

## South Africa Member of AIHTC (1) Overview

(Greenwich Mean Time, UTC/GMT+2, Population: 59 million)

### 1. Organizations

South Africa has no specific heat transfer and/or thermal science societies and most scholars conducting heat transfer research are members of the South African Institute of Mechanical Engineers (SAIMEChE) or the South African Institution of Chemical Engineers (SAIChE).

### 2. Major Meetings

There are no regular national meetings dedicated to heat transfer and thermal sciences. However, contributions on heat transfer and thermal sciences can be presented at the South African Conference on Computational and Applied Mechanics (SACAM) which takes place every two years. Further, 15 major international conferences under the auspices of HEFAT (International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics) have been organized from South Africa since 2002 by Prof Josua Meyer. Four of these conferences were presented in South Africa. The next HEFAT2022 conference has been scheduled for 8 – 10 August 2022 in Amsterdam. The conference website is available on: [hefat2022.org](http://hefat2022.org)



South Africa was also selected by the AIHTC as venue for the next 17<sup>th</sup> International Heat Transfer Conferences (IHTC17); which is considered as the “Olympics of Heat Transfer” and is being presented only every fourth year. The conference was scheduled to be presented in Cape Town in August 2022. Because of the Covid-19 international travel restrictions the conference has been postponed to 3 – 7 July 2023. The conference website is available on: [IHTC17.org](http://IHTC17.org)



### 3. Major journals

There are no South African journals dedicated to heat transfer or thermal sciences. However, articles on heat transfer and thermal sciences are accepted for publication in the accredited R&D Journal of the SAIMEChE. Most scholars publish their work in well-established English journals listed on the International Scientific Index (ISI) and/or articles listed by Scopus. Articles published in these journals earn funding from the Department of

Education that subsidizes most universities in South Africa. At many universities financial incentives exist to publish in journals with high impact factors.

### 4. Education (undergraduate and postgraduate studies)

South Africa has 27 universities of which many offers engineering. The quality and standards vary but the quality of the below eight universities are very high as these Universities has been accredited by the Engineering Council of South Africa (ECSA). Since ECSA is a signatory of the Washington Accord the programmes are accepted for professional registration via the International Engineering Alliance in the following 20 countries: Korea, Russia, Malaysia, China, South Africa, New Zealand, Australia, Canada, Ireland, Hong Kong China, Chinese Taipei, Singapore, Sri Lanka, Japan, India, United States, Turkey, United Kingdom, Costa Rica, Pakistan and Peru.

University of Cape Town  
University of Kwazulu-Natal  
Nelson Mandela Metropolitan University  
North-West University  
University of Pretoria  
University of Johannesburg  
University of Stellenbosch  
University of the Witwatersrand

All the above universities present four-year bachelor's degree, followed by a honours and/or masters and then a PhD-degree.

### 5. University System

The Council on Higher Education (CHE) is an independent statutory quality council for South African higher education. Its vision is to “... lead and manage quality assurance; research and monitor trends and development; initiate critical discourse on contemporary higher education issues; and provide advice to the Minister on strategy and policy. The main areas of work of the CHE are to: provide advice to the Minister of Higher Education and Training on all higher education matters on request, and proactively; promote a system of quality assurance for all higher education institutions, including private providers of higher education, which focuses on programme accreditation, institutional audits, national reviews, standards development, quality promotion and capacity development; monitor the state of higher education and publish information regarding developments in higher education on a regular basis; and contribute to the development of higher education through intellectual engagement with key issues in a number of activities in partnership with relevant stakeholders”.

The academic ranks at most universities are junior lecturer, lecturer, senior lecture, associate professor and professor. Tenure is commonly awarded after 2 years since the appointment. The mandatory retirement age is 65. In some exceptional cases further contract appointments are made. Retired professors are usually appointed after retirement as “emeritus professors” and may continue conducting research and supervision of postgraduate students.

### 6. Foundations of Scientific Research

The only general foundation of research support is the National Research Foundation (NRF). It is an independent statutory body that funds research, high-end human capacity and critical research infrastructure to promote knowledge production across all disciplinary fields. Funding levels are usually very low and therefore most scholars rely on international research foundations and industry for research funding.

### 7. Major Public/Private Research Institutes

Most research in heat transfer is conducted by individuals or research groups within universities. Usually in programmes that offers mechanical-, chemical- and/or nuclear engineering.

by Prof Josua P Meyer (University of Pretoria) and Prof Jat du Toit (North-West University)

**South Africa, Member of AIHTC (2)**

**1. 17<sup>th</sup> International Heat Transfer Conference - IHTC17**

Jat du Toit

**2. 13<sup>th</sup> South African Conference on Computational and Applied Mechanics**

**SACAM 2024**

Jaap Hoffmann

**1. 17<sup>th</sup> International Heat Transfer Conference (IHTC17)**



**Jat du Toit**, Unit for Energy and Technology Systems, North-West Univ., Potchefstroom, jat.dutoit@nwu.ac.za

The 17<sup>th</sup> International Heat Transfer Conference (IHTC 17) was held in the Cape Town International Convection Centre in Cape Town from 14 to 18 August 2023. It was originally scheduled to take place in 2022. However, due to the uncertainty whether the COVID-19 pandemic would make a face-to-face conference possible, it was postponed to 2023. IHTC 17 was organised and hosted by the International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT) under the auspices of the Assembly for International Heat

Transfer Conferences (AIHTC). IHTC 17 was supported by the South African Institution of Mechanical Engineers, the International Centre for Heat and Mass Transfer (ICHMT) and the American Society of Thermal and Fluids Engineers (ASTFE).

