Decolonizing Science and Technology Studies?

Alessandro Mongili
University of Padova

Corresponding author
Alessandro Mongili
University of Padova, Department of Philosophy, Sociology, Education and Applied Psychology
Via Cesarotti 10/12, 35123
Padova (PD), Italy
alessandro.mongili@unipd.it

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Abstract

This *Scenario* analyzes the relationships between STS, postcolonial studies, the decolonial approach, and other frameworks that address planetary issues and the heterogeneous positioning of social studies of science and technology. First, it defines STS as a "*Science of the North*", not only because it has been largely produced within the Euro-Atlantic area, but also because its conceptual apparatus presents itself as universal, even though it originated in a limited region of the world. Next, after outlining the main postcolonial and decolonial approaches, the article explores the openings that have emerged – especially in recent years – toward a fruitful hybridization between the two perspectives, both methodologically and theoretically. In particular, it highlights the encounters between non-Western and Western epistemic practices and the questioning of taken-for-granted roles within STS methodological practices themselves. Finally, the richness that STS can contribute to postcolonial studies is identified in its focus on materiality and planetary concerns, and thus in the fact that it does not restrict analysis solely to the discursive, semiotic, or representational dimensions of coloniality, as often happens in classical postcolonial studies.

Keywords

STS; postcolonial studies; decolonial approach; hybridity; local knowledge.

1. Introduction

Science is rooted in styles of thought within which are embedded assumptions about the taken-for-granted. In this way, it becomes an authority for the classification of what exists, the setting of priorities, and the quantification. Moreover, technology incorporates within itself – rendering them invisible, ubiquitous, and powerful – priorities, alliances, information, and knowledge; in other words, it functions as a social glue (Star 1991; see also Fleck 1979, 99, 142). Among these elements are colonial, neocolonial, and imperial elements, included in the process of meaning-making and knowledge production through entangled relationships, and in-between of them. This *Scenario* analyzes how these dimensions constitute both a foundation in the construction of STS and their object of study, and, at the same time, a removal.

Technology and science are global and planetary phenomena. Can the same be said of STS? If not, in what ways does this reflection challenge the field? Conversely, what do STS contribute to postcolonial or decolonial thought? Or should we rather consider them a *science of the North*? If that were the case, how could STS be meaningfully practiced across most of the world, and what would be their relevance for scholars from the South or from the margins of the West? What kind of reflexivity should we demand from those who lead this field? And what creative contribution can we make to its further development? The cognitive process we call STS compels us – by virtue of its own theoretical and methodological foundations – to adopt a critical and reflexive stance toward itself.

2. Science and Technology Studies as a "Science of the North"

Within STS, the overlap between the "global" and the Western is almost complete, even though the number of contributions from non-English-speaking countries has increased. Studies from other regions remain marginal, and even STS practiced in marginal areas rarely succeeds in translating itself to a global level. As Alexandra Hofmänner pointed out, two thirds of the contributions to *The Handbook of Science and Technology Studies* (Felt et al. 2017) came from the USA or the UK, and 90% from the USA and Europe. Approaching STS still means, for the most part, being trained in a mere history of ideas rather than engaging in a reflexive reconstruction of a knowledge trajectory and of the conditions within which this tradition emerged. As a cognitive process, STS produces collectives, excludes themes such as colonialism, defines priorities, and generates aspirations among those who enter the field (Dumoulin et al. 2017, 424; Hofmänner 2021, 17, 22, 31). The STS conceptual apparatus was developed on the basis of research conducted in "advanced" countries, yet it carries universalistic claims. Its origins are traced back to the SSK in England and Scotland, within prestigious academic institutions, and to the work of heroic entrepreneurs of heterogeneity – like any other intellectual enterprise conventionally narrated. Too many foundational contributions have been erased, among them those of Ludwik Fleck, the Soviet school of Boris Hessen, and the critique of the political role and non-neutral character of scientific knowledge developed in Italy during the 1970s, initially by physicists (Graham 1993; Hofmänner 2021, 22-33; Ienna 2023; Löwy 2016, 510-515; Mongili 1998).

The knowledge produced by STS itself cannot be detached from those who produce it, from where it is produced, in what language, and from its epistemic relationship to the phenomena studied (Strathern 2018). That STS constitutes a *science of the North* appears beyond doubt. Since the 1980s, STS have experienced a spectacular rise in the West, thanks to the ethnographic turn, laboratory studies, and controversy studies investigating science "*in the making*". A total agnosticism toward epistemological problems was adopted, focusing instead on the hybrid process through which epistemic qualities are attributed to scientific facts. Subsequently, attention shifted to technological development and its entanglement with science within a single, indistinguishable field of practice – technoscience (Collins 1985; Knorr-Cetina 1981; Latour 1987; Latour and Woolgar 1986; Pickering 1993). STS, particularly with Latour, deconstructed dichotomic models, even undermining the idea of Othering, so constitutive of Western supremacist visions. If there are assemblages of heterogeneous entities, there is no "Other" opposed to

