International Society of Biomechanics Newsletter

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AFFILIATE SOCIETIES OF ISB:

American Society of Biomechanics; Australian and New Zealand Society of Biomechanics; Brazilian Society of Biomechanics,British Association of Sport and Exercise Sciences; Bulgarian Society of Biomechanics; Canadian Society of Biomechanics/Société canadienne de biomécanique; Chinese Society of Sports Biomechanics; Comisia de Biomecanica Inginerie si Informatica (Romania); Czech Society of Biomechanics; International Society of Biomechanics in Sports, Japanese Society of Biomechanics; Korean Society of Sport Biomechanics; Polish Society of Biomechanics; Russian Society of Biomechanics; Société de biomécanique (France), Taiwanese Society of Biomechanics.

Note from the President

I think most of us are familiar with those email messages describing how one can claim millions of dollars by providing the sender with your bank account details. The letter is usually a family member or victim of "a coup that overthrew a government" somewhere in Africa. This person has access to a fortune and is willing to share it with anyone who has a bank account.

On the one hand, I'm amazed that these messages continue to proliferate, but at the same time, I'm saddened by the thought that many associate Africa with these ridiculous email messages. In contrast, an issue that *should* sadden many is the amputation rate in Africa. In Angola, for instance, one in every 334 citizens is an amputee. Clearly this problem extends beyond Angola---and even beyond Africa---since countries such as Afghanistan, Vietnam and Cambodia have similar problems.

This statistic is more than a number to me; 20 years ago when I was in the South African Medical Services, I was present when people from this country were being carried off helicopters after having stepped on landmines. One such patient was concerned because he was getting blood on the sheet covering the stretcher. I couldn't speak Portuguese, and he couldn't speak English, and I remember thinking how terrifying it must be to have your life changed so dramatically in an instant in time.

In the USA, the problem of amputation rates in patients with diabetes is well known. Across all individuals, the prevalence of this problem is 1 in 1785 (7% of the population has diabetes and 8 in 1000 diabetic patients has an amputation). From this perspective, the problem facing the average Angolan is five times worse than the diabetic amputation problem in the USA. However, the issue extends beyond trauma, since only 3% of all arable land in Angola is currently under cultivation---due to the fear of landmines.

In the previous newsletter, I described my visit to the Tanzanian Training Center for Orthopaedic Technologists (TATCOT) in Moshi, Tanzania. Based on positive feedback I have had from ISB members, I thought that I would follow up with a "Special Edition" newsletter focusing on the African continent. Having said this, it would be presumptuous of me to think that I could adequately represent all the activities spanning an entire continent! With this disclaimer, I would nevertheless like to attempt to raise the level of awareness of biomechanics in this part of the world---since I think it is unacceptable to think of ourselves as an international society when we only have one or two members from an entire continent.

I am hoping this newsletter is a starting point for ISB members to reach out to individuals and institutions in Africa. In this respect, I would like to acknowledge those people who have already committed time and resources to this initiative:

- Vicon for donating a 6 camera system
- The Cleveland Clinic for donating two forceplates and a 12 channel amplifier
- Anybody Technologies for software (see page 13)
- AMTI for free calibration of forceplates for TATCOT
- Kit Vaughan for offering to train individuals from TATCOT in the methods of gait analysis
- Joe Hamill for agreeing to go to Tanzania to install forceplates
- And colleagues on council for sending textbooks to Tanzania (including Ewald Hennig, Cheryl Metcalf and Joe Hamill)

Through efforts such as these, we will continue to "encourage international contacts amongst scientists, promote the dissemination of knowledge, and form liaisons with national organizations". After all, contacts between people across various continents are central to the mission of the ISB.

As always, please feel free to contact me with any suggestions or comments.

Brian L. Davis
ISB President

From Congo-Brazzaville to Canada via Switzerland:

Thoughts along the way.

Fidèle Likibi, Ph.D.

Originally from Congo-Brazzaville in the centre of Africa, I have followed an academic route that took me from Africa to Europe and then on to North America. Along the way I obtained a Masters and a Ph.D. in biomedical engineering, but the path has been punctuated with certain obstacles.

