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# Friends or Foes of Nonhumans? The Place of Scientific Experts in the Philosophy of Bruno Latour

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## ABSTRACT

Bruno Latour has long denounced the constraints on political deliberation caused by the alleged impersonal objectivity of scientific discourse. However, throughout his career, the French philosopher has advanced some critiques of the role of scientific experts. With his proposal of the Parliament of Things, Latour expected to redefine the scientific expert as a translator for nonhumans in the general quest of integrating sciences and politics. However, the late Latour re-elaborated this alternative under the light of the new climate regime, which reveals that scientists are no longer able to translate the legion of nonhuman actors bursting into contemporary politics. This paper aims to give a recount of the Latourian assessment of scientific expertise, while also indicating another plausible redefinition of the scientific expert as a teaching figure. This is derived from the vindication of rhetoric and the pedagogical vein that traverse Latourian philosophy. At the end, there will be a review of three specific practices which exemplify that pedagogical role: cartography of controversies, art exhibitions and citizen science.

**Keywords:** Bruno Latour, scientific expertise, deliberative democracy, scientific pedagogy

You don't need a weatherman
to know which way the wind blows

Bob Dylan

## INTRODUCTION

Bruno Latour was one of the most prolific authors of the past decades, widely read in philosophy and the social sciences. His work helped to establish Science and Technology Studies (STS), an interdisciplinary field concerned with the intersection between techno-scientific practices and socio-political phenomena. Latour had the privilege of simultaneously being a classical and a controversial referent within the STS. His first book, *Laboratory Life* (1979), remains a landmark for the anthropology of science. But even at the starting point of his career, heated debates were triggered around topics such as ethnographic reflexivity (Knorr-Cetina, 1983), the lack of methodological criteria in experimental practice (Gieryn, 1982), and the agonistic interaction among scientific communities (Martin, 1997). Faithful to his ambivalent style, Latour spent the next decades emending some of his prior conclusions while posing new provocative hypotheses. Plenty of the ideas of his early period can be found under the project of Actor-Network Theory (ANT), a novel type of sociology of science crafted alongside Michel Callon and John

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Law. As a distinctive trait, ANT defended the idea that non-human actors have agency, play a significant role in the resolution of scientific controversies, and are key components of the social fabric (Callon and Latour, 1981). This ontological realism, often mistaken for naturalism or technological determinism (Callon and Latour, 1992), is a strong premise of Latourian philosophy. Generally, the more intimately related the sciences and the politics happens to be, the more polemic are the arguments advanced by Latour. In this aspect, the Parliament of Things – the request for nonhuman political representation based on the recognition of their agency – exemplifies how defiant Latour was for philosophy and sociology.

One topic at the core of STS is the political role of scientific experts. Traditional philosophy and sociology of science have inquired about what differentiates experts from laypeople and what means allow to achieve expertise. One notorious author in this area is Harry Collins (1985), who conducted a long-term ethnography within a scientific community to identify the specific traits of the expert's cognition. Unlike common thinking and the algorithms of artificial intelligence, scientific experts have the flexibility to interpret different contexts and choose how to apply the theoretical and tacit knowledge they have previously acquired. Against a purely logical or rational comprehension of scientific reasoning, Collins stressed that expertise is socially embedded, meaning that scientists are not merely sages who accumulate wisdom after decades of study but members of interactive communities who question, defy, and persuade each other in the process of crafting specialised knowledge. Similarly, Latour also explored how expertise is established in the first place since it does not derive only from academic credentials or rational criteria. ANT argued that expertise ought to be constructed through the assembly of alliances to be later distributed among scientific communities; all this being highly indexical and opportunistic (Latour, 1987). In any case, STS not only elucidated the social dimension of expertise but also called into question its political implications. Instead of focusing on the demarcation between scientific expertise and other kinds of cultural knowledge, like epistemology did, STS interrogates the way heterogeneous actors use their respective knowledge to influence each other. Within STS, there are both sympathetic and adverse stances towards scientific experts, but one of the most intriguing critics was, indeed, Bruno Latour.

Broadly stated, the role of scientific experts might become problematic in the framework of deliberative democracy. STS, however diverse, tend to support public deliberation, not only as a mode of sovereignty but also as the dialogical mechanism through which a plethora of actors can direct their particular efforts in a univocal direction. Note that this is not a mere declaration of principles or some political preference, but the result of empirical inquiry. For instance, laboratory ethnographers have found that the communication inside a single research group is characterised by rhetorical resources and reversible interpretations of the data gathered (Knorr-Cetina, 1981; Law and Williams, 1982). Scientists struggle to convince their colleagues, editorial houses, journalists, funding organizations, citizens, and politicians that their results are innovative and accurate. Still, this collective feature of techno-science is far from being a smooth exchange, since the composition of "hybrid forums" where actors converge must deal with the question of who can be counted as a relevant participant (Callon, Lascoumes and Barthe, 2009). Latour celebrated the inherent difficulties of the construction of the body politic, *but he saw it as problematic that scientific experts are regarded as the only authorised interlocutors between 'nature' and politicians*. He openly rejected the 'consulting' role taken by experts in government (Latour, 2005), for it serves as an excuse for politicians to elude civic responsibility and to exclude the mass of actors from any decision. In this sense, one can ask if traditional scientific expertise enhances or reduces the political dialogue.

