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## **Pursuing plausibility**

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**Abstract:** There is a need for a corrective to the cultural and institutional mindsets that seek to calculate incalculable futures. Plausibility is an under-theorised and illusive concept yet one that critically moves beyond a search for a factual encounter with the future. While not assuming that plausibility will unproblematically lift policy making and technology assessment from failures of both imagination and prediction, teasing apart the tensions latent in the concept is helpful and timely. The articles in this special issue ask: is plausibility another mode of relating to the future that acknowledges an intrinsically uncertain and contingent future? Does plausibility offer a pathway away from the pathologies of prediction and probabilistic thinking to create a more fruitful space to make better decisions? This introductory article describes the intellectual pursuit of plausibility through a description of the contemporary conditions that necessitate a revised approach to uncertainty and a historical account of the rise of probabilistic thinking.

**Keywords:** plausibility; scenarios; post-normal science; foresight; technology assessment; sustainability; innovation.

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Maria: "If we had enough information, we could predict the consequences of our actions. Would you want to know? If you kissed that girl, if you talked to that man, if you take that job, or marry that woman, or steal that paper? If we knew what would happen in the end, would we ever be able to take the first step, to make the first move?"

*Code 46* (Winterbottom, 2003)

## 1 Introduction

In a workshop held in Ispra in 2012 on plausibility, Silvio Funtowicz, philosopher of science known for the concept of 'post-normal science' (Funtowicz and Ravetz, 1985, 1990, 1993), wondered if plausibility was a 'MacGuffin', sparking a debate about the difficulties in nailing down the relevance and anchoring strength of the concept. A MacGuffin, popularised by American filmmaker Alfred Hitchcock, is an object in a film that drives the plot, providing the justification for the conflictual premises of the story. It can be a treasure map, a rabbit's foot or an uttered word (as in 'rosebud' in *Citizen Kane*). However, the MacGuffin eventually proves to be distracting or worthless for the larger thrust of the story. We were asked to consider: Do explorations of plausibility lead us astray, only serving to distract from the more important stakes of managing uncertain futures? Or does it provide a powerful entry point to explore the limits of prediction enabling a more fruitful assessment of the multifarious trajectories of complex systems? The richness of that conversation, and the fact that this introduction is written in Bodega Bay, where Hitchcock filmed *The Birds* (the MacGuffin was a pair of love birds) makes framing up this special issue in terms of filmmaking irresistible. So, in this introduction to the special issue, we start with an acknowledgement that this collection is an ensemble, with wildly diverse authors following separate plotlines and pursuing distinct goals while still sharing a common grounding in plausibility. While plausibility stands up as a theme and starting point for the articles, the authors approach it in dramatically different ways, using different lenses, and indeed, genres of thought to explore the meaning and significance of plausibility.

Plausibility as a concept is drawn upon in disciplines from medicine to philosophy to economics to law, yet it is rarely studied directly. It is also a mundane concept, colloquial and at the same time embodying an unsolved number of intriguing aspects. Both the plausible and the implausible need to be interrogated and better understood in the context they appear. In his work about credibility and practices of assessing claims of believability, Shapin (1994) notes that plausibility is not intrinsic in something but it is about the work that goes into the claims. It is inherently bound by contextual properties: it has cultural, emotional, social, temporal and spatial dimensions.

Plausibility is heartily raised in future studies and in nearly all explanations of scenario planning it is named as a criterion for good scenarios. It is summoned as a means to distinguish the inquiry-lead process of collaborative decision making often embraced through scenario planning from its more data-led cousins, like forecasting or stochastic modelling. Yet there is little in the literature on scenario planning that describes what is meant by plausible or how plausibility is established in practice. There are few exceptions to this neglect outside of Millett (2003, 2009) whose work is deconstructed by Ramírez and Selin (2014) in a piece that explores the deployment of plausibility in scenario planning, contrasting its usage with probability. The future studies community trades in plausibility but rarely exceeds a simple juxtaposition of plausibility against such concepts as possibility (a range of options without judgment), probability (quantifying uncertainties), and desirability (preferred options). Plausibility appears as a central hallmark of such time honoured approaches to decision making under uncertainty, but what the term actually means and how exactly it matters is ignored.

In attempts to unpack the meaning of plausibility, a review of standard definitions is not very helpful. Straight definitions of plausibility are tricky; from the Free Online Dictionary, plausibility may be understood as “seemingly or apparently valid, likely, or acceptable; credible: for example in a plausible excuse”; “giving a deceptive impression of truth or reliability”; or “disingenuously smooth; fast-talking”.<sup>2</sup> This definition relays internal contradictions. Does plausibility imply validity and likelihood or swarthy and questionable ethics? Already at first scratch, the meaning of plausibility invites debates about reliability, persuasion, and trust. Plausibility has the Latin root of *plausibilis*, deserving of applause, which raises concerns about the extent to which popular opinion is the marker of plausibility (thereby at the expense of minority views). Definitions are one thing, a word in use is another, and we can see, for example in the definition of the precautionary principle (see e.g., COMEST, 2005) that plausibility is used in practice in a myriad of ways that are not adequately captured by this three-fold dictionary definition.

