

Course leader presentation

Thomas Bosch

Thomas Bosch is Professor of General Zoology at Kiel University. He studied Biology at the University of Munich and Swansea College (UK) between 1976-1983, and received his doctorate from the University of Munich in 1986. Thomas has held a number of academic positions, including a postdoctoral position at the University of California, a research associate position at the University of Munich, professorship for Zoology at the Friedrich Schiller University of Jena in 1997, and in 2000 to present, a professorship of General Zoology at Kiel University. Thomas is also managing editor of *Zoology*.

Thomas' research focusses on how the organisms and their immune systems have been shaped by, and evolved with the microorganisms which inhabit them, and how an organism's symbionts can influence the fitness and traits of their hosts. He proposes that symbiosis is essential to life, and that in order to understand the physiology, evolution and development of a species, it cannot be studied in isolation, and that a symbiotic unit ("holobiont") may well be a unit of selection.

Selected works

Rees T, Bosch T, Douglas AE (2018) How the microbiome challenges our concept of self. *Plos Biology* 16:e2005358.

Hamada M, Schröder K, Bathia J, Jörn U, Fraune S, Khalturina M, Khalturina K, Shinzato C, Satoh N, Bosch TC (2018) Metabolic co-dependence drives the evolutionarily ancient Hydra-Chlorella Symbiosis. *eLife*, doi: <https://doi.org/10.1101/234757>.

Schröder K and Bosch TCG (2016) The Origin of Mucosal Immunity: Lessons from the Holobiont Hydra. *mBio* 7(6). doi: 10.1128/mBio.01184-16.

Gilbert SF, Bosch TCH, Ledón-Rettig C (2015) Eco-Evo-Devo: developmental symbiosis and developmental plasticity as evolutionary agents. *Nat Rev Genet* 16:611-622.

Bosch TCG, McFall-Ngai MJ (2011) Metaorganisms as the new frontier. *Zoology (Jena)*. 114, pp.185-190.

Fraune S, Bosch TCG (2007) Long-term maintenance of species-specific bacterial microbiota in the basal metazoan Hydra. *PNAS* 104:13146-13151.

Useful links

<http://www.bosch.zoologie.uni-kiel.de/>

<https://www.metaorganism-research.com/de/videos/thomas-bosch-about-metaorganism-research-in-kiel/>

Scott Gilbert

Scott is emeritus Professor of developmental biology at Swarthmore College. He specialises and teaches in developmental genetics, embryology, and the history and critiques of biology. He is also a Finland Distinguished Professor emeritus at the University of Helsinki. Scott is also a major actor of the “evo-devo” field, and a founder of the field of “ecological developmental biology” (“eco-devo”). Some of his specific research interests are in the development of evolutionary novelty, and the history of embryology with respect to genetics.

Scott has received many awards for his work, including the Choice Outstanding Academic Book Award, the Viktor Hamburger Prize for Excellence in Education (2002), and the Kowalevsky Prize in Evolutionary Developmental Biology (2004).

Scott received his B.A. in biology and religion from Wesleyan University in 1971 and his M.A. in the history of science from The Johns Hopkins University. He received his PhD in biology from the paediatric genetics laboratory of Dr. Barbara Migeon at the Johns Hopkins University in 1976. Scott undertook postdoctoral research at the University of Wisconsin in the laboratories of Dr. Masayasu Nomura and Dr. Robert Auerbach. In 2016, he presented a lecture on developmental biology to the Dalai Lama.

Scott has published three textbooks, firstly *Developmental Biology* (now in its 11th addition, and the 12th is to be published soon), perhaps the most widely used textbook in the field, secondly, *Ecological Developmental Biology*, and finally, (2015), *Fear, Wonder, and Science in the New Age of Reproductive Biotechnology* (2017).

Selected works

Roughgarden J, Gilbert SF, Rosenberg E, et al (2017) Holobionts as Units of Selection and a Model of Their Population Dynamics and Evolution. *Biol Theory* 1-22.

Gilbert S and Baressi M (2016) *Developmental Biology (11 ed.)*. Sinauer Associates

Gilbert S and Epel D (2015) *Ecological Developmental Biology: The Environment Regulation of Development, Health, and Evolution*. Sinauer Associates.

Hilbert SF, Sapp J, Tauber AI (2012) A symbiotic view of life: we have never been individuals. *Q Rev Biol* 87:325-341

Gilbert S (2003). The genome in its ecological context: philosophical perspectives on interspecies epigenesis. *Annals of the New York Academy of Science*, 981, pp.202-218.

