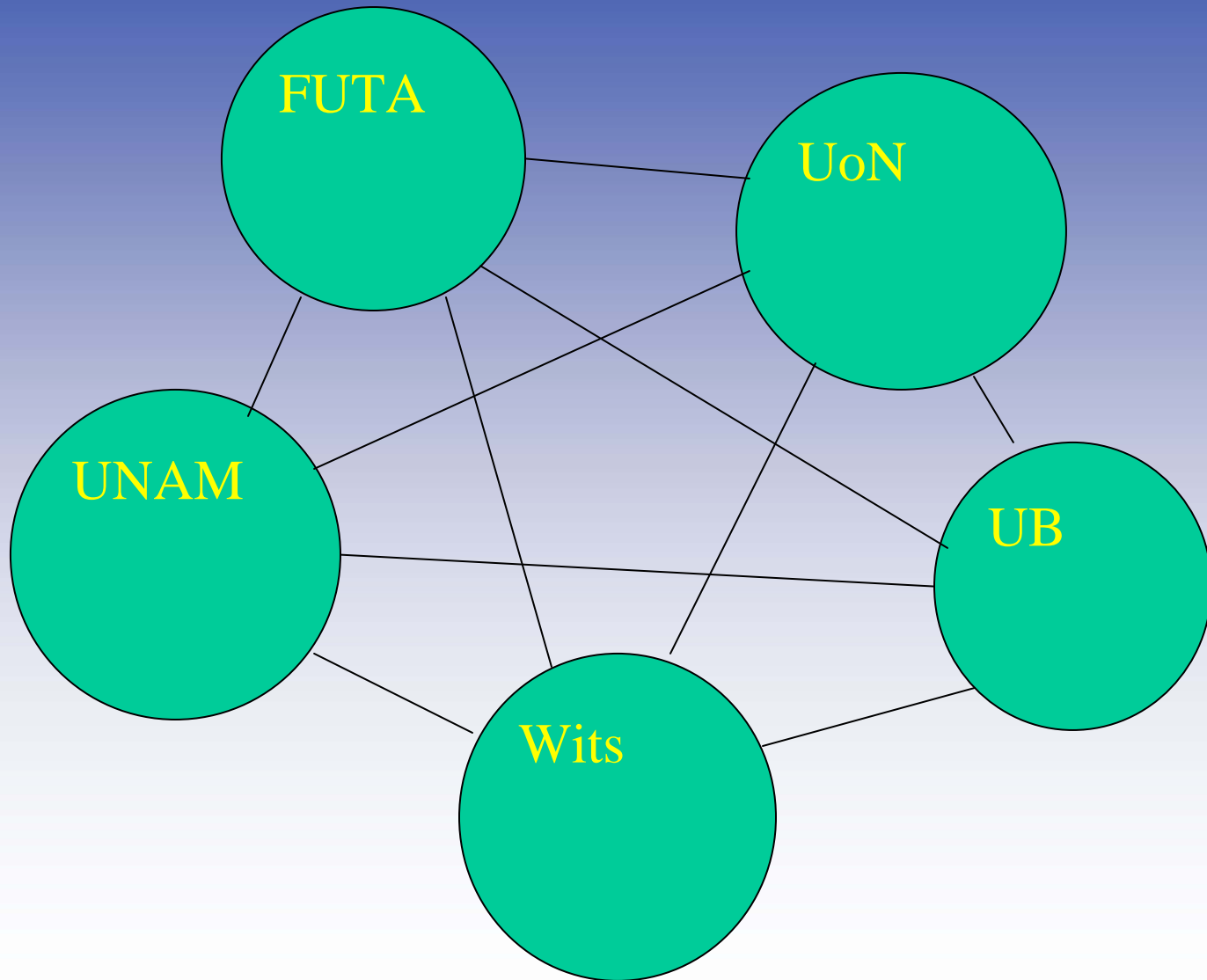
26th – 30th July 2010

- By Dr D. Billing
- Interpretation of XRD patterns
- Wits + CoE-SM + AMSEN students from Wits + UB
- Theoretical + computer program