The University of Brazzaville, as most universities in Africa, does not have high-performance equipment and enough financing to offer high quality education. Some equipment dates from the time of European colonization and has never been replaced since independence in the middle of the last century! There are no laboratories that utilize technology at the cutting edge of academic research. The Internet is still a luxury in many countries in Africa, and libraries are poorly supplied with journals and books. Those that are available are often obsolete and do not include knowledge acquired in the 21st century. Moreover, it is difficult to keep order in classrooms during lectures because of the large number of students in the room. These conditions make it very difficult for students to achieve success, and it often seems like one is tackling an assault course! Therefore to succeed, students should have other sources of knowledge besides libraries, such as buying books from developed countries. Unfortunately, this is prohibitively expensive for the majority of African students.

In the Congo, I received a degree in natural sciences. After studying in that kind of setting, I was naturally not only surprised, but also scared by new equipment and technology I encountered in Switzerland! Every student had his computer in every laboratory throughout the University. (In Brazzaville, all students had to share one or two computers). Personally, the use of computers was my major snag at the beginning, and I needed to go for remedial classes to improve my knowledge in computer sciences. This did not end my problems, because I still had to work after school or during the weekends, to support myself in Switzerland and also to help parents and friends in Africa. I was not alone in that situation---my colleagues from others countries of Africa had to face the same issues, with the only difference being the degree of poverty in the countries of origin. Despite these difficulties, I enjoyed my time in Switzerland, with the highlight being my job as a research assistant in artificial organs.

When I moved to Canada, what I found was similar to that I found in Switzerland, and therefore I didn't face same difficulties as those I met when I arrived in Europe.

In conclusion, like many of my friends from African countries, I am pleased that success can be achieved if one is willing to persevere and become acclimatized to new academic environments. When I was at the University of Brazzaville, I never thought that one day I would be performing in depth studies into the bone tissue engineering and the orthopedic biomaterials and biomechanics, but that is exactly what I am currently doing!

Fidèle Likibi, Ph.D., from Montreal, Canada.
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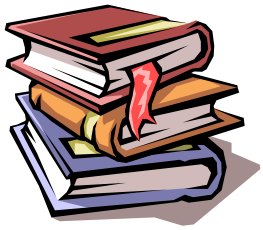


Book Review

Title: Nonlinear theory of Elasticity - Applications in Biomechanics
Author: Larry Taber
Reviewed by: Evelyn Carew, Ph.D.,
Mathematics Department
Kent State University, Salem Campus

Editor's note: Dr. Carew is formerly from Sierra Leone.

Math and non-math majors are likely to describe a class on tensors and nonlinear elasticity as "difficult". Perceived difficulty is usually compounded by texts that adopt widely varying notation so that continuity of thought and understanding is difficult to maintain across texts. "Applications in Biomechanics" presents an opportunity to give physical interpretation to seemingly abstract mathematical quantities (tensors) in terms of what they mean, what they measure, and where and how they act. In this Professor Taber has done a superb job.

The text is structured into six chapters and two appendices. Chapter 1 is an Introduction; chapter 2 covers Vectors, Dyadics and Tensors; chapter 3 covers Analysis of Deformation; chapter 4 covers Analysis of Stress; chapter 5 covers Constitutive Relations, and chapter 6 covers Biomechanics Applications. The appendices are on the Linear Theory of Elasticity and Special Coordinate Systems. The reader is first introduced to the fundamentals of tensors and their mathematical manipulation. Physical tensors of interest like strain, deformation, and stress that describe the behavior of real materials are described. The text then goes on to develop the mathematical description of cause and effect in real materials.

The text defaults to nonlinear elasticity (always a difficult area) in a very clear and concise way such that it is hardly noticeable and provides a complete coverage of linear elasticity in a separate appendix. There is a good balance between the use of direct (tensor) notation and component (indicial) notation. Selective relevant examples in biomechanics are discussed and solved and each chapter ends with a comprehensive list of exercises. The result is a text that is well-written, notation-friendly, readable, non-overwhelming, and palatable in terms of content and size.

