Genomic Psychiatry

OPEN

INNOVATORS & IDEAS: RESEARCH LEADER

# Miguel E. Rentería: At the intersection of genomics, neuroscience, and big data



*Genomic Psychiatry*; https://doi.org/10.61373/gp025k.0080

**Keywords:** Neurogenomics, neuroimaging, Parkinson's disease, big data, psychiatric genomics

**Dr Miguel E. Rentería illuminates our understanding of brain disorders through groundbreaking computational neurogenomics research that promises personalized treatments for millions worldwide. This inspiring Genomic Press Interview reveals how a curious child from Mexico who "asked too many questions" became a world-leading scientist at QIMR Berghofer Medical Research Institute, where he masterfully combines genomics, neuroscience, and cutting-edge data science to unlock the mysteries of Parkinson's disease and psychiatric conditions. With over 120 publications in prestigious journals, including Nature and Nature Genetics, garnering more than 10,000 citations, Rentería stands as a beacon of scientific excellence and global collaboration. His visionary leadership of the Australian Parkinson's Genetics Study, now encompassing nearly 20,000 volunteers nationwide, represents the largest cohort of its kind in Australia and exemplifies his commitment to building transformative research resources. As Co-Chair of ENIGMA's working group on Suicidal Thoughts and Behaviours and founding member of PGC's Suicide Genetics group, he drives international efforts to understand the most complex brain conditions. His pioneering integration of wearable sensors with genomic data creates unprecedented opportunities for precision medicine. At the same time, his passionate advocacy for global equity ensures genetic research benefits all populations, not just those of European ancestry. Honoured with the 2024 Adèle Green Emerging Research Leadership Award, the prestigious Al & Val Rosenstrauss Fellowship, and recognition as an Atlantic Fellow at the Global Brain Health Institute, Rentería continues to inspire through his determination to transform how we diagnose, monitor, and treat brain disorders, driven by the philosophy of *carpe diem* and an unwavering belief that science should be for everyone.**

**Figure 1.** Miguel E. Rentería, PhD, QIMR Berghofer Medical Research Institute, Australia.

## Part 1: Miguel E. Rentería – Life and Career

**Could you give us a glimpse into your personal history, emphasizing the pivotal moments that first kindled your passion for science?**

I grew up in Morelia, a beautiful colonial city in Mexico. My father, a car electrician, taught me problem-solving, while my mother, a full-time housewife, gave my siblings and me her complete attention. The first inkling of a scientific path came from a primary school teacher who told my parents I was destined to be a scientist because I "asked too many questions."

My interest became more focused thanks to a family friend who gifted me a chemistry book. I fell in love with inorganic chemistry and began competing in Chemistry Olympiads. This passion led me to the Universidad Nacional Autónoma de México (UNAM), where a pivotal moment occurred. In 2003, the year the human genome draft was published, UNAM launched a pioneering undergraduate programme in Genomic Sciences. Hearing Francisco Bolivar-Zapata, a founder of modern biotechnology in Mexico, speak about the human genome solidified my decision. I applied and was selected for the first-ever cohort—a multidisciplinary leap into the unknown that my curiosity and ambition drove me to take.

This journey eventually led me to Australia, where I did my PhD in Brisbane under the excellent supervision of Professors Nick Martin, Sarah Medland, and Margie Wright. There, I became involved in the early phase of the ENIGMA consortium and was a first author on a landmark 2015 *Nature* paper.

After my PhD, I felt a desire to help build scientific capacity in Mexico. Supported by a Chevening Scholarship, I pursued a Master of Public Policy at Oxford, which led to establishing a science-for-policy office with the Mexican Senate. While initially a success, the office was shut down following a change in government—a difficult lesson in the intersection of science and politics. That experience prompted my return to full-time research. I undertook a postdoctoral fellowship at Brigham & Women's Hospital and Harvard Medical School, funded by an Australian NHMRC fellowship, where I pivoted my work towards the genetics of Parkinson's disease. In 2018, I returned to Australia to establish own my research programme, founding the Australian Parkinson's Genetics Study and building the team I lead today.

Received: 12 August 2025. Accepted: 15 August 2025.
Published online: 26 August 2025.

