Annotated bibliography on science

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References

[1] Uri Alon. How to Build a Motivated Research Group. *Molecular Cell*, 37(2):151–152, 2010.

> Drawing on Decy and Ryan theory of self-determined behaviour, there are three conditions to be motivated: competence, autonomy and social connectedness. When chosing a project of a new member of a research group, these conditions are linked with talents and passions of the new member, and alignment of objectives with the research group, respectively. Author also offers advice to foster competence, autonomy and connectedness in the context of a research group.

[2] Christian Berggren and Solmaz Filiz Karabag. Scientific misconduct at an elite medical institute: The role of competing institutional logics and fragmented control. *Research Policy*, (December 2016):1–16, 2018.

> The paper analyzes a case of medical and academic misconduct, the Karolinska case, using a institutional theory framework. The case was about the practices of Paolo Macchiarini when developing a technique of artificial trachea transplant, which lead to the death of several patients. Authors research what factors lead to maintaining the misconduct a long time period, what actors lead to the exposure of the misconduct and the lessons learned for other insitutional settings. The case reveals a resource asymmetry between the market-oriented logic and medical and scientific logics. The market-oriented logic fosters academic institutions to focus their efforts to develop their brands and compete for resources.It also reveals the problem of fragmented control in the academic field. Following this market-research logic, the function of scientific quality control is judged as less relevant, and it is outsourced to editors of academic journals. This leads to a fragmented control of scientific activity. Conversely, academic journals are also driven by a market-oriented logic, which may lead them to relax standards of peer reviewing, and an asymmetry between rapid entry (acceptance) and slow exit (retraction). It is significant that the most effective whistleblower of this case was a docummentary on a Swedish television.

[3] Elias G. Carayannis and David F.J. Campbell. 'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3/4):201, 2009.

The merit of this article is introducing a fourth element in the triple helix model of institutional innovation described in [?] which is the media-based and culture-based public. This fourth elements emphasizes the need that innovation policy should communicate its objectives and rationales to the public to seek for legitimation and justification. This can be achieved through cultural artifacts such as movies, that can arise awareness on utility of innovation among the public for supporting R+D policies and to enroll prospective students in science and engineering. So, the innovation system adapts to the requirements of the media-based democracy.

[4] Arturo Casadevall and Ferric C. Fang. Reforming Science: Methodological and Cultural Reforms. *Infection and Immunity*, 80(3):891–896, mar 2012.

Authors assess critically the present state of science and advocate for its reform. This manuscript focus on methodological and cultural reforms. The cultural problems of science are: A workforce imbalance favouring male, senior researchers; favouring strong competition for funding and positions; and operating under the priority rule, where credit goes to the one that provides answer first. This culture leads to saturation of the peer review system, publication bias, taking conservative approaches to acquire funding and creating incentives for scientific misconduct. This culture drives the increase of honest and dishonest retractions, eroding the credibility of science. As methodological reforms, authors propose revision of criteria of promotion, re-embracing philosophy (logic, epistemology and ethics) in scientific training, enhanced training in probability and statistics, and use of checklist in publication workflow. As cultural reforms, they propose replacing competition by collaboration.

[5] Jonathan Drennan. Cognitive interviewing: Verbal data in the design and pretesting of questionnaires. *Journal of Advanced Nursing*, 42(1):57–63, 2003.

Cognitive interviewing (also known as verbal protocols and think-aloud interviewing) involves asking survey respondents to think out loud as they go through a survey questionnaire and tell them everything they are thinking. It is particularly useful when there is uncertainty on how respondents will answer questionnaires or doubt about their understanding of the wording of questions. Response problems can be: lexical, inclusion/exclusion (scope of the question), temporal, logical (questions with connecting words requiring more than one answer) and computational. Cognitive interview techniques are: probing (require informants to paraphrase questions in their own words), observing respondent's behaviour, and to encourage respondents to verbalize their thoughts (think aloud) about the questionnaire. Problems found while answering the questionnaire can be classified in four headings: understanding, retrieval, judgement and response formatting.

[6] Henry Etzkowitz. Research groups as 'quasi-firms': the invention of the entrepreneurial university. *Research Policy*, 32(1):109–121, jan 2003.

The integration of academia in innovation systems leads to an expansion of the mission of the university. First mission of university was preservation and dissemination of knowledge (teaching). The first academic revo-

lution made research a second university function, and the second revolution added the technology transfer and economic development mission. The second revolution transformed the way that research was organized in academia: from professors assisted by assistants to research groups where professors and assistant professors have large autonomy, assisted by graduate students. The development of research groups lead to individual and collective entrepreneurship within academia, and to increasing collaboration with the state and the industry. Then, linear innovation evolved into reverse linearity (innovation process starting from commercial and societal needs) and interaction models of innovation. The new mission of the university motivated the creation of new organizational units, like enterprise incubators and technology transfer units. University management had to choose between separating or integrating business activities and managing conflicts of interest.

