THE CATSA BULLETIN – 2024

The official newsletter of the Catalysis Society of South Africa

149-462 NPO | Champagne Sports Resort, Central Drakensberg KwaZulu-Natal, South Africa | Issue IX November 2024

Welcome to CATSA 2024

The 34th annual meeting of the Catalysis Society of South Africa (CATSA) is held in the lovely Drakensberg's Champagne Sports Resort, a conference venue with an on-site golf course. The conference is themed: "Advancing Innovative Catalysis". The local organising committee (LOC) is excited to announce that Prof. Ben L. Feringa (Nobel laureate 2016) is the conference's plenary speaker. The LOC is overwhelmed by the positive response to the call for this conference and we are at full capacity. All delegates will be accommodated in either hotel rooms or chalets, all situated on the Champagne Sports Resort premises. We received a great number of abstracts on the exciting work done in the field of biocatalysis, electrocatalysis, heterogeneous catalysis and homogeneous catalysis in Africa.

The annual meeting is not only a place for intellectual exchange, but also a place to meet your colleagues in the field of catalysis and start new collaborations. We have put together an interesting social program to ensure that the participants will meet each other over the 4 days of the conference.

The LOC for the 34th annual Meeting of the Catalysis Society of South Africa is happy to host you at Champagne Sports Resort on 03-06 November 2024.

Reinout Meijboom - Conference Chair (CATSA2024)

Prof. Reinout Meijboom
University of Johannesburg
Chairperson
CATSA2024 conference

Prof. Ben Feringa
University of Groningen
CATSA 2024 Eminent Visitor

From the Chairperson of CATSA

Prof. Cornie van Sittert,
Chairperson of CATSA

Dear member of the Catalysis Society of South Africa,

Another year has passed, and we gather again for our annual national conference. The annual CATSA conference is a highlight for many South African researchers in catalysis. It serves as a hub where new research networks are established, existing ones are strengthened, and colleagues transform into friends.

Interest in our Society and annual conference remains strong locally and internationally. On the latter, the UK Catalysis Hub approached us with a proposal to promote international interaction in all areas of catalysis. Locally, the attendance at our annual conference is continuously growing, and in 2023, potential delegates were turned away due to venue capacity limits.

Within CATSA, we are witnessing a remarkable growth of young talent, a testament to our Society's promising future. Four of our young South African researchers received the International Association of Catalysis Societies (IACS) 2024 Awards to attend the International Congress on Catalysis, ICC 2024. Additionally, the committee awarded five international travel grants, further nurturing the potential of our young members.

The 2024 CATSA Committee

During the Annual General Meeting (AGM) of the Society, held during the 2023 annual conference, new members to the 2024 CATSA Committee were elected for a two-year term. The new committee is as follows:

Chairperson | Cornie van Sittert (NWU)
Secretary | Nico Fischer (UCT)
Treasurer | Marilé Landman (UP)
Media Officer | Zama Duma (CSIR)
2024 Conference Chair | Reinout Meijboom (UJ)
Student Representative | Estefan van Vuuren (UP)
Francois du Toit (Clariant)
Selwyn Mapolie (SU)
Linda Jewel (UWC)
Mzamo Shozi (UKZN)
Holger Friedrich (UKZN)
Thelma Ngwenya (MINTEK)
Mabuatsela Maphoru (TUT)
Thirusha Naicker (SASOL)
Charles Noakes (Poretech)

Furthermore, we are privileged to welcome our eminent visitor of 2024, Professor Ben Feringa. He is a distinguished researcher in organic synthesis who specializes in molecular nanotechnology and homogeneous catalysis. He was the 2016 Nobel Prize laureate in Chemistry for “the design and synthesis of molecular machines."

However, none of the highlights mentioned above would have been possible without the founding of CATSA. This year, we are proud to recognise one of the founding members of CATSA, Professor Manie Vosloo, by awarding him the CATSA Lifetime Achievement Award. His significant contributions to the field of catalysis, both in research and in the training and education of researchers, serve as an inspiration to us all.

Lastly, I would like to express my gratitude to the LOC for their hard work, to the sponsors for their continued support, to all colleagues who have generously contributed their time to the growth and well-being of our Society, and to all of you for your continued support of CATSA.

