

## “EPIGENETIC LANDSCAPES AND SOCIAL CONFIGURATIONS”

### Epigenetic variation, phenotypic heritability, and evolution

Freddy Bugge Christiansen, **Bioinformatics Research Centre (BiRC)**

*Thursday, January 9 at 9.30 AM*

The occurrence of heritable complex diseases is associated with variation at positions in our genome. Genome-wide association studies, however, have not succeeded in explaining a major part of the heritable variation in these traits. This “missing heritability” may be due to transmissible epigenetic modifications and/or correspondence between the environments of parents and their offspring. The combination in terms of environment-sensitive epigenetic modifications of DNA provides a particularly powerful source of familial aggregation, and study of such epigenetic modifications may in turn reflect upon environmental causes of diseases.

### Contexts of genetic regulation – (what) can biology learn from anthropology and science and technology studies?

Jörg Niewöhner, Humboldt University, Germany

*Thursday, January 9, at 10.15 AM*

Research on epigenetic regulation of gene expression shows that epigenetic mechanisms appear to be extraordinarily responsive to outside influences. For example, researchers report that simply handling lab animals when putting them into different cages during experimentation has an effect that may well be larger than some drug related effects that are usually the focus of such studies.

This raises the question how to conceptualise “outside”: genomic, cellular, organismic, biophysical environment, milieu? Rather than looking at current experimental practice in epigenetics to study how “outside” enters study design, this paper takes a conceptual turn into science and technology studies and anthropology where this problem has been discussed for some time around the notion of “context”. What are the alternatives to a layered understanding that has the material body in the centre and “culture” and “history” draped around it as epiphenomena. I propose that the anthropological notion of “practice” cuts across layers and established systemic thinking and might provide a thought provoking alternative to study designs that try to bring culture into increasingly local and embedded biology.

## Epigenetic return: urban life and mental health between history and the present

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*Thursday, January 9, at 2.15 PM*

The relationship between urban life and mental health has a long history in the sociological literature, with many early scholars in the discipline drawing strong associations between life in the city and the likelihood of developing a psychiatric illness (Faris and Dunham, 1939; Hollingshead and Redlich, 1954). But if this intimate entanglement of urban and psychiatric life was one of the foundational concerns of the (then) new discipline of sociology, interest waned in the second half of the century, as, first, social scientists began to enrol the neuropsychiatric complex as an object of study (and not a collaborating discipline,) and, second, the psychological and psychiatric disciplines turned their gaze on the pathological individual (sometimes at the expense her milieu).

More recently, however, the relationship between urbanicity and mental health has been revisited by an emerging neurobiological and epigenetic research paradigm, which is once again working to understand how, in the development of psychiatric illness, the city gets 'under the skin' (Lederbogen *et al.*, 2011; Roth *et al.*, 2009). In this paper, I draw on the history and present of urban mental health research to more precisely locate this emerging paradigm. I ask: how can or should social scientists of urban life both interpret and engage with an epigenetic and neurobiological investigation into mental health and the city? What can an older sociological programme, with its lively interest in the rich intersection of urban and social space, and the psychiatric and neurobiological vicissitudes of social life, contribute to this agenda? Most importantly: what can that discipline's archive teach us about dwelling in this space – a space in which sociological, neuropsychiatric, and epigenetic research agendas seem to be increasingly hard to disentangle from one another?

## Cultural evolution and the propagation of the most flexible

**Davor Löffler**, Institute of Sociology, Free University, Berlin

*Thursday January 9 at 4.15 PM*

As it is more and more recognized that human evolution is based on multiple evolutionary principles that go beyond explanations by standard evolutionary theory, the major subject of contemporary anthropology becomes to expose the various factors and mechanisms of this development. One such approach of unifying different types of selective forces, feedback loops and outcomes is presented in the integral model of "cultural capacities". It enables to derive types of cultural behaviour and formalize stages of cultural capacities from

archaeological findings by taking into account the interdependencies of instrumental behaviour, technological artefacts, cognitive properties, social dependencies and biological features. The model shows that the “take-off” of human cultural evolution lies in the flexibility of bodily operations and cooperative actions based on the transmission of semantic information. As survival becomes increasingly dependent on the organisation of cooperative and social actions, sociality itself becomes a second nature with special selective forces that are put forth by certain adaptive demands. The new evolutionary role of sociality is evident in the genetic incorporation of adaptive modules that are related to the social environment, as for example in joint intention in early childhood, ontogenetic development or emotional communication by universal facial expressions. It can be shown that human cultural evolution is not based on the selection of the fittest phenotype in reference to natural forces, but on the propagation of organisms that are the most flexible regarding the capability of learning and performing new bodily operations. Within this model of human evolution sociality establishes a second causal arrow of selection that poses “a problem and a prism” for the paradigm of epigenetics. While social learning and newly arising problems in niche construction are linked to epigenetic mechanisms in neurons, which therefore play an important role in cultural evolution, the frame-problem and the slowness of human evolution forbid a strong epigenetic argument. On the other hand it can be argued that important DNA changes during human evolution are not to be located on the level of expressions of the outside form of the phenotype, but on the level of epigenetic mechanisms. For example encephalization might be understood as an effect of a fastened epigenetic interplay between neural stimulation and the fixation of new connections, making not the emerging specialized brain areas, but the underlying connecting and imprinting mechanisms a materialization of a cognitive module. At the same time epigenetic mechanisms can be conceived as the contact surface of a top-down-influence: if survival is dependent on cultural cooperation, semantically mediated stressors can theoretically have an impact on gene expression and transmission of properties, thus exemplifying an interdependency of the dimensions of sociality, biology and individuality.

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