Feng Shui and the Demarcation Project

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Abstract
The vast majority of well-informed philosophers of science and scientists who are clearly (uncontroversially) scientists are able to extensionally differentiate between almost all scientific and non-scientific practices, disciplines, theories, attitudes, modes of procedure, etc., and do so or would do so in much the same way. This legitimately leads to the conclusion that the main problem of scientific demarcation has already, in a sense, been solved, although an explicative integrated account of that solution has not yet been given. Doing so is the goal of the project proposed in Fernandez-Beanato (Journal for General Philosophy of Science 51(3):375–391, 2020b). To advance toward the solution of the scientific demarcation problem, this article executes part of that project: a first step for scientific demarcation is the composition of a broad “list” (set) of accepted characteristics, conditions, or properties of science, or indicators of scientificity (most of them, by themselves, unnecessary and insufficient) which might be collectively used to establish a demarcation between those theories, cognitive fields, practices, etc. which are scientific and those which are not. This article deals with feng shui as a clear case of a non-science. It defines feng shui and then lists properties of science that feng shui possesses and properties of science that it lacks. This article then shows that the proposed demarcatory list demarcates feng shui as non-scientific, in agreement with the current philosophical and scientific consensus.

1 Introduction

The problem of how to demarcate science from non-science remains unsolved. An intensional epistemic demarcation of science has eluded philosophers so far because science is a complex phenomenon composed of many epistemically relevant “dimensions”, facets

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1 The main problems of scientific demarcation are defined here as those of “establishing criteria based on reflection on science and its history to: i) most generally, intensionally demarcate science from non-science (i.e. the problem of defining “science”); and: ii) in particular, to intensionally demarcate science from pseudoscience.” (Fernandez-Beanato, 2020b, p. 375).

2 “An intensional definition of ‘science’ would involve properties of [science or of] scientificity, as opposed to an extensional definition, which would be given by a list of all the sciences.” (Fernandez-Beanato, 2020a, p. 97).

3 An epistemic scientific demarcation criterion is a criterion that determines a demarcation between science and non-science with respect to what is “special about the knowledge claims and the modes of inquiry of the sciences”, i.e. about exclusive or typical properties that these claims and methods enjoy “in a way that exhibits an epistemic guarantee or evidential basis that is [epistemically] safer for science than for non-science” (Laudan, 1983, p. 118).
or aspects: it includes methodic, propositional, pragmatical, psychological, attitudinal, social, axiological, institutional and other types of epistemically relevant components.

This multiplicity of epistemically relevant aspects of science has the consequence that, even if a succinct definition of broad science can be given (as was done in Fernandez-Beanato (2020b)), such a definition is difficult to apply consensually in practice without the specification of its many more concrete, low-level properties of different types.

Consequently, the debate about scientific demarcation has paused. Paradoxically, this situation coexists with an immense corpus of mostly mutually consistent philosophical sources about demarcation. Many high-quality authors have published proposed lists of scientific demarcation criteria. Many of the properties of science surveyed here were presented in negative form in these sources, as reasons why some units of analysis are pseudoscientific, or were presented as properties of good scientific theories, focusing on the propositional aspect of science.

It is a commonly held view that there is hitherto no commonly accepted unitary account of the nature of science (e.g. Brigandt, 2013, p. 225). This view is true of explicit, articulated, explicated and approximately complete accounts. As noted in Fernandez-Beanato (2020b), some authors (e.g. Fasce, 2017) have called attention to the small amount of overlap among the abovementioned lists of properties of science—most of which are considerably short (consisting of ten criteria or less)—, worrying that it might be indicative of a lack of consensus among their authors. Indeed, these authors do not always explicitly advocate all the same criteria. But the idea that there is hitherto no commonly accepted unitary account of the nature of science is misleading if it is taken to mean that there is no commonly accepted fuzzy or vague intension (notion) of “science” that can serve as our explicandum. An almost complete lack of dispute among these authors with regard to the properties of science, and the fact that many of the different authors tacitly incorporate many

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4 Following Bunge (2003, p. 180), I use “methodic” for things of or relating to methods (or sets or collections of methods), and I reserve the word “methodological” for things of or relating to studies of methods.

5 Fernandez-Beanato (2020b) reviewed those of Hempel (1951, p. 74), Popper (1959/2002, p. 11; 1962, p. 39), Lakatos (1970, p. 118) and Kuhn (1977, pp. 321–22, 336). Hansson (2017) highlights Gruenberger (1964), Dutch (1982), Radner & Radner (1982), Kitcher (1982, pp. 30–54), Hansson (1983), Grove (1985), Thagard (1988), Glymour & Stalker (1990), Derksen (1993, 2001) and Vollmer (1993). Fasce (2017) adds Tuomela (1985), Schick & Vaught (1995), Coker (2001), Park (2003), Lilienfeld, Ammirati, & David (2012) and Lack & Rousseau (2016). Other works advocating particular properties of science are those of Hempel (1942, 1965); Hempel & Oppenheim (1948), Russell (1949), Bunge (1960, 2003, 2013), Simon (1969), Thagard (2011, pp. 26–9), Mahner (2013), Boudry (2013), Ladyman (2013), Shermer (2013) and Lilienfeld (2016). There are more, but these are the all the ones that will be used in this article.

6 This is the case with some exceptions which have been left out of our list and that will be analysed in a future work—notably, the demands for (i) exclusively natural ontology and problematicism, (ii) a priori methodological naturalism and (iii) scientific realism—regarding a priori methodological naturalism, the approach taken here puts no a priori epistemic territorial constraints on what content can be scientific: it admits that in principle, science could be about anything, i.e. the content of its propositions does not have to be exclusively about something in particular, for example the natural world; it does not even have to be about reality, as it is possible to scientifically discuss counterfactuals). In fact, the 54 authors used for the making of the full demarcatory list are only a sample of the numerous authors who have written on this topic, the vast majority of whom do not contradict their peers otherwise. The rest of the apparent differences among the lists are due to variations in subject matter, or in approach, or in particular interest, or in degree of philosophical sophistication, or to differences in the degrees of importance adjudicated to different properties in incomplete lists, as none of these lists is presented as exhaustive, presumably only those properties considered to be the most important being included in them (the problem of the inequality of degree of importance or “weight” of the properties will be dealt with in a future work).
of the other authors’ criteria into their own analyses, point to the fact that there is indeed a large measure of compatibility (non-contradiction) about the intension of “science”.