**We would like to know more about your career trajectory leading up to your most relevant leadership role. What defining moments channelled you toward that leadership responsibility?**

My career trajectory has been a gradual assumption of responsibility, but the transition into a formal leadership role felt quite sudden—though it was a conscious and willing step. For me, my most defining leadership role today is as the founder and lead of the Australian Parkinson's Genetics Study (APGS). It is a nationwide cohort that now includes nearly 20,000 volunteers, and I am particularly proud of this initiative because I started it from the ground up by building a strong network of collaborators, funders, and participants who believed in the vision.

The catalyst was identifying a critical gap: Australia had outstanding researchers but no large-scale, national cohort for Parkinson's genetics. I saw an opportunity to build a resource that could empower local research and contribute to international efforts.

My past experiences have intentionally shaped my approach to leadership. My early work with the ENIGMA consortium was an apprenticeship in large-scale, collaborative science. Later, my Master of Public Policy at Oxford and the Atlantic Fellows program at UCSF provided me with formal training in strategy and stakeholder engagement. From these experiences, I have cultivated a leadership style that I strive to make methodical, strategic, and systematic.

**What is a decision or choice that seemed like a mistake at the time but ended up being valuable or transformative for your career or life?**

My decision to step away from research to work in science policy certainly felt like a misstep when it came to an abrupt end. At the time, I was incredibly frustrated. We were building something of real value, and the decision to shut the office down was based on ideology rather than merit.

Looking back, however, that "detour" was one of the most valuable and transformative experiences of my life. My time at Oxford was profound. I was part of a cohort of nearly 120 students from over 60 countries, and the experience was a constant exercise in challenging my ideas. Studying political philosophy, economics, and behavioural science fundamentally changed my mental frameworks. On a personal level, I also made some of my dearest friends there, and it was in Oxford that I married my wife.

That entire experience has had a lasting influence on my work as a research leader today (see Figure 2). It taught me to be more strategic, more intentional in my goals, and more persuasive in communicating the value of our work. What once seemed like a mistake became the very foundation for a more impactful approach to science.

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

Throughout my training, I have seen a pattern in successful PIs and teams. In addition to a commitment to excellence, work ethic, and technical skills, they also prioritise leadership, management, and mentorship skills.

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

My lab's current primary focus is tackling the challenge of clinical heterogeneity in Parkinson's disease. While the field has made tremendous progress in identifying genes that influence a person's risk, we understand very little about what drives the vast differences in symptoms and progression from one person to another.

To overcome the data bottleneck, my lab is pioneering the use of wearable sensors and digital biomarkers at scale in combination with genomics. This approach will allow us to collect objective, continuous, real-world data on movement, sleep, and other key indicators. We are currently building this as a powerful new phenotyping layer on top of the Australian Parkinson's Genetics Study (APGS). By integrating rich, longitudinal digital data with our existing deep genetic data, we are creating a uniquely powerful resource to identify the pathways that modify the course of Parkinson's and pave the way for personalised therapies.

Alongside this, my lab continues its work in psychiatric genetics, particularly through leadership roles in international consortia like ENIGMA, where we investigate the neurobiological underpinnings of traits like suicidal thoughts and behaviours.

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

On a practical level, I hope to help change the current paradigm of how Parkinson's disease is diagnosed, monitored, and treated. The approach has been largely reactive. My goal is to use the powerful combination of digital and genomic biomarkers to dismantle this uncertainty and usher in an era of precision medicine for Parkinson's.

More broadly, the methodologies we are developing will serve as a blueprint for how we study other complex brain disorders. The challenge of heterogeneity is a major hurdle in Alzheimer's disease, depression, and many other conditions. By demonstrating the power of integrating deep genomics with scalable, real-world individual data, I aim to inspire a shift in the wider field.

Ultimately, my work aims to move beyond broad labels and uncover the specific biological pathways that shape a person's individual experience with a brain disorder. By doing so, I hope we can not only create better therapies but also empower patients with more accurate information and, most importantly, a more concrete basis for hope.

**What do you most enjoy in your capacity as an academic or research leader?**

I enjoy the creative freedom to pursue scientific questions that I find genuinely interesting. While my core focus is on brain disorders, I find immense satisfaction in applying our lab's computational toolkit to new areas. Some of our most exciting work has emerged from "side projects" where we have mapped genes implicated in conditions like snoring, age-related cataracts, and even acne. These curiosity-driven explorations are incredibly rewarding.

Beyond the science, I derive a great deal of enjoyment from working with my team. The collaborative process of troubleshooting problems, brainstorming new projects, and mentoring students is the lifeblood of our lab. I am particularly committed to training a more diverse scientific community, and it is a great privilege to help cultivate the next generation, rooted in my firm belief that science is at its best when it is made by everyone, for the benefit of everyone.