Investigating the conceptual and methodological dimensions of plausibility is a means to better understand the meaning and significance of the ways individuals and communities know, explore, assess, and shape their presents and futures across time, cultures, and professional practices. How political institutions use the term and how organisations tangle with plausibility is equally interesting. How scientific communities establish plausibility is a particularly interesting locus of concern bringing questions of disciplinary knowledge, evidence, and values in science to the fore.

As in film, the articles in this special issue use different lenses to bring plausibility into view. Some take use a telephoto lens to narrow the field of view and bring distant things closer, as in Michelson’s treatment of plausibility in institutions where foresight needs to be integrated in policy making. Others, like Strand’s essay on the plausibility of current narratives of science and innovation, use a wide-angle lens to incorporate a very expansive view.

The invitation to think about plausibility manufactures a stage to explore a broad range of topics: responsibility (Strand), quality (Wiek et al., Boenink, Saltelli et al.), semiotics (Curvelo), the epistemology of the future (Nordman), and the institutionalisation and normalisation of plausibility (Michelson). In this way, the *mise-en-scene*, the cinematic feel, of the special issue is one of eclectic and contrasting portraits of plausibility.

To best frame these articles, as editors of this special issue, we will take the prerogative in this introduction to explain our attraction to and thinking about the term.

Our interest in plausibility is derived from our disappointment with sterile speculation and our exposure to the faulty workings of promissory rhetoric and, indeed a shot of fear that contemporary society is speeding out of balance with little signs of recalibrating for unprecedented futures. We have witnessed, through our research into technology and environmental assessment, and in our work in science policy, that technological advance is grossly outpaced by our ability to understand, much less govern, the new worlds that are being ushered in. With our commitments to sustainability, we recognise that many of the approaches to the future that rely on probability (thus shying away from plausibility) do so at the expense of taking into account issues of environmental and social justice.

What follows is an explanation of why we think plausibility matters now, to our contemporary condition, and how we each became infatuated with the term through our respective research in technology assessment and post-normal science. As we began dissecting the import and workings of plausibility, we found it informative to look back historically to better appreciate how the reliance on probability developed and has become favoured over plausibility. From this historical understanding, we then turn to the papers in the special issue and discuss the collection.

## **2 Setting the stage**

Despite different lenses and levels of engagement with plausibility, authors in this special issue share an appreciation of the context in which an interest in plausibility occurs. The context is a world with messy problems and no clear answers where mechanistic ‘solutions’ are bandied around. The risk management literature is replete with ever more sophisticated models for calculating futures, which work wonderfully in many situations from air traffic control, to mapping flu epidemics, to estimating population growth. However, in contexts of wicked problems (Rittel and Webber, 1973) we often witness an impoverish approach to prediction in the face of what Ramírez and Ravetz (2011, p.471) have called feral futures, which occur when “futures previously considered to be predictable are expected that they might become, unpredictable, without having been thought to be unpredictable to start with”. Some dynamics of change are so mired in indeterminacy that contemporary techniques to establish a verifiable trajectory are stopped in the tracks. It is not possible to establish causal relationships.

Instead, we increasingly find that our cultural and institutional capacity to anticipate and shoulder risk falls short. We see the ‘future’ perversely tamed into numbers with prediction and probability shielding complexity and uncertainty.<sup>3</sup> Feral futures invite a reckoning with the limits of quantitative predictive models indebted to Cartesian mindsets. Part of the trouble is the reliance on decades of risk calculations that fail to capture surprise or deviance arising from systemic effects. Einstein aptly captured the limits of calculations: “not everything that counts can be counted”.

While the limits of prediction are regularly faced (and often ignored) in many everyday business practices or policy environments, the plot thickens when catastrophe strikes. In recent catastrophes, from the financial meltdown to the Gulf oil spill and the nuclear emergency in Japan, events erupted from outside of the risk frameworks used to make decisions. In the case of the Deepwater Horizon oil spill of 2010, there was unwavering reliance upon protocols that had not anticipated the sequence of events that caused the explosion. Hence, from a risk management perspective, the probabilities of these events were deemed so low that they were not considered sufficiently likely to

warrant attention or preparation. We are living in a ‘risk society’ where accidents, systemic crashes and ‘black swan events’ (Taleb, 2007) have become commonplace to the extent that Perrow’s (1984) study of complex technological systems (such as air and marine traffic, chemical and nuclear plants, dams, etc.) was named *Normal Accidents*. The normalcy of these deadly and costly ‘accidents’ draw attention to the reality that catastrophic events that slip off the map of reason are not aberrations but part and parcel of contemporary society, reliant as it is on large scale complex technological systems. Our alarming inability to grapple with manifold uncertainty and govern indeterminate complex systems highlights the importance of questioning our contemporary frameworks for assessing risk and managing futures.

