




NATIONAL UNIVERSITY OF
SCIENCE AND TECHNOLOGY

RESEARCH NEWSLETTER

AUGUST 2022

RESEARCH AND INTERNATIONALISATION OFFICE



What can
earthworms,
fish, snails
tell us about
pollution?

- RESEARCH TRAINING AND FUNDING OPPORTUNITIES
- UPCOMING CONFERENCES AND WORKSHOPS





NATIONAL UNIVERSITY OF
SCIENCE AND TECHNOLOGY

INTERNATIONAL CONFERENCE ON BUSINESS MANAGEMENT SCIENCE (ICBMS) IN THE POST COVID-19 ERA

20-21 OCTOBER 2022

REGISTRATION FEE

US\$30.00 Presenters
US\$25.00 Non-presenters

SUB-THEMES

- Entrepreneurship in the post Covid-19 era.
- Business Management Science in the post Covid-19 era.
- The impact of Covid-19 on managers, marketers, bankers, financiers as individuals and organisations on the way they carry out their duties and their adaptation to the whole pandemic as we face the future.
- Survival strategies used by different organisations during the Covid-19 pandemic and how they can be useful in the post Covid-19 era.
- New business practices introduced as adaptive responses to the Covid-19 pandemic and how they can be scaled up.
- The Post Covid-19 era and the 5th Industrial Revolution.
- Opportunities and challenges arising from the Covid-19 pandemic and its consequent lockdowns.
- Challenges of using the e-platforms and e-commerce during Covid-19 pandemic and the way forward post Covid-19 era.
- Possible ways of improving the use of technology in commerce in the post Covid-19 era.
- Post Covid-19 funding and recapitalising in the post Covid-19 era.
- Possible sources of business funding in the post Covid-19 era and how to access them.
- Boosting the informal economy in the post Covid-19 era.

Any other relevant paper which focuses on Post Covid-19 era and commerce shall be accepted based on the committee's decision

IMPORTANT DATES

- Deadline for submission of Abstracts - 15 August 2022.
- Notification of acceptance - 31 August 2022.
- Full paper submission - 13 October 2022.
- Deadline for registration - 7 October 2022.
- Registration opens as soon as acceptance letter has been received.

GUIDELINES AND INSTRUCTIONS FOR ABSTRACTS

- Conceptual and empirical papers, covering the main theme and related sub-themes above are therefore accepted for presentation.
- An abstract of 250-300 words.
- Times New Roman font size 12.
- Single line spacing.
- Submitted as word file.
- English only.
- Articles which meet the required standard shall be published in an online NUST journal.

Abstracts should be submitted electronically via e-mail as an attachment to the scientific team at business.sciencecon@nust.ac.zw

Length of article - 5000 to 8000 words.

Referencing Style - Harvard System of Referencing.

CONFERENCE VENUE NUST Delta Theatre & Virtual

*For more information on the international conference,
please contact the conference coordinators:*

Dr N Makwanise: +263 773 716 733 | ndakaitei.makwanise@nust.ac.zw

Mr M.J. Ndlovu: +263 778 199 577 | mlisa.ndlovu@nust.ac.zw



@nustzim



@NUST.ZIM



www.nust.ac.zw



+263-292-282842



info@nust.ac.zw

What can earthworms, fish, snails tell us about pollution?

By Israel Mbekezeli Dabengwa

AN Ecotoxicology Research Group (ERG) from the National University of Science and Technology (NUST) is investigating the levels and effects of pollutants from human activities such as farming and industrial chemicals, domestic waste and hard metals from mining on natural resources like land and water.

Ecotoxicology is the study of the effects of toxic chemicals on biological organisms, especially at the population, community, ecosystem, and biosphere levels. It is a multidisciplinary field, which integrates toxicology and ecology.

Toxicology is the study of how natural or man-made poisons cause undesirable effects in living organisms while ecology is the study of the environment.

The NUST ERG is led by Dr Norah Basopo, a Senior Lecturer in the Department of Applied Biology and Biochemistry.

Her team comprises of Prof Andrew Siwela, Dr Nancy Nleya, Dr Edward Zumbika and Mr Aleck Maunganidze.

ERG currently has 7 students who include Donald Tapfuma (PhD), Donald Ndebele (MPhil), Joanna Change (MPhil), Ophias Mazuru (MPhil), Fiona Buwerimwe (MPhil), Melody Ukama (MPhil) and Ronald Ndlovu (MPhil).

