

Enzyme Technology

CLONING AND EXPRESSION OF ENZYMES

Prof. Kugen Permaul



NRF Rating	C2
h-index (scopus)	21
Masters students (current)	6
Doctoral students (current)	2
Masters students (completed)	22
Doctoral students (completed)	8
Postdocs (completed)	4
Collaborators	11
Publications	54
National Conferences	---
International Conferences	49

Prof. K. Permaul obtained his undergraduate and postgraduate degrees from the University of KwaZulu-Natal. His early research projects focused on bacterial molecular genetics, especially plasmid biology. He graduated with a PhD in 1999 and spent a year as a postdoctoral fellow before being employed as a lecturer at the Durban University of Technology (DUT) in 2000. He has steadily progressed up the academic ranks, culminating in the award of a full professorship. He was appointed as Head of the Department of Biotechnology and Food Technology in 2014. Prof. Permaul's research projects have involved: detection and quantification of mycotoxins in food commodities; production of potable water by ultrafiltration; characterisation and production of amylase, inulinase and chitinase enzymes; directed evolution and expression of a xylanase enzyme and genomic sequencing of a thermophilic fungus. Current research projects focus on expression of xylanase, xylosidase, chitinase and other carbohydrase genes and the use of chitin as a bioresource. Eight doctoral

students and 22 masters students have been successfully supervised and a further eight postgraduates are currently being supervised or co-supervised. Prof. Permaul is an NRF C-rated researcher who has published in high-impact scientific journals and is involved in peer-review of research for several international journals, as well as for international and local academic institutions and the NRF.

Prof. Permaul is the principal investigator of a multinational research project, BRICS-BEST (Bioenergy from Eco-Sustainable Technology) involving all five BRICS countries and including 37 researchers. Total funding from each of the countries national research funding bodies is approximately R14 million. The full title of the project is 'BRICS technology platform for integrated bioprocessing of agricultural residues for eco-sustainable production of biofuels and by-products' and the project entails the use of waste agricultural biomass for the production of fuels and biochemicals.

National Collaborations

Dr R. Govinden, University of KwaZulu-Natal; Prof. B. Sithole, Dr P. Lekha and Dr J. Andrew, CSIR.

International Collaborations

Prof. E. Nordberg-Karlsson, University of Lund, Sweden; Prof. L. Tong, Columbia University, USA; Prof. Z-X. Wang, Tianjin University of Science and Technology, China; Dr C.R. Soccol, University of Parana, Brazil; Prof A.P. Sinitsyn, Moscow State University, Russia; Dr S.K. Yadav, CIAB, India.

Enzyme Technology

BIOCATALYSIS AND BIOMATERIALS

Prof. Tukayi Kudanga



NRF Rating	C2
h-index (scopus)	19
Masters students (current)	5
Doctoral students (current)	1
Masters students (completed)	4
Doctoral students (completed)	3
Postdocs (completed)	1
Collaborators	6
Publications	49
National Conferences	10
International Conferences	9

Professor Kudanga joined the department in 2014 and is a Full Professor. His areas of expertise include enzyme biotechnology, biocatalysis and biomaterials. His current research focuses mainly on enzymatic synthesis of bioactive compounds, enzymatic modification of food biopolymers, and development of green technologies for functionalisation of lignocellulose materials. He is also interested in the search for novel biocatalysts, developing new applications

as well as modifying enzymes for relevant biotechnological applications. He has won several academic and research awards including the Council Award in recognition of NRF rating (DUT and CPUT), Departmental Researcher of the year 2018 (DUT), Vice Chancellor's Prize at the National University of Science and Technology (NUST), and NUST Book Prize. Prof. Kudanga is also a member of several national and international scientific bodies.

National Collaborations

Dr Marilize Le Roes-Hill, Cape Peninsula University of Technology; Dr Maryna De Wit, University of the Free State; Dr Stephen Amoo, ARC; Dr Lester Davids, University of Cape Town.

International Collaborations

Prof. Georg Guebitz, University of Natural Resources and Life Sciences, Austria; Prof. Gibson Nyanhongo, University of Natural Resources and Life Sciences, Austria; Dr Silvia Fademrecht, University of Stuttgart, Germany; Prof. Dr Juergen Pleiss, University of Stuttgart, Germany; Prof. Sergio Riva, Italian National Council of Research (C.N.R.), Italy; Prof. Tomasz Ciach, Warsaw University of Technology, Poland.

