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ANALYTICAL ESSAY

Lateral Relations in World Politics: Rethinking Interactions and Change among Fields, Systems, and Sectors

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Scholarship drawing from a wide array of perspectives including field theoretical and functional differentiation approaches has shed increasing light on the sectoral dimensions of world politics. In contrast to dominant approaches emphasizing hierarchy and power in relations between global fields, this article offers a novel interpretive framework for understanding how diverse fields, systems, or sectors may interact and facilitate change in world politics beyond the operation of established hierarchies and power dynamics. Taking forward the previously underutilized concept of symbolically generalized media of communication, this article elucidates two processes of international political change by which different fields, systems, or sectors may transform world politics. The first process, lateral retreat, is illustrated with reference to the case study of the Protestant Reformation, in which internal changes in the religious field facilitated the development of an increasingly autonomous political domain. The second process, lateral penetration, is illustrated with reference to the international political response to the climate change and Covid-19 crises, in which the scientific sector contributed toward transformed political priorities and associated hierarchies, at least in the short term. These diverse cases are used to indicate the broad potential scope of application of the concept of symbolically generalized media of communication to enrich relational theorizing in the study of international relations, and to improve understanding of diverse dynamics of international political change missed in traditional power- (and anarchy-) centric accounts.

Los estudios basados en un amplio abanico de perspectivas, incluyendo enfoques teóricos de campo y de diferenciación funcional, han arrojado cada vez más luz sobre las dimensiones sectoriales de la política mundial. En contraste con los enfoques dominantes, que enfatizan la jerarquía, y el poder en las relaciones entre los campos globales, este artículo ofrece un novedoso marco interpretativo para entender cómo diversos campos, sistemas o sectores pueden interactuar y facilitar el cambio en la política mundial más allá del funcionamiento de las jerarquías establecidas y las dinámicas de poder. Retomando el concepto, hasta ahora infrautilizado, de medios de comunicación simbólicamente generalizados,

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este artículo dilucida dos procesos de cambio político internacional mediante los cuales diferentes campos, sistemas o sectores pueden transformar la política mundial. El primer proceso, el retroceso lateral, se ilustra con referencia al estudio del caso de la Reforma Protestante, en el que los cambios internos en el ámbito religioso facilitaron el desarrollo de un dominio político cada vez más autónomo. El segundo proceso, la penetración lateral, se ilustra con referencia a la respuesta política internacional a las crisis del cambio climático y de la COVID-19, en la que el sector científico contribuyó a transformar las prioridades políticas y las jerarquías asociadas, al menos a corto plazo. Estos diversos casos se utilizan para indicar el amplio alcance potencial de la aplicación del concepto de medios de comunicación simbólicamente generalizados para enriquecer la teorización relacional en el estudio de las relaciones internacionales, y para mejorar la comprensión de las diversas dinámicas del cambio político internacional que se pierden en los relatos tradicionales centrados en el poder (y en la anarquía).

En se fondant sur un large éventail de perspectives, notamment les approches de différenciations théorique et fonctionnelle, les chercheurs mettent de plus en plus en évidence les dimensions sectorielles de la politique mondiale. Par contraste avec les approches dominantes qui soulignent la hiérarchie et le pouvoir dans les relations entre les différents domaines à l'échelle mondiale, cet article propose un nouveau cadre d'interprétation visant à comprendre les façons dont divers domaines, systèmes et secteurs peuvent interagir et faciliter les changements dans la politique mondiale, au-delà du fonctionnement de hiérarchies et de dynamiques de pouvoir établies. Grâce à la mise en avant du concept jusque-là sous-exploité de médias de communication symboliquement généralisés, cet article explicite deux processus de changement en politique internationale, qui permettraient à différents domaines, systèmes et secteurs de transformer la politique mondiale. Le premier processus, la retraite latérale, est illustré en faisant référence à l'étude de cas de la Réforme protestante, au cours de laquelle des modifications internes dans le domaine religieux ont facilité le développement d'un domaine politique de plus en plus autonome. Le second processus, la pénétration latérale, est illustré en faisant référence à la réponse politique internationale au changement climatique et à la crise du Covid-19, dans le cadre de laquelle le secteur scientifique a contribué à la modification des priorités politiques et des hiérarchies associées, au moins sur le court terme. Ces différents cas servent à montrer la largeur du champ d'application potentiel du concept de médias de communication symboliquement généralisés afin d'enrichir la théorisation relationnelle dans l'étude des relations internationales et d'améliorer la compréhension des diverses dynamiques en matière de changement en politique internationale omises par les explications traditionnelles, plutôt centrées sur le pouvoir (et l'anarchie).

