



S.E.T. for socio-economic growth

National Science and Technology Forum (NSTF)

media release

International Day for Biological Diversity, 22 May 2024:

Dr Daniel Hart opens our eyes to the importance of mole rats as ecological engineers

International Day for Biological Diversity, 22 May 2024: In December 2000, the United Nations General Assembly (UNGA) proclaimed 22 May as International Day for Biological Diversity (IDB) to increase understanding and awareness of biodiversity issues. Biological diversity is often understood in terms of the wide variety of plants, animals and microorganisms, but it also includes genetic differences within each species. The theme for the day this year is “Be part of the Plan”, a call to action for all people, governments, businesses and communities to do their part to help halt and reverse the loss of biodiversity by supporting the implementation of the Kunming-Montreal Global Biodiversity Framework, also referred to as, the Biodiversity Plan. Biodiversity plays an integral role in maintaining life on earth and its decline threatens the wellbeing of all biota and can lead to the earth becoming even less hospitable to human beings and other life forms.

Dr Daniel Hart is the winner of the 2023 TW Kambule-NSTF Emerging Researcher Award. He is a Senior Research Fellow: Zoology and Entomology Department, Faculty of Natural and Agricultural Sciences at the University of Pretoria (UP). His research focuses on the evolutionary physiological and biomedical studies of African vertebrates. Dr Hart was part of an international team with Prof Nigel Bennett whose research into African mole-rats was featured in articles published in the journal *Science* (See the list of articles below).

The African mole-rats (family Bathyergidae) are a unique group of subterranean hystricomorph rodents that display the widest range in social behaviours of all mammals. Species within the group range from solitary dwelling to the eusocial Damaraland mole-rat (*Fukomys damarensis*) and naked mole-rat (*Heterocephalus glaber*). African mole-rats have a dramatic effect on the ecological process when they burrow underground, they alter the physical and chemical properties of the soil, increasing plant productivity and diversity which increases plant species richness. When excavating their burrows, mole rats churn soil together with vegetation, uneaten food, and their urine and excrement. Their mounds are highly concentrated with minerals such as nitrogen, magnesium, potassium, sodium and calcium, perfect for plant density.

Mole-rats can live for up to 30 years, longer than any other rodents, seemingly, without the physiological deterioration that affects most older animals and they are immune to some forms of pain. Scientists now believe that this apparent immunity to aging may hold the secret to preventing and treating aging-related diseases, such as dementia or cancer, in humans. Dr Daniel Hart’s research focus is mainly on, African vertebrates he is particularly interested in the African mole-rat as a main study animal. He investigates the ecological and physiological factors that affect the control of reproduction and sociality of these animals. Dr Hart said that he has a keen interest in using knowledge of the biology of these mammals to improve treatments of human medical conditions. African mole-rats are interesting non-model mammals for understanding ageing, oxygen limitation, pain receptors and cancer biology because they have evolved a range of solutions to living in a subterranean environment.

TW Kambule-NSTF Award Winner: Dr Daniel Hart was awarded the **TW Kambule-NSTF Emerging Researcher Award** at the prestigious 2023 NSTF-South32 Awards, with a prize proudly sponsored by the South African Young Academy of Science (SAYAS). He received the award for utilising concepts from the evolutionary biology of mammals to address questions of health, biological, social and economic relevance to humans and improve treatments of human medical conditions, as well as predict future consequences of climate change.



Dr Hart smoothly transitioned from athletics to the wonderous world of science through the help of his many mentors who helped him hone his investigative research skills. He said: “I was a brutish rugby player, walking around with no shoes but every single time I spoke to a senior academic it always piqued my fancy. When I met Prof Nigel Bennet it just went from zero to 100%, and I’ve been able to work and collaborate with some of the top people in the world”.

Dr Hart is now a research fellow in Prof Bennet’s African mole rat research lab, studying the mole-rats’ incredible capabilities, which some would consider superpowers,

He says: “Discovering patterns where there shouldn’t be a pattern is my ‘wow’ moment”. When he was studying mole-rats in Germany and he ended up getting painful ant bites, the mole-rats were being bitten as well but were not reacting and he realised that they were impervious to that pain.

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Upon further research he realised that the ants inject formic acid when they bite, which attacks the nervous system of mammals, but he discovered that the mole-rats developed unique genes to bypass the pain response. This groundbreaking research led to him being featured on one of the top international journals, *Science*, in 2019. Dr Hart said that this research is important because it could help inform how humans adapt to climate change and treat diseases like cancer. He concluded: “I’m not a very artistic person, but, I find it beautiful to look for patterns and the processes that appear in nature. What drives me and what keeps me up at night is being able to put together pieces of information that seem to be unrelated, but actually form this complex web of what keeps an animal going and keeps the ecosystem going.”

About the NSTF (National Science and Technology Forum): NSTF is an independent non-profit stakeholder body and network – a civil-society forum of over 130 organisations involved in science, engineering, technology (SET) and innovation in SA.

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- [Mole Rats Promote Biodiversity | Scientific American](#)
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- [Rapid molecular evolution of pain insensitivity in multiple African rodents | Science](#)
- [Cultural transmission of vocal dialect in the naked mole-rat | Science](#)
- [Inactivating mutations in Drosha mediate vascular abnormalities similar to hereditary hemorrhagic telangiectasia | Science Signaling](#)
- [Rapid molecular evolution of pain insensitivity in multiple African rodents | Science](#)
- [DNA methylation networks underlying mammalian traits | Science](#)

About the NSTF

The National Science and Technology Forum (NSTF), established in 1995:

- is a broadly-representative stakeholder body for all science, engineering and technology (SET) and innovation organisations in South Africa
- gathers stakeholders around burning issues of national and global interest, across the public and private sectors, including matters of public policy
- includes a network of professional societies in SET and STEM education (STEM = science, technology, engineering and mathematics) - the NSTF proSET membership sector.
- recognises, awards and profiles the outstanding contributions of individuals and groups to SET and innovation through the prestigious NSTF Awards
- runs and supports collaborative projects and youth outreach, including recognition of top performance in mathematics and science, role modelling, bursary and STEM career information
- runs and supports the STEMulator.org which attracts youth and educators to Explore>Discover>Learn the world of STEM including careers. (Established by NSTF proSET)

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