At first sight, Latour was a sceptic of scientific expertise and promoted post-truth politics – at least according to a 2018 article in the New York Times. This interpretation, albeit a common one, is a misreading of Latourian philosophy, for which the overall goal was to bring science closer to politics. But if scientific experts are not suitable for that enterprise, then who? In this article, I will first explore how Latour problematized the traditional role of scientific experts in two opportunities: an early and hostile definition of the expert as a silencer of crowds and a later depiction of the expert as a gatekeeper separating the realms of science and politics. Then I shall review how Latour tried to solve the political implications of the traditional role of expertise with his proposal of the Parliament of Things. However, Latour himself admitted that this proposal was not possible to execute due to contemporary distrust in scientific discourse and the intricacies of the new climate regime. Finally, drawing from Latourian philosophy, I will propose a redefinition of the scientific expert as a pedagogical figure and I will see its actual application in three current research practices: cartography of controversies, art exhibitions, and citizen science. Albeit not systematically enunciated in the French philosopher's bibliography, this reinterpretation is coherent with the spirit behind the Parliament of Things. Generally, this paper offers a synthesis of the place scientific experts hold in the *oeuvre* of Latour while avoiding some possible misunderstandings or shortcomings.

## SCIENTIFIC EXPERTS AS SILENCERS OF THE CROWD

In a combative essay titled *Socrates' and Callicles' Settlement*, written amidst the 'science wars', Latour (1997) stated that the controversy between the objectivist scientists and the relativist postmodernists recalls the ancient debate

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of *right* and *might*. On one side, there is Socrates (with his contemporary emulous Alan Sokal and Steve Weinberg), who claimed that reason is a higher virtue than rhetoric, for it is directed towards the universal laws that structure the cosmos. On the other hand, Callicles (and his present-day followers Bourdieu and Habermas) contended that rhetoric is indispensable for political deliberation since the crowd of citizens must be organised either by brutal force or persuasive speech. For Latour, behind this apparent opposition lays a tacit agreement to exclude the Athenian people from the deliberative process. Since Socrates lacks the academic prestige of Gorgias, the military power of Polus, and the financial means of Callicles, he aims for a higher-level resource: true knowledge. "It is a great power to which Socrates appeals, [...] since it can enslave all the other forms [i.e., non-scientific] of expertise and know-how (Latour, 1997: 199)". Mimicking the geometers' method of demonstration, Plato deployed natural facts and laws to establish a political body constrained by science, simultaneously condemning all other possible knowledge.

Compelling with the plot, Callicles agreed that it is not convenient to let the crowd intervene in politics; the only difference is that he resorted to mundane force rather than transcendental reason. Since the citizens are illiterate for Socrates and selfish for Callicles, a commanding elite is required in any case. Ironically, there is only one conception of science at stake, for Callicles did not question the image of reason defended by Socrates; the real dispute is regarding which is the best tool to silence the crowd. "What is beyond question for both Socrates and the Sophists is that some expert knowledge is necessary either to make the people of Athens behave in the right way or to keep them at bay and shut their mouths (Latour, 1997: 201)". According to the aristocratic vein common to Socrates and Callicles, politics is reduced to the monologue of an expert in front of a crowd of non-expert citizens. Latour (1997: 215) continued:

> "[T]he Third Estate has been turned, by Socrates and by Callicles, into a barbaric population of unintelligent, spoiled, and sickly slaves and children, who are now waiting eagerly for their pittance of morality, without which they would have "no understanding" of what to do, what to choose, what to know, what to hope".

Opposing this monolithic tie between science (reason) and politics (might), Latour insisted that a truly democratic body, "in order to take decisions, cannot rely on expert knowledge only, given the constraints of number, totality, urgency and priority that politics imposes. It requires a disseminated knowledge as multifarious as the multitude itself (Latour, 1997: 201)". In other words, the French philosopher aims for a polyphonic deliberation among voices with distinct kinds of expertise.

Certainly this is a hostile and idiosyncratic reading of Plato[1], but a closer look at other Greek scholars reveals that Latour is not completely mistaken when denouncing the philosophical consequences of the settlement between Socrates and the sophists. Saxonhouse (1983) suggested that the encounter with Gorgias, according to the given dates, might coincide with the Peloponnesian War, which is not only historical context but also a hermeneutical cue about the very nature of the discussion. After defeating Gorgias, Socrates easily outwits Polus and extensively undermines Callicles' arguments. The last part of the dialogue actually portrays three silent sophists listening to the expert's speech. The political implications of Socrates' arguments and behaviour, as Wolin (1960) and Rocco (1997) have shown, are part of a larger strategy Plato carried throughout several dialogues to create an anti-democratic regime. Surprisingly enough, on her reading of the *Protagoras*, Nussbaum (1991) drew conclusions similar to Latour's. By systematically condemning collective rhetoric and praising individual reason, Socrates undermines the possibilities of political education among the youth of Athens. He does not only dismiss the status of his interlocutors but also invites the curious spectators – who are not students *stricto sensu* – to leave their financial and political affairs to devote themselves to philosophy. If every citizen of Athens followed Socrates dictum, the agora would be emptied. In short, despite the heroic role Socrates has in philosophy, he must not be considered as a leading role in political thinking.