Keywords: relationalism, fields, systems
Palabras clave: relacionalismo, campos, sistemas
Mots clés: relationalisme, domaines, systèmes

Introduction

In his classic text, Kenneth Waltz (1979, 39) expressed the idea that the "interstate system is not the only international system one can think of." While Waltz was positioning his theory of the international relations (IR) against competing theories of the international, such as Wallerstein's theory of global capitalism, his observation was nonetheless more general, since many foundational IR theorists justified

the existence of a distinctive IR discipline *and* theory on the notion that international politics constituted a separate domain of social action, with its own structural logic, dynamics, and institutions (Buzan and Little 2000; Guilhot 2008). However, as realist structuralism fell out of favor, criticized for being too reductionist and simplistic for a globalizing world, questions about the position of the international political system in relation to other international systems and social domains were left aside as hubristic grand-theoretical interrogations too detached from "action-guiding" investigations and emancipatory aspirations (Brown 2013). Thus, while IR rationalism moved to break down IR into methodologically isolated analytical problems, the constructivist and critical literatures blended these with society, not only by describing world politics in social terms but also by treating virtually any social domain as inherently political, from culture and language to the personal sphere (Tickner 1997; Dunne, Hansen, and Wight 2013). Paradoxically, in this process the IR discipline became increasingly detached from macro discussions—in the words of Buzan and Little (2000, 20), preferring to "think small and narrow rather than big and wide"—while the study of the evolution, functioning, and change of the world order became more a concern of global history and international historical sociology than of IR (Spruyt 1994; Hobson, Lawson, and Rosenberg 2010; Acharya 2014; Buzan and Lawson 2015).

There were notable exceptions and in recent years, a range of scholars have renewed interest in theorizing world order and the relative location of the international political system. However, rather than focusing on the latter as an independent sphere, these new literatures approach it as existing in a state that Go and Lawson (2017, 20) called "interactive multiplicity"—as part of a global society that is simultaneously highly interconnected and highly differentiated, composed of a variety of coevolving political, social, economic, cultural, scientific, artistic, religious, and other domains and structures that intersect and interact in multiple ways. Rooted in a productive engagement with diverse sociological approaches—from Bourdieusian practice theory, to social network theory, to Luhmannian functional differentiation, among others—these literatures conceptualize world politics and international structures not in terms of levels, states, or even individuals, but "relationally," in terms of interacting networks, systems, or fields (we will deal with terminology later) involving "not simply material exchanges, but also communication and symbolic transactions" (Nexon 2009, 45; Buzan and Albert 2010; Adler and Pouliot 2011; Albert, Buzan, and Zürn 2013; McCourt 2016; Bueger and Gadinger 2018; Nexon and Neumann 2018; Kurki 2020).

This article seeks to contribute to these literatures by elaborating what we claim is a lingering deficit in these accounts: the mechanisms through which systems, fields, or sectors interact with each other beyond hierarchy and power. To date, much of the relational literature has maintained a "vertical" approach, often emphasizing intra-system (-field) developments rather than inter-system (-field) ones: while relational approaches have increased IR's sensitivity for the particularities of diverse social structures and domains, prevalent uses have been oriented toward unpacking hegemonies, pecking orders, and hierarchies arising *within* a more variegated international order or society, seeking to challenge anarchy with hierarchy (Mattern and Zarakol 2016; Musgrave and Nexon 2018; Nexon and Neumann 2018; Ikenberry and Nexon 2019). This vertical approach, given its preoccupation with the primacy of power, obfuscates other patterns of world ordering and inter-field interaction whereby systems or fields may influence each other without sacrificing their autonomy and field/system-specific logics. It also obscures other forms of differentiation, such as the racialized differentiation that accompanied imperial modes of integration (Getachew 2019). Moreover, the undertheorization of inter-sectoral relations is a problem that transcends IR, with Bourdieu, for instance, admitting that inter-field relations was something he "[. . .] would not normally answer because it is too difficult," better left for empirical inquiry (Bourdieu and Wacquant 1992, 109). Thus,

while there is recognition that fields or systems can relate to each other in multiple ways and be more or less dependent, contemporary global sociologists consider the "dynamics of field autonomization, articulation, convergence, subsumption, or separation" to remain undertheorized and underexamined (Go and Krause 2016, 10).

To address this issue, we expand on an alternative form of inter-field/systemic interaction that we denominate "lateral relations," seeking to consider the reverse side of the relationship between the international political system and other sectors of world society: processes whereby international political structures and hierarchies are reshaped by changes in other systems and fields. Doing so, however, requires first clarifying the theoretical nature of the problem of inter-field and inter-system relations, before moving on to provide alternative tools to better conceptualize how diverse global fields or systems can affect world politics. Hence, in the first section of the article, we discuss the distinguishing characteristics of systems and fields, drawing on Bourdieusian field theory and Luhmannian systems theory, respectively, to then consider how despite their differences the concept of "symbolically generalized media of communication" (MC) enables operationalization of a lateral relations approach considering interactions between the international political system and other domains, whether conceived as fields or systems.

