

October 2020

MEDIA RELEASE

National Geographic Society profiles UP researcher who traces ancient human diseases

PRETORIA – Dr Riaan Rifkin, a Research Fellow at the University of Pretoria (UP), was honoured with a profile in a recent edition of *National Geographic Society* for his work on tracing the DNA of ancient human diseases.

The National Geographic Society funds his research at the Centre for Microbial Ecology and Genomics (CMEG) at UP. Spending time in cave sites, searching for ancient DNA in sediments and human remains, is part of Dr Rifkin's daily routine. He is looking for clues concerning the past prevalence of common and novel human diseases. He wants to find out "which diseases plagued ancient humans, and which of these were taken to Europe and Asia as our ancestors left Africa to populate these regions. Our ancestors knew how to overcome illnesses at that time," he says.

Rifkin is a bioarcheologist at CMEG, which is housed in the Department of Biochemistry, Genetics and Microbiology in the Faculty of Natural and Agricultural Sciences at UP. He holds a Master's degree in prehistoric rock art from the Rock Art Research Institute at the University of the Witwatersrand, as well as a PhD from its Institute for Human Evolution. "My research focused on the use of red ochre – a soft clay-based earth pigment – by ancient southern Africans going back 100 000 years, and what this might tell us about the cognitive and social evolution of our species. While ancient humans likely used red ochre as a symbolic body cosmetic, our experiments have shown that this also proved to be a very good sunscreen, insect repellent, and animal hide tanning ingredient."

Ancient humans using red ochre powder for these purposes were already very 'modern' at least 100 000 years ago, "before our species left Africa for Asia and Europe".

Based on his work with the Ovahimba in Namibia, where women use red ochre daily, he developed an interest in the possible influence of diseases in our African ancestors. "The Ovahimba informed me that the red ochre mixture also prevented them from being bitten by mosquitoes. As mosquitoes are important disease vectors still today – including Zika virus, West Nile virus, Chikungunya virus, dengue, and malaria – I started to gather information concerning ancient African diseases, and how these would have influenced the evolution of our species in Africa," he says.

As a bioarcheologist, he studies ancient disease organisms at a molecular (DNA) level and works in the field of molecular archaeology. He says: "My research at UP focuses on discovering ancient DNA from southern African archaeological sites, including sediments and human remains. The remains span the period from circa 75 000 to 1 500 years ago. My primary aim is to generate a sub-Saharan African disease baseline database that precedes the departure of *homo sapiens* from Africa after circa 75 000 years ago."

He recently secured funding for a five-year project through the Benjamin R. Oppenheimer Trust which awarded him a fellowship for his studies in molecular archaeology. The long-term objective of the fellowship is to contribute to alleviating the adverse influence of ancient re-emerging 'ancestral' diseases on contemporary humans.

But why study ancient diseases? And how can novel data about prehistoric pathogens benefit modern society? The impact of disease on prehistoric humans is illustrated by the fact that roughly two-thirds of modern-day hunter-gatherers, such as the Kalahari San and the Tanzanian Hadza, succumb to disease before reaching 15 years of age. Despite the fact that many of the approximately 400 recognised human pathogens had a profound influence on human evolutionary history, many are still implicated in the deaths of millions of people annually.

“So, even in our modern day and age, we are not immune against pathogens. Epidemics caused by Zika virus, avian influenza and even the *Yersinia pestis* bacterium – the causative agent of the ‘black death’ plague – still pester modern human society. But recognising which disease-causing pathogens were brought from Africa to the rest of the world, after our ancestors left the continent some 65 000 years ago, is a challenging venture,” says Dr Rifkin.

This entails determining the evolutionary relationships between ancient African human populations and pathogenic and beneficial microbial species, and exploring the ways in which emerging ‘ancestral’ human diseases are expected to affect modern-day sub-Saharan African populations. The final step is producing policy guidelines for the integration of novel DNA information into epidemiological models about disease emergence and outbreak-response planning.

This involves integrating archaeology, molecular ecology and palaeo-epidemiology. While this innovative approach holds vast potential for interpreting past human lifestyles, it also holds great potential for predicting the emergence of new diseases.

For interviews with Dr Rifkin, please email Primarashni.Gower@up.ac.za or call 083 229 9011.

ABOUT THE UNIVERSITY OF PRETORIA

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on the Hatfield Campus, Pretoria. This 111-year-old institution is also the largest producer of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only university in the country that has a Faculty of Veterinary Science, and overall has 120 academic departments, as well as 92 centres and institutes, accommodating more than 55 000 students and offering about 1100 study programmes.

UP is one of the top five universities in South Africa, according to the 2019-2020 rankings by the Center for World University Rankings. It is also ranked among the top 100 universities worldwide in three fields of study (veterinary science, theology and law), and among the top 1% in eight fields of study (agricultural sciences, clinical medicine, engineering, environment/ecology, immunology, microbiology, plant and animal sciences, and social sciences).

In June 2019, the annual UK Financial Times Executive Education Rankings once again ranked GIBS as the top South African and African business school. The University also has an extensive community engagement programme. Furthermore, UP is building considerable capacities and strengths for the Fourth Industrial Revolution by preparing students for the world beyond university and offering work-readiness and entrepreneurship training to its students.

For more information, go to www.up.ac.za