The students have specific research roles including studying the genotoxic effects of pollutants



Project Leader of the Ecotoxicology Research Group, Dr Norah Basopo

on fish and soil pollution using land snails as biomarkers and are at various stages of their studies.

The group is funded by NUST and the International Science Programme (ISP) from Uppsala University to carry out their investigations on ecotoxicology and upgrade their laboratory.

The main purpose of the research is to investigate pollution in environments including land and water, as pollution is a common problem that affects human existence and the planet at large.

Our consumerist nature takes a negative toll on the environment producing pollutants that poison the land and water.

Although it is common knowledge that pollution has negative effects, very little is known about the extent to which humans and their natural resources bear the brunt of pollution. Without such evidence, it is not easy to come up with solutions that have long-lasting impacts.

The ERG utilises biomarkers

including organisms like water snails, fish, frogs and water plants to detect levels as well as effects of the pollutants.

Biomarkers are used to assess pollution in water while land snails, earthworms and plants are used to assess inland pollution.

These methods are known as active and passive biomonitoring techniques that are used to collect baseline data about pollutants in the environment.

The group also breeds its own fish, earthworms and water snails, which are used for laboratory exposure studies or can be translocated to polluted areas for stipulated durations.

Laboratory exposure studies assess how much these organisms bio-accumulate (unknowingly gather) chemical pollutants in the environment they are exposed to. For example, snails are found in sediments and that is where most pollutants, especially heavy metals are deposited. The snail is useful

for exposure studies because it lives around these sediments and has enough exposure to accumulate heavy metals.

“Plants or other organisms at the lower side of the food chain can take up some pollutants. Each of them can utilise or refine some of these contaminants because it has mechanisms that can break down these pollutants.

“However, some of the organisms are not equipped to break down all the pollutants they encounter. So, when these pollutants are not broken down, it is what we call ‘bio-accumulation’, which can negatively affect the organism,” explained Dr Basopo.

She added that bio-accumulation blocks the activity of some enzymes as they compete with substrates. A simple way of understanding this, is to think of an enzyme as a lock and the substrate as a key that opens a door where biological processes are expected to occur.

Now, when a pollutant such as a heavy metal blocks the lock, the key can no longer function, and the door leading to the expected biological processes can no longer open.

Eventually, when humans eat some of the organisms, for example, contaminated fish, beef, meat and grain products that have bio-accumulated, they are at risk of taking in some pollutants.

“Any organism that is exposed to pollution has enzymes that react to the pollution. So, we would be looking at the activity of those enzymes in the organisms to tell us the extent of pollution in the environment or the effects of certain pollutants on the environment,” explained Joana Change, an MPhil student who is part of the researchers.

The ERG studies are also targeting some emerging chemicals referred to as “contaminants of emerging concern”.

These are chemical pollutants of organic nature for which regulations



Students from the Ecotoxicology Research Group

have not been established yet. This list includes household pharmaceuticals, personal care products, perfluorinated compounds, gasoline additives, hormones, pesticides, plasticizers, laundry detergents, disinfectants and surfactants.

These chemicals can damage genetic material in cells while others affect hormone systems in water and inland organisms.

Evidence has shown that some of the contaminants of emerging concern are not removed at wastewater treatment facilities and find their way into inland and water environments where they adversely affect living organisms.

When it comes to water treatment, most treatment facilities focus on contaminants commonly discharged into the environment in high concentrations and pay little or no attention to the contaminants discharged in low concentrations like contaminants of emerging concern.

So far, the methods used by the NUST ERG are standardised, internationally accepted protocols and are validated using statistical tools.

Currently, the group uses gas chromatography, atomic absorption spectroscopy, for analysis of the pollutants and their effects on the biomarker organisms. In future, the group aims to develop its own testing

protocols for detecting specific pollutants in different environmental samples.

The NUST ERG hopes to increase its funding base and assist the students to obtain fellowships and scholarships for career development and funding for data collection.

NUST ERG has disseminated some of its findings through conferences, seminars and research papers. When it comes to the seminars, they have targeted some key stakeholders such as the Bulawayo City Council, Environmental Management Agency (EMA), Zimbabwe National Water Authority (ZINWA), and the public at large. Some of the Group's work can be found on the following link: <https://www.youtube.com/watch?v=4CYal5-HTF0> The results of the current research from the ERG provides a blueprint for other areas in Zimbabwe to understand the extent of pollution.

Some indicator organisms used in the Ecotoxicology Research Laboratory.



Research Profiles of Toxicology Group

Dr Norah Basopo is the Project Leader of the Ecotoxicology Research Group.

