

INNOVATORS & IDEAS: RISING STAR

Haitham Amal: Nitric oxide is a shared molecular mechanism of multiple neurodevelopmental and neurodegenerative disorders

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Haitham Amal is an internationally recognized expert in cell signaling and brain disorders who heads the Laboratory of Neuromics, Cell Signaling, and Translational Medicine at the Hebrew University of Jerusalem. His research program integrates proteomics with systems biology, combining biochemical, pharmacological, and behavioral approaches. Currently a Visiting Professor at Boston Children's Hospital and Harvard Medical School, Dr. Amal previously conducted his postdoctoral studies at the Massachusetts Institute of Technology (MIT), where he served as a Senior Postdoctoral Associate in the Biological Engineering Department and was affiliated with the Stanley Center for Psychiatric Research at the Broad Institute of MIT and Harvard. His innovative research has been supported by numerous competitive grants, including awards from the German DFG, Israel Science Foundation, and the US Department of Defense, with his contributions recognized through the Krill Prize from the Wolf Foundation and the Eagles Autism Foundation Research Grant as its first international recipient. His research established essential connections between nitric oxide and autism spectrum disorder (ASD), while also revealing significant pathological overlaps between ASD and Alzheimer's disease. Building on these discoveries, Dr. Amal has co-founded Point6 Bio Ltd, developing biological diagnostic tools for ASD, and NeuroNOS Ltd., focused on nitric oxide synthase inhibitors for treating neurological disorders. In this Genomic Press interview, Dr. Amal shares his insights on the path to these discoveries and his vision for advancing our understanding of neurological disorders.

Part 1: Haitham Amal – Life and Career

We would like to know more about your career trajectory leading up to your current role. What defining moments channeled you toward this opportunity?

In 2007, I began my journey into neuroscience with a master's degree at Tel Aviv University, where I became captivated by the field while researching the long-term effects of low-dose THC on cognitive function. This experience sparked a deep interest, leading me to further my studies with a PhD at the Technion, where I focused on identifying disease-specific chemical signatures. Following this, I completed a postdoctoral fellowship in the Department of Biological Engineering at the Massachusetts Institute of Technology (MIT), exploring proteomics and systems biology in autism and Alzheimer's under the mentorship of Professor Steven Tannenbaum. This path has continually deepened my commitment to understanding the biochemical underpinnings of neurological disorders. My work at MIT led to the establishment of my lab at the Hebrew University, where I established and led a large group of scientists with the ultimate goal of developing a drug for autism spectrum disorder (ASD) and Alzheimer's disease (AD).



Figure 1. Haitham Amal, BScPharm, PhD, Hebrew University of Jerusalem, Israel.

Please share with us what initially piqued your interest in your favorite research or professional focus area.

Meeting families and children with autism in Boston during my time at MIT inspired me to focus on a single goal: to help develop biological diagnostics and treatment for autism spectrum disorder (ASD). These encounters reinforced my commitment to addressing the unmet medical needs of individuals with ASD and shaped my research path toward creating tools and interventions that could improve their quality of life.

What impact do you hope to achieve in your field by focusing on specific research topics?

As a pharmacologist and neuroscientist, my unique expertise in understanding how drugs impact the brain is instrumental in achieving my goal of developing treatments for neurological disorders. My approach combines insights into molecular processes and synaptic behavior, which allows me to unravel complex brain mechanisms. By focusing on biochemical and behavioral levels, I aim to bridge the gap between molecular changes and observable outcomes, ultimately contributing to a deeper understanding of the brain's "black box" and advancing the development of effective therapies.



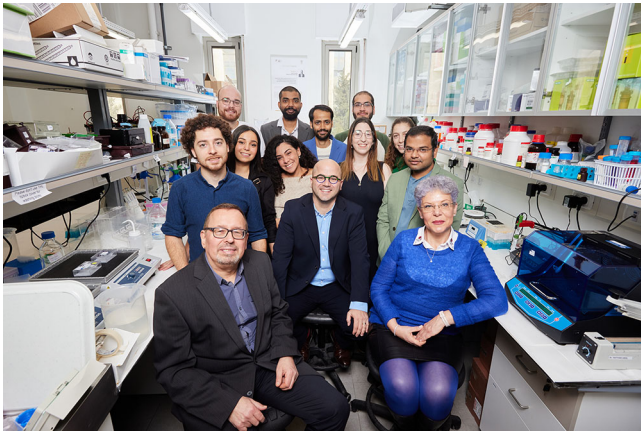


Figure 2. Haitham Amal and his dedicated team at their lab in Jerusalem.

Please tell us more about your current scholarly focal points within your chosen field of science?