As Wilkinson and Ramirez (2009) – see also Ravetz (2008) and Saltelli et al. in this special issue for other cases – argue, the ongoing financial crisis illustrates the fallibility of sophisticated attempts to approach decision making through probability distribution models that portend to *know* futures. “The implicit assumptions that growth can continue forever, that uncertainty can be packaged in calculable risks, that all risk can be priced in the market, that markets for different risks of risks (derivatives, hedges) can be developed again and again, that markets are rational and efficient...became locked into the phenomenal growth of the financial industry” (Flowers et al., 2009). Further, the assumption of the rationality of human actors was built into the models and as many scholars have noted, studying decision makers in practice reveals plenty of ‘irrationality’ (Ball, 2010; Fehr, 2010; Kahneman, 2011). It is not merely a failure of tools to tame uncertainty, but also of a mindset informing practices and the culture of the financial sector that says that the future can be accurately and reliably modelled and that humans will (and should always) behave rationally.

This special issue arises in this context of ‘normal accidents’, ‘feral futures’ and a cultural mindset that seeks to calculate the incalculable at great human and environmental expenses. While not assuming that plausibility will get us out of the bind of our failures of both imagination and prediction, we do propose that teasing apart the meanings and workings of assessing future-oriented knowledge is helpful and timely. As Adam (2005) has described, there is a “crucial disjuncture between the seemingly unbounded capacity to produce futures that can extend over thousands of years, the lack of knowledge about potential outcomes and impacts of these creations and the socio-political inability and/or unwillingness to take responsibility for the futures of our making”. The articles collected in this special issue thus share an initial provocation and set of questions: *Is plausibility another mode of relating to the future that acknowledges an intrinsically uncertain and contingent future? Does plausibility offer a pathway away from the pathologies of prediction and probabilistic thinking that enables better decision making in the present?*

Plausibility arises for us, and for the authors in this special issue, as an under-theorised and illusive concept yet one that is relevant to move beyond a search for a factual encounter with the future. More than a MacGuffin, plausibility is a premise that opens doors for encountering important questions about uncertain futures and our societal ability to manage them. What follows is our zooming in and out of plausibility, experimenting with different lenses that reveal foreground and background to a concept that we ultimately reject as a MacGuffin.

### 3 The backstory: the impetus of our concerns

Plausibility first came up for the Center for Nanotechnology in Society (CNS) in 2007–2008 in the course of a technology assessment research project on human enhancement that refined scenario methodologies to create ‘triggers’ for public discussion about the societal implications of nanotechnology by developing mini-scenarios, or scenes, that featured nano-enabled applications (Selin and Hudson, 2010). Through this NanoFutures project, we developed procedures to vet the ‘scenes’ with scientists and engineers for plausibility in order to ascertain the viability of the speculative technologies to ensure that we were positing valid possibilities (Selin, 2011). Yet unravelling what plausibility is and how one goes about establishing it raised questions about the ontological and epistemological status of the future. We understood that we were not working to establish a feasibility, or accuracy or even realism. However, through this process, we realised that what plausibility really meant was not totally clear and felt practically important and intellectually exciting.

Thus, plausibility arose not as a theoretical debate within the literature on scenarios, but rather emerged from an applied research project at the CNS. Yet plausibility is often put forth in the literature as a characteristic of scenarios despite a highly diverse practice with sharp distinctions between scenarios that are qualitative or quantitative, normative or descriptive, participative or expert. There also exists a bifurcation within future-oriented practices of those who see uncertainty as reducible and prediction a possibility and those methodologies that take uncertainty as intrinsic and prediction unreasonable (Wilkinson, 2009). Within these genealogies of scenarios (Bradfield et al., 2005), there are differences in disciplinary understandings of scenarios and diverse applications of scenarios that maintain distinctive purposes, goals, epistemologies, and contexts of use. Even amidst the diversity of this field of practice, an ongoing debate surrounds the relative importance of probability and plausibility (Ramírez and Selin, 2014), which deeper still, grapples with the epistemic dimensions of the future. These debates reach into what constitutes quality in anticipatory knowledge and are infused into the concerns collected in this special issue.

