

## 2023— Come away with me..... Norah Jones

### Letter from the Editor...

Welcome to the 2023 edition of the: “InnoVenton Times”.

This edition reflects some of the highlights at InnoVenton during the year.

InnoVenton received ISO 9001 Certification this year for its’ quality management system. We were the 2022 recipients of *The Innovation Excellence Award* acknowledged by the Nelson Mandela University at a formal function in 2023 for this achievement.

We also take a look at some of the activities promoted by the Technology Station Program and some of the Technology Development Projects completed during the year. Worth a mention are the Pyrolysis projects and Personal Care Product development projects that have gained momentum, drawing in much interest from clients.

InnoVenton hosted 5 Interns, they all took part in our Graduate Intern Training Program that covered various disciplines to promote cross learning experiences. Every year we create opportunities for young chemists and process technicians who can apply to participate in this skills development initiative.

InnoVenton presented two Short Learning Programs this year: “Process Safety” and “Data Analysis for Analysts, Scientists and Engineers”. The workshops on offer to SME’s and individuals included; “So, you want to start your own Cosmetic Business”, “An introduction to Cosmetic Formulation”, “Formulating Surfactant-based personal care products”. If you would like to sign up for one of these learning opportunities or check out what else we have on offer in 2024 you can follow our website or Facebook page for updates.

An opportunity to Market InnoVenton came when we hosted the launch of the World IP Day for the University. We were able to show case our product and process development activities at the Nelson Mandela University Research Week and the “Inside Outside” Engagement Festival.

Naturally, our stakeholders play a pivotal role in ensuring the sustainability of the institute and enable us to contribute our expertise to several areas in the Chemical Technology and Bio economy space. So, we

would like to acknowledge the role that the Technology Innovation Agency and the Department of Science and Technology play.

To our suppliers, your commitment to meeting our tight turnaround times and willingness to assist where possible goes along way towards improving our capacity and ability to deliver to

our clients. Thank you.

To our staff, thank you for your dogged resilience that has helped us soldier on through 2023. “Teamwork makes the Dream work” – John C. Maxwell.

Once again...Delight and surprise our customers. Amaze our stakeholders. And consider, “The way to achieve your own success is to be willing to help someone else get it first”. (Melissa c/o - I. Vanzant)

Photo (L to R): Dr Melissa Gouws, Dr Jackie Collins, Dr Gary Dugmore, Mrs Louise Hamilton, Mr Peter Grant, Dr Carla Kampman, Mr Philip Van Zyl.



## Microalgae– wonder product for South Africa

12/05/2023 Courtesy of Nelson Mandela University Marketing

With a powerful biorefinery to process microalgae as a renewable, health-giving resource, InnoVenton/DCTS innovates and develops products for the energy, pharmaceutical, agriculture and food sectors.



Using biostimulants extracted from microalgae to boost agricultural plant growth and contribute to nanomedicine, is all part of the value chain at InnoVenton/DCTS (Institute for Chemical Technology and Downstream Chemicals Technology Station).

“From concept to the harvesting and formulation of

microalgae for a range of products, InnoVenton/DCTS is focused on contributing to a vibrant bio-economy,” says InnoVenton Acting Director, Dr Gary Dugmore. “We have intentionally positioned ourselves to support the Department of Science and Innovation’s bio-economy strategy, with its emphasis on the industrial and environmental sectors, agriculture and health.”

At InnoVenton they have microalgae growing in ponds and buckets. It’s a rapid way of growing biomass that doesn’t take up much space, and, while it uses a lot of water to grow it, the water is repeatedly reused.

“In 2008 we first started using microalgae in our biorefinery to develop a recovered-waste fossil fuel product called Coalgae®. Essentially, we mix algae slurry with fine waste coal and pass it through the filter process,” says InnoVenton’s technical manager, Louise Hamilton.

“Coalgae® is fully developed but the techno-economics of using it on a large scale are not there yet. We’re actively working on this, but in the meantime, we are testing it with smaller businesses. Currently, for example, a chicken abattoir in Jansenville, Eastern Cape is using it as fuel for their 20-ton boiler.”

Innovation with microalgae is not new but it is currently enjoying considerable momentum worldwide. “It’s all about getting away from fossil fuel and non-renewable sources,” explains Dr Dugmore. “The CSIR, for example, used algae-based technology to make biodegradable plastic bags. We can use the carbon from algae rather than carbon from fossil fuels to contribute to South Africa’s bio-economy drive.”

The InnoVenton team has been working on developing higher-value products, using the biorefinery facility to get as much value as possible out of the microalgae, and increasing their collaborations with industry, small and large.

“Omnia Fertilizer is one of the larger companies we are working with to test our biostimulant product – a microalgal extract that stimulates growth in plants as a complement to fertiliser to increase crop yields,” says Hamilton. “In adverse conditions such as drought or poor soil, it helps the plants cope better and uptake nutrients more efficiently.”

Microalgae are known for their antioxidant, immune-boosting and anti-inflammatory properties and high protein content and are used as a beneficial food-grade ingredient, as well as for food colourants and cosmetics.



One of several InnoVenton successes is a low-tech, cost effective, high yield spirulina cultivation system to produce biofertiliser and animal feed. For example, the microalgae formula has been developed to replace fishmeal in fish feed. This is currently being tested at a Gqerberha-based tilapia aquaculture project.

# DSI-TIA SIIP Algal Biorefinery Support Program

—Dr Carla Kampman

The Biorefinery program has positioned InnoVenton to address factors limiting the development of the microalgae value chain in the Bioeconomy. The Program lays a platform of resources which develop, package, transfer and support microalgae technologies and products through to manufacturing and commercial activities by empowering SMME's, entrepreneurs, and larger commercial entities who have shown interest. In this way the risks related to commercialization are reduced and the technologies are accessible (TRL5-8) during and after commercial uptake.