Useful links

<https://vimeo.com/120356578>

Rob Knight

Rob is professor of bioengineering, paediatrics, computer science and engineering at the University of California, San Diego. He is a leader in microbiome research, and one of the founders of the Earth Microbiome Project (which aims to characterize microbial life) and the American Gut Project (which microbiome samples from all around the world to compare them). He is also the founding Director of the Center for Microbiome Innovation.

Rob created his own lab at CU Boulder in 2005. Along with Catherine Lozupone, he developed *UniFrac*, a software allowing researchers to use bacterial sequencing data in order to identify microbial species. He has done much work regarding the microbiota and diet. Using the UniFrac software, Rob, along with Jeffrey Gordan, found that obesity plausibly affects the diversity of microbiota. Furthermore, with his team in 2013, he has shown that transplanting human fecal microbiota into germ-free mice can result in a lean or obese phenotype being displayed. This work has led to researchers being able to predict whether a person is obese or lean based solely on their microbiome.

Rob has also brought his research on the microbiome to the public. His book, *Follow Your Gut* (Simon and Schuster 2015) considers how antibiotics, diet and the environment affect our microbiome, whilst his other book *Dirt is Good* (2017) provides practical advice to parents about child health and the microbiome.

Selected Works

Gilbert JA, Blaser MJ, Caporaso JG, et al (2018) Current understanding of the human microbiome. *Nature Medicine* 24:392–400. doi: 10.1038/nm.4517

Griffiths PE, Pocheville A, Calcott B, et al (2015) Measuring Causal Specificity. *Philosophy of Science* 82:529–555. doi: 10.1086/682914

Knight R (2015) *Follow Your Gut: The Enormous Impact of Tiny Microbes*. Simon and Schuster.

Ridaura V, et al (2013) Gut Microbiota from Twins Discordant for Obesity Modulate Metabolism in Mice. *Science* 341 (6150).

Clemente JC, Ursell LK, Parfey LW, Knight R (2012) The Impact of the Gut Microbiota on Human Health: An Integrative View. *Cell* 148:1258-1270.

Gonzalez A, Clemente JC, Shade A, et al (2011) Our microbial selves: what ecology can teach us. *EMBO reports* 12:775–784. doi: 10.1038/embor.2011.137

Lozupone C and Knight R (2005) UniFrac: a New Phylogenetic Method for Comparing Microbial Communities. *Applied and environmental microbiology* 71(12), pp.8228-8235.

Useful Links (websites, video clip)

<http://www.earthmicrobiome.org/>

<http://humanfoodproject.com/americangut/>

<http://cmi.ucsd.edu/>

https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en

<https://www.youtube.com/watch?v=0a7CDZ3liCo>

Jan-Pieter Konsman

Jan-Pieter is a CNRS investigator in neuroscience at the INCIA (Aquitaine Institute for Cognitive and Integrative Neuroscience) lab. His expertise include Neuroimmunology, neuroinflammation, functional neuroanatomy and the regulation of food intake and energy balance. He has been involved in a number of projects in neuroscience, including a project on neuroinflammation and sepsis-associated encephalopathy and another on neuroimmune pathways underlying disease-associated anorexia.

Jan-Pieter also works on the philosophy of science.

Selected works

Hooks KB, Konsman JP, O'Malley MA (2019) Microbiota-gut-brain research: a critical analysis. *Behavioral and Brain Sciences*. doi: 10.1017/S0140525X18002133

Duclos M, Ouerdani A, Mormede P, Konsman JP (2013) Food restriction-induced hyperactivity: addiction or adaptation to starvation? . *Psychoneuroendocrinology*, 38 (6), pp. 884-97.

Pourtau L, Leemburg S, Roux P, Leste-Lasserre T, Costaglioli P, Garbay B, Drutel G, Konsman JP (2011) Hormone, hypothalamic and striatal responses to reduced body weight are important in the treatment of small tumors. *Brain Behav Immun*, 25 (4) pp. 777-86.

Nadjar A, Savant J, Combe C, Parnet P, Konsman JP (2010) Brain cyclooxygenase-2 mediates interleukin-1-induced cellular activation in preoptic and arcuate hypothalamus, but not sickness symptoms. *Neurobiol Dis*, 39 (3), pp. 393-401.

Konsman JP, Parnet P, Dantzer R (2002) Cytokine-induced sickness behaviour: mechanisms and implications. *Trends in Neurosciences* 25:154–159. doi: 10.1016/S0166-2236(00)02088-9

Useful Links

<http://www.incia.u-bordeaux1.fr/spip.php?article315>

<https://www.youtube.com/watch?v=LjcfXmtgcSU>

Johannes Martens

Johannes Martens is a Postdoctoral Researcher at the FnRs Institute Supérieur de Philosophie of the Université catholique de Louvain, Belgium. In October, he will be a CNRS Junior Researcher. He works in the philosophy of biology, in particular at the intersection between the biology of evolution and the economy. In these domains, his perspective is both formal and epistemological. He aims at providing a critical analysis of the transfer of models and concepts that appear between these two disciplines, such as evolutionary game theory, the analogy between utility and fitness, evolutionary economy, economic rationality, and models of cooperation in biology and in economics.

