
# 7TH CSIR CONFERENCE

## TOUCHING LIVES THROUGH INNOVATION

## PROGRAMME

11 – 12 November 2020

**www.csir75.co.za**

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

CSIR
Touching lives through innovation

# CONFERENCE OVERVIEW

## DAY 1

| | DAY 1 – WEDNESDAY 11 NOVEMBER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 08:00 – 08:50 | Opening session | | | | | | | | |
| 09:00 – 09:50 | Plenary session 1 | | | | | | | | |
| 10:00 – 10:50 | Plenary session 2 | | | | | | | | |
| 11:00 – 11:50 | Advanced Agriculture & Food | Manufac-turing | Smart Places | | | | | | |
| 12:00 – 12:50 | Advanced Agriculture & Food | Manufac-turing | Smart Places | | | | | | |
| 13:00 – 13:50 | Advanced Agriculture & Food | Manufac-turing | Smart Places | | | | Health | Mining | NextGen Enterprises and Institutions |
| 14:00 – 14:50 | | | | Chemicals | Defence & Security | Smart Mobility | Health | Mining | NextGen Enterprises and Institutions |
| 15:00 – 16:00 | | | | Chemicals | Defence & Security | Smart Mobility | Health | Mining | NextGen Enterprises and Institutions |
| 16:00 – 17:00 | | | | Chemicals | | Smart Mobility | | | |

**View ten technology demonstrations** – details on page 43

# CONFERENCE OVERVIEW

## DAY 2

| | DAY 2 – THURSDAY 12 NOVEMBER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 08:30 – 09:25 | Plenary session 3 | | | | | | | | |
| 09:30 – 10:25 | Advanced Agriculture & Food | Manufac-turing | Smart Places | | | | | | NextGen Enterprises and Institutions |
| 10:30 – 11:25 | Advanced Agriculture & Food | Manufac-turing | Smart Places | | | | | | NextGen Enterprises and Institutions |
| 11:30 – 12:00 | Break / No activities | | | | | | | | |
| 12:00 – 12:50 | | | Smart Places | Chemicals | Defence & Security | C4IR South Africa Inaugural Webinar | | | |
| 13:00 – 13:50 | | | | Chemicals | Defence & Security | 25 years of the UNDP in South Africa | Health | Mining | |
| 14:00 – 14:50 | | | | Chemicals | | | Health | Science Communi-cation | |
| 15:00 – 16:00 | | | | | | | Health | | |
| 15:30 – 18:00 | CSIR Excellence Awards | | | | | | | | |

**View ten technology demonstrations** – details on page 43

# DAY ONE

## DAY 1 – WEDNESDAY 11 NOVEMBER

### Opening session

**08:00 – 08:50**

*Main stage:*

**08:00** National anthem

**08:05** Welcome remarks, *Dr Thulani Dlamini, CSIR Chief Executive Officer*

**08:15** Remarks, *Prof Thokozani Majozi, Chairperson of the CSIR Board*

**08:25** Keynote Address, *Dr Blade Nzimande, Minister of Higher Education, Science and Innovation*

**08:45** Entertainment

**09:00 – 09:50**

*Main stage:*

**The fourth industrial revolution and industrialisation opportunities for South Africa's economic recovery**

*Lee Naik, Chief Executive Officer, TransUnion Africa; Mamello Matikinca-Ngwenya, Chief economist, FNB South Africa; Dr Thulani Dlamini, CSIR Chief Executive Officer; Mauricio ZuaZua, Partner and Board Member, Kearney; Siya Madyibi, Corporate, External and Legal Affairs Director, Microsoft*

**10:00 – 10:50**

*Main stage:*

**Feeding Africa: Innovation strategies to address Africa's food security challenges and lessons from the Covid-19 pandemic**

*Ms Mmampei Chaba, Chief Director: Multilateral and Africa engagements, Department of Science and Innovation (Host); Dr Victor Konde, United Nations Economic Commission for Africa; Alain Onibon, Food and Agriculture Organisation of the United Nations; Zvikomborero Tangawamira, CSIR Business Development Manager: Advanced Agriculture and Food; Mr Tommie van Zyl, Chief Executive Officer: ZZ2*

**11:00 – 11:50**

#### ADVANCED AGRICULTURE & FOOD

**Keeping food safe from farm to fork: The science and technology contribution to Food**

Hosted by *Dr Dharmarai Naicker, CSIR Competence Area Manager: Agro-processing and Food*

#### MANUFACTURING

**4IR Factory of the Future: Case study on how digital transformation accelerated time to market in the production of ventilators**

Hosted by *Martin Sanne, Executive Manager: CSIR Future Production: Manufacturing*

#### SMART PLACES: ENERGY

**Accelerating South Africa's energy transformation and economic recovery**

Hosted by *Dr Clinton Carter Brown, Head: CSIR Energy Centre*

**12:00 – 12:50**

**Smart agriculture for improved productivity and profitability**

Hosted by *Prof Moses Cho, CSIR Research Group Leader: Precision Agriculture*

**Learning Factory: Growing into digital transformation for 4IR**

Hosted by *Shaniel Davrajh, CSIR Principal Engineer*

**Load shedding over the next three years: Magnitude and mitigation**

*Dr Jarrad Wright, CSIR Principal Engineer and Joanne Calitz, CSIR Senior Researcher*

**13:00 – 14:00**

**Integrating climate-smart crops into global value chains to address food security in Africa**

Hosted by *Dr Ereck Chakauya, Network Manager: AUDA-Nepad SANBIO*

**13:00**

**Production of metal sheets by direct powder rolling**

*Dr Silethelwe Chikosha, CSIR Senior Researcher*

**13:20**

**Research and development of high-temperature materials for jet engines**

*Prof Sisa Pityana, CSIR Principal Researcher and Dr Monnamme Tlotleng, CSIR Senior Researcher*

**13:40**

**Innovative underwater imaging solutions**

*Josiah Jideani, CSIR Senior Engineer*

**13:00**

**Transitioning to a sustainable, low-carbon and equitable energy: How are we doing?**

*Esther Mkhwebane, CSIR Researcher and Ruan Fourie, CSIR Energy Economist*

**13:20**

**An energy living lab – The Upper Blinkwater Minigrid**

*Mpeli Rampokanyo, CSIR Principal Engineer*

**13:40**

**Better decision-making for sustainable development**

*Dr Gregory Schreiner, CSIR Senior Environmental Assessment Practitioner*

# DAY ONE *continued*

| | CHEMICALS | DEFENCE AND SECURITY | SMART MOBILITY |
|---|---|---|---|
| **14:00 – 14:50** | **The significance of biocatalysis in the fourth industrial revolution**<br>Hosted by *Dr Tsepo Tsekoa, CSIR Principal Researcher* | **Information and cyber security in the new normal**<br>Hosted by *Dr Jabu Mtsweni, Manager: CSIR Information and Cyber Security Centre* | **Reducing road freight costs and emissions through green tyres**<br>Hosted by *Dr Christopher de Saxe, CSIR Principal Engineer* |
| **15:00 – 16:30** | 15:00<br>**Biopharmaceuticals: Global partnerships, localisation and technology convergence**<br>*Dr Tsepo Tsekoa, CSIR Principal Researcher in conversation with Prof Patrick Soon-Shiong, MD, Nantworks*<br><br>15:30<br>**Nano-delivery systems in the context of Covid-19**<br>*Tshepo Nkuna, CSIR Researcher*<br><br>16:00<br>**The role of disruptive technologies in building a bio-based economy**<br>*Dr Ghaneshree Moonsamy, CSIR Senior Researcher* | 15:00<br>**Biometrics from cradle to grave**<br>*Yaseen Moolla, CSIR Senior Researcher and Norman Nelufule, CSIR Researcher*<br><br>15:30<br>**A technological solution for cyber security in South Africa: Lost Packet Warehousing Service**<br>*Dr Noluntu Mpekoa: CSIR Research Group Leader, CSIR Information and Cyber Security Centre and Dr Heloise Meyer: CSIR Senior Researcher* | 15:00<br>**Travel and mobility patterns in Gauteng: The results of a household travel survey**<br>An interview *with Shaun Mhlanga, CSIR Senior Researcher and Prof Mark Zuidgeest, Director of Undergraduate Studies: Department of Civil Engineering, University of Cape Town*<br><br>15:30<br>**Digital solutions for public transport operations: Lessons and tools from the Covid-19 response in Gauteng**<br>*Khangwelo Muronga, CSIR Senior Technologist and Phindile Binda, CSIR Technologist*<br><br>16:00<br>**Exploring new safety frontiers: The journey to facilitate safe South African road transport**<br>*Dr Christopher De Saxe, CSIR Principal Engineer and Karien Venter, CSIR Senior Researcher* |
| | **HEALTH** | **MINING** | **NEXTGEN ENTERPRISES AND INSTITUTIONS** |
| **13:00 – 13:50** | **Digital precision medicine: How to use advanced genomic knowledge to ensure impact**<br>*Dr Janine Scholefield, CSIR Research Group Leader: Bioengineering and Integrated Genomics* | **Improving the longevity of mines through modernisation**<br>*Hosted by Fatheela Brovko, Impact Area Manager: Mining and Mineral Resources* | **Re-imagining the ICT regulatory landscape in the fourth industrial revolution era – a conversation with regulators**<br>*Hosted by Dr Ntsibane Ntlatlapa, CSIR Impact Area Manager: Networked Systems and Applications* |