Progress to date has seen the first year funded and a range of milestones completed. Technology transfer documents have been completed they range from descriptions of 7 process, 5 whole microalgae products, 2 fractionated microalgae products, 4 market reviews and 4 regulatory requirements. Skills development forms a major part of equipping individuals for this area of work so two interns were trained during the year. A list and scope of technology transfer services were completed and 3 stakeholder engagements in the form of workshops and forums were held. At present we have Technology Demonstrators are running to show proof of concept and intermediate scaleup. We look forward to actioning a second year of deliverables for this program as the technology and our capacity is developed and the dream of commercialization pursued.

The key elements of the program align with the countries Bioeconomy strategy and with InnoVenton in terms of its position in our Higher Education Institution (HEI) Faculty of Science and as a Host Technology Station. So, through the program we continue to:

- Develop Microalgae as a renewable feedstock
- Develop and create productization steps of knowledge for the value chain
- Leverage concepts & research from HEI
- Transfer technologies and products to manufacturing and commercialization through SMME's, entrepreneurs, and

- larger commercial entities
- Develop integrated biorefineries from microalgal feedstock
- Value propositions: cultivation technologies and product line formulations,
- Packaged Microalgae Biorefinery concepts,
- Formulation pilot facilities,
- Fractionation pilot facilities and process technology development and Biochemical/chemical derivatization product & process technology.
- Skills Development & Training can be actioned by developing and delivering appropriate Short Learning programmes to transfer skills and disseminate technology.



Photo: Microalgae Biorefinery Interns; Alindile Vimbelo and Bushra Budal working with Philip Van Zyl



Photos: Technology Demonstrators



# Phycocyanin

## Process development

\_\_\_Dr Anna Collins

A technology transfer package has been documented, to produce a prototype food grade Phycocyanin product and to set up a Technology Demonstration facility for production. Memcon, has assisted us with some of the preparation stages.



Technology level advancement has been achieved by demonstrating scalable product purification steps by polishing extract by passing it through filters, followed by reverse osmosis. Successful spray drying parameters have been demonstrated with 3 prototypes being produced for further testing.

Fresh samples were produced to test the efficacy and scalability of ultrafiltration for water removal and extract purification. Phycocyanin extract was subjected to an ultrafiltration process using a pressurized stirring cell.

Phycocyanin recovery of >95% was achieved with an increase in purity. The idea is to run Pilot scale trials on industrial scale equipment.



## InnoVenton

**Our role is to provide technology support services, skills development training and a technology development capability for basic research and client projects. This includes improving the alignment of basic research and formal teaching with needs.**



# Essential Sterolin Project

## Manufacture of 10 kg $\beta$ -sitosterol- $\beta$ -D-glucopyranoside

\_ Dr Gary Dugmore

Essential Sterolin Products (Pty) Ltd (ESP) requested InnoVenton DCTS to evaluate the technical feasibility of producing  $\beta$ -sitosterol- $\beta$ -D-glucopyranoside using the kilo lab facility located at InnoVenton. The process is a four-step synthesis starting from glucose and  $\beta$ -sitosterol.

A rigorous process of development was undertaken in the laboratory, where critical process parameters were identified and necessary adjustments made, informed by the initial scale up process, to enable more practical large-scale manufacture. The Technology has been developed to production scale (TRL7 & 8).

Kilo Scale manufacture under expected conditions enabled validation of an integrated process. The BSSG Product meets quality specifications, and the process has been optimised and documented. A total of 10 kg was manufactured for the client.



Photos: Kilo Lab Trial Prototyping and manufacture of 10 Kg  $\beta$ -sitosterol- $\beta$ -D-glucopyranoside



## An introductory Guide to Cosmetic Formulation

Are you interested in setting up your own natural skin care business, but don't know where to start? Join us for a day to find out.

*You don't even need a scientific background.*

### The course will cover

- Evaluating your formulation idea
- Introduction to formulation terminology and the language of formulation

### Who should attend?

**Inventors and entrepreneurs who would like to acquire basic tools to better understand and evaluate their idea**

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### So, you want to start your own cosmetic business workshop.

We had the privilege of hosting an awesome workshop which was presented by Mr John Knowlton, 15 delegates attended, and they thoroughly enjoyed the experience and learnt so much. Two sessions covered the following topics: Defining the opportunity and the four golden questions, identifying the market for your new product, the product development process, how to find a good manufacturer, developing claims for your product range and lastly the regulatory environment in the South African cosmetic industry. The workshop equipped the attendees with information that will help them going forward in the future when starting and running their businesses.



## Build a simulated fluid bed (bubbling bed) batch gasifier –

— Mr Peter Grant

A modified fixed bed batch gasifier which operates in a simulated batch mode, bubbling bed configuration at conditions simulating the temperature and kinetics of a fluid bed gasifier was built. Its' maximum operating temperature is 1100°C.

Hot syngas is withdrawn at the top of the biomass bed to ensure complete carryover of gas and pyrolysis products into the chilled condenser system. Agent flow is introduced at the bottom of the bed and syngas exits at the top of the bed, thus counter batch bubbling, at a gas velocity low enough not to carry over fines.

The prototype gasifier will be used to run tests on refuse derived fuel pellets and biomass samples for Gas Technology Institute and other interested SME's.



Photo: Modified Bubbling Bed Gasifier and Condenser

## Pyrolysis work for GTI

Peter Grant and Michael du Preez have been busy with pyrolysis work for GTI based in America. The work involves assembling cold traps which are used to catch moisture and light oils. The samples are heated up (plastics and pine wood) to 650 degrees Celsius under nitrogen, maintaining 650 degrees for 1 hour. Gas Analysis is done on samples every 20 minutes. Cold traps trap any vapors and wax that the samples may emit and then solvent is used to extract and separate the oils, wax and water in the lab.

# InnoVenton

## Downstream Chemicals

### Technology Station

From its inception the Technology Station activities at InnoVenton have been fully integrated into the larger institute to maximise the impact that we have externally.

*InnoVenton/DCTS strives to provide specific technology support and innovation in the areas of:*

- ◆ Product replacement; extension or formulations
- ◆ Improving production/process flexibility;
- ◆ Reducing production lead times; Reducing environmental impacts; improving product quality; improving working conditions/safety;
- ◆ Providing expert technology, analytical, testing services; and
- ◆ Providing custom designed short learning programs for industry
- ◆ Kilo-lab, Distillation and Process Plant Facilities
- ◆ TIA Seed Funded Projects, Major Projects and Youth development Projects.