In the second part, we develop two "proof-of-concept" case studies, the Protestant Reformation and the role of science in the climate change and Covid-19 crises, to elucidate two patterns of lateral relations that we denominate *lateral retreat* and *lateral penetration*, respectively. These cases were selected as the clearest exemplars of the two patterns, each entailing global episodes whereby world politics was shaken by "external" changes in two other systems, religion in the first case and science in the second. Described as "one of the most important episodes of radical institutional change in the last millennium" (Becker et al. 2020, 857), the case of the Protestant Reformation serves to elucidate a process of lateral retreat, whereby the diminished scope of the MC of the religious sector facilitated the development of an increasingly autonomous international political system. In contrast to traditional "Westphalian" narratives focused on the victory of the *raison d'état* over *raison religieuse* and the consolidation of a sovereign–territorial state system, we emphasize how the Protestant reformulation of Latin Christianity promoted a curtailment of religious logics across politics and society. In particular, we argue that by narrowing the function of faith and key religious MC (the Papacy, canon law, priesthood, and the Bible, among others), Lutheran reformism generated space for the "desacralization" of politics and social affairs in much of Europe—enabling the consolidation of national/confessional conceptions of the state as an autonomous political and moral community, and simultaneously, the development of distinctive modalities of international (European) political interaction and organization. In the second case, we go beyond the conventional interest of IR in policy science, expert governance, and epistemic communities, to illustrate a process of *lateral penetration*, whereby political logics and institutions were reshaped by the intrusions of the MC of the scientific sector. Here, we draw from developments across two global sociotechnical crises to consider how science and its MC saw its epistemic standing augmented, with ecological and epidemiological reasonings circumscribing political autonomy and reshaping political priorities. This analysis highlights how insights from science and technology studies (STS) on boundary objects can be bridged with understandings of MC to consider how institutions of the international political system can be reshaped by other sectors through the intermediary role of these objects.

The two patterns of lateral relations considered in this article—lateral retreat and lateral penetration—are not the only prospective patterns of inter-field and inter-system relations: fields or systems can be suppressed, subjected to moderate structural changes, lead to structural transformation, or various hybrid

possibilities among these, as we consider further in the conclusion.[1] Nonetheless, by enabling an examination of processes of world ordering and change beyond hierarchy and anarchy, the cases serve as an initial illustration of the dynamics of lateral relations. Our article thus contributes toward widening relational theorizing in IR, opening up a more complete perspective on the functioning of a complex world society and of the position of world politics in relation to other social domains. Moreover, it complements an incipient literature that sees international order as an emergent outcome of multiple dynamics within a polycentric world society, involving not only diverse social and material systems, but potentially nonhuman ones (Go and Lawson 2017; Corry 2020).

Fields, Systems, and Sectors in World Society

While the idea that world politics constitutes a *system* has a long lineage in IR, the specific implications of this categorization remain underexplored, often departing from the limitations of the Waltzian definition of the international political system as an undifferentiated anarchical structure and of systemic understandings of world politics that "focus on the uppermost layer and 'bracket' (i.e., ignore) the rest" (Braumoeller 2012, 13; Donnelly 2019). However, alternative approaches working with more integrated conceptions of world society have often not fared much better in clarifying what it means to think world politics and society in terms of systems, fields or sectors, with conceptualizations of world society often eschewing the differentiation within it in favor of considering the prospective development of an integrated global community (Boli and Thomas 1999). Nevertheless, in recent years, scholarship has started to bring the internal differentiation of world society into sectors, fields, or systems to the forefront (Albert and Buzan 2013; Buzan and Schouenburg 2018).

Terms such as fields, systems, and sectors become consequential when it is accepted that they capture internal patterns of differentiation and organization with substantive implications for the overall functioning of the social whole (Albert, Buzan, and Zürn 2013). Accordingly, the distinction between systems and fields has had much greater development in sociological theorizing within theories of society. As noted by Stichweh (2013), the idea that modern society is structured around different functional domains and stable areas of meaning is as old as sociology itself and a basic pillar in many models of societal evolution, from Durkheim, Weber, and Simmel, to Habermas, Luhmann, and Bourdieu, among others. These theories share the view that the modernization and convolution of society has involved the increasing individualization, rationalization, and autonomization of different spheres of social and individual life, as social relations shifted away from the "substantive reason of religion and metaphysics," unified world conceptions, and localized trust relations (Habermas and Ben-Habib 1981, 8; Giddens 1990, 34). Accordingly, a central concern of these theories has been elucidating the structuring, reproduction, and interaction of different social spheres in order to understand the limitations, possibilities, and risks confronted by a complex and decentralized society increasingly difficult to coordinate (Beck 2009).

