Trial, error and knowledge in Rittel and Webber's "Wicked Problems" and Latour's Promethean monism [1]

Tentativa, erro e conhecimento nos "Wicked Problems" de Rittel e Webber, e no monismo prometeico de Latour

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7

Abstract:
In the essay "'Wicked Problems' and 'Tame Problems': deconstructing an aporetic dualism in dialogue with Karl Popper and Thomas Kuhn" (2024), we proceeded with a critical and deconstructive analysis of the dualist foundation of Horst Rittel and Melvin Webber, established in the article "Dilemmas in a general theory of planning" (1973). The aim was to escape the aporia created by the two authors, when they ontologically distinguished scientific and engineering fields from planning and public policy fields. In the current essay, we synthesize our already established monist thesis for "tame problems" and "wicked problems" and confront it with Bruno Latour's thesis, also monist, on "matters of fact" and "matters of concern". Starting from the myth of Prometheus in Plato, we proceeded with a critical analysis of the lecture "A Cautious Prometheus?" (2009), by Latour, exploring the "symbolic forms" of language and myth, by Ernst Cassirer, the concepts of trial and error in Karl Popper and scientific anomalies in Thomas Kuhn. The objective is to make Latourian monism explicit and ratify our own, putting into perspective the nature of knowledge and error in different fields, with special attention to design and science.

Keywords: Philosophy of Design, Dualism, Monism, Wicked Problems, Matters of Concern.

Resumo:
No ensaio "'Wicked Problems' and 'Tame Problems': deconstructing an aporetic dualism in dialog with Karl Popper and Thomas Kuhn" (2024) procedemos com uma análise crítica e desconstrutiva do fundamento dualista de Horst Rittel e Melvin Webber, estabelecido no artigo "Dilemmas in a general theory of planning" (1973). O objetivo foi escapar da aporia lançada pelos dois autores, quando distinguiram ontologicamente campos científicos e de engenharia, de campos de planejamento e de políticas públicas. No ensaio atual, sintetizamos nossa tese monista já estabelecida para os "tame problems" e "wicked problems" e a confrontamos com a tese, também monista, de Bruno Latour, sobre "matters of fact" e "matters of concern". A partir do mito de Prometeu em Platão, procedemos com uma análise crítica da palestra "A Cautious Prometheus?" (2009), de Latour, explorando as "formas simbólicas" da língua e do mito, de Ernst Cassirer, os conceitos de tentativa e de erro em Karl Popper e as anomalias científicas em Thomas Kuhn. O objetivo é explicitar o monismo latouriano e ratificar o nosso, colocando em perspectiva a natureza do conhecimento e do erro em diferentes campos, com especial atenção ao design e à ciência.

Palavras chave: Filosofia do design, Dualismo, Monismo, Problemas Perversos, Questões de Interesse.

1 Assumptions, grounds and a conjecture

This essay is the second part of an investigation into the controversial and widespread paper by Horst Rittel and Melvin Webber (1973) "Dilemmas in a general theory of planning" — "Dilemmas", henceforth. The complexity of the concepts involved, as well as the space available to present the arguments, forced us to divide the topic and objectives into separate papers. In a previous essay ("Wicked Problems" and "Tame Problems": deconstructing an aporetic dualism in dialog with Karl Popper and Thomas Kuhn) we proceeded with a critical and deconstructive examination of the dualist foundation of "Dilemmas", adopting monism in its place. The purpose was to escape the aporia contained in Rittel and Webber's (1973, p. 160) thesis that "social problems are never solved."

In the present investigation, we continue with our monistic description of "wicked problems", taking as an analogy the structure of Bruno Latour's thesis, which establishes the concept of "matters of concern", incorporated into his lecture "A Cautious Prometheus?", by 2009. We rely on the relationship between trial and error extracted from the myth of Prometheus, in dialogue with Latour's ideas and Ernst Cassirer's (2011) unified conceptions of culture and non-hierarchical knowledge, with an emphasis on the "symbolic forms" of language and myth.

It is important to highlight that the central assumptions explored in our first essay are set out by Rittel and Webber in 1973, and defended by them as established rules for the practice of contemporary science:

(1) Karl Popper's epistemological demarcation between science and metaphysics, established in 1935 in the first German edition of "The Logic of Scientific Discovery" and published in English in 1959.

(2) Thomas Kuhn's metaphor of science as puzzle-solving, proposed in 1962 in the first edition of "The Structure of Scientific Revolutions".

Thus, we believe that the success of the deconstruction we undertook of the dualism inherent in "Dilemmas" is not due to the use of external theories that are contrary to the authors' thesis. The reason is that we have delved deeper into the analysis of Popperian and Kuhnian concepts, used by Rittel and Webber, but questionably isolated in "Dilemmas" from other foundations that are inseparable from the epistemologies of Popper and Kuhn. The isolation and dissociation of ideas, in addition to transmitting the false impression that "Dilemmas" is in agreement with the conceptions of Popper and Kuhn, produce the flawed dualist thesis, that problems of natural sciences and engineering (tame problems) are understood as being under control and definitively solvable and, therefore, intrinsically distinct from problems of social sciences, planning and public policies (wicked problems), which are uncontrollable and unsolvable. Below we summarize the results of the first paper. This scheme also establishes the foundations of the current essay, and is used in the analysis and comparison with Latour's thesis:

(1) For Popper and Kuhn, theories and, consequently, solutions to science problems are provisional[2]. With the emergence of errors and anomalies and new replacement scientific theories, it is common for such problems to return to the core of empirical investigations,

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[2] Despite the numerous conceptual differences between Popper and Kuhn, both understand scientific knowledge as provisional, not admitting that science can reach an ultimate and essential truth. This is also our understanding.

revealing themselves to be recalcitrant (wicked), as usually occurs with projective, planning and public policy problems.

(2) Assuming (1), the class of tame problems (as Rittel and Webber describe it) reveals itself to be an illusion: a chimera with a positivist head and a scientist tail.

(3) Assuming (2), the dualist description also falls apart, since it is no longer possible to identify two classes of problems that are irreducible and independent of each other, i.e., ontologically distinct.

(4) Invalidating dualism (3) does not eliminate the wicked problems, nor does it mitigate the difficulties we face in this class. Hence the need to develop an alternative description to the dualism of "Dilemmas".

(5) Unlike the qualitative distinction of dualism, the distinction of monism, due to its unitary core, is quantitative or of degree.

(6) If, according to (1), (2), (3) and (4), only wicked problems exist, and (5), they are presented in degrees of difficulty to solve, then (if there is demand in the theories), dichotomies, trichotomies[3], and even more heuristic divisions can be established within the same species of problems.

(7) Dichotomies, by definition, can be incorporated into monisms without generating the opposition of impermeable ontological genres, as in dualisms. By replacing dualism with monism and bifurcating it into a dichotomy, the description for "Dilemmas" gains in coherence and explanatory strength, at the same time that it does not antagonize the models of Popper and Kuhn.