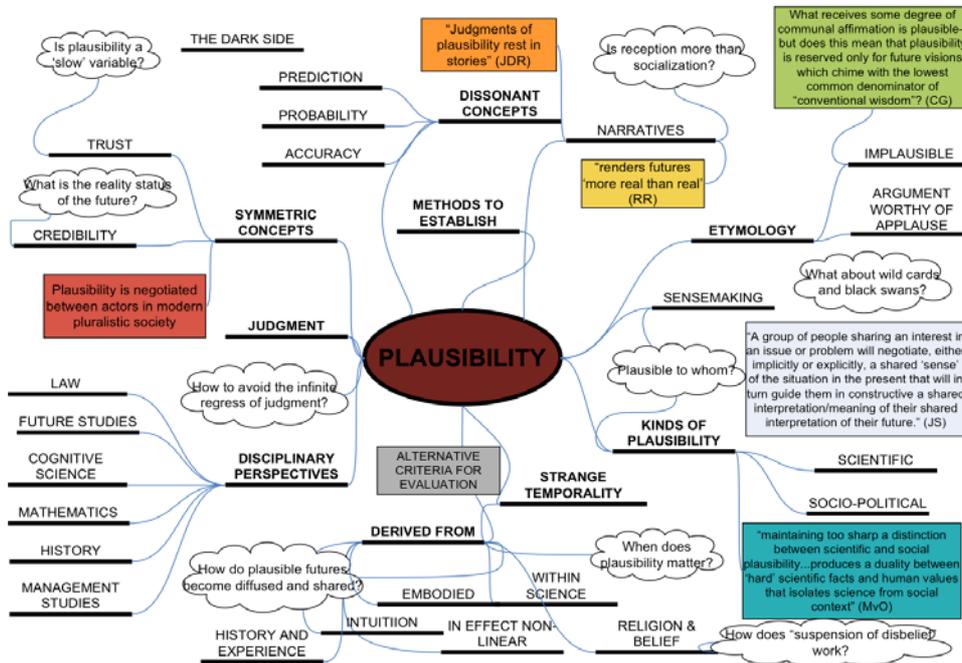
Discussion about plausibility continued at the Oxford Futures Forum and led from Ramírez’s attention to the subject and Wilkinson’s commitment to addressing the epistemological foundations of scenarios (Wilkinson and Eidinow, 2008). Some critical questions about plausibility that occurred at this event and were carried forward (Wilkinson and Ramirez, 2009) included:

- Where is plausibility located temporally – in anticipatory knowledge, in retrospective sensemaking, in imagination and creativity; in individuals or in conversations or teams? Is it most salient in the past, present or future?
- What roles does plausibility play in relating past, future, and present to each other?
- How do probability and plausibility relate to each other? How might they overlap and help each other? How do they contest each other?
- Which intellectual fields have most to say on it?

In November 2009, the CNS, in collaboration with the Consortium for Science, Policy and Outcomes (Arizona State University) and the Institute for Science, Policy and Innovation (University of Oxford), convened an interdisciplinary group of scenario practitioners, science and society scholars, philosophers and historians to explore the

conceptual and methodological underpinnings of plausibility. This involved nurturing an appreciation of what it is, why it matters, how it is evaluated, and for whom it occurs as a central value. The goals of that event were to identify the ‘state of the art’ (concepts, empirical studies) regarding plausibility; account for research and knowledge gaps surrounding plausibility; and develop a coordinated research agenda. As such, the discussions were far-reaching (see Figure 1) and helped to sketch research trajectories that ranged from the exploration of analytical modes of accounting for plausibility to more philosophical inquiries related to future-orientation and being.

**Figure 1** Conceptual mapping of discussions during the International Workshop on Plausibility at Arizona State University, 2009 (see online version for colours)



relation between science and policy is no longer functional, and that it has to be changed to a science-policy model based on quality. This acknowledgement has several implications for governance, for those who produce knowledge and for those who deploy it. Through an edited collection of stories, Guimarães Pereira and Funtowicz (2009) illustrate how science cannot be considered as the sole input under conditions of uncertainty and large unknowns; other *knowledges* and their sources are often directly, even crucially, relevant, especially when the activity is speculatively examining time and societal transformations.

The post-normal science framework, and its guiding principle – *quality* – requires the invited or non-invited participation of an extended peer community<sup>4</sup> (Funtowicz and Ravetz, 1990). Plausibility relates directly to the quality of knowledge produced in realms where facts are uncertain, undetermined or even unknown. The establishment of what is ‘plausible’ and ‘implausible’ needs necessarily to be a collective endeavour and cannot be left exclusively to specific societal groups, especially in the context of anticipation, if not because of responsibility in a broad sense, then at least in light of issues of accountability.

The connections between plausibility and post normal science gather steam as society hastens its move into circumstances beyond the actuarial calculation of risk and force the recognition of the impossibility of assigning probabilities. Foucault’s (1983) ideas about normalisation as a modern power function and numbers-based governance points at statistics and probability as the key operations to maintain institutions and governance. Through statistical operations individuals and other factors are mere objects of measurement that can subsequently be treated according to relevant norms and rules. If numbers cannot be used, it is not possible to talk about risks, liability and responsibility. Quantification has been very successful in many disciplines but quantification methods have been experimented in areas where incommensurability reigns and rigor is not a quality of the numbers produced, such as in human sciences (Porter, 1953). When these approaches move into the future, methods confront what French futurist Bertrand Jouvenal (1967) laid out: the expression “knowledge of the future” is a contradiction in terms. But then, the questions arise: What other mechanisms can we adopt to govern under uncertainties and unknowns? Who, in the face of limited data, will be sharing the responsibility of enacting one or another path to the future? What language can we use that speaks different ways of knowing that does not rely on certitude?