Cornie van Sittert *(NWU)* – Chairperson of CATSA

Prof. Manie Vosloo *CATSA2024 Lifetime Achievement Award Recipient*

CATSA 2023 overview

Prof. Norah de Leeuw *CATSA2023 Eminent Visitor*

CATSA2023 was held from 05-08 November 2023 at the Diaz Beach Resort in Mossel Bay. The conference was well attended, and we had 260 delegates, of which 46% were students.

The eminent CATSA visitor gave the opening talk at the conference, with keynote addresses by experts in the various sub-disciplines (Bio-catalysis: Dean Brady; electrocatalysis; Priscilla Baker; DFT: Cornie van Sittert; heterogeneous catalysis: Holger Friedrich and homogeneous catalysis: Banothile Makhubela). As usual, a large portion of the program was filled with students telling us about their results and the implications. CATSA celebrates academic excellence and the prize for the best oral presentation went to Ms. Candace Eslick, University of Cape Town (UCT), for her presentation “Conversion of DME to gLPG over a Pd/Beta zeolite”. The poster sessions were given prominence in the program and were well attended resulting in a vibrant atmosphere around the posters, as well as direct interaction with the sponsors and exhibitors at the conference. The winner of the best poster presentation prize went to Ms. Riyazah du Toit (UCT).

Candace Eslick *(UCT), Best Student Oral Presentation, CATSA2023*

Riyazah du Toit *(UCT), right, Best Student Poster Presentation, CATSA2023*

The annual meeting of the Catalysis Society of South Africa is not only an academic event, but also to get to know the various researchers in the field in South Africa. Thus, social events form an integral part of CATSA conferences. For the 2023 conference, the LOC, organised a variety of events to cater for the diverse CATSA community starting on Sunday with a student challenge going back to old school games, followed by a successful pub quiz (showing most of the delegates that they need each other to find all the answers). The traditional Poretech challenge (this year the Kubb stick game) was held at the end of the Monday of the conference (which was won by the team from the University of Bayreuth with Sasol coming 2nd). This was followed by an evening of karaoke. On Tuesday, the conference had its traditional, glamourous banquette.

Conferences, like the CATSA conference, are not possible without the great support from our sponsors. We would like to thank the gold sponsors, Poretech, Clariant, Hidden Analytical, Anton Paar, and Verder Scientific, the silver sponsors, Sasol and Specsgroup, and the bronze sponsors and donors, CSIR, HySA and Bruker. Organising the conference is not the work of one, but of a whole group of people, and I would like to thank all the committee members for the amount of time and work they have put into making a successful conference.

Eric van Steen *(UCT)* – Conference Chair (CATSA2023)

Outlook CATSA2025

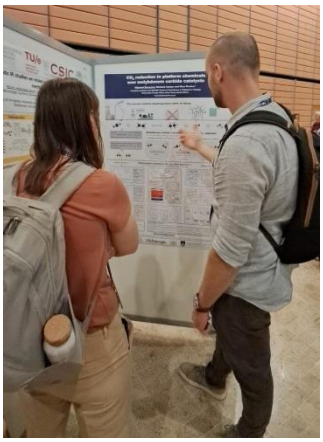
***Profs. Linda Jewell (left) and Xinying Liu (right)**, Co-Chairs of CATSA2025*

The 35th annual conference of the Catalysis Society of South Africa, CATSA2025, will be hosted by the Institute for Catalysis and Energy Sustainability (ICES) from the Department of Chemical Engineering at the University of South Africa (UNISA). Co-chaired by Professors Linda Jewell and Xinying Liu, the conference's theme is "Using catalysis to Solve the United Nations Sustainable Development Goals (UN SDGs)" where the Eminent Visitor will be Professor Angeliki Lemonidou from the Aristotle University of Thessaloniki. Prof. Lemonidou's research focus is the development of nano-structured materials for the transformation of hydrocarbons and bio-based compounds. The conference will be hosted in Magalies Park Resort , 09-12 November 2025, where around 300 delegates are anticipated to be in attendance.

***Prof. Angeliki Lemonidou,** Aristotle University of Thessaloniki, CATSA2025 Eminent Visitor*

International Congress on Catalysis

Four members of CATSA received the Young Researcher Support Award from the IACS to attend the 18th ICC in Lyon, France. UCT's Dr. Wijnand Marquart and Mr. Lindokuhle Ngema, presented posters titled "CO_2 reduction to platform chemicals over molybdenum carbide catalysts" and "Mo_2C catalyst screening for the reverse water-gas shift reaction" whereas Miss Monique van den Berg's poster North-West University (NWU) was titled "Bimetallic nickel nanoparticles as catalysts for HER – A DFT study".