The level of mathematics competency required to fully understand the material in the text should not be underestimated however. This after all is a graduate text. At a minimum the reader should have a good grasp of vector analysis, matrix algebra, and calculus. Also, feedback from students I have taught suggested that they would have benefited from more worked examples and a solutions manual for the exercises.

Taber's book is an excellent text for the mathematically competent reader new to the subject area, or the expert that is looking for a comprehensive overview of the material.

Places to visit on the web

Brian Davis

Digging for bones in Africa:

For an account of what its like to be a paleoanthropologist, and to read about Ethiopia's Dr. Yohannes Haile-Selassi's switch from a degree in history to looking for hominid bones: http://www.cmnh.org/inthenews.html#haile and http://www.cmnh.org/page7.pdf

On a related topic---the paleoanthropological discoveries of three generations of the Leakey family --- from grandparents Mary and Louis Leakey to their granddaughter Louise Leakey--- are described at: http://www.leakeyfoundation.org/foundation/f1_1.jsp

Academics:

The Database of African Theses and Dissertations (DATAD) is a program to improve management and access to African scholarly work. For a searchable database of African dissertations, see: http://www.aau.org/datad/

"Africa Research Central" is a searchable database (in French and English) that locates primary source repositories in Africa. The information available for each repository varies, but may include, in addition to contact information, access and holdings information, full-text articles, or photographs See http://www.africa-research.org/mainframe.html

Powerpoint:

Here is a resource that some may find useful. It provides powerpoint slides on a range of topics. I did a search for "foot biomechanics", and it provided 238 presentations!! Other searches, with the number of powerpoint presentations in parentheses are; ACL injury (145), back pain (over 1000), wheelchair (904), and gait (756). For details, see: http://www.slidebay.com/

A moment in history:

In 1923, Dr. Raymond Dart and his wife Dora traveled from Britain to South Africa, where Dart was to take up a new post as head of the Anatomy Department. He was thirty years old and later recalled, "I hated the idea of uprooting myself from what was then the world's center of medicine [University College, London]". In "Adventures with the Missing Link", Dart relates how two boxes of fossils were delivered to his house one Saturday afternoon in 1924, just as he was dressing for a wedding reception. Unable to contain his curiosity, he opened two boxes immediately. He later recalled, "a thrill of excitement shot through me. On the very top of the rock heap was what was undoubtedly an endocranial cast or mold of the interior of the skull. Had it been only the fossilised brain cast of any species of ape it would have ranked as a great discovery, for such a thing had never before been reported. But I knew at a glance that what lay in my hands was no ordinary anthropoidal brain. Here in lime-consolidated sand was the replica of a brain three times as large as that of a baboon and considerably bigger than that of an adult chimpanzee. The startling image of the convolutions and furrows of the brain and the blood vessels of the skull were plainly visible.

But was there anywhere among this pile of rocks, a face to fit the brain? I ransacked feverishly through the boxes. My search was rewarded, for I found a large stone with a depression into which the cast fitted perfectly.… I stood in the shade holding the brain as greedily as any miser hugs his gold, my mind racing ahead. Here I was certain was one of the most significant finds ever made in the history of anthropology. Darwin's largely discredited theory that man's early progenitors probably lived in Africa came back to me. Was I to be the instrument by which his 'missing link' was found?

For more info see: http://www.press.uchicago.edu/Misc/Chicago/284158_brain.html

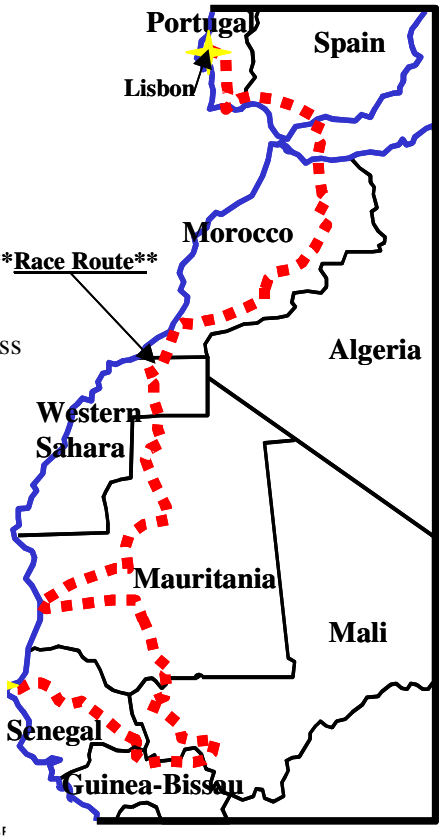
Dakar Rally Race 2006
Start date: 31 December, 20
End date: 15 January, 2006.