Common to these two forays into plausibility is a fixation on science and technological systems and their social role in shaping futures. In the CNS context, as in the post normal science community, it is understood that new technologies stress our capacity to anticipate and require new forms of governance. Anticipation is important because choices about emerging technologies are complicated by the Collingridge dilemma (Collingridge, 1980) whereas “outcomes cannot be predicted until a technology is adopted, yet once path dependencies materialize and technologies get ‘locked in’, control or modulation becomes difficult as rigidities in markets, cultural values, institutions and policy form” [Selin, (2011), p.724]. Whether from the vantage point of technology assessment or governing science, the base question is one of who is responsible over the long term and what does responsibility for the future look like.

What is evident in these early discoveries, conversations and theories is that there is much unpacking to do of the what plausibility means and what role it plays. Plausibility sparks questions about anticipatory knowledge and even reaches more fundamentally into what we know and how we know it. The very (un)knowability of the future is illuminated

in such a way that we can begin to unravel the norms, values, methods, cultures and logics that give rise to a variety of future-oriented practices. While plausibility is fascinating and compelling, it is not unproblematic or well resolved. In order to clarify plausibility and its kindred term, probability, we have found it useful to look back in time to better understand the impulse to calculate futures in numerical terms rather than draw on other ways of ‘knowing’ futures.

## 5 Prelude to plausibility: the historical beginnings of plausibility

In this section, we will briefly explore with a historical lens developments of our trust (Porter, 1953) or faith (Ravetz, 2008) in numbers, identifying for the sake of our argument some moments when our usage of words, our colloquial language has been replaced by the invocation of numbers, focusing on the situations where we seek examples and models to follow, or to diagnose situations and deal with the unknown and uncertainty, or yet to make sense of the world and to anticipate our future states. We have been for some centuries now and for different reasons in a Cartesian mindset where concepts like statistics and probability have been primary resources to make and justify decisions and implement policies, often underpinning sometimes whole fields of research as the basis for ‘predicting’ and controlling our present and futures.

Invocation of ‘examples’ as models for virtuous conduct or effective practice was at the basis of political, legal, social and medical activities throughout the period preceding Enlightenment (Harvey, 1995; Pender, 2006). *Exemplaria*, the Latin expression for usage of ‘exemplars’ saw its crisis through literature in the words of Boccaccio, Montaigne, Petrarca, Cervantes who through their writings questioned how the doctrine of *imitatio* could address matters of contingency, chance, uniqueness and plurality of perspectives (Goldhill, 1994; Hampton, 1998; Rigolot, 1998; Stierle, 1998). By the end of the Renaissance, another type of order independent of the authority of chosen personalities needed to be sought. This tension emerged in political and societal arenas of the Western world and nature seemed to be the perfect medium to seek this concealed order, the normal and examples to follow. Mathematics embraced this endeavour; as Galileo wrote: “unless we can understand and express the world in mathematic language we will be lost forever in obscure labyrinths”<sup>5</sup>.

The way was paved for what was called statistics, the establishment of the ‘normal’ and the ‘average man’ (Hacking, 1990). Statistics emerged in the early 17th century, in some countries, like the UK and Sweden, the questions arose from elite concerns (morality, health, etc.) and in others they were aimed to ascertain the power of the state, like in France and Prussia (Hacking, *op. cit.*). As in present times, underlying each question or enquiry, are tacit assumptions about the functioning of society and nature, as well as implicit normalisation ideals relayed by the agents that pursue this form of enquiry. If statistics were first of descriptive nature they became later the means of understanding the material world, adopted as laws on their own right (Hacking, *op. cit.*). The numbers generated by this form of enquiry, followed rational, objective and legitimate protocols. Evidence for causality laws arising from this form of enquiry thrive along an enormous number of disciplines. Enumeration requires categorisation, and defining new classes of people (or species, values, etc.) for the purposes of statistics which has consequences for the ways in which we conceive of others and think of our own possibilities and potentialities. It is therefore not far fetched to see statistics as an

attempt to replace the authority of *exemplars* with representativeness, averages and the ‘normal’ as the newer *exemplars*, as an attempt of a different rationalisation. However, it is important to keep in sight that what is derived as representative, average and normal, is actually established and approved by the agent (state, authority, elite, etc.) that conducts the enquiry.