**Enquiries:** Mrs Louise Hamilton T 041 504 3281

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## Process manufacture development of Herbicide Active

Chemical Process Development of a fine/speciality chemical in a re-industrialization project. This herbicide active is used to control bush encroachment in rangeland. InnoVenton have a suitable multipurposed pilot facility with two Buchi Chemreactor systems (CR30 and CR51K).

Some key issues were highlighted when the lab scale process was run on the pilot plant, to produce data and samples for registration (Australia), further process development was required to further develop and optimise the scaled-up process, this will result in a Technology Transfer Package. A rigorous process of development was undertaken in the laboratory and the kilo lab, where critical process parameters were identified to understand the process, factors affecting the yield and purity, i.e.: reaction kinetics, side reactions.



## In-Service Training /Intern Project Development

InnoVenton set up an internship training programme focusing on developing and upskilling individuals. The idea is to end up with versatile skilled technicians who have applied knowledge. This should put them in a position where they can contribute and add value to operations at any company they find themselves working at.

The 2023 Interns were placed in areas of Product Improvement and Development, Marketing, Monitoring, Testing and Microalgae bioprocessing. They are Bushra Budul (Biorefinery), Alindile Vimbelo (Biorefinery), Leilane Ah Shene (Marketing), Joshua Spence (Marketing), Moeketsi Vinjwa (Analytical Chemistry).

Photo (left to right) our gang of interns: Vuyisa Ntsundwana (2022), Anneke Van Rooy (2022), Olebogang Mogapi (2022), Zoleka Nyati (2022), Alindile Vimbelo (2023), Joshua Spence (2023), Leilane Ah Shene (2023), Bushra Budal (2023), Moeketsi Vinjwa (2022).



**InnoVenton has been granted corporate membership status as part of the South African Institution of Chemical Engineers.**

## 2023 TS projects

### Personal Care Product Development

\_\_\_\_ Mrs Anneke Greef

#### Afrotame

The client has her own hair care business and used a contract manufacturer to manufacture her hair care products. However, after experiencing inconsistency errors she plans to improve her products and their formulations. In addition, the client is allergic to coconut oil which



is a popular ingredient used in hair care especially hair growth products therefore coconut-oil alternatives were explored. We created formulations from scratch for a sulfate-free, cream-based shampoo and hair mask to assist with hair growth without coconut oil. After 12 months of stability testing, only the hair mask passed the stability assessment. The shampoo was reformulated and is currently being tested for stability.

#### The Shidan Industries

Shidan Industries is an existing hair care business with a hair salon in where they use their own products. Currently they make use of a contract manufacturer but they want to start in-house manufacturing. They want to start a new hair care range consisting of a sulfate-free shampoo, conditioner and hair mask with argan oil and hemp seed oil as the hero-ingredients. The conditioner and hair mask has passed the stability assessment while the reformulated shampoo is currently in stability.

#### Shidan Industries Hair Care Products- prototypes



#### Mariza Naude

The client lives on a farm where they have loads of animal fat waste. She upcycles the animal fat into tallow to use in soaps, creams and body butter. She required our expertise to formulate an anti-aging face cream and an emulsified body butter with the tallow as the hero-ingredient. We refined her tallow-making process prior to incorporating the tallow into cosmetic products. She was extremely happy with her prototypes and signed-off the service.

#### Nkubha Investments

The client wants to start her own cleaning business with three cleaning products including a multi-purpose cleaner, dishwashing product and a stain remover for clothing. Her ideas for the three cleaning products were almost identical to established products on the market. We gave her more creative alternative ideas for the



three products. We developed a concentrated dishwashing paste that is waterless, sustainable and will last very long. Additionally, a gel-like multipurpose cleaner was developed with biodegradable ingredients and a very simple 2-ingredient stain remover. The formulations and methods were kept simple since the client wants to manufacture herself and she has no experience in this field. She has signed-off the product development and wants us to do stability testing followed by creating prototype samples that she can give to her prospective clients.

#### Karabo Mani

The client wants to create an acne care kit for young and mature skin respectively. She was hesitant about the ingredients she wanted to use in her products so we did a feasibility study. From the feasibility study she



selected the ingredients that she wants to use in her products. The product development is still underway but relatively close to completion.



### Aphelele Mbiyo

The client wants to create skin care products that focus and target skin concerns specific to areas of body that are not spoken about. Her products include a facial serum targeting hyperpigmentation and dark spots, a facial moisturising cream to target eczema-prone and dry skin, a body scrub to target ingrown hairs and uneven skin tone, a body moisturising cream to create a skin tightening effect and a body glow oil with moisturising properties targeted at very dry skin. A feasibility study was done for her since she was uncertain about the ingredients she wants to use in her products. We are currently in the product development stage.

### Dr C Govind Inc.

The client wants to sell an in-house cream to their clients to use post-sclerotherapy. Currently, there are two known cosmetic ingredients to use but are sold separately. The client wants to combine the two ingredients into a cosmetic cream to target bruising and pigmentation post-sclerotherapy. A feasibility study was conducted to firstly ensure the two ingredients can be sourced in South Africa and secondly to obtain the formulation guidelines of the two ingredients. The feasibility was signed-off and product development process is underway.



## Facilities, Safety, Health & Environment

InnoVenton is committed to Health and Safety at our Institute and encourages staff and students to work towards promoting a safe, healthy working environment. Our engagement with the Faculties SHE committee keeps channels of communication open with the University.

The implementation of stock control logs to trace chemicals on site is showing its usefulness. Our Chemists are encouraged to ensure their chemicals are registered and to make use of designated storage areas for their reagents. In this way we can decrease the volumes of reagents in the laboratories, reduce the amount of expired and unused reagents and control the quantities of stock inhouse.