She is a Senior lecturer in the Applied Biology and Biochemistry Department at NUST. She holds a PhD in Biochemistry (NUST, Zimbabwe), MAppSc in Toxicology (RMIT, Australia), PGD in Toxicology (RMIT, Australia), PGD in Higher Education (NUST, Zimbabwe) and BSc in Biological Sciences and Biochemistry (UZ, Zimbabwe). A researcher with interests and expertise in the field of Biochemical Ecotoxicology, Dr Basopo is passionate about the conservation and protection of aquatic and terrestrial ecosystems.

Her research focuses on assessing the levels and effects of anthropogenic pollutants on water resources and terrestrial environments. She employs techniques such as Gas chromatography, UV-Vis spectrophotometry and Atomic absorption spectrometry to analyse levels of chemical pollutants in aquatic and terrestrial ecosystems. Biochemical markers are exploited to assess the effects of pollutants like pesticides, heavy metals, and polycyclic aromatic hydrocarbons on aquatic and terrestrial biota. She is a vibrant researcher who has

mentored several undergraduate and postgraduate students. She is currently supervising one PhD and five MPhil students. She is passionate about the empowerment of the Girl Child. Dr Basopo has visited underprivileged schools and conducted workshops to motivate girls and raise awareness on Environmental Pollution as well as university opportunities and career options a Girl Child can pursue in STEM. She has published her work in peer-reviewed journals such as *Environmental Science and Pollution Research*, *African Journal of Aquatic Science* and *Bulletin of Environmental Contamination and Toxicology*.

Dr Basopo has peer-reviewed scientific manuscripts for several journals including the *Zimbabwe Journal of Science Technology*, *Ecotoxicology and Environmental Safety*, and *Environmental Toxicology and Chemistry*. She has been an external examiner for other institutions including Bindura University of Science Education (Zimbabwe) and the University of the Free State (South Africa).

Dr Basopo is a recipient of several travel grants including SANORD,



NUST Research grant, Erasmus International Credit Mobility and Marie Skłodowska-Curie Actions.

She has also received research grants from the following: NUST Research Board (2017), NUST Research Board (2019-2020), International Science Program (ISP), Uppsala University, Sweden (2014-current).

Dr. Basopo took over the group in 2014. Previously, the group was led by Prof Yogi Naik, Pro-Vice Chancellor for Research and Academic Affairs. Dr Basopo started off as a teacher at Evelyn High School before joining NUST as a technician. While working as a technician, she enrolled for Mphil and then went on to PhD. She aspires to be a professor.



Dr Nleya is a lecturer in the Department of Applied Biology and Biochemistry.

She holds a PhD in Animal Health (North-West University, SA); MSc in Applied Microbiology and Biotechnology (NUST, Zimbabwe) and BSc (Hons) in Applied Biology and Biochemistry (NUST, Zimbabwe). She has a passion to solve problems associated with food security and safety focussing on mycotoxins, mainly aflatoxins (toxic secondary metabolites from moulds from the *Aspergillus* genus), as well as environmental contaminants. Dr. Nleya is an expert with technical skills in analytical methods used in food analysis such as analytical biochemistry, spectrophotometry, and high-performance liquid chromatography as well as cultural and biotechnological methods for the identification of microbial contaminants in food matrices, water bodies and the environment.

Currently, she is doing postdoctoral research with the North-West University on *Aspergillus* genomics to find ways of mitigating mycotoxin contamination of ag-

gricultural produce. She has published research work in the following journals: Advances in BioResearch, Tropical Plant Research, Toxins, Frontiers in Microbiology, Separations and IntechOpen books.

She has received local and international travel grants to present research findings at international conferences and attend skills development training workshops. She is an alumnus of the TechWomen, an emerging

leaders programme (USA) that supports and mentor women in STEM. Dr Nleya is involved in collaborative research and is currently executing a project funded by Research Council of Zimbabwe in agricultural biotechnology with partners from the Harare Institute of Technology and Lilongwe University of Agriculture and Natural Resource, Natural Resources College (Malawi).

Profiles of students from the Ecotoxicology Research Group

Name: Donald Tapiwa Alexander Tapfuma

Position at NUST: Research Assistant

Degree programme: PhD in Biochemistry

Institute: NUST

Areas of interest: Principles of Ecotoxicology, Environmental Toxicology, Aquatic Toxicology, Analytical Chemistry, Enzymology and Biogeochemistry of heavy metals

Awards: Lewis Jonker award for the Young Water Scientist, Best Oral Presentation: Water, Ecosystems and the Environment Sub-theme, Erasmus+ International Credit Mobility (ICM) and the Higher Life Foundation Delta Philanthropies Doctoral Fellowship.

