

Thomaz F S Bastiaanssen, PhD

*Bioinformatics, Microbiome-Gut-Brain Axis,
Theoretical Ecology, Medical Ecology*

Curriculum Vitae



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Professional Summary

I am a bioinformatician interested in the interplay between the gut microbiome and host mood and mental health. The focus of my research currently lies in understanding microbiome-gut-brain communication from a theoretical ecology/bioinformatics perspective. In particular, I am interested in understanding the role of stability and volatility of the gut microbiome in anxiety and depression and in integrating different types of 'omics data in a biologically interpretable manner. As a bioinformatician, I value clear and easily interpretable analysis of complex data in order to promote interdisciplinary collaboration. I have a strong sense of justice and am committed to fostering a culture of inclusivity, equity and diversity in academia.

Employment

- 2024 - **Postdoc**, *Amsterdam University Medical Centres, VUmc*, Amsterdam
The role of host-microbial co-metabolism in depression and anxiety disorders
- Funded by NWO ZonMw Veni 2023 grant
- 2021 - 2024 **Postdoc**, *University College Cork*, Cork
Lead bioinformatician for the Cryanlab
- Awarded the '21/'22 APC Scientific Excellence award

Education

- 2018 - 2021 **PhD**, *University College Cork*, Cork
Thesis Title: Mining the Microbiome for Markers of Microbiota-Gut-Brain Communication and Mental Health
- Supervised by Prof. J.F. Cryan, Prof. T.G. Dinan and Dr. M.J. Claesson
- 2014 - 2017 **MSc**, *Utrecht University*, Utrecht
Research Trajectory: Molecular and Cellular Life Sciences - Bioinformatics
- 2010 - 2013 **BSc**, *Utrecht University*, Utrecht
Majored in Biology with a Minor in Art History

Research Contributions

As a bioinformatician with a background in molecular biology, microbiology and theoretical ecology, I have contributed to the microbiome field and, most significantly, the microbiome-gut-brain axis field.

- I have developed a method to measure microbial volatility and have associated it with severity of the host stress response. Volatility is now studied in many microbiome fields.
- My microbiome bioinformatics guidebooks have been used by several lecturers and research groups across many universities, both for research and educational purposes.
- I have developed and continue to maintain several free and open source bioinformatics and statistical analysis tools in the R programming language.

Mentorship

2022 - **Benjamín Valderrama**, *PhD candidate, University College Cork, Ireland*
2022 - **Emma Todd**, *PhD candidate, Deakin University, Australia*
2021 - 2022 **Alessandro Atzeni**, *PhD candidate, University of Rovira i Virgili, Spain*
2021 - 2022 **Samuele Laudani**, *PhD candidate, University of Catania, Italy*
2019 - 2020 **Simon Spichak**, *MSc candidate, University College Cork, Ireland*

Research Skills

Academic: Study development • Mentoring • Grantsmanship • Scientific writing

Bioinformatics: 16S analysis • metagenomic shotgun analysis • RNAseq analysis • Metabolomics analysis • Microbiome functional inference • Volatility analysis • Multi-omics integration

General Programming: R • tidyverse • R package development • Python • Bash • Server management

Statistics: Experimental design • Data analysis • Generalised linear models • Generalised linear mixed effects models • Principal component analysis • Compositional data analysis • Mediation analysis

Selected Grants, Honours & Awards

Grants: Principal applicant

2024 **The role of microbiome-immuno-metabolic interactions in depression and anxiety disorders**, *The Netherlands Organization for Scientific Research (NWO, ZonMw)*, Veni
Awarded: 320.000 €.

Grants: Co-applicant

2023 **Role of prenatal stress in the co-development of children's gut microbiome and socioemotional problems**, *Canadian Institutes of Health Research (CIHR)*
Awarded: 1,735,000 CAD.