Responsible waste management practices remain part of our institutional culture. Environmental Stewardship is a value we aspire to hold on to. *Reduce, Reuse and Recycle* continue to be principles on which our waste management is based on.

### Mazoyi Group

The Mazoyi Group manufactures complementary medicines for children and adults. These medicines aim to assist with colic, phlegm, eczema, wind and appetite in children and detoxifying in adults. The Mazoyi Mixture is sold in pharmacies and online. It is an aloe-based herbal mixture/remedy. The company would like to expand its product range with the introduction of three new baby skincare products, namely, a moisturiser, a bum cream and a soap bar. A feasibility study has been completed to highlight possible formulations and timelines for the above-mentioned baby products using *Aloe ferox* as a highlighted ingredient.

### Data Analysis Short Learning Programme



InnoVenton hosted a Data Analysis SLP with excel, for analyst, scientists and engineers. This Programme equips participants with the following skills and knowledge:

- How to obtain summaries of a given data set, identify trends and use Z scores,
- How to perform inferential statistical analysis such as calculation of confidence intervals, t-tests, ANOVA,
- How to perform simple and multiple regression analysis on given data and the validation and use of such regression models to define optimum conditions.

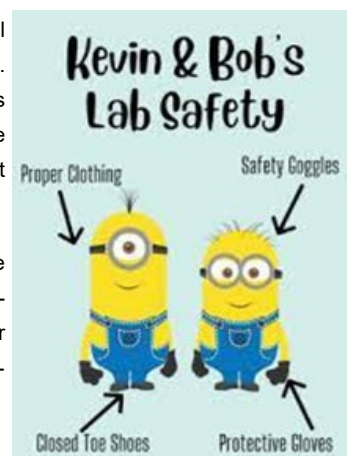
This short learning programme placed emphasis on the interpretation of computer output rather than calculations.

Appropriately labelled chemical waste enables responsible disposal. ChemSolved and Easy Waste has assisted us with responsible waste disposal for many years and meet our service requirements.

InnoVenton draws on the expertise offered by the universities infrastructure and support divisions to offer assistance when facility related challenges arise.

The University Technical Services

Department and their Teams have worked with us to keep the building utilities in working order, we will continue to work closely with them to maintain the buildings and laboratories in the new year. Several areas of improvement have been identified which we trust they will be instrumental in addressing.



# Marketing Mayhem

## World IP Day, “Women and IP”

InnoVenton was proud to host the Media Launch for the 2023 World Intellectual Property Day celebrations.



Photo: Ms Olwethu Poswayo, Dr Carla Kampman, Mr Philip Van Zyl, and Dr Anna Collins.

The theme for the year was “Women and IP accelerating innovation and creativity”. We partnered with the Nelson Mandela University Innovation office for this promotion on the 19<sup>th</sup> of April.

The event was opened by the DVC: Research, Innovation, and Internationalization; Dr Thandi Mgwebi (photo below) who welcomed several representatives; the CIPC Commissioner, head of NIPMO, SEDA, TIA, InnoVenton and members of the media, SABC, CNN and the Herald to name a few.



InnoVenton set up an exhibition showcasing some of the projects and products developed as part of the event. These included Coalgae®, Low smoke fuel, Algae-based fertilizers and Fish feed which were promoted by Dr Carla Kampman.



Photo: Dr Jackie Collins and Mrs Anneke Greef promoting Phycocyanin and its uses.

Mrs Anneke Greef drew young and old to her table because of the blue phycocyanin ice-cream they could taste, she explained the benefits of phycocyanin and showed the other products it's been used in like cosmetics. Dr Nicole Vorster and Dr Marthie-Postma Botha have created a skin care range called “Olyf” with anti-inflammatory, anti-fungal, anti-microbial and anti-aging properties. In this way they have used olive extracts to formulate products that aspire to Clean Beauty and Circular Beauty philosophies. Ms Norma Koza has formulated and optimised a fish feed for aquaculture using olive pomace extracts as an antioxidant.

Ms Chrizé van den Heever (photo below, left) displayed her Tinted Powder Sunscreen and explained the benefits of it to her audience.

We hope to have inspired women in research and development to value the IP they generate as part of the creative innovation process.



Photo: Women talk about IP and show what they have developed with fellow entrepreneurs at the Nelson Mandela conference center.







Discussions and debates were on.



Interviews with the media ensured the event was well publicised.



Products were promoted.



This was a good opportunity for the university to bring attention to its role in assisting women with IP advice relate to their business.





### 6<sup>th</sup> BioAfrica Convention in Durban

InnoVenton, in partnership with the Innovation Office, represented the Nelson Mandela University at the 6<sup>th</sup> Annual BioAfrica Convention held in Durban in 2023.

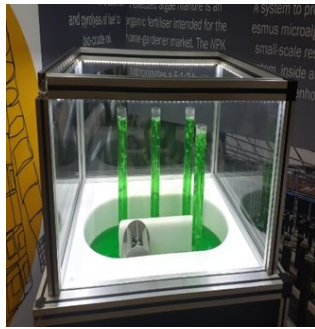
The Bio Africa convention is a forum which provides our continent with an opportunity to collaborate around aspirations, opportunities and a vision for a continental bio-economy. Peter Grant and Phillip Van Zyl attended on our behalf showcasing the various products and technology InnoVenton has to offer in this field like:

- Phycocyanin as a Food Colouring
- The *Spirulina* Low Tech Bucket System
- Spirulina Fish Feed
- Low-Smoke Fuel (LSF) Process and Product – for Household Use
- Olive Pomace Antioxidant Extracts

For more Information regarding the Bio Africa Convention follow this link <https://www.bioafricaconvention.com/>



Photo above: Philip Van Zyl and Peter Grant



### National Science Week

InnoVenton celebrated National Science Week, by hosting students from Paterson Highschool. We hosted an Open Day in which learners had a tour of the facility and had a chance to explore what we do at InnoVenton.

The students were shown how microalgae can be used as a renewable resource for environmental sustainability and in health products. How biomass can be used as an alternative energy source. Chemical synthesis and process development can be used to promote health and support agriculture. They were also shown how Formulation Science enables entrepreneurs to start their own businesses and be self-sufficient.