There is, indeed, an existing and philosophically informed agreement about the intension of “science”, in that the vast majority of well-informed philosophers of science, other specialists in science studies and scientists who are clearly (uncontroversially) scientists would agree on the vast majority of the properties of science. This would yield a consensus about a multifaceted intension that determines, in turn, the existing consensus about the extension of the term “science”. This is the best explanation for the phenomenon of ready recognition, i.e. the fact that the vast majority of well-informed philosophers of science and scientists who are clearly (uncontroversially) scientists are able to extensionally differentiate between almost all scientific and non-scientific practices, disciplines, theories, attitudes, modes of procedure, etc., and do so or would do so in much the same way (cf. Pigliucci & Boudry, 2013, p. 2; Pigliucci, 2013, p. 11; Boudry, 2013, p. 83). Agreement about extension across a wide variety of cases is prima facie evidence for agreement about intension. The overlapping extension is explained by an overlapping intension: most specialists agree on what is science and what is not science because most of them mostly agree on what scientificity is. All this, in turn, leads to the conclusion that the main problem of scientific demarcation has already, in a sense, been solved, although an explicative integrated account of that solution has not yet been given.7

Doing so is the goal of the project proposed in Fernandez-Beanato (2020b). This article executes part of that project. Fernandez-Beanato (2020b) indicated that the first step to take in order to achieve scientific demarcation is the composition of a broad “list” (set) of accepted characteristics, conditions, or properties of science, or indicators of scientificity (most of them, by themselves, unnecessary and insufficient) which might be collectively used to establish a demarcation between those theories, cognitive fields (CFs), practices, attitudes, etc. which are scientific and those which are not.

That properties which, taken individually, are not necessary nor sufficient conditions for scientificity can be used in a demarcation criterion should not puzzle the reader. It is not a problematic idea. It is a sensible procedure that we correctly employ even in everyday common-sensical reasoning. For example, in my home, eating while standing in the kitchen, making much noise while eating, having muddy feet while eating and scratching vigorously while eating are, taken individually, not sufficient nor necessary conditions to demarcate whether the eating agent in question is me or my dog. But when an agent, in a particular concrete event taking place in my home, displays three or all four of these properties, it is epistemically safe to conclude that the eating agent is my dog and not me. Sensible as this procedure is, it has never been attempted before using hundreds of properties of science for the demarcation of science.

Then, a boundary or “cut” should be ascertained: the minimum score (measured in total aggregated amount of properties featured) that a theory, cognitive field, practice, etc. would have to feature in order for it to be legitimately deemed scientific. The “cut” value for each type of unit would be established to be the scientificity value of the lowest-valued clear case of a scientific unit of that type, provided that

7 In between clear cases of scientificity and of non-scientificity, there might be a third, “middle zone”, inhabited by units of analysis which have the respective “weights” of characteristics typical of each of the other two realms in sufficiently similar aggregated amounts. There is probably a grey or borderline area. “Science” is probably a vague concept, in that borderline cases probably exist.
there were no clear cases of a non-scientific unit of that type that had an equal or greater value. For example, the “cut” value for cognitive fields would be established to be the scientificity value of the lowest-valued clear case of a scientific cognitive field, provided that there were no clear cases of a non-scientific field that had an equal or greater value.

All this would be done by performing comparative analyses of a wide range of several clear cases of particular sciences and of non-sciences of different subtypes (natural sciences, social sciences, pseudosciences, non-pseudoscientific non-sciences, etc.). The identification of these clear cases of particular sciences and of non-sciences will be done according to the assessments made by the current international philosophical and scientific consensus (admittedly, philosophical consistencies are never unanimous, but the consensus about the extension of science is sufficiently extended and territorially covering to serve as an acceptably firm base for intensional scientific demarcation).

This article deals with feng shui as a clear case of a non-science. Feng shui is a cognitive field that is commonly considered to be non-scientific and pseudoscientific by both philosophers and scientists (Sullivan, 1990, p. 264; Tseng, 2013, p. 6; Matthews, 2018, pp. 31, 33; 2019a; 2019b; Hong, 2020). My demarcatory list identifies feng shui as non-scientific, in agreement with the current philosophical and scientific consensus. Section 2 contains a demarcatory list of 36 properties of science (summarized in Table 1 of the Appendix), which is an extract from the full, 217-property list developed by me from the works of 54 authors, after a comprehensive survey of the properties of science that have been discussed in the academic philosophy of science literature. The properties in the extract are those from the full list that were found to be clearly possessed by, or lacking in, feng shui. Subsection 3.1 defines feng shui. Subsection 3.2 lists properties of science that feng shui has, while Subsection 3.3 lists properties of science that feng shui lacks. Section 4 argues that feng shui does not feature enough properties of the demarcatory list and therefore should be deemed non-scientific.

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8 In line with common philosophical thought (Hansson, 2017), this article defines a “pseudoscience” as a non-scientific doctrine or field that is presented by its theoreticians or practitioners as if it were scientific or a science or that is easily taken to be so by a given epistemic community (Fernandez-Beanato, 2020b).

9 Regarding clear cases of particular sciences, many cognitive fields are nearly universally accepted as scientific, e.g. the formal sciences, the natural sciences of physics, chemistry, astronomy, and biology, and, with less certainty, psychology and sociology. The fields of analytic philosophy and human history (when properly conducted) are also nearly universally accepted as sciences in the broad sense (as understood in Bunge (1983), Hoyningen-Huene (2013), Hansson (2013, pp. 62–64), Boudry (2017) and Fernandez-Beanato (2020b)). Also, several clear cases of non-scientific fields feature prominently in the academic scientific and philosophical literature. Genethliac astrology has been used profitably as a clear (and paradigmatic, in the everyday, not the Kuhnian sense of this word) case of a non-scientific and pseudoscientific CF according to a consensus shared by philosophers, scientists and historians of science (Thagard, 1978, p. 223; Grim, 1990, p. 15; Pigliucci, 2013, p. 17). Parapsychology (at least the type that resorted to paranormal explanations) is another CF commonly considered to be non-scientific and pseudoscientific (Grim, 1990, pp. 183, 186; Sommer, 2014, p. 42), and creation “science” is often considered to be a prime example of a non-scientific and pseudoscientific CF (cf. Mc Mullin, 1993, p. ix; Boudry, 2011, p. 4) by both philosophers and scientists. The same is true of homeopathy (e.g. Tuomela, 1987, pp. 93–4, 99; Smith, 2012; Cleland and Brindell, 2013, pp. 183–4; Hansson, 2013, pp. 69–70; Koertge, 2013, p. 178; Ladyman, 2013, pp. 49, 53; Mahner, 2013, pp. 30, 35; Pigliucci and Boudry, 2013, p. 3; Baran et al., 2014, p. 41). The contention that common sense is not scientific is correctly justified in Fernandez-Beanato (2020b). And, there is no substantial doubt that fields such as art and religion are non-scientific.
2 The Demarcatory List