At the most basic level, both fields and systems refer to stable sets of relations that configure "spaces" of social action with their own logics, rationalities, and institutional architectures, be they, for example, the economy, religion, art, or science, to name a few common examples at the macro level. In the approach taken in this article, as in other IR literature drawing on Bourdieusian and Luhmannian understandings of fields and systems, these spaces are understood relationally rather than institutionally or organizationally: while some fields or systems may be highly institutionalized and organized, most institutions and organizations are crossed by

[1] We are grateful to an anonymous reviewer for this point.

fields and systems—such that a business company can be not only an economic organization, but also a political one and a legal entity.[2] Despite their similarities, there are significant differences when understanding differentiation in terms of fields or systems—a complex issue that has tended to be obfuscated in existing literature (Stichweh 2013). *System*-thinking, which Martin (2016) associates primarily with Luhmann, considers the guiding logic of a system to be the resolution of a problem in society, with the definition of the problem and the legitimacy of the offered solution being set not from outside but rather by the operation of the system in question. Thus, society does not *need* an economic system or a scientific one, but the emergence of separate economic and scientific systems facilitates the resolution of a number of social challenges—in the case of the former, for example, the production of better knowledge than the one offered by prior systems of "truth," namely religion and tradition (Stichweh 1996). At the same time, it is for science to define what science is and how to go about it—and the same applies for other systems such as the economy or art. In this process, systems gain autonomy, albeit autonomy does not mean autarky; while structurally coupled to their environment and to each other, each system processes external and internal events and communications according to their unique logic, or what Luhmann called their "code."[3] As a result, systems organize themselves differently, assuming distinct forms of internal differentiation. For instance, Luhmann saw both politics and science to be differentiated segmentarily, the first into territorial states, the second into academic disciplines, while the economy has developed global markets alongside a core–periphery structure (Luhmann 2013b, 98–99).

In the case of *field* thinking, this externally oriented functional requirement is softened. Thus, fields according to Martin (2016, 166) have an *internal* orientation, so that the self-organizing force is not the system/environment relationship but the "mutual susceptibility" and recognition of internal elements—for Bourdieu, for example, a field is a domain of social interaction where all participants acknowledge that there is something "at stake" (*enjeu*), even when this recognition does not imply consensus or cooperation (Bourdieu 1990, 66; 2004). This makes the notion of field less structural and demanding. While some macro fields can roughly coincide with primary social systems, field logics can emerge around almost anything as long as "actors have a general consensus regarding field rules and cultural norms" (Kluttz and Fligstein 2016, 199), with different types of field theories concentrating on different types of fields and field dynamics—from the more abstract, ideological, and macro fields of Bourdieu to the concrete and semi-institutionalized "strategic action fields" of Fligstein and McAdam (Fligstein and McAdam 2012; Kluttz and Fligstein 2016).

Both fields and systems presume self-organization and a degree of autonomy—something that distinguishes these concepts from the more general and instrumental notion of sectors. Some systems show field behaviors, but most fields are not systems. For instance, Martin (2016) mentions that "high cuisine" is indeed a field but likely not a system, as it lacks a clear functional coding (in some sense it is closer to art, if an aesthetic logic prevails). Similarly, some IR scholars consider global governance to be "more" than a sector, with some approaching it as a separate organizational field with its own conditions of membership and legitimacy (Dingwerth and Pattberg 2009; Sending 2015), and others as an emerging subsystem of world politics that addresses problems stemming from the territorial organization of

[2] In this, our approach differs from approaches that have worked with more restrictive organizational or institutional definitions of fields, where a field is a group of organizations doing something in common, aware of each other as like-units, and susceptible to common functional or normative "isomorphic" pressures—the type of usage found in Dingwerth and Pattberg (2009) and to a large extent in Haas (1976).

[3] Codes are fundamental binary distinctions that structure all communications and expectations in functional terms: thus, for Luhmann the code of politics is governing/governed, of law legal/illegal, of science true/false, and so forth (Luhmann 1990b).

political authority (Jaeger 2007; Peña 2015). The question of boundaries has tended to be avoided, including by Bourdieu and Luhmann themselves, since boundaries are relational products arising from system reproduction and field struggles—for instance, what art is or is not, is set by art, and one has to be part of art or "see" art to be able to influence art definitions.[4] For the purpose of this article, it is sufficient to assume—as both Bourdieu (2004) and Luhmann (1995, 12) did—that there are social fields and systems, and that some of the primary ones, such as politics, economy, science, and religion, are intuitively identifiable and exert major structuring effects over society. It is these primary social fields or systems that are common both to field thinking and to system thinking and therefore in this article, we use these terms interchangeably in this sense. In the next section, we address both Bourdieu's field theory and Luhmann's social system theory to engage with the problem of inter-systemic interaction, moving then to introduce the concept of MC.

Across Fields: Power, Capitals, and Hierarchies

In general terms, IR scholarship has worked with a tacit recognition that there are other systems and fields in society, although as previously outlined even the relational IR literature has tended to concentrate on the internal dynamics of an expanded world political system, or on how political power could be extended to solve problems arising from the increasing complexity of society. Ahead, we highlight how this is linked to Bourdieu's approach, which has been the most influential and prevalent relational approach applied in IR (McCourt 2016; Jackson and Nexon 2019).