### Animal Feed Manufacturers Association AFMA

Dr Carla Kampman attended the annual AFMA forum representing InnoVenton. DSM representatives Siphon Mabusela and Thabitha Nguveni and the CSIR's Mhlahli Mojola met with Carla (photo below) to discuss possibilities with whole and fractionated microalgae.





The 2023 SACI Career and Innovation Day at Rhodes was a great opportunity to spend time with graduates and share what InnoVenton is all about and what we do. Dr Melissa Gouws was invited to share with the delegates the role InnoVenton plays and how we could assist and promote innovation and entrepreneurship amongst graduates. Many had questions about starting their own businesses, taking products to the market and how to handle IP associated with their ideas.



Photo: Rhodes hosts the annual SACI Career and Innovation Day



# InnoVenton

## Product Formulation

*Have you ever wanted to Formulate your own product?  
But weren't sure where to start?*

*InnoVenton can help you understand how to mix and blend various components in a way so that they don't react but instead interact to provide a final product with very specific desired properties or functions.*

*You would have access to Chemical Research and Development expertise and Technology Support as you design your formulation.*

*Some products developed in our laboratories include: personal care products, household cleaning products, pharmaceutical products, industrial chemical products and water treatment products to name a few.*

We would help you design and optimise your formulation.

**Enquiries:** Dr Carla Kampman T 041 504 3281

E: [Carla.Kampman@mandela.ac.za](mailto:Carla.Kampman@mandela.ac.za)

### Heraeus Process Safety SLP

Short Learning Program delegates from Heraeus attended the Process Safety SLP, due to the successful results from its Staff, Heraeus held a handover ceremony on the 10 February 2023 to celebrate their achievements. Photo: Left to right ;Masixole Pana, Sibonokuhle Nyanga, Mervonecia Groepe, Mandla Yingwana, Alfred Casper, Masizole Zotwa, Nwabisa Ngwabeni, Dr Shawn Gouws, Jamine Wilson and Michael Naidoo.



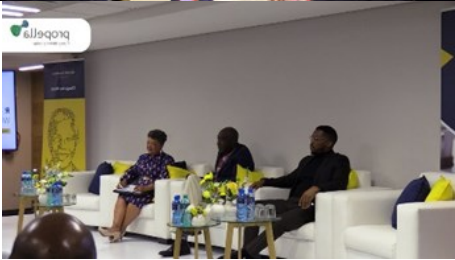


### Nelson Mandela University Research Week

Nelson Mandela University hosted its second annual research week this year and InnoVenton set up an expo stall there for the first time. Research week served as a platform to engage, connect, and contribute, it gave researchers an opportunity to engage with each other and share ideas related to research and innovation activities. The core aim of this week was to raise engagement, synergistic partnerships, and elevating networks that contribute to the thriving research culture within the institution.



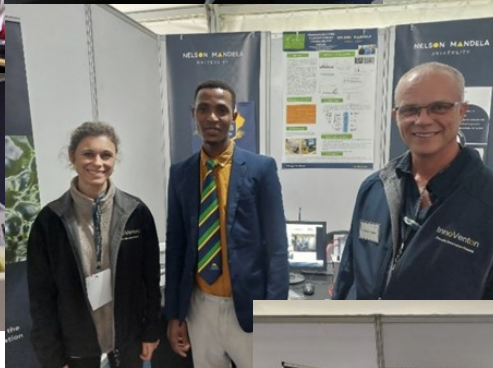
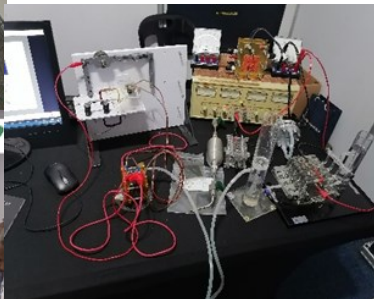
Photo (above): Leilane Ah Shene (intern) enjoying the buffet at the Nelson Mandela University Research Week.



At our stall we had a neat and informative set up which got attention from people passing by and popping in to ask questions about InnoVenton and what we do. We showcased our brochures, magazines and tech packages. One half of our stall was based on Algae cultivation and gasification and the other half was based on Dr. Gouws's research on Green Hydrogen Production. A demonstration model showed the splitting of water into hydrogen and oxygen in an electrolyser. This hydrogen flows through a fuel cell to create energy which drives a small electric fan.



Director General, Dr. Phil Mjwara (photo below) visited our stall and expressed his satisfaction that InnoVenton was involved in these activities. The purpose of the project is to move away from electricity produced by using burning coal and to use electricity using solar panels and wind turbines to decrease carbon dioxide emissions in the atmosphere.



InnoVenton





# InnoVenton

Technology  
and  
Specialized Development

*InnoVenton/DCTS strives to provide specific technology support and innovation in the areas of:*

◆ **Research**

- Applied Chemistry in Product and Process Development

◆ **Teaching and Learning**

- Short learning programs, workshops.

◆ **Engagement and Services**

- Technology Support
- Technology Demonstration
- Analytical and testing services

Our experts are willing to assess and assist you with your process and development requirements.

**WATERS and Microcep held an information Seminar about their specialist instrumentation at InnoVenton.**

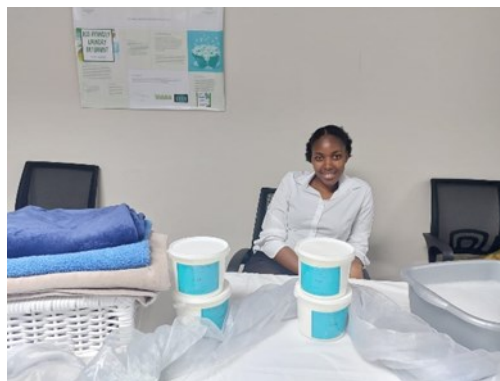
Anthony, Kim, Dylan and Louis interacted with the delegates and presented the latest offerings in Radian ASAP, Xevo G3 QTof and Xevo TQ Absolute MS and (Arc and Acquity Premier Ranges) HPLC, UPLC and UHPLC.