Enzyme Technology

Dr Santhosh Pillai



h-index (scopus)	8
Masters students (current)	5
Doctoral students (current)	1
Masters students (completed)	4
Doctoral students (completed)	2
Postdocs (completed)	2
Collaborators	8
Publications	20
National Conferences	10
International Conferences	13

Dr Santhosh Pillai graduated with a DTech in Biotechnology from the Durban University of Technology in 2010. After completing his doctorate, he was employed as senior research technician and part time lecturer at DUT and has since steadily progressed up the ranks to become a full time academic in 2014 and a senior lecturer in 2016. His areas of expertise are microbial enzymology, biocatalysis, environmental microbiology, food microbiology and plant pathology. His research area encompasses bioconversion of biomass to bioenergy (bioethanol, biohydrogen, biobutanol) and value-added products (oligosaccharides, organic acids,

animal feed) and exploring microbial enzyme systems for industrial applications (food, feed, detergent, pulp and paper, pharmaceutical, bioremediation, etc.). His current research focuses on exploring microbial peptides and other metabolites for food preservation as well as pharmaceutical applications. Dr Pillai has published in peer reviewed scientific journals and is a reviewer for several international journals as well as for academic institutions in South Africa and the NRF. He is also successful in acquiring research funds from the NRF and other funding agencies.

National Collaborations

Dr Abe Gerrano, Agricultural Research Council (VOPI); Dr Samuel Ayodele Iwarere, University of KwaZulu-Natal; Mr Neo Moloi, Sawubona Mycelium; Ms Elaine Ram, Technology Innovation Agency (TIA).

International Collaborations

Dr Peter Biely and Dr Vladimir Puchart, Slovak Academy of Sciences, Slovakia; Prof. Ashok Pandey, CSIR-Indian Institute for Toxicology Research, India; Dr Koel Mukherjee, Birla Institute of Technology, India

Enzyme Technology

Dr Adarsh Puri



h-index (scopus)	4
Masters students (current)	2
Doctoral students (current)	1
Masters students (completed)	3
Doctoral students (completed)	0
Postdocs (completed)	2
Collaborators	---
Publications	13
National Conferences	12
International Conferences	7

Dr Puri joined the Department of Biotechnology and Food Technology as a postdoctoral fellow in the Enzyme Technology Research group during April 2013. His area of expertise includes Enzyme Technology, Environmental Biotechnology, Fermentation and Microbiology. His research projects have been focused on the production, purification and characterisation of novel thermostable enzymes for enhanced bioethanol production, plant-growth-promotion, global warming mitigation using biomimetic carbon

sequestration and biocontrol of insect pests of KwaZulu-Natal. More recently, he initiated research projects on nanobiotechnology and enhanced production of biofuels using microbial thermostable enzymes. In addition, Dr Puri is an indispensable member of key national (Agricultural Research Council, Technology Innovation Agency) and international projects (BRICS, National Research Foundation SA-China).

Dr Algasan Govender



h-index (scopus)

8

Dr Algasan Govender's research is currently focused on the isolation and characterisation of novel fungal catabolic enzymes for the production and generation of bioactive compounds. These enzymes include xylosidases, phytases, chitinases and N-acetylglucosidases.

His research also focuses on the engineering of metabolic pathways in *Escherichia coli* for the synthesis of precursors required for the generation of industrially relevant compounds. Currently a significant amount of emphasis has been given towards the production of biodegradable plastics from crustacean and fungal biomass.

Food and Nutrition Security

Prof. Eric Amonsou



NRF Rating	Y2
h-index (scopus)	12
Masters students (current)	3
Doctoral students (current)	5
Masters students (completed)	8
Doctoral students (completed)	4
Postdocs	1
Collaborators	10
Publications	50
National Conferences	5
International Conferences	5

Professor Eric Amonsou joined the Department of Biotechnology and Food Technology in 2013 and is an associate Professor. His area of expertise is in plant protein application in foods. His current research mainly focuses on structure-composition and modification of major food biopolymers for improved functionality and applications in dough systems and beverages. The formation of protein-polysaccharide complexes and nanostructured materials, which can be applied

in emulsion stabilization, hydrogels, biocomposite films and encapsulation of bioactive compounds, also forms a vital part of his research. Other areas of research interest include food rheology and innovative product development for scale-up and commercialisation. In 2018, Prof Amonsou received the DUT innovator of the year award for the successful development of "Multilife" breakfast cereal prototype based on Amadumbe, a traditional South African tuber crop.