Much of the appeal of Bourdieu's theory for IR scholars follows from how it facilitates a conception of *social* fields *of practice* as *political* fields *of power* while preserving their cultural distinctiveness, enabling a conversion of the "everyday" to "scales familiar to analysts of world politics"—such that, for example, environmental governance, diplomacy, or nuclear security emerge as separate realms affected by but relatively independent of traditional structural forces, be this balance of power or global capitalism (Nexon and Neumann 2018, 670; Bigo 2011; Leander 2011; Adler-Nissen and Pouliot 2014). Furthermore, concepts such as fields, capital, and habitus have energized "hierarchy-centric" studies, with empire, hegemony, and other forms of international ordering and stratification reconceived as "global fields" and "international quasi-states" that generate their own meta-capitals and conditions of prestige and status (Go 2008; Kauppi 2018; Musgrave and Nexon 2018; Nexon and Neumann 2018).

This is no accident, as power and hierarchy are constitutive of how Bourdieu conceived fields and their interaction. Thus, while in principle the value of a particular capital is field-specific, for Bourdieu all capitals are forms of symbolically accumulated power that actors compete for—whether in one of its primary forms (economic, cultural, and social) or in any of their many secondary varieties (literary, intellectual, linguistic, and so forth) (Bourdieu 1986, 1990). This quality grants capital(s), and thus power, its fungibility and capacity to travel across fields—with Bourdieu, for instance, considering economic capital the most fungible one in advanced capitalist societies (Sapiro 2018). This has major implications for how the relationship between fields is understood. In this approach, power stands as a transcendental currency, "a force that pervades all human relations" (Swartz 2013, 3), and the field of power serves as a "meta-field" where those with considerable amounts of fungible capitals compete with each other (Bourdieu and Wacquant 1992, 76). Not only is the distribution of power fundamental to understand positions and dispositions *within* fields, but also the patterning of relations *between* fields: fields can be strong, weak, autonomous, or dominated. Hierarchy arises then as a core

[4] See discussion in Fligstein and McAdam (2012, 214–16).

"structural homology" across society, and much of Bourdieu's analysis was geared toward exploring the effects of these homologies over fields, agents' strategies, and the primary institutions that assure the reproduction of economic and cultural capital (Wacquant 1993, 8–12; Swartz 1997, 130–35). Field autonomy for Bourdieu was a variable resulting from the relative distance of a field from the political field and the field of power, so that the juridical field or diplomacy is expected to be less autonomous than art and science, and thus display stronger homologies with the political field. For this reason, Bourdieu's work has been critiqued for reducing "social life to an endless struggle for power between actors" and for being better suited to explain "enduring hierarchies" than change (Jackson 2008, 170).

In this article, in contrast, we aim to move beyond a vertical power-centric conception of inter-field relations to consider how fields and systems may interact and influence each other without shedding their autonomy or subordinating their field logics to the logic of power. More specifically, are there other media and interactive mechanisms beyond power that may facilitate structural homologies and other patterns of inter-field communication? How do these mechanisms and media facilitate world political and social change? As elucidated in the section ahead, the Luhmannian conception of MC may provide an answer to these questions.

Across Systems: Functions, Irritations, and Media of Communication

The structural transcendence of power is precisely what gets demoted in theories that take functional differentiation and autonomy more seriously, as it is the case with Luhmann's systems theory. Updating the static functionalism of Talcott Parsons, three general aspects of Luhmannian sociology are of relevance for our argument. First, Luhmann viewed system autonomy as the central concern of sociological inquiry: how social systems manage to reproduce themselves when constantly exposed to changes and "irritations" from the outside and from within. Second, conceiving contemporary society as functionally differentiated, his theory did not presume any form of structural hierarchy ordering society nor attributed functional superiority to any particular system (Luhmann 1977, 36). Third, contrary to Bourdieu and other power theorists such as Foucault and Gramsci, Luhmann considered that "most issues occurring in society require neither power nor collectively binding decisions," meaning that most structured communications and interactions in society take place *beyond* power (King and Thornhill 2003, 70; Borch 2005). Hence, Luhmann worked with a more restrictive conception of power as the code of the political system and *only* of the political system (Luhmann 2017, 124).[5] Consequently, there is no meta-field of power nor does the political system enjoy a privileged vantage point over society. On the contrary, Luhmann saw many challenges in contemporary society in terms of the functional asymmetry between a still largely territorialized political system and systems such as the economy, science, and even the mass media, which had achieved high degrees of functional autonomy and become genuinely global (Luhmann 1990b, 1997, 2008).

To conceive intersystemic interactions in this flat world society, Luhmann drew from a theory of symbolically generalized media, considering social coordination to be facilitated by the existence of informational elements and artifacts that symbolically codified preferences and expectations according to systems' codes, reducing the complexity and openness of social situations and communications (Luhmann 2017, 122).[6] These media therefore extend significantly beyond what are standardly conceived of as MC, such as language and print and broadcast media. Power, for instance, is the medium that "communicates an asymmetrical relationship, a causal relationship, and that motivates the transmission of selections of action from the

[5] For a detailed discussion on Luhmann's conception of power, see King and Thornhill (2003).