If, on the one hand, this sequence of results exposes the incomplete epistemological basis of Rittel and Webber's arguments, on the other, it may seem like an unconditional defense of monism, as a panacea for the evils of dualism. But this is not the case. In fact, when describing specific realities, and depending on the intrinsic characteristics of those realities, dualism is just as effective an instrument as monism, and both, like the whole framework of gnoseology, contain their own limitations. The risk lies when gnoseology, understood as a "general theory of knowledge", and the ontology that supports it are conceived in a systematic way, as occurs in the classic examples of Descartes, and other unconditional defenders of dualism, and also of its opposite, monism, as in Spinoza, seeking to explain the most diverse aspects and characteristics of the world by a single descriptive theoretical model.

Unlike philosophers from this tradition, Rittel and Webber are apparently not seduced by the idea of explaining reality as a whole, either in a dual or unitary way, not even in the social sphere. On the contrary, in "Dilemmas", when it comes to thinking about society, the authors make an effort to show the growing emergence of diversity and plurality of positions in the 1960s and 1970s. On the other hand, they act in a surgical manner, imposing an irreducibility controlled by the concepts only for the two elements that interest them: tame problems and wicked problems. Thus, contrary to what one might expect, it is precisely some of the restrictions that the dualist model imposes that are used in an insightful way by Rittel and

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[3] The wider use of wicked problems in areas such as the environment has given rise to derivative concepts such as "Super Wicked" (Levin *et al,* 2012).

Webber in defense of the apparently infallible point of view of an irreducibility between classes of objects (Silva; Ribeiro, 2024).

Therefore, if, by definition, dualism is the opposition of elements that are irreducible and independent of each other —and the concepts of wicked and tame problems have these characteristics—, in order to overcome Rittel and Webber's arguments it is not enough to state that all problems have a wicked character, as, for example, Richard Coyne (2005) argues from a pragmatic perspective, because it would still be necessary to identify what is wicked in tame problems (Silva; Ribeiro, 2024). For the same reason, one cannot consider only part of Kuhn's theory, as Bayard Catron (1981) does, to affirm that wicked problems can be tamed (Silva; Ribeiro, 2024). It is necessary to compare the conceptual structure of dualism and the problems of knowledge (as proposed by Rittel and Webber), including the aspects of Popper's and Kuhn's theories that they did not address, in order to identify the flaws in the "Dilemmas" model: (1), (2) and (3) of the previous list summarize these aspects and flaws; (4), (5), (6) and (7) lay the foundations for a monist description.

Within this framework, our perspective does not isolate part of the phenomena and also does not presuppose them as analytically and definitively solvable separately. By its own aggregating definition, we consider monism as capable of incorporating characteristics of problems in science and other fields of knowledge, such as design and other areas of planning, based on a "conjecture", as Popper would say, around a project that understands knowledge as not definitive, and "non-cumulative", as Kuhn would add. In this context, the reflections of the neo-Kantian philosopher Ernst Cassirer act as a mediator, especially in his mature work, "The Philosophy of Symbolic Forms" [4] (1957), in which he establishes criteria for thinking about mythical narrative and its contribution to the sphere of knowledge. His phenomenalist conceptions (equidistant from empiricism and rationalism) add to Kant's philosophy a defense of autonomy and non-hierarchy between sciences and other areas of knowledge, and place him as a philosopher and privileged interlocutor in our investigation. As Cassirer states:

> This acquisition of the world as idea is, rather, the aim and product of the symbolic form the result of language, myth, religion, art, and theoretical knowledge. Each of these builds up its own intelligible realm of intrinsic meaning, which stands out sharply and clearly from any merely purposive behavior within the biological sphere (Cassirer, 1957, p. 276).

And the relevance of the proposal "of the world as idea" is reaffirmed as a link, or "common determination", to the distinction between the different domains of knowledge:

> [...] that symbolism as such, understood in its entire breadth and universality, is by no means restricted to those systems of pure conceptual signs represented by exact science, and particularly by mathematics and mathematical natural science. At first sight the worlds of language and myth seem utterly incommensurate with the, world of conceptual signs: and yet a common determination is manifested in all these worlds, insofar as they all belong to the sphere of representation (Cassirer, 1957, p. 48).

Specifically regarding language and myth, Cassirer considers that these, among other "symbolic forms", contribute to understanding aspects of the world, which must be added to those of epistemology and science in order to determine reality in its "totality":

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[4] We follow the interpretation of Mario Porta (2010, 2011), who does not link "The Philosophy of Symbolic Forms" to semiotics, nor to the work of Charles S. Peirce and pragmatism, but defends the thesis of a continuity of Cassirer's work within neokantism.

> The image world of myth, the phonetic structures of language, and the signs employed by exact knowledge —each determine a specific dimension of representation— and only taken in their totality do these dimensions constitute the whole of the spiritual horizon. We lose our eye for the whole if we restrict the symbolic function in advance to the plane of conceptual, abstract knowledge. We must recognize rather that this function does not belong to a particular stage of the theoretical world view, but conditions and sustains this view in its totality (Cassirer, 1957, p. 48).

These conceptions were originally published by Cassirer in three volumes during the 1920s. During this period, the Vienna Circle stood out on the epistemology scene, defending positivist positions based on sensitive experience, logic and mathematics, seeking to discredit metaphysics by understanding it as incapable of providing a non-empirical basis for scientific theories. Cassirer's reflections bypass this view, keeping a distance from neopositivism and remnants of scientism, which in itself would justify approaching this author. But in this essay, the main reason for dialogue with Cassirer is the relevance of his vision, which reflects on the totality of knowledge, without hierarchizing language, myth, art and theoretical knowledge. Exploring this understanding expands the possibilities for reflection on emerging fields such as design, based on a metaphysical framework that cannot be ignored.

2 The logos in a monist description

With the previous understanding established, and with the contribution of the symbolic forms of language and myth, we can move on to Latour's reflections. This philosopher and anthropologist incorporates some of his ideas, elaborated in works such as "Science in action", from 1987 and *"Nous n'avons jamais été modernes",* from 1991, in the writing of the lecture "A cautious Prometheus?", given at the meeting of the Design History Society, in England, in 2008. Timely for our purposes, Latour organizes these ideas around the growing debate about the expansion of the concept of design. Reading Latour's lecture, we follow in the footsteps of a philosopher who exploits a traditional resource in the history of ideas, of interweaving theory, in the sense of logos, of rational discourse, with mythical narrative, thus enhancing his arguments.

Methodologically, we chose to divide the analysis into three stages. In the current section, we focus only on the formal core of Latour's thesis, on its structural relationship to our monist model for "Dilemmas". In the next section, we examine the myth of Prometheus (sprayed on the theoretical basis of the Latourian thesis), and the relationships between trial, error and knowledge (which are underlying and not made explicit by Latour). This strategy allows us to better decompose and discriminate each of these elements.