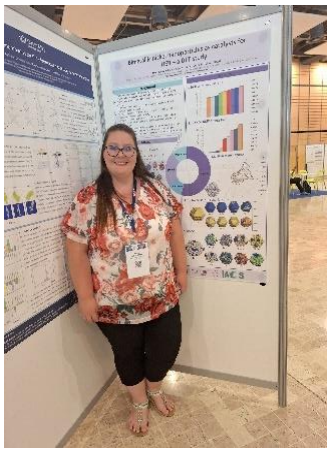


***Wijnand Marquart,** right (UCT)*

***Sanele Moloi** (UCT)*

When asked about their voyage the researchers reported: It was a privilege to attend the 18th ICC, hosted by the French catalysis community in Lyon, France, from 14-19 July 2024. We are deeply grateful to IACS for their generous support, awarding us the ICC-2024 Young Researcher Support award, which made our participation possible.

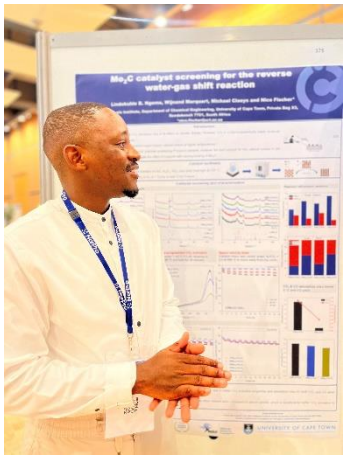
Poster presentations were delivered by Dr. Marquart, Ms. van den Berg and Mr. Ngema, while Mr. Sanele Moloi (UCT) gave a short oral presentation. These presentations fostered comprehensive engagement with researchers from around the world, providing valuable opportunities for collaboration. The 18th ICC brought together 2250 researchers from across the globe. The scientific program included five plenary lectures, three award lectures, 25 keynote lectures, over 500 (short) oral presentations, and 1500 posters covering 32 different scientific topics. These ranged from molecular catalysis, computational catalysis, characterization of catalysts, surface sciences, photo catalysis, CO_2 conversion and much more. Plenary talks were delivered by Prof. Umit Ozkan, Prof. Keiichi Tomishige, Prof. Jeroen A. van Bokhoven, Prof. Ulrike Diebold and Prof. Thomas Maschmeyer, all showcasing the exciting progress their research groups have made in addressing global challenges through catalysis.



***Monique van den Berg** (NWU)*

Mr. Moloi presented his short oral lecture titled "*Effect of alumina support modifiers on the activity and selectivity of Ru-based Fischer-Tropsch synthesis catalysts*" during the "Catalysis in refining and petrochemistry: current and future trends" session on Monday, 15 July. His presentation was well-received, with excellent feedback from the audience. We would like to sincerely thank CATSA, ICC and IACS for their support and making our trip to the 18th ICC in Lyon possible. The conference provided an invaluable platform for us to connect with researchers from diverse backgrounds and to share our insights on catalysis research. We highly encourage our fellow CATSA students and postdocs to apply for the next IACS Young Researcher Support award to attend the 19th ICC in 2028 which will be hosted in Kyoto, Japan.

The purpose of the CATSA student travel grant is to promote the development of young scientists and engineers by supporting students in catalysis to present their research at international scientific conferences of note. Moreover, in this manner, CATSA aims to actively promote South African catalysis expertise in the international arena. The grant will assist the student with a fixed amount that may be applied towards the costs of conference registration, travel and subsistence. This year, a total of five international travel awards were granted to students from various institutions in the country.