# DAY ONE *continued*

| | HEALTH | MINING | NEXTGEN ENTERPRISES AND INSTITUTIONS |
|---|---|---|---|
| 14:00 – 16:00 | **14:00**<br>**Precision Medicine – Making macrophages in a dish: Modelling the African response to immunity**<br>*Dr Dimakatso Gumede, CSIR Senior Researcher*<br><br>**14:30**<br>**Precision Medicine - Proteomics in health and disease: Opportunities and challenges from a South African perspective**<br>*Dr Stoyan Stoychev, CSIR Senior Researcher and Head of Proteomics at ReSyn Biosciences*<br><br>**15:00**<br>**Precision Medicine – Drug repurposing for cancer precision medicine**<br>*Dr Deepak Balaji Thimiri Govindaraj, Manager, CSIR Synthetic Biology and Precision Medicine Centre*<br><br>**15:30**<br>**Microarray technology based multiplex point-of-care diagnostic**<br>*Bridgett Malatji, CSIR Laboratory Technologist* | **14:00**<br>**Re-imagining mining and the role of research and innovation in the journey**<br>*Hosted by Bongi Ntsoelengoe, Executive Manager: CSIR Future Production: Mining*<br><br>**15:00**<br>**In pursuit of zero harm: Technology as a tool in support of mining's zero harm objective**<br>*Riaan Bergh, CSIR Impact Area Manager: Mining Testing and Training*<br><br>**15:30**<br>**Supporting health, safety and optimal extraction through the use of a geophysical toolbox approach**<br>*Dr Michael van Schoor, CSIR Principal Researcher* | **14:00**<br>**Distributed Ledger Technologies – What are they and who is using them?**<br>*Hosted by Dr Neil Croft, CSIR Researcher*<br><br>**15:00**<br>**Television Whitespace enabling rural and utility connectivity with CSIR geo-location spectrum database technology**<br>*Dr Albert Lysko, CSIR Principal Researcher and Dr Luzango Mfupe, CSIR Principal Researcher*<br><br>**15:30**<br>**Resource allocation in Fog-enabled 5G Networks**<br>*Nosipho Khumalo, MSc Studentship, CSIR* |

# DAY TWO

| | DAY 2 – THURSDAY 12 NOVEMBER | | |
|---|---|---|---|
| 08:30 – 09:25 | *Main stage:*<br>**Building back better – SMMEs as drivers of South Africa's economic recovery**<br>*Phuthi Mahanyele-Dabengwa, Naspers Chief Executive Officer; Yanesh Naidoo, Sales and Design Director, Jendamark Automation; Advocate Pieter Holl, Chief Executive Officer: The Innovation Hub; Sipho Mbhokota, CSIR Executive Manager: CSIR Defence and Security* | | |
| 09:30 – 10:25 | **ADVANCED AGRICULTURE & FOOD**<br>**Cannabis: Opportunities for research, product development and job creation**<br>Hosted by *Dr Blessed Okole, CSIR Research Group leader: Agro-processing* | **MANUFACTURING**<br>**Industrialisation of additive manufacturing towards the revival of the SA manufacturing industry**<br>Hosted by *Dr Ntombi Mathe, CSIR Senior Researcher* | **SMART PLACES: ENERGY**<br>**Ecological Infrastructure: People and business building a secure future together**<br>*Hosted by Dr Michelle Audouin, CSIR Senior Researcher* |
| 10:30 – 11:30 | **Industrialisation of medicinal cannabis**<br>*Hosted by Dr Blessed Okole, CSIR Research Group Leader: Agro-processing* | 10:30<br>**Design for additive manufacturing: Reaching further**<br>Hosted by *Duwan Bester, CSIR Senior Engineer*<br>11:00<br>**Structuring light to enhance laser-based applications**<br>*Dr Darryl Naidoo, CSIR Principal Researcher and Dr Angela Dudley, Wits University Senior Lecturer* | **Towards inclusive smart cities in South Africa – How should local government respond to the challenge?**<br>*Hosted by Tinus Kruger, CSIR Research Group Leader: Housing and Urban Studies* |
| 09:30 – 10:25 | **NEXTGEN ENTERPRISES AND INSTITUTIONS**<br>**Cloud or On-Premise?**<br>*Hosted by Dr Happy Sithole, Centre Manager for the National Integrated Cyber Infrastructure System* | | |
| 10:30 – 11:30 | **Hallo Digital Humanities: A reshaping of the Humanities in the fourth industrial revolution**<br>*Hosted by Dr Karen Calteaux, CSIR Research Group Leader: Digital audio-visual technologies* | | |

# DAY TWO *continued*

| | | | |
|---|---|---|---|
| 12:00 – 12:50 | **SMART PLACES**<br>**The Green Book – Adapting settlements for the future**<br>*Hosted by Alize le Roux, CSIR Principal Researcher* | | |
| | **CHEMICALS**<br>**Creating a smart, sustainable and circular plastics economy in South Africa – What will it take?**<br>*Hosted by Dr Vincent Ojijo, CSIR Research Group Leader: Advanced Polymers and Composites* | **DEFENCE AND SECURITY**<br>**Sustainable integrated security for the protection of large and complex infrastructure**<br>*Hosted by Dr Duarte Goncalves, CSIR Principal Engineer* | **C4IR SOUTH AFRICA INAUGURAL WEBINAR**<br>**The landscape and best practices in data policy to unlock fourth industrial revolution opportunities for socio-economic development in South Africa**<br>*Co-hosted by Dr Fulufhelo Nelwamondo, Executive Manager: CSIR NextGen Enterprises and Institutions and Ms Khungeka Njobe, CSIR Group Executive: Business Excellence and Integration* |
| 13:00 – 14:30 | 13:00<br>**Polymer-based functional materials for growth sectors: Current and future challenges**<br>*Prof Suprakas Sinha Ray, Manager, Centre for Nanostructures and Advanced Materials, DSI-CSIR Nanotechnology Innovation Centre in conversation with Dr Virendra Kumar Gupta Head, Research and Development Polymer and Senior Vice President, Reliance Industries Limited, India*<br>13:30<br>**Renewable polymers and renewable chemistry: An industry perspective**<br>*Dr Jan van de Loosdrecht, Executive Manager, CSIR Future Production: Chemicals, in conversation with Prof Dr Gert-Jan Gruter, Chief Technology Officer, Avantium and Professor of Industrial Sustainable Chemistry, University of Amsterdam, The Netherlands*<br>14:00<br>**Graphene: The wonder material that could revolutionise advanced manufacturing**<br>*An interview with Neill Ricketts, Chief Executive Officer, Versarien* | 13:00<br>**Developing a South African hydrogen fuel cell powered unmanned aerial vehicle**<br>*Erik Wegman, CSIR Senior Engineer*<br>13:30<br>**Autonomous vehicles in the South African context**<br>*Dr Dithoto Modungwa, CSIR Research Group Leader: Tactical Mobility* | **UNDP**<br>13:00 - 14:00<br>**Celebrating 75 years of the United Nations; Reviewing 25 years of the United Nations Development Programme in South Africa** |

# DAY TWO *continued*

| | | |
|---|---|---|
| 13:00 – 13:50 | **HEALTH**<br>**The CSIR Microbiome Mapping Initiative: Establishing an African baseline of gut health**<br>*Dr Jerolen Naidoo, CSIR Senior Researcher* | **MINING – MANDELA MINING PRECINCT**<br>**Launch of the Technology Availability and Readiness Atlas (TARA)**<br>*Hosted by: Johan Le Roux, Acting Director: Mandela Mining Precinct, CSIR* |
| 14:00 – 15:30 | 14:00<br>**Veterinary molecular diagnostics and vaccines – Novel technologies for molecular diagnostics of infectious diseases**<br>*Dr Essa Suleman, CSIR (Acting) Research Group Leader: Veterinary Molecular Diagnostics and Vaccines*<br><br>14:30<br>**Biological disaster management post Covid-19: The Tokabio perspective**<br>*Dr Phiyani Lebea, Managing Director: Tokabio (Pty) Ltd*<br><br>15:00<br>**Diagnostics – Lessons from Covid-19 testing**<br>*Phumelele Ramphoma, Laboratory Manager: Covid-19 Diagnostic Laboratory* | **SCIENCE COMMUNICATION**<br>**14:00 – 15:00**<br>**Demolishing science communication barriers for the benefit of society**<br>*Facilitator: Robert Inglis, Research Communication Specialist, Founder and Director of Jive Media* |
| 15:30 – 18:00 | **CSIR Excellence Awards** | |

# ADVANCED AGRICULTURE AND FOOD

Wednesday 11 November 2020 | 11:00 - 11:50

## Keeping food safe from farm to fork: The science and technology contribution to Food 4.0

*Dr Dharmarai Naicker, CSIR Competence Area Manager: Agroprocessing and Food (Host); Yael Joffe PhD RD FACN, CSO 3X4 Genetics; Michele Francis Padayachee, Executive, GS1 South Africa Division of the Consumer Goods Council of South Africa; Tarryn Daniels, Program Manager: AIDC -GS1 South Africa, A division of the Consumer Goods Council of South Africa; Charlene De Wit, Zone Asia Oceania and Africa: Quality, Nestlé*

Food safety is an issue of growing importance due to several world-wide trends that contribute to increasing safety risks in food systems, such as the growing movement of people across borders; increased movement of agricultural and food products across borders; rapid urbanisation; changes in food processing and handling practices; and the emergence and re-emergence of diseases, pathogens, toxins and other issues.

Digital building blocks such as big data, Internet of Things, artificial intelligence, blockchain, nano-technologies and advances in sciences such as genomics for precision nutrition are some of the technologies that the CSIR is integrating to support the advancement of the agriculture and food industry to improve industry competitiveness while ensuring societal needs are meet. The panel will discuss disruptive technologies such as traceability, blockchain technologies as applied to food safety, nanosensors in smart food packaging; as well as the application of genomics for precision nutrition; innovation gaps; and CSIR key focus areas to transform the industry.



Wednesday 11 November 2020 | 12:00 - 12:50


## Smart agriculture for improved productivity and profitability

*Prof Moses Cho, CSIR Research Group Leader: Precision Agriculture (Host); Mr Zano Mataruka, Senior Investment Officer, International Finance Corporation; Mr Humbulani Mudau, Chief Director: Space Science and Technology, Department of Science and Technology; Abdulrazak Ibrahim, PhD, Capacity Development and Agripreneurship, Forum for Agricultural Research in Africa; Mr Aron Kole, Managing Director, FarmSol*

Ending hunger by 2030 – sustainable development goal number two of the United Nations – is fast slipping out of reach. The adverse effects of climate change on agriculture, the plummeting involvement of young populations in agriculture and the increasing cost of agricultural inputs are, particularly in developing economies, all contributing factors.

