## *Saggi / Essays*

# From the Taming of Chance to the Rhetoric of Uncertainty

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In my talk I will refer to my professional experience, which is that of a social scientist working in the field of risk governance. I will relate Hacking's thoughts to a personal awareness about the power of chance and the illusion of expert management. My purpose is to show the importance of Hacking`s insights at a time when powerful science and technology are deployed, but control is patently absent.

Whenever I came across Hacking´s work, at different times of my professional and personal life, I was struck by his capacity of considering and putting together, in a meaningful narrative, aspects of reality which more often than not are treated as if they were totally separate by different scholars in different fields and disciplines. Hacking`s accounts of, among other, *The Emergence of Probability*[1] and *The Taming of Chance*[2] are based on solid, extremely well documented, disciplined and possibly sometimes painstakingly research of when, why, where, how, who, what for (and possibly against what against whom). At someone else's hands, the result might be just a well documented chronicle, but Hacking also has "imagination", a curiosity driven speculative imagination. And moreover, he is not afraid of relying on "fantasy", like when, in *Representing and Intervening*[3], he defends the argument that people invented language out of boredom (following the thesis of the Leakey family who excavated Olduvi gorge).

And there is also the Hacking of *Mad Travelers*[4], which I didn't know until the book was given to me by a friend, in its Italian translation of 2004. There he talks of

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This paper was read at the Holberg Symposium, held in Bergen, Norway, on 24 November 2009 in the occasion of the award of the Holberg International Memorial Prize to Ian Hacking, University of Toronto, College de France. The Prize was established in 2003 by the government of Norway in honour of Ludvig Holberg and is awarded annually for outstanding scholarly work in the fields of the arts and humanities, social sciences, law and theology. Previous recipients have been: Julia Kristeva (2004); Jürgen Habermas (2005), Shmuel Eisnstadt (2006), Ronald Dworkin (2007), Fedric Jameson (2008). The name of the Holberg Prize laureate for 2010 has just been announced and is Natalie Zemon Davis. More information can be found at http://www.holbergprisen.no/en.

The author wishes to thank the organizing committee, and in particular Ragnar Fjelland and Roger Strand, for inviting her to participate in a discussion with prize winner Ian Hacking and two other distinguished scholars, Dagfinn Føllesdal and Merle Jacob.

our limitless reservoir of ignorance and conceptual confusions that new knowledge seldom helps relieve. He also comments on how "scientific knowledge about ourselves – the mere belief system – changes how we think of ourselves, the possibilities that are open to us, the kinds of people that we take ourselves and our fellows to be"[5]. This sounds to me like a warning against the attempt to bring everything under the umbrella of positivist science, as fostered for example in a recent article in Nature: "Unmet mental-health needs are massive and growing: the number of Americans receiving mental-health care has almost doubled in the past 20 years. There is a moral imperative to turn the craft of psychology – in danger of falling, Freud-like, out of fashion – into a robust and valued science informed by the best available research and economic evidence"[6].

In the above quote, what strikes me as interesting and worrying at the same time, is the claim that a "robust and valued science" (whatever that means) is to be grounded not only in the best available research, but also in economic evidence. Reference to a "moral imperative" leaves no space for any alternative account.

Hacking's considerations seems to me all the more important at a time when an all pervasive techno-scientific apparatus leads towards the possible definition of human beings exclusively in terms of their genetic make-up. The compassion and human understanding that Hacking shows for Albert Dadas (and for his doctor, Philippe Tissié) should be taken as a reminder and a warning in times when the distinction is blurring between discovery and invention, in particular in the life sciences and with the advent of synthetic biology.

Hacking explores and draws new paths, which connect apparently separate ideas, events, and historical contingencies. He provides meaningful answers because he asks good questions: how certain ideas developed in a concrete context, but also how a certain context made it possible for such ideas to become of practical use, on the basis of available data and in order to support deeply felt needs.

What were the circumstances – he asks – that made it possible for probability, "discovered", studied, and partially formalized centuries before, to become so largely applied, including to human phenomena, in the XIX century?[7]

The widespread use of statistical data became possible only once these were systematically collected. This also originated the possibility of finding regularities in a world where the deterministic vision had been progressively eroding, opening up the frightening possibility of a lawlessness world dominated by chance. In his own words:

> I write of the taming of chance, that is, of the way in which *apparently* chance or irregular events have been brought under the control of natural or social law. The world became not more chancy, but far less so. Chance, which was once the superstition of the vulgar, became the centrepiece of natural and social science, or so genteel and rational people are led to believe[8] (*italics* mine).

I stressed the adverb "apparently" because it seems key in Hacking's narrative[9] and because, in my view, it adequately characterizes also what happened next, in the continuous attempts, by science but not only science, to curb uncertainty and conquer ignorance as a way to understand, control, and intervene in the natural and human world.