The Dakar Rally is the largest, most popular, and toughest off-road rally competition in the world. This year the rally started in Lisbon, Portugal, and travelled through Spain, Morocco, Mauritania, Mali, Guinea, and of course ended in Dakar, Senegal. With its popularity, the event enjoys worldwide TV and other media coverage. There are various categories for cars, trucks, motorcycles, quads, and sidecars. Just finishing the event is considered a great accomplishment!

Official rally web site: www.dakar.com

This year there were tragically two deaths---one being a spectator, and the other a competitor (the 23rd competitior to die in the history of the Dakar rally). Additionally, there were a number of musculoskeletal injuries suffered by competitors this year:

Knee injury
Wrist tendonitis
Broken ankle
Cranial trauma
Broken pelvis
Ruptured spleen
Neck injury
Broken arm
Broken rib
Knee lacertation
Dislocated left clavicle and brief loss of consciousness



Thanks to Jason Frampton, Cleveland, for contributing to this story.

Thesis Abstract Corner

Degree of Doctor of Philosophy in Orthopaedics
Faculty of Medicine, Mbarara University of Science and Technology, Uganda, East Africa.

The Biomechanics of Vertebral Compression Fractures and Cement Augmentation

Mark Makumbi Kayanja MD

Supervisors: Isador Lieberman BSc., MD, MBA, FRSC (C), Sam Luboga MBchB, MMed (Surg), PhD

The contents of this manuscript represent work that was performed from August 2001 – December 2004 on the biomechanics of vertebral compression fractures and polymethylmethacrylate augmentation on multilevel segments obtained from 61 spines.

The first objective was to determine if anterior vertebral strain and intradiscal pressure in multilevel segments could be used as indicators of load transfer. A method was developed of simulating osteoporosis and creating a vertebral compression fracture. The results showed vertebral strain and intra-discal pressure were indicators of vertebral load transfer, which was higher on the superior vertebra in compression and flexion. Extreme flexion led to strain concentration on the anterior vertebral shell till the point of fracture, as the posterior elements took up more and more strain. When the vertebral body fractured its stiffness was reduced, and further loading on the vertebra led to higher than normal strains. The next highest level of strain was on the superior adjacent vertebral body which may then have been predisposed to subsequent fracture.

The second objective was to determine if the biomechanical test method had an effect on the augmentation effect. The augmentation effect from the introduction of polymethylmethacrylate cement, through a kyphoplasty procedure, into a fractured vertebral body (augmentation) on segment stiffness, and segment strength was measured. The two methods showed different measurements but similar differences between segment stiffness and strength before and after augmentation. Additionally the multilevel thoracic segments that underwent kyphoplasty for a vertebral compression fracture demonstrated a higher range of motion for a given load following augmentation probably due to the concurrent posterior column injury sustained at the time of index fracture. This phenomenon partially explains the difficulty in obtaining 100% sagittal realignment following kyphoplasty for vertebral compression fractures.

The third objective was to determine if the introduction of polymethylmethacrylate cement into the centrum of the intermediate vertebral body prior to fracture altered multilevel segment stiffness or intermediate vertebral strain. The prophylactic augmentation did not significantly alter multilevel segment stiffness or strength. Multilevel segment stiffness changes when vertebral compression fractures occur. Augmentation of these index fractures may then lead to further changes in stiffness. A study was therefore performed to obtain serial stiffness and strength measurements with serial compression fractures. Repeated compressive fractures of multilevel segments gradually increased strength through compaction, and gradually reduced stiffness from trabecular disruption. This cadaveric model probably explained the clinically observed increase in thoracic kyphosis or reduction in lumbar lordosis seen following progressive vertebral compression fractures.