A total of 621 persons comprising general registrants, keynote speakers, plenary speakers, sponsors and exhibitors, and accompanying persons attended IHTC 17. The contributions included the Fourier lecture, 5 Award lectures, 7 Panel discussions, 26 Keynote lectures, and 27 Poster sessions encompassing 475 Poster presentations.

In the Fourier lecture presented by the President of AIHTC, Prof Xing Zhang, he dealt with nanoscale thermal measurements – new challenges and opportunities. The 2022 Luikov medal was awarded to Prof Renato Cotta and in his plenary lecture he focussed on hybrid numerical-analytical approach in transport phenomena: bridging the best of both worlds. Prof Chang-Ying Zhao was the recipient of the William Begell medal and in his plenary lecture he considered micro/nanoscale thermal radiation: fundamentals and applications abstract. The recipient of the Nukiyama Memorial Award was Prof Junichiro Shiomi who dealt with exploring thermal functional materials through massive parameter-space search in his plenary lecture. The first of two AUTSE Young Scientist Awards was awarded to Dr Aoran Fan. Unfortunately, Dr Fan could not receive the award personally and her plenary lecture in-situ multi-physical field measurement and multidisciplinary optimisation for power devices was presented on her behalf by Prof Xing Zhang. The second AUTSE Young Scientist Award was awarded to Dr Yutaku Kita who presented a plenary lecture on predicting spray quenching: progress and challenges.

The 7 Panel discussions addressed: (i) multiphase flow for energy systems; (ii) towards the next-level thermal engineering optimisation; (iii) green transformation (GX) for carbon neutrality; (iv) AI applications to heat transfer; (v) battery thermal management – recent trends and future challenges; (vi) thermal management; and (vii) heat and mass transfer needs in next generation solar energy. The panels consisted of leading experts and the discussions were insightful.

A total of 26 keynote lectures delivered covering a wide range of topics. Topics such as waves and rivulet formation in isothermal and heated falling liquid films; the role of the liquid film characteristics on the heat transfer process during flow boiling and convective condensation; heat and mass transfer in droplet flows: from advanced measurements to models; exploring heat transfer mechanisms in laminar flows: from jet impingement to micro-scale phenomena; refrigerant charge reduction in heat pumps with propane and the influence on heat transfer and heat exchanger design; lithium-ion battery cells, from characterisation to thermal management; and modelling heat and mass transfer phenomena in nanostructured materials for energy applications, were addressed in the keynote lectures.

The presenting author of each of the 475 posters got the opportunity at the beginning of the relevant poster session to give brief 2-minute oral presentation on the gist of the poster. To accommodate all the posters three poster sessions were run in parallel with a total of 27 poster sessions over the five days of the conference. To arrange the poster sessions the poster papers were sorted into 52 subject areas including amongst others air conditioning and

refrigeration; energy efficiency; inverse problems; numerical simulation; two-phase, bubble flow and water film; and thermal storage. Many lively discussions took place around the posters which were in many instances continued during the coffee breaks and lunches. During the conference dinner, for the first time, certificates were given to the authors of the best poster in each poster session based on a review of the papers accepted for inclusion in the proceedings.

During the opening ceremony the attendees were entertained by a choir from the University of Cape Town singing a number of traditional South African songs. A troupe from Cape Town treated the diners during the conference dinner to feast of dancing, acrobatics and songs expressing the heart and soul of Africa. A number of the attendees had the privilege to visit the Department of Mechanical and Mechatronic Engineering at the University of Stellenbosch and be exposed to the facilities and the research activities.

It can be concluded that IHTC 17 was a resounding success and a wonderful opportunity for the exchange of ideas and the forging of ties.

**2. 13<sup>th</sup> South African Conference on Computational and Applied Mechanics (SACAM 2024)**



**Jaap Hoffmann** Dept. of Mech. & Mechatron. Eng., Univ. Stellenbosch, hoffmaj@sun.ac.za

The 13<sup>th</sup> South African Conference on Computational and Applied Mechanics (SACAM 2024) will be held on 22 and 23 January 2024 at STIAS Wallenberg Centre in Stellenbosch.

SACAM is a premier international conference on Computational and Applied Mechanics on the African continent that attracts local and international participants. SACAM is held every two years under the auspices of the South African Association for Applied Mechanics (SAAM) as a forum for presenting current computational and applied mechanics developments. The main function of SACAM is to bring together engineers, scientists and applied mathematicians from academia, research institutions and industry to encourage scientific engagement and exchange of ideas in applied and computational mechanics. The conference covers a wide range of topics which include thermodynamics and heat transfer, both from thermal-fluids and solid / structural mechanics perspectives. SACAM 2024 will, amongst others, include a keynote on the thermal-hydraulic behavior of a micro modular prismatic block nuclear reactor during a depressurized loss of forced coolant (DLOFC) event and the associated scam of the reactor.