Food and Nutrition Security

Prof Oluwatosin A. Ijabadeniyi



NRF Rating	C2
h-index (scopus)	10
Masters students (current)	3
Doctoral students (current)	3
Masters students (completed)	8
Doctoral students (completed)	4
Postdocs	1
Collaborators	11
Publications	44
National Conferences	11
International Conferences	11

Prof. Ijabadeniyi joined the Department in 2011 and is an Associate Professor in the Department of Biotechnology and Food Technology at the Durban University of Technology. His areas of expertise include food safety, food quality, traditional fermented foods, food microbiology, crop processing and value addition and empowerment of small holder farmers. His current research focuses on incidences

of food borne pathogens that constitute a public health risk, including *Listeria monocytogenes*, *Salmonella*, *E. coli* O157:H7 and *Aspergillus flavus*. The use of different interventions to control persistent pathogens in foods also forms a vital part of his food safety research interest. His interests further lie in studying the quality and storage stability of fermented foods, in particular African indigenous fermented foods.

National Collaborations

- Dr Obiro C. Wokadala; ARC – Institute of Tropical and Subtropical crops, Nelspruit.
- Dr Anthony Olusegun Obilana, Cape Peninsula University of Technology, Cape Town

International Collaborations

- Prof Claudia Narvaez (University of Manitoba, Canada)
- Dr. Mrs. Oluwatoyin Oluwole (Federal Institute of Industrial Research Nigeria)
- Dr Didier Montet, (CIRAD, Montpellier France)
- Piet Stouten (SELAMAT, Netherlands)
- Prof Dennis Sandris Nielsen (University of Copenhagen, Denmark).
- Prof Rotimi Aluko (University of Manitoba, Canada).
- Dr Tatyana Fedorova, Research Center of Biotechnology RAS, Russia
- Prof Obadina Adewale, University of Agriculture, Abeokuta, Nigeria
- Dr Modesto Olanyaa, USDA, USA

Food and Nutrition Security

Prof. John Mellem



NRF Rating	---
h-index (scopus)	6
Masters students (current)	6
Doctoral students (current)	2
Masters students (completed)	5
Doctoral students (completed)	2
Postdocs	2
Collaborators	6
Publications	28
National Conferences	14
International Conferences	4

Professor Mellem joined the department in 2007 and is an Associate Professor. His areas of expertise include development of food functional ingredients/ nutraceuticals for their antioxidant, antidiabetic and anticancer activity. His current research focuses on the identification and characterization of bioactive peptides from selected South African under-utilized grains and legumes to address non-

communicable diseases [viz. diabetes, cancer, CVD (cardiovascular diseases)] resulting in value addition to existing underutilized or neglected crops thereby increasing their adoption by farmers and contributing to food security. His interests further lie in the development of bionanomaterials for the delivery of bioactive compounds against cancer cells

National Collaborations

Dr Abe Gerrano, Agricultural Research Council (VOPI), South Africa.
Dr Sonja Venter, Agricultural Research Council (VOPI), South Africa.
Dr Michael Bairu, Agricultural Research Council (VOPI), South Africa.
Dr Anthony Obilana, Cape Peninsula University of Technology, South Africa
Prof. Himansu Bajjnath, University of KwaZulu-Natal, South Africa

International Collaborations

Prof. Ralf Greiner, Max Rubner-Institut (MRI), Karlsruhe, Germany
Prof. Alain Dufresne, Grenoble Institute of Technology, Pangora, France

Plant Biotechnology

Dr Viresh Mohanlal



h-index (scopus)	8
Masters students (current)	2
Doctoral students (current)	1
Masters students (completed)	6
Doctoral students (completed)	1
Publications	29
National Conferences	12
International Conferences	---