Can smart or satellite agriculture, a data-driven approach to farming make a difference? Satellite farming generally involves acquiring real-time information about the soil/crop condition and climate, and rapidly responding to such information to optimise food production through the application of variable rate technology. The CSIR has pooled the required competences and technologies to put satellite farming within reach of commercial farmers and agribusinesses. Join us to gain first-hand information on what it is possible today.

# ADVANCED AGRICULTURE AND FOOD

Wednesday 11 November 2020 | 13:00 - 13:50

## Integrating climate-smart crops into global value chains to address food security in Africa

*Dr Ereck Chakauya, Network Manager: AUDA-Nepad SANBIO (Host), Dr Tawanda Muzhingi, Senior Scientist, International Potato Centre Regional Office for Africa, Nairobi, Kenya; Professor Trust Beta, Professor and Canada Research Chair in Functional Foods, Department of Food and Human Nutritional Sciences, University of Manitoba; Dr Nomusa Dlamini, CSIR Principal Researcher*

Indigenous small grain cereals like sorghum and millet remain important crops for food security, nutrition and health because they are well adapted to African climatic conditions and are climate-smart crops.

There is growing research interest in sorghum, millet and other cereal grains for their phytochemical content, mainly polyphenols, which research has shown may have health benefits, particularly in managing some non-communicable diseases. These crops also provide much needed micro-nutrients that could ease the burden of malnutrition in Africa through product development using indigenous food. This panel highlights the work that is being done globally and discusses collaboration for scale and impact in a global alliance and through private-public partnerships.



Thursday 12 November 2020 | 09:30 - 10:30

## Cannabis: Opportunities for research, product development and job creation

*Dr Blessed Okole, CSIR Research Group Leader: Agro-processing (Host)*

Over 50 countries around the world have legalised some form of cannabis for medicinal use and only three of these are from Africa. For centuries, cannabis has been widely grown in Africa and the UN estimates that more than 38 000 tonnes of cannabis are produced in Africa each year. Governments in many African countries are looking to capitalise on the opportunities available from the legalisation of cannabis and the international demand for Africa's legally produced cannabis.

This panel will discuss the opportunities and challenges for the cannabis industry and what national strategies are in place to support the industry. The panel will discuss the full value chain from supply to product development and assess some of the infrastructure in place to support industrialisation of cannabis in South Africa, including the legal framework in place to support the industrialisation of cannabis.

## ADVANCED AGRICULTURE AND FOOD

**Thursday 12 November 2020 | 10:30**

### Industrialisation of medicinal cannabis

*Dr Blessed Okole, CSIR Research Group Leader: Agro-processing (Host), Prof David Katerere, Professor of Pharmaceutical Science, Tshwane University of Technology; Andy Radford, Managing Director, Mandela Bay Composites Cluster*

The cannabis and hemp industry has been identified as an emerging lucrative industry within South Africa, with potential to support socio-economic development. What should be done to correct industrialisation requirements that seem to be excluding the poor and marginalised? How can cannabis be industrialised without benefitting an elite few at the expense of modern day slaves? The market is flooded with imported and counterfeit products. How does Africa protect its market base in the continent, and compete internationally? This discussion will answer some of these questions and outline the role of the CSIR in alleviating these challenges.

## MANUFACTURING

**Wednesday 11 November 2020 | 11:00 - 11:50**

### 4IR Factory of the Future: A case study on how digital transformation accelerated time to market in the production of ventilators

*Martin Sanne, Executive Manager: CSIR Future Production: Manufacturing; Mr Johan du Toit, Chief Executive Officer, Simera; Mr Cobus Oosthuizen, Country Manager and Chief Executive Officer, Siemens Industries Software Africa and Middle East; Mr Peter Brierly, Operations Director: Akacia Medical and Healthcare (Pty); Dr Nthabiseng Legoete, Chief Executive Officer, Quali Health; Riaan Coetzee, CSIR Research Group Leader: Future Production Systems; Ajith Gopal, Manager: CSIR Centre for Robotics and Future Production*

This case study takes the audience on a journey in which a multidisciplinary, multi-organisation South African team was able to design, develop and produce ventilators needed amidst the Covid-19 pandemic within three months.

It will highlight how digital transformation using digital lifecycle software has accelerated the product development process and later on was used to create a virtual factory consisting of multiple private companies.

It will also touch base on how digital twins were used to accelerate the production lines and optimised the design of a ventilator.

# MANUFACTURING

Wednesday 11 November 2020 | 12:00 - 12:50

## Learning Factory: Growing into digital transformation for 4IR

*Shaniel Davrajh, CSIR Principal Engineer (Host)*

A learning factory is being established as a CSIR-wide technology platform to support skills development and transfer, as well as innovation in the context of the fourth industrial revolution (4IR). The facility aims to develop and implement 4IR technologies for digital transformation applications, including integration of value chains and broader cyber-physical systems. Industries set to benefit include chemicals processing, remote mining inspections, 3D printing, cyber-security, smart logistics and agricultural applications. A state-of-the-art smart manufacturing facility is also being established to focus on the integration of value chains.

Wednesday 11 November 2020 | 13:00 - 13:20

## Production of metal sheets by direct powder rolling

*Dr Silethelwe Chikosha, CSIR Senior Researcher*

Powder technologies are known for cost reductions of up to 25% when used to manufacture products, compared to ingot metallurgy manufacturing. The CSIR evaluated powder technologies for manufacturing products of expensive metals with exceptional properties, such as titanium metal. Titanium products are expensive, which limit their application to niche industries such as aerospace and biomedical. The high cost of titanium is linked to the difficulties associated with its extraction and the multiple fabrication steps required to produce semi-finished or finished products by ingot metallurgy. The direct powder rolling technology was identified for development as an alternative for making titanium sheets. The development focused on reducing the number of fabrication steps for titanium sheets. The technology was demonstrated to be capable of producing titanium sheets that meet ASTM standard with reduced fabrication steps. The technology can be extended to other materials that are expensive or difficult to fabricate using multiple deformation steps.

# MANUFACTURING

Wednesday 11 November 2020 | 13:20 - 13:40


## Research and development of high temperature materials for jet engines

*Prof Sisa Pityana, CSIR Principal Researcher and*
*Dr Monnamme Tlotleng, CSIR Senior Researcher*

Additive manufacturing, also known as 3D printing, is a term used to describe the fabrication of three-dimensional objects from raw materials, using an additive process where successive layers of materials are built to create a component.

These technologies are used for rapid prototyping of components in research and development, pre-production fabrication processes, as well as full-scale production operations. Advanced manufacturing, using laser 3D printing, is becoming the leading technology for research and development in the aerospace industry, specifically for rapid prototypes. In recent years, the CSIR has made significant investments in the development of laser additive manufacturing platforms for 3D printing of metallic components. The technology presents significant opportunities for the local aerospace industry to manufacture components using different materials such as Titanium aluminide and Nickel-based super-alloys. Titanium-aluminide alloys are currently being used as an alternative to nickel-based super-alloy in performance turbo chargers for automotive engines. The alloys are also being researched for their potential use in low-pressure turbine blades in jet engines. The CSIR's Prof Sisa Pityana and Dr Monnamme Tlotleng share the latest developments and progress.

Wednesday 11 November 2020 | 13:40 - 14:00

## Innovative underwater imaging solutions

*Josiah Jideani, CSIR Senior Engineer*

The CSIR in collaboration with the South African Navy and Armscor, is using Synthetic Aperture Sonar to develop innovative high-resolution underwater imaging solution. Developments in this domain could have broad applications in defence, underwater surveying and underwater asset management.

# MANUFACTURING

Thursday 12 November 2020 | 09:30 - 10:25

## Industrialisation of additive manufacturing towards the revival of the SA manufacturing industry

*Hosted by Dr Ntombi Mathe, CSIR Senior Researcher*

This webinar will explore metal additive manufacturing for industrial application and its techno-economic benefits. In recent years, the South African manufacturing industry has faced a great decline in the demand for South African products both locally and globally, which has led to job losses and closure of factories. As one of the fourth industrial revolution technologies, additive manufacturing has seen increased interest in producing complex parts for the aerospace, mining, transport and other industries.

The CSIR has developed locally manufactured metal 3D printers with the aim of contributing towards the local manufacturing industry through access to technologies. However, these systems have only been used as research and development tools and it is important to develop models and systems that will allow for the full industrialisation of advanced manufacturing. In South Africa, 90% of the metal 3D printers are located at higher education institutions with only one company using advanced manufacturing as a stand-alone systems to print parts as needed.

Thursday 12 November 2020 | 10:30 - 10:55

## Design for additive manufacturing: Reaching further

*Duwan Bester, CSIR Senior Engineer*

Design for additive manufacturing (DfAM) is one of the factors that are driving down part costs in metal additive manufacturing. This is resulting in the technology becoming cheaper and more viable for other industries to use. The CSIR has been building on its DfAM capabilities for the last few years. Some of the software tools used in DfAM are expensive and not many companies, especially SMMEs, are able to make the investment. To broaden the CSIR's capabilities in DfAM and the additive manufacturing broadly, the organisation has acquired build simulation software and topology optimisation software and can offer these capabilities to companies to illustrate the benefits of using advanced manufacturing.

## MANUFACTURING

Thursday 12 November 2020 | 11:00 - 11:30

### Structuring light to enhance laser-based applications

*Dr Darryl Naidoo, CSIR Principal Researcher and*
*Dr Angela Dudley, Wits University Senior Lecturer*

Laser-based processes such as cutting, welding, additive manufacturing, communications and imaging have become ubiquitous in precision manufacturing and applications. Enhancing South Africa's global competitiveness in these flourishing areas depends on innovation within the laser-material interaction. South Africa's efforts, through the CSIR and Wits University, have resulted in the development of several novel solutions aimed at advancing application areas by transcending standard laser paradigms. Join us for a webinar where we showcase several ground-breaking scientific outputs in the area of structured light and expand on our efforts to enhance laser-based applications.