My lab's work has garnered international recognition, exemplified by a recent publication on a novel mechanism underlying autism pathogenesis. We were the first to show that nitric oxide (NO) plays a crucial role in ASD. This study, using samples from low-functioning children with ASD, transgenic mouse models, and in-vitro human platforms, achieved widespread interest. I think this work will shape perspectives on the biological mechanisms of other neurological disorders. Furthermore, we have published several papers on the link between neurodevelopmental disorders and neurodegenerative diseases. We also made significant contributions to sex differences in the brain, publishing three impactful papers. In my lab, we conduct experiments on both sexes equally. We have a strong interest in aging mechanisms and have published another paper on this topic.

What habits and values did you develop during your academic studies or subsequent postdoctoral experiences that you uphold within your research environment?

I have developed the habit of diving deeply into the data and learning from failures, as they are invaluable growth opportunities. Additionally, serendipity often plays a crucial role in research, leading to unexpected discoveries and insights.

At Genomic Press, we prioritize fostering research endeavors based solely on their inherent merit, uninfluenced by geography or the researchers' personal or demographic traits. Are there particular cultural facets within the scientific community that warrant transformative scrutiny, or is there a cause within science that deeply stirs your passions?

Promoting diversity and inclusivity in the scientific community is essential for fostering innovation and creativity. Cultural facets such as representation in research, access to opportunities for underrepresented groups, and collaborative approaches across disciplines deserve transformative scrutiny.

What do you most enjoy in your capacity as an academic or research rising star?

I enjoy participating in conferences where I can meet people from all over the world and share ideas. Additionally, mentoring my great students is incredibly fulfilling and rewarding for me.

Outside professional confines, how do you prefer to allocate your leisure moments, or conversely, in what manner would you envision spending these moments given a choice?

I enjoy studying new languages, watching sports, and swimming. During my schooling, I learned five languages: English, Arabic, Hebrew, French, and Italian. These interests and language skills allow me to connect with diverse cultures and people, enriching my personal and professional life.

Part 2: Haitham Amal – Selected questions from the Proust Questionnaire¹

What is your idea of perfect happiness?

The health and well-being of my family.

What is your greatest fear?

None.

Which living person do you most admire

My mentor at MIT, Professor Steven Tannenbaum, who inspired me to value every detail in scientific data and fostered my appreciation for the nuances of research. I believe that he deserved the Nobel Prize for the discovery that nitric oxide is produced in a mammalian cell.

What is your greatest extravagance?

Travel with my family.

What are you most proud of?

My two kids.

What is your greatest regret?

None.

What is the quality you most admire in people?

Resilience—the strength to overcome challenges and keep moving forward.

What is the trait you most dislike in people?

Dishonesty—the inability to be truthful and transparent.

What do you consider the most overrated virtue?

Patience – In excess, patience might delay necessary action or change.

What is your favorite occupation (or activity)?

Traveling.

Where would you most like to live?

Boston, Massachusetts, USA

What is your most treasured possession?

The gift of unconditional love given by my parents, wife, and kids.

When and where were you happiest? And why were so happy then?

When I first met my wife Rageda and when my two kids, Sama and Adam, were born.

What is your current state of mind?

I am currently on sabbatical at Harvard University and enjoy networking, collaborating, and discussing science with great people.

¹In the late nineteenth century, various questionnaires were a popular diversion designed to discover new things about old friends. What is now known as the 35-question Proust Questionnaire became famous after Marcel Proust's answers to these questions were found and published posthumously. Proust answered the questions twice, at ages 14 and 20. In 2003 Proust's handwritten answers were auctioned off for \$130,000. Multiple other historical and contemporary figures have answered the Proust Questionnaire, including among others Karl Marx, Oscar Wilde, Arthur Conan Doyle, Fernando Pessoa, Stéphane Mallarmé, Paul Cézanne, Vladimir Nabokov, Kazuo Ishiguro, Catherine Deneuve, Sophia Loren, Gina Lollobrigida, Gloria Steinem, Pelé, Valentino, Yoko Ono, Elton John, Martin Scorsese, Pedro Almodóvar, Richard Branson, Jimmy Carter, David Chang, Spike Lee, Hugh Jackman, and Zendaya. The Proust Questionnaire is often used to interview celebrities: the idea is that by answering these questions, an individual will reveal his or her true nature. We have condensed the Proust Questionnaire by reducing the number of questions and slightly rewording some. These curated questions provide insights into the individual's inner world, ranging from notions of happiness and fear to aspirations and inspirations.



What is your most marked characteristic?

My main obsession is my intense drive to complete everything ahead of schedule.

Among your talents, which one(s) give(s) you a competitive edge?

Motivation.

What do you consider your greatest achievement?

Discovering that nitric oxide plays a key role in autism.

If you could change one thing about yourself, what would it be?

It would be to worry less.

What do you most value in your friends?

Loyalty.

Who are your favorite writers?

Too many to list here.

Who are your heroes of fiction?

Harry Potter.

Who are your heroes in real life?

My dad and mom.

What aphorism or motto best encapsulates your life philosophy?

"In the middle of difficulty lies opportunity" (Albert Einstein).

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