Many years ago, in the mid seventies, *chance* in the form of an earthquake which struck the region were I was born and was living at the time, brought me to leave a field of research which I had begun to practice, and to become involved in issues or risks, disasters, catastrophes and the like. It was then a field associated, at least in Europe and more so in Italy, mostly with students and practitioners of natural sciences. They were studying the features of earthquakes, volcanic eruptions, floods, landslides, chemical spills, toxic releases, nuclear accidents and the like, also with the aim of inserting the uncertainties of their occurrence and of their disastrous consequences into the familiar frame of calculable risk, based on probability of event and expected damage.

A tradition of social science research did exist, but was somewhat marginal and in some cases ancillary (Foucault *sensu*) to the needs of state bureaucrats, policy makers and regulators, or even to those of technology developers and promoters. It was (as Hacking would say) a "numerical world" where numerical estimates were required and considered key for policy, i.e. for informing decisions and investments in planning, prevention and response, as well as in research and technological innovation considered relevant to that purpose.

Social scientists therefore were expected to provide numbers, possibly following the path of Chauncey Starr, an electrical engineer expert in nuclear energy and working at the Electric Power Research Institute in Palo Alto. He had devised some very complicated formulae for "revealing" the individual and societal degree of acceptability of a given technology through calculations of its monetary costs and benefits. Starr's article, published in Science in 1969[10], contributed to the amplification of the risk debate and engaged a growing number of psychologists, anthropologists, and sociologists who were dissatisfied with his economically based approach and were questioning the possibility of finding, and the rationale of looking for, an all-purpose number for societal risk acceptability.

Risk experts (be they assessors or other) and decision makers were puzzled: Why is it that people don't understand probabilities? Why are they suspicious of extremely promising technologies? Why do they hold distorted perceptions of risk? Instead of simply looking for answers to such questions, some influential social scientists reframed them and began to explore new dimensions of the risk issue, including cultural, political and ethical ones. In what traditional experts labeled as distortion and bias, the "new comers" detected different personal and societal values, singular preferences, and incompatible problem framings. Numbers were also provided, notably in the psychometric approach[11], but they were not always fit for purpose (as when they showed that experts too may be are biased). From the anthropological and sociological traditions many voices were heard denouncing the attempts of reducing the whole debate to calculable risk and of using "money" as the sole unit for evaluation and comparison.

As Mary Douglas put it:

> Every choice we make is beset with uncertainty. This is the basic condition of human knowledge[12]. A great deal of risk analysis is concerned with trying to turn uncertainty into probabilities. What seems to be in each case a purely technical exercise quickly becomes one that rests directly upon the philosophical foundations of inference[13].

The effort of turning uncertainty into probability, i.e. into "known", calculable risk is pursued even when dealing with complex systems, made of tightly coupled components. Charles Perrow coined the original expression "normal accidents" to signify that failures are inevitable in such systems including those carefully designed (such as nuclear power plants), which one would expect to be well understood and controllable.

> The odd term *normal accident* – he writes – is meant to signal that, given the system characteristics [complexity and tight coupling], multiple and unexpected interactions of failures are inevitable. This is an expression of an integral characteristic of the system, not a statement of frequency. It is normal for us to die, but we die only once. System accidents are uncommon, even rare; yet this is not at all reassuring, if they can produce catastrophes[14].

One may say that accidents, just like death, are a necessity regulated by chance. They are bound to happen, but we cannot possibly know when and how. (Or perhaps, once we know, it is too late to do anything about.) Therefore conventional risk assessments are inappropriate and perhaps even counterproductive, as they assume that the individual components of the system are well known and their interactions well understood (through modeling or other.)

A few pages, in the first 1984 version of Perrow's book (which was republished in an expanded version in 1999) were dedicated to recombinant DNA technology, then in its infancy. A recent *Nature* editorial quotes that "authorities in many parts of the world often have only the vaguest notion of how many high-level biosecurity facilities exist on their territory, and that so few of them can document what stocks of deadly biological pathogens such facilities hold and exchange"[15]. The editorial's author refers to a report of the US General Accounting Office, issued in September 2009[16], which estimates that the number of American BSL-3 facilities has more than trebled, from around 415 in 2004 to 1,362 last year. He/she than comments: "But the report emphasizes the uncertainties. 'The universe of BSL-3 and -4 laboratories is unknown' it [the report] states. '[T]here are likely other laboratories that we were unable to identify'"[17]. In my own turn, I comment that the wording of the report suggests not that we are in a state of uncertainty, but rather ignorance, including "known unknowns" and possibly "unknown unknowns".