2.1 Introduction

In the literature on demarcating science from non-science, authors identify many properties that they use as criteria of science or of scientificity. Sometimes, some of the different epistemically relevant aspects of science are naturally fused. For example, a single property having to do with the practices of institutionalized scientific communities could include inseparable sociological, institutional, pragmatical and axiological aspects. Consequently, the aspects will not always be neatly separated into different properties.

Different units of analysis (e.g. cognitive fields, theories, practices, attitudes) can be assessed with regard to their lack or possession of properties of science. All units of analysis that are accepted as scientific by the consensus of the global philosophical and scientific communities are identified as scientific by them because those units of analysis possess good scientific credentials (qualifications). A unit of analysis has good scientific credentials tout court if and only if it possesses enough properties of science of certain types. Different types of good scientific credentials are possessed by a unit of analysis when it possesses enough properties of science of correspondingly different types. For example, a unit of analysis possesses good propositional scientific credentials if and only if it possesses enough of the propositional and specific properties of science (i.e. specific properties of science which are most directly related to its propositional content, rather than being most directly related to other aspects such as methods, attitudes, etc.).

This article’s main contention is that the sole application of the following list of criteria of scientificity will determine, in the case of feng shui, a scientific demarcation that corresponds to the extensional demarcation of the current philosophical and scientific consensus regarding the extension of the term “science”. Feng shui will be shown to be non-scientific by showing that it does not possess enough of these properties (in other words, by showing that it does not possess good scientific credentials).

This work does not claim to present or to list the intensional properties of science in their simplest forms; rather, the expressions of properties are taken as they are articulated in the literature. Because of this, some of the items mentioned here as a single property are in fact (i) clusters that could conceivably be further decomposed into conjunctions or disjunctions of simpler properties or (ii) are composed of a main property or properties with some preferable specifications indicated. This work does not claim that there is no redundancy in its list of properties, as overlapping is bound to occur in the expressions of different properties. No effort was made to eliminate redundancy because this work aims to give a compendium of scientificity criteria as they are presented in an extensive literature.

Full justification of the inclusion of each property in the list is not given, but citations of the philosophers of science who have appealed to these properties for scientific demarcation are provided. The referencing of these properties to the works of different authors who

10 In case there is a difference between being a property/criterion/aspect of science and being a property/criterion/aspect of scientificity, the inclusive disjunction “of science, or of scientificity” should be deemed implicit every time I write about properties, or criteria, or aspects, of science or of scientificity.
defended them should not be construed as an endorsement of any of these authors’ other positions or stances. The inclusion of a property in the list does imply that I agree that that property is typical of, or advisable in, science.

### 2.2 List of Properties Relevant to Feng Shui

The following is the most comprehensive list of properties of science that has been published in the philosophy of science literature to account for the fact that feng shui is (correctly) deemed non-scientific:

1) **Predictive power**: Science predicts (Hempel, 1942, 1965; Hempel & Oppenheim, 1948; Bunge, 1960, pp. 20–1). Features predictive power (cf. Mahner, 2013, p. 39) in regard to observable phenomena (Hempel, 1951, p. 74; Gruenberger, 1964, p. 1414).

2) **General legality**: Scientific knowledge is legal (Bunge, 1960, p. 17). “Scientific investigation aims to disclose the general principles that govern the workings of the universe” (Kitcher, 1982, p. 35). “Science, as its name implies, is primarily knowledge; by convention it is knowledge of a certain kind, the kind, namely, which seeks general laws connecting a number of particular facts” (Russell, 1949, p. 10).

3) **Explanatory legality**: Science’s explanations are proposed with respect to laws (Hempel, 1942, 1965; Hempel & Oppenheim, 1948; Bunge, 1960, pp. 19–20).

4) **Empirical adequacy within an intended domain of application** (“consequences deducible from a theory should be in demonstrable agreement with the results of existing experiments and observations” in its intended domain, and that agreement should be “not only quantitative (…) but qualitative as well”) (Kuhn, 1977, p. 321).

5) **Has been replicated**: The experiences (i.e. thinking processes, observations or experiments) on which it is based have been repeated/replicated (cf. Lack & Rousseau, 2016, p. 41; Lilienfeld, 2016, pp. 268, 270).

6) **Has a high degree of theoretical confirmation** (success of tests or of predictions) (Vollmer, 1993). Its theories have been confirmed by experiential evidence to a good extent (Hempel, 1951, p. 74; Glymour & Stalker, 1990, p. 94). That is, (a) a high degree of empirical adequacy of the theory to the data already known when the theory is formulated and (b) a high degree of theoretical predictive success, that is a high degree of empirical adequacy of the theory to the new data that is collected after the formulation of the theory (in connection with the virtue of explaining new facts) (Shermer, 2013, p. 208; Ladyman, 2013, p. 54). The doctrine’s problem-solving strategies do not encounter recurrent difficulties in a significant range of cases of the type for which it was proposed (Kitcher, 1982, p. 48).

Science is based on well-confirmed general theories (cf. Tuomela, 1985, p. 228).

7) **Does not use unfounded immunizations** (Derkson, 1993, pp. 23–5).

8) **Connectivity** (Lilienfeld et al. 2012, pp. 21, 25–6; cf. Mahner, 2013, p. 39; Lilienfeld et al. 2015, pp. 8–9): A science is “generally a doctrine or body of doctrines” or practices not “isolated and distinct from the science of its time” (cf. Tuomela, 1985, p. 229).