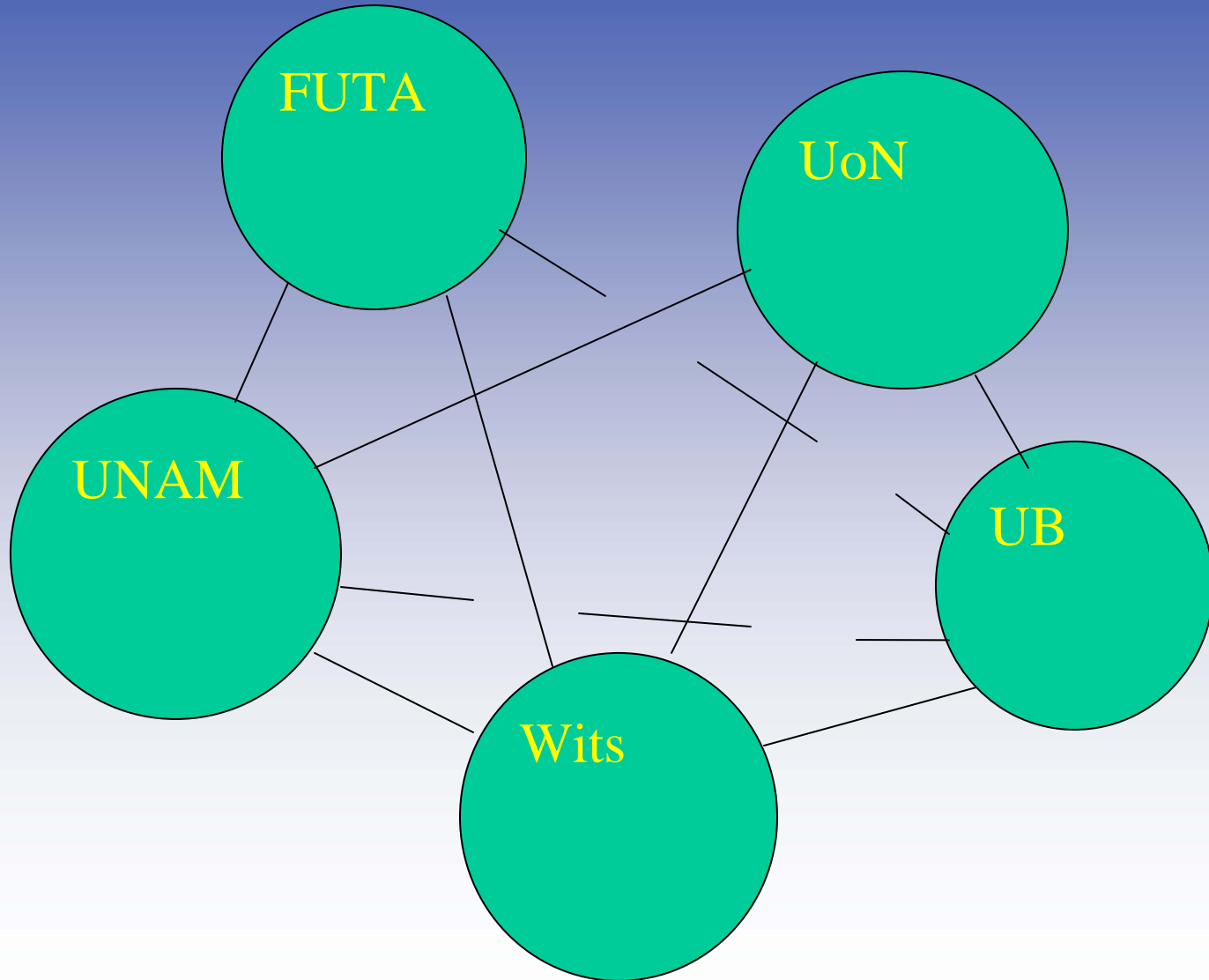
- Repeat at FUTA



Networking in AMSEN: ideal



Networking in AMSEN: actual



Effects of AMSEN

- Students being trained, undertaking research & presenting their work
- Better networking & collaboration between Nodes
- Staff being promoted & one student made a staff member
- Students encouraged to behave professionally
- Better networking & collaboration within own university
- Better networking & collaboration with other universities in same country (other students share AMSEN benefits)
- Exposure to other university culture
- Other students being attracted (funded from elsewhere):
 - From Kenya (Started MSc 2010)
 - From Ghana (To start PhD in 2011)



Other AMSEN achievements

- Profs Jain and Cornish gave their inaugural lectures in 2010
- Prof Jain was elected to FInstP
- Prof Cornish was elected to FRSSAf
- Mrs OA Olaseinde had a baby girl on 14th September 2010



How is it all working?

- Research Teams – some working well, others with little networking. Co-supervision mostly working well – one student still has one supervisor... some supervisors are less active
- Research work – mostly very well
- Student reports – most all right – some “progress”
- Presentations and conferences – very encouraging!
Two problems...
- Student conduct – mostly very good
- Overall: good progress, with 2 students lagging



Problems

- Communication is very difficult at times, especially with Nigeria
- Infrastructure not always good; manufacturers give little support
- Problems with transferring money... exchange rates
- Glitch with dividing money... resolved
- Difficulty in finding administrative staff
- U. Botswana and U. Namibia has difficulty in finding students
- University rules!
- Sometimes takes a long time to get the students into the programme!
- One student lacks application, but should finish GDE



Near future...

- Improve Networking with FUTA
- Expose students to different environments to help their future careers, e.g. Material Science International
- Try to make present equipment function
- Fill vacancy at UB
- Other workshops, e.g. Thermo-Calc, FUTA's XRD...
- Upgrade to PhD where possible
- Increase and encourage working with institutes and industry
- Complete current projects
- More conference publications, leading on to journal publications



Further future...

- Current students will ensure the networking continues
- Increased funding for more liaison: TWAS, SIDA and MacArthur ?
- Work with USA universities on course development?
- Tighten up student admissions!
- Mini-sabbaticals for graduated students
- Sustainability – how to carry on...
 - Government
 - Other foundations?
 - Industry





Thank you!

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