Towards an Historical Ecology of Research Environments

The rediscovery of the laboratory as a major research topic in the history of science in the last decades has shown: Laboratory research takes place and is shaped in historically contingent material, instrumental and spatial settings. Accordingly, the historical reconstruction of these *technical* conditions has become indispensable to the explanation of the *epistemic* output of laboratory research. In spite of this revaluation, the task at the end stayed the same: The analysis of laboratory settings is meant to be an *explanadum* to the knowledge generated by laboratory research.

In our panel we would like to reverse this vector of explanation and focus the laboratory not from the perspective of historical epistemologists but as historical ecologists. Hence, we understand the laboratory not as a mere technical milieu to scientific knowledge production but as a specific habitat of human inquiry more broadly, taking it serious as an *existentiale* of research. We will argue that a major part of the knowledge produced in these habitats does not fit the distinction epistemic/technical. This is why it remained largely invisible in historiographical analysis. We will shift the focus from epistemic ends to the mundane world of laboratory technologies and knowledges as habitats in their own right.

In order to elaborate the historical specificity of this approach, we will revisit the emergence of the research laboratory in 19th and early 20th century asking for the new 'habitat-knowledge' that constituted and consolidated this modern research environment in glass science, experimental zoology and soil ecology.

Glass Science. Boundary Work in Laboratory Research (1860 – 1935)
Kijan Espahangizi, ETH Zürich

Glass vessels play an ambiguous role in the historiography of laboratory research. Historians of science typically construe laboratory glassware as ahistorical quasi-immaterial bodies, whose properties they limit to form, transparency, neutrality, and at best to annoying fragility. But this popular image of a transparent experimental container obstructs the view on the historicity and physico-chemical functionality of this constitutive inner boundary in modern laboratory environments.
In contrast to that, I will ask how glass vessels perform the complex causal containment of the spatially enclosed experimental phenomena in research habitats. Approaching the history of laboratory research from this marginal perspective, I examine the painstaking efforts to demarcate experimental boundaries in late 19th and early 20th century.

Since the 1860s, the ongoing professionalization of exact laboratory research and with it the diverse and intensive use of glassware created a new awareness in the scientific community of measurement errors caused by glass vessels. Especially the physico-chemical interaction of glass and water troubled laboratory sciences like chemistry, gasometry, physical chemistry, cathode ray physics, cell physiology, bacteriology, medicine, and pharmacology.
Focusing especially on the chemical laboratory of the German Physikalisch-Technische Reichsanstalt led by Franz Mylius I will explore the collaboration between experimentalists, glass science, glass container industry and public authorities which aimed at solving the endemic glass boundary problems. I will argue that the new glass theories, modified batches, standardized glass testing methods and classifications of glass quality developed in this context provided important habitat knowledge to the emergence of a modern laboratory research environment.

Hybrid Habitats in History of Ecology: Winogradsky's Sulphur Bacteria Research, 1880-1900

Lloyd Ackert, Drexel University

One of the most interesting questions in the history of ecology is how scientists defined their research environment. Negotiating between the problems and advantages of field and laboratory work, ecologists routinely brought their objects to the laboratory or laboratory methods to the field. This transfer becomes even more ambiguous, if ecological research is applied not to plants or animals, but to a new field closely tied to the laboratory – microbiology.

In the 1880s the Russian microbiologist Sergei Winogradsky conducted an experimental research program on microorganisms living in extreme habitats – Alpine sulphur springs – which would lead him to propose the 'novel physiological law' of chemosynthesis. Based on his specific habitat knowledges of laboratory and field, Winogradsky deployed a complex array of technologies (microscopes, ehrlenmeyer flasks, and geissler chambers) and practices (from organic chemistry to natural history) to develop a novel 'ecological' research program. This perspective allowed him to generalize his specific conclusions—e.g. that the sulphur granules embedded in *Beggiatoa alba* filaments were not morphological characters useful for classification, but rather central to the organism's nutritional and respiratory function—into a law of nature.

From the perspective of historical ecology, the different environments Winogradsky negotiated come into historiographical focus. Winogradsky juxtaposed his different habitat knowledges to produce a hybrid habitat between laboratory and field, between ecology, microbiology and experimental physiology. By challenging the accepted methods of laboratory research—and their relationship to natural history—in late-19th century microbiology, Winogradsky's hybrid habitat helped to found the new ecological science of soil microbiology.

Of axolotls and men or How the aquarium brought life to the life sciences, 1864 – 1900

Christian Reiss, Max-Planck-Institute for the History of Science

This paper explores the history of an integral, but mostly neglected technology in the life sciences – the aquarium. Denounced as a hobby and spectacle, the aquarium seems to have appeared almost miraculously as a functioning part of many laboratories. But, as I will show in my presentation, the science part is unthinkable without the hobby and spectacle part and shows how laboratories were constructed for the different needs of both researchers and research organisms.

Drawing on my research on the history of European aquarium culture, I will show how its pervasiveness and popularity were both products of and reactions to processes of industrialization and urbanization. Being partly rooted in the context of the acclimatization and zoo movement, the aquarium was one way of keeping exotic animals and played a major role in the practical shift from dead specimens to living animals, turning natural history into an experimental science. This new practice depended on the establishment of places and technologies to create research habitats in which both animals and scientists could come together. Focusing on the history of the Mexican axolotl, I will show this transition from a colonial curiosity, via aquarium fanciers, to a laboratory animal.

In parallel, the pragmatic challenge of keeping research organisms alive and the resulting habitat knowledge fostered the emergence of a specific kind of ecological knowledge. As I will show, aquarium fanciers turned out to be crucial in this process of habitat construction, turning a fragile assemblage into a ready-made technology.