## SMART PLACES: ENERGY

Wednesday 11 November 2020 | 11:00 - 11:50

### Accelerating South Africa's energy transformation and economic recovery

*Dr Clinton Carter Brown, Head: CSIR Energy Centre, CSIR (Host); Nhlanhla Ngidi, Head of Energy and Electricity: South African Local Government Association; Mandy Rambharos, Head: Eskom Just Energy Transition office; Aalia Cassim, Director: Microeconomic Policy, Division: Economic Policy Analysis and Forecasting, National Treasury; Dr Jarrad Wright, CSIR principal engineer*

South Africa is relatively energy secure, but highly dependent on coal for much of its energy needs, and even more dependent on imported oil and liquid fuels for the transportation sector. Efforts to decarbonise the South African energy mix and increase energy security to ensure a cleaner and more sustainable sector will require creative thinking, enabling technologies, strong partnerships and ambitious leadership. Recent CSIR research showed that it is already least-cost to pursue a low-carbon renewable energy led mix. More interestingly, there is a relatively small cost premium to further accelerate low carbon technologies and carbon dioxide emission reductions from the power sector. This furthermore presents an opportunity to decarbonise other harder-to-abate sectors like industrial processes and transportation by increasing levels of sector-coupling, whilst ensuring costs remain competitive and affordable for all energy users.

This sector coupling opportunity in South Africa implicitly requires a scaled-up hydrogen economy where hydrogen is used as an energy carrier, as a storage mechanism and for final end-use both locally and for export markets. This session intends to unpack some of the long-term decarbonisation opportunities that exist for South Africa in the energy sector and intends to encourage open and frank discussions about the future of the energy sector as a critical enabler and driver for economic growth and job creation.

Wednesday 11 November 2020 | 12:00 - 12:50

## Load shedding over the next three years: Magnitude and mitigation

*Dr Jarrad Wright, CSIR Principal Engineer and Joanne Calitz, CSIR Senior Researcher*

The South African economy and public have been directly impacted by the national load-shedding that resulted in disruptive electricity supply curtailment and blackouts. The CSIR has performed in-depth analysis of the South African power system to assess the extent to which load-shedding is expected to continue, the magnitude thereof, and most importantly, the options and solutions to reduce and mitigate load-shedding. The webinar will provide a scientifically informed perspective of the likelihood and extent of load shedding over the next three to five years, and provide some practical options for the mitigation thereof.

Wednesday 11 November 2020 | 13:00

## Transitioning to a sustainable, low-carbon and equitable energy: How are we doing? The just energy transition in South Africa

*Esther Mkhwebane, CSIR Researcher and Ruan Fourie, CSIR Energy Economist*

This talk will provide feedback based on research undertaken by the CSIR on the just energy transition in South Africa. It will touch on socio-economic impact, reskilling, manufacturing localisation potential, as well as opportunities and hindrances for SMME participation.

## SMART PLACES: ENERGY

Wednesday 11 November 2020 | 13:20

### An energy living lab – The Upper Blinkwater Minigrid

*Mpeli Rampokanyo, CSIR Principal Engineer*

A mini-grid pilot project was initiated for electrification of the remote village of Upper Blinkwater in the Eastern Cape in South Africa, situated 23 km north-west of Fort Beaufort, a part of the Raymond Mhlaba Local Municipality. The pilot project will be used as a living lab by mainly South African universities and research facilities to study the development of power consumption, increasing loads and the desired feedback in terms of local prosperity. In this talk, the feasibility study to integrate wind energy is discussed.

Wednesday 11 November 2020 | 13:40

### Better decision-making for sustainable development

*Dr Gregory Schreiner, CSIR Senior Environmental Assessment Practitioner*

As a way of navigating increasing socio-ecological complexity, the CSIR is experimenting with new tools for modelling the interactions between humans and their environment, with the primary aim of guiding authority decision-making. This presentation discusses the case study of the Saldanha Bay Risk and Resilience Assessment, commissioned by the Western Cape Provincial Government in 2019. The presentation will detail a number of novel systems modelling methodologies adopted by the project team, and discuss how these approaches significantly advance the conventional approaches usually adopted for impact assessment.

## SMART PLACES: ENERGY

**Thursday 12 November 2020 | 09:30 - 10:25**

### Ecological Infrastructure: People and business building a secure future together

*Dr Michelle Audouin, CSIR senior researcher (Host);. Ms Marlene Laros, Director: Biodiversity and Coastal Management, Western Cape Government, Environmental Affairs and Development Planning; Carla Hudson Programme Manager: Mine Water Coordinating Body; Dr Ilse Kotzee, CSIR Researcher; Dr Lindie Smith-Adao, CSIR Senior Researcher; Dr David le Maitre, CSIR Principal Researcher; Kerri Savin, Sustainability Manager, Nedbank*

Global change drivers such as population growth, climate change, and urbanisation, are putting ever-increasing pressure on natural resources. It is critical that resource management balances the growing socio-economic needs with the sustainability of the natural resource base, as well as environmental health considerations. Water scarcity, for instance, remains a critical issue, potentially restricting the development options for South Africa. Additional drivers, such as increasing demand for water and failing public services, are resulting in increased competition for this resource. Covid-19 has further underlined the need for clean water and adequate sanitation. There are many options for addressing environmental and water-related challenges such as, for example, effectively protecting South Africa's Strategic Water Source Areas – the 10% of the land that supplies 50% of the surface water and the strategic groundwater areas. The proper management, and restoration where necessary, of ecological infrastructure is vital for securing and protecting these water resources in the face of development pressures and climate change. The CSIR brings together a panel – inclusive of stakeholders from both the private and public sectors – to discuss the role of ecological infrastructure in addressing environmental challenges in support of sustainable development.

**Thursday 11 November 2020 | 10:30 - 11:30**

### Towards inclusive smart cities in South Africa – how should local government respond to the challenge

*Hosted by Tinus Kruger, CSIR Research Group Leader: Housing and Urban Studies; Dr Kevin Naidoo, Executive Manager: Municipal Governance, Department of Cooperative Governance and Traditional Affairs; Engela Petzer, CSIR Senior Researcher; Nonopa Tenza, Metropolitan Municipality Specialist, Public Sector, Corporate & Investment Bank, Standard Bank; Andile Skosana, Chief Executive Officer, CityConsolidator Africa (Pty) Ltd*

The webinar focuses on smart cities within the South African context, with a view of sharing ideas and discussing challenges, opportunities and pressures faced by municipalities related to smart city initiatives. The webinar will include presentations as well as a facilitated discussion, structured around an ongoing CSIR research project on smart cities. The study highlights the fact that a South African interpretation of the smart city concept needs to be informed by local realities. To truly touch lives through innovation, the South African understanding of a smart city should be guided by the principle of inclusivity.



## SMART PLACES: ENERGY

**Thursday 12 November 2020 | 12:00 - 12:50**

### The Green Book – Adapting settlements for the future

*Hosted by Alize le Roux, CSIR Principal Researcher*

A growing number of South Africans in cities and towns are set to be exposed to the adverse impacts of weather-induced natural hazards, which threaten livelihoods, increase vulnerability, and undermine hard-earned development gains.

To address this growing challenge, contribute to proactive disaster risk reduction and to reduce the losses experienced from climate disasters, the Green Book was established as an open-access online planning support tool and made public in March 2019. The Green Book provides scientific evidence, tools and resources in support of local government's pursuit to plan and design climate-resilient, hazard-resistant settlements.

Mainstreaming and embedding this rich and dense source of information and tools into local government planning policies, plans, processes and systems requires up-take, buy-in and extensive capacity development.

To ensure the Green Book is utilised to its fullest extent, a new partnership between the CSIR, Santam, the Department of Environmental, Forestry and Fisheries and the National Disaster Management Centre, has been established to support the testing, roll-out, training and uptake of the Green Book in municipalities.

The webinar will feature the Green Book as a planning support system, followed by a panel discussion with the public and private sector role-players on the value of the Green Book as well as the lessons learned from piloting this dynamic planning support system in 11 local municipalities across South-Africa.

## CHEMICALS

**Wednesday 11 November 2020 | 14:00 - 14:50**

### The significance of biocatalysis in the fourth industrial revolution

*Hosted by Dr Tsepo Tsekoa, CSIR Principal Researcher*

The webinar will investigate pertinent issues relating to biocatalysis and its benefits in a green economy. The panel will outline what benefits it has and why South Africa should invest in it. This will be followed by industry perspectives and experience with biocatalysis, followed by the perspective of a chemist.

The discussion will then touch on CSIR breakthroughs in biocatalysis, future ideas for biocatalysis and the elusive questions. What is still required for South Africa to make biocatalysis a force to be reckoned with and what is the role of biocatalysis in the fourth industrial revolution?

## CHEMICALS

Wednesday 11 November 2020 | 15:00 - 15:30

### Biopharmaceuticals: Global partnerships, localisation and technology convergence

*Dr Tsepo Tsekoa, CSIR Principal Researcher in conversation with Prof Patrick Soon-Shiong, MD, Chairman and CEO of Nantworks*

Prof Shiong is a South African born surgeon living in the USA. He founded and sold several healthcare companies and developed the blockbuster cancer drug, Abraxane. The CSIR's Dr Tsepo Tsekoa joins him in a conversation on how the convergence of healthcare, information technology and artificial intelligence is transforming healthcare.

Tsekoa will highlight the CSIR's biopharmaceuticals production capability and breakthroughs, and what role partnerships are playing to maximise impact. He will give an inside view on the monoclonal antibodies portfolio, including work on Rabies Rabivir, CAP256-VRC26 HIV antibodies and biosimilars. He will reveal more on recent global partnerships and localisation efforts to make technologies for example for biosimilars, available in South Africa. He compares notes with Soon-Shiong on the future, but also on the CSIR's involvement in the Covid-19 pandemic through recombinant diagnostics and therapeutics production, and briefly introduces the CSIR vision for capacitating the local industry to produce clinical grade biologics for regulated trials and market entry.