a "We". STS scholars subsequently developed research on innovation, science policy, medicine, embodiment, practices, and sociomaterial aspects (Latour 1987; Mol 2002; Pickering 1993) – remaining agnostic toward science while increasingly engaged with the reassembling of the social and the political on a planetary, technoscientific background (Chakrabarty 2021; Latour 2005). For STS, everything that belongs to a sociotechnical collective must be considered according to its shared agency – nothing can be read as "other". All entities involved in sociotechnical processes are taken into account. This principle of methodological symmetry opened vast possibilities for investigating technoscientific processes, although it has mostly been applied only to two kinds of knowledge: *rejected* and *accepted*. Many elements once deemed irrelevant for analyzing technoscience are now included in STS analyses (Hofmänner 2021, 254; Latour 1992; Prasad 2023). However, many scholars have excluded coloniality *in-between* from the count of entities forming sociotechnical collectives. Latour himself (1999), in his work on the translation of Amazonian soils and flora, illustrates a chain of heterogeneous elements; yet, although the study was conducted partly in the Amazon, local or Indigenous knowledges never appear. Similarly, in De Laet and Mol's famous research on the *bushpump* (2000), colonial Rhodesia is completely effaced. John Law's celebrated study (1984) on long-distance control in Portuguese navigation rests on an Orientalist imaginative geography (Prasad 2023, 124-139). Alexandra Hofmänner has questioned how Thomas Hughes's monumental study of Large Technological Systems could have overlooked Johannesburg's gigantic electrical system, which programmatically excluded most of the population for colonial reasons (Hofmänner 2021, 19-20).

The desire to free STS from ideological burdens is legitimate, yet offering a partial framework that denies the entanglement of technoscience and politics impoverishes the knowledge process itself (Prasad 2023; Hofmänner 2021, 222). This had already been noticed by Ludwik Fleck, whose experience as a Jewish scholar in structurally antisemitic societies shaped his thought and who explicitly warned us about the political misuse of science and technology (Löwy 2016, 521). Technoscience acts politically insofar as it is "a source of changing power relations among actors, which may leave some in better situations but marginalize or harm others" (Pfotenhauer and Juhl 2017, 86). It is also an object of politics and embodies political constraints in its design and uses. The link between technoscience and politics is thus recursive (Callon et al. 2009; Mol 2002; Star 1991; Star 1999; Winner 1986). Considering the colonial may appear a return to the dominance of *passe-partout* categories saturated with ideology (Latour 2004, 245-246), yet it actually leads to a more complete rendering of processes directed by Western elites who manage complex technologies according to exogenous organizational models (Anderson 2002, 644). Its omission poses a greater danger than its overemphasis. The reflexivity principle of the *Strong Programme* (Bloor 1976) urged us to adopt a causal, impartial, and symmetrical approach to the kind of knowledge we produce. In the end, however, STS themselves appear as a universalized form of knowledge – while remaining a science of the North.

3. Postcolonial, Decolonial, and Beyond

What happens within STS also happens across technoscience as a whole. It presents itself as a universal phenomenon, and the uniformity of many standardized procedures can obscure

the variety of actual situations. Its existence, however, is constrained by institutional relations, infrastructures, and materials that condition diverse practices (Haraway 1988; Timmermans and Berg 1997, 275). Outside the boundaries of advanced countries, technoscience is often viewed as a replica, and its colonial context is ignored, trivialized, or devalued – according to an asymmetry of intellectual labor that has produced the situation in which "theory is made in the metropolis, while data are collected in the colonies". The Western tradition is thus seen as the only one capable of accurately understanding nature, social relations, and causal paths, and of producing theoretical and analytical categories with universal validity (Dumoulin et al. 2017, 434-436; Harding 2011, 6; McNeil 2005; Prasad 2023). The idea that science and technology develop similarly everywhere and possess universal value leads to a conception of the world as reducible to what John Law (2015) has called a *One-World World* – a world that denies legitimacy to the existence of other "worlds" and alternative epistemic processes. To understand this dimension, it is necessary to engage with other theoretical traditions, starting with dependency theories developed in the 1960s, and later with the "New Humanities" and postcolonial studies of the 1990s, where the topological relations between knowledge and power were examined.

Dependency theories were based on the observation of limited integration and the differentiated institutionalization of science between North and South, considering the former as the center and the latter as the periphery (Amin 1976; Dumoulin et al. 2017, 427-428). They took modernization as an inevitable evolutionary path for all countries, mirroring development policies (Basalla 1967; Eisenstadt 2000; Rostow 1960). The use of science to demarcate the difference between the *West and the Rest* parallels the traditional dichotomy between "development" and "underdevelopment" (Escobar 1995; Prasad 2023, 17; Rajão and Duque 2014). This approach was later challenged by the field of postcolonial studies, which refers both to the impact and legacy of historical imperialism and colonialism and to contemporary forms of neocolonialism. These studies include a territorial reference to colonial spaces and a critical reference to the West. Within them, postcolonial STS have focused on the relationships between North Atlantic technoscience, colonial subjugation policies, non-Western forms of knowledge, and the failure of "development" and "innovation" policies in regions marked by colonial relations (McNeil 2005, 106-107). Gayatri Chakravorty Spivak's *Can the Subaltern Speak?* (1988), together with the work of Homi Bhabha and Stuart Hall, fueled a critical debate that led to the reevaluation of Frantz Fanon (Chakrabarty 2021, 17). The introduction of *subalternity* as a category in research on the non-West has been foundational, and must be traced back to the theoretical work of Antonio Gramsci. According to the Sardinian thinker, subalterns represent disaggregated, fragmented social segments – workers, peasants, women, religious minorities, ethnic and racialized groups – who suffer the initiative of the dominant class and exist in a state of self-defense. They are often reduced to folklore or pop culture due to nature of the domination exercised through cultural hegemony (Gramsci 2011; Fresu 2023).