9) **Contiguity**: For each particular research field, there is at least one other contiguous scientific research field (whose investigators are similarly capable of scientific inference, action and discussion as the members of the first scientific research field are) such that (a) the two fields share some items in their general outlooks, formal backgrounds, specific backgrounds, funds of knowledge, aims, and methodics, and (b) either the domain of one of the two fields is included in that of the other or each member of the domain of one of the fields is a component of a system in the domain of the other (Tuomela, 1985, pp. 216–8; Bunge, 2003, p. 260).
10) Bulk external consistency, i.e. compatibility with the bulk of “known facts”, well-confirmed knowledge and other theories contemporaneously accepted (Kuhn, 1977, pp. 321–2; Dutch, 1982, p. 8; cf. Glymour & Stalker, 1990, p. 94; Vollmer, 1993; Schick & Vaughn, 1995, pp. 180–1; Coker, 2001, p. 4; Park, 2003; Bunge, 2013, p. 21; cf. Mahner, 2013, p. 39). The bulk of consequences of the theory are externally consistent (Dutch, 1982, pp. 8–9).11

11) It uses, and abides by, evidence (Mahner, 2013, p. 39), i.e. empirical data relevant to a hypothesis or theory. This data is obtained through carefully controlled, demanding and precise observation/study or, preferably when possible, demanding, randomized controlled experiments (Simon, 1969, p. 414) or rigorous trials (Grunenberger, 1964, p. 1414; Lawson, 2007, p. 4; Bunge, 2013, pp. 1–48). It is better if this evidence is compelling (Lilienfeld, 2016, p. 268). Science devises rigorous tests for its propositions (Dutch, 1982, p. 12). It “convinces by appeal to the evidence, [and] by arguments based upon logical and/or mathematical reasoning” (Coker, 2001, p. 6).

12) Does not use cherry-picking: Does not use handpicked (“cherry-picked”) evidence, examples or outcomes (Lack & Rousseau, 2016, pp. 28, 45–6; Lilienfeld, 2016, p. 272) if “they are not representative of the general category that the investigation refers to.” (Hansson, 1983, cited in Hansson, 2017).

13) Factual screening and sorting: Features screening and sorting of putative facts that is appropriate to separate pseudofacts from facts (Radner & Radner, 1982, p. 70), and a lack of reluctance to weed out pseudofactual, suspicious or low-quality putative evidence (Radner & Radner, 1982, p. 38).

14) It is evidenced: Presents coherent evidence/proof of its propositions (Dutch, 1982, p. 12; cf. Tuomela, 1985, p. 232). There is no lack of evidence (cf. Coker, 2001, p. 4). It does not falsely claim to have provided proof elsewhere or avoids giving proof citing didactical reasons (Derksen, 2001, pp. 340–1). It incorporates sufficient untainted evidence (Derksen, 1993, pp. 21–3).

15) Methodical scientificity: Has adopted the general scientific method as its main strategy for dealing with its cognitive problematics (Bunge, 2003, p. 260; 2013, p. 48). One definition of the general scientific method is:

The sequence: Survey of a body of knowledge → Choice of problem in this body of knowledge → Problem formulation or reformulation → Application or invention [and application] of an approach for handling the problem → Tentative solution (hypothesis, theory, experimental design, measuring instrument, etc.) → Checking the tentative solution → Evaluating the tentative solution in the light of both test and background knowledge → Revision or repetition of any of the previous steps → Estimation of impact on background knowledge → Final evaluation (until new notice) (Bunge, 2003, p. 180).

“The method of science is not an immutable given but a plastic collection of ideas and rules” (Tuomela, 1985, p. 210). It changes or has changed, however slowly, as a result of scientific inquiry (formal or empirical) (Bunge, 2003, p. 260). The reliability of all the methods and techniques of science can be independently tested (cf. Mahner, 2013, p. 39). “The scientific method is self-correcting” (Schick & Vaughn, 1995, p. 159).

11 External consistency is an unnecessary property because it could be the case that the bulk of external “knowledge” were false.
16) Independent recognizability of correctness: Its descriptions and explanations can be independently recognized as correct (Kitcher, 1982, p. 49).

17) Features “confirmations and disconfirmations, in contrast to pseudoscience, which is typically oblivious to such matters” (Thagard, 1988, p. 162).

18) Checks for variation of variables: Experimentation is epistemically better than passive observation because experiments involve “the control of variables and therefore the possibility of finding and testing” hypothesis, including causal hypothesis (Bunge, 2013, pp. 1–48; Lack & Rousseau, 2016, p. 45).

19) Systemicity: When possible, science treats reality systemically, i.e. like a system that can be conceptually dismantled and analysed. “[S]ystemicity implies analyticity, for understanding a system involves analysing it. Systemicity also includes the valid component of holism, namely the thesis that ‘a whole is more than the set of its parts’” (Bunge, 2013, pp. 13–5).

20) Criticalness: The critical nature of science incorporates a critical, sceptical and examinatory attitude (Tuomela, 1985, p. 212; Mahner, 2013, p. 39). Science is critical (Derksen, 1993, pp. 36–7). It uses constructive criticism within a philosophical matrix (cf. Bunge, 2013, p. 32). Scientific scepticism: “a mindset of doubt coupled with an open-mindedness to new claims.” “[W]e must strike a healthy balance”, a “judicious mix”, “between doubt and open-mindedness; this balance is the approach often termed [scientific] scepticism” (Lilienfeld et al. 2012, pp. 12–13; Lilienfeld et al. 2015, pp. 4–5). Science features a certain scepticism “even towards one’s most cherished theories. Blind commitment to a theory is (…) an intellectual crime.” (Lakatos, 1978, p. 1). Science is self-critical (cf. Derksen, 2001, pp. 332–7; Lilienfeld, 2016, p. 272); it “relies on – and insists on – self-questioning” (Coker, 2001, p. 6).

21) Revises or checks, or at least tends to revise or check, in light of new evidence or criticism. Satisfactorily accounts for the new evidence or answers original criticism (Radner & Radner, 1982, pp. 51, 95; Coker, 2001, p. 1; cf. Derksen, 2001, pp. 332–7) in order to strengthen the scientific content of its proposals, or at least tends to (Radner & Radner, 1982, p. 96).

22) Considers its disconfirmations, misses and incorrect predictions (cf. Lilienfeld, 2016, p. 269). Scientists show regard of refuting information: observations or experiments that conflict with a theory are not neglected (Hansson, 1983, cited in Hansson, 2017). It does not ignore all findings that contradict its conclusions (Coker, 2001, p. 4). It does not ignore conflicting evidence (Coker, 2001, p. 1). The doctrine’s theorists and practitioners do not dismiss unresolved problems as “exceptional cases” (Kitcher, 1982, pp. 48–9). Keeps track of failures (cf. Bunge, 2013, p. 18). “Failures are searched for and studied closely” (Coker, 2001, p. 6). The doctrine’s theorists do not refuse to follow up on unresolved problems (Kitcher, 1982, p. 48).