The fourth objective was to determine if the introduction of polymethylmethacrylate cement into a fractured segment improved segment stiffness and altered adjacent vertebral strain. Multilevel segments were tested before and after vertebral compression fractures augmented with cement measuring adjacent level vertebral strain and segment stiffness. There was increased load transfer through the centrum of the vertebra following augmentation that reduced adjacent vertebral strain. The index fracture occurred at the intermediate vertebra and the superior adjacent vertebra was then at risk of subsequent fracture. This risk of fracture in the superior adjacent vertebra was reduced following augmentation by load transfer through the augmented vertebra to the inferior adjacent vertebra.

The fifth objective was to determine the centrum distribution in multilevel segments. Using 2 and 4 level segments the contribution of the intervertebral disc was determined and was found to allow load distribution between the centrum and the vertebral shell, with greater centrum load in compression than flexion. In two adjacent vertebrae with an intervening disc, the centrum load was higher in the inferior vertebra and lower in the superior vertebra.

The sixth objective was to determine how adjacent vertebral strain and centrum load vary before and after vertebral compression fractures augmented with cement. Using multilevel segments adjacent vertebral strain and centrum load were measured before and after an index vertebral compression fracture that was augmented with cement in both normal and osteoporotic segments. Osteoporosis reversed the load distribution between vertebral centrum and vertebral shell. Higher vertebral shell strains associated with lower centrum load occurred increasing the risk of fracture, and this risk was further compounded by flexion. Cement augmentation restored stiffness to the immediate pre-fracture levels but did not completely restore stiffness to normal. Through the augmentation process the centrum load bearing pathway was activated normalizing the load transfer pattern to that observed in normal segments thus preventing adjacent level fractures. By constraining high risk flexion and lowering applied loads to the spine subsequent fractures can most likely be prevented.

The changes in stiffness and strength that occur from one, two and three level augmentations were studied in the seventh objective. The stiffness of the multilevel segment appeared dependent upon the vertebral body-inter-vertebral disc complex. Stiffness and strength increased with BMD and were not significantly altered by the number of levels of PMMA augmentation. There was therefore a biomechanical basis for the clinical extension of cement augmentation to include adjacent collapsed vertebrae or adjacent vertebrae sandwiched between previously augmented ones.

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Nelson Mandel and Sport

Exerpts from “In the words of Nelson Mandela” by Jennifer Crwys-Williams

I did not enjoy the violence of boxing as much as the science of it. (p. 18)

When I left the stadium my nerves were completely shattered. (p. 100, where he was referring to the 1995 Rugby World Cup). Two years later he told the New York Times, “*I’m still recovering*!”

I have always believed that sport is a right, not a privilege. (p. 107)

Upcoming conferences in Africa

April 2-5th 2006: 8th World Conference on Injury Prevention and Safety Promotion conference, Durban, South Africa

Note: three tracks relate to the field of biomechanics:

- Track 3: Workplace, Institutional And Home Safety (Incorporating Workplace Injuries, Work Safety and Health and Home and Institutional Safety)
- Track 4: Trauma Management, Rehabilitation And Disaster Management (This track includes rehabilitation models and technologies, and traumatology.)
- Track 5: Leisure Related, Sport And Product Safety (Incorporating Sport and Leisure-related Safety and Product Safety)

For more information: http://www.safety2006.info/

April 10-12th 2006: International conference on sport and development.
Note: this is being organized jointly by the University of the Western Cape (UWC), in collaboration with the Katholieke Universiteit Leuven and the Universiteit Gent.
For more information: http://www.uct-cmc.co.za/conferences/2006/intsportdev/info.php

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June 14-17th 2006: 4th International Trauma Congress, Durban, South Africa
For more information: http://www.traumasa.co.za/TraumaCongress/

September 7-8th, 2006: 3rd Africa Downunder Conference, Perth Australia.
For more information: http://www.africadownunderconference.com/
Note: information from this website includes the following, "Don't get left behind in a cloud of dust: There are limited presentation and sponsorship slots still available for the 3rd Africa Downunder Conference to be held in Perth this spring. This phenomenally successful event serves as a melting pot for Australians and Africans in the resources industry – and is it is the only conference of its kind specifically designed as a hook-up venue for the two continents."

