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The Yearbook: 11 early-career researchers to watch

Up-and-coming researchers who are blazing a trail in their respective fields share what they are most excited about and where their research going in the next 5 years.

Loic Yengo: Statistical genomics
Group Leader, University of Queensland, Australia.

The next 5 years will see the advent of larger and more-diverse collections of human genomes. This will yield exciting opportunities for expanding existing maps of disease-causing genetic variation within and between human populations. I particularly look forward to quantifying the contribution of rare genetic variants to the heritability of complex traits. Another promising direction will be toward the discovery of disease-causing genetic variants in populations of African ancestry, currently under-represented in genetic studies worldwide. Answering these questions will require novel and scalable data analysis methods, which I will continue to develop in the coming years. Watch this space!

Nowsheen Goonoo: Biomaterials and nanotechnology
Postdoctoral researcher, University of Mauritius, Mauritius.

For the past 7 years, I have been working on the design and development of biodegradable nanofibers consisting of materials derived from Mauritian natural resources — such as seaweeds and aloe vera — to address a key burning issue in Mauritian society: the treatment of diabetic foot ulcers. These nano-wound dressings have already been tested on small-animal models, and my vision is to launch them within the next 5 years as the first Mauritian nanotechnology product. I hope this will help to accelerate the healing of diabetic foot ulcers and prevent lower-limb amputations.

Pranav Rajpurkar: Biomedical AI
Assistant professor at Harvard Medical School, USA.

I am excited about a future in which artificial intelligence (AI) models are capable of highly complex medical decision-making. Today's medical AI models are built to tackle a simplification of a more complex reality — they consider only a handful of diseases, ignore available context, and fail to communicate their outputs in natural language. Toward narrowing these gaps, my lab develops self-supervised learning, multimodal learning, and natural-language-generation capabilities for the next phase of medical AI. With a focus on application to medical images and sensors, our work blends innovation in algorithm development, dataset curation, and human-interaction studies.

Mariam Jamal-Hanjani: Cancer evolution and metastasis
Group leader, University College London, UK.

My research is focused on understanding the biological processes that lead to metastasis, drug resistance and, ultimately, death in patients with cancer. I have the privilege of studying this using research autopsies within the PEACE study, which, combined with studies such as the TRACERx lung-cancer-evolution program, can shed light on how cancer cells interact with their surrounding environment to aid metastatic dissemination. Given the great clinical unmet need, I am especially excited to study the relationship between the metastatic process and altered cancer metabolism — which often results in a catabolic state in patients who develop cachexia and have a poor prognosis.

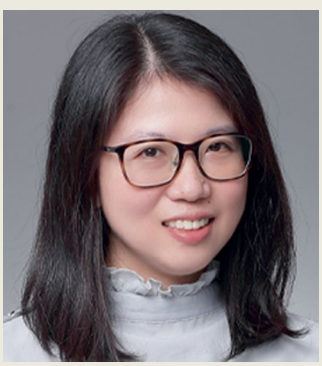
CREDITS: INSTITUTE FOR MOLECULAR BIOSCIENCE, THE UNIVERSITY OF QUEENSLAND; JOHN SOARES; AACR ANNUAL MEETING 2022

Jotham Suez: The microbiome in health and disease
Assistant professor, Johns Hopkins Bloomberg School of Public Health, USA.

Which foods should humans eat to prevent cardiometabolic disease? Are artificial sweeteners the right choice for weight loss? Can probiotics improve health? Finding a consensus answer to any of these questions in the biomedical literature can prove challenging. Part of the reason for this is that it is personalized! Through our research, we now have a better understanding of how the unique collection of microbes each person harbors in their body (the microbiome) dictates how they respond to certain foods and drugs. Our goal is to understand how this happens, as this will allow us to identify and therapeutically target microbial mechanisms involved in disease.

Kathy Leung: Disease modeling
Assistant professor, The University of Hong Kong, Hong Kong.