23) Reactive dynamicity: Science does not tend to remain stagnant in the face of contradictory evidence (Lilienfeld et al. 2015, p. 11): its hypotheses and theories are or would be changed due to confrontation with recalcitrant adverse empirical or other evidence (cf. Tuomela, 1985, p. 228).

24) It is peer reviewed (Park, 2003; Lilienfeld, 2016, pp. 268–9): Its “findings are expressed primarily through scientific journals that are peer-reviewed and maintain rigorous standards for honesty and accuracy” (Coker, 2001, p. 6).

25) Avoidance of cognitive errors and biases: Tends to, tries to and mostly succeeds in its attempt to avoid all the known cognitive errors and biases, including naïve realism, self-confirmation bias, premature closure, belief perseverance, illusory correlation, hindsight bias, groupthink, overreliance on heuristics, availability heuristic, anchoring heuristic,
affect heuristic, representativeness heuristic, base-rate neglect, bias blind spot, unpacking, aggregate bias, search satisfying, diagnostic overshadowing, diagnosis momentum, psych-out error, pathology bias, etc. (Lilienfeld et al. 2012, pp. 14–21; cf. Derksen, 2001, pp. 337–8; Lack & Rousseau, 2016, p. 21). This is served by implementing controlled tests (Lack & Rousseau, 2016, p. 48).

26) Concern for evidentiary criteria: It is not indifferent to criteria of valid evidence (e.g. that evidence must be obtained through meaningful, controlled, repeatable observations or experiments) (Coker, 2001, p. 2).

27) Lack of appeal to mysteries: Does not appeal to unfounded non-mysteries (cf. Tuomela, 1985, p. 228), i.e. presenting a real phenomenon that already has a satisfactory scientific explanation as if it were mysterious, or misrepresenting a scientifically explained phenomenon to make it mysterious, or even inventing phenomena. For example, the Bermuda Triangle “mystery” was a manufactured “mystery”, i.e. it appeared to be a mystery only because facts about the circumstances, location and the frequency of the alleged disappearances with respect to those in other parts of the oceans or seas were grossly misrepresented and even invented by writers promoting the alleged mystery.

28) Does not create mystery: Does not deliberately create mystery where none exists, by omitting crucial information or important details (Coker, 2001, p. 3). The Bermuda Triangle “mystery” is, again, a good example.

29) Rationality (cf. Mahner, 2013, p. 39), i.e. conformity of beliefs with reasons to believe and of actions with reasons for action. “Scientific activity is both end-rational and means-rational” when properly pursued. Its means-end rationality is characterized by its objectivity, criticalness, progress (Tuomela, 1985, pp. 212–8) and all the rest of its properties that are listed here. Concepts, judgements and arguments feature logical rules and are organized in systems, not chaotically (Bunge, 1960, pp. 6–17; Simon, 1969, p. 414; cf. Bunge, 2013, pp. 21–2).

30) Ethos: Its general outlook includes the ethos of the free search for truth (…) and system (Bunge, 2003, p. 260).

31) Willingness to test: The community that proposes the theory or that practices the discipline features a high degree of disposition, willingness and concern towards testing, confirming or disconfirming their theory (Popper 1959/2002, p. 280; Mahner, 2013, p. 32; Lilienfeld, 2016, p. 272). Scientists are willing to test: if it is possible to test a theory, it will be tested (Hansson, 1983, cited in Hansson, 2017). That community does not avoid “putting its claims to a meaningful test” (Coker, 2001, p. 2), e.g. careful, methodological experiments.

32) Disposition to comply: Features a high degree of disposition of that community to comply with the results of the tests once these have been carried out (Boudry, 2013, p. 87). The community does not “ignore results of those carried out” (Coker, 2001, p. 2).

33) Its research community does not evade scientific peer review (Lilienfeld et al. 2012, pp. 21, 24; Lilienfeld et al. 2015, pp. 7–8).

34) Promise: The theory promises further fruitful development (Kitcher, 1982, pp. 48, 54).

35) Progressiveness: Progress is, or has been, made (Tuomela, 1985, pp. 212–8; Grove, 1985, pp. 237–8; Thagard, 1988, p. 168; 2011, pp. 27–31; cf. Mahner, 2013, p. 39). “As time goes on, more and more is learned about the (…) processes under study.” (Coker, 2001, p. 6). Progresses over time: develops new theories that explain newly discovered facts or even new facts (Thagard, 1988, pp. 168–70; 2011, pp. 27–31). New information is uncovered, and discoveries are made. New theories are proposed, and old concepts are modified or discarded in light of new discoveries (Coker, 2001, pp. 3, 6). Progressiveness as opposed to immutability/staticity in the face of problems (taking
into account what alternative explanations are available) (Thagard, 1988, pp. 168–9).

In Lakatosian terms, the scientific research programme in question has undergone/is undergoing theoretically progressive problemshift/s (Lakatos, 1970, p. 118).

36) Self-correctiveness (Lilienfeld et al. 2012, pp. 21, 23, 29; Lilienfeld et al. 2015, p. 7; cf. Lack & Rousseau, 2016, pp. 41, 47; Lilienfeld, 2016, pp. 271–2). “Science is plastic and progressive in the sense that it corrects its results (its ‘truths’) – and, what is more, also its methods. What is most important in science is accordingly just its self-corrective and progressive method rather than its substance or content at any given time.” Self-correctiveness is “a central feature of the scientific method not possessed by any other method for gathering knowledge about the world. Critical scientific discussion, which also concerns the results of testing scientific hypotheses, can be expected to lead to a process in which inquiry corrects its own mistakes – be these mistakes in erroneous data or false theories, or even errors in the scientific method itself”. “[S]cience can systematically eliminate errors. Thus it can be shown for some central scientific tests at least that, when the observations accumulate, an erroneous hypothesis is very likely to be rejected. The same can be said of scientific discussion and debate at large”. “[S]elf-correction can apply both to truth and the methods of obtaining truths” (Tuomela, 1985, pp. 210–1, 213–4). The community of theorists is open to correction (Lack & Rousseau, 2016, p. 20). “[E]rroneous claims tend to be gradually ferreted out [of science] by a process akin to natural selection” (Lilienfeld et al. 2015, p. 11).