At the bottom of the dispute lie the opposing understandings Plato and Latour have of the notion of rhetoric. As De Romilly (1975) asserted, the Greek philosopher saw a dangerous link between rhetoric and *magis*, the illusions sophists deployed in front of gullible citizens to obtain economic and political status. Unfortunately, by proscribing rhetoric altogether from philosophy, Plato also exiles the possibility of any *magis-terio*; namely, the process by which a master teaches knowledge and skills to his students. Aware of this, Latour employed Cassin's (1995) etymological distinction between mathematical demonstration (*epideixis*) and public exhibition (*apodeixis*) to argue that rhetoric and reason are not radically different. Rather than being competing activities, the latter is just a weaker form of eloquence, while the former is a stronger kind of argumentation (cfr. Netz, 1999). By reducing the

[1] Harman (2009: 91) comments that Latour and Socrates are both expert debunkers. Socrates started his public life questioning the alleged experts of Athens, while Latour began his career distrusting both classical philosophers and sociologists of science. At the end, the two of them found that unquestionable expertise cannot be found in any living creature. "In this sense, Latour and Socrates are oddly united in their *rejection* of privileged experts".

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gap between reason and rhetoric, Latour is not only seeking to democratise knowledge. As Freed (2005) comments, the French philosopher strived to expose that there is no discourse inherently legitimate – not even scientific knowledge. That was already anticipated by ANT: from a symmetrical point of view, all actors are initially equal until one voice eventually gains enough force to silence the other. This is why, for political deliberation, citizens' voices should not surrender *in advance* to experts' claims. When Latour puts reason and rhetoric on the same level, he does not advocate for Callicles' voluntarism, nor does he advocate for the relativistic "anything goes". Rather, he underlined the collective nature of the deliberative process and the contingent means by which legitimacy is acquired. Thus, heterogeneous political decisions are preferable to a pseudo-deliberation where one single expert presents himself as a spokesman of reason.

## CONCEIVING THE SCIENTIFIC EXPERT AS GATEKEEPER

In line with this communitarian spirit, Latour published *Cogitamus*[2], where he replaced the Cartesian heritage of the individual *cogito* with the collective thinking of the crowd. In contrast with Latour's diatribe against Plato, this book reveals a moderate attitude from the French philosopher. After proclaiming that sciences and politics are inexorably tangled, but due to the work of translation, they can never be completely identical, he asks which mediators can serve as bridges between those two realms. Latour (2014: 151) stated:

> "The classic and usual solution – even though currently deteriorated – consists in trusting the experts to play the role of mediators between the laboratories and the crowd. Unfortunately, many of these experts resemble the gatekeepers of ancient abbeys: facing inward, they must respect closure and remain silent as tombs, while facing outward, they ought to have people skills and chatter like parrots".

Here, experts must renounce the inherent uncertainty scientific research and adopt a rhetorical style similar to that of journalists. Actually, Latour's description is more suitable for science communicators – such as Pere Estupinyà, Neil deGrasse Tyson, or Adam Savage – than traditional experts, who inhabit the Ivory Tower and the consulting stances within governments. In fact, experts conducting actual research must have plenty of social skills in order to engage other key actors who promote their work in the first place (Noworny, 1993). But one might ask why, after the results are published, those very scientists become aloof and disinterested in creating new social ties with laypeople. The gatekeeper metaphor helps to understand how scientists, once they turn their backs on research and face the general public, promote an idealized and obsolete image of "Science"[3]. Note that the issue is not whether the task of science communication is a worthy enterprise (Basley and Tanner, 2011), but rather the political consequences of such narrow propagandist activity.

Latour (2014) still showed discomfort if scientific experts are the only authorised mediators between the realms of science and politics – or, to put it slightly differently, between the crowds of humans and nonhumans. In this scenario, the alleged superiority of reason does not only silence the citizens, it also turns politicians into mere executors of whatever action the scientific discourse recommends. In his distinctive ironic style, the French philosopher illustrated the situation as follows:

> "The mediation [between the laboratory and the crowd] is even less possible, since the politicians, to disembarrass themselves from controversies with the citizens, simulate to behave only according to what the matters of fact dictate. 'We will only take action when we are certain. As long as we do not know, we shall not intervene'. It is indeed a bizarre theory of public action: it delegates entirely all political decisions to scientific certainties (Latour, 2014: 151-152)".

Throughout *Cogitamus*, the French philosopher makes numerous references to the H1N1 pandemic, but the passage just quoted might also describe the recent case of COVID-19. Over the past couple of years, citizens have witnessed how politicians acted reluctantly and gathered scientific committees to determine routes of action according to the scarce evidence collected so far. Of course, Latour is not against these "hybrid forums" – to remain with Callon's term – but he noticed that, instead of proper collective deliberations, those committees are limited to a unilateral transmission of information that oversimplifies both scientific and political activities. On one side, 'scientific certainties' are extremely rare, especially when concerning current controversies. On the other side,

[2] This book drew little attention since it is a recapitulation in the style of pedagogical letters of many prior theses of Latour. Since there is no English version, I translated directly from the original in French.