In the lack of awareness about uncertainty and ignorance, or perhaps failing the intellectual and practical tools to cope with them, often business goes on as usual. Expert work proceeds as if complex systems were controllable or at least predictable, as if uncertainty could be precisely calculated or maybe ignored. The expression "risk governance" (a rather new entry in the risk debate) is often understood as a synonym of risk management – where political considerations are tolerated as legitimate – and as opposed to risk assessment, still conceived as a set of objective evaluations and value-free technical procedures.

The instances are countless of surprise coming unexpected in supposedly well known or precisely designed systems. The greater our capacity of manipulating, the greater the uncertainty introduced into the environment (and perhaps soon into human biology) so that many events and phenomena once conceived as "natural" are recognized to be the product of interactions between physical and human constituents.

Consequently even the distinction between natural and man-made risks and

disasters, once somewhat reassuring (if nothing else for assigning blame) is an attempt of normalization that no longer holds. Hurricanes, floods, landslides, forest fires, and the like (perhaps even earthquakes) are no longer "acts of God(s)", which we have to accept despite attempts to better understand and foresee them.

The by now well established tradition of studying "Na-Tech" (Natural Technological) risks and disasters, such as a flood dispersing toxic waste from 'safe' storage into the environment, is being coupled by the exploration of "Tech-Na" (Technological-Natural) risks/disasters, such as the case of an explosion in an industrial installation causing a landslide, or the construction of a dam interfering with the geology of a certain location and possibly provoking an earthquake.

Climate is the paradigmatic example of a highly complex system and the complex interactions between atmospheric phenomena and human action are far from being understood. There is room not only for scientific debate but, as recent disclosure from the *New York Times* about electronic correspondence violations and possible "data massaging"[18] have suggested, also for clashes between different interests and belief systems.

Powerful computer models have been devised to illustrate climate and other complex systems dynamics, but the uncertainties are immense and definitely not reducible to calculable probabilities.

As Pilkey and Pilkey-Jarvis[19] have convincingly shown, models which result from reductionist assumptions, from mathematical and computational views of complexity, are often flawed and possibly misleading. At each level of the assessment uncertainties are introduced and they build up into a cascading of uncertainties, when one deals with, for example, climate change, fisheries depletion, nuclear waste repositories, or coastal erosion.

With increasing frequency the current rhetoric in research programmes and policy documents includes recognition of uncertainty and even ignorance. However, research and policy continue to be largely oriented by the assumption that uncertainty and ignorance will finally be dissolved. Perhaps the most significant example of this faithful belief is the Precautionary Principle in its Rio 1992 formulation, where uncertainty is not even called by that name, but defined as ¨"lack of full scientific certainty" (therefore conceived as temporary, and finally to be defeated through the accumulation of scientific knowledge). The principle reads as follows: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation"[20].

In this talk, I mentioned some important works published in the early nineteen-eighties to illustrate that the issues and the themes were already present then, which continued to be explored in the following years by a growing number of scholars. Their writings gained resonance among colleagues in the natural and human sciences as well as larger audiences, thus contributing to the mounting of a public debate. Some books were particularly influential in popularizing risk themes, as it was the case with the English version of Ulrich Beck's *Risk Society*[21].

In our (new) century the words of Stephen Toulmin and Sheila Jasanoff, coming from very different scholarly backgrounds, resonate with the "early warnings" of Mary Douglas.

In the following quote, Toulmin identifies, and somewhat regrets, the separation between Rationality and Reasonableness, the lack of cross fertilization between theory and practice:

> In the Humanities the term "Reason" referred to reasonable practices, in Natural Philosophy, to rational theories and deductions. The humanities recalled the variety we are familiar with in day-to-day experience: in real life, generalizations are hazardous, and certitude is too much to insist on. Exact scientists sought rather to put everything in theoretical order: formal certainty was their goal. So emerged the tension between Rationality and Reasonableness – the demand for correct answers to questions of Theory and respect for honest disagreement about matters of Practice – that has remained a challenge up to our own times[22].

In the same vein, Jasanoff points at the limitations of a single paradigm for reading the complexity of human experience:

> Technologies that succeed in the world operate far more as complex forms of life. They remake the ways in which people imagine and conduct their day-to-day experience, think about themselves, and shape their relations with one another. [ …] When weighing up the costs and benefits of technologies, then, quantitative estimates of physical or environmental harm do not begin to register the complexity and intensity of people's preferences. At stake in innovation are not simply determinate benefits that can be compared with equally determinate costs. Preferences that may be affected include commitments of ways to ordering the very rhythms of existence [… ][23].

Toulmin's plea for a "Return to Reason" which is able to reconcile Rationality and Reasonableness, and the Jasanoff's reminder of the power of technologies in remaking our lives and imaginaries, seem to me to belong to the same intellectual and moral tradition from which Ian Hacking's fundamental question emerges: "But how can chance ever be tamed?"[24]

I would like to finish my talk with two somewhat unconventional quotes, to question the conventional separation between disciplines, between science and the humanities, between expert and lay knowledge. The first one is from Salvador Dalí's autobiography.