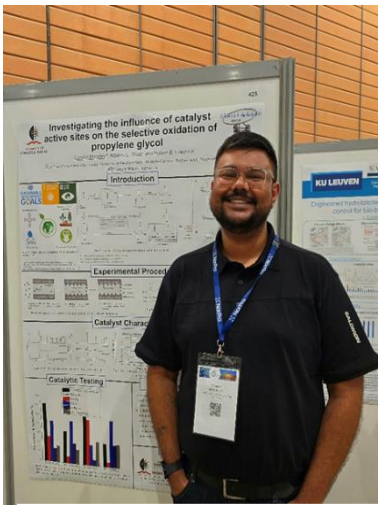


***Lindo Ngema** (UCT)*

Nicholas Featherstone: I had the privilege of attending the 18th ICC in Lyon, France from the 14th to the 19th of July 2024, thanks largely to the contribution made by CATSA. I was fortunate enough get an oral presentation to present a section of my PhD work titled: "Improved activity in CO_2-hydrogenation over iron-based catalysts upon in-situ dosing of water" based on a particularly interesting observation made whilst investigating something entirely different. The conference took on the slogan "Roots and Wings for a Better World" and certainly lived up to the idea with a wide range of interesting fundamental scientific talks into many interesting discussions with industrial partners in the exhibition booths, and everything in between; it really did show the importance of every step of the process. At the conference there were many scientific topics of interest, though it is most interesting to note that the area of research which I focus on, CO_2-conversion, was the largest, with ten sessions across the parallel sessions running. A large amount of interesting work was presented on, and I learnt a huge amount about photocatalytic conversion of CO_2 as well as methanol synthesis, two topics relevant to my work though ones that I could not previously have said to know much about. My talk itself garnered much attention, I received many questions running into the tea break after my session, amusingly, I seemed to have a queue of people wanting to talk to me, something I certainly have never had before, there were many fantastic suggestions of things to look further into and several thought-provoking questions which will surely help me strengthen my arguments going forward. Perhaps the most notable experience of the congress was seeing how well South Africa science stacks up against our international colleagues, who are reliant on more funding and synchrotron work and yet express no amount more insight than we are capable of, CATSA as well as the many institutions involved in catalysis in South Africa can take real pride in the quality of our work and contributions to the wider body of knowledge.

***Nicholas Featherstone** (UCT)*

Cheslin Moodley: From July 14th to 19th, I attended the 18th ICC in Lyon, France. This gathering brought together 2332 delegates from 67 countries, fostering a rich exchange of knowledge and expertise. The conference featured 510 oral presentations, including 33 invited talks, and 1371 posters, showcasing the breadth and depth of research in the field. Plenary sessions covered a wide range of catalysis topics, from electrocatalysis and thermocatalysis to advanced spectroscopic techniques and biomass conversion. These presentations were clear and informative, effectively bridging fundamental concepts with practical applications and cutting-edge characterisation methods. For me, a particular highlight was Keiichi Tomishige's plenary on heterogeneous catalysis for biomass-based platform chemicals, which offered valuable insights directly relevant to my own research.



***Cheslin Moodley** (UKZN)*

Participation in parallel sessions focused on acid-base catalysis, catalyst preparation, metal and metal oxide catalysis, biomass conversion, and carbon dioxide utilisation. These sessions provided opportunities to engage with both established researchers and PhD students, giving valuable perspectives on catalyst design and characterisation. The wealth of ideas presented will significantly contribute to the advancement of my PhD research and inspire future endeavours.

I presented a poster entitled "Investigating the influence of catalyst active sites on the selective oxidation of propylene glycol." The poster generated fruitful discussions and constructive feedback, leading to new insights into catalyst design, reactor optimization, and data interpretation. Networking with other researchers (KIT/IKFT - Germany, Monash University - Australia, University of Namur - Belgium and the University of Cape Town - South Africa) working on advanced catalyst characterisation techniques and biomass

derived products further broadened my understanding of the field. I extend sincere gratitude to my supervisors, Prof. Holger B. Friedrich and Dr. Mzamo L. Shozi, for their unwavering support. Additionally, I acknowledge the combined financial contributions of the National Research Foundation (NRF) of South Africa, the University of KwaZulu-Natal (College of Agriculture, Engineering and Science), and CATSA, which made my participation possible. I am eager to apply the knowledge gained at the congress to contribute to the growing body of catalysis research and ultimately shape a more sustainable future.