Grant Consortia Network

I have been actively involved in numerous grant consortia and have forged a strong international collaborative network with several leading researchers and groups, including Carmine Pariante, Marion Leboyer, Annamaria Cattaneo, Brenda Penninx, Igor Branchi, Rima Kaddurah Daouk, Rob Knight, Sarkis Mazmanian, Oliver Fiehn, John F. Cryan, Gerard Clarke, Ines Thiele, Beatrice Passani, Daniela Cota, Sophie Layé, Nathalie Delzenne, Felice Jacka, Livia de Picker, Soyoung Park, Francesco Papaleo, Eric Guerci.

Honours

2021 - 2022 **APC Microbiome Ireland Scientific Excellence award**

Awards

2023 **European Society of Neurogastroenterology and Motility (ESNM)**, *Best abstract for Translational Science award*, Awarded during the NeuroGastro 2023 meeting in Bucharest.

2018 **4th Intl Symposium on Resilience Research**, *Best poster award*, Awarded during Resilienz meeting in Mainz.

2016 **GENIEUR travel grant**, To attend "Molecular Methods in IBS Research: genetics, epigenetics and microbiota research" in Heidelberg.

2015 - 2016 **ERASMUS+ Traineeship**, For MSc internship in Cork.

Board & Committee membership

Editorial Boards

2023 - **Gut Pathogens**, *Associate Editor*, Springer Journal

Scientific committees

2024 - **ECNP Early Career Academy**, *Inaugural member*

2024 - **ECNP Depression Meta-Network**, *Member*

2023 - **ECNP Resilience Network**, *Junior shell member*

Academic committees

2018 - 2023 **APC Wellbeing Committee**, *Founding member*, served as chair in 2021.

Organisational experience

- 2021 **Canadian Biomarker Integration Network for Depression (CAN-BIND)**, *Chaired session*.

Selected Publications

- 2023 **Thomaz FS Bastiaanssen, Thomas P Quinn, and Amy Loughman**, Bugs as Features (Part I): Concepts and foundations for the compositional data analysis of the microbiome-gut-brain axis, In: *Nature Mental Health*

This is part one of a two-part guidebook on the bioinformatic analysis of microbiome-gut-brain axis experiments. In the first part, we cover the foundations. The guidebooks have already been adopted by multiple research groups and are currently taught at Boulder University, Colorado. Notably, it includes a detailed and well-annotated demonstrative microbiome-gut-brain axis analysis in R. This publication demonstrates my aptitude in clearly demonstrating complex bioinformatics techniques.

- 2023 **Thomaz FS, Bastiaanssen, Thomas P Quinn, and Amy Loughman**, Bugs as Features (Part II): A perspective on enriching microbiome-gut-brain axis analyses with multidisciplinary techniques, In: *Nature Mental Health*

This is part two of a two-part guidebook on the bioinformatic analysis of microbiome-gut-brain axis experiments. In the second part, we give our perspective on the current state of the microbiome-gut-brain axis field and its challenges. We introduce and discuss techniques from adjacent fields that could be used to address these issues. It includes a heavily annotated demonstration of these techniques in R. This publication demonstrates my interest in multidisciplinary research and clear vision forward for the microbiome-gut-brain axis field.

- 2023 **Thomaz FS Bastiaanssen, Sarah-Jane Leigh, Gabriel SS Tofani, Cassandra E Gheorghe, Gerard Clarke, and John F Cryan**, Kronos: A computational tool to facilitate biological rhythmicity analysis, In: *bioRxiv* (preprint)

This is a free and open-source bioinformatics tool I developed in order to analyse circadian rhythmicity data. This data was collected as part of an ongoing study, but no existing bioinformatics tools could adequately handle our relatively straightforward experimental design. Kronos has enjoyed much interest at scientific conferences year and has been adopted by several groups studying the circadian rhythmicity in biological data. This manuscript demonstrates my ability to develop specialised bioinformatics tools to address emerging research questions.