What this early history of the rise of statistics shows is how the hidden orders of the world could be tamed through mathematical elaborations. What quickly followed was that not only the present could be ordered, but that even future states could be predicted. *Probabilis* was once about ‘*opinio*’; T. Aquinas’s definition of ‘*opinio*’ refers to beliefs or doctrine not proved by demonstration. The meaning of the word was among other things ‘worthy of approbation’. Hence, in medieval times, probability was not primarily a matter of evidence or reason. Probability indicated approval or acceptability by intelligent people. The primary sense of the word *probabilitas* is not evidential support but support from respected people. This meaning reminds us etymologically of plausibility, whereas something plausible is ‘worthy of applause’. This also means that something that was probable could also be false.

Probabilities as we know them today were developed in the 17th century; their link with numerical ideas of randomness seems first to have occurred in print only in 1662 with Pascal being called the founder of modern probability theory. There are a number of ‘interpretations of probability’ (see for example, Hacking, 1975). While the classical and logical interpretations of probability deal with examination of the space of ‘all possible outcomes’, the *frequentist* interpretation of probability deals with a ‘finite actual space of outcomes’. The establishment of the possible or the actual outcomes pose questions regarding the establishment of that space to start with, even with the most elementary examples of a tossing of a coin. But in here we are more concerned with other types of interpretation, which are generally referred to as subjective probability. These types of probability rely on degree of belief, utilities, Bayesian methods<sup>6</sup> and others alike, where ‘expert opinion’ is the key operation to establish the resulting figures. These are the types of probability used in situations where gaps of knowledge abound, such as the case of climate change (Dessai and Hulme, 2004). These are the types of probability that are most commonly used to estimate risk and that underpin social and environmental modelling, hence in situations where uncertainties are high, causality chains are incomplete or unknown, and where future states can be highly speculative. In such situations numbers derived cannot be objective, nor neutral, and are often misleading. Even if assumptions are stated – which is not always the case – those numbers can hide specific conceptions of the world that were not made transparent. These numbers are derived after values, intuition and imagination of the ‘experts’ that construct them. They are neither accurate nor they are authoritative. They represent the thinking of the specific people, often elite professionals, that create them.

This teasing apart of probability invites us to consider the assumptions and cultural values that become ensnared in models. Probability and other numerical bases for prediction are privileged in Western society and treated as superior to qualitative renderings. Despite many testaments to the shortcomings of statistics (e.g., Hacking, 1975; Siegfried, 2010; Alonso and Starr, 1989; Woolf, 1989), probability (Hacking, 1990), and prediction (e.g., Sarewitz et al., 2000; Pilkey and Pilkey-Jarvey, 2007) whether the issue is climate change or epidemiology, probabilities and associated operations carry the air of exactness and are assumed to be cleansed of the messier trappings of values, culture and subjectivity. However, perhaps we have never escaped

*exemplaria*. Instead, we have given it different forms and disguised our need to invoke examples – as if this was a not rational thing to do – with supplying numbers. We are however, witnessing the irresponsible character and uselessness of so many numbers that are given to us in everyday circumstances as well as in catastrophic conditions when we need good sense the most. Now with the emergence of the promises of ‘big data’ to reveal what the masses are doing, thinking and believing, this quest for perfect numbers continues and normalisation attempts are further applauded. Questions accumulate about whether this more attenuated accumulation of data about self and society are an improvement on undifferentiated statistics or just another disguise.

With raising plausibility as more than a distraction, we propose that the questions evoked and the mysteries unfolded by pursuing plausibility are worthy of attention. We are also perhaps timidly proposing, through plausibility, ways to open up decision making to language that can account for intuition, imagination and experience in a far richer and more meaningful fashion than the numbers can achieve. To escape the tyranny of numbers as the only rhetoric deployed in matters that concerns us all, we propose to reflect on this situation using a concept to which little attention has been paid: plausibility.

## 6 Portraits of plausibility

The collection of papers in this special issue is not representative of the possibilities opened up by pursuing plausibility in all of its dimensions, nor do they fully capture the far-reaching and rich discussions that took place during the two workshops in Tempe and Ispra. However, the theme of plausibility has enabled a broad swath of papers that take up questions about the limits of prediction, the power of persuasion, and what to do about incalculable futures. The fields looked at are intimately linked to planning, foresight, and policymaking. Given the diverse interpretations and varied depths that plausibility as such is investigated, perhaps we can acquiesce that plausibility shares one quality with Hitchcock’s MacGuffin. A MacGuffin can be simply defined as a “a plot element that catches the viewers’ attention or drives the plot of a work<sup>7</sup>”... “which could refer to nearly anything at all in a story, given that audience-member attention occurs at the individual level and is not reliably predictable”. Plausibility captured attention, sparked diverse reflections and led the authors in this special issue to quite different places.

These papers present several different explicit or implicit uses of plausibility which adds depth to the collection but also highlights that the theme is not well toiled and that there are few agreed upon precepts. We have purposefully invited authors from different disciplinary traditions from philosophy to sustainability science, and so the collection also reveals how different fields of study interrogate a new term or make sense of a practice. Sometimes plausibility takes centre stage, and other times plausibility provides the plot of the story or makes a slight appearance.