Let's make one caveat: we do not align our gnoseological conceptions with those of Latour, since we do not share his professed empiricism, nor his realism. In the paper "Why has criticism run out of steam? From matters of fact to matters of concern", from 2004, this philosopher is explicit about these positions:

> The question was never to get away from facts but closer to them, not fighting empiricism but, on the contrary, renewing empiricism.
>
> What I am going to argue is that the critical mind, if it is to renew itself and be relevant again, is to be found in the cultivation of a *stubbornly realist attitude* —to speak like William James— but a realism dealing with what I will call *matters of concern*, not *matters of fact*. The mistake we made, the mistake I made, was to believe that there was no efficient way to criticize matters of fact except by moving *away* from them and directing one's attention *toward* the conditions that made them possible. But this meant accepting much too uncritically what matters of fact were. This was remaining too faithful to the unfortunate solution inherited from the philosophy of Immanuel Kant. Critique has not been critical enough in spite of all its sorescratching. Reality

11

is not defined by matters of fact. Matters of fact are not all that is given in experience. Matters of fact are only very partial and, I would argue, very polemical, very political renderings of matters of concern and only a subset of what could also be called states of affairs. It is this second empiricism, this return to the realist attitude, that I'd like to offer as the next task for the critically minded (Latour, 2004, p. 231–232).

Latour adopts what he calls a "second empiricism" (not the first, of Locke or Hume, and not probably the logical empiricism of the Vienna Circle) and "a stubbornly realist attitude", but, we would say, a moderate one, due to his preference for matters of concern and not raw facts. He associates himself with William James, and distances himself from the Kantian tradition of apriorism and phenomenalism, of which Cassirer is a part, and with which we are close. And, precisely for this reason, the divergences contained in this caveat are decisive for our objective, because, contrary to restricting the structural comparison we propose, they confirm the idea that monist descriptions are not necessarily the monopoly of any particular gnoseological position and reinforce our arguments in favor of a monism in "Dilemmas" as well.

There is a parallel between our procedure in "Dilemmas" of questioning tame problems in relation to wicked problems and the way Latour attacks matters of fact in relation to matters of concern. As we will see, in a way analogous to the foundations of the first section, Latour seeks to "dissolve" matters of fact, and proposes a thesis, which in its essence is monistic:

> If it is true as I have claimed that we have never been modern, and if it is true, as a consequence, that "matters of fact" have now clearly become "matters of concern", then there is logic to the following observation: the typically modernist divide between materiality on the one hand and design on the other is slowly being dissolved away. The more objects are turned into things —that is, the more matters of facts are turned into matters of concern— the more they are rendered into objects of design through and through (Latour, 2009, p. 2).

And Latour continues to reaffirm his disbelief in the values of modernity:

> For me, the word design is a little tracer whose expansion could prove the depth to which we have stopped believing that we have been modern. In other words, the more we think of ourselves as designers, the less we think of ourselves as modernizers. It is from this philosophical or anthropological position on design that I address this audience tonight (Latour, 2009, p. 2-3).

The polarity described by Latour allows us to identify two sets of concepts that seem to be irreducibly opposed or, we would say, dualistically. If matters of fact are considered from the point of view of a supposed objectivity, then they are external and independent of human beings, in other words, they constitute objects. In this modernist understanding of reality, so-called positive science deals with scientific "facts" as the result of "neutral" observations (or as close to it as possible) of phenomena in nature. Therefore, once identified, described and established through experiments and inductive logic, such facts are understood as permanent and predictable, requiring no further verification[5]. In contrast, in the fields of planning and

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[5] This understanding of nature, with an empiricist perspective, defended in the 17th century by Isaac Newton, promotes induction and disdains the invention of hypotheses: "I have not as yet been able to deduce from phenomena the reason for these properties of gravity, and I do not °feign° [*sic] hypotheses. For whatever is not deduced from the phenomena must be called a hypothesis; and hypotheses, whether metaphysical or physical, or based on occult qualities, or mechanical, have no place in experimental philosophy [physics]." (Newton, 1999, p. 943). The broad success of its physical science indirectly gives credit to positivism and scientism (Burtt, 1925). *According to the footnote in this edition: "°°. The word 'fingo' in Newton's famous declaration, 'Hypotheses non fingo,' appears to be the Latin equivalent of the English word 'feign.' Andrew Motte translated 'fingo' by 'frame,' a verb which at that time could have a pejorative sense. For details see the Guide, §9.1." (Newton, 1999, p. 943).

public policy, matters of concern are always in dispute between researchers, social, ethnic and political groups, in areas where objectivity seems to lose its force and everyone's interest counts, and can conflict or combine with that of others. In this context, objects become things. If we follow Latour's line of argument and his critical view of how modernity defines itself, we can identify close links between this period and "materiality" with positivism (Figure 1).

Figure 1: Scheme of the modernist conception (criticized by Latour) that distinguishes and isolates materiality, preserving matters of fact and objects.
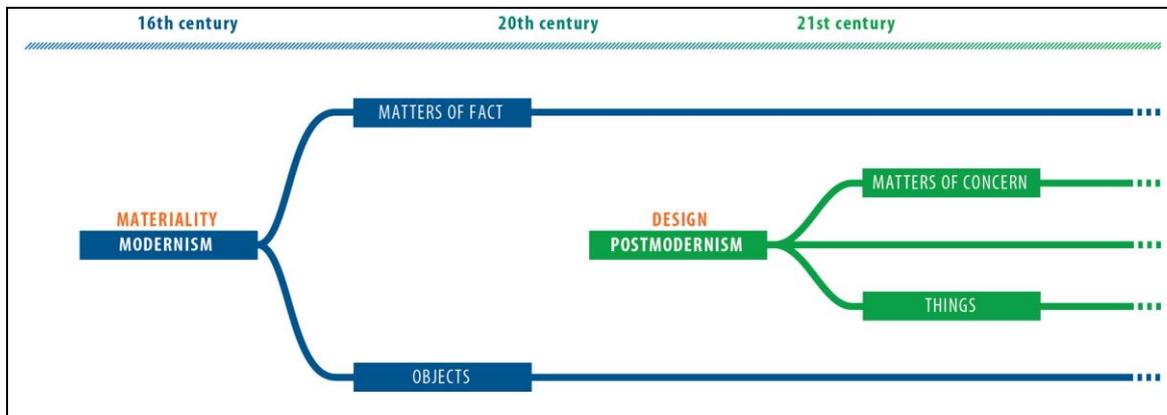
Source: Authors.

In contrast to this understanding, Latour, attentive to the historical and temporal aspects of theories, still at the beginning of the lecture, defends, with the statement that "we have never been modern", a transformation of matters of fact into matters of concern and of objects into things. Design is inserted into this historical-cultural context as a watershed between the modernist vision, which sees science and technology as immutable materialities that can do anything in the name of innovation, and the post-modernist vision, which believes it is enough to eliminate the modern point of view and accept pluralism in order to overcome oppression (Figure 2).