September 12 –16th 2006: The 24th International Congress of Radiology, Cape Town, South Africa
For more information: http://www.isr2006.co.za/

September 11-13, 2006: The Sixth IASTED International Conference on Modelling, Simulation And Optimization ~MSO 2006~, Gaborone, Botswana

For more information: http://www.iasted.org/conferences/2006/Botswana/mso.htm

MODELLING, SIMULATION, AND OPTIMIZATION

TUTORIAL SUBMISSIONS

For this conference, individuals are encouraged to submit a tutorial topic related to Modelling, Simulation and Optimization. Tutorial proposals should clearly indicate the topic, background knowledge expected of the participants, objectives, time allocations for the major course topics, and the qualifications of the instructor(s). Tutorials should be three hours in length.

Editor's note: Botswana is about the size of France or Kenya, but its low population density has ensured that its beautiful wilderness has remained unspoiled. Botswana is also home to 120,000 migrant elephants – the largest elephant population in the world. The Kalahari Desert covers 84% of the country, yet in the midst of this desert is the world's largest inland delta. The Okavango Delta is a breathtaking labyrinth of lagoons, lakes, and hidden channels covering an area of 17000 km².

The Okavango Delta

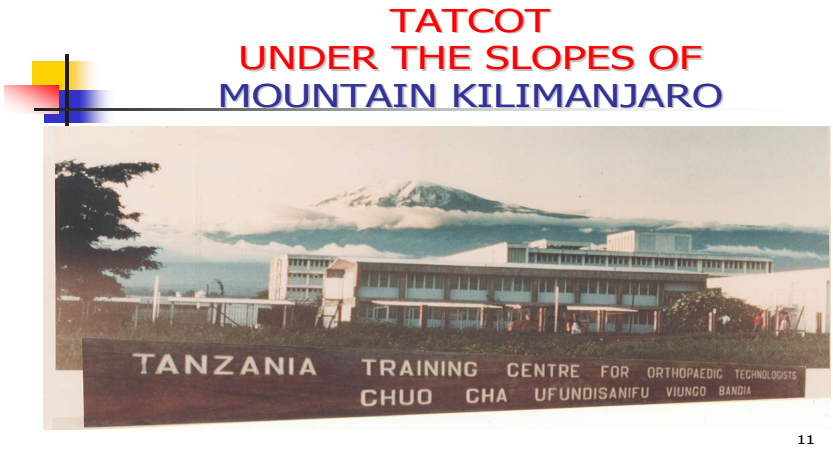
December (3-7th 2006: 19th World Diabetes Congress, Cape Town, South Africa.
For more information: http://www.idf2006.org

TANZANIA TRAINING CENTRE FOR ORTHOPAEDIC TECHNOLOGISTS
KCMC-MOSHI, TANZANIA

1 Tanzania Training Centre for Orthopaedic Technologists "TATCOT":

TATCOT was founded in 1981 with material, financial and human resources support from the Government of the United Republic of Tanzania and the Federal Republic of Germany. The initial objective of establishing the centre was to train and qualify technical orthopaedic professionals within East Africa, i.e. Kenya, Uganda and Tanzania with adequate knowledge and skills to fit disabled people with different types of orthoses and prostheses.

After the first three years of its operation, there were an increasing number of applicants to the course from many English speaking countries. The school now represents one of the first supra-regional training centers in orthopaedic technology in Africa. The different courses offered at the centre are accredited and recognized by both the International Society for Prosthetics and Orthotics (ISPO) and the World Health Organization (WHO).