His research also focusses on the question of biological individuality, from a Darwinian perspective, such as evolutionary transitions from a unicellular state to a multicellular state, and the evolution of colonies of eusocial insects, often considered to be 'superorganisms.

Between 2012-2015, Johannes was a postdoctoral fellow at the University of Bristol, for the ERC project, *Darwinism & Rational Choice*, led by Samir Okasha. Between 2015-2016, he was a postdoctoral fellow at IHPST (Institute for History of Sciences and Technology) on the ANR *Explabio*, which investigated modes of explanation in evolutionary biology, led by Philippe Huneman.

Selected Works

Marten J (2019) Inclusive fitness as a measure of biological utility. *Philosophy of Science* 86, pp.1-22.

Martens J (2018) *L'évolution des organismes. Une perspective épistémologique*. Materiologiques.

Martens J (2018) Inclusive fitness and the maximizing agent analogy. *British Journal for the Philosophy of Science* 68 (3): 865-915.

Martens J, Huneman P (2017) The behavioural ecology of irrational behaviours. *History and Philosophy of the Life Sciences* 39.

Martens J, Okasha S (2016) Hamilton's rule and the goal of individual behaviour in symmetric two-players. *Journal of Evolutionary Biology* 29 (3): 473-482.

Martens J (2010) Organisms in evolution. *History of Philosophy of Life Sciences* 31(2-3), pp.373-400.

Useful links

<https://johannesmartensblog.wordpress.com/>

Thomas Pradeu

Thomas is a Senior CNRS Investigator in philosophy of science and Primary Investigator of the ERC-funded project "IDEM" (Immunity, Development, and the Microbiota) at ImmunoConcept, a biological lab specialized in immunology at the CNRS and the University of Bordeaux. His main interests are in the philosophy of biology and immunology, in particular, conceptual issues regarding immune-microbiota interactions, cancer, developmental biology, and physiology. Thomas has published extensively in the philosophy of biology and immunology, including his very influential book *The Limits of Self: Immunology and Biological Identity* (OUP 2012), where he defends the "Discontinuity" theory of immunity, and presents his account of biological individuality grounded in immunology. Thomas received a Lakatos Award (2015) for this book. He has also published articles about the philosophy of cancer, viruses, and the metaphysics of science, and has, along with Alexandre Guay, published a collection of essays on the metaphysics of individuals in biology and physics.

Thomas is also coordinator of PhilInBioMed (Institute for Philosophy in Biology and Medicine), an interdisciplinary institute that promotes for collaboration of philosophers and medical sciences.

Before coming to Bordeaux, Thomas was an Associate Professor in Philosophy at Paris-Sorbonne University. He has training in both science and philosophy.

Selected works

Laplane, L., Mantovani, P., Adolphs, R., Chang, H., Mantovani, A., McFall-Ngai, M., Rovelli, C., Sober, E., & Pradeu, T. (2019), Why science needs philosophy. *Proceedings of the National Academy of Sciences*.

Pradeu T (2017) Thirty years of Biology & Philosophy: Philosophy of which biology? *Biology & Philosophy* 32(2), 149-167.

Chiu L, Bazin T, Truchetet M-E, Schaeveerbeke T, Belhaes L & Pradeu T (2017) Protective Microbiota: From Localized to Long-Reaching Co-Immunity. *Frontiers in Immunology* 8, Articles 8.

Pradeu T (2016) Organisms or biological individuals? Combining physiological and evolutionary individuality. *Biology & Philosophy* 31(6), 797-817.

Pradeu T (2012) *The Limits of the Self: Immunology and Biology Identity*. Oxford University Press. Paperback (2018).

Pradeu T., Kostyrka G., and Dupré J (2016) Understanding Viruses: Philosophical Investigations. *Studies in History and Philosophy of Biological and Biomedical Sciences* 59, pp.57-63

Pradeu T, Jaeger S, Vivier E (2013) The Speed of Change: Towards a Discontinuity Theory of Immunity? *Nature Reviews Immunology* 13, 764–769.

Pradeu T (2010) What is an organism? An Immunological Answer. *History and Philosophy of the Life Sciences*, 32(2-3), pp.247-267.

Useful links

<https://www.immuconcept.org/>

<https://www.philinbiomed.org/>

<https://www.college-de-france.fr/site/philippe-sansonetti/symposium-2018-06-29-09h45.htm>