The 13th edition of the Natural Gas Conversion Symposium (NGCS13), attended by **Mufudzi Chaza** (PhD candidate from the UCT), was held from the 21st to 25th of April 2024 in Xiamen, China. NGCS13 attracted 800 participants (conference record) with scientists, researchers, and engineers from academia and industry in 29 countries to showcase their research on advancing "Towards Carbon Neutrality". The symposium featured 7 plenary lectures, 82 keynote lectures, 126 invited lectures, 180 oral presentations, and 230 poster presentations. Seven parallel sessions covered all kinds of topics on catalysis: 'conversion and separation of light alkanes', 'production and conversion of syngas', 'carbon capture, utilisation and storage', 'sustainability', 'materials and model systems', ' processes and assessment' and 'cutting-edge area'. I presented an oral presentation showcasing a segment of my MSc research entitled "*Support Effects on Ruthenium-based Power-to-Liquids Fischer-Tropsch Synthesis Catalysts for High Carbon Monoxide Conversion*." This research is a component of the broader COALCO$_2$-to-X project, funded by the Department of Science and Innovation (DSI) in South Africa. The audience positively engaged with the presentation, offering valuable contributions. I was honoured to receive recognition as one of the recipients of the "Chemical Science Best Oral Presentation Award" for my contribution.

***Mufudzi Chaza** (UCT), third from left*

Attending NGCS13 at precisely the right moment aligned with my current research trajectory, providing invaluable insights from diverse presentations, lectures, and discussions focused on C_1 catalysis. These insights will significantly enrich my PhD studies and future research endeavours. Moreover, being at NGCS13 facilitated networking opportunities with esteemed experts in catalysis, particularly in the Fischer-Tropsch synthesis, a crucial aspect of my academic and professional aspirations as a young chemical engineer.

I want to express my heartfelt appreciation to the NGCS13 committee for orchestrating an exceptional symposium and for extending me the opportunity to deliver an oral presentation and meet experts in catalysis from all over the world while experiencing the dynamic coastal city of Xiamen in southeastern China. None of this would have been feasible without the generous backing of CATSA, whose financial support enabled my journey to China to share my research findings.

National Conferences on Catalysis

AfrSuEnS conference organisers and award recipients

The 1St International Symposium on **African Sustainable Energy Solutions** (AfrSuEnS) was successfully convened on 25-28 August 2024, at Sun City, North-West Province, South Africa, hosted by the Institute of Catalysis and Energy Solutions (ICES), a newly established research institute at University of South Africa (UNISA) that focuses on the development of advanced strategic leadership in fundamental and applied catalysis research for energy solutions.

The symposium was supported by the local and international committees including the Gauteng Catalysis Forum (GCF), the International Association for Carbon Capture (IACC) and the South Africa – China Science and Technology Association (SACTSA). Totally, 110 researchers from across the world working in the domains of alternative/green fuel and chemical production, biomass/waste to energy, CO_2 capture, storage and utilisation, electro/photo processes for energy conversions, hydrogen energy, energy storage and energy projects in Africa, and other relevant fields came together for the conference. The event featured advances in renewable energy, engaged in lively conversation about problems and solutions related to sustainable fuel/power supply, and promoted the development of energy transition. It concluded

with panel discussions that were led by the Erinite Energy, the Elleyhill Power, the Isondo Precious Metals, the Gauteng Infrastructure Financing Agency (GIFA) and ICES, which examined the challenges and opportunities associated with energy solutions, and identified key tools that can hasten the energy transition across the African continent.

Gauteng Catalysis Forum

The Gauteng Catalysis Forum (GCF) hosted its biannual seminars in April and September 2024. The 4th GCF seminar was hosted on 4 April 2024 at the University of Johannesburg (UJ) where MSc and PhD students from various institutions around the Gauteng region and beyond shared their progress as well as research findings in the field of catalysis. The seminar included keynote lectures by Professors Eric van Steen and Selwyn Mapolie. The fifth seminar by GCF was convened at the University of the Witwatersrand on the 11th of October 2024 and was co-organized with the Council for Scientific and Industrial Research (CSIR). The seminar was based on characterisation techniques which are conventionally used in catalysis. More than 140 delegates were in physical and virtual attendance where speakers from various facets of catalysis which included electrocatalysis, heterogenous catalysis, and crystallography gave enlightening talks. Professor Peter Wasserchied from Friedrich-Alexander-Universität provided a keynote address about the development of chemical hydrogen storage systems, in particular the use of Liquid Organic Hydrogen Carrier (LOHC) systems whereas Mr. Deogratias Tumwijukye gave a lecture on spatially resolved *operando* ^{57}Fe Mössbauer spectroscopy studies of iron-based catalysts for Fischer-Tropsch synthesis. Dr Alisa Govender from the analytics department at SASOL provided an insightful talk on the elucidation of deactivation mechanisms of Low-Temperature Fischer-Tropsch catalyst using electron microscopy. The GCF, which held its first seminar in July 2022, comprises of multiple institutions from the Gauteng region which include: The CSIR, University of the Witwatersrand, MINTEK, the South African Nuclear Energy Corporation (NECSA), UJ, Tshwane University of Technology (TUT), UNISA, University of Pretoria (UP) and the Vaal University of Technology (VUT).