Wednesday 11 November 2020 | 15:30

### Nano-delivery systems in the context of Covid-19

*Tshepo Nkuna, CSIR Researcher*

Globally, more than a million people have died due to Covid-19 and there is neither treatment nor vaccine approved as yet. The current recommended strategies for preventing the spread of Covid-19 have shown little success. However, like other viruses, the spike proteins (class 1 fusion) mediate infection and the virus requires a host to replicate and propagate. The CSIR has developed targeted nanomedicines incorporating therapeutics that inhibit cellular infection (prevention) and nucleoside analogs that disrupt the replication of the viral genome resulting in early sequence termination (treatment). We have successfully shown inhibition of cellular infections by a pseudovirus with class 1 fusion proteins in-vitro.

# CHEMICALS

Wednesday 11 November 2020 | 16:00 - 16:30

## The role of disruptive technologies in building a bio-based economy

*Dr Ghaneshree Moonsamy, CSIR Senior Researcher*

The bio-based economy represents an increasing area of global development with key drivers being environmental sustainability, climate change and reducing the dependence on fossil based resources. In line with global technology initiatives in this area, the CSIR is involved in a number of bio-based technology developments at various stages in order to drive a rapid concept-to-commercial approach. The technology development portfolio includes bio-based chemicals; agricultural and industrial biologicals and probiotics. The benefits for South Africa in adopting a bio-based approach is reduction in the carbon economy, new competitive industries, food security, improving the science base and job creation.

Thursday 12 November 2020 | 12:00 - 12:50

## Creating a smart, sustainable and circular plastics economy in South Africa – What will it take?

*Dr Vincent Ojijo, CSIR Research Group Leader: Advanced Polymers and Composites (Host)*

South Africa, like the rest of the world, is grappling with plastic pollution and unsustainable utilisation of plastic materials. A recent publication by The Pew Charitable Trusts and Sytemiq estimates that the annual flow of plastics into the ocean will be approximately 23 to 37 million metric tons per year, tripling the current statistics. This is equivalent to 50 kg per metre of the world's coastline. This is a complex problem that requires interventions from various stakeholders. Therefore, this panel discussion is aimed at fostering conversations around possible intervention strategies, including reduction, substitution, recycling and disposal, and their relevance to the South African context.

## CHEMICALS

Thursday 12 November 2020 | 13:00 - 13:25

### Polymer-based functional materials for growth sectors: Current and future challenges


*Prof Suprakas Sinha Ray, Manager, Centre for Nanostructures and Advanced Materials, DSI-CSIR Nanotechnology Innovation Centre in conversation with Dr Virendra Kumar Gupta, Head, Research and Development Polymer and Senior Vice President, Reliance Industries Limited, India*

Reliance Industries Limited (RIL) is a multinational conglomerate company headquartered in Mumbai, India that endeavours to bring value-added, new-age materials to its downstream manufacturers and help them establish a leadership position for India in this large and growing market globally.

The CSIR's Prof Suprakas Sinha Ray talks to Dr Virendra Kumar Gupta about composites (fibre-reinforced polymers) that have a huge market and are used in a variety of end-use applications like wind energy, railways, aerospace and infrastructure, where the materials need to have the strength of steel but a much lower weight. The demand for such composites in India is growing at double digits, especially with initiatives like Make In India and other government projects like Smart Cities. Prof Sinha Ray draws the comparisons with South Africa.

Thursday 12 November 2020 | 13:30 - 13:55

### Renewable polymers and renewable chemistry: and industry perspective


*Dr Jan van de Loosdrecht, Executive Manager: CSIR Future Production: Chemicals, in conversation with Prof Dr Gert-Jan Gruter, Chief Technology Officer, Avantium, and Professor of Industrial Sustainable Chemistry, University of Amsterdam, The Netherlands*

Avantium develops innovative chemistry technologies across industry value chains to produce chemicals and materials based on renewable feedstock instead of fossil resources. Join in on a conversation between the CSIR's Dr Jan van de Loosdrecht and Avantium Chief Technology Officer Prof Dr Gert-Jan Gruter. Gruter provides an industry perspective on renewable polymers and renewable chemistry.

## CHEMICALS

Thursday 12 November 2020 | 14:00 - 14:30

### Graphene: The wonder material that could revolutionise advanced manufacturing

*Join us for an interview with Neill Ricketts, Chief Executive Officer, Versarien*

**Creating new opportunities for South African industry through graphene technologies development**

The graphene platform at the CSIR is working on an exciting and ambitious project that seeks to create new capabilities in the development of graphene-based composites as well as the possible establishment of graphene manufacturing capacity in the country.

Collaboration with international producers is critical, both for the acquisition of graphene as well as for the possible localisation.

The unique physico-chemical properties of graphene, such as high mechanical strength, excellent chemical stability, high electrical conductivity, excellent thermal stability and thermal conductivity, gas impermeability and interesting optical properties, make it a desirable ingredient in applications related to electronics, sensors, water treatment, batteries, coatings, displays, advanced composites and biomedical applications.

Thus, graphene-related work will not only help to assist South African industries to be competitive, but will also prepare the country for the science of the future. A significant set of skills and know-how will be developed.

In this interview with Neill Ricketts, Chief Executive Officer, Versarien, we explore the potential of graphene technologies, the benefits for industry, the caveats and the links to the fourth industrial revolution.

## DEFENCE AND SECURITY

Wednesday 11 November 2020 | 14:00 - 14:50

### Information and cyber security in the new normal

*Dr Jabu Mtsweni, Manager: CSIR Information and Cyber Security Centre (Host); Mr Nilesh Jivraj, Cybersecurity Expert: Kaspersky; Kweku Arthur, CSIR Chief Information Security Officer; Mr Dominic White, Group Technical Director: Sense Post & Orange Cyber; Craig Rosewarne, Managing Director: Wolfpack Information Risk (Pty) Ltd; Dr Noluxolo Gcaza, CSIR Research Group Leader, Information and Cybersecurity Center: Governance, Privacy and Trust*

The digital world is transforming at faster rates than we could have imagined, accelerating the fourth industrial revolutions and forcing developing nations such as South Africa to take notice.

The Covid-19 pandemic has also accelerated digitalisation across many organisations, changing the way in which we work and use technology. It is a given that digital technologies will now, more than ever before, drive how organisations, both public and private, conduct their daily activities. This comes with a number of benefits, but also risks and threats, as most crimes have now also moved into the cyberspace.

This webinar will bring together private and public experts to share their information and cyber security experience during the new normal, and provide research-based solutions on how organisations should prepare themselves in the cyberspace to protect their employees, customers, and providers.

# DEFENCE AND SECURITY

Wednesday 11 November 2020 | 15:00 - 15:25


## Biometrics from cradle to grave

*Yaseen Moolla, CSIR Senior Researcher and Norman Nelufule, CSIR Researcher*

The secure and accurate recognition of individuals plays an important role in modern society. While contact-based fingerprint recognition has grown in usage in the past decade, interest has grown in the use of other biometrics techniques, and how to use them in the most secure, reliable and effective manners. This is a multifaceted challenge which is approached from several angles.

The CSIR investigates the use of various biometrics to secure the identities of infants, protect them from identity theft and identity fraud, increase their safety, and improve service delivery to children and parents. For adults, the CSIR studies the use of contactless fingerprints and face recognition for effective, hygienic and versatile solutions. Researchers investigate methods to maximise the full biometric potential of the national smartcard identity cards, and subsurface fingerprint acquisition for high security scenarios. The organisation goes further to investigate new biometric technologies for forensic crime scene investigation, and for assisting mortuaries in identifying unknown individuals.

Wednesday 11 November 2020 | 15:30 - 16:00


## A technological solution for cyber security in South Africa: Lost Packet Warehousing Service

*Dr Noluntu Mpekoa, CSIR Research Group Leader, CSIR Information and Cyber Security Centre and Dr Heloise Meyer: CSIR Senior Researcher*

Recently, well-known and established South African organisations have experienced cyberattacks. The South African Bank Risk Information Centre (SABRIC) confirmed in October 2019 that the industry had been hit by a wave of Distributed Denial of Service attacks targeting multiple banks. This happened shortly after the website of City of Johannesburg succumbed to a ransomware attack. These attacks are a wakeup call for South African organisations and underlines the essential need for suitable detection mechanisms to prevent cyberattacks.

The detection of cyberattacks relies not only on understanding existing attacks, but also being able to identify emerging threats. The continuous and strategic collection of relevant and valuable cybersecurity data sets can offer insight into ongoing threats or cyberattacks, while also assisting with the combatting of cybercrime. Although various third-party providers, such as Shodan and Have I Been Pwned (HIBP), exist and do provide access to cybersecurity data sets, these providers have little to no presence in South Africa. Most of the available cybersecurity data sets are heavily slanted towards the United States and the identified trends might not be relevant to the South African context.

This talk introduces the Lost Packet Warehousing Service, a technological solution that will function as the primary source for cyber security within South Africa, allowing for the continuous but passive collection of cybersecurity data sets. The speakers also discuss the steps taken to maintain the security and privacy of the collected cybersecurity sets.

# DEFENCE AND SECURITY

Thursday 12 November 2020 | 12:00 - 12:50

## Sustainable integrated security for the protection of large and complex infrastructure

*Dr Duarte Goncalves, CSIR Principal Engineer (Host); Maj Gen (ret) Johan Jooste, Project Manager: Environmental Law Enforcement and Security, Department of Environment, Forestry and Fisheries; Mr Nndwakhulu Rambau, Chief Security Officer, Transnet Freight Rail; Mrs Nthabiseng Mosupye, Chief Deputy Commissioner - Government Information Technology Officer Department of Correctional Services; Advocate Karen Pillary, Acting General Manager: Security, Eskom*

Threats to national resources, such as our national parks, rail network system, power network, prisons and many other large complex operational environments, continue to grow. The desired security response mechanisms and strategies require deeper insights into threat scenarios, the development of concepts of operation for these facilities, the establishment of sustained capabilities to counter these threats as well as integrated technology solutions to serve as a force multi-plier for these counter-threat capabilities.

This panel discussion will focus on the lessons learnt from the integrated deployment of security technologies, personnel and processes in providing counter-threat capabilities. The panel will explore the security concepts of operations in large complex operational environments that will lead in better utilisation of resources and better response to security threats.