[6] Chernilo (2002) offers a comprehensive primer on symbolically generalized media theory.

more powerful to the less powerful" (Guzzini 2004, 211). However, many other MC have developed in relation to other relevant social problems, such as money in relation to the problem of scarcity, truth in relation to knowledge, law to legality, and love to intimacy, resulting in the respective consolidation of major social systems such as the economy, science, law, and the family (Luhmann 2013b). The symbolic properties of a given medium are what ultimately support the degree of functional autonomy and adaptability to environmental change of systems, such that "society does not rise as dough; it does not grow evenly": it complexifies certain functional spheres, for example, science or finance, while others such as morality or art have more meagre "system formation" potential, as their MC are less symbolically efficient (Luhmann 2012, 233–35). Whereas in field theory attention has been focused on the fungibility of capitals, MC provides an alternative approach to understanding inter-field relations without assuming the primacy of the political.

MC may therefore help us to understand not only the self-reproduction of a system or field but also the structural coupling and dependencies that these may develop with one another. Successful media (and the respective systems around them) tend to develop a range of symbolic "substitutes" and secondary media that widen the possibilities of more "primitive" forms of social interaction, such as those requiring physical proximity, shared experience, or interpersonal trust (Luhmann 1991). For instance, in contemporary society, the medium of power operates through substitutes such as hierarchies (where rank substitutes power asymmetries), histories (power via the recollection of past achievements), status, legal rules, and policy priorities, among others, which enable power to overcome the logistical limitations of coercion (Guzzini 2004; Luhmann 2017). Other social systems have also generated effective media substitutes, such as fiat money by the economy, marriage in relation to love, or scientific theories in relation to science, which widened the circulation and adaptability of system-specific relations—such that while hierarchies and legal rules make politics more adaptable that if it sustained on coercion, fiat money enables more economic possibilities than bartering (Luhmann 2012, 232).

This symbolic character grants MC their semantic plasticity, facilitating the conversion of external irritations and intrusions into useful information that systems can process according to their own logics. For instance, money enables pricing an artwork so that it can be traded in a market, but this price can also be used as a marker of artistic excellence (particularly for those that do not know much about art) (Luhmann 2012, 208). Similarly, legal media facilitate a smoother reproduction of systems such as the economy, via contracts and property rights, as well as politics, with power becoming increasingly legalized and the state evolving into a *Rechtsstaat*. However, these translations are always open and incomplete, as a system's media can never fully operate as a substitute for another without overriding the latter's autonomy: just as no tribunal or political decision can establish a scientific truth (although they can influence science through power substitutes, such as research priorities, grants, or making some research illegal), wealth cannot be fully converted into love, nor scientific knowledge can substitute power (although it can influence political priorities, as we will discuss).

Although a number of IR scholars have considered functional differentiation to discuss world politics and the functioning of coexisting international societies—mainly as a result of the fruitful collaboration between English School scholarship and a German school of IR theory (Buzan and Albert 2010; Kessler 2012; Zürn, Buzan, and Albert 2013; Albert 2016; Buzan and Schouenburg 2018)—the notion of MC has received limited attention in IR to date. However, concepts from STS can help us to consider how MC may operate in practice in global inter-field or inter-system relations.

Exploring the constitutive role of scientific discourses, practices, and epistemes on patterns of social and political ordering, STS literature emphasizes the importance of *boundary work*, the set of discourses and practices involved in demar-

cating science from nonscience, and the role played by "hybrid" artifacts, entities, and other media in coproducing this interface (Guggenheim and Nowotny 2003). As noted earlier, this focus on boundaries addresses an overlooked aspect of both Bourdieusian field theoretical approaches and Luhmannian systems theory. STS underlines the importance of *boundary objects*, that is, material-epistemic packages that sit "between two *different social worlds* [our emphasis]" and that can be used for specific purposes within each world "without losing their own identity," and of the activities of *boundary organizations*, the dual-character institutions that manage the translation process and that are particularly relevant for the conversion of science into useful knowledge and policy advice (Gieryn 1983; Guston 2001, 400–401; Star 2010). These boundary entities and artifacts can be rather symbolic and abstract, as is the case of some concepts, theories, and procedures, or more concrete and formal, as with certain indicators, technologies, and infrastructures—with Guston, for example, pointing to a research patent as a boundary object that can be used by a scientist to set research priorities, by an entrepreneur to launch a new business, or by a bureaucrat to measure the productivity of research. Some of these ideas have been referred to by IR scholars when discussing the hybrid nature of expert regimes and of epistemic communities involved in the global governance of different area issues, and recent analyses of global environmental governance have drawn from STS and boundary notions to discuss the construction of governance objects, the formation of expert consensus, and the functioning of hybrid bodies such as the Intergovernmental Panel on Climate Change (IPCC) (Lidskog and Sundqvist 2015; Allan 2017; Beck and Mahony 2018).[7] We consider that these notions of boundary objects and organizations can be integrated within a more general lateral relations approach, enabling the operationalization of MC-centered analysis of these relations, as elucidated in the section ahead on lateral penetration with reference to the case study of science and the climate change and Covid-19 crises.