Edward Said (1979) and Gayatri Spivak (1988) emphasized the importance of rendering subalterns visible and giving them voice in historical and cultural processes. Spivak notes that subjects from most of the world, as represented in Western discourse, are recognized only insofar as they resemble a Westernized middle class (Spivak 1988, 271, 282). However, the use of the subaltern concept raises significant challenges in postcolonial studies, as it risks shifting attention away from the materiality of domination toward purely semiotic,

discursive, or representational issues (Mbembe 2001, 5; M'charek 2014a). Dipesh Chakrabarty has summarized these concerns through a critique of the Subaltern Studies' neglect of Dalit invisibility and caste hierarchies. In line with Fanon's theory of the "black body", he raises the problem of bodies marked by exclusion and disgust, urging us to move beyond philosophical abstractions that privilege the "anonymous" body, so as to overcome the lack of a theory of materiality (Chakrabarty 2021, 124-125; Fanon 1959; Mbembe 2001, 9). Frantz Fanon critiqued how medicine and psychiatry served as tools to legitimize domination, adopting Manichaean dichotomies between "modern" and "savage" peoples and supporting colonial practices of alienation. This produces a *colonial trauma* acting within the psychic states of colonized peoples, making bodies a privileged site of analysis (Fanon 1959). Edward Said (1979; 1993) analyzed how peoples in the Levant internalized essentialist prejudices crafted by Western discourse on the "Orient". It explains the Levant through the essentialist character of its civilization. This dichotomy creates a "historicism without history" in which the real history of the "Non-West" (or Not-Quite-West) becomes irrelevant or is marked by perpetual "lack" (Anderson 2002, 646). Through their colonial relations, hegemonic countries developed a self-definition in supremacist terms. Homi Bhabha (1990; 1994) likewise analyzed colonial discourse as an apparatus that translates racial, cultural, and historical differences into a knowledge form representing the colonized as degenerate. Recognition of difference thus becomes a means to deny the colonized full contemporaneity. The colonial subject is driven toward mimicry, concealment, or passing, while Western identity consolidates through self-exaltation. The colonized identity is often reduced to natural inferiority, particularly in racial terms. Bhabha identifies *hybridity* as a way out – a transformative postcolonial space capable of destabilizing colonial binarism (Bhabha 1994). In postcolonial contexts, inequality and cultural oppression can thus be overcome (Shepherd 2005, 131). Hybrids and hybridity immediately resonate with STS, and the need to describe agency in hybrid terms. The idea of the *entanglement* between material and human agency – and the radically hybrid character of modes of existence – is perhaps the most distinctive feature of STS (Callon 1984; Latour 1993, 11; Pickering 1993, 577; Prasad 2023, 144). Naturally, in postcolonial theory, the issue is not one of human versus nonhuman, since it remains grounded in discourse and sociohistorical action. Yet hybridity offers a way to think about forms of knowing and acting that escape binary or hierarchical logics (Bhabha 1994). Dipesh Chakrabarty pointed out that the West, starting from its own history, has removed the colonial fact and allowed itself to forge theoretical categories of universal validity, including historical periodizations. A North-Atlantic historiographical canon thus serves as a reference for most of the world. While European or North American historians can ignore most of the world's history without diminishing their scholarly status, "we cannot even afford a... symmetry of ignorance... without appearing outdated or unfashionable" (Chakrabarty 1992, 2). The rest of humanity is thereby reduced to an anthropological "Other", whose history becomes mere empirical material for data collection – relegated to a "waiting room of history" characterized by constant delay (*ibid.*, 2-3). More recently, Chakrabarty has criticized postcolonial studies for their indifference toward environmental crisis and planetary issues. Failing to relate geological time and human history, as postcolonial studies often do, is untenable when the gap between the two calendars is disappearing (Chakrabarty 2021, 17-38).

Decolonial hypotheses, by contrast, take the subaltern position as the epistemic and political foundation of their enterprise. They aim to overturn hegemonic European epistemologies and replace them with a new, revolutionary – though unified – framework. Peruvian sociologist Aníbal Quijano developed the concept of *coloniality* to describe a colonial condition not necessarily tied to formal colonial rule. Coloniality manifests as the dominance of a discourse in which anything opposing a Eurocentric worldview is deemed dangerous, inferior, or marginal. Upon this base rises a Eurocentric hierarchical system and an epistemology that excludes knowledge from the Global South. Coloniality thus appears as a Eurocentric structure of power that has ruled the world since the "discovery" of the Americas (Quijano 2000). In this sense, colonial experience is subsumed into the Latin American one, through which the birth of Western modernity too is explained. This view considers the colonial Other as both "ontologically given" and "historically constituted". Yet decolonial thought rarely considers European colonialism outside the Americas, nor other forms such as Japanese, Tsarist, Soviet, or Chinese colonialism (Chen 2010, 66-68; Harding 2016, 1066-1076; Mignolo 2011; Prasad 2023, 113). Epistemologically, decolonial thought proposes the emergence of an *epistemology of the South* leading not only to decolonization but to final liberation (Anderson 2020; Grosfoguel 2003; Quijano 2000; de Sousa Santos 2014). In this respect, it contrasts with the dominant STS approach, which grounds objectivity in limited location and situated knowledge (Haraway 1988). Decolonial theory reinstates a revolutionary objectivity founded on the separation between subject and object, far removed from STS agnosticism (Anderson 2020, 430-438).