3 Feng shui

3.1 Introduction

Let us now see how the list of properties of science in Sect. 2 can be used to rationally reconstruct, or explicate, our demarcatory consensus regarding the non-scientificity of feng shui.

Feng shui (traditional Chinese characters: 風水, simplified: 风水, Hanyu Pinyin: fēngshuǐ), also known as siting and as Chinese geomancy or topomancy, is a traditional practice purported to be able to “harmonize” individuals with their surrounding environments by taking into consideration certain energy forces or fields, therefore promoting the individuals’ well-being. It covers the locations and orientations of cities, villages, farms, buildings, homes, and, traditionally, tombs and graves, their characteristics, structure, architecture, layout, configurations, arrangements, proportions, contents, decoration, the positions and smooth functioning of their internal moving parts, lighting, gardening and aromatization.

The main one of these energies or forces, called chi or ch’i (traditional: 氣, simplified: 气, Hanyu Pinyin: qì), is identified as a primal, universal and flowing life force or vital energy as yet undiscovered by modern science, or, alternatively, as an entity that already has a standing in modern science, for example “electromagnetic energy” (e.g. Brown, 2005, p. 24). To cover both of these ontological versions and any others within the variety of feng shui schools, this article assesses feng shui independently of particular ontologies of the energies or forces in question. This course of action is fruitful since the belief in

12 Feng shui is just one of many disciplines or practices allegedly using chi. Other examples are qigong, reiki, so-called traditional Chinese medicine, martial arts and different Taoist practices.
the alleged results of feng shui practices, which is the common denominator of all versions, is sufficient to assess feng shui as a whole.

Here, “feng shui” is not to be understood in a wider sense, i.e. as including any approach directed to achieve some type of “human–environment harmony”. Such a definition of “feng shui”, besides being non-standard, would be too wide, as it would include scientific approaches guided by considerations regarding ecology, conservation, sustainability, psychology, habitat planning, etc., and featuring no reference to the pseudoscientific beliefs discussed here (see, e.g. Lau, 2005). “Feng shui” is not just another name for the study of “environmental protection and management, energy conservation, renewable energy, sustainability and ecology” (cf. Mak & So, 2015, p. xxvii).

The wide definition would also include practices guided by mere common sense; but, for example mere commonsense architecture is not feng shui. The availability of water, one of the most important principles of feng shui, is obviously essential for human life. “Contentment goes along with living by a lake with nice views” (Matthews, 2019b, p. 264), and a restaurant with a pleasing sea view will attract more customers, because these are “psychologically attractive settings” (Emmons, 1992, p. 48). This is probably why some principles of feng shui “can obviously be explained by theories of modern environmental science” (Mak & So, 2015, p. xxviii); why, if Han (1995) is correct, major landscape criteria in environmental psychology are similar to criteria in the Form (or Shapes) School of feng shui and why Lynch (2003) and Mak and Ng (2005) found that architects and designers design the way feng shui experts would advise them to design (although some of the professionals consulted might have been believers in feng shui) (cf. March, 1968, pp. 254–5). The main findings in So and Lu (regarding airflow) (2001) and those in Low et al. (2012) could be other examples of calling unrelated successes “feng shui”. Contentment also goes along with places, features, arrangements, or configurations favoured by one’s culture or beliefs.

The claim that feng shui is not scientific is a specific, technical one. It does not imply that there are no truths in feng shui or that it does not make any good recommendations. Because of common sense and of socially accumulated environmental experience, feng shui does make recommendations for the siting of villages that are advantageous with regard to self-protection and the use of natural resources such as water and land (see Anderson & Anderson, 1973, pp. 45–50; Yoon, 2009).

Let us see now how feng shui stands in regard to the possession of our scientificity properties.

3.2 The Properties of Feng Shui

The best versions of feng shui have the following properties:

Feng shui is a naturalistic holistic conception that purports to refer primarily to legal workings of the system of nature or of the cosmos. Ernst Eitel, the nineteenth-century German missionary who was among the first systematic Western scholars of feng shui (Matthews, 2019a; 2019b, chap. 7), asserted: “There is one truth in Feng-shui. […] It is the recognition of the uniformity and universality of the operation of natural laws,” (Eitel, 1873 [1987], p. 82). This, and its intuition of interconnectedness and interdependence between humans and their surrounding environments, appear to be why some scholars have said that feng shui is (or was) rudimentary natural science (Eitel, 1873 [1987]) or that it has a scientific aspect (Yoon, 2009). This makes it possess properties 2, 3 and 19.
But feng shui can also use unfounded immunizations to avoid or evade disconfirmations/falsifications. For an example, see its lack of property 7, below in Subsection 3.3.

### 3.3 The Properties That Feng Shui (Mostly) Does Not Have

Feng shui lacks predictive power (lack of property 1) (Matthews, 2019b, p. 297) beyond the advantageous recommendations mentioned in Subsection 3.1 (assessments on the predictive power of a cognitive field (CF) should be done overall and with attention to the possibility of the existence of epistemically better alternative explanations, because almost every belief system predicts successfully in some respect of some time, e.g. believers in the Bermuda Triangle successfully predict that ships and airplanes will be lost in that area). There are no studies published in reputable peer-reviewed scientific journals showing feng shui’s differential empirical adequacy or success in any sufficiently relevant and specific predictions. As, e.g. in the cases of parapsychology and astrology, apparently confirmatory/corroboratory experimental results or successful predictions are reported from time to time. But only a consistent record of success (without an epistemically better explanation) by independent investigators can be accepted for deeming that a CF possesses predictive power or that a claim has been experimentally confirmed/corroborated conclusively. This demand for consistency is because differences of interpretation, flaws in observational or experimental design, mistakes due to cognitive errors and biases, fraud, etc., can occur. Scientific experiments on feng shui are not usually carried out (Eitel, 1873 [1987], p. 69; Matthews, 2019b, pp. 288, 293). But when they are, their outcomes do not support feng shui. “[T]he testing that has been done confirms what is obvious: (…) the bulk of (…) confirmations are simply (…) affirming the consequent” (Matthews, 2019a, p. 4; 2019b, p. 267). Affirmations of the consequent (i.e. arguments of the form P → Q, Q, therefore P) are routine in science, but they should not be used when epistemically better explanatory alternatives are available. Feng shui “claims have never been confirmed in any reputable laboratory test” (Matthews, 2019a, p. 4). Also, in feng shui, “[u]nrepeatable experiments are too frequently adduced” (Matthews, 2018, p. 31) (“unrepeatable” in the sense that they are in-principle repeatable but cannot be empirically replicated) (Matthews, 2018, pp. 26–7).

