Make creativity part of study programs for scientists-in-training, say researchers

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Professor Dr Itai Yanai from New York University and Professor Dr Martin Lercher from HHU advocate greater scientific creativity, in particular in the case of scientists-in-training. Credit: University of Princeton/Sonali Majumdar

The bioinformatician Professor Dr. Martin Lercher from Heinrich Heine

University Düsseldorf (HHU) and his colleague Professor Dr. Itai Yanai from New York University (NYU) are focusing on the topic of creativity in research. In the latest editorial in the journal *Nature Biotechnology*, they advocate teaching the importance of creative processes for the advancement of science especially in graduate study programs.

The authors observe that the rate of scientific innovation appears to be slowing down: The proportion of research projects that push science in new directions by breaking with previous understanding has decreased since the second half of the 20th century. Such projects have been replaced by more results-oriented approaches, which advance research areas but rarely result in transformative science.

This reflects a fundamental development: Publicly funded research projects are being dominated by hypothesis-driven approaches, which tend to confirm the hypotheses rather than seeking genuinely new and unexpected results.

Professor Martin Lercher, head of the Computational Cell Biology research group at HHU and Professor Itai Yanai, Director of the Applied Bioinformatics Laboratories at NYU, believe there is a need to rethink how scientists-in-training are educated. They write that "graduate study programs should renew an emphasis on creativity by teaching the tools of innovative thinking."

The two authors have been calling for the "promotion of the creative side of the scientific process" for years. Their approach draws on the concept of "day science" and "night science" developed by the Nobel Prize winner François Jacob: "Day science" refers to modern science as a systematic, well-planned process guided by hypotheses developed in advance, while "night science" is the non-systematic, creative part of science, namely free thinking and the often intuitive exploration of ideas.

Lercher says, "The first thing scientists-in-training learn today is how to establish a foothold in the world of research through the definition of highly specific projects, which lead to predictable results, which in turn lead to citable publications. Knowing and practicing this is of course important as it enables incremental advances in research areas and the provision of reliable answers to detailed questions."

Yanai adds, "Yet, we cannot see this as the be-all and end-all, as this structured process rarely results in new discoveries, which are however critical for the advancement of science."

In *Nature Biotechnology*, the two authors call for the integration of scientific creativity courses into the curricula of graduate study programs. The most powerful tool for creative science might be improvisational, open scientific discussions, both with close colleagues and with experts in related fields.

By gaining an insight into the creativity toolbox of other subjects, graduate students and postdoctoral fellows can learn to pose new questions from different perspectives. Lercher and Yanai believe that "inventing the right question can advance science more than answering an existing one."

Finally, the authors emphasize in their editorial that placing an emphasis on creativity in the sciences would also help to reduce misconceptions among the public about the scientific process, encouraging increased numbers of creative young people to pursue a career in science.

More information: Itai Yanai et al, Make science disruptive again, *Nature Biotechnology* (2023). DOI: 10.1038/s41587-023-01736-5

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