A possible point of convergence with STS lies in the shared interest in the processes that construct a naturalized basis for race or biological classifications (M'charek et al. 2014a; 2014b; Schwartz Cowan 2008; Seth 2009). Decolonial approaches identify racialization as the abyssal form of marginalization that renders nonwhite populations inferior or subhuman (de Sousa Santos 2014). STS scholars examine practices of constructing naturalized differences between populations as both epistemically and materially embedded in technoscientific devices. Racism operates in the formation of classificatory systems incorporated into such devices and their operational use in border controls and registration systems. In an often invisible but ostensibly objective entanglement, technoscience and racism generate *technologies of belonging* that produce hetero-directed identification through databases, lists, maps, genetic tests, and naming practices. Databases on DNA, genome, and biological and biometric characteristics reveal how technology constitutes and classifies populations according to biological and genetic criteria, resulting in the "absent presence" of racism (M'charek et al. 2014b, 469).

Taking East Asia as a vantage point, Kuan-hsing Chen (2010) and other Far Eastern scholars developed the *Asia as a Method* hypothesis, which reflects the need to take into account the heterogeneity and plurality of colonial experiences in Asia, Africa, Oceania, and elsewhere, as well as the diverse epistemological encounters and clashes that differ greatly from Euro-American experiences. Its object is not so much the historical form of colonialism as *neocolonial imperialism*, even more dynamic and, though less reliant on military intervention, producing devastating inequalities, marginalization, economic and financial concentration, global division of labor, and environmental degradation (Anderson 2012;

2020; Chen 2010, 18-22). *Asia as a Method* urges us to "provincialize" not only Europe but also the Americas – without replacing them with an "Asia", seen as a unity, but as a heterogeneous site of conceptual production and theoretical transformation (Chen 2010, 217-222). This method involves:

a. deconstructing otherness, recognizing that "the West" is not a unified entity and may not even be the "Other" of anyone;
b. *regionalizing* rather than simply provincializing the West, dismantling it into multiple expressions; and
c. rejecting the formula "*The West and the Rest*", which overstates the West as the universal point of opposition (Hall 1992; Said 1979).

The heterogeneous, plural, and ambiguous nature of Asian colonial experience reveals how imperial countries could become colonized – and, after decolonization, again pursue imperial policies. *Decolonization* does not necessarily rhyme with *anticolonialism*; rather, under Cold War conditions, decolonization became entangled with modernization and knowledge production processes, often through imported technologies and externally directed development projects, which frequently failed and deepened dependency (Chen 2010, xii–xiv, 66, 211; Escobar 1995; Lu and Qiu 2023, 273).

Isabelle Stengers placed at the core of her concept of *cosmopolitics* the centrality of practices, understood as a constraint on agency shaped by the temporal dialectic of resistance and accommodation (Pickering 1993). Returning technoscience to its practices allows it to be compared, hybridized, and understood as an ordinary form of knowing. For Stengers, technoscience must also be thought in relation to those who bear its consequences – both human and nonhuman worlds (κοσμοί) marginalized by hegemonic epistemic processes, as in colonization. This may lead to "civilize the way scientists think of themselves, that is, to separate them from hegemonic-order words such as rationality, objectivity, and universality" (Stengers 2018, 87). Cosmopolitics should promote, through deliberation, the overcoming of divergences between dominant and dominated – both human and nonhuman – including the victims of colonization (*ibid.*, 94-95). Her proposal may be the one that most effectively hybridizes STS and postcolonial studies, by fully recognizing humans as collective geological and biological planetary agents, and by attempting to transcend the analytical divide between human history and geological or climatic change. Focusing on the disastrous planetary situation, summarized in the Anthropocenic hypothesis, means including in analysis every relevant dimension – from embodiment to inequality, from colonialism to extractivism. For this reason, as Chakrabarty argues, we must abandon the rhetoric of "globalization", since "the globe [...] is a humanocentric construction; the planet, or the Earth system, decenters the humans". Chakrabarty highlights the anthropocentric link between globalization and the long trajectory of modernizations. Countries marked by colonial histories have often chosen extractive models of political development and territorial exploitation. This is how the Anthropocene manifests itself across most of the world (de la Cadena and Blaser 2018, 2; Chakrabarty 2021, 4, 207-217).

4. A Post-Colonial Moment in STS: New Symmetrical Approaches

> We are the ones who have done the invisible work of creating a unity of action in the face of a multiplicity of selves, *as well as*, and at the same time, the *invisible work* of lending unity to the face of the torturer or of the executive. We have usually been the delegated to, the disciplined. [...]. This experience is about multivocality or heterogeneity, but not only that.
> – Star 1991, 29