All papers are focused on the future, whether in the form of scenarios (Wiek et al., Nordmann, Boenink), simulation models (Saltelli et al.) or in the form of policies (Strand, Michelson). Some of the papers are more oriented towards methodological and conceptual aspects of plausibility (Nordmann, Wiek et al., Boenink), while others explore its taken-for-granted invocation in some areas of science and technology such as innovation policies (Strand), geoengineering (Curvelo), or nanotechnologies (Michelson). Others still work to lay groundwork to understand why the current ways of imagining and

modeling need attention and can no longer be left to ‘predict and control’ mindsets (Saltelli et al.). These scholars examine plausibility either as a normative concept or a prescriptive one.

Strand relates his essay on the orientation of current innovation policy by questioning ‘whose applause’ matter. He reflects on the plausibility of constructing plausible futures within the current narratives about the place of science and innovation in the development of human societies. Offering a review of ‘old Utopias’ or ‘dreams’ about ‘science and progress’ he concludes that those current unquestioned policies’ dreams about science and innovation are not totally different from those of Condorcet: increased wealth and welfare through scientific and technological development and free markets and improved politics and morality through social sciences. For Strand it is the taken-for-grantedness of unchallenged plausibility claims about current narratives of innovation that needs attention and action from the side of those that can do something about it: scholars, policy-makers, business and citizenry.

Nordmann examines plausibility within a graduated ladder that ranges from logically possible to actually real where he suggests plausibility is equivalent to *serious possibility*. Furthermore, he associates the assertion of serious possibility with ‘credibility’ within a given world. The term, he argues, pertains to the realm of *abductive* scenarios (or invented scenarios). He introduces the term ‘plausibility<sup>2</sup>’ (‘plausibility squared’) to examine situations where future explorations of plausibility are carried out in worlds for which plausibility claims need to be ascertained. Plausibility in this case has the function of ‘sorting things out’ but Nordmann wonders: How do you ascertain the plausible if in the future you are trying to anticipate you will no longer be the same?

Nordmann argues that ‘plausibility<sup>2</sup>’ brings very little to policymaking advice as a quality, but on the other hand he admits that plausible or implausible claims are inherently linked to the language about the future. Moreover, he observes that ‘plausibility<sup>2</sup>’ judgments deserve to be taken seriously for the purpose of engaging in a hermeneutics of possible futures.

Wiek et al. offer a discussion of plausibility meanings *viz. à viz.* other kindred concepts used in relation to future scenarios, such as consistency, desirability and probability. The authors place plausibility as a central quality criterion of scenarios that allows exploring scenarios for credibility and saliency. They define plausibility as ‘occurable’, i.e., to be able to become real, or to happen. By developing a set of plausibility *indications* precisely based on occurrence, they move to create a scale ordered from minimum threshold for plausibility to maximum evidence of plausibility. Hence, Wiek et al. present plausibility as a quality assessment criterion, and illustrate its application through a scenarios case study in Phoenix in 2050. They illustrate how a plausibility assertion challenges the other kindred terms and in what ways plausibility is dependent on other properties of scenarios. They conclude that plausibility opens up a greater terrain of futures than the kindred concepts of consistency, desirability and probability afford.

Boenink examines socio-technical scenarios and techno-ethical scenarios in order to examine their claims of plausibility. In her paper, she draws from Selin’s (2011) treatment of plausibility to focus on credibility yet introduces further definitional nuances. She observes that plausibility is an important criterion for both types of scenarios, but for the former it is tied to conviction whereas for the latter plausibility serves to counteract the unbounded fantasy and undesirable free floating speculation in policy-making. The plausibility of the scenarios is given in both cases by considering

historical and empirical insight. Boenink argues that plausibility is an important starting point for policy makers to assess emerging technologies with greater reflexivity.

Curvelo examines the plausibility of geo-engineering proposals through visual representations available through different media arguing that imaging and imagining are a continuum. Visual representations are powerful methods of meaning-making and are, from a narrative point of view, qualitatively similar to verbal expressions. Through this analysis she questions whether the plausibility of geo-engineering visual narratives are due to internal developments in the field or to the wider context of current science and innovation. While Curvelo presents how several authors in different contexts conceive of plausibility to either mean believability (reasonable to believe) or actionability (reasonable to do), she instead trains her attention on the semiotics of plausibility through geo-engineering imag[ination]s. For example, visual appeals to history, or to current presents, tangible or quotidian elements, a sense of certainty, coherence and truthfulness and reliability, etc., are commonly used elements to (re)present plausibility in those geo-engineering visual narratives.