PhD thesis title: Distribution and toxic effects of mercury species and selected heavy metals in aquatic ecosystems in the Matabeleland region in areas surrounding Artisanal Small-scale Gold Mining activities.

Publications:

Majaya Rachel Delfina, Donald Tapfuma, Sanele Mnkandla, Norah Basopo (2016). Toxicological effects of differently polluted dam waters spiked with pesticides on freshwater snails *Lymnaea natalensis*. International Journal of Chemistry. DOI:<http://doi.org/10.5539/ijc.v8n3p1>



Name: Joanna Change

Position at NUST: Lab technician

Awards: Best Presenter – NUST Research Day 2019

Research interests: aquatic ecotoxicology, exposure studies, effects of anthropogenic activity at cellular and molecular level.

MPhil thesis title: The effect of coal mining activities on aquatic bodies, plants and the freshwater snail, *Helisoma Duryi* in Hwange, Zimbabwe

Publications:

Change, J.B., Siwela, A.H. and Basopo, N. (2019). An assessment of effects of pollutants from coal mining activities on freshwater bodies: A case study of a coal mining region in Matabeleland North, Zimbabwe. The SETAC Africa 9th Annual Meeting, held jointly with the Society for Risk Analysis (SRA) Fifth World Congress on Risk, Cape Town, South Africa. 5 – 8 May, 2019. Change, J.B., Siwela, A.H. and Basopo, N. (2019). Oxidative stress associated with pollutants from

coal mining activities on aquatic plants: A case study of a coal mining region in Matabeleland North, Zimbabwe. 7th NUST Annual Research day, Bulawayo, Zimbabwe. 20 – 21 June 2019. Change, J.B., Siwela, A.H. and Basopo, N. (2021). A comparison of the activity of Superoxide dismutase and Catalase in freshwater snails and aquatic plants exposed to effluent from coal mining activities. 10th Young Environmental Scientists Meeting, Virtual Meeting. 22 – 26 February 2021. Change, J.B., Siwela, A.H. and Basopo, N. (2021). A study of Bioconcentration of metals by aquatic plants in a coal mining area in Zimbabwe. Setac Africa 10th Biennial Conference. Virtual Meeting. 20 – 22 September 2021.



Name: Ophias Mazuru

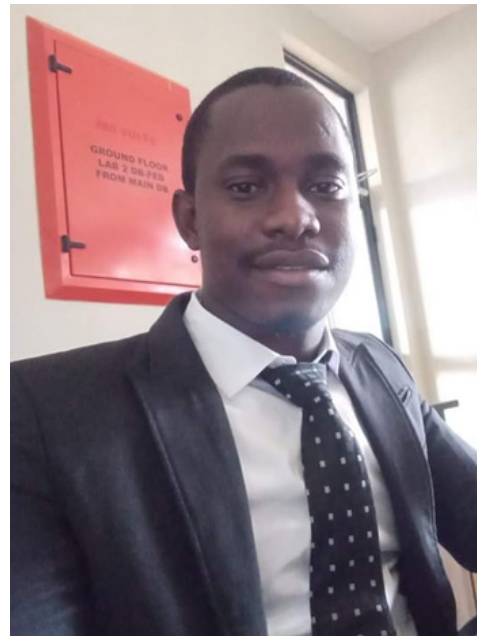
Position at NUST: MPhil student

Position in the Ecotoxicology Research Group: Technician who uses the comet machine to study the genotoxic effects of pollutants in fish.

Degree programme: MPhil in Biochemistry

Institute: NUST

Areas of interest: Genotoxic and biochemical effects of anthropogenic pollutants



Name: Ronald Ndlovu

Position at NUST: MPhil student

Position in the Ecotoxicology Research Group: Junior Researcher

Research interests: I focus on endocrine disruption in frogs and fish

MPhil project title: Endocrine disruptive and lipid peroxidative effects of environmental pollutants in uMguza, Insiza, and Matopos dams on fresh water fish (*Oreochromis mossambicus*) and amphibians (*Xenopus laevis*)



Name: Fiona Buwerimwe

Position at NUST: MPhil student and tutorial assistant at Applied Biology and Biochemistry department

Research interests: Discovering the effects on pollutants on aquatic organisms

MPhil thesis title: Toxicological effects of some heavy metals and pesticide residues from Ncema, Mzingwane and Matopo Dam water on aquatic plants and animals