Figure 2: Scheme of Latour's initial conception, not preserving matters of fact and objects, but "dissolving" them into matters of concern and things.
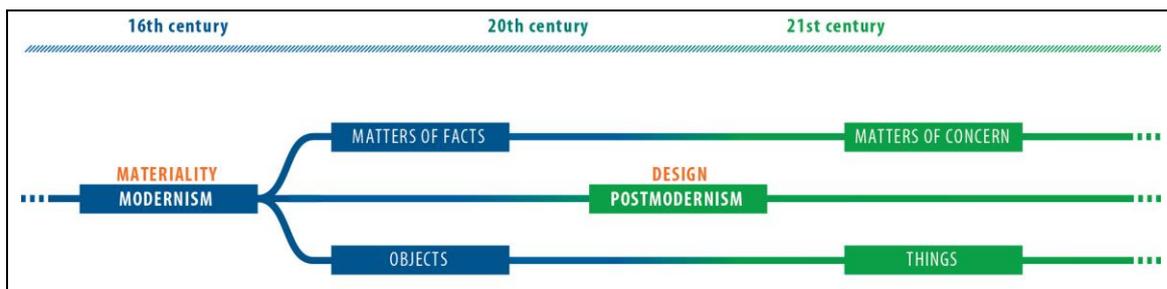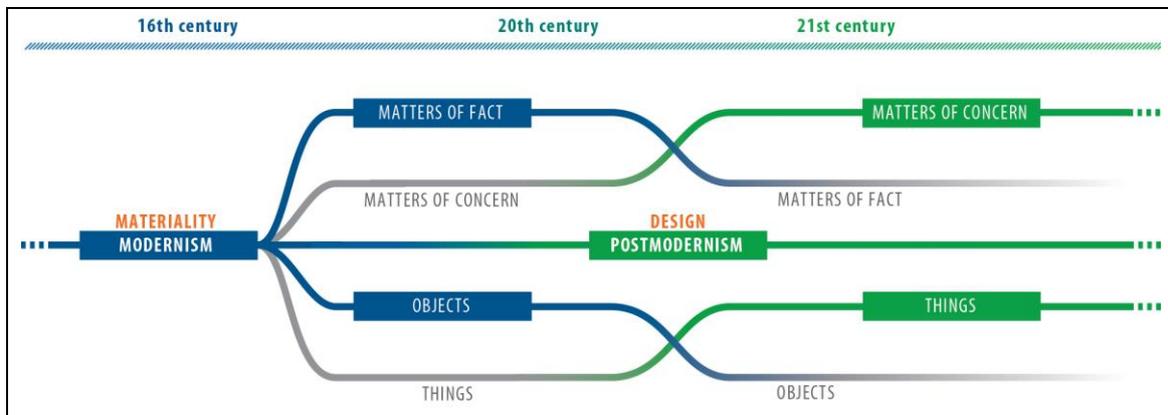

Source: Authors.

But in the final part of the lecture, Latour goes beyond the "deconstruction" of the modern and also questions the insufficiency of the postmodern interdiction:

> However, breaking down the tyranny of the modernist point of view will lead nowhere since we have never been modern. Critique, deconstruction and iconoclasm, once again, will simply not do the job of finding an alternative design. What is needed instead are tools that capture **what have always been the hidden practices of modernist innovations:** objects have always been projects; matters of fact have always been matters of concern (Latour, 2009, p. 13, our highlight.).

As we can see, Latour ends up, in a sense, reworking his notion of transformation (Figure 2) and thereby avoiding the mistake of thinking about a simple conversion of matters of fact into

matters of concern and of objects into things. Thus, when dealing with the "hidden practices of modernist innovations" he refers to matters of concern and things that already existed in modernity, but were incomprehensible to a modernist perspective (Figure 3).

Figure 3: Scheme of Latour's final conception indicating that matters of concern and things already existed "hidden" in modernity.

Source: Authors.

Let's pause for a moment to reflect on Latour's nuanced thinking. His concepts call for special attention to some ideas that germinated in the history of science in the first half of the 20th century, under the aegis of modernity. For example, the statement that "matters of fact have always been matters of concern" (Latour, 2009, p. 13) echoes the heterodox notions of philosophers such as Gaston Bachelard (1947) and Ludwik Fleck (1979) and the historian of science Alexandre Koyré (1957), that facts of science, in a way, are *conceptually made* and not simply discovered and extracted from a pre-existing and unalterable external reality. It is important to note that Kuhn (1970), one of the contemporary critics of positivism and empiricism, was influenced by these philosophers. In this sense, for these authors, including Latour, the popular empiricist maxim that against facts there are no arguments makes little sense. But unlike Bachelard, Fleck, Koyré and Kuhn, Latour assumes, as we have seen, a "second empiricism" and a realism that makes his vision at least *sui generis*. On the other hand, in seeking to substantiate matters of concern, Latour relies on the social and historical conditions in which cultural movements and theories (including scientific ones) are elaborated, and is therefore far from positivism. Seeking a tenuous balance in his position —of claiming to be an empiricist without being a positivist— he denies irreducible and independent pairs (modern *versus* postmodern; matters of fact *versus* matters of concern; objects *versus* things; science *versus* politics), pairs that fit into dualistic and sometimes even Manichean descriptions (Figure 1). Thus, if Latour's thesis is correct, and one of the sides "never" existed, his non-formally expressed monism, as much as the monism we propose for "Dilemmas", results from questioning a dualism that is only apparent.

Bearing these elements in mind, it remains to compare the formal framework of Latourian monism with ours, constructed for "Dilemmas". In order to highlight the structural analogy between the two, it is enough to stick to fundamentals (1), (2), (3) and (4) of the first section, which are the core of Rittel and Webber's deconstruction of dualism and inflection towards monism. To this end, we have preserved the logical and conceptual structure of the arguments of the four items, adapting them to matters of fact and matters of concern, instead of tame problems and wicked problems:

(1) For Latour, matters of concern were hidden by modernist innovations, but "[...] objects have always been projects; matters of fact have always been matters of concern." (Latour, 2009, p. 13).

(2) Assuming (1), the class of matters of fact (as modernists describe it) reveals itself to be an illusion: a chimera with a positivist head and a scientistic tail.

(3) Assuming (2), the dualist description of the modernists also falls apart, since it is no longer possible to identify two classes of matters that are irreducible and independent of each other, in other words, ontologically distinct.

(4) Invalidating dualism (3) does not eliminate matters of concern, nor does it mitigate the difficulties we face in this class. Hence the need to develop an alternative description to modernist dualism. This is what Latour proposes, in his implicitly monist thesis, establishing design at the center of discussions.

With this mirroring, it is possible to identify formal correspondences between the concepts at stake, and the equivalent internal consistency of Latour's tacit monism, and our declared one for "Dilemmas". From this point on, we move from structural formality to an understanding that contrasts ideas, not coincidentally, common to both monisms.

3 The myth and the relationships between trial, error and knowledge

Once the exposition of Latour's thesis has been formally and analytically established, and bearing in mind its central structures, it is possible to state that the resulting theory does not seem to depend on any idea coming from the myth of Prometheus in order to sustain itself. But for the general argument of the lecture, Latour appropriates this narrative, obviously articulating Promethean action with his theory. So, we can ask ourselves, what are the reasons that lead Latour to such an incorporation? A plausible hypothesis, given that his academic presentation is aimed at an audience of designers and design historians, would be the plot of the myth itself and the historical and widespread link between this epic and the universal themes of creation, knowledge and error. This assumption would place Prometheus as an element that reinforces the understanding of Latour's proposal in a dynamic with two heterogeneous discursive components intertwined: myth, as a primordial narrative and logos, as a rational discourse. But, for our purposes, it is interesting to go beyond this possibility. If, on the one hand, it is possible to understand the Latourian thesis without myth, on the other, it is precisely from the Promethean narrative that we can raise the problem of the relationships between *trial, error and knowledge*. To capture the various dimensions involved in this examination, a brief interlude is necessary, dealing with the origins and appropriations of the mythologem of the theft of fire by Western culture, as well as a synthesis of its narrative.