[3] For instance, the MasterClass™ by Neil deGrasse Tyson – entitled *Scientific Thinking and Communication* – has the main goal is to teach students to think critically and to promote scepticism as a scientific value. Latour (1994) claimed that 'critical thinking' is not an accurate description of the uncertainties and slow consensus of actual research. Instead of minutely disassembling arguments, researchers struggle to link humans and nonhumans to create new hybrids.

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when politicians invoke the reliable reason of science to silence other voices, they neglect to do the job they were elected for: guide the people and take responsibility for their decisions. Certainly there are plenty of other actors involved in the legislative process - such as NGOs, activists, and industrialists – but their discourses are rarely posed as the source of higher knowledge like in the case of scientists. It is as if, even today, scientific discourse still holds some of its old rhetorical privileges.

Following the guard metaphor, Latour (2014: 153) defined the scientific experts as reactionary figures, since "they try to dissimulate before the public the messy kitchen of ongoing scientific research, while they also pretend to protect the scientific communities from the passionate interests of the multitude". Instead of protecting the ancient Great Wall of China that keeps laboratories and the agora divided, experts should help overthrow that barrier – as if it were the Berlin Wall separating entire families. Also, evoking his *opera prima*, the French philosopher claimed that laboratory walls were never impermeable in the first place: "the gates [of science] are crossed, in multiple ways, by dissident researchers, industrialists, activists, journalists, bloggers, and amateurs (Latour, 2014: 153)". Then he confessed that he has nothing against experts but only the desire to fully open the gates that isolate the sciences from the hectic life of politics:

> "I hope that climategate, after the failure of the Copenhagen Summit, becomes the end of the role of expert to solve all by himself the political questions concerning sciences and techniques. I do not mean that those experts have failed and that we should leave the task to other wiser and more affirmative experts. On the contrary, the role assigned to experts has become unbearable and some novel props and combinations are required (Latour, 2014: 153)".

This last passage reveals a significant change in the way Latour approached the political role of scientific experts. They are no longer those wicked silencers of the crowd, but exploited workers who cannot keep pace with the proliferation of voices in the public debate. As already mentioned, before the ecological crisis, scientific experts had to dialogue with colleagues, editorial houses, journalists, funding organizations, and politicians, but now the crowd has multiplied: activists, hackers, conspiracy theorists, Anthropocene deniers, microbes, vaccines, shipping containers, melting icebergs, and burning forests have entered the discussion. In the late nineties, Latour disclosed his contempt for the experts, but more recently, the French philosopher showed pity for the titanic burden civic society and politicians have put on their shoulders. Despite this shift, the implications of having scientific experts as advisors remain problematic. Even if they are no longer seeking to silence the crowd, scientific experts have failed to bridge the masses of humans and nonhumans. Translation is already difficult in a simple conversation, let alone the immense polyphony of public debate.

## ECOLOGICAL CRISIS AND THE FAILED TRANSLATION OF SCIENTIFIC EXPERTS

The Parliament of Things entered the Latourian *corpus* by the end of *Nous n'avons jamais été modernes*. Latour (1991) stated that it is impossible to understand science and its political implications if we remain in the framework of modern metaphysics. The modern constitution emphasises the incommensurability between nature and society, reducing all actors to material phenomena, social conventions, or arbitrary signs; while simultaneously forbidding any possible hybridisation. Based on several empirical cases from STS, Latour realised that there is actually no ontological division between nature and society, object and subject, or things and signs. Rather, in everyday practices, nonhumans traverse the spheres of nature, culture, and discourse. This metaphysical perspective was renamed a "flat ontology" (Bryant, 2011), which is coherent with ANT's insistence on giving a symmetrical analysis to all actors involved in techno-science. This proposal demands a change in how we think of objects and the way we relate to them. Accordingly, the main tenet of the Parliament of Things proclaims that, once we return the nonhumans their lost ontological status, we ought to give them political representation – their "voice" should be taken into account when we discuss matters regarding the possibility of existence on Earth. Unfortunately, the Parliament of Things appeared as a *Deus ex Machina* in this provocative essay. Afterwards, Latour (2004) studied how environmental public policies were legislated under the label of *Politics of Nature*[4]. Despite its lack of systematic formulation, the Parliament of Things seemed like a promise to reformulate in better terms the old ties between science and politics.

On the occasion of the Spinozalens Prize, Latour (2020) gave a retrospective lecture about the Parliament of Things, with a detailed recount of his intentions when he coined the term and its further developments. Initially, Latour explained that the intention "was not, as some people have argued, to give a voice to nonhumans; rather, it was a way to give a voice to scientists, [since] there is no other way for the nonhuman to talk in a sort of coherent

[4] In an interview with Blok and Jensen (2011), Latour admitted that this book was somehow a failure due to its abstract arguments seeking to dismantle the fact/value dichotomy and the notion of 'Nature' as a homogeneous whole. This was, in a way, the last work done by Latour in STS; for he dedicated his later years to art exhibitions and political ecology.