Name: Melody Ukama

Position at NUST: MPhil in Applied Biology and Biochemistry

Research interests: Mycotoxicology

MPhil thesis: Development of a nitrogen-fixing *Rhizobia-Bacillus subtilis* formulation for aflatoxigenic fungi exclusion and optimal pod yield production in ground nuts in Zimbabwe

RIO trains early career researchers on grant, proposal writing

RIO conducted a 5-day workshop for 20 early career researchers on how to write proposals for grants and answer calls for funding opportunities. The workshop mixed both theory and practical work, in which early career researchers worked on real world calls for funding from various sources. The workshop was funded by the Association of Commonwealth Universities Early Career Training Research Grant, which the University won through Dr Paul Makoni, Dr Cinderella Dube and Mr Israel Mbekezeli Dabengwa.



Early career researchers and their mentors pose for a group photograph at the NUST Council Chambers.

Research training and funding opportunities

The Research and Internationalisation Office (RIO) coordinates University's research activities. Among some of its functions, RIO builds capacity and offers training to NUST researchers in proposal development, project implementation, and report writing (including publishing in peer-reviewed journals). The Office assists researchers in identifying

funding sources, the preparation of project proposals, submission of project proposals to donors and project implementation. RIO is a key player throughout the life of every project. RIO offers support in all the phases of the project from proposal development through to project closure and reporting. The Office helps in ensuring compliance with policies and requirements

of the University (internal) and funding agencies (external). RIO offers training at Faculty, Departmental and individual levels. As a researcher when you need assistance to write or develop a research proposal, come to RIO, the doors are always open to assist you become a better researcher.

Apply for funding from the NUST Research and Development Board

Did you know that you can apply for funding from the NUST Research and Development Board?

Who is eligible to apply?

- Academic Staff: All full-time academic members of staff, Research Fellows and full-time temporary members of staff.
- Non-Academic members of Staff can only apply through an Academic member of staff.
- Students: Undergraduate, MPhil and PhD can be funded through their supervisors.

What is funded?

- Researches
- Conferences (currently only in the Southern Region, that is, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Eswatini, Zambia and Zimbabwe).
- Journal publications costs.

Application Forms

Application forms can be obtained from Faculty Representatives or from the RIO Office.

CALLS, CONFERENCES AND WORKSHOPS

Upcoming events

2nd Virtual Annual Education for Sustainable Development Interdisciplinary Research Conference (ESDIR) from 14 to 16 September 2022.

THEME: "Exploring Innovation, Sustainability, and Creativity for Sustainable Development". For more information, copy and paste this link: <https://www.nust.ac.zw/index.php/education-for-sustainable-development.html>

9th International Conference on Communication and Information Science (ICCIS) from 23 to 24 August 2022, Council Chambers.

THEME: "Knowledge and Information Communication in the COVID-19 Era". For more information, copy and paste this link: <https://www.nust.ac.zw/index.php/international-conference-on-communication-and-information-science.html>

Copyright First Responders with Kyle

Courtney: the first session will be August 19th @ 10am Pacific/1pm Eastern. Paste and go to – <https://nwill.org/> International Conference on Communication and Information Science (23-24 August 2022) – Paste and go to: <https://www.nust.ac.zw/index.php/international-conference-on-communication-and-information-science.html>

2022 Northwest ILL Conference Registration Open!

8-16 September 2022 – Paste and go to: [https://nwill.org/2nd International Conference on Education for Sustainable Development \(14-16 September 2022\)](https://nwill.org/2nd International Conference on Education for Sustainable Development (14-16 September 2022)) – Paste and go to: <https://www.nust.ac.zw/index.php/education-for-sustainable-development.html>

Peer Review Week 2022 (19-23 September 2022)

– an annual event to celebrate the value of peer review, will be dedicated to the theme "Research integrity: creating and supporting trust in research": <https://peerreviewweek.wordpress.com/>

17th Southern African Energy Efficiency Confederation (SAEEEC) Conference, 28-30 September 2022

– General conference enquiries: Motlatjo Ramaloko, Exhibition, sponsorship and speakers: Helen Couvaras, go2energy@saeecconfed.org.za, membership@saeecconfed.org.za. Pre-conference training/workshops: Thieda Ferreira: training@saeecconfed.org.za, secgen@saeecconfed.org.za