The inclusion of the colonial in STS analyses is a recent achievement, which provides another layer to the argument about situatedness and construction of scientific knowledge – the imbrication of science(s) within colonial discourses and practices and its continued impact in postcolonial contexts (Prasad 2023, 32). Since the early stages of the Social Studies of Scientific Knowledge (SSK), it has been clear that sciences and societies co-constitute each other at particular times and places, and that beliefs must be analyzed symmetrically. Subsequently, ANT extended analytical symmetry to the human–nonhuman pair (Latour 2005; Harding 2016, 1064; Law and Lin 2017, 213-214). STS have emphasized that linear and asymmetric representations of technoscience are not only too simple, but also "detrimental to understand its development" (Bijker 1992, 75). They exclude what are considered marginal dimensions – that is, all moments other than design and conception. Actor-Network Theory has considered technoscientific phenomena as sets with open borders, continuously changing and hybrid. As hybrids, they are not different from phenomena concerning so-called traditional societies (Latour 1993). ANT has encouraged us to take into account everything that is part of sociotechnical processes, not only design, invention, or stabilization. Although these principles are clear, in research practice their application is often removed – except maybe in studies conducted in the Far East, where STS have had to confront intersections between Western science and other forms of knowledge (Lin 2017, 406). Analyses of the modes of existence of technoscience beyond design, the engineering of the heterogeneous, and the teleology implicit in the emphasis on the stabilization of scientific facts and technological artifacts have helped to confront the erasure of the colonial. Increasing attention has been paid to articulation, to the role of users and maintenance or repair technicians, and to critiques of the master's narrative (Mongili 2008). As Leigh Star (2015, 151) wrote, "A system becomes a system in design and use, not the one without the other". Steven Jackson reverses the idyllic vision of the existing by proposing that we consider as regular what is usually thought of as exceptional – namely instability, decay, and disorder – through his powerful concept of *broken world thinking* (Jackson 2014). This is a very useful concept for understanding phenomena typical of places marked by coloniality, such as the obsession with developing massive material infrastructures. The idea is that by designing and building them, one automatically enters "development".

Infrastructures correspond to relations among materiality, institutions, politics, knowledge practices, and entities located at different scales. They bring about not only new transformations, but also new topologies and politics, directly implicating colonialism (Anand et al. 2018, 10-18). Infrastructure interventions can be divided into two types. The first often

follows a military logic or aims at the segregation of native populations, who are confined or excluded from the development of road networks, military installations, food distribution systems, or energy grids. These infrastructural policies frequently produce diseases or are used to facilitate massacres and the extermination of Indigenous peoples (Harvey 2018, 83; Hofmänner 2021, 227-230; Mbembe 2003; von Schnitzel 2018, 137-140). The second type includes projects responding to demands for mobility, connection, or access to technologically updated services, often used by local authorities as tools of political consensus due to their association with promised development – but also as mechanisms to channel public funds to private speculators and to maintain clientelism and corruption. Very often, due to the absence of maintenance structures, they decay, are abandoned, or remain incomplete. From a developmental standpoint, they are chimeras (Anand et al. 2018; Appel 2018, 58; Larkin 2018, 175-176). The study of infrastructures and large technical systems has, however, largely avoided addressing, within conventional STS, the problem of their development as devices of centralization, ordering, infrastructural exclusion, and as weapons against populations (Hofmänner 2021, 49-50; Hughes 1987).

STS were born to investigate the continuous movement of translation across manifest disciplinary and territorial boundaries within which technoscience exists (Morita and Mohácsi 2013, 7). It exists as a relational phenomenon: connected, infrastructured, and circulating across different worlds. It has a structural link to design and to the corporations but is not reducible to them. Hence, it is constitutively tied to power asymmetries and the strategic formation of hegemony – something particularly evident in the digital, platform, and algorithmic era, which "also mirroring back to users calculated snapshots of themselves as members of taste publics or participatory communities" (Gillespie 2014, 14). Forms of use, maintenance, repair, the variety of device interpretations, their placement within a context and its transformation, and their spatiotemporal variations all constitute their multiplicity. Within this multiplicity, technologies can exist between what is situated and what "attempts to represent information across localities". Technologies themselves appear as *means of translation* for the collective activities performed by heterogeneous entities (Star 2015, 150-156). The information and data enabling the circulation of technologies are not neutral; they carry with them categories, conventions, standards, hierarchies of priority, exclusions, and invisibilities, and they express a particular *knowledge logic*. The technical data of devices remain unaltered and constitute an infrastructure present in every set. They assign essentialist forms to phenomena, assume their categorizations as the only plausible ones, and become operational through the technologies that incorporate these categorizations in the structuring of data (Bowker and Star 1999; Gillespie 2014).

However, the fragility and variability of forms of use prevent us from explaining sociotechnical phenomena solely from the standpoint of design or the data embedded within (Denis and Pontille 2025; Jackson 2014). The multiplicity of ontological forms corresponding to the different *enactments* of devices is another element that allows us to analyze the translatability of these forms beyond Western technoscience and vice versa – as in the well-known example of the translatability of Yoruba calculation practices into Western ones, presented in Verran's *Science and an African Logic* (2001). It is nevertheless difficult to escape the hegemonic thought that defines an "ordered and immanent law-determined one World" (Cech

et al. 2017; Law 2015). Three main critical claims summarize the limits of this hegemonic thinking: "(1) realities are enacted in practice; (2) since there are different practices, there are different enacted realities; (3) these practices and realities overlap and weave together to generate ontological multiplicity" (Law and Joks 2019, 425).

