



Palazzo Feltrinelli Conference

Second international conference on exaptation and inverse question-driven innovation:

The origin of new science and technology in highly connected eco-systems
and the quest for a higher scientific and technological creativity.

Palazzo Feltrinelli, Lake Garda, Italy

26, 27 and 28 of April 2018

Organizers:

- Luciano Pilotti, University of Milan, Italy
- Pierpaolo Andriani, Kedge Business School, France
- Mariano Mastrogiorgio, IE Business School, Spain

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1. Rationale

The criteria that inspire the institutions that set the governance for private and public R&D rely on what Norbert Wiener —the father of cybernetics— called *the direct question*, that is: “we have a problem, what is the solution?”. This approach assumes that the areas of ignorance are known (“we know what we don’t know”) and that the way to go to solve the problems can be identified *ex ante*.

However, historical evidence shows that many fundamental breakthroughs in science and technology followed what Wiener called *the inverse question*. These are cases in which the solution precedes the identification of the question. As Meyer writes: “*Many of the essential medical discoveries in history came about not because someone came up with a hypothesis, tested it, and discovered that it was correct, but more typically because someone stumbled upon an answer, after some creative thought, figured out what problem had been inadvertently solved*” (2007: p.300). Often, problems solved through the inverse question approach revealed new areas of the *adjacent possible*, which were not even supposed to exist. An essential, but under-appreciated, mechanism of the inverse question is exaptation, which is the cooption of artifacts (or biological traits) for functions different from the ones they were designed (or selected) for. The microwave oven, the bow and arrow, the first antibiotic, antiseptic, and antidepressant are all cases of exaptation.

The Palazzo Feltrinelli second international conference aims to discuss the contribution of exaptation and inverse question-driven innovation on scientific and technological development and the way research and development is organized and funded.

We invite theoretical, empirical and methodological contributions that address the following aspects, although papers related to but not directly connected to the three aspects described below will be also considered.

The contribution of artefacts in inverse question-driven innovation

In inverse question-driven innovation discovery is often mediated by the presence of artefacts. For instance, Roentgen discovered x-rays by tinkering with Crookes-tubes and photographic plates (Kevles, 1998); pharmacological psychiatry started with the observation of the unusual reactions of tuberculous patients when administered the latest antituberculous drug (Kline, 1970), and the modern industry of organic chemistry originated with the discovery of purple aniline by Thomas Perkins (Garfield, 2002). In all these cases, the discoverers were on the quest of other things but paid attention to the unusual affordances of the artefacts they were tinkering with. The Pasteurian dictum that “chance favors the prepared mind” seems to be mediated by artefacts.

What is the role of artefact-mediated discovery in inverse question-driven innovation? How and to what extent does it contribute to radical innovation, scientific breakthroughs, and technological development?

Institutional processes for inverse question-driven innovation

Most of the institutions that regulate science and technological development are structured to answer direct rather than inverse questions. Moreover, evidence in the pharmaceutical and medical research seem to point out that in the past decades the importance of direct question-driven science and innovation has increased (Leaf, 2013; Scannell, Blanckley, Boldon, & Warrington, 2012), squeezing out unexpected, serendipitous discoveries and causing a decline in pharmaceutical research productivity.

Would a better balance between direct and inverse question-driven research promote a more effective R&D system, so avoiding the conformity that seems to characterize much of existing research (Nicholson and Ioannidis 2012) and at the same time improving creativity and the balance between radical and incremental innovation? And, what are the changes in the nature of institutional procedures and incentive system that are needed to achieve such balance?

The context of inverse question-driven innovation

The increase of complexity, variety and connectivity of modern societies and economic systems generates new opportunities for inverse question-driven innovation. The modern context of innovation in highly diverse and inter-connected systems such as smart cities (and regions) and laboratories is dominated by an increasing tendency toward hybridization of technical and scientific knowledge driven by public and private (including crowd-based) investments. This dynamic generates externalities of all types and ecologies of value, among which we focus on the possibility that increasing interconnected and diverse systems facilitates the discovery of new-to-the-world functions leading to radical innovation.

What type of governance, incentive system and institutional support do we need in such systems in order to facilitate inverse question-driven innovation in such environments?

Format of the conference

The conference will be divided in plenary sessions with keynote speakers and paper sessions. The format of the conference, combined with a small number of participants, is conducive to generating intense conversations among the attendees. Questions, debates, and discussions will be actively encouraged.

Keynote speakers

Gino Cattani. Professor of Management and Organizations, Stern School of Business New York University.

Giovanni Dosi. Professor of Economics and Director of the Institute of Economics at the Scuola Superiore Sant'Anna in Pisa; Co-Director of the task forces “Industrial Policy” and “Intellectual Property Rights”, IPD - Initiative for Policy Dialogue at Columbia University; Continental European Editor of *Industrial and Corporate Change*.

Teppo Felin. Professor of Strategy, Saïd Business School University of Oxford.

Raghu Garud. Alvin H. Clemens Professor of Management and Organization, and the Research Director of the Farrell Center for Corporate Innovation and Entrepreneurship, Pennsylvania State University.

Stuart Kauffman. Emeritus professor of biochemistry at the University of Pennsylvania and affiliate faculty at the Institute for Systems Biology. He has a number of awards including a MacArthur Fellowship and a Wiener Medal.

Dave King. Founder and CEO of Exaptive. He is an engineer and software architect. He has been involved in high-tech entrepreneurship since starting at MIT in 1993 and has designed and developed award-winning enterprise software for leveraging data. Dave speaks internationally about data science, data-driven software, modular design, and how they facilitate 'aha' moments.

Caterina La Porta, Stefano Zapperi. Center for Complexity and Biosystems, University of Milan.

Clifton Leaf. Editor-in-chief of *Fortune*, co-chair of its Brainstorm Health conference and author of the book ‘The Truth in Small Doses: Why We're Losing the War on Cancer-and How to Win It’.

Giuseppe Longhi. Professor of Urban Resources, IUAV Venice.

Giuseppe Longo. Directeur de Recherche CNRS, Ecole Normale Supérieure (Paris, France), and former professor of Mathematics of Logic and Computing, University of Pisa.

Vittorio Loreto. Professor of Physics of Complex Systems and Director of the Social Dynamics Lab, University of Rome La Sapienza.

Nicola Nosengo. Journalist, Partner at formicablu, Scuola Internazionale Superiore di Studi Avanzati di Trieste. He collaborates with Nature, Wired and The Economist.

David Swinney. CEO of iRND3 (Institute for Rare and Neglected Diseases Drug Discovery).

Call for Papers

Paper sessions will give the opportunity to present (and get feedback on) early-stage work on exaptation and inverse-driven innovation (in particular to young scholars).

The deadline for long-abstract submissions is:

January 21th 2018

Long abstracts must be submitted to:

exaptation2018@gmail.com

Long abstract should not exceed 1,200 words. Acceptance will be communicated on January 28th.

Participation to the conference is subject to a conference fee of *100 euros*, which covers entrance, wifi access, food catering, and conference materials. Details about payment transfer will be announced soon.

Location

Palazzo Feltrinelli

Via Castello, 4

Gargnano del Garda (BS), 25084 Italy

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