> It is time for us, in the history of thought, to see that the real as given to us by rational science is not all of the real. The world of logical and allegedly experimental reasons, as nineteen-century science bequeathed it to us, is in immense dispute. The very method of knowledge is suspect. The equation has been formulated by skipping over the unknowns and assuming a part of the problem to have been solved[25].

And, somewhat provocatively, but by no means with lack of respect for different styles of thought, the last one is from *Le Petit Prince*:

> Mais bien sûr, nous qui comprenons la vie, nous nous moquons bien des numéros![26]

***Notes***

[1] Hacking, 1975.
[2] Hacking, 1990.

[3] Hacking, 1983, pp. 135-136.
[4] Hacking, 1998.
[5] Hacking, 1998, p. 10.
[6] *Nature*, 2009, p. 15.
[7] Hacking, 1990, p. 10.
[8] Ibidem.
[9] In the discussion following my presentation, Hacking disagreed with this interpretation, saying that he meant just "apparently", and not "*apparently*".
[10] Starr, 1969.
[11] See for example Kahneman et al., 1982.
[12] … and, one may add, of human existence.
[13] Douglas, 1985, p. 42.
[14] Perrow, 1984 p. 5.
[15] *Nature*, 2009, p. 12.
[16] www.gao.gov/new.items/d09574.pdf
[17] See note 14.
[18] Revkin, 2009. The article was published just three days before the Symposium; it was one of a vast number that appeared since then in the international press and the blogosphere, where the whole affair is known as the Climategate.
[19] Pilkey and Pilkey-Jarvis, 2007
[20] Rio Declaration on Environment and Development, Rio de Janeiro, 3-14 June 1992, Principle 15.
[21] Beck, 1992 (original German edition, 1986).
[22] Toulmin, 2001, p. 32.
[23] Jasanoff, 2009 p. Xvii.
[24] Hacking, 1990, p. 10.
[25] Dalí and Perinaud, 2004, p. 152.
[26] (de) Saint-Exupéry, 1943, p. 24.

### *References*

Beck, U. (1992), *Risk Society*, London: Sage (original German version, *Risikogesellschaft*, Frankfurt: Suhrkamp, 1986)

Dalí, S. and Perinaud, A. (2004), *Maniac Eyeball. The Unspeakable Confessions of Salvador Dalí*, Creation Books (original: Dalí S. et Perinaud, A. *Comme on devient Dalí*, Paris: Editions Robert Laffont, S.A., 1973).

Douglas, M. (1985), *Risk Acceptability according to the Social Sciences*, London: Routledge and Kegan Paul.

Hacking, I. (1975), *The Emergence of Probability*, Cambridge: Cambridge University Press.

Hacking, I. (1983), *Representing and Intervening*, Cambridge: Cambridge University Press.

Hacking, I. (1990), *The Taming of Chance*, Cambridge: Cambridge University Press.

Hacking, I. (1998), *Mad Travelers: Reflections on the Reality of Transient Mental Illness*, Charlottesville: University of Virginia Press.

Kahneman, D., Slovic, P., and Tversky, A. (eds) (1982), *Judgment under Uncertainty: Heuristics and Biases*, Cambridge: Cambridge University Press.

Jasanoff, S. (2009), "Border Crossing: Social Sciences and Public Policy", Preface to Guimarães Pereira Â. and Funtowicz, S. (eds), *Science for Policy. New Challenges, New Opportunities*, New Delhi: Oxford University Press, Xi-XXVi.

Nature Editorial (2009), "Psychology: a reality check", *Nature*, 461 (7266), 15 0ctober.

Nature Editorial (2009), "Containing Risk", *Nature*, 462, (7270), 12 November.

Perrow, C. (1984), *Normal Accidents. Living with High-Risk Technologies*, New York: Basic Books (republished 1999 by Princeton University Press).

Pilkey O. H. and Pilkey-Jarvis, L. (2007), *Useless Arithmetic: Why Environmental Scientists Can't Predict the Future*, New York: Columbia University Press.

Revkin, A.C. (2009), "Hacked E-Mail Is New Fodder for Climate Dispute", *New York Times*, November 20.

(de) Saint-Exupéry, A. (2008), *Le Petit Prince*, Évreux: Folio (first published in 1943 New York: Reynald & Hitchcock).

Starr, C. (1969), "Social benefit versus technological risk: What is our society willing to pay for safety", *Science*, 165 (3899), pp. 1232-1238.

Toulmin, S. (2001), *Return to Reason*, Cambridge, MA: Harvard University Press.