Dr Mohanlal joined the Department in 1996 and is a Senior Lecturer. His areas of expertise include biochemistry, phytochemistry, indigenous plant knowledge, nanotechnology, drug development and discovery and analytical chemistry. New lead compounds isolated from natural plant species will be synthesised and modified to improve its biological activity. Current research in the field of synthetic chemistry includes the development of new benzopyridines and coumarins. The novel synthesised coumarins showed tremendous potential as a treatment for tuberculosis and was filed as a patent application in 2019 (PATENT APPLICATION NO: 2019/05328). In addition to the above our recent endeavors include chemical synthesis and structural elucidation of analogues that mimic biologic

activity of plant metabolites that are known for important pharmacological properties. His current research focuses on synthesis and structural elucidation of novel synthetic coumarin scaffolds for their potential pharmacological properties. Several projects have been conducted by B.Tech, MAppSc, PhD and Postdoctoral students which include the structural elucidation of the novel secondary metabolites such as alkaloids, cyanogenic glycosides, glycosylates, terpenoids, flavonoids and anthraquinones from indigenous plants. The use of different interventions to control persistent pathogens in foods also forms a vital part of his food safety research interest. His interests further lie in studying the quality and storage stability of fermented foods, in particular African indigenous fermented foods.

Plant Biotechnology

Dr Saheed Sabiu

NRF Rating	Y2
h-index (scopus)	13
Masters students (current)	2
Doctoral students (current)	2
Masters students (completed)	---
Doctoral students (completed)	---
Collaborators	3
Publications	41
National Conferences	10
International Conferences	4

Dr. Saheed joined the Department of Biotechnology and Food Technology in 2019 as a Senior Lecturer. He has special interests in phytopharmacology, drug discovery and development, redox biology and molecular biotechnology. He is currently researching into the detailed concepts of therapeutic mechanisms of secondary metabolites in degenerative and microbial diseases while reporting health benefits. This is done in a way that provides valuable data which will lead to new small molecule targets that could potentially be lead for drug discovery. Dr. Saheed reviews bursary and scholarship applications for the NRF and is actively reviewing for more than 15 good impact factor

journals in his field. He also serves as external examiner for several universities. Due to his interest and contributions to the field of phytopharmacology and redox biology, he has just been appointed the Guest Editor of a Special Issue on 'Mechanistic roles of plant secondary metabolites in oxidative stress-linked diseases' by the Evidence Based Complimentary Alternative Medicine Journal (ECAM). He is also an affiliate of the Next-Generation Sequencing (NGS) Unit of the University of the Free State (UFS), where he is focusing on molecular dynamics of enteric and respiratory viruses using whole genome sequencing and metagenomic approaches.

National Collaborations

Dr MM Nyaga, UFS-NGS Unit; Dr. S. Amoo (ARC).

International Collaborations

Prof. MN Arul (KTH, Sweden).

Water and Wastewater Technology

Prof. Feroz Mahomed Swalaha



NRF Rating	---
h-index (scopus)	---
Masters students (current)	2
Doctoral students (current)	1
Masters students (completed)	10
Doctoral students (completed)	6
Postdocs	2
Collaborators	1
Publications	25
National Conferences	18
International Conferences	15

Prof. Feroz Mahomed Swalaha is an Associate Professor and the current Head of the Department of Biotechnology and Food Technology at the Durban University of Technology. He has worked extensively in the fields of biological wastewater treatment with the aid of mathematical modelling. Prof. Swalaha is currently working on assessing pathogen removal during wastewater treatment as well as new methods

for viral pathogen detection in river waters. This includes development of new standards for viral pathogens in water. He also maintains an interest in developing new technologies for the treatment of water-borne pathogens such as virulent *E. coli* serotypes and surveying of pathogens such as *Legionella* spp. in domestic settings.

Currently, the group is investigating:

- Prevalence of pathogenic genes in *E. coli* and their distribution and removal during wastewater treatment
- Emergent pathogens detection and quantification of the risks they pose
- Viral pathogens survey and their detection along with development of new standards for these pathogens and indicators
- Fate of veterinary antibiotics in wastewater treatment processes
- Prevalence of pathogenic *Legionella* spp. in irrigation water
- Cold plasma inactivation of waterborne pathogens