

# Gene, Genomics and Networks

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## ABSTRACT

Innovations in biomedical research have the potential to transform the healthcare diagnostics. Human genomics research is another approach which provides new tools and techniques by which life science researchers hope will help in predicting susceptibility towards common diseases. In this backdrop, this paper attempts to explore at the intersection of health, technology and society by attempting to understand as how human genomics approach can help the life scientists to unravel the disease susceptibility in case of human genetic disorders. Actor-Network Theory has been deployed as a theoretical framework as it gives some agency to non-human actors along with human actors. It has been argued in this paper that non-human ‘actants’ play a decisive role in case of human genomics research. Rise of human genomics has been traced since the term ‘genomics’ was first coined to the present day’s promise and hope generated by the advances in human genomics. Some misconceptions and clarifications regarding ANT have also been discussed in this paper.

## KEYWORDS

ANT, Disease, Genomics, Health, India

## INTRODUCTION

Genomics has been defined by various institutions. Genomics is a more recent term that describes the study of all of a person’s genes (the genomes<sup>1</sup> including interactions of those genes with each other and with the person’s environment of those genes with each other and with the person’s environment. Genomics includes the scientific study of complex diseases such as heart disease, asthma, diabetes, and cancer because these diseases are typically caused more by a combination of genetic and environmental factors than by individual genes. Genomics is offering new possibilities for therapies and treatments for some complex diseases, as well as new diagnostic methods (NHGRI).

Sociologist of science and technology Stuart Hogarth suggests that genomics transcend the traditional definition of genomics.

*Genomics is a multi-faceted development involving new developments in basic science, clinical practice, commerce, regulatory practice and public policy... (Hogarth, 2007).*

Fujimura argues that “Genomics” refers to the new world that molecular genetic sciences, computer sciences, and their institutional affiliates (the Human Genome Project) in the U.S., Japan and Europe have created. She further elaborates that this new world includes the scientific projects being conducted across the globe, the transformation of genes into commodities with major investments and high profit expectations by biotechnology companies and venture capitalists, present

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and potential medical applications, and social, legal, and ethical concerns about the consequences of these technologies (Fujimura, 2000).

Department of Biotechnology, Government of India through its policies, guidelines and regulation documents has lays special emphasis on genomics based research to address diseases of national concern where genomics could play a spearheading role in devising appropriate intervention and treatment by opening dedicated centres which will conduct genome-wide association studies (GWAS) and correlative biology research (NBDS-DBT, 2015). With technological advancements, human genomics research is also focusing on personalized healthcare in a big way, this can be seen in the context of rise in genomics based firms also over the world and also in India.

Here Actor-Network Theory (ANT) has been deployed as a theoretical framework. Gene, and machines used in human genomics research have been enrolled as a non-human 'actants'. Human genomics researchers, their transnational collaborators, institutions make dynamic actor-networks. Key words and main concepts of ANT have been discussed (see Table 1). An attempt has been made to clarify the misunderstanding related to ANT in relation to agency given to non-human actors.

## **ACTOR-NETWORK THEORY**

The approach was developed in the writings of Michel Callon, Bruno Latour and John Law in the 1980s (Latour B., 2005). The terms actor-network theory was devised by Michel Callon and appeared around in 1982. Though actor-network theory is very different, it borrows from Kuhn and other sociologists of scientific knowledge. Or was scientific knowledge a representation of reality produced by a special scientific method? Such was the view of epistemology. In the late 1960s sociologists read Kuhn and created sociology of scientific knowledge. A paradigm can be understood, they said, as a culture. Scientists acquire this culture and use it to guide their puzzle-solving practices. Successful puzzle-solving extends the culture, which thus reflects both physical reality and social practices. Kuhn said that scientists work through cases, exemplars. Knowing the formalisms isn't enough. One needs to know what they (scientists) mean in practice. (Law, 2008). ANT has attracted diverse interest and is an established approach in the domain of STS Studies. Action and agency are key notions for our interpretations of ANT. According to this theory, there are no differences between non-human and human forms of agency; that animals, machines, and in the present context even genes can be 'actors' in the same sense as human are. Callon and Latour have defined an actor as 'any element which bends space around itself, makes other elements dependent upon it and translates their will into a language of its own (1981). The gene, PCR machines, microarray chips, NSG sequencers, hybrids such as biobanks may be seen as an actor who is bending space around it and making other elements (human) dependent upon it and is translating their will into a language (DNA Sequence) of its own (Vimal, 2015). By using this framework, the objective is to explore the various actors and networks among themselves involved in the human genome research. Non-human actors like gene have agency and are not merely passive entities, they are part of the production of knowledge and practice. Genomics is independent neither of the agency of scientists and medical practitioners, nor of the individuals on whom the technologies are practiced nor of the non-human actors like the gene, next generation sequencers etc. For the purpose of critical analysis, humans and non-humans (e.g., technologies, institutions, corporations, etc.) are epistemologically treated as equivalent and are 'actors' in as much as they have the ability to act and be acted upon (Williams-Jones & Graham 2003).

Actor-network theory (ANT) is also known as enrolment theory or the sociology of translation. ANT is a theoretical framework for exploring collective sociotechnical processes, whose spokespersons have paid particular attention to science and technologic activity. Stemming from a Science and Technologies Studies (STS) interest in the elevated status of scientific knowledge and counter to heroic accounts or innovation models, ANT suggests that the work of science is not fundamentally different from other social activities. ANT privileges neither natural (realism) nor cultural (social constructivism) accounts of scientific production, asserting instead that science is a process of

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