## Formulation Science Showcase 2023

***The BSc Formulation Science Students, “Class of 2023” exhibited an inspirational range of products at their annual product showcase held in December at InnoVenton.***

Two BSc Formulation Science Students exhibited their 2023 projects at this year’s Showcase. They developed business plans to support their products and had to “pitch” their ideas to a panel of critics who served as “potential investors”. This year there was a “formulation of a mild hand washing powder” by Miss Phiwokuhle Mbatha. (photo below)



Miss Nelisiwe Mazabuko produced a “formulation of waterless face wash tablets” .



Each formulation had a unique selling point, each lady had samples of their product supported by marketing material for evaluation.

Dr Nicole Vorster is the programme’s coordinator, for more information feel free to contact her at:

[Nicole.Vorster@mandela.ac.za](mailto:Nicole.Vorster@mandela.ac.za)

### Nelson Mandela University Inside Outside Engagement Festival

InnoVenton was invited to showcase its intervention during the Covid Pandemic at the engagement festival. It was encouraging to see how different organisations across civil society worked together to combat the pandemic.



Photo: Dr Melissa Gouws and Miss Bushra Budal at the exhibition.



Delegates at the Nelson Mandela University "inside outside engagement festival", Dr Bruce Damons (photo below) leading a discussion sessions with the participants.



Colourful entertainment for our international visitors and to celebrate our diversity and cultural wealth.

NELSON MANDELA  
UNIVERSITY

## InnoVenton

### Kilo Lab Facility

The Kilo Lab chemical process development pilot facility at InnoVenton is utilized to serve both large companies and SME's. We produce test batches for quality control purposes and conduct product development trials to TRL5/6. This facility is unique to the Nelson Mandela University, serving as a unique asset on the Africa continent at an HEI.

To find out more contact [InnoVenton@mandela.ac.za](mailto:InnoVenton@mandela.ac.za).



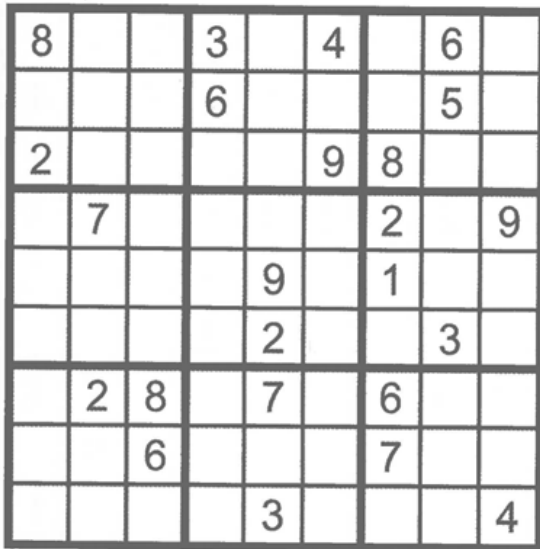




## SUDOKO

Each row, column and 3x3 block must contain all the numbers 1-9.

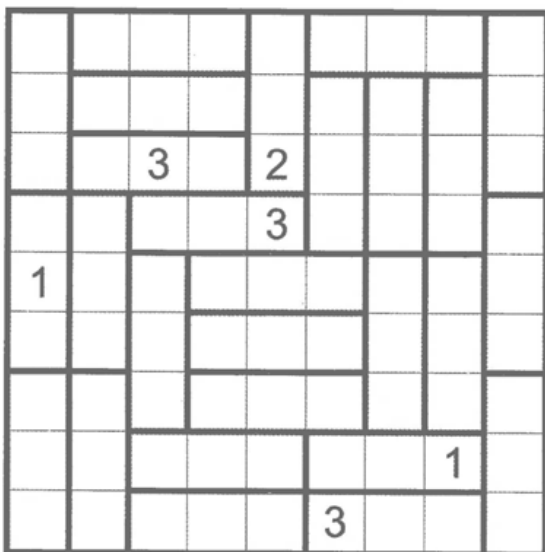
Do not repeat numbers in any row, column or 3x3 block.



## TATAMI

Each tile of 3 cells must contain the numbers 1-3, no repeats.

Adjacent cells can't have the same number.

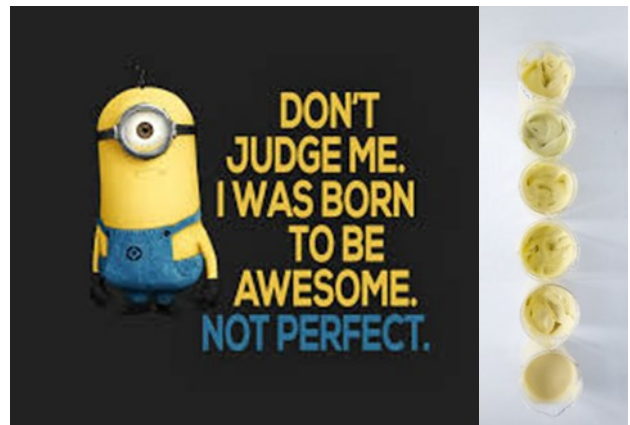


## WORDSEARCH

### ACTION MOVIE NIGHT



- |               |              |                |              |
|---------------|--------------|----------------|--------------|
| BAD BOYS      | EXTRACTION   | MAN ON FIRE    | THE ROCK     |
| CASINO ROYALE | FACE/OFF     | MORTAL KOMBAT  | TOP GUN      |
| COMMANDO      | FAST X       | SPEED          | UNCHARTED    |
| CON AIR       | JASON BOURNE | TAKEN          | UNDER SIEGE  |
| CRANK         | JOHN WICK    | THE BATMAN     | WANTED       |
| DIE HARD      | MACHETE      | THE KING'S MAN | WRATH OF MAN |



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### Engagement Forum for Microalgae

InnoVenton hosted a joint Microalgae workshop with various stakeholders, including government, higher education institutions, researchers, and entrepreneurs. The purpose of the workshop was to discuss and assess the critical elements for developing a roadmap to industrialize microalgae and the microalgal products in South Africa.