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way except for the scientist's activity". Instead of making a bold political proposal, Latour clarifies that the Parliament of Things was the description of an already existing, albeit extra-official, phenomenon. On one hand, just as politicians speak for humans in Congress, scientists speak for nonhumans in laboratories, making huge efforts to understand their issues and find possible solutions. On the other hand, there is a conceptual correlation between 'Parliament' and 'Thing', both alluding to their deliberative features. 'Thing' refers etymologically to 'assembly' rather than 'object'; the former implies a collaborative process, while the latter suggests inertia. In other words, the Parliament of Things seeks to characterise both the deliberative actions around the nonhuman at the laboratory and the collective inner core of the nonhuman as an assembly itself. Latour stressed this idea: "the Parliament of Things is actually there, as a competition of voices in the public debate". In this scenario, the scientific expert is redefined as a diplomatic figure: an interpreter and representative of the nonhumans.

Surprisingly, by positioning the scientists in the translation networks that pass through the laboratory and the agora, Latour displayed a rather sympathetic attitude towards the experts. They are no longer silencers of the crowd nor guards keeping separated sciences and politics; on the contrary, they have become the main channel through which any possible dialogue between humans and nonhumans is built. However, Latour does not say that we should blindly trust whatever they claim. He insisted that scientific discourse should be put into an enunciation scheme in order to make it comprehensible and disputable. In other words, scientists ought to adopt a model of situated knowledge, recognising the particularities of the subject who elaborated statements about the facts of nature, instead of appealing to impersonal and neutral laws of nature as a source of legitimacy (Haraway, 1988). In this way, Latour wanted to preserve the beauty of experimental practice – its capacity to make nonhumans speak for themselves – while avoiding the excesses of authoritarianism caused by a naïve sense of objectivity. There remains the suspicion he had for those who use the old-fashioned realist adage that 'laws of nature are true, whether you like it or not'. But if scientific experts avoid such a reactionary stance and assume the consensual nature of their knowledge, then they could strengthen the public debate instead of muting it. Experts should become the third party enabling the discussion between laypeople and the multitude of nonhumans that are inevitably related in plenty of circumstances of our contemporary world. Scientists as translators are a key component of the Parliament of Things, but this colossal "hybrid forum" is never reduced to the scientific discourse.

Yet the persisting problem is that, when scientists proclaim themselves as the *only* spokesmen of nature, collective deliberation is weakened. Even if experts abandon their privileges sustained by the alleged superiority of reason and even if they unite the laboratory with the agora, the mass of nonhumans has increased to a degree that overwhelms the researcher communities. Nowadays, the ecological crisis has become so ubiquitous that laypeople have re-encountered an indomitable climate defying their modes of existence (Serres, 1990). The solution is not to simply include non-scientists, who might not be capable of making intelligible the voices of nonhumans. The Parliament of Things is not just a request to amplify the agora as if all the voices were automatically compatible. The peremptory demand is to translate those incomprehensible voices so we can properly negotiate with them. Since nonhumans are not immediately understandable, they must undergo a chain of experimental practices in order to be suited for dialogue. Certainly, Latour claimed that "nonhumans already have an endless number of canals to have their voices heard […], they are represented by scientists, militants, artists, citizens, and politicians". But one might question how fluently composed nonhuman voices are under those non-scientific canals[5]. Despite his contempt for the classic role of expertise, the French philosopher never disowned the specific traits of scientific cognition nor implied that anyone could be counted as an expert. Redefining the scientific expert as a translator seemed to solve the negative political implications explained above, but the Parliament of Things also denoted a problem that turned that solution useless. Modern societies have produced an enormous mass of nonhumans that strive for political representation – there are simply too many nonhumans to be accounted for by the scarce researchers willing to assume the interpreter role.

In the second half of the Spinozalens Prize lecture, Latour (2020) admitted that his philosophy passed from an optimistic to a tragic position by witnessing that contemporary societies have grown sceptical towards science on volatile issues such as epidemics, vaccinations, agriculture, and ecology. It did not matter if scientific experts change their attitude if they were no longer welcomed in public deliberation. Making a simile with the transition from Rousseau to Robespierre, Latour explained that the Parliament of Things went through an inversion of its original position. At first, humans were invited to grant political representation to the excluded nonhumans in a condescending fashion. Unfortunately, today nonhumans are imposing their dissident voices on the new climate regime. Just like citizens overthrow governments when they feel politicians are not representing them appropriately, nonhumans disrupt our political life if they are not sufficiently translated by scientists. This inversion led Latour to eventually discard the term 'nonhumans' and embrace the notion of 'Gaia'. This was not a mere

[5] Here, scientists still have some advantage over laypeople who try to speak in the name of nature. Ideally, politicians must hear weather scientists as much as ecological activists, but those discourses should not be considered inherently equivalent; actually, that would render the translation quest pointless. The question is, instead, which collective has the knowledge and skills to better articulate the voices of nonhumans with other networks.