It follows that, according to an extended symmetrical principle, knowledge practices and realities judged by the mainstream as irrational or unfounded should not be excluded from inquiry. Different practices create different realities – not only through the meanings attributed to devices but also in relation to their situated *enactments* (Anderson 2020; Law 2015, 127; Mol 1999, 75). The goal is to clarify how realities are enacted, not what their essence is. For this reason, it is necessary to adopt a "politics of how" (Law and Joks 2019, 440), which considers knowledge, practices, enactment, and multiple realities symmetrically. John Law and Solveig Joks (2019, 440) summarized the theoretical shift accomplished by STS beyond conventional social sciences as the move from the "politics of who" – concerning only social relations, individual and collective rights and duties, and social actors' performances – to the "politics of what", concerning people and things, and thus the *enactment* of nonhumans. This is the fundamental shift from the analysis of the solely social to the inclusion of *assemblages* and hybrid *agencements* between humans and nonhumans, produced by practices (Mol 2002; Pickering 1993). To integrate phenomena such as colonialism and planetary issues, it is necessary to adopt a "politics of how" (Law and Joks 2019, 440), which symmetrically considers knowledge, practices, *enactments*, and multiple realities. Unfortunately, the theoretical efforts undertaken so far within STS – which remains a field of study centered on Anglo-Saxon cultural hegemony – continue to face the risk of being unable to see the Other except as an ontological given, rather than as the product of historical and social processes (Prasad 2023, 112-113).

It remains difficult to confront the question of *cui bono* in technoscientific processes: to whose advantage – and excluding whom – do they take shape? Too often, subalternity is confused with poverty or backwardness. Colonial history, understood as a duration acting in the present rather than a distant origin, is still difficult to assume. For instance, the role of colonialism has been erased from studies of the Scientific Revolution, seen as "embodiment of Eurocentric historicism without history" (Prasad 2023, 10, 87; Said 1979). The entanglement between technoscience and power has always posed a problem concerning both practices and their ideological uses. It involves principles of classification, standards, hierarchies of priority, communication forms, quantification modes, and data cultures (Bowker 2005, 184; Bowker and Star 1999). These are key elements of legitimation and consensus, particularly affecting marginalized, minority, and so-called "backward" or peripheral groups (Star 1991). Hence, they also concern the colonial, even though marginality and coloniality cannot be overlapped.

As Nicola Manghi has shown, Latour was well aware of the need to analyze why the Ivorians he studied in Abidjan in 1974 were deprived of the right to speak within a "modern" and "developmental" context – because they had to mirror themselves in a discourse that portrayed them as lacking competence. Drawing on concepts developed by Deleuze and Guattari in *Anti-Oedipus*, Latour showed how individuals involved in the same collective agency are simultaneously classified as modern and backward, competent and incompetent, educated and ignorant. The position of anyone identified as incompetent and backward – because

"native" or "indigenous" – is outside civil society, that of a shadow or a labourer. Thus, it is the relation of domination itself that assigns people, competences, status, and their relation to materiality and machines (Manghi 2021).

The possibility of addressing issues of technoscience in peripheral areas has been significantly enhanced by these theoretical advances. It has been crucial to abandon a taxonomic vision of culture and to adopt a generative one, in which culture is understood not as a repertoire but as a production or reproduction that takes place when people encounter the world. Today, as in the past, anyone can participate in multiple cultures, ethnicities, nationalities, classes, genders, kinships, and histories (Barad 2003; Kavita et al. 2012, 15). However, for this to be possible, the social sciences must critically analyze the role of the ideologies of development and modernity as powerful actors in the creation of subalternity and marginalization of places and groups – even through technoscience. This could recreate a virtuous circle so that "the subalterns may speak", supporting groups seeking to transform subaltern realities through their collective political practice (Escobar 1995, 17).

5. Local Knowledge and Postcolonial Topology

In STS there are several openings toward different knowledge traditions. Diversities and ontological multiplicities are problematized rather than excluded as a deviation (Morita 2014, 311; Star 1999, 384). The greatest danger – one that I myself personally experience – is the instinctive tendency to adhere to a classification in which a form of Western knowledge exists on one side, and "non-Western knowledges" on the other. This is a schematic framework that is extremely difficult to abandon, yet necessary to overcome, because it takes for granted boundaries that do not actually exist and renders the two highlighted poles internally coherent phenomena, which they are far from being. However, dominant epistemologies tend to deny the existence of different knowledge traditions, if not prohibit or delegitimize them, by associating other modes of knowing with superstition, irrationality, or ignorance (Cech et al. 2017, 750-754; Ma and Lynch 2014, 655). So, non-Western knowledge are translated into Western problems. They appear as cognitive forms destined to conflict, since only one form of knowledge is considered suitable to explain natural phenomena, while others are regarded as beliefs or mistaken projections. Within them, moreover, the very division between nature and culture is rarely relevant. Their devaluation is also linked to their exploitation. They are extracted from their contexts of production and traditional uses, without any reciprocal circulation of concepts or practices with the originating populations, as shown, among others, by Cory Hayden's research on the use of active principles derived from plants known in Mexican popular culture as medicinal and redirected toward value production in the pharmaceutical industry (Hayden 2004).