- 2021 **Marcus Boehme, Katherine E Guzzetta, Thomaz F S Bastiaanssen, Marcel van de Wouw, Gerard M Moloney, Andreu Gual-Grau, Simon Spichak, Loreto Olavarria-Ramirez, Patrick Fitzgerald, Enrique Morillas, Nathaniel L Ritz, Minal Jaggar, Caitlin S M Cowan, Fiona Crispie, Francisco Donoso, Evelyn Halitzki, Marta C Neto, Marzia Sichetti, Anna V Golubeva, Rachel S Fitzgerald, Marcus J Claesson, Paul D Cotter, Olivia F O'Leary, Timothy G Dinan, and John F Cryan**, "Microbiota from young mice counteracts selective age-associated behavioral deficits", In: *Nature Aging*

I am co-first author in this publication. In this study, we demonstrate that faecal microbiome transplantation from young mice can restore neurobehavioural symptoms of aging in aged recipients. This paper demonstrates my ability to design and lead complex preclinical studies and my expertise in integrating complex behavioural data with multiple types of 'omics (metabolomics, transcriptomics, metagenomics) data.

- 2021 **Thomaz F S Bastiaanssen, Anand Gururajan, Marcel van de Wouw, Gerard M Moloney, Nathaniel L Ritz, Caitriona M Long-Smith, Niamh C Wiley, Amy B Murphy, Joshua M Lyte, Fiona Fouhy, Catherine Stanton, Marcus J Claesson, Timothy G Dinan, John F Cryan**, "Volatility as a Concept to Understand the Impact of Stress on the Microbiome", In: *Psychoneuroendocrinology*

In this study, I introduce the metric **volatility**, the degree of compositional change in a microbial ecosystem, and show that volatility is associated with an exacerbated stress response, both in mice and in humans. This manuscript demonstrates my strong ecological background and my ability to develop and validate new, informative metrics to assess complex phenomena such as the stress response.