Thursday 12 November 2020 | 13:00 - 13:25

## Developing a South African hydrogen fuel cell powered unmanned aerial vehicle

*Erik Wegman, CSIR Senior Engineer*

The CSIR and the various Hydrogen South Africa (HySA) centres of competence are developing a hydrogen fuel cell powered version of a CSIR-developed long-endurance modular unmanned aerial vehicle (UAV). HySA is a national flagship programme initiated by the Department of Science and Innovation, aimed at developing South African intellectual property, knowledge, human resources, products, components and processes to support South African participation in international platforms using hydrogen and fuel cell technologies. The HySA participants are located at the universities of North West, Cape Town and the Western Cape.

## DEFENCE AND SECURITY

**Thursday 12 November 2020 | 13:30 - 14:00**

### Autonomous vehicles in the South African context

*Dr Dithoto Modungwa, CSIR Research Group Leader: Tactical Mobility*

Based on a substantial track record in soldier safety systems, the CSIR is undertaking work into the development of autonomous vehicles geared towards removing humans from dangerous situations and also to act as force multipliers.

Vehicles should be suited to the South African context. This takes into consideration the navigation of unstructured environments, which often include unmarked routes, off-road and informal routes, or deteriorated road surfaces. It requires expertise in automated steering, braking, gearing and acceleration, path planning, decision-making and utilisation of on-board sensors for situational awareness – needed for lane changing, park distance control, obstacle tracking and avoidance, as well as algorithms for autonomous navigation. The end-goal is a development approach for vehicles and mobile platforms for both military and civilian applications. The CSIR undertakes the research in partnership with tertiary and research institutions to help ensure that the field is embedded in future frontiers of science, as well as to create new employment opportunities, new platforms and new industries. This includes the potential creation of business spin offsand skills for smart manufacturing, maintenance and services.

## SMART MOBILITY

**Wednesday 11 November 2020 | 14:00 - 14:50**

### Reducing road freight costs and emissions through green tyres

*Dr Christopher de Saxe, CSIR principal engineer (Host); Prof. Frank Kienhöfer, Visiting Associate Professor at the University of the Witwatersrand; Dr Xiaoxiang Na, Senior Research Associate, University of Cambridge, United Kingdom; Mr Frans Gericke, Michelin Tyre Company South Africa; Mr Hein Venter, Michelin Tyre Company South Africa; Mr Christian Gazalet, Michelin Tyre Company South Africa; and Mr Rehaan Abdulla, University of the Witwatersrand.*

Logistics companies are increasing their efforts to reduce costs and carbon emissions, to which fuel use is the main contributor. Green tyres have the potential to improve fuel efficiency, but local transport operators are yet to be convinced of their value. The CSIR, in collaboration with the universities of the Witwatersrand and Cambridge, and tyre manufacturer Michelin, performed full-scale research trials of energy-saving green tyres on trucks. Tests were carried out on two 56-tonne trucks over three days on the high-speed oval track at Gerotek, and demonstrated a significant 8% to10% reduction in fuel consumption. This equates to an 8% to10% reduction in carbon emissions and 4% saving in operating costs. Don't miss this opportunity to get first-hand information from the experts on reducing road freight costs and emissions through green tyres.





## SMART MOBILITY

Wednesday 11 November 2020 | 15:00 - 15:25

### Travel and mobility patterns in Gauteng: The results of a household travel survey

*An interview with Shaun Mhlanga, CSIR Senior Researcher and Prof Mark Zuidgeest, Director of Undergraduate Studies: Department of Civil Engineering, University of Cape Town*

The 2019/20 Gauteng General Household Travel Survey reports on general travel and mobility patterns in Gauteng from a household perspective.

The analysis reveals valuable insights to understanding trip-making patterns, accessibility to modes of mobility, including public transport services, and further illustrates a barometer to measure government socio-economic investment programme and priorities against legislated transport policy objectives.

Travel survey insights are critical inputs to professionals in that they influence demand forecasting, transport modelling and policy analysis; whereas for government, it forms part of decision-support tools to inform the allocation, planning, and management of transport infrastructure and services.

Wednesday 11 November 2020 | 15:30 - 15:55

### Digital solutions for public transport operations: Lessons and tools from the Covid-19 response in Gauteng

*Khangwelo Muronga, CSIR Senior Technologist and Phindile Binda, CSIR Technologist*

The global Covid-19 pandemic has resulted in new National Disaster Management Act regulations in South Africa. These regulations affected public transport operations. The Gauteng Department of Roads and Transport requested assistance from the CSIR with technological tools in relation to compliance as well as with interventions to help limit the spread of the corona virus in public transport in Gauteng. Various technological tools were developed, first to identify the industry players, register the industry players and then assist them with compliance recording and reporting.

## SMART MOBILITY

Wednesday 11 November 2020 | 16:00 - 16:30

### Exploring new safety frontiers: The journey to facilitate safe South African road transport

*Dr Christopher De Saxe, CSIR Principal Engineer and Karien Venter, CSIR Senior Researcher*

South Africa has a road safety crisis, resulting from a complex web of issues around drivers, vehicles and infrastructure. Discover how the CSIR is helping to address two of these crucial issues, through experimental naturalistic driving studies and a novel approach to truck design.

Wednesday 11 November 2020 | 13:00 - 13:50

# Digital precision medicine: How to use advanced genomic knowledge to ensure impact

*Dr Janine Scholefield, CSIR Research Group Leader: Bioengineering and Integrated Genomics (Host); Professor Maritha Kotze, Department of Pathology, Faculty of Health Sciences, Stellenbosch University; Prof. Collen Masimirembwa, President and Chief Scientific Officer, The African Institute of Biomedical Science and Technology; Dr Chris Seebregts, Founder and Chief Executive Officer, Jembi; Dr Jerolen Naidoo, CSIR Senior Researcher*

The phrase precision medicine has been with us for over a decade. Yet, it is only recently, by embracing the fourth industrial revolution, which seeks to identify novel approaches in combating disease by combining big data knowledge of genomics with artificial intelligence that we can apply precision medicine strategies on a population scale. In this session, we outline the pipeline for developing the digital precision medicine platform, which aims to provide best treatment outcomes for patients within the unique genetic context of the South African population.

## Introductory Talk 1: The CSIR's work in the digital precision medicine space

*Dr Janine Scholefield, CSIR Research Group Leader: Bioengineering and Integrated Genomics*

As the country's scientists move towards lobbying policy-makers and government for more precision-medicine solutions to be implemented in the health sector, more and more technologies are becoming commonly accepted as necessary to address Africa's inflated health burden. As an introductory talk to this session, Dr Scholefield will outline a strategic initiative pipeline for integrating omics-based technologies in the health sector.

## Talk 2: Establishing a pharmacogenomics platform for extending point-of-care DNA testing to whole genome sequencing in cancer treatment

*Prof. Maritha Kotze, Department of Pathology, Faculty of Health Sciences, Stellenbosch University*

Establishment of the SAMRC Genomic Centre has the potential to unlock Africa's diverse gene pool and grow capacity for whole genome sequencing (WGS) as the most comprehensive testing strategy currently available. Use of a pathology-supporting genetic testing framework, incorporating WGS, provides the ultimate solution for addressing different aspects of cancer across the continuum of care. In this context, a novel point-of-care DNA test kit targeting cancer and other common non-communicable (NCD) disease pathways, was developed. Use of this tool during a genetic counselling session enables creation of the clinical context for reporting of complex WGS data, while addressing critical data sharing and dissemination challenges involved in securing data integrity throughout the clinical workflow.

## Talk 3: Preemptive pharmacogenomic testing in Africa for the reduction of adverse drug reactions.

*Prof. Collen Masimirembwa, President and Chief Scientific Officer, The African Institute of Biomedical Science and Technology*

Adverse drug reactions (ADRs) are a major challenge in the use of medicines and are associated with hospital admissions and increased healthcare costs. In South Africa, one in nine admissions are due to ADRs and in the treatment of HIV, drugs such as efavirenz are associated with ADRs in more than 30% of the patients. Our research has led to the design of an open array chip that can detect genetic variations associated with risk for ADRs and the development of dosing algorithms that can guide clinicians in drug selection and dose adjustment to reduce ADRs. We propose the introduction of such pre-emptive pharmacogenetic testing as a public health intervention in reducing the burden of ADRs.

## Talk 4: Responsible and beneficial big data science for healthcare

*Dr Chris Seebregts, Founder and Chief Executive Officer, Jembi*

In the era of increasing health data collection and utilisation, it is critically important to consider how this resource can be managed responsibly to ensure beneficial use and to create impact. Important aspects include adopting FAIR and ethical principles for data extraction, representation, storage, collation and usage. Some principles are enforced by research ethics committees for health research data and through legal agreements for data collected and collated from non-research and routine health information systems. These governance processes are also essential for the advanced and beneficial application of advanced analytics, statistical machine learning and artificial intelligence.

**Panel discussion:** Speakers joined by Dr Jerolen Naidoo, CSIR Senior Researcher.

# HEALTH

Wednesday 11 November 2020 | 14:00 - 14:25

## Precision Medicine - Making macrophages in a dish: Modelling the African response to immunity

*Dr Dimakatso Gumede, CSIR Senior Researcher*

Macrophages are plastic cells of the haematopoietic system, and are critical for host immune response. However, chronic activation of the immune system can cause constitutive secretion of pro-inflammatory cytokines, leading to hyperinflammation. Previous studies have used human peripheral blood mononuclear cells to explore potential targets for reducing hyperinflammation, but their limitation is a lack of self-renewal. The advent of the technology in which induced pluripotent stem cells (iPSCs) are generated from skin cells, has led to the unlimited ability to derive macrophages from these cells. This iPSC technology will thus be used in this study to derive macrophages to investigate potential targets for treatment of systemic inflammation, which has been observed in SARS-CoV2 infections.