In cosmogony, the analogy of archetypal characters with the recurring theme of the theft of fire is normally interpreted by specialists as the immemorial representation of humankind's acquisition of knowledge and its consequences for peoples' cultural formation. In the West, the appropriation of these narratives, not only on this subject, is an ancient metaphorical strategy. The use of myths as a way of explaining paradigmatic elements, which cannot be historically located (because they go back to prehistory), or not demonstrated empirically (because they belong to the psyche and other immaterial spheres), dates back to ancient Greece, and follows the trajectory of ideas and arts to the present day. Among many renowned examples are the tale

of "Er" in Plato, "Leviathan" and "Behemoth" in Hobbes, "Dionysian Rituals" in Nietzsche, "Oedipus" in Freud, and "Electra" in Jung. And under the direct influence of the Promethean narrative, literary works such as Mary Shelley's "Frankenstein, or, The Modern Prometheus", Günter Anders' theoretical essay "On Promethean Shame", and Latour's lecture "A Cautious Prometheus?" keep this tradition fruitful and alive.

The myth of Prometheus, full of variants in its primarily oral form, was crystallized in written productions such as Hesiod's epic poem "Works and Days", Aeschylus' tragedy "Prometheus Bound", and Plato's dialogue "Protagoras". We chose to present the later Platonic narrative, as we understand that its configuration and plot allow us to better reflect on the polarity and complementarity between the figures of Prometheus and his brother, Epimetheus, in an episteme already consolidated in the period in which Plato lived, placing side by side, trial, error and knowledge.

The Platonic Prometheus is narrated, not by the historical Protagoras, but by a character who represents this sophist, contemporary and adversary of Socrates and Plato. Protagoras (in the dialogue of the same name) is one of those who choose to demonstrate knowledge of a specific topic (in this case, virtue) by telling a story, rather than developing an argument. Here is his condensed narrative:

When the gods "shaped" mortals, they delegated the task of attributing the characteristics of survival and self-preservation to living beings to two brothers of the titan race, Prometheus (Προμηθεύς, etymologically, from *pró* = before, and *manthánein* = to learn: the one who learns before, or the provident, prudent, cautious) and Epimetheus (Ἐπιμηθεύς, from *epí* = after, and *manthánein*, to learn: the one who learns after, or the imprudent, the one who makes mistakes before learning). Epimetheus persuades Prometheus and takes over the distribution of the faculties to the creatures, leaving the final conference to his foresighted brother. However, being careless when distributing physical attributes and protections, Epimetheus forgets about humanity. Faced with the imminent extermination of the human race, fragile, naked and unprotected, Prometheus, *desperate*, steals fire and knowledge in practical arts from Hephaestus (god of craftsman and blacksmith) and Athena (goddess of wisdom), offering them to the human race. From then on, two exclusive traits of the gods are shared with humanity, which begins to articulate words and invent "[...] houses, clothes, shoes, and blankets [...]" (Plato, 1997, p. 757).

After this interlude, and without forgetting the Cassierian understanding of language and myth, let's analyze how Latour establishes the relationship between Prometheus and design. At the beginning of his lecture, the philosopher lists "Five advantages of the concept of 'design'". The second one interests us in particular:

> A second and perhaps more important implication of design is an attentiveness to *details* that is completely lacking in the heroic, Promethean, hubristic dream of action. "Go forward, break radically with the past and the consequences will take care of themselves!" This was the old way — to build, to construct, to destroy, to radically overhaul: But that has never been the way of approaching a design project. A mad attention to the details has always been attached to the very definition of design skills (Latour, 2009, p. 3).

Regardless of the fact that we don't agree with the idea that design has "A mad attention to the details", this quote is essential for us to understand how Latour incorporates the myth into his reflection. Latour's Prometheus immediately loses his reputation for caution, for being

inattentive to detail. But this inattention is precisely the characteristic that Plato and also Hesiod attribute to Epimetheus. However, Latour's criticism of Promethean distraction is not surprising, since the title of his lecture already introduces suspicion about the hero's epithet: "A Cautious Prometheus?"

Latour, a philosopher by training, obviously knows the Protagoras dialogue. If he chooses to subvert the tradition of myth, one must assume he has a reason.

It is possible to conjecture about what motivates Latour. One clue might be his understanding that design never starts from scratch[6], but is always a "redesign". "If humanity 'has been made (or should I have said designed?) as the image of God', then they too should learn that things are never created but rather carefully and modestly redesigned" (Latour, 2009, p. 5, our highlight). From this position that "To design is never to create *ex nihilo*" (Latour, 2009, p. 5), Latour seeks to distance the essence of Prometheus from the purposes of design: "Introducing Prometheus to some other hero of the past as a 'designer' would doubtlessly have angered him" (Latour, 2009 p. 3). If we put these two points of Latourian reasoning together (design never starting from scratch, and Prometheus never assuming himself as a designer), the Promethean action can no longer be understood as "redesigning". However, it is remarkable that this philosopher proposes a concept from the Hebrew-Christian cosmogony (*creatio ex nihilo*) to deal with a Greek myth, without considering a central idea in Hellenic culture: that of "creation" as production from something, *póiesis* (ποίησις). Now, if for the Hebrew-Christian culture a god creates the world out of nothing (*ex nihilo*), on the contrary, the Greek ordered world, the *cosmos* (κόσμος), is not properly created, but produced, built, or manufactured by a craftsman god (*demiurge*), who shapes reality from pre-existing and formless matter, the *khaos* (χάος). The myth of Prometheus follows this cosmogenesis by narrating, as we have seen, one of the stages of production in nature: the distribution of characteristics to already existing living beings and the Promethean adaptation or "redesigning" of Epimetheus' failed plan in order to save the human species. Therefore, by denying Prometheus redesign, Latour imposes yet another divergence from the originary myth, intentionally distancing Prometheus from what he understands as a characteristic of design.

But even if we just look at the question in the title, the suspicion about Prometheus' caution already produces a turn in the structure of the myth. Firstly, the character of Epimetheus is no longer necessary in the economy of discourse, since his essence has been transferred to his brother. And this is what happens: at no point in the lecture does Latour refer to Epimetheus. Furthermore, by concentrating the actions on Prometheus, justifying both humanity's oblivion and the need for theft, without mentioning Epimetheus, he condenses the plot and simplifies it. The strategy also justifies Latour's provocative tone, when he calls the hero's actions the fruit of a "hubristic dream". And, finally, this dream connects with his thesis, associating itself with the modernist movement with roots in a vision long gestated in the West of "to construct" and "to destroy" without rules or limits: "This was the old way", insists Latour (2009, p. 3). On the other hand, for this philosopher, *a new post-promethean path* is "carefully" constituted along with the expansion of the term design:

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[6] Unlike Latour, we understand, like Richard Buchanan (2000) and Per Galle (2002, 2007), that it is inherent to the activity of design to conceive of objects that do not yet exist.