Michelson looks into anticipatory governance and the interplay of foresight and policy in the case of nanotechnologies through the Project on Emerging Technologies (PEN) based in Washington DC that ran between 2005–10. He aims at contributing normatively to increasing the understanding of plausibility as a criterion for assessing the quality of future-oriented information. He found through his empirical work several strategies through which PEN could strengthen plausibility of its forward-looking research, recommending these findings to other anticipatory governance enterprises.

Saltelli et al. look into quality of models, simulations and predictions to investigate and propose other methods to better check for quality of those objects. Although the paper mainly focuses on alternative deliberative protocols for sensitivity analysis and auditing, one can see ‘sensitivity’ as a quality of plausibility and indeed many of the steps described to apply this methodology are steps of quality assurance in knowledge production that are equally relevant for other contexts of uncertainty.

## **7 Conclusions: pursuing plausibility**

From these articles and from our own scholarly pursuit of plausibility, we have encountered several dilemmas that we believe need to be further explored to create a safer space for responsible decision making under conditions of heightened uncertainty.

First, we recognise that not all problems are unclear, nor do all situations require futures thinking. Some systems can be well circumscribed, quantified and modelled. Yet in other cases, unknowns loom and problems are ill structured (Simon, 1973) or simply messy (Ackoff, 1974) and it is in these situations that qualitative foresight methods are often brought in to clarify the situation. Plausibility comes in as a complement, perhaps even a point of departure but not necessarily a replacement, to other modes of reasoning.

Plausibility invites multi-disciplinary thinking and a broader range of knowledge and experience to enter into a decision context. To vet scenarios or to better understand a complex situation, engaging interdisciplinary viewpoints is crucial, which suggests the inclusion of all ways of knowing, yet how to carefully integrate diverse forms of knowledge is not trivial. Not unproblematically, plausibility engages the normative, and more work needs to be done to better understand how to handle incommensurability between different value systems. In particular, plausibility is etymologically and

practically related to 'applause' so questions remain about 'whose applause' and the chance that popular opinion (the applause of the status quo) could undercut deviant, minority views. Along these lines, our imagination about the future is often plagued by cognitive traps, such as over-confidence or anchoring (weighing heavily familiar events), that need to be reckoned with.

The very need to delve into plausibility is born from the value found in letting problems and solutions stay unclear longer, in order to eventually arrive at clearer questions. There is something important about suspending judgment and letting go of a need to know. We argue that forfeiting the illusion of control and adopting more humility is enabled through seeking plausibility. Plausibility is about inviting a reasoned ambivalence towards prediction; it is about keeping logic in clear view without rushing to assign probabilities. When there is high uncertainty about the casual relations, nurturing openness to the future and sustaining curiosity may be more useful than definiteness. Scenarios offer one process methodology for 'suspending disbelief' and prolonging reflection; what are other tools relevant for business and policy making that create space for critical co-inquiry into alternative futures?

Some of the authors in this special issue have worked to systematically assess plausibility. One open question is if such processes of domestication erase some of the openings enabled from delving into plausibility. There may be risks to rush in with a new metric, as another measurement scheme could replace one false sense of knowing with another.

We also suggest further research on the dialectic between the plausible and implausible. While there is not a straightforward continuum between the plausible and implausible, there is some kind of spectrum from the extremely plausible (norms, business as usual, foundational assumptions, axiomatic uncertainty) to the implausible, which indeed is nearly inconceivable or incredible. However, people often have trouble articulating their tacit sense of implausibility and there are open questions about the value of pushing that articulation and entertaining what feels implausible.

Overall, plausibility is a generative companion for those interested in thinking through the limits of prediction whilst appreciating the dire need to consider consequences. More than a MacGuffin, plausibility helpfully raises questions and critiques of the risk paradigm without seeking to replace it. As revealed through the multi-textured papers, nailing down plausibility is not the point. Rather explorations of plausibility remind us to resist the impulse for precision and instead to get comfortable with fluidity and uncertainty. Embracing the messiness, when it comes to the future, does not equate to sloppiness, but responsibility. It is about lifting the veil of illusionary control and surrendering to the palliative care for probability offered by plausibility.

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## Notes

- 1 The opinions on this paper are sole of the author and can never be considered as official opinions of the European Commission.
- 2 See <http://www.thefreedictionary.com/plausibility> (accessed 28 November 2013).
- 3 See Toulmin (2001) to better understand why certain methods of inquiry were at a certain point in history given more importance than others.
- 4 An *extended peer community* consists not merely of persons with some form or other of institutional accreditation, but rather of all those with a desire to participate in *extended peer* review processes for the resolution of a specific issue.
- 5 In Galileo Galilei, *Il Saggiatore*, Cap. V.
- 6 See a comprehensive piece by Hájek (2012) on interpretations of probability.
- 7 MacGuffin, *WordNet 3.0*, Princeton University [online] [http://en.wikipedia.org/wiki/MacGuffin#cite\\_note-14](http://en.wikipedia.org/wiki/MacGuffin#cite_note-14) (accessed 8/12/2013).