Having specified the nature of MC, in the next two sections we engage in a preliminary examination of two general patterns of lateral relations in world politics, retreat and penetration, whereby changes in the MC of the religious and scientific fields/systems impacted the autonomy and functioning of world political institutions. Drawing from the above discussion, we consider first internal changes in these fields/systems and then trace how they were communicated outward through changes and reconfigurations in major MC and boundary objects. In so doing, we capture aspects of inter-field/system relations that established approaches to IR insufficiently address. In contrast to standard accounts laying emphasis on "the institutional structures of early modern European states" (Nexon 2009, 5), we look at the retreat of organized religion in the emergence of an increasingly autonomous international political system, and in contrast to instrumental accounts of the organization of science for political ends (Allan 2018, 18), we explore the penetration of scientific objects and reasonings into the political domain. Our use of large-scale "macro" illustrations of the dynamics of international structural change in these case studies is in line with established practice in the study of patterns of world ordering (Reus-Smit 2011; Nexon and Neumann 2018; Møller 2021).

[7] The general orientation of this vast and interdisciplinary literature is to understand how different organizational arrangements facilitate the translation of technical expertise and authority into legitimate and/or effective regimes and governance instruments—as ultimately "World Politics rests on science and expertise for maintaining a functioning multilateral system of governance" (Biermann et al. 2009; Hale and Held 2011; Haas 2018, 1). Boundary concepts have influenced other STS approaches with applications in IR, for example, Latour's Actor-Network Theory, which see assemblages of human and nonhuman entities as the basic structure of social action. See Barry (2013).

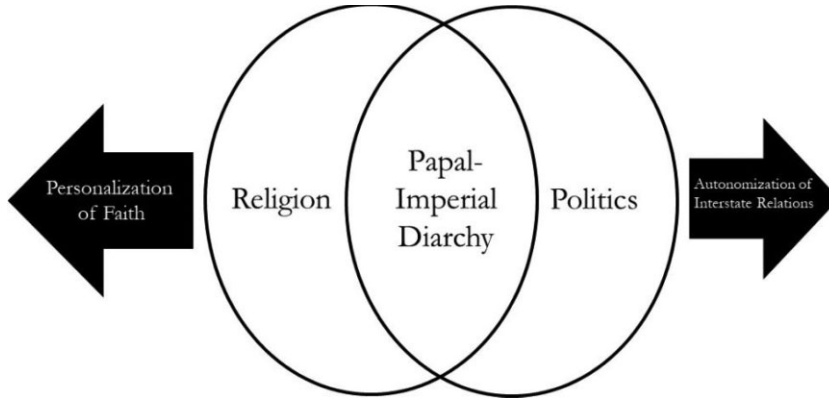

Figure 1. Lateral retreat during the Protestant reformation.

Lateral Retreat in the Protestant Reformation: Personalization of Faith and De-Sacralization of Politics

We approach the Reformation as a pattern of lateral relations that we denominate lateral retreat, where internal changes in the functional logic of a given system or field result in the functional retrenchment of some of its central MC, and provide an expanded semantic space for other systems' logics and media to gain autonomy. To explore this pattern, we model this process of transformation according to four analytical stages: (1) an endogenous remarking of the functional scope of the religious field by Luther and other Protestant reformers; (2) a period of social, political, and cultural turmoil as this remarking undermined the operation of the MC linking religious authority to other social domains and destabilized the hybrid hierarchies sustaining the late medieval order; (3) the re-codification of religious media on the basis of increasingly autonomous national-confessional political logics; and (4) the displacement of the institutions of transnational Catholicism by political considerations and legal jurisdictions established around "morally sovereign" nation states.

Initiated by Martin Luther and a group of theologians at the University of Wittenberg to "read the Scripture in the proper light" and denounce the corrupt practices of the Church (Dixon 2010, 18), the Protestant Reformation was a religious reformist movement that advanced a comprehensive framework to attack "the whole set of attitudes, social and political, as well as religious, which had come to be associated with the teachings of the Catholic Church" (Skinner 2004, 3). Provoking a crisis of faith across much of Europe within a few decades, this crisis irremediably fissured the two pillars organizing sociopolitical relations in the region since at least the twelfth century: the moral hegemony of the Papacy and the dynastic authority of the Holy Roman Emperor (HRE), what Phillips (2011, 27) referred as the "papal-imperial diarchy."[8] In figure 1, this movement from religion outward is reflected in the arrow on the left, and the consequent repercussions for the international political system are represented in the arrow on the right, with increasingly distinct religious and political spheres emerging from the previous diarchy as a result of the shrinking scope of the religious MC such as the Papacy, the Bible, the priesthood, and canon law, as elucidated in the text ahead.