> [...] the expansion of the word "design" is an indication (a weak one to be sure) of what could be called a post Promethean theory of action. This theory of action has arisen just at the moment (this is its really interesting feature) when every single thing, every detail of our daily existence, from the way we produce food, to the way we travel, build cars or houses, clone cows, etc is to be, well, redesigned. It is just at the moment where the dimensions of the tasks at hand have been fantastically amplified by the various ecological crises, that a non- or a post- Promethean's sense of what it means to act is taking over public consciousness (Latour, 2009, p. 3).

Placing Prometheus and modernism, understood as non-cautious, side by side, and caution on the side of design, intentionally distances this titan from a relationship with the ideas of planning and design. Latour is quite clear about this: "In design there is nothing foundational. It seems to me that to say you plan to design something, does not carry the same risk of hubris as saying one is going to build something" (Latour, 2009, p. 3). And he supports this view in a analogous way to his argument that contrasts the pairs modern and postmodern, and matters of fact and matters of concern, "dissolving" one of the sides. By associating the lack of caution with Prometheus, as well as promoting a complete inversion of the meaning of the myth, Latour associates this narrative with the modernist furor and matters of fact. This articulated solution reinforces Latour's criticism of modernism, which he sees as Promethean, in a historical period oriented towards titanic undertakings, which lead to the devastation of even nature, due to a lack of planning: "'après moi le déluge!'" (Latour, 2009, p. 3).

Although the inversion of the Promethean essence serves Latour's purposes, from our point of view, the juggling and omissions contained in it seem to us part of an unnecessary effort, and he himself indicates the most sensitive and vulnerable point of his argument:

> The modification is so deep that things are no longer 'made' or 'fabricated', but rather carefully 'designed', and if I may use the term, precautionarily designed. It is as though we had to combine the engineering tradition with the precautionary principle; it is as though we had to imagine Prometheus stealing fire from heaven in a cautious way! (Latour, 2009, p. 4).

It's surprising that this philosopher leads us to imagine Prometheus stealing fire "in a cautious way!", even ironically, because we wouldn't need to think about such a circumstance if Latour hadn't subtracted Prometheus' cautious nature. Now, if there's ever a time when Prometheus doesn't act prudently, it's precisely when he steals, because he was *desperate*, and for good reason. In the words of Protagoras: "[...] desperate to find some means of survival for the human race [...]" (Plato, 1997, p. 757). Furthermore, if, as Latour states in the quote before, we need "[...] to combine the engineering tradition with the precautionary principle [...]", it's because the equation of knowledge, in its original effort of intertwined trial and error, would be unbalanced without Epimetheus, and Latour, obliged to remain faithful to this model in order to deal with the complex matters of concern, proposes combining imprudent engineering with cautious design.

Therefore, and this is the central point here, in the originary myth, the essences of Promethean caution and Epimethean imprudence are mutually imbricated in the act of knowing. Is it possible to think differently about knowledge? The history of ideas confirms this opposing view in the most varied lines of thought, from rationalists such as Parmenides and Plato, through Descartes and the modernist *mathesis universalis*, to their traditional empiricist opponents such as Locke, Hume and contemporary logical positivists, the latter clinging to a scientific *episteme* based on sensitive experience, mathematics and logic, seeking to eliminate metaphysics and extirpate the error in their theories. But as we have seen, Latour's "second empiricism" seeks to go around

these traditional patterns, as a means of solving questions that go beyond facts and matters of facts. Thus, Latour's ingenious way out inserts design into the equation as the field that takes care of matters of concern and cautiously elaborates "things" (Figure 4).

Figure 4: Scheme of Latour's final conception incorporating his *non-cautious* Prometheus.
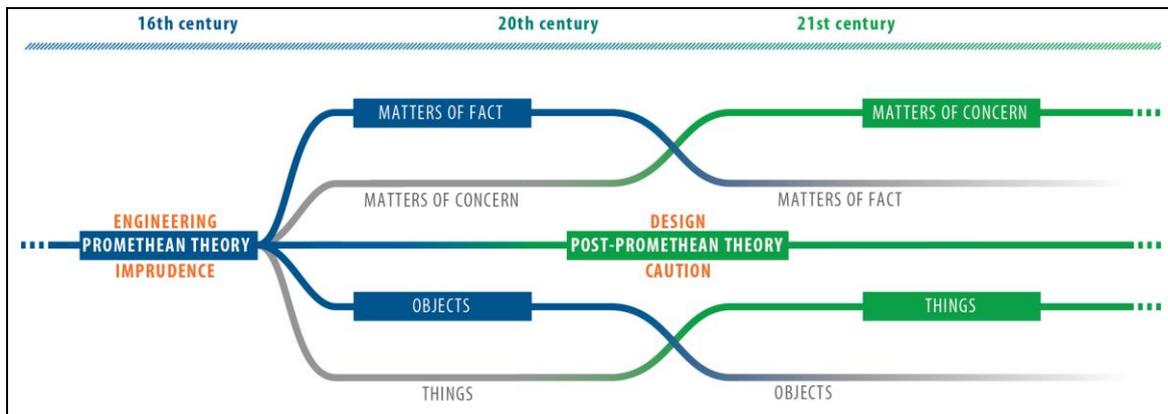
Source: Authors.

However, as we have shown, the price this philosopher pays for inverting the essence of Prometheus, transforming him into a imprudent engineer, is that he has to perform enormous contortions and even mutilate the myth in order to adapt it to his theory. For our part, we believe it is possible to think of a description that maintains Latour's intention, through a way out in which the expansion of design continues to guarantee this field its protagonism, without sacrificing the structure of the myth in its ancestral form. In such an adaptation, there is no need to question the structural arguments of his thesis, since its core (matters of fact, matters of concern, objects and things) remains. On the contrary, it is enough to follow his suggestion of uniting dichotomous but non-dualistic elements: "It is as though we had to combine the engineering tradition with the precautionary principle;" (Latour, 2009, p. 4). Assuming this orientation, it is reasonable to bring back the figure of Epimetheus and place him next to his complementary counterpart, Prometheus, a place he never needed to leave. With these changes, the three investigated layers of Latourian theory, the *formal*, the *mythological* and the *error*, maintain their balance and dialog with each other, with their structures and functionalities in harmony. The final scheme of Latour's thesis, summarized in Figure 4, can be compared with the adaptation we propose in Figure 5.