I am interested in mathematical modeling of a wide range of diseases such as influenza; COVID-19; human papilloma virus and cervical cancer; hand, foot and mouth disease; colorectal cancer; and breast cancer. I am motivated by high-impact quantitative problems in health. I conduct epidemiological and economic evaluations of disease-intervention strategies, such as risk-based cancer screening; estimating the effectiveness of vaccines, antivirals and public health measures that target COVID-19; and evaluating the impact of intervention programs that targeting communicable and non-communicable diseases. In the next 5 years, I hope my research can contribute to improving population health and, thus, social recovery in a post-pandemic world.



Anna Sophie Berghoff: Personalized cancer treatment
Associate professor, Medical University of Vienna, Austria.

Personalizing treatments for patients is the most exciting part of modern oncology for me. Each patient must receive the most efficient treatment but, in addition, quality of life and, in particular, the side-effect profiles of drugs need to be considered. We need to see beyond the characteristics of the disease and consider more information on the patient's symptomatic burden, (epi-)genetics, immune system, co-morbidities, and lifestyle characteristics in our treatment decisions. Eventually we need to build a 360° biomarker, including a manifold amount of information on the disease, as well as the personal patient characteristics, to provide a truly personalized, optimal treatment regimen.

Mireille Kamariza: Infectious disease diagnostics
Junior fellow at Harvard University and incoming assistant professor at the University of California at Los Angeles, USA.

I have a positive outlook for the future of science. I am excited to see the application of innovative technologies and infrastructures developed during the COVID-19 pandemic to longstanding infectious diseases, including tuberculosis and malaria. There has been explosive growth in the diagnostic and surveillance sequencing space, as countries raced to identify which SARS-Cov-2 variant was driving transmission at a given time. These infrastructures can be used to combat other infections, whether seasonal or endemic (e.g., influenza virus or Lassa virus), enabling early detection and rapid control of outbreaks. In my lab, we will continue to leverage chemical and biochemical tools to develop affordable and easily deployable diagnostic technologies that work well in low-income countries.

CREDITS: DAVID HAAS ; MEDUNI WIEN / FELICITAS MATERN; MICHAEL BUTTS

Robbie Majzner: CAR T cell engineering
Assistant professor, Stanford University, USA.

Chimeric antigen receptor (CAR) T cells have emerged as one of the most exciting forms of cancer immunotherapy and have demonstrated their awesome potential to cure patients. However, CARs today look very similar to those that were first invented three decades ago. My laboratory is utilizing biological insights into T cell signaling pathways to reimagine how we engineer CARs. This has allowed us to create signaling platforms (based on logic gating) that make CAR T cells far more specific, which limits off-tumor toxicity. My lab will continue to marry synthetic biology with basic scientific discovery to propel new therapies for patients in need.

Mychael V. Lourenco: Neurodegenerative disease
Assistant professor, Federal University of Rio de Janeiro, Brazil.

I am fascinated by the changes that take place in the brain to cause neurodegeneration and dementia. Dementia is a worldwide health concern that needs to be investigated more thoroughly and addressed more efficiently. Although the field once upheld 'insoluble proteinaceous aggregates attack neurons' as the corollary for the molecular changes in dementia, we now understand that its nature is far more complex. I see my future research contributing to the identification of novel molecular mechanisms that may help explain this complexity and proposing novel and effective strategies for neuroprotection. I am particularly excited by the translational prospects of our research program.

Myriam Chalabi: Cancer immunotherapy
Medical Oncologist, Netherlands Cancer Institute, the Netherlands.

The unprecedented effect of neoadjuvant immunotherapy on early-stage colon cancers is one of the most exciting recent developments in the field, and it is already changing the treatment paradigm for mismatch repair–deficient tumors. Equally intriguing are the responses in mismatch repair–proficient tumors, previously considered resistant to immunotherapy. We are currently in the process of in-depth characterization of these immune responses on the single-cell level; cracking this code can have tremendous impact on this large patient population. My research in the near future will focus on clinical and translational aspects of novel neoadjuvant immunotherapy treatments in gastrointestinal cancers. The goal is more cures and the development of new strategies and organ-sparing approaches.

CREDITS: STEVE FISCH; ANDREJAGT, NKI