Luther's rejection of Catholic doctrine followed a profound reassessment of the nature of faith, that is, the basic code of the religious field (at least in this context),

[8] As a historical period of "plural reform movements" and religious conflict, the Reformation can be stretched from heretic movements in the high-middle ages to religious wars in the eighteenth century. Most "canonical" developments, however, happened within the sixteenth and early seventeenth centuries—with major milestones occurring in the short period between the publication of Martin Luther's Ninety-Five Theses in 1517 and the Peace of Augsburg in 1555 (Lindberg 2009, xiii; Onnekink 2016).

looking for a way to resolve a long-standing debate in Catholic theology about how to follow God's commands in a fallen world. Opposing the Patristic view of "justification" (i.e., the conditions under which an individual is granted salvation), where believers' sins could be washed off gradually via confession or by buying indulgences, Luther argued this could only be achieved *sola fide*, "by faith alone," as a result of an individual's *direct* grasping and appropriation of Christ's righteousness and grace (Skinner 2004, 8–9). Outlining a doctrine known as "solfidianism," Luther considered that this personal positioning enabled individuals to be saintly in relation to God while acting within the narrow possibilities of an imperfect world, thus offering a way out "from the cruel dilemma from the old testament, with its law which no one can hope to follow and its threat of damnation for those who fail to follow it" (Skinner 2004). This altering of the logic of faith enabled Luther to strengthen the Augustinian notion that Christians were simultaneous inhabitants of two kingdoms: the *spiritual* kingdom of Christ, to which they were linked by faith alone, and the *temporal* Kingdom of Law, which comprised a political and social order that while not conducive to salvation was necessary to regulate human relations more or less justly. Accordingly, by promoting a "stronger internalization of faith as a personal experience" (Luhmann 2013a, 145; Ngien 2018, 272), Lutheranism not only challenged the hegemony of the Roman Catholic Church (RCC) over Christian life in much of Europe but also advanced a narrower conception of the domain of operation of Catholic religion as a social system. While our focus is on the implications this narrowing had for politics, the Lutheran demarcation of religion and faith had significant lateral effects over many other domains and fields, from the economy (the topic of Weber's classic work), to modern science (contributing to loosening natural philosophy arguments from theological debates and Aristotelian scholasticism), to the arts (where Protestant iconoclasticism is considered to have favored a more private experience of visual art) (Koerner 2004; Gregory 2012; Tawney 2015; Rublack 2017).

With respect to politics, the Protestant redefinition of the working of faith undermined the hybrid system of spiritual–territorial hierarchies in place in Europe since the collapse of the Western Roman Empire. Contrary to the Eastern Patriarchate, where religious institutions remained under imperial control, after the fall of Rome the Papacy had managed to survive as a relatively independent body specialized in granting moral authority and regulating the attribution of "sacredness" (a faith substitute) over the profane (Luhmann 2013a, 40–41), but lacking strong political and military support. Since the crowning of Charlemagne on Christmas Day 800 AD, this support role was formally delegated to the HRE, "the ultimate temporal authority in Western Europe" (Fawtier 1989, 82; Wilson 2016). Accordingly, the Pope derived his religious authority from the institution of Apostolic Succession that enabled him to stand as the first "Vicar of Christ," while the Emperor, by being consecrated by the Pope, benefited from *translatio imperii*, upgrading from German king to inheritor of Rome's imperial claims, such that while the Emperor could be called Holy and Roman, the Pope was *Pontifex Maximum*, a priestly titled appropriated by Emperor Augustus, since 1075 even adopting the purple robe (MacCulloch 2009). Through this translation process, the HRE was invested with the moral hegemony of a universal religious constitution (Catholic, from Greek, meaning universal) that made him "first sovereign" in Europe. This granted the HRE with legal and moral jurisdiction over other kings and princes, even though in practice the Capetian Kings of France never fully accepted this (Fawtier 1989, 88). Thus, while kingdoms such as France, England, Sweden, and Spain had become increasingly consolidated during the high-middle ages and *de facto* questioned imperial primacy, their kings remained *de jure* vassals of the emperor and recognized imperial prestige—with French kings ("Emperors in their own kingdom") being particularly interested in acquiring the imperial title. As a counterpart to *translatio imperii* the Emperor became the official *defensor eclessia*, defender of the Faith, and acquired the responsibility for

maintaining religious uniformity and implementing the Church's moral hegemony on Earth—acting therefore as the temporal bridge between the political sphere (*regnum*) and the spiritual (*sacerdotium*) (Hall 1997).

The remarking by Luther of the functional scope of the religious field dissolved the notion of the Pope and Emperor as "parallel and universal powers" and facilitated the transferal of territorial jurisdictions of sacerdotium to temporal authorities (Skinner 2004, 15). According to Luther's interpretation