Wednesday 11 November 2020 | 14:30 - 14:55

## Precision medicine – Proteomics in health and disease: Opportunities and challenges from a South African perspective

*Dr Stoyan Stoychev, CSIR Senior Researcher and Head of Proteomics at ReSyn Biosciences*

It has become widely recognised that profiling of the human genome alone is insufficient for diagnosing and monitoring most diseases due to the inability to gather all information related to the patient physiological state. Proteomics aim to profile the entire protein complement of an organism that is expressed under a physiological condition. Due to its dynamic nature, the proteome provides the possibility to monitor disease onset, progression, adverse drug reactions and mechanism of drug action. In this presentation we discuss the application of mass spectrometry-based proteome profiling for clinical diagnosis and precision medicine in a South African context.

# HEALTH

Wednesday 11 November 2020 | 15:00 - 15:25

## Precision medicine: Drug repurposing for cancer precision medicine

*Dr Deepak Balaji Thimiri Govindaraj, Centre Manager, CSIR Synthetic Biology and Precision Medicine Centre*

The gold standard treatment of ovarian cancer comprises platinum-based chemotherapeutic agents that bind DNA and cause cells to undergo apoptosis. However, the frequent emergence of drug resistance causes patients to relapse. Therefore, new treatment strategies are required. To address this unmet medical need, an international collaborative project led by the CSIR will develop a pipeline for the identification of drugs and drug combinations capable of overcoming platinum resistance. The cutting-edge technology will combine tissue engineering, chemical synthesis and microfluidic technology. It will help screen drugs in patients with relapsed ovarian cancer who have exhausted all other treatment options, offering tailored alternatives.

Wednesday 11 November 2020 | 15:30 - 16:00

## Microarray technology based multiplex point-of-care diagnostic

*Bridgett Malatji, CSIR Laboratory Technologist*

HIV/AIDS mortality is due to opportunistic illnesses or infections that take advantage of the weakened immune system in infected individuals. In Africa, one of the most common of these opportunistic illnesses include infection by Mycobacterium tuberculosis (M.tb) responsible for tuberculosis (TB). HIV coinfection with M.tb has negative implication for disease management, given that each pathogen accelerates the morbidity caused by the other. Effective management of patients infected with both pathogens is restricted by the fact that their diagnosis are done separately. The situation is more difficult in remote areas where patients have to wait for much longer to obtain their TB diagnostic results. The CSIR seeks to respond to this need by developing a point-of-care multiplex microarray technology for simultaneous detection of HIV and M.tb in blood that will reduce time and cost associated with the diagnosis of these diseases.

# HEALTH

Thursday 12 November 2020 | 13:00 - 13:50

## The CSIR Microbiome Mapping Initiative: Establishing an African baseline of gut health.

*An interview with Dr Jerolen Naidoo, CSIR Senior Researcher*

The human microbiome refers to the collection of microorganisms, such as bacteria and viruses that co-inhabit discrete sites across the human body. These microbes have emerged as critical determinants of health outcomes leading to the microbiome being referred to as our 'second genome'. Adverse perturbations of the genetic and functional diversity of the human gut microbiome (dysbiosis) results in altered susceptibility and severity for a number of human diseases and can also influence treatment outcomes. The CSIR microbiome mapping initiative aims to explore this microbiome-human health axis within the South African population.

Thursday 12 November 2020 | 14:00 - 14:25

## Veterinary molecular diagnostics and vaccines – Novel technologies for molecular diagnostics of infectious diseases

*Dr Essa Suleman, CSIR (Acting) Research Group Leader: Veterinary Molecular Diagnostics and Vaccines*

Current technologies for detection of infectious diseases are primarily based on Polymerase Chain Reaction (PCR) technology and derivatives, which require expensive equipment, laboratories and highly trained personnel. This often results in significant delays which hinder rapid and effective responses to control infectious disease outbreaks. Furthermore, there is a need for rapid, molecular diagnostics as well point-of-care diagnostics, particularly in rural areas. To address these challenges, the CSIR is developing novel technologies and diagnostics. The lab-on-chip point-of-care technology platform will enable accurate, rapid and sensitive molecular diagnostics at point of care for a variety of infectious diseases with applications in the animal, human and environmental health sectors. For diseases such as Covid-19, high resolution melt and isothermal amplification are being developed to facilitate rapid and cost effective identification of different strain types and point-of-care diagnostics respectively.

# HEALTH

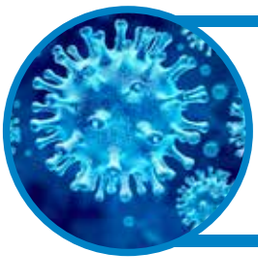
Thursday 12 November 2020 | 14:30

## Biological disaster management post Covid-19: The Tokabio perspective

*Dr Phiyani Lebea, Managing Director: Tokabio (Pty) Ltd*

TOKABIO
DETECT • ANALYSE • PRESCRIBE

Thursday 12 November 2020 | 15:00 - 15:30



## Diagnostics – Lessons from Covid-19 testing

*Phumelele Ramphoma, Laboratory Manager: Covid-19 Diagnostic Laboratory*

Cases of 2019 coronavirus disease (Covid-19) caused by the severe respiratory syndrome coronavirus-2 or SARS-CoV-2 are approaching 39 million. The virus is mainly transmitted via contaminated aerosols from coughing and sneezing, or even talking. The majority of Covid-19 cases are either asymptomatic or result in only mild symptoms. However, the remaining cases, about 20%, lead to severe illness with the mortality rate standing at about 5%. With the death toll approaching 1.1 million around the world, there is still no effective vaccine against Covid-19, and early diagnosis and isolation have been the most powerful tool for decision makers in the public and private sectors to fight the spread of the diseases. Since the beginning of the lockdown period in South Africa, the CSIR has been providing mass molecular testing for employees of major public and private South African institutions. Researchers share lessons learnt.

# MINING

Wednesday 11 November 2020 | 13:00 - 13:50

## Improving the longevity of mines through modernisation

*Fatheela Brovko, Impact Area Manager: Mining and Mineral Resources (Host); Thobile Nhleko, CSIR senior researcher; Peter Klein, CSIR senior researcher; Martin Pretorius, Programme Manager, Mandela Mining Precinct*

The mining industry in South Africa is a key contributor to the South African economy, however a year-on-year decline in the overall profitability of the industry has been observed. Challenges facing the mining industry include increased costs, decreased productivity, health and safety risks, and environmental and social issues. The industry needs to modernise to remain sustainable. Modernisation (or 'Mining 4.0') involves the heightened use of technologies, and changes to people and processes. This panel session will focus on research and development conducted by the CSIR in collaboration with academic institutions, facilitated by the Mandela Mining Precinct, towards modernising existing conventional narrow reef underground operations in South Africa.



Thursday 12 November 2020 | 14:00 - 14:50

## Re-imagining mining and the role of research and innovation in the journey

*Bongi Ntsoelengoe, Executive Manager: CSIR Future Production: Mining (Host); Sietse van der Woude, Senior Executive: Modernisation and Safety, Minerals Council South Africa; Bernard Swanepoel, Director, To the Point Growth Specialists; Rick Howes, Chief Executive Officer: Dundee Precious Metals; Sihle Mdluli, Director: Strategy and Corporate Services, Bushveld Minerals*

The sustainability of the mining industry in South Africa is under threat due to pressures such as high production cost, low profit margins, labour unrest and rising demands by government. Added local challenges have further limited economic recovery for the industry, as seen in job losses and the exiting of multinational players. Modernisation of the mining industry can lead to the required transformation and return to productivity.

However, financial restrictions and cost savings have negatively affected investment in research and technology innovation. Studies have shown that research, development and innovation are essential components of modernisation by enabling testing, developing and demonstrating appropriate technology solutions. Which raises the question: "What is the role of research and innovation in the modernisation journey and how accessible is it?"

## MINING

Wednesday 11 November 2020 | 15:00 - 15:25

### In pursuit of zero harm: Technology as a tool in support of mining's zero harm objective

*Riaan Bergh, CSIR Impact Area Manager: Mining Testing and Training*

The mining sector is an important pillar of the South African economy. The sector faces many challenges to deliver sustained productivity, transformation and technological advancement in areas such as digitalisation and the tools honed by the fourth industrial revolution. However, at the centre of this, are those who deliver underground riches to the surface. In the pursuit of Zero Harm, and impacting on the lives of thousands, technology remains the game changer to ensure quality, independent testing and verification services, targeted training, relevant research outcomes and competent technical advice. This is a combination of experience, human expertise and infrastructure. Facing statutory requirements, pressure to modernise operations and economic challenges, the mining sector has the opportunity to craft a model for closer collaboration and co-creation of capabilities with the CSIR as research, development and innovation provider.

Wednesday 11 November 2020 | 15:30 - 16:00

### Supporting health, safety and optimal extraction through the use of a geophysical toolbox approach

*Dr Michael van Schoor, CSIR Principal Researcher*

Two key pain points in the local deep-level hard rock mining industry are safety (zero harm objective) and optimal extraction. Although mining fatalities have decreased over the past decade it appears to be plateauing and more should be done to strive towards zero harm. The major causal factor in mining fatalities has consistently been falls of ground, which are typically responsible for 40% to 50% of fatalities. In terms of optimal extraction, if any unseen geological structures like faults, potholes or intrusions affect the continuity and mineable area of to-be-mined blocks, it equates to a significant loss of potential income and also contributes to poor and unsafe ground conditions. This webinar outlines how the application of an integrated in-mine geophysical approach (or geophysical toolbox approach) can contribute to mitigating the above mining challenges.

## MINING

Thursday 12 November 2020 | 13:00 - 13:50

# Launch of the Technology Availability and Readiness Atlas (TARA) – Mandela Mining Precinct

*Johan Le Roux, Acting Director: Mandela Mining Precinct, CSIR*

The Technology Availability and Readiness Atlas (TARA) has been punted as the Autotrader® of South African mining equipment and makes access to the selection of local mining equipment, seamless. In its vision to maximise the returns of South Africa's mineral wealth, and in so doing, stimulate the production of local mining equipment, the Mandela Mining Precinct has, through its Real-Time Information Management Systems (RTIMS) research programme developed the TARA online database, accessible on this link: https://miningtara.co.za/.

The Mining Equipment Manufacturers of South Africa (MEMSA) has been identified as a strategic partner to the Mandela Mining Precinct, given their role in the mining original equipment manufacturers (OEM) space. TARA is an online platform enabling OEMs to capture their commercially available offerings to the industry, while enabling mining houses to keep abreast of local capabilities and offerings.