Feng shui is not empirically adequate (lack of property 4) beyond the advantageous recommendations mentioned in Subsection 3.1 (assessments on the empirical adequacy of a CF should be done overall, because almost every belief system is empirically adequate in some respect of some time, e.g. astrology predicts successfully sometimes, and homeopaths cause remissions via the placebo effect). There are no differentially confirming/corroborating accounts of feng shui published in reputable peer-reviewed scientific journals (lack of property 5). As in the case of astrology, the confirmation/corroboration of feng shui would require a sample of cases that is sufficiently large and representative enough to show that, in general, the number of cases that confirm the predictions of feng shui tends to be higher than the number that is expected to happen by mere chance or for other well-known reasons, that is a number higher than the number that would occur if the feng shui theory were false. Ideally, this would take the form of large-scale statistical studies.

Therefore, feng shui lacks theoretical confirmation (success of tests or of predictions, lack of property 6) (cf. Eitel, 1873 [1987], p. 69).

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13 “Differential” in the sense of being better at predicting than well-established and bulk externally consistent scientific theories.
Feng shui sometimes resorts to unfounded immunizing stratagems (lack of properties 7, 17 and 22) or “‘get out of jail’ cards” (Matthews, 2019b, p. 294). These are stratagems that feng shui theoreticians and practitioners employ to avoid or evade disconfirmation/falsification. In this way, the impression that most results are confirmatory/corroboratory of feng shui can be maintained; in more extreme cases, these recourses can make feng shui immune to testing. For example, feng shui theoreticians, practitioners and believers claim that taking certain feng shui measures indicated for prosperity can bring money to interested parties, but not necessarily, because prosperity has to be understood in a wider sense, as welfare, such as having sufficient food and heat. But then again, prosperity should also be understood in an even wider sense, as sustainability, that is the ability to maintain the conditions that can lead to welfare, which in turn can lead to having money. Sustainability does not necessarily entail welfare, in the same sense that welfare does not necessarily entail monetary wealth. And, in any case, it is up to the individual to take the relevant opportunities to earn money. So, if the individual does not get much money, it can be that she did not make a good enough use of the available opportunities. And even if it could be proved that she did (which is exceedingly difficult), the fact that she did not earn enough money is still not a disconfirmation/falsification of feng shui, because it could still be the case that her karma is awful.

The karmic stratagem, of course, has the power to render feng shui unfalsifiable (empirically invulnerable), because karma is an inscrutable factor. In any case, any defender of feng shui who is concerned with epistemic intersubjectivity or with epistemically justified acceptance of feng shui claims must contend that feng shui predictions are effectively fulfilled in a number of cases. This number, of course, has to be higher than expected by mere chance if there is going to be a non-mystical way of knowing that feng shui works. But this is inscrutable at present because not enough large-scale (observational or experimental) scientific studies of feng shui’s alleged effects have been conducted, if any.

The question of whether feng shui’s use of these subterfuges renders feng shui altogether unfalsifiable is a complex one. Narrowly construed and definite feng shui claims, without reference to karma or to other immunizing subterfuges, are testable and falsifiable, which is why they have been falsified. This is why this assessment will not count the property of falsifiability for or against feng shui.

Feng shui is isolated and non-externally systematic in that it is not, in Bunge’s words, “a component of the system of the sciences” (Matthews, 2019b, p. 280; quote: Bunge, 1987, p. 576). Feng shui is not integrated with any of the most successful uncontroversially scientific CFs; it is not tied up nor intertwined with physics, chemistry or biology. Neither the specific concepts (t-theoretical concepts) of the different theoretical feng shui views on why feng shui would work nor those theories themselves are integrated into uncontroversial science. This makes feng shui lack properties 8, 9, 16, 30 and 33.

Feng shui is bulk externally inconsistent (lack of property 10) (Matthews, 2018, p. 33; 2019b, pp. 293–4) in many ways. One example is its use of scientific terms without regard for their scientific meanings (cf. Matthews, 2019b, p. 235). Empirically, feng shui is inconsistent, e.g. with basic ceteris paribus assumptions in biology, psychology and economy which indicate that no other relevant factors are at work influencing degrees of health or prosperity.

Because of the lack of predictive power, empirical adequacy and experimentation (testing) covered above in this subsection, it can be concluded that feng shui does not abide by evidence (lack of property 11).

Feng shui features “cherry-picking” (lack of properties 12 and 14) (Matthews, 2018, p. 31). Because the CF of feng shui is forced to present an appearance of
empirical adequacy in the face of the abovementioned predictive failures if it wants to be deemed legitimate, feng shui theoreticians and practitioners pick and choose results (see, e.g. the discussion about unfounded immunizing stratagems above in this subsection).

As covered above in this subsection, feng shui does not perform enough scientific observation or experimentation (this in turn indicates that feng shui theoreticians, practitioners and believers have no desire for scientific vindication (Matthews, 2018, p. 31; 2019a, p. 5)). Feng shui is also not (self-)critical (lack of property 20) (Matthews, 2018, p. 31; 2019b, pp. 257–8). Self-criticalness would be best implemented in this case via a more sceptical attitude accompanied by large-scale scientific self-check, including objective observation and experimentation with discrimination of variables and consideration of alternative scientific explanations, which are already available and bulk externally consistent. As covered above in this subsection, feng shui falls short in all of these fronts. Also, as covered above in this subsection, it is deemed acceptable in the CF of feng shui to explain away disconfirmations/falsifications by recourse to unfounded immunizing stratagems. All this means that “disconfirmation is neither sought nor recognized” (Matthews, 2018, p. 31) in feng shui (lack of properties 13, 17, 21, 31 and 32).

Feng shui does not primarily use the general scientific method as its main strategy for dealing with its cognitive problematics (lack of property 15) (cf. Matthews, 2019b, p. 293). From the analysis above in this subsection, it can be seen that this is especially notable in feng shui’s lack of systematic observation and experimentation (in Bunge’s terms, feng shui falls short particularly in the methodic steps of checking its solution to cognitive problems and evaluating it in the light of both test and background knowledge).