Figure 5: Scheme of our adaptation of Latour's conception incorporating Epimetheus and Prometheus with the characteristics of the original Greek myth.
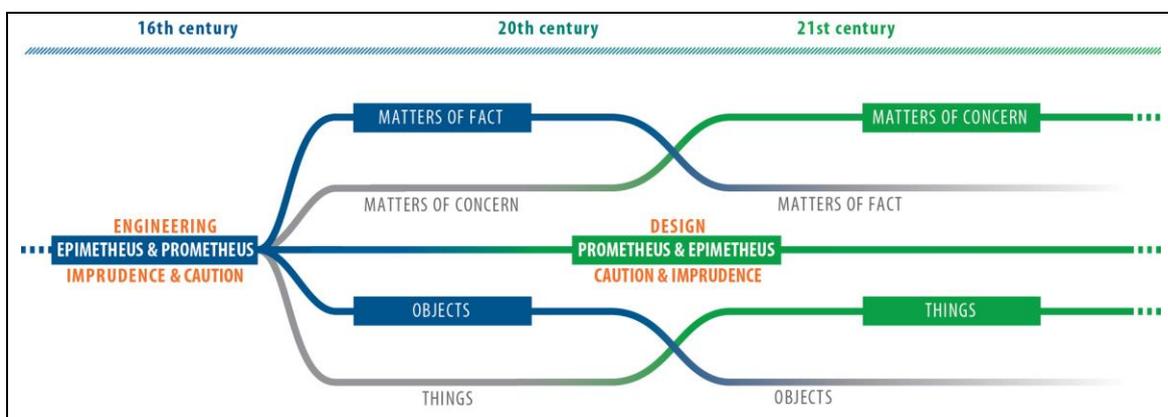
Source: Authors.

If, with these changes, Latour's lecture loses its provocative questioning, on the other hand, this philosopher could assert, with more emphasis, that engineering modernism, now with an essence that mixes Epimetheus and Prometheus, builds, destroys and radically transforms, acting on a megalomaniac dream, because its knowledge is not immune to mistakes, but acts by attempts.

Following the Platonic narrative, incorporated into Figure 5, our adaptation of the myth to Latour's thesis aims for internal coherence and highlights three points:

(1) Prometheus resumes the "redesign" of things and the world. From this, this titan also incorporates without incongruity the "[...] mad attention to the details [...]" (Latour, 2009, p. 3).

(2) Latour's thesis can finally connect isolated elements in a coherent way, which until then had no plausible explanation:

   (A) Latour's understanding that design never creates from scratch (*ex nihilo*) matches the Greek mythologeme, as we have seen, based on the idea of production (*póiesis*) from pre-existing and formless matter.

   (B) If the two titans remain united at all times by a common purpose, in the modern period, in which matters of fact predominate, even though Prometheus doesn't act systematically, he is there, with his recovered caution, alongside matters of concern, "[...] what have always been the hidden practices of modernist innovations [...]" (Latour, 2009, p. 13).

(3) The conflicts between Latour's interpretation of myth and his conception of logos are eliminated:

   (A) In the realm of myth, it is no longer necessary to split up the complementary essences of Prometheus and Epimetheus, much less exclude the latter character from the plot, nor invert the character of the former.

   (B) And in the sphere of the logos it is possible to preserve dichotomous elements, without resorting to any dualism, since it is not possible to ontologically isolate matters of fact from matters of concern, as Latour thinks, but neither is it possible to separate objects from projects, caution from imprudence, knowledge from trial and error.

Of course, since Latour vehemently questions the attribute of caution in Prometheus, aligning this questioning with the consequences derived from his interpretation, this philosopher would probably not admit our adaptation with the Platonic version of the myth. In any case, our differentiation and position have been established. As a final step in this essay, it remains to return to "Dilemmas" and reiterate the monist position we defend, taking into account points on the theme of knowledge, trial and error that are common to the theses of Rittel and Webber and Latour.

4 The ratification of a dichotomous monism for "Dilemmas"

Rittel and Webber, attentive to the roots of knowledge problems, in their division between science and fields of planning, bring the element of error to the center of the controversy in "Dilemmas", assuming that only science admits trial and error. Within this framework, can

wicked problems and tame problems be associated with the figures of Epimetheus and Prometheus? Returning to Popperian and Kuhnunian reflections can help us with this last task.

In a presentation to the German Sociological Society in 1961, Popper states:

> I have now reached the point where I can formulate my *main thesis,* as thesis number six. It consists of the following.
>
> *Sixth thesis:*
>
> (a) The method of the social sciences, like that of the natural sciences, consists in trying out tentative solutions to certain problems: the problems from which our investigations start, and those which turn up during the investigation. [...]
>
> (e) Thus the method of science is one of tentative attempts to solve our problems; by conjectures which are controlled by severe criticism. It is a consciously critical development of the method of 'trial and error' (Popper, 1976, p. 89–90).

Even if we suspect that Rittel and Webber had no contact with this text before it was translated from German into English in 1976, since "Dilemmas" precedes it by three years, Popper's earlier quote is clear: "the method of 'trial and error'" applies to both the natural and social sciences[7]. However, Rittel and Webber, when dealing with property 5 of wicked problems, reject the use of trial and error in the social sciences: "Every solution to a wicked problem is a 'one-shot operation'; because there is no opportunity to learn by trial-and-error, every attempt counts significantly" (Rittel; Webber, 1973, p. 163). This refusal is closely related to the claim of property 10 that "The planner has no right to be wrong" (Rittel; Webber, 1973, p. 166). This position confuses the arguments of these authors, since it is also in property 10 that Popper is quoted. An attempt to escape this embarrassment would be to adapt the Kuhnian position (1962) to their purposes: contrary to Popper, Kuhn argues that errors (understood as anomalies) when they are infrequent do not have the force to overthrow theories, and such isolated events are more likely to discredit the scientists who detect them in their experiments. But, as we discussed earlier (Silva; Ribeiro, 2024), Kuhnian theory goes far beyond anomalies, and if Rittel and Webber were to look to Kuhn for support, they could be led to question whether, in addition to the planner, the scientist also *has no right to be wrong*. Thus, the authors' lack of an answer to this complex question prohibits speculation on trial and error, linked to the figures of the Promethean myth, at least in the dualistic configuration in "Dilemmas".

However, in the same way as Latour, Rittel and Webber express their two central concepts figuratively. The authors do not resort to myths, but to metaphors of a manifestly dualistic nature:

> [...] we are calling them "wicked" not because these properties are themselves ethically deplorable. We use the term "wicked" in a meaning akin to that of "malignant" (in contrast to "benign") or "vicious" (like a circle) or "tricky" (like a leprechaun) or "aggressive" (like a lion, in contrast to the docility of a lamb). We do not mean to personify these properties of social systems by implying malicious intent (Rittel; Webber, 1973, p. 160–161).

The metaphor of the "'tricky' leprechaun" is limited to wicked problems. However, with a second metaphor, the authors go on to reaffirm their dualism, since it is not possible for a lion, even under the skin of a lamb (to use yet another metaphor), to cease to be genetically and intrinsically a feline. For the same reason, a lamb will never be a lion. Still in the previous

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[7] For a counterpoint and critique of the "trial and error" method and other Popperian positions in the social sciences, see the work of Theodor W. Adorno (1976), presented at the same conference, after Popper's contribution.

quote, they obviously deny a Manichean understanding of wicked problems and tame problems, since a lion's instinct is not ethically deplorable given its predatory nature. And in a non-metaphorical way they confirm that

> The kinds of problems that planners deal with —societal problems— are inherently different from the problems that scientists and perhaps some classes of engineers deal with. Planning problems are inherently wicked (Rittel; Webber, 1973, p. 160).