Photo Dr Carla Kampman (right) with the group of delegates.

### Exciting Collaboration Sparks Innovation at St Paul's University:

A recent collaboration between Nelson Mandela University and St Paul's University in Limuru, Kenya proved to be a successful and fruitful endeavour. This dynamic partnership brought together experts Louise Hamilton and Nicole Vorster from Nelson Mandela University, who were invited by St Paul's University to conduct engaging workshops at their Limuru campus for undergraduate students across various faculties including Business, IT, Health Science, and Communication.

#### Day One: Exploring Technology and Innovation

On the first day, Louise Hamilton took the stage to introduce the Technology Station program and delve into the fascinating world of Technology Innovation.



She shared insights into the diverse activities of the Technology Station and shed light on the microalgal biorefinery. Louise captivated the audience by exploring the potential applications of microalgae in industries such as food, animal feed, and cosmetics. Emphasizing Kenya's ideal climate for microalgae cultivation, she sparked a lot of interest in the students. To wrap up the day, Louise also offered a glimpse into the entrepreneurial realm with a brief presentation on starting a cosmetic business.

#### Day Two: Crafting Cosmetics

Nicole Vorster took centre stage on the second day, leading an interactive workshop on the art of making cosmetic creams and lotions. The day commenced with a comprehensive theory session, breaking



down the components of creams, discussing various ingredients, and illustrating the construction of a formulated product. Nicole's live demonstration of crafting a cream captivated the audience, providing a rare and eye-opening experience. This hands-on approach inspired the students and staff who realised that creating cosmetics is a tangible skill within their reach.

The highlight of the day was when participants gathered in groups to evaluate a selection of prepared creams. The workshop concluded with a closing ceremony attended by the University's Vice-Chancellor, featuring speeches and a certificate awarding ceremony.

### A Resounding Success and Future Collaborations

The visit proved to be a tremendous success, fostering enthusiasm and engagement among students and staff. Many expressed interest in the prospect of launching their own businesses. In recognition of the positive response, St Paul's University has extended an invitation for Louise and Nicole to return for follow-up workshops next year. Plans are already underway to bring a larger team from InnoVenton to further enrich the learning experience. Louise and Nicole extended their heartfelt gratitude to St Paul's University for the warm welcome and enthusiastic participation. This collaboration exemplifies the power of knowledge exchange and the potential for innovation when institutions come together.

### Fragrance workshop Training

Dr Nicole Vorster and Mrs Anne Greef attended a training workshop hosted by Moellhausen, based in Italy.

The perfumer continued with an interactive presentation in which the participants would smell a fragrance and the different fragrance notes would be highlighted by the perfumer. Other topics like extraction methods and stability of fragrances in end-products were covered. The raw materials used in fragrances, their uniqueness, affinities and classifications were discussed.



### The Vice Chancellor's Excellence Awards



Dr Carla Kampman and the InnoVenton Team were recipients of the 2022 Nelson Mandela University Innovation Excellence Award.

### Midred Mpalala Retired

InnoVenton wishes Mrs Mildred Mpalala all the best as she takes on Retirement from 2024. Her Granddaughter came along to witness her send off from InnoVenton at our year end staff function (Photo below).



InnoVenton continues to respond to client needs through provision of technology support services that include **consultation & feasibility studies, non-routine testing, prototyping & toll sample preparation, technology demonstration and short learning programs.**



## New Equipment Acquisitions



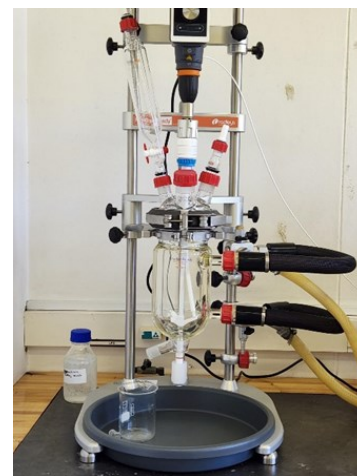
A laboratory spray drier was purchased for in-house spray drying applications and is available to provide small-scale spray drying services to customers. Presently successfully used to spray dry, heat sensitive proteins and suitable for producing fine powder samples of most water-based samples.



The new **Profic Vario 11 Anion** will fast track and enable the quantification of inorganic anions.

### Analytical Testing Equipment for Chromatography:

An **Agilent 1260 Infinity II HPLC** was purchased through the TIA Major Equipment Fund. It will enable us to quantify Non-volatile organic products.



**Radleys Reactor** for laboratory scale organic synthesis reactions (1L) complete with **Julabo Cryo** – compact circulator



The **Agilent 5977C Insert Plus GC-MSD** was acquired to enhance the capabilities of our Thermal Desorption Two-dimensional (GC x GC) Chromatograph so that we can identify volatile and semi-volatile products.



**Processing equipment:** Vibrating sieve, Hydraulic press and a mixer.



**Laboratory Utilities:** Vivid Air supplied a **Fume cupboard** for the Formulation Science Laboratory. This will enable a safer working environment for BSc Formulation Science students who work on their projects in this laboratory.



**Photo: Dr Nicole Vorster with the Team from Vivid Air.**

**Apex Scientific**, supplied the formulation Science Programme with a new **Rotovap**.



**Photo: Jared Muller, Ms Ndumi Koza and Dr Nicole Vorster.**

## Collaborations

InnoVenton prides itself in the collaborations with other Technology stations, Agencies and International SME's. Some of whom are mentioned below and the projects they are associated with.

- Maria Naude – NDA
- Isegen – NDA
- Sasol – Contract Agreement
- Essential Sterolin Products
- Zuplex
- CPUT—Phycocyanin and Spirulina potential in food products.
- MUT— Cosmetic formulation

# InnoVenton

## Technology and Specialized Development

*InnoVenton/DCTS strives to provide specific technology support and innovation in the areas of:*

### ◆ Research

- Applied Chemistry in Product and Process Development

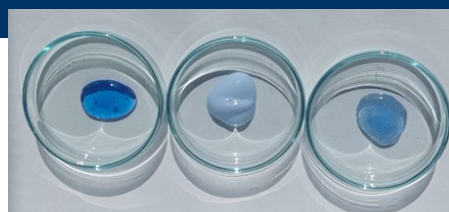
### ◆ Teaching and Learning

- Short learning programs, workshops.