**At Genomic Press, we prioritize fostering research endeavours 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 you feel strongly devoted to?**

The cause I am most devoted to is making science a truly global and equitable endeavour. I grew up in a developing country where pursuing a career in science is often seen as a privilege rather than a vital necessity. What policymakers need to understand is that while investing in science is expensive, the long-term cost of *not* doing it is far greater. My mission is to train and mentor emerging talents, particularly from underrepresented backgrounds, from wherever I am.

If there is one cultural facet of my field that warrants transformative scrutiny, it is the profound ancestral imbalance in genetic research. Our current knowledge base is disproportionately derived from studies of European ancestry populations. This is a systemic failure. We aspire to an era of evidence-based medicine, but for much of the world's population, what we currently have is evidence-biased medicine.

Addressing this is central to my work. To build a future where the benefits of genomic medicine are accessible to all, we must ensure all populations are represented in the research that drives it. My cause is threefold: to diversify our data, to diversify our scientific workforce, and to ensure the knowledge we create is shared by all.

**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?**

Finding a balance is essential. I greatly enjoy spending time outdoors, which provides a necessary counterbalance to a primarily computational career. I also enjoy watching movies and reading books; the simple act of learning new things is a source of immense satisfaction. Above all, my

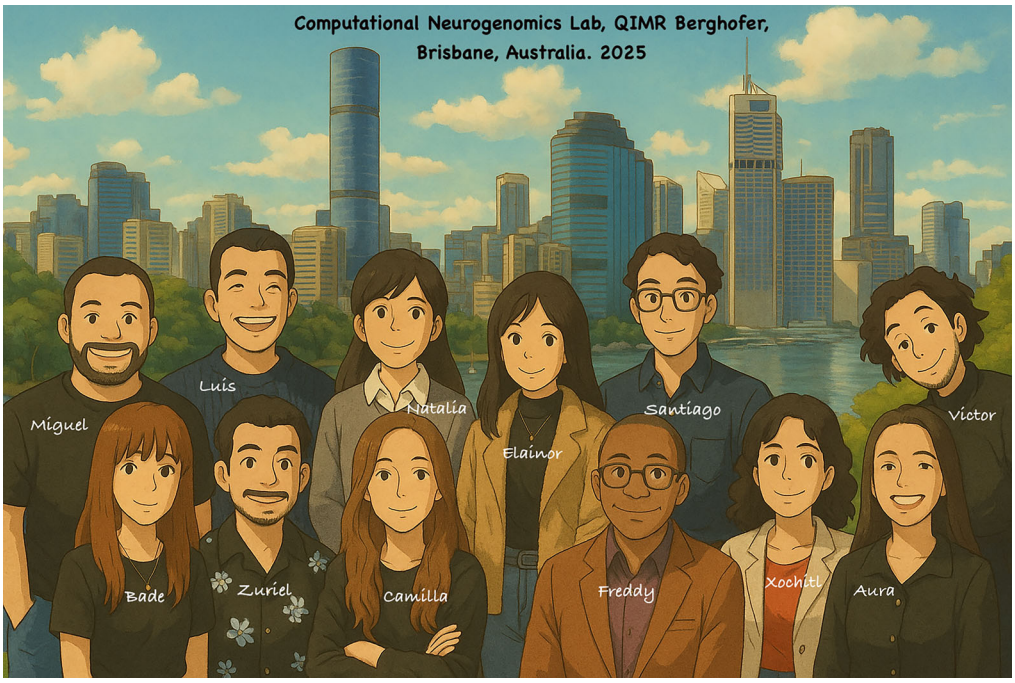


**Figure 2.** Illustrated group portrait of the Computational Neurogenomics Lab's team at QIMR Berghofer, set against the Brisbane city skyline and river. The illustration captures the diversity, camaraderie, and collaborative spirit of the group in July 2025.

most treasured moments are those spent with my family. Now and then, I also enjoy cooking, as it offers a different kind of creative outlet.

Music is also a constant and important presence in my life. I often use it to shape my environment. When I am reading or writing, classical music or opera helps me to focus. At other times, I prefer the improvisational nature of jazz. Moreover, on the odd occasion, for a completely different kind of energy, I will listen to rock n' roll.