All Publications

- 2024 Ritz, Nathaniel L, Lorraine A Draper, **Thomaz F S Bastiaanssen**, Christopher J R Turkington, Veronica L Peterson, Marcel van de Wouw, Klara Vlckova, Christine Fülling, Katherine E Guzzetta, Aurelijus Burokas, Hugh Harris, Marion Dalmasso, Fiona Crispie, Paul D Cotter, Andrey N Shkorporov, Gerard M Moloney, Timothy G Dinan, Colin Hill, and John F Cryan (Feb. 2024). "The gut virome is associated with stress-induced changes in behaviour and immune responses in mice". en. In: *Nat. Microbiol.*, pp. 1–18.
- Ritz, Nathaniel L., Marta Brocka, Mary I. Butler, Caitlin S. M. Cowan, Camila Barrera-Bugueño, Christopher J. R. Turkington, Lorraine A. Draper, **Thomaz F. S. Bastiaanssen**, Valentine Turpin, Lorena Morales, David Campos, Cassandra E. Gheorghe, Anna Ratsika, Virat Sharma, Anna V. Golubeva, Maria R. Aburto, Andrey N. Shkorporov, Gerard M. Moloney, Colin Hill, Gerard Clarke, David A. Slattery, Timothy G. Dinan, and John F. Cryan (2024). "Social anxiety disorder-associated gut microbiota increases social fear". In: *Proceedings of the National Academy of Sciences* 121.1, e2308706120.
- Voulgaropoulou, Stella D, **Thomaz FS Bastiaanssen**, Nuno D Alves, Aurelia Viglione, Joeri Bordes, Benjamin Jurek, Pasquale Paribello, and Milou SC Sep (2024). "An interdisciplinary perspective on resilience-A special section in Neuroscience Applied". In: *Neuroscience Applied*, p. 104044.
- 2023 **Bastiaanssen, Thomaz FS**, Sarah-Jane Leigh, Gabriel SS Tofani, Cassandra E Gheorghe, Gerard Clarke, and John F Cryan (2023). "Kronos: A computational tool to facilitate biological rhythmicity analysis". In: *bioRxiv*, pp. 2023–04.
- Bastiaanssen, Thomaz FS**, Thomas P Quinn, and John F Cryan (2023). "Knowledge-based Integration of Multi-Omic Datasets with Anansi: Annotation-based Analysis of Specific Interactions". In: *arXiv preprint arXiv:2305.10832*.
- Bastiaanssen, Thomaz FS**, Thomas P Quinn, and Amy Loughman (2023a). "Bugs as features (part 1): concepts and foundations for the compositional data analysis of the microbiome–gut–brain axis". In: *Nature Mental Health* 1.12, pp. 930–938.
- Bastiaanssen, Thomaz FS**, Thomas P Quinn, and Amy Loughman (2023b). "Bugs as features (part 2): a perspective on enriching microbiome–gut–brain axis analyses". In: *Nature Mental Health* 1.12, pp. 939–949.
- Berding, Kirsten, **Thomaz FS Bastiaanssen**, Gerard M Moloney, Serena Boscaini, Conall R Strain, Andrea Anesi, Caitriona Long-Smith, Fulvio Mattivi, Catherine Stanton, Gerard Clarke, et al. (2023). "Feed your microbes to deal with stress: a psychobiotic diet impacts microbial stability and perceived stress in a healthy adult population". In: *Molecular psychiatry* 28.2, pp. 601–610.
- Butler, Mary I, **Thomaz FS Bastiaanssen**, Caitriona Long-Smith, Sabrina Morkl, Kirsten Berding, Nathaniel L Ritz, Conall Strain, Dhrati Patangia, Shriram Patel, Catherine Stanton, et al. (2023). "The gut microbiome in social anxiety disorder: evidence of altered composition and function". In: *Translational Psychiatry* 13.1, p. 95.
- Carbia, Carina, **Thomaz FS Bastiaanssen**, Luigi Francesco Iannone, Rubén García-Cabrerizo, Serena Boscaini, Kirsten Berding, Conall R Strain, Gerard Clarke, Catherine Stanton, Timothy G Dinan, et al. (2023). "The Microbiome-Gut-Brain axis regulates social cognition & craving in young binge drinkers". In: *EBioMedicine* 89.
- Cruz-Pereira, Joana S, Gerard M Moloney, **Thomaz FS Bastiaanssen**, Serena Boscaini, Patrick Fitzgerald, Gerard Clarke, and John F Cryan (2023). "Age-associated deficits in social behaviour are microbiota-dependent". In: *Brain, Behavior, and Immunity* 110, pp. 119–124.