The Mandela Mining Precinct-developed platform is positioned to foster the modernisation and mechanisation of mining in South Africa. The online platform has been designed to allow OEMs to upload their own product offerings, their technical specifications and images, according to set data fields that align to the mining extraction value chain processes. In addition, OEMs can add their own choice of features and specifications, lending the system great flexibility. From the "Equipment" page, users are able to find specific items through a filtering by category, or a search function.

The Mandela Mining Precinct is a public private partnership between the Department of Science and Innovation and Minerals Council South Africa. The Precinct is hosted by the CSIR.

**Welcome and opening**
*Johan Le Roux, Acting Director: Mandela Mining Precinct, CSIR*

**Introducing the TARA platform**
*Jean-Jacques Verhaeghe, RTIMS Programme Manager, Mandela Mining Precinct*

**The value of TARA to the industry**
*Ossie Carstens, Chief Executive Officer, MEMSA*

**Front-end demo**
*Maxine Penn, Marketing, Fermel*

**Question and answers**

**Closing remarks**
*Freddy Mugeri, Board Chairperson, MEMSA*

Wednesday 11 November 2020 | 13:00 - 13:50


## Re-imagining the ICT regulatory landscape in the fourth industrial revolution era – a conversation with regulators

*Dr Ntsibane Ntlatlapa, CSIR Impact Area Manager: Networked Systems and Applications (Host)*

In its first draft report, the Presidential Commission on the Fourth Industrial Revolution developed the South African definition of the fourth industrial revolution as an era in which people are using smart, connected and converged cyber, physical and biological systems and smart business models to define and reshape the social, economic and political spheres. This definition calls for collaboration among several sectors of the economy to achieve the intended impact. This conversation focuses on the type of industry regulations that are required in the era of the fourth industrial revolution.

Wednesday 11 November 2020 | 14:00 - 14:55

## Distributed Ledger Technologies – What are they and who is using them?

*Dr Neil Croft, CSIR Researcher (Host)*

Most of us may have heard of the terms blockchain and cryptocurrencies. Although these go hand in hand, the underlying technology driving the fintech space is the novel idea of distributed ledger technologies. Without the use of trusted third parties, transactions, data and smart contracts can be created and consumed in an autonomous way. Three types of distributed ledger technology systems exist: permissionless, permissioned and hybrid, and all are currently being explored as possible solutions pertaining to industries such as cross- border transactions, food supply chain management, financial market liquidity, hedging and shareholder staking, to name a few. This webinar will cover an in-depth look of the technology itself followed by some real- world use cases.

Wednesday 11 November 2020 | 15:00 - 15:25

## Television Whitespace enabling rural and utility connectivity with CSIR geo-location spectrum database technology

*Dr Albert Lysko, CSIR Principal Researcher and Dr Luzango Mfupe, CSIR Principal Researcher*

Connectivity has become a necessity for the efficient running of utilities and for providing broadband to people. Television Whitespace connectivity enabled by CSIR-developed technology can provide 24 Mbps speeds, distances in excess of 10 km; offers excellent propagation properties with a considerable tree/vegetation penetration, and is even able to handle partial non-line-of-sight conditions. The talk will summarise CSIR experiences with Television Whitespace, explain how to start with it, and overview the associated business opportunities.

Wednesday 11 November 2020 | 15:30 - 16:00

## Resource allocation in Fog-enabled 5G Networks

*Nosipho Khumalo, MSc Studentship, CSIR*

The need to cope with the continuously growing number of connected users and the increased demand for mobile broadband services in the Internet of Things, has led to the notion of introducing the fog computing paradigm in fifth generation (5G) mobile networks in the form of fog radio access network (F-RAN) so as to reduce network bottlenecks and improve latency. However, despite the potential, the management of computational resources remains a challenge in F-RAN architectures. This presentation will first investigate the application of resource management techniques in 5G F-RANs and present a literature survey. Then, we propose a reactive algorithm for dynamic and autonomous resource management based on the auto-scaling method in cloud virtualisation. Finally, we demonstrate, through simulation-based performance evaluation, the efficiency of the proposed algorithm and discuss the results.

Thursday 12 November 2020 | 09:30 - 10:25

## Cloud or On-premise?

*Hosted by Dr Happy Sithole, Centre Manager for the National Integrated Cyber Infrastructure System*

Organisations globally are having to make decisions on whether they are supposed to invest in infrastructure on their own premises or use the cloud. There is growing drive on developing private cloud and have hybrid implementation of infrastructure. The issues that decisions makers are faced with are: Is the cloud secure? How do I test that? What is the cost benefit analysis of the various options? When it comes to on-premise cloud, do I have sufficient skills to deploy and run OpenStack?

Thursday 12 November 2020 | 10:30 - 11:30

## Hallo Digital Humanities: A reshaping of the humanities in the fourth industrial revolution

*Hosted by Dr Karen Calteaux, CSIR Research Group Leader: Digital Audio-visual Technologies; Prof. Menno van Zaanen, SADiLaR, North-West University; Prof. Sonja Bosch, University of South Africa; Mr Juan Steyn, Project Manager, SADILaR, North-West University*

The fourth industrial revolution has led to a revisitation of a wide range of (research) areas. In particular, the field of humanities, which is typically seen as rather non-technical, is currently reshaping itself. The traditional research field of humanities is embracing computational techniques to answer new research questions. This novel direction in the field of humanities is called Digital Humanities. In particular, the computational techniques allow for the analysis of large amounts of texts; previously it was impossible due to the huge manual effort. In this webinar, presentations from researchers in the area of computational language analysis and digital humanities will illustrate research in the field of humanities impacted by the fourth industrial revolution. The webinar is presented as a collaboration between the CSIR and the South African Centre for Digital Language Resources (SADiLaR) – a South African Research Infrastructure.

## C4IR SOUTH AFRICA INAUGURAL WEBINAR

**Thursday 12 November 2020 | 12:00 - 12:50**


### The landscape and best practices in data policy to unlock fourth industrial revolution opportunities for socio-economic development in South Africa

*Co-hosted by Dr Fulufhelo Nelwamondo, Executive Manager: CSIR NextGen Enterprises and Institutions and Ms Khungeka Njobe, CSIR Group Executive: Business Excellence and Integration*

The World Economic Forum (WEF) Affiliate Centre for the Fourth Industrial Revolution South Africa (C4IR SA), following a multi-stakeholder consultation, identified five focus areas, namely the Internet of Things, Robotics and Smart Cities; Blockchain and Distributed Ledger; Artificial Intelligence and Machine Learning; Autonomous and Urban Mobility and Data Policy. These focus areas have the potential to positively transform sectors in the South African economy and address development challenges. As part of its inaugural activities, the Centre has noted that data policy is key to unlocking the potential of the fourth industrial revolution (4IR) technologies globally and locally.

The programme includes sharing of global best practices in data policy; a presentation on synthesis of the data policy landscape analysis, situation analysis, gap analysis and stakeholder needs and requirements. A process to develop a roadmap to initiate a data policy project by C4IR SA will be discussed. Stakeholders at the webinar will also be briefed on how to partner with the C4IR SA and projects in 4IR technologies of their interest.

## 75 UNDP

**Thursday 12 November 2020 | 13:00 - 14:00**

### Celebrating 75 years of the United Nations: Reviewing 25 years of the United Nations Development Programme in South Africa

In 2019, South Africa (SA) celebrated 25 years of democracy. The United Nations Development Programme South Africa (UNDP SA) undertook a review of its work in improving the lives of South Africans over the past 25 years, and its contribution towards the global Sustainable Development Goals (SDGs). As part of the United Nations 75th anniversary celebrations, UNDP SA presents its 25-year highlight reel showcasing its impact within society through its various programmes, including:

- Inclusive, just and sustainable economic growth;
- Effective, efficient and transformative governance; and
- Climate resilience and sustainably managed natural resources.

The UNDP played a leading role in developing and contributing towards the achievement of the SDGs in South Africa, Africa and globally. This showcase will include lessons learned along the journey and feature current and future initiatives. On the virtual tour, audiences can download the 25-year report and view feedback from UNDP partners over the years. Looking ahead, UNDP SA will focus on innovative projects and partnerships to support South Africa and Africa in achieving the SDGs.

Thursday 12 November 2020 | 14:00 - 15:00

## Demolishing science communication barriers for the benefit of society

*Facilitator: Robert Inglis, Research Communication Specialist, Founder and Director of Jive Media. Katekani Ngobeni, CSIR Senior Researcher; Rusana Philander, Freelance Journalist, Fin24; Chanel Retief, Reporter, Daily Maverick; Zamuxolo Matiwana, SAASTA Youth Journalism Programme; Lebo Tshangela, Journalist, SABC.*

Strengthening public understanding of science is key in building a knowledge-based society. Science communication has a vital role to play in orchestrating efforts to achieve this national goal.

The media has critical role to play to spread awareness about the role and importance of science in society. But journalists have the difficult job of translating and processing detailed and complex information provided by scientists. Scientists, on the other hand, have the responsibility of conveying the value of science to the public, but fear being misrepresented. This results in an often-strained relationship between these two professions. What would it take to permanently break down the barrier between journalists and scientists? What is it that scientists can/should do when communicating scientific content?

This session seeks to foster trusting relationships between scientists and journalists in the interest of science engagement and public understanding of science and technology.

# TECHNOLOGY DEMONSTRATIONS

View ten of our technologies, suitable for use by a variety of sectors.

- A combined face, body and number recognition system for access control and surveillance purposes
- A live video and image processing toolbox
- A security surveillance camera and alerting system
- A food-packaging innovation for longer shelf life
- A novel technology for production of cellulose nanocrystals from sawdust
- Highly potent anti-HIV antibodies produced using plants
- An app to help farmers forecast the water requirements of apple orchards
- A low-cost, green solution that removes nutrients from wastewater
- Text and audio synchronisation for accessible digital reading and learning
- A low-cost solution for smarter utilisation of national radio frequency spectrum resources