## Part 2: Miguel E. Rentería – Selected questions from the Proust Questionnaire[1]

**What is your most marked characteristic?**
It is a combination of determination and resilience. Science is a field defined by obstacles. Rather than seeing setbacks as endpoints, I have always been determined to find a new path forward. Resilience is the most essential trait for any scientist.

**Among your talents, which one(s) give(s) you a competitive edge?**
The ability to wear multiple and very different hats. In an increasingly interdisciplinary field, being able to switch between the mindset of a geneticist, a data scientist, a strategist, or a mentor is a distinct advantage.

**If you could change one thing about yourself, what would it be?**
I want to improve my time management and be more patient. The ambition to pursue many projects is a constant battle against the clock.

**What is your current state of mind?**
Hopeful and energised about my long-term goals, but also slightly restless about the pace of progress. There are many moving parts in life and work right now, so there is an element of caution mixed with the excitement.

**What is your idea of perfect happiness?**
A healthy, thriving family, combined with meaningful work that has the potential to make a positive global impact.

**When and where were you happiest? And why were so happy then?**
My year studying at Oxford. It was a period of intense intellectual stimulation, surrounded by inspiring people from all over the world. It was a time of immense personal growth, and it was where my life with my wife began.

**What is your greatest fear?**
While I understand it is an unavoidable part of life, my greatest fear would be a serious illness or debilitating condition affecting me or a loved one.

**What is your greatest regret?**
I do not tend to hold onto regrets. Every decision and experience, whether good or bad at the time, has contributed to who I am today.

**What are you most proud of?**
I have built a meaningful life and a successful career here in Australia after leaving my home country and starting from scratch.

**What do you consider your greatest achievement?**
My most outstanding achievements are yet to come.

**What or who is your greatest passion?**
My family.

[1]In 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 favourite occupation (or activity)?**
Travelling to new places and meeting new people.

**What is your greatest extravagance?**
Technology, video games, and gadgets.

**What is your most treasured possession?**
My most treasured 'possessions' are not material. They are my family, my friends, my freedom, and my health.

**Where would you most like to live?**
I think of my life in chapters, with each place being special. Right now, I genuinely love living in Australia. I feel very privileged to call it home.

**What is the quality you most admire in people?**
A combination of integrity and intellectual curiosity.

**What is the trait you most dislike in people?**
Dishonesty and arrogance that is not backed by substance.

**What do you consider the most overrated virtue?**
Blind obedience. Progress, both in science and society, comes from critical thinking and questioning the status quo, not from unquestioning compliance.

**What do you most value in your friends?**
Beyond loyalty and trustworthiness, I value a depth of conversation and a shared curiosity about the world.

**Which living person do you most admire?**
Michael J. Fox. Not only do I love his movies, but he has transformed his battle with Parkinson's into a global movement for a cure, built on hope, science, and relentless optimism. We are all fighting this together thanks to his leadership.

**Who are your heroes in real life?**
I thank my parents for their unwavering belief in me and for the sacrifices they made to give me opportunities they never had themselves.

**If you could have dinner with any historical figure, who would it be and why?**
Rather than a single figure, I would host a colloquium with philosophers from different eras and cultures—perhaps Aristotle, Confucius, and Jean Paul Sartre—and listen to them debate contemporary affairs, especially around the ethics of technology and the future of humanity.

**Who are your favourite writers?**
Yuval Noah Harari, for his ability to synthesize history and science to ask profound, big-picture questions about humanity's past and future.

**Who are your heroes of fiction?**
Dr Ellie Arroway from Carl Sagan's *Contact*. She is driven by pure curiosity and a desire to understand humanity's place in the universe. She is determined and perseveres against political and scientific scepticism, which mirrors the challenges of a research career.

**What aphorism or motto best encapsulates your life philosophy?**
*Carpe diem*[2] We have one life, and we should strive to experience it as fully as possible by seizing opportunities, engaging with new people, and exploring new places.

*Colombo, Sri Lanka*
*12 August 2025*

**Miguel E. Rentería**[1]
[1]*QIMR Berghofer Medical Research Institute, 300 Herston Road, Brisbane, Queensland 4006, Australia*
✉ *e-mail: miguel.renteria@qimrb.edu.au*



[2]The Latin phrase "*Carpe Diem*" originates from Horace's *Odes* (23 BC). While typically rendered as "seize the day," the literal translation is "pluck the day" – evoking the harvesting of ripe fruit. This agricultural imagery reflects Horace's Epicurean emphasis on appreciating life's fleeting moments through thoughtful engagement rather than forceful acquisition.