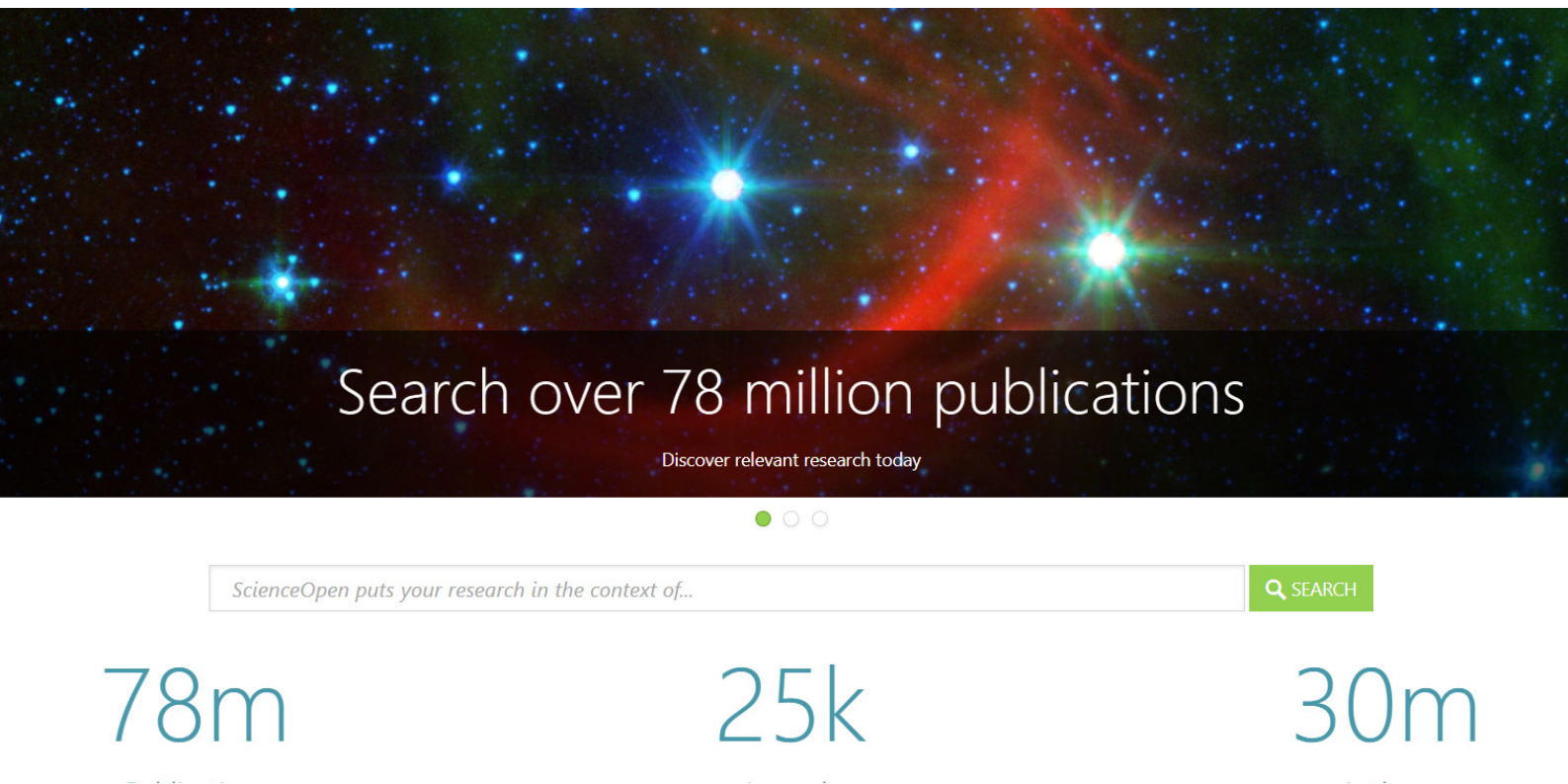
New Scientist Live London (7-9 October 2022)

ExCeL London & Online – Paste and go to: <https://live.newscientist.com>

International Open Access Week 2022 will be held under theme "Open for Climate Justice" (24-30 October) – Paste and go to: <https://www.openaccessweek.org/theme/en>



Want to perform a literature search and don't want to pay for Web of Science or Scopus or perhaps you are tired of the limited functionality of the free Google Scholar?



Search over 78 million publications

Discover relevant research today

ScienceOpen puts your research in the context of...

78m 25k 30m

Search results are clearly labelled by type of publication, number of citations, altmetrics scores, etc. and allow for filtering. You can also access citation metrics.

<https://www.scienceopen.com/>