Gauteng Catalysis Forum seminar attendees at Wits University (Left), and UJ (Right)

CATSA Student Committee 2024

The 2024 CATSA student committee consists of eight members from seven universities across South Africa. The members are: Student representative - Estefan van Vuuren, PhD student from UP, Blessing Mkhonazi, PhD student from UJ, Violet Moagi, PhD student from TUT, Siphumelele Majodina, PhD student from Nelson Mandela University (NMU), Olwethu Poswayo, PhD student from NMU, Aaron-Luke Folkhard, PhD student from University of Kwa-Zulu Natal (UKZN), Daniel Malesela Teffu, PhD student from University of Limpopo (UL) and Monique van den Berg, PhD student at NWU. The committee is responsible for communicating students' queries to the executive committee and has planned the student challenge 2024: Science Bingo! Put on your thinking caps for this year's student challenge, which will require a variety of knowledge to compete! During 2024, the committee had meetings to keep up to date with the planning of the conference, additionally the team was responsible for running the CATSA social media page of X (formerly Twitter).

Student representatives of CATSA

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Editor's Choices

Longtime member of CATSA, and the Catalysis Institute's Professor **Eric van Steen** from UCT was awarded the Champion of Research Capacity Development and Transformation Award 2024 by the Department of Science and Innovation (DSI) as well as the National Research Foundation (NRF). The award is a testament to Prof. van Steen's contribution to academia in South Africa with over 200 students (26 PhDs, 47 MSc, and over 135 BSc) graduated over his career which spans over 30 years.

Prof. van Steen's research expertise lie in, *inter alia*, Fischer-Tropsch Synthesis, selective aerobic oxidation of methane, and development of novel catalyst systems. He served as the Head of Department of the Chemical Engineering at UCT for several years between 2002 and 2018 and was the chairperson of the 33rd Annual Conference of CATSA in 2023. Congratulations to Prof. van Steen.

Prof. van Steen receiving the Champion of Research Capacity Development and Transformation Award 2024

Mr. Duma at the M&G200 YSA Gala Dinner in Bryanston

CATSA member and Media Officer, Mr. **Zama Duma**, was awarded the 2024 Mail & Guardian's 200 Young South Africans (M&G200 YSA) in the Technology and Innovation Category. Over 4 000 nominations were received and only 200 individuals were awarded at an invitation-only Gala Dinner in Bryanston, Johannesburg. Mr. Duma received the award for his contribution to green methanol research and industrial development in South Africa more especially for the "Green Methanol Corridor" which was launched by the Southern-African German Chamber of Commerce on behalf of Green eFuels Producers in November 2023, Sandton.

The corridor entails green methanol production from renewable hydrogen and CO_2 derived from wastewater treatment plants in the Vaal Special Economic Zone (VSEZ). The project is anticipated to commence construction in 2025 with initial development costs projected at R2.4 billion where the port of Durban will be the Point of Sale (PoS) for the export market. The CATSA executive committee (Exco) extended hearty congratulations to Mr. Duma who works as a research scientist at the CSIR with a focus on heterogeneously catalysed renewable hydrogen production, hydrogen storage in green methanol, as well as Carbon Capture and Utilisation (CCU), and has also served as the student representative and chairperson of the CATSA student committee in 2021-2022.

From the Editor

Dear Member of CATSA, thank you to all the members of the society who have assisted with various stories pertaining to catalysis advancement in South Africa and beyond. On the Media front, we launched a new website this year and are doubling down on ensuring that CATSA has visibility in the 5th Industrial Revolution whilst remaining true to our core values and ideologies.

***Zama Duma** (CSIR)* - Media Officer

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