[7] Henry Etzkowitz and Loet Leydesdorff. The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Research Policy*, 29(2):109–123, feb 2000.

The evolution of innovation systems is modelled in terms of academia-state-industry relationship. Three models of interactions emerge. In the etatistic model, the nation state encompasses academia and industry and directs the relations between them. The laissez-faire model consists of separate the three institutional spheres with strong borders dividing them and highly circumscribed relations among the spheres. Triple Helix III is generating a knowledge infrastructure in terms of overlapping institutional spheres, with each taking the role of the other and with hybrid organizations emerging at the interfaces. These hybrid organization can be university spin-off firms, tri-lateral initiatives for knowledge-based economic development and strategic alliances among firms, government laboratories and academic research groups. This interplay between actors constitutes the triple-helix model of innovation. This model represents an evolution from linear models of innovation (mode 1), with defined transitions between basic research, applied research and experimental development to nonlinear models of innovation (mode 2).

[8] Ferric C Fang and Arturo Casadevall. Reforming Science: Structural Reforms. *Infection and Immunity*, 80(3):897–901, mar 2012.

Authors assess critically the present state of science and advocate for its reform. This manuscript focus on structural reforms, focusing on biomedical science in the United States. Many dysfunctional aspects of science are rational responses to scientist to incentives presented by the present system. These incentives are driven mainly by how governmental financial support is provided to scientists. Authors identify five structural problems. Inadequate funding is leading to a hypercompetitive scientific environment, and indirect costs are underestimated. Agencies reduce funding to investigator-initiated projects, favouring targeted research and big science, while the success of targeted research depends on previous funding on basic science. Many women and minorities achieve success in scientific career, leading to leaky pipelines in the scientific system. There is an increase of administrative burden to address concerns on animal welfare, patient safety and the accountability of public funds. The grant peer review system is not effective in ranking grant applications. In addition to obvious remedies, authors propose balancing and renewing the scuentific workforce, recognize the impact of basic research, restrict laboratory size, and undertake a scientific study of science.

[9] B. A. Nosek, G. Alter, G. C. Banks, D. Borsboom, S. D. Bowman, S. J. Breckler, S. Buck, C. D. Chambers, G. Chin, G. Christensen, M. Contestabile, A. Dafoe, E. Eich, J. Freese, R. Glennerster, D. Goroff, D. P. Green, B. Hesse, M. Humphreys, J. Ishiyama, D. Karlan, A. Kraut, A. Lupia, P. Mabry, T. Madon, N. Malhotra, E. Mayo-Wilson, M. McNutt, E. Miguel, E. L. Paluck, U. Simonsohn, C. Soderberg, B. A. Spellman, J. Turitto, G. VandenBos, S. Vazire, E. J. Wagenmakers, R. Wilson, and T. Yarkoni. Promoting an open research culture. *Science*, 348(6242):1422–1425, jun 2015.

This editorial describes the transparency and openness promotion guidelines proposed by the Transparency and Openness Promotion Committee. These guidelines propose how can journals adapt their procedures and policies for publication to promote the values of transparency, openness and reproducibility in science. The defined standards cover citation, replication and aspects of the scientific process. The later define standards for design, research materials, data sharing and analytic methods (share code). Two additional standards cover aspects related with preregistration of studies and analysis plans.

[10] Brian A. Nosek and Daniël Lakens. Registered Reports. *Social Psychology*, 45(3):137–141, may 2014.

The present science culture, novel and positive results are considered more publishable than replications and negative results. The availability of direct replications can help to increase precision of effect size estimations via meta-analysis, can establish generalizability of results and replication that produce negative results facilitate the identification of boundary conditions for real effects. Preregistered studies, that are evaluated on the grounds of theoretical and methodological quality, and whose results will be published irrespective of the outcome, can help to change the incentives of reviewers and editors favoring novel and positive results. This editorial presents a special issue centered in replicating classic, textbook studies of social psychology through preregistration.

[11] Robert Rosenthal. The file drawer problem and tolerance for null results. *Psychological Bulletin*, 86(3):638–641, 1979.

The file drawer problem posits that published studies are a biased sample of the studies that are actually carried out. The importance of this effect can be measured in terms of the tolerance for future null results, defined as the number of studies averaging null results that must be in the file drawers before the overall probability of a Type I error is brought to a desired level of significance, namely $p = 0.05$. The larger the number of studies needed, the higher the tolerance. Rosenthal proposes a measure of tolerance based on Zs addition. If k is the number of studies combined, a reasonable level of tolerance is at least $5k + 10$.

[12] Matti Vuorre and James P. Curley. Curating Research Assets: A Tutorial on the Git Version Control System. *Advances in Methods and Practices in Psychological Science*, page 251524591875482, apr 2018.

Git is a version control system designed to control the workflow of software development projects. Authors posit that Git can be also used as tools for controlling the workflow of a research project, allowing version control and sharing of data, analysis and documents. The GitHub website allows also collaboration among research teams, that can work on parallel versions of a similar project, which are later consolidated in GitHub.