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adherence to Lovelock's hypothesis or the Anthropocene[6] trend, but a way to highlight the devastating effect of nonhumans untranslated voices. In this sense, once humans realise they depend on nonhumans to survive, they should ask permission from Gaia – just like non-western peoples did with their respective deities – before using her vital resources. Note that the French philosopher is no longer concerned with the political role of experts or with the quest to bring science and society closer. Rather, in this urgent state of affairs, the main task is to reformulate how we conceive life, territoriality, and humankind in order to preserve the Earth (Latour, 2021).

## SCIENTIFIC EXPERTS AS PEDAGOGICAL FIGURES

Until now, we have seen that Latour has critiqued scientific expertise when it is used to invalidate the crowd or to separate the laboratories from the agora. The Parliament of Things was a proposition to enhance democracy by including laypeople and non-humans. This framework redefined the expert as a translator who employed experimental practices to render the voice of nonhumans compatible with human politics. As Latour (1994: 104) commented, by "turning into a minority the [nonhumans] excluded from science and politics", a new alliance between sciences and politics was possible. Despite the allure of this proposal, the late Latour (2020) recognised that the Parliament of Things failed to generate a wider conscience about the relevance of nonhumans and to reshape scientific expertise. It is indeed ironic that contemporary societies are constantly traversed by techno-science, yet the authority of scientific discourse has been questioned by many detractors. For Collins (2014) this is the unfortunate result of a series failures: the seventies energy crisis, the abuse of nuclear power, mad cows' disease, the anti-vaccine movement, climategate, etc. Today, experts alone are not able to translate the myriad of nonhumans and the alternative canals of representation are dubious since laypeople do not have the specific traits of scientific cognition. As Baber (2020) summarises, scientific expertise involves 4E (embodied, embedded, enacted, and extended) cognition, which is acquired after several years of academic formation and participating in controversial experimental research. No matter how ecologically conscious or well-intended some human collectives might appear, they lack the means to be proper interpreters of nonhumans. This has led us to a flawed outcome: either experts are reactionary figures hindering the composition of "hybrid forums", or they are diplomats unable to translate the plethora of enraged nonhumans.

Still, the translational model crafted by Latour might open another possible solution not explicitly formulated by the French philosopher. As already mentioned, ANT stated that scientific expertise is not an initial attribute of some actors but the result of particular theoretical and technical training. Thus, every actor could, at least in principle, become a suitable translator for nonhumans. Certainly, the hierarchical structure and social inequities of educational institutions prevent any citizen from becoming an efficient scientist (Hess et al., 2017) – not everyone can access the formation that separates the expert from the layperson. But it might be the case that scientific experts educate laypeople to become competent enough in such theoretical and technical knowledge to be engaged in some of the practices involving nonhumans. If the expert is not only a translator but a pedagogical figure that turns laypeople into proficient interpreters, then the mass of nonhumans would be counterbalanced by a strengthened army of humans willing and capable of entering into dialogue with them. I contend that this redefinition of the expert as a pedagogical figure is a conceptual consequence of Latour's plea for rhetoric. Returning to De Romilly (1975), persuasion shares the two meanings of *magis*: illusion and teaching. While old-fashioned scientists were told that their quest was the pursuit of knowledge for its own sake, teachers are quite conscious that the transmission of such knowledge must include the effort of assembling the audience, keeping them interested, and turning them into active citizens. In other words, if scientific expertise is understood as a form of *magisterio* that amplify the translation channels, then the Parliament of Things might become a feasible project.

Now I shall briefly recount three already existing practices where this pedagogical vein can be seen. First, Cartography of Controversies, which is actually the main subject of *Cogitamus* (Latour, 2014). Second, Art Exhibitions as an intermediate space between science and society, where larger audiences are assembled and invited to interact with nonhuman entities. Third, Citizen Science, the best example of how laypeople can be involved in experimental practices. Of course, each alternative entails some limitations that shall not be discussed here. Instead, my main goal is to point out that, even if the vindication of scientific expertise as a form of *magisterio* is not explicitly stated in the texts of Latour, this alternative solution in coherent with the spirit of the French philosopher – who actually assumed a marked teaching role for his readers.

[6] In a late interview with Miranda (2019), Latour was asked for his seeming unrestricted endorsement of the ideas behind the Gaia hypothesis by Lovelock and the notion of the Anthropocene by Zalasiewicz, since those theses are highly disputed among natural scientists and received with certain suspicion among social scientists. The French author maintained that those concepts, despite their ambiguity, were useful to describe the general crisis of the XXI century.

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**Cartographies of Controversies**

The narrative context of Cogitamus is the epistolary exchange between a fictional German student and Bruno Latour, who introduces her to his courses taught at the *Centre de Sociologie de l'Innovation*. Initially, this course was a pedagogical strategy to familiarize engineers and other scientists with two main theses of ANT: 1) the unavoidable interconnection of sciences and politics; and 2) the ineluctable transformation of information when it passes from one actor to another. According to Latour (2014), his intention was not only to make accessible his sociology of science to laypeople but also to close the gap between 'hard sciences' and 'humanities'. By considering scientific literature as a form of text susceptible to interpretation, the French philosopher combines the production of facts with a semiotic-hermeneutical approach. Again, this is more than a mere reiteration of the insights of his opera prima; it is a conscious effort to render non-scientists able to understand the inner dynamics of scientific research. Thanks to the Cartographies of Controversies, laypeople no longer require a degree in sciences to comprehend the intersections between the laboratory and the agora. In other words, by recording and tracing how scientific controversies are opened, developed, and closed, the public might become aware of how nonhumans actively participate in several political affairs. Note, also, that here, Latour is taking the opposite strategy of the gatekeeper-experts by promoting an accurate portrait of the uncertainties of scientific research.