2 The Objective

The present objective of the centre is to offer short and long-term courses with a broad range of subjects including clinical examination of disabled people and individual evaluation for prescription of the appropriate device/appliance. The graduates of the different causes are expected therefore to:

- Acquire a clear concept of the role and responsibilities of professionals towards disabled people, colleagues, the clinical team and nationally.
- Gain sufficient levels of theoretical knowledge and practical competency to efficiently and safely discharge her/his professional duties.
- Know how to use locally available materials and adapt the technology appropriately.
- Be able to operate and maintain orthopaedic tools, machines and common workshop equipment.

3 Courses Offered:

The centre offers the following short and long-term training programs such as:

- One year certificate course in Lower limb Prosthetic Technology (LLPT).
- One year certificate course in Lower limb Orthotic Technology (LLOT).
- One year certificate course in Wheelchair Technology (WTTC).
- Other tailored courses of up to six months duration.

TATCOT has also developed a B.Sc. Degree under the Faculty of Rehabilitation Medicine of Kilimanjaro Christian Medical College – a constituted college of TUMAINI University. The main objective of the course is to enable the qualifying student to have a high level of professional competence in the following main areas in prosthetics and orthotics:

- Clinical practice in Orthotics and prosthetics science
- Training and Education
- Research Activities
- Community Activities
- Consultancy Activities

To qualify for B. Sc Degree in Prosthetics and Orthotics course, candidates should meet one of the following requirements

- Have an A- level certificate (A.C.S.E) with three principal passes (i.e. not lower than 4 points) in any of the science subjects, such as Physics, Chemistry, Biology, Mathematics
- Hold a qualification equivalent to the above from an institution recognized by college
- Have a recognized Diploma in Orthopaedic Technology. Candidate holding a diploma in Orthopaedic Technology from an approved and recognized institution will be considered for admission into the course, provided they have obtained distinction (i.e. B grade or above) in Mathematics, Mechanics, Biomechanics, Pathology, Prosthetics and Orthotics practice.

4 Academics:

All the theoretical teaching are carried out within the school by both full time academic staff or part-time teachers from neighboring colleges. Most of the practical instructions for the first and second year students is carried out within the centre whereas the clinical work for the third years is carried out at the Consultant Orthopaedic Centre which is attached to the school. The third year students are sent to various Orthopaedic Centers within the country for their field work for 6 weeks. Supervision is done by both Regional Orthopaedic Technologists in consultation with TATCOT staff.

The school is managed by a team of academic and supporting staff. The academic staff is composed of thirteen full-time and five part-time tutors. The center is mainly funded by the Ministry of Health of the United Republic of Tanzania. Local students participate in a cost sharing scheme whereas foreign students are either sponsored by their respective government or sponsored by foreign organizations, e.g. USAID, World Health Organization (WHO), Swedish Organization of Handicapped, Norwegian Agency for Development Co-operation (NORAD), and others.

5 Orthopaedic Centres in Tanzania

The centre has in collaboration with regional hospitals throughout Tanzania, e.g. Muhimbili Orthopaedic Centre (MOI), Kilimanjaro Christian Medical Centre, Bugando Referral Hospital and many others.

6 Collaborations

TATCOT as a training institution, it has been collaborating with other institutions such as World Health Organization (WHO), Internationale Weiterbildung Und Entwicklung (InWent), International Society of Prosthetics and Orthotics (ISPO), United States of America Aids Agency (USAID), International Committee of Red Cross (ICRC), Handicap International, National Center for Training and Education In Prosthetics and Orthotics (NCTEPO), Don Bosco University (El- Salvador), Otto Bock (Germany), and with many other organizations throughout Africa as well as in Vietnam, China, and Jordan.

7 Research

Recently the centre has embarked on research projects on specific areas, e.g. survey and field evaluation on orthopaedic services and devices to suit the needs of non industrial countries. Some of them are: TATCOT foot, TATCOT Wheelchair, Walking canes, Mechanical Orthopaedic joints, Jaipur foot and knee joint, Water Casting versus Sand Casting Techniques.