Feng shui makes “no effort to disentangle variables and study their contributions” (lack of property 18) (Matthews, 2019b, p. 293). Such disentanglement would be necessary if feng shui conducted scientific (analytic) observation or experimentation. Many authors, including Needham, have noted that feng shui was born out of a holistic worldview; this should not be, and is not, an obstacle to the possibility of testing feng shui scientifically (which is better done by conceptually disentangling variables).

Feng shui remains stagnant in the face of contradictory evidence. This is in part because the feng shui community is willing to use unfounded immunizing stratagems (see above in this subsection) to avoid accepting disconfirmations/falsifications. Feng shui does not progress. Its content of knowledge does not grow (lack of properties 23, 34, 35 and 36). “[D]espite 3000–4000 years of adherence and cultivation, there is no cognitive growth” (Matthews, 2019b, pp. 273–4, quote: 293–4).

As indicated above in this subsection for the features of predictive power, empirical adequacy and experimentation, feng shui claims are not “reported in any mainstream science journal”, and “there are no contributions to established, peer-reviewed, scientific research journals” (Matthews, 2019a, p. 4; 2019b, p. 293) that have come from the feng shui field (lack of property 24).

Given the abovementioned lack of sufficient scientific observation or experimentation and the existence of failures in empirical adequacy and prediction, no scientific bases exist for believing that most empirical results are confirmatory/corroboratory of feng shui or for choosing mostly confirmatory results as the bases for believing in feng shui or in its reliability. This is because, in such situations, believers can be prey to cognitive errors and
biases, including confirmation bias (which is one of the reasons why scientific validation is necessary). The existence of said failures indicates that continued belief in feng shui requires that believers be prey to some of those errors and biases (lack of property 25) (Matthews, 2018, p. 31).

In its disregard for scientific observation, experimentation and in its “cherry-picking”, feng shui ignores criteria for obtaining evidence validly (lack of property 26).

By its use of unfounded immunizing stratagems, feng shui appeals to unfounded non-mysteries, in that it deliberately creates mystery where none exists by omitting crucial information on disconfirmations (lack of properties 27 and 28) (Eitel, 1873 [1987], p. 1; Matthews, 2019b, pp. 265, 288).

Disregarding scientific observation and experimentation in empirical areas, as well as scientific validation and (self-)criticalness, are not conducive to reliable or truth-like beliefs about reality. Therefore, feng shui beliefs do not conform with reasons for believing, which amounts to irrationality (lack of property 29).

4 Conclusions

An intuition of interconnectedness and interdependence between humans and their surrounding environments is coherent, rational, reasonable and correct according to current physics, chemistry, biology, ecology, economy and psychology. So, in some sense, Emmons (1992, p. 40) is wrong to say that “the notion of living in harmony with environmental elements appears to be entirely a kind of magic”. Said intuition could even arguably be considered protoscience in a premodern context (for example as cosmological theory, as in Liu, 2015, p. 33). This, and the abovementioned empirical successes, are reasons why the claim that feng shui is not scientific does not imply that feng shui lacks cultural value or that it cannot be a good alternative in some contexts. But the temporal dimension, the social or cultural context and the availability of epistemically better or worse alternatives should play their parts in assessments of pseudoscientificity.

A protoscience is protoscience only as long as it is the cognitive field that contextually (in a given period and society) has the most properties of science on the topics and aspects of reality that it covers. In this way, previous developments stop being scientific as soon as a (demonstrably) sufficiently epistemically progressive integral separated approach develops.

Feng shui has become a pseudoscientific CF in modern times because of its unjustified continuity in the face of much more scientific and available alternatives. Therefore, the continued belief in, or promotion of, feng shui (with all of its theoretical posits and propositions regarding the empirical) as a science or as scientific is a pseudoscientific attitude.

This article has shown that feng shui lacks at least 33 of the properties of science featured in the demarcatory list (properties 1, 4–18 and 20–36), while having at least 3 (properties 2–3 and 19). This (possibly provisional) tally counts strongly against the scientificity of feng shui. Although the minimum score for a CF to be legitimately deemed scientific has not been ascertained yet, because more case studies are necessary, it seems clear that feng shui will not reach it.

This is yet one more case in which the full demarcatory list demarcates in a manner that is equivalent to that of the current international philosophical and scientific consensus regarding the extension of the term “science”.

Feng Shui and the Demarcation Project
## Appendix

Table 1  Chart of properties

| Number of the property in the list | Short name of the property                                      |
|-----------------------------------|-----------------------------------------------------------------|
| 1                                 | Predictive power                                                |
| 2                                 | General legality                                                |
| 3                                 | Explanatory legality                                            |
| 4                                 | Empirical adequacy                                              |
| 5                                 | Has been replicated                                             |
| 6                                 | High degree of theoretical confirmation                         |
| 7                                 | Does not use unfounded immunizations                            |
| 8                                 | Connectivity                                                    |
| 9                                 | Contiguity                                                       |
| 10                                | Bulk external consistency                                        |
| 11                                | Uses, and abides by, evidence                                   |
| 12                                | Does not use cherry-picking                                     |
| 13                                | Factual screening and sorting                                   |
| 14                                | It is evidenced                                                 |
| 15                                | Methodical scientificity                                         |
| 16                                | Independent recognizability of correctness                      |
| 17                                | Confirmations and disconfirmations                               |
| 18                                | Checks for variation of variables                               |
| 19                                | Systemicity                                                     |
| 20                                | Criticalness                                                    |
| 21                                | Revises or checks                                               |
| 22                                | Considers its disconfirmations                                  |
| 23                                | Reactive dynamictiy                                              |
| 24                                | It is peer reviewed                                             |
| 25                                | Avoidance of cognitive errors and biases                        |
| 26                                | Concern for evidentiary criteria                                |
| 27                                | Lack of appeal to mysteries                                     |
| 28                                | Does not create mystery                                         |
| 29                                | Rationality                                                     |
| 30                                | Ethos                                                           |
| 31                                | Willingness to test                                             |
| 32                                | Disposition to comply                                           |
| 33                                | Does not evade scientific peer review                           |
| 34                                | Promise                                                         |
| 35                                | Progressiveness                                                 |
| 36                                | Self-correctiveness                                             |
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