This pedagogical experience was reformulated as a systematized research method by Tommaso Venturini. In his view, controversy mapping (CM) – as he renamed it – aims to develop multiple tools for scholars and citizens to observe and describe the social debate over technoscientific issues. As a methodology of its own, CM entails neither conceptual assumptions nor specific protocols. Its openness, however, is not a sign of the old naïve objectivity that longed for purely empirical descriptions freed from any kind of theoretical premises. Rather, it is an invitation to eclecticism, in the sense that only a plurality of perspectives can include all the involved actors in the controversy. Those informants, regardless of whether they are erudite or not, must be considered as better informed than the investigators, since their particular know-how is intimately linked with the issue discussed. Venturini (2010) emphasise that CM does not seek to bring closure to any controversy – on the contrary, it is a tool to prevent a premature resolution. This is a coextension of the ANT tenet that any matters of concern can be arranged in multiple alternative ways due to its inherent heterogeneous nature. CM is a practical method, therefore, to open public deliberation by avoiding the a priori stance that authorized scientific discourse is the only reasonable perspective. This methodology takes seriously the vindication of rhetoric suggested by Latour when it tries to register how different discourses are intersected and what type of negotiations (i.e., compromises, hybridizations) take place to reach a solution, even if fragile and transitory, that encompasses dissimilar human and nonhuman collectives. In other words, the cartographer, whereas expert or lay, will witness plenty of empirical cases where the translation networks are central to the composition of the social fabric.

It could be argued that becoming aware of the translations made by techno-science is not quite the same as becoming a proficient translator; still, as Latour (2014) commented, if the public is familiar with the intricacies of research, they could better judge which scientific statement is good or bad. Furthermore, CM also sheds light on another problem unnoticed so far: the summoning of relevant publics for each controversy. After some years of mapping controversies, Venturini encountered a classic dilemma: how to craft maps simple enough to be read but also complex enough to include several perspectives? In any case, the maps would not improve the political debate. The answer was not to aim for an intermediate point but to reshape the map itself as a device to gather pertinent audiences. So far, this article has referred to the 'general public', the 'human mass' or the 'citizens', as if they were a coherent body, but any attempt at science pedagogy would realise that this is a misguided conception. Venturini (2016: 76) puts it clearly: "there is no such thing as a homogeneous public [...], rather the public is a gaggle of ghosts provisionally assembled around a specific issue and by no means uniform by it". Before addressing any fictional pre-existing audience, CM must inquire who the actors concerned by each controversy are and what degree of complexity they are willing to handle. Following these considerations, CM is reformulated as a collective tool that depicts techno-scientific issues, brings together relevant actors, and allows them to contribute in the research process. It makes a big difference whether laypeople passively receive the enclosed cartographies or when they can position themselves in the maps and even propose further redefinitions of the issue described.

**Art Exhibitions**

Another pedagogical exercise that sensitises laypeople about the intersection of sciences and politics and the pivotal role of nonhumans is the Art Exhibitions (AE). As a matter of fact, once Latour stopped carrying out STS researched, he dedicated himself to this type of work at the *Zentrum für Kunst und Medien* (ZKM) in Karlsruhe, Germany. Some of the topics exposed included non-western deities, iconoclasm, the anthropology of the moderns, the ecological concept of 'critical zones' and, probably the most famous of Latour's exhibitions, the visualisation of non-human assemblies in *Making Things Public* (Latour and Weibel, 2005). In there, a group of philosophers, sociologists, engineers, and artists converged to craft and comment on several technological devices to open new lines of thought over the possibility of an 'object-oriented democracy'. The range of topics comprised quite diverse

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themes such as diplomacy, multiculturalism, nationalism, psychometrics of audition and visualisation, ethology, astronomy, cybernetics, the atomic bomb, hydraulic systems, music and cinema, religious rites, and so much more. Whether this experience helped to crystallize the prior intentions of the Parliament of Things or not is beyond the point. AE, despite its political aspirations, remains a powerful tool to sensitise audiences over the relevance, presence and agency of nonhumans. In this framework, the transmission of knowledge is quite different from the disembodied discourses of epistemology, since the ontological component has a leading role in the AE. Also, as Hodgson, Vlieghe and Zamojski (2018) have suggested, the collective traits of the AE as a public event have a double effect – on the one hand, it advocates for more accessible intersections between the sciences, politics, arts, and citizens; on the other, it underlines the communal dynamics of science and technology, debunking the myth of the lonely genius.