- Delprete, C, R Rimondini Giorgini, E Lucarini, **TFS Bastiaanssen**, D Scicchitano, N Interino, F Formaggio, F Uhlig, C Ghelardini, NP Hyland, et al. (2023). "Disruption of the microbiota-gut-brain axis is a defining characteristic of the α -Gal A (-/0) mouse model of Fabry disease". In: *Gut Microbes* 15.2, p. 2256045.
- Elisseeva, Sophia, **Thomaz FS Bastiaanssen**, Elisa Santovito, Alexander V Zhdanov, John F Cryan, Joe P Kerry, and Dmitri B Papkovsky (2023). "Combining the oxygen sensor based respirometry and 16S rRNA amplicon sequencing for the analysis of microbiota in commercial mince products". In: *Meat Science* 205, p. 109316.
- Lachmansingh, David Antoine, Benjamin Valderrama, **Thomaz Bastiaanssen**, John Cryan, Gerard Clarke, and Aonghus Lavelle (2023). "Impact of dietary fiber on gut microbiota composition, function and gut-brain-modules in healthy adults—a systematic review protocol". In: *HRB Open Research* 6, p. 62.
- Laudani, Samuele, Sebastiano A Torrisi, Silvia Alboni, **Thomaz FS Bastiaanssen**, Cristina Benatti, Veronica Rivi, Rachel D Moloney, Virginia Fuochi, Pio M Furneri, Filippo Drago, et al. (2023). "Gut microbiota alterations promote traumatic stress susceptibility associated with p-cresol-induced dopaminergic dysfunctions". In: *Brain, Behavior, and Immunity* 107, pp. 385–396.
- Lynch, Caoimhe MK, Caitlin SM Cowan, **Thomaz FS Bastiaanssen**, Gerard M Moloney, Nigel Theune, Marcel van de Wouw, Eva Florensa Zanuy, Ana Paula Ventura-Silva, Martin G Codagnone, Francisca Villalobos-Manríquez, et al. (2023). "Critical windows of early-life microbiota disruption on behaviour, neuroimmune function, and neurodevelopment". In: *Brain, Behavior, and Immunity* 108, pp. 309–327.
- Mörkl, Sabrina, Andreas Oberascher, Josef M Tatschl, Sonja Lackner, **Thomaz FS Bastiaanssen**, Mary I Butler, Maximilian Moser, Matthias Frühwirth, Harald Mangge, John F Cryan, et al. (2023). "The microbe-heart-brain dialogue: Vagal activity is associated with gut-microbiome patterns in women". In: *Journal of Affective Disorders Reports* 12, p. 100553.
- Murray, Nuala, Sukainah Al Khalaf, **Thomaz FS Bastiaanssen**, David Kaulmann, Edgar Lonergan, John F Cryan, Gerard Clarke, Ali S Khashan, and Karen O'Connor (2023). "Compositional and Functional Alterations in Intestinal Microbiota in Patients with Psychosis or Schizophrenia: A Systematic Review and Meta-analysis". In: *Schizophrenia Bulletin*, sbad049.
- Pawluski, Jodi L, Pauline Murail, Florine Grudet, Lena Bys, Anna V Golubeva, **Thomaz Bastiaanssen**, Tim F Oberlander, John F Cryan, Siobhain M O'Mahony, and Thierry D Charlier (2023). "Gestational stress and perinatal SSRIs differentially impact the maternal and neonatal microbiome-gut-brain axis". In: *Journal of Neuroendocrinology* 35.7, e13261.
- 2022 Atzeni, Alessandro, **Thomaz FS Bastiaanssen**, John F Cryan, Francisco J Tinahones, Jesus Vioque, Dolores Corella, Montserrat Fito, Josep Vidal, Isabel Moreno-Indias, Ana M Gomez-Perez, et al. (2022). "Taxonomic and functional fecal microbiota signatures associated with insulin resistance in non-diabetic subjects with overweight/obesity within the frame of the PREDIMED-plus study". In: *Frontiers in Endocrinology* 13, p. 804455.
- Caputi, Valentina, **Thomaz FS Bastiaanssen**, Veronica Peterson, Jahangir Sajjad, Amy Murphy, Catherine Stanton, Brian McNamara, George D Shorten, John F Cryan, and Siobhain M O'Mahony (2022). "Sex, pain, and the microbiome: the relationship between baseline gut microbiota composition, gender and somatic pain in healthy individuals". In: *Brain, Behavior, and Immunity* 104, pp. 191–204.
- Costa, Alessia, Barbara Rani, **Thomaz FS Bastiaanssen**, Francesco Bonfiglio, Eoin Gunnigle, Gustavo Provensi, Moira Rossitto, Marcus Boehme, Conall Strain, Clara S Martínez, et al. (2022). "Diet prevents social stress-induced maladaptive Neurobehavioural and gut microbiota changes in a histamine-dependent manner". In: *International Journal of Molecular Sciences* 23.2, p. 862.