A metaphysics underlies these figures of speech: if Rittel and Webber do not express themselves in this regard in philosophical vocabulary, it does not mean that their distinction is not ontological. Their understanding that the two types of problems "are inherently different" denotes the requirement for discrimination of an ontological and consequently dualistic nature (Figure 6).

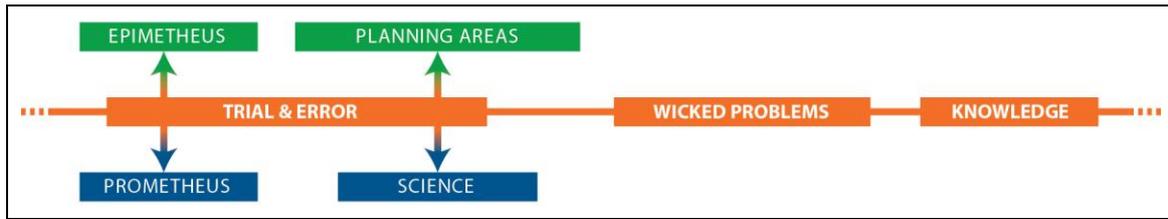Figure 6: Scheme of dualism in "Dilemmas".
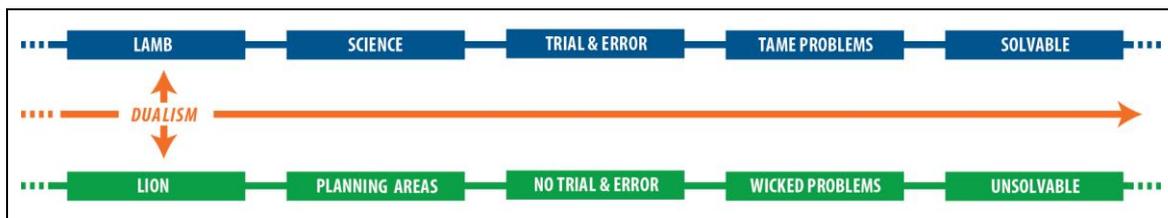
Source: Authors.

It is important to highlight that the scheme in figure 6, because it is crossed by an explicit dualism, prevents the Promethean myth from adequately describing Rittel and Webber's thesis. However, if we return to our thesis of a dichotomous monism in "Dilemmas" (Silva; Ribeiro, 2024), it is possible to propose that Prometheus and Epimetheus replace the metaphor of the lion and the lamb with advantages. The results are as follows:

(1) Considering only the convergent positions that we extract from the theories of Popper, Kuhn, and Latour (with the exception of purely mental and abstract disciplines such as logic and mathematics), knowledge is always subject to revision, as it involves theory and experimental practice.

(2) The practices inherent in planning fields such as design require complex experimentation and learning through trial and error, and Epimetheus is a legitimate symbol of these activities. And the *projects* developed in these Fields —in the etymological sense of *projecting*— *anticipate reality* and *launch ahead*, in the predictive manner of Prometheus.

(3) The descriptive and predictive capabilities of phenomena that characterize the natural sciences, engineering and the technologies derived from them, make Prometheus a herald of these fields, but his empirical practice, even in controlled experiments, also *requires* trial and error, typical of Epimetheus.

(4) As a result of (1), (2) and (3), the figures of the lion and the lamb lose their significance, along with the dualism that originated in *"Dilemmas"*, and the use of trial and error is no longer exclusive to science.

The graph in figure 7 illustrates the previous list:

Figure 7: Scheme incorporating the myth of Prometheus into our proposed monism for "Dilemmas".

Underlying the minimalist configuration of Figure 7 are intertwined and complementary concepts that would lose coherence and descriptive depth if they were artificially split up and simplified by a dualist description. Intentionally distancing itself from hierarchies, our description is as complex as the theme demands and is congruent because its monist structure embraces the dichotomy of planning and scientific fields in a larger unity, admitting that wicked problems are also found within science.

5 Final considerations

If it is a truism to state that problems about the nature of error constitute fundamental questions for mythology, philosophy, science and other fields of knowledge, in this essay we assume these questions as essential for the constitution of the philosophy of design and our objects of study today.

The deliberate use of metaphors by Rittel and Webber and of an ancient myth by Latour, when dealing with intricate questions about knowledge, was an incentive to stay close to the approach styles of these authors. In this way, we expanded the possibilities of a critical dialogue with their theses and of explaining our positions, convergences and divergences with their theories. Additionally, but no less relevant, we sought to rehabilitate the little understood and consequently despised figure of Epimetheus, putting his characteristics into perspective with the practice of trial and error experiments, as fundamental to design as descriptive and predictive theories. Going beyond myth, but remaining in the territory of mythologems, it is not without reason that ancestral tales of creation and knowledge have been celebrated by so many scholars throughout the history of ideas. Impressive, for example, is the ubiquity of narratives about the theft of fire associated with humanity's acquisition of knowledge. This planetary diffusion is presented by essayist and writer Alberto Mussa (2021), who reminds us of Cassirer when he affirms the importance of "articulated language" within myths:

> The theft of fire (I believe) is one of the three or four oldest stories still told on the face of the earth. It is also the oldest known ideological program, which ends up establishing the very concept of humanity. But it is also the myth that exposes, or presupposes, the ethnocentric vocation of the human species — largely due to the very ability we have to speak, to use articulate language. (MUSSA, 2021, p. 19, our translation)

Still according to Mussa, such origin narratives are widespread in the most diverse cultures, including the native peoples of pre-colonial Brazil. If we agree with this author that the theme of the theft of fire is "the oldest known ideological program", this common core of humanity could represent a meeting point between European, Latin American, African and other epistemologies. For example, the rejection of a hierarchy between areas of knowledge and the valuing of different types of knowledge is linked to the autonomy of these fields, including planning fields such as design, which we have only touched on with Cassirer's ideas in this essay. This

question, which can be articulated with the figure of Prometheus, needs to take into account his brother, Epimetheus, with all the wealth of little-explored elements and idiosyncrasies that this character embodies.

Finally, if knowledge cannot ignore error and is always subject to revision, as Popper, Kuhn and Latour would agree, the philosophy of design, due to its metaphysical character, requires a redoubled effort to think about the peculiarities of a field that is expanding in its concept, its limits and attributions. In this context, as an offshoot of the current essay, we continue to explore the fruitfulness of monistic descriptions by directing them towards urgent ethical questions, involving and demanding unequivocal positions from design. This procedure is increasingly justified because, as we have seen, in the context of the wicked problems, humanity and nature have, since Cartesian modernity, been separated from each other in an artificial and dualistic way. Contrary to the idea of freedom that goes from Descartes, passes through Kant and is allied with the interests of capitalism, the philosopher Hans Jonas (1984, 2001), in a timely manner, conceives freedom as also encompassing nature. Influenced by Charles Darwin (1859), whose theory does not distinguish between the human evolutionary process and that of other living beings, Jonas elaborates a monist ontology and ethics that are congruent with our intentions to think of less antagonistic actions for designers, in their relationships with projects, with the built world and with an increasingly threatened nature. But we reiterate, if up to now monistic descriptions are adequate to our objects of study, it does not mean that they are a universal gnoseological formula to be applied indiscriminately.

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