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Medical Imaging in South Africa: from Allan MacLeod Cormack to Herman Potgieter

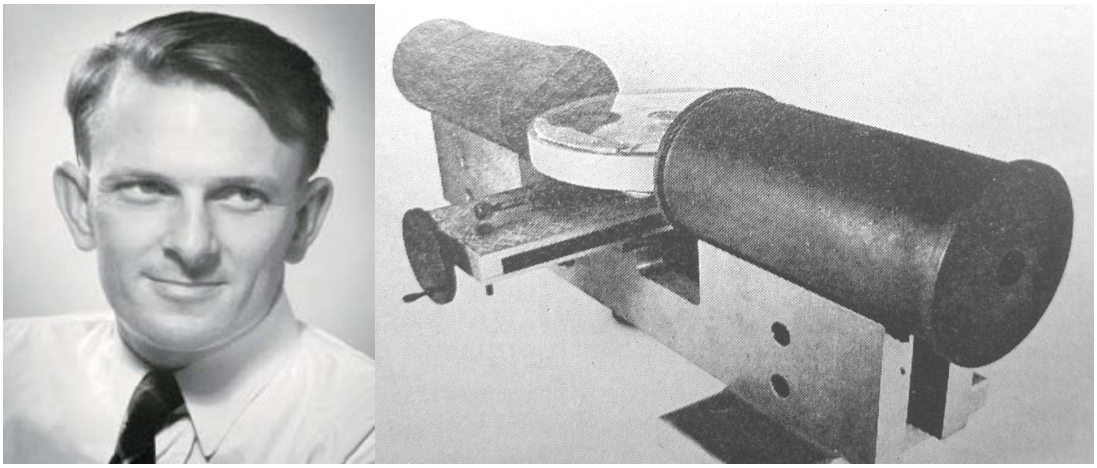
Allan MacLeod Cormack (1924 – 1998) was the joint winner (with G.N. Hounsfield) of the1979 Nobel Prize in physics. He studied physics as an undergraduate student at the University of Cape Town---about 1 mile away from where he was a high school student at Rondebosch Boys High School. After moving to England to further his studies at Cambridge University, he moved back to Cape Town in 1955 to work as a nuclear physicist at one of South Africa's major teaching hospitals, Groote Schuur Hospital. During his stay there, he encountered the problem of locating a tumor in 3D space. "It was immediately obvious that ithe problem was a mathematical one. If a fine beam of γ rays of intensity I_o is incident on the body and the emerging intensity is I, then the measurable quantity

$$G = \ln(I_o / I) = \int_L f.ds$$

where f is the variable absorption coefficient along the line L. Hence, if f is a function in two dimensions, and g is known for all lines intersecting the body, the questions is, "can f be determined if G is known?"

In the case of the team headed up by Herman Potgieter, the question was very different, and more along the lines, "Can we develop an X-ray device that can scan mine workers who may have swallowed precious gems or hidden diamonds in their shoes---without subjecting anyone to harmful levels of radiation? The result of this work (done at De Beers corporation) is now the basis for new medical imaging technology ("Lodox") that cuts radiation exposure by up to 75 percent.

Potgieter's approach was to place a slotted tungsten plate over the X-ray tubes to prevent photon "scatter", and to use 12 digital CCD cameras to record photons in 680-millimeter-wide swaths. Two sweeps down the full length of a person's body results in a map showing anything from gems to shrapnel or internal injuries. According to a 2005 article written by Maurice McDowell (see http://dataweek.co.za/), "in terms of medical breakthroughs of South African origin, [the development of Lodox] more than compares to the pioneering work carried out by Professor Allan Cormack".



Allan Macleod Cormack (left) with his CT scanning device (right).

Thanks to Kit Vaughan and Michael Wyeth (University of Cape Town) who provided information related to Allan Cormack's discovery.

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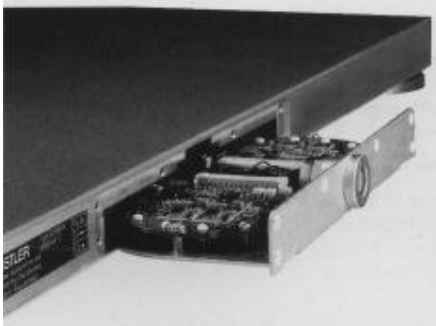

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