- Cruz-Pereira, Joana S, Gerard M Moloney, **Thomaz FS Bastiaanssen**, Serena Boscaini, Gabriel Tofani, Julia Borrás-Bisa, Marcel van de Wouw, Patrick Fitzgerald, Timothy G Dinan, Gerard Clarke, et al. (2022). "Prebiotic supplementation modulates selective effects of stress on behavior and brain metabolome in aged mice". In: *Neurobiology of Stress* 21, p. 100501.
- Dinan, Timothy G, Paul J Kennedy, Livia H Morais, Amy Murphy, Caitriona M Long-Smith, Gerard M Moloney, **Thomaz FS Bastiaanssen**, Andrew P Allen, Aoife Collery, David Mullins, et al. (2022). "Altered stress responses in adults born by Caesarean section". In: *Neurobiology of Stress* 16, p. 100425.
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- Sen, Paromita, Eoin Sherwin, Kiran Sandhu, **Thomaz FS Bastiaanssen**, Gerard M Moloney, Anna Golubeva, Patrick Fitzgerald, Ana Paula Ventura Da Silva, Barbara Chruścicka-Smaga, Loreto Olavarría-Ramírez, et al. (2022). "The live biotherapeutic *Blautia stercoris* MRx0006 attenuates social deficits, repetitive behaviour, and anxiety-like behaviour in a mouse model relevant to autism". In: *Brain, behavior, and immunity* 106, pp. 115–126.
- 2021 **Bastiaanssen, Thomaz FS** and John F Cryan (2021a). "Dairy alters the microbiome, are we but skimming the surface?" In: *EBioMedicine* 68.
- Bastiaanssen, Thomaz FS** and John F Cryan (2021b). "The microbiota-gut-brain axis in mental health and medication response: parsing directionality and causality". In: *International Journal of Neuropsychopharmacology* 24.3, pp. 216–220.
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- Berding, Kirsten, Caitriona M Long-Smith, Carina Carbia, **Thomaz FS Bastiaanssen**, Marcel van de Wouw, Niamh Wiley, Conall R Strain, Fiona Fouhy, Catherine Stanton, John F Cryan, et al. (2021). "A specific dietary fibre supplementation improves cognitive performance—an exploratory randomised, placebo-controlled, crossover study". In: *Psychopharmacology* 238, pp. 149–163.
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- Nychyk, Oleksandr, Wiley Barton, Agata M Rudolf, Serena Boscaini, Aaron Walsh, **Thomaz FS Bastiaanssen**, Linda Giblin, Paul Cormican, Liang Chen, Yolanda Piotrowicz, et al. (2021). "Protein quality and quantity influence the effect of dietary fat on weight gain and tissue partitioning via host-microbiota changes". In: *Cell Reports* 35.6.
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Tian, Peijun, **Thomaz FS Bastiaanssen**, Linhong Song, Bin Jiang, Xu Zhang, Jianxin Zhao, Hao Zhang, Wei Chen, John F Cryan, and Gang Wang (2021). "Unraveling the microbial mechanisms underlying the psychobiotic potential of a Bifidobacterium breve strain". In: *Molecular Nutrition & Food Research* 65.8, p. 2000704.

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Lach, Gilliard, Christine Fülling, **Thomaz FS Bastiaanssen**, Fiona Fouhy, Aoife N O'Donovan, Ana Paula Ventura-Silva, Catherine Stanton, Timothy G Dinan, and John F Cryan (2020). "Enduring neurobehavioral effects induced by microbiota depletion during the adolescent period". In: *Translational Psychiatry* 10.1, p. 382.

Moloney, Gerard M, Caitriona M Long-Smith, Amy Murphy, Danielle Dorland, Sara Firuzeh Hojabri, Loreto Olavarria Ramirez, David Campos Marin, **Thomaz FS Bastiaanssen**, Anne-Marie Cusack, Kirsten Berding, et al. (2020). "Improvements in sleep indices during exam stress due to consumption of a Bifidobacterium longum". In: *Brain, Behavior, & Immunity-Health* 10, p. 100174.

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- O'Connor, Karen M, Eric F Lucking, **Thomaz FS Bastiaanssen**, Veronica L Peterson, Fiona Crispie, Paul D Cotter, Gerard Clarke, John F Cryan, and Ken D O'Halloran (2020). "Prebiotic administration modulates gut microbiota and faecal short-chain fatty acid concentrations but does not prevent chronic intermittent hypoxia-induced apnoea and hypertension in adult rats". In: *EBioMedicine* 59.
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