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Stream C: Innovating for Adaptation

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Abstract: In the last decade Niche Construction has been heralded as the neglected process in evolution. But niche construction is just one way in which the organism's interaction with and construction of the environment can have potential evolutionary significance. This constructed environment does not just select for, it also produces new variation. Nearly three decades ago, and in parallel with Odling-Smee's article 'Niche-constructing phenotypes', West and King introduced the 'Ontogenetic Niche' to give the phenomena of exogenetic inheritance a formal name. Since then a range of fields in the life sciences and medicine has amassed evidence that parents influence their offspring by means other than DNA (parental effects). Diverse scientists use different theoretical constructs for overlapping sets of processes, all of which show one way or another how heritable variation can be environmentally induced and developmentally regulated. Here I propose the concept of 'developmental niche construction' as a framework to integrate findings from fields ranging from molecular biology to developmental psychology. It elucidates how a diverse range of mechanisms contributes to the transgenerational transfer of developmental resources. These mechanisms may lead to functional and internally coherent phenotypic variants, and could therefore cause some organism-environment complementarity, and therefore directionality in evolution, that is not due to natural selection. The paper explores the overall significance of these developments in the life sciences, and particularly how they advance the ongoing integration of development, heredity, ecology, and evolution.

Bio: Karola Stotz is senior lecturer at the department of philosophy at Macquarie University. She received her Masters in physical and cultural anthropology from the University of Mainz, Germany and her PhD in philosophy from the University of Ghent in Belgium. She has worked at the Konrad Lorenz Institute for Evolution and Cognition Research in Austria, the Unit for History and Philosophy of Science at the University of Sydney, the Department of HPS at the University of Pittsburgh and the Cognitive Science Program at Indiana University. In 2008 she was awarded a 5-year Australian Research Fellowship and discovery grant at the University of Sydney with the project "Postgenomic Perspectives on Human Nature". From 2014-2016 she was working on a Templeton World Charity Foundation project entitled: "Causal Foundations of Biological Information". Stotz has published on philosophical issues in evolutionary, developmental and molecular biology, psychobiology and cognition. She focused particularly on the nature nurture controversy, non-genetic inheritance and developmental niche construction, nonreductive and integrative explanatory strategies, and 4 E (embodied, embedded, enactive and extended) cognition. Together with Paul Griffiths she pioneered the use of 'experimental philosophy' methods in the field of philosophy of science.