AE have an advantage over CM since the centrality of the location helps to entwine more intimately the human and nonhuman collectives. While CM is effective in revealing the uncertainties and consensus of scientific research in the making, it has the risk of being locked in the domains of discourse by operating mainly with scientific bibliographies and other signs. AE, on the contrary, provides an opportunity where symbolic and tangible actors converge. This is by no means a minor detail. Koopal and Vliege (2002) following the premises of the Latourian 'flat ontology', indicate that AE is an intersectional practice that encompasses the visibility of infrastructure, the assembly of artefacts, the aesthetic value of technology, and human interaction with those nonhuman entities. Again, it might be questioned if witnessing the composition of techno-scientific devices is enough to render laypeople competent translators. In which sense a conscious and efficient user of artefacts can be counted as a legitimate spokesman for nonhumans? Still, as Pérez-Bustos (2015) has extensively reported, AE have more pedagogical potential than other methods when it comes to teaching young students about techno-science. Exposure to nonhumans, by itself, might be a sterile experience if it is not complemented by a didactic component. This is why interactive museums and science fairs are the best examples of how AE allows students to have a protagonist role in the process. Lastly, adding a feminist reflexion, Pérez-Bustos stresses that AE must be embedded in a pedagogical relationship not reduced solely to the transmission of knowledge but also including an interpersonal care bond.

**Citizen Science**

As previously reviewed, Latourian philosophy strives for the recognition of nonhumans as acting entities and their subsequent political representation. This is a request for politicians, sociologists, and citizens, since most scientists already acknowledge nonhumans as agents that must be taken into account. Scientific experts still hold a relevant position within the Parliament of Things since they are the most competent translators. The *quid* of the matter is whether laypeople might become suitable translators as well only by means of theoretical education and political awareness – Latour's answer would be negative. Experimental practices are the royal road to acquire the type of 4E cognition that characterise scientific reasoning. Fortunately, experimentation is not the exclusive property of scientists, so many other human actors can produce and engage in experimental practices of their own. Citizen Science (CS) is, therefore, the most convenient interface where scientists and laypeople collaborate on a common experimental project. For Vohland (2021: 1) the broad definition of CS as "the active engagement of the general public in scientific research tasks" leads to multiple questions. Who is the general public? Do these research tasks aim to produce innovative knowledge? What are the funding sources for CS? Is it exploitative using underpaid citizens as research assistants? Are the results of CS considered for public policy? Certainly, CS is an emerging practice with many complications yet to be solved, but it is the best option so far to render possible the redefinition of scientific expertise as an interpreter.

Let's consider, for instance, recent coral reef research in Hawaii with the participation of twenty-seven non-scientists (Camp et al., 2016). This project anticipated the Decade of Ocean Science for Sustainable Development proposed by the United Nations. It is hard to find a research field more intricate than ocean sciences, which includes quite dissimilar objects like sea life, communications infrastructure, plastic waste, tectonic plates, heat regulation, and so on. In the Hawaii experience, citizens contributed by gathering and analysing data – that is, identifying particular species of sponges, using standardised scales to measure reefs, and recording general observations. Of course, this was not an inherent skill of citizens but the result of a training program. At the end of the project, they commented that their knowledge about marine ecosystems had increased. They also became more conscious about the preservation of coral reef and started taking environmental-friendly actions such as recycling plastic or using natural sunscreen. Citizens even expressed their desire to be more politically active on ecological matters and longed to participate in further research. Is this not a lucid description of how the Parliament of Things would look like, at least in a very local context? How different from scientists are those citizens who have learned to classify using taxonomies and measure with scales? Are they not proper auxiliary interpreters for the scientific experts in their quest to speak in behalf of nonhumans?

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Undoubtedly, CS is far from being a panacea. Three caveats could be raised at this point. First, as Jasanoff (2002) says, contemporary societies are increasingly aware of the role of technology and its risks and, unfortunately, this has led to a generalized concern about the complexity of science. How could CS projects seduce laypeople to participate? Should public engagement in research be seen as a civic right or as a duty? Any CS project that fails to properly define the actors to which it is directed might face the same problems already mentioned in the case of CM. Second, some scientists are reticent about CS, invoking concerns about whether the swift technical training is enough to replace a professional. This apprehension is baseless, yet it reveals the real problem – scientific experts still want to judge the competence of other actors. Dickerson-Lange (2016) comments that CS ought to be a two-fold experience, meaning that scientists also must learn something from citizens in the process. Citizens should also be included in the experimental design and discussion of results. Third, taking this last point to its final consequences, Stengers (2000) warns about the need of devices that close the gap between the concerns of the communities and the scientific networks. Yet, those devices are not harmonic but rather agonistic, since the expert's theories and explanations must be defied by the very citizens. If laypeople cannot use their own modalities to turn the scientific discourse upside down, they won't be able to use the research projects as a platform to connect their particular interests with political legislation.

Certainly, connecting the laboratory and the agora did not intend to ease the labour of crafting knowledge, technology, and the social fabric. Re-conceptualizing the expert as a pedagogical figure who teaches laypeople how to translate the voice of nonhumans is a key step in the alignment of science and politics. This is not just a noble cause to follow, but an urgent one, since the contemporary world needs to regain trust in science and create new forms of research to sufficiently respond to the demands of the new climate regime. Scientists must abandon their old preaching style and start collaborating with the general public to compose the world to come.

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