The conciliatory idea of a postcolonial encounter becomes possible only if science can be defined not with reference to an immutable methodological essence, but on the basis of the extraction of elements to be mobilized, accumulated, combined, and displayed, using the right tools for the job – that is, according to epistemic practices (Knorr-Cetina 1999; Latour 1987; Clarke and Fukimura 1992). To avoid confrontation, one must identify elements of

sameness on which differences can be negotiated. These can be found in practices, which the ANT approach places at the core of knowledge processes. The principle by which the future acquisition of Western science is promised in exchange for the present recognition of Western superiority and one's own epistemic subalternity – of colonial origin – can be pragmatically overcome (Lin and Law 2014, 3; Mongili 2021; Seth 2009, 377; Verran 2002, 730-731, 752-754). For example, in the diagnostic practice studied by Wen-yuan Lin and John Law in Taiwan, the set of elements taken into account is correlated with place. Its rooting in a place is often asserted, sometimes even generating nativist theories of knowledge. In traditional knowledge systems, *place* is not synonymous with *limited*, since they often consider existence holistically – as an interconnected whole (Candea 2010, 60; Cech et al. 2017, 748; Kuhn 2020, 66; Lin and Law 2014, 9). The concept of *space* is not understood as a point equivalent to any other on a map but derives its meaning from the unique presences that characterize it. The spatial aspect of the concept of *practice* refers to the fact that every practice is situated, in the sense that it occurs in a specific place. At the same time, each practice is fluid and relational – it takes place in situations and is a collective phenomenon (Anzaldúa 1987; Haraway 1988; Harding 2016, 1078).

Non-hegemonic forms of knowledge are important for scholars not because they are true or useful, but for their use and agency (Cech et al. 2017, 745-746). Helen Verran (2002) analyzed the encounter between Aboriginal and Western knowledges in Australia, describing how Western fire management researchers sought to learn from Indigenous expertise by following training offered by Aboriginal elders. In fire management among the Yolŋgu people, ritual takes the place of the text. Yolŋgu epistemic practices were incommensurable with Western scientific ones. Verran observed that these Aboriginal forms were tied to clan belonging and its link with a specific spatial portion – a hybrid for which the Yolŋgu language uses the term *wanga*. In Western science, a formal relationship is established between what happens locally and its generality elsewhere. In this Aboriginal forms of knowledge, the land is not an inert topographical space but a process of creation, whose existence cannot be detached from the ritual activities that enact it (Law 2015, 126-127; Verran 2002, 749). The epistemic encounter/clash between scientists and Aboriginal knowledge holders was characterized by the *disconcertment* of Western researchers. According to Verran, disconcertment arises from the diversity of modes of knowledge production and the absence of long chains of translation in Aboriginal knowledge. Collective memory, elaborated in musical, choreutic, graphic, and narrative forms, becomes knowledge at the moment when these forms are expressed in spaces defined by specific communities. This symmetry is eliminated in dominant Western epistemologies, beginning with that between body and mind. Western conceptualization proceeds through a regime of translations, from the isolation of the scientific fact to its inscription in papers and graphs, and the use of images that then circulate within the scientific community. The regimes of generalization in the two modes of knowledge reflect different immanent ideals and metaphysics (Verran 2002, 752-754; Law and Lin 2017, 215-217).

Translations of participants' conceptualizations can also become productive within STS, through a traffic of concepts or translational movement that is not limited to the narratives of informants, understood only as partners. It must also extend to their theoretical constructions, which offer relevant forms of conceptualization. Atsuro Morita and Gergely

Mohácsi call this hybrid-rooted theoretical form *lateral conceptualization*. They promote the contribution of participants to conceptual development that hybridizes the theoretical forms encountered in fieldwork with academic conceptual apparatuses. Their analyses stem from Morita's research among mechanics in northern Thailand working with Japanese second-hand harvesting machines (Morita 2014). In this case, the problems of technological transfer were not mechanically attributed to the "backward" features of the recipient culture, but explored through a translational movement across disciplinary, national, and ontological boundaries. Rather than interpreting informants' practices and accounts, a lateral conceptualization proceeds by creating parallel lists of words and concepts – one attributable to the ethnographer and their culture, the other to the participants. Each item of the two lists is used to performatively destabilize the other, intertwining them to create something new, based on fruitful conceptual traffic (Morita and Mohácsi 2013, 13). The goal is to favor translation (and dialogue) rather than extraction. We can thus "multiply reality" rather than merely negotiate hybrids. The study of category formation in non-hegemonic forms of knowledge has become part of contemporary reflection (Dumoulin et al. 2017; de la Cadena and Blaser 2018). As Morita and Mohácsi (2013) point out, Melanesian conceptions of *person* and *collective* oppose the Western notions of *individual* and *society*, while Amerindian cosmologies contrast the binary concepts of *body* and *spirit* with the hegemonic *nature/culture* scheme. From these considerations derives the important idea of postulating *multinaturalism* as a more adequate theoretical form than multiculturalism:

> Whereas multiculturalism assumes a universally shared bodily constitution – single nature – and diverse and often incommensurable mental worlds – multiple cultures, Amerindians conceive that humans and non-humans, jaguars and ghosts, for example, share the same spiritual quality while their different bodies bring to each species vastly different perspectives. Viveiros de Castro characterizes this as multinaturalism. (Morita and Mohácsi 2013, 10)