### ◆ Engagement and Services

- Technology Support
- Technology Demonstration
- Analytical and testing services

Our experts are willing to assess and assist you with your process and development requirements.



# InnoVenton

## Collaborations

Would you and your Team like to collaborate with  
InnoVenton ?

For more information contact Dr Gary Dugmore .

E: Gary.Dugmore@mandela.ac.za /T: 041 504 3281



## Training Offered

In 2023 a range of Learning Programs were offered; we plan to host most of these again in 2024. Updated course dates and rates can be found on our website or social media. Enquiries should be directed to [InnoVenton@mandela.ac.za](mailto:InnoVenton@mandela.ac.za).

- ◆ Chemical Process Technology (Formal NMU Diploma)
- ◆ Chemical Formulation Science (Formal NMU Honors)
- ◆ Basic Chemistry (SLP)
- ◆ Basic Chemical Engineering (SLP)
- ◆ Process Safety (SLP)
- ◆ Data Analysis with Excel for Analysts, Scientists and Engineers (SLP)
- ◆ Evaluating your Business Idea Enabling Technology Development Workshop
- ◆ An introductory guide to Cosmetic Formulation Workshop
- ◆ Creams and Lotions Workshop
- ◆ Formulating surfactant-based personal care products



If you are not willing to learn, no one can help you.

If you are determined to learn, no one can stop you.



# InnoVenton

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## Specialist Analytical Services

### Gas Chromatography

- ◆ GCMS, (Fingerprinting comparison of volatile/semi-volatile organic compounds)
- ◆ SIMDIS, (Simulated Distillation of Fuels)
- ◆ GC x GC, (Separation of complex hydrocarbon mixtures)

### Coal and Biomass Analysis

- ◆ Thermal Gravimetric Prox-Analysis (moisture, volatiles, ash, fixed carbon)
- ◆ Calorific Value

### Spectroscopy

- ◆ UV/Vis, Qualitative and Quantitative analysis
- ◆ FTIR, Raw material fingerprinting

### Fuel Analysis

- ◆ Flash point, Density, Viscosity, Cetane number
- ◆ Copper Strip, Iodine Value
- ◆ CFPP, Cloud Point, Oxidation Stability
- ◆ Vapour Pressure, Distillation Points
- ◆ Energy Value, Carbon Residue
- ◆ Sulfated Ash, Total Contamination

**Our Technology Station is willing to assess and assist you with your testing and analysis requirements.**

## Looking forward - 2024

2024 promises to be another project packed year. The following are a few of the main activities planned :

**Product and Process Development Projects:** Entrepreneurs in the Chemical manufacturing sector continue to show interest in our pilot scale facility at InnoVenton where they can have test batches produced to qualify their products.

**Biorefinery Program:** The program, funded by the DSI will provide a resource platform to develop and support microalgae technologies. Setup transfer packages and product ideas for manufacturing and commercial activities.

**Cosmetic Formulation Improvement:** Clients have requested assistance to improve formulations for body lotions and face creams using various specialized key ingredients.

**Graduate Internship Program:** We look forward to our next intake of Interns and the training lined up for them.

**Marketing at InnoVenton:** We look forward to promoting the expertise on offer and activities that InnoVenton showcases.



## Process Safety SLP

This course will provide a broad understanding of the tools and problem-solving techniques used in process safety.



The course covers different hazards found in the chemical industry, safe work permits, consequences of toxic vapours, fires and explosions the SHE considerations regarding these consequences, process design and operations, asset integrity, legal aspects, management of change and safety cultures. The format of the presentations will be on MS Teams.

### Who would benefit:

- Anyone involved with a role that does not have direct line responsibility for process safety
- Anyone who would like to develop a broad understanding of process safety

**InnoVenton**

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E [InnoVenton@mandela.ac.za](mailto:InnoVenton@mandela.ac.za)

**NELSON MANDELA**  
UNIVERSITY



## Looking forward - 2024

### Milk Tart Brûlé

For a truly “transporting” Milk Tart Brûlé ... Takes 1 hour, 12 Servings.

Ingredients:

- 1 litre milk
- 2 cinnamon sticks
- 60 ml flour
- 60 ml cornflour
- 500 ml sugar
- 2 ml salt
- 15 ml butter
- 2 ml baking powder
- 4 eggs, separated

Topping:

- 10 ml castor sugar per dish

Crust:

- Mix the biscuit crumbs with the butter and drop spoonfuls into small greased dishes. Press firmly into place to make a crust.

Filling:

Boil the milk with the cinnamon sticks.

Mix the flour, cornflour, sugar and salt with a little water until smooth. Mix a little of the boiling milk with the flour paste and then mix everything into the boiling milk. Boil until thickened and cooked.

Remove the cinnamon sticks. Stir the butter and baking powder into the mixture. Beat the egg yolks, stir a little of the hot mixture into the egg yolks and then quickly stir all the egg yolk mixture into the hot mixture. Whisk the egg whites until soft peaks form and fold them into the mixture. Spoon the filling on top of the biscuit crust in each dish and smooth the top. Allow to cool.

Topping:

Sprinkle the castor sugar over the filling and, using a blowtorch, heat until the sugar is hard and light brown in colour. Serve immediately.

By: Nicky Brecher / Boere Chic

### InnoVenton

*InnoVenton/DCTS plans to expand and focus on development services in the areas of:*

◆ **Chemical Process Development**

- Product and Process Development for tailored solutions.

◆ **Bio Energy Solutions**

- Gasification and biogas process development.

Our experts are willing to assess and assist you with your process and development requirements.




### For More About InnoVenton

Visit our website: <http://innoventondcts.mandela.ac.za>

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T: 041 504 3233/3281

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