The realities touched by these situations are extremely diverse. In the cases of traditional Korean and Chinese medicine, one witnesses the negotiation of a role in the public sphere that usually results in institutionalization in a secondary position and in a subordinated hybridity. In research conducted in South Korea, Eunjeong Ma and Michael Lynch analyzed the difficulty of accepting computer tomography as a valid diagnostic practice within traditional Korean medicine. Their analysis shows the resistance to hybridizing forms of knowledge in a postcolonial context, particularly among the local modernizing élite (Ma and Lynch 2014). The negotiation of hybrids here is conditioned by the need to hierarchize local knowledge forms with respect to those of Western origin. In other contexts, as in studies on Chinese medicine, it has been observed that traditional medical concepts such as meridians (*jīng luò*, 經絡), vital energy (*qì*, 氣), *yīn-yáng* (陰陽), and the five phases (*wǔ xíng*, 五行) have been reformulated – during institutionalization – in terms of biomedical anatomy, or redefined in discrete and ontologizing ways (Lin 2017, 409). These heterogeneous and hybrid negotiated outcomes, however, do not seem to prevail over the erasure of local knowledge, which advances as a "hegemonic machine" that recognizes no other worlds but its own (Stengers 2018, 86).

Indeed, the devaluation of technoscience and knowledge processes occurring outside "advanced" countries remains a persistent bias. Amit Prasad has shown that even recently, the successful containment of Covid in many African countries was entirely silenced in the West (Prasad 2023, 47). In technology as well, the lack of recognition of innovations originating from the margins is evident. This concerns both innovations emerging from processes not conventionally acknowledged as innovative and successful cases perceived as "exceptions" or "miracles". This gap deepens as the imaginary of a place becomes more tightly linked to subalternity (Jackson 2014; Mongili 2021; Prasad 2023, 47). It involves "invisible technicians" in laboratories, experts in so-called *traditional knowledge* labeled as "indigenous", aged or "unsuitable" users, and inhabitants of places considered "backward" (Godin and Vinck 2017; Shapin 1989). It is a phenomenon present everywhere, with a topological diffusion that grows alongside power asymmetries and the pervasive presence of coloniality in various societies. The inability to recognize the coevalness of all, even within STS, coincides with the misunderstanding of segregation and marginalization of the "backward".

In the training of scholars from marginal areas, this process is observable in forms of reverse selection. As shown by studies by Erin Cech, Anneke Metz and colleagues on the curricula of Native American students in Science, Engineering, and Health Studies (Cech et al. 2017, 748-760), they are required to adhere to the radical delegitimization of indigenous, local, and alternative epistemologies, and thus to exclude the possibility to enact locally different realities. These forms of knowledge are excluded from curricula and burdened with derogatory stereotypes – not only in scientific and technological studies but also in ecological sciences, the humanities, and the socio-anthropological disciplines. Students interested in such knowledge forms are marginalized, making credentials in alternative epistemologies impossible. Similar phenomena have been observed in other marginal areas, such as the scandalized reception of Tracey Heatherington's studies in Sardinia by local scholars accustomed to taking for granted the association of all things Italian with civilization and all things Sardinian with backwardness (Heatherington 2013), or the exclusion of Sámi cultural knowledge from academic curricula in the Sápmi region (Kuhn 2020, 120, 130). Toward the erasure of epistemologies treated as waste has also worked the hegemonic preservationist culture, culminating in that strand of environmentalism that dreams of returning to a wilderness freed from humans – and especially from Indigenous people (Denis and Pontille 2025, 292; Heatherington 2010; Merchant 2003).

6. Conclusion

Across much of the world, technoscience operates in continuity with colonialism – through the extraction of minerals, the construction of massive infrastructures, and the violent reshaping of landscapes, territories, waters, forests, and air. These processes are accompanied by the localization of intensive practices of cultivation, industrial pollution, energy production, and the extraction of rare metals (de la Cadena and Blaser 2018, 2). The encounter between distinct epistemologies and metaphysical frameworks, within contexts marked by power asymmetries and colonial domination, confronts STS with the task of examining how different elements participate in these processes and the directions they take. Such elements can be

positioned differently in relation to power, scale, projects, and uses. Yet the performances of a single device – and the infrastructures that operate across multiple scales – often converge on specific courses of action, aligning heterogeneous elements within unique situations (Clarke et al. 2015; Star 2010). Their analysis is made difficult precisely because they are more *liminal* than *ontological*. As Michel Serres (2009, 109-110) observed, these processes no longer unfold within the same metric, nor according to new forms of measurable distance. What has changed is the very space in which they occur: a topological space, without fixed distance or scale, where temporal relations cannot be determined through stable metrics. In geometry, topology refers to *homeomorphism* – the way relations can take on analogous forms across different times and places, without necessarily belonging to the same structure or system. Adopting a topological approach therefore stands in fundamental tension with the rigid typologies and classificatory schemes that have long structured Western systems of knowledge (Bowker and Star 1999, 116-117, 191; Gromme and Rupert 2020, 241-245; Mongili 2015, 23). The value of such an approach can be illustrated by the topological analysis of the distributed nature of race, which resists reducing race to a single dimension – be it skin color, DNA, or ethnicity – and instead highlights how it is variously constructed across times and places. It also allows us to trace how "elements that are distant in time and space can become proximate and relevant in the here and now", helping us understand "how technologies that seem indifferent to racial differences contribute to the enactment of race" (M'charek et al. 2014b, 471-472).

As with any political question, coloniality also operates within the world of technology – through classificatory structures, systems of data organization and formation, standards, and algorithms. Without following this analytical path, and without engaging with the complexity such research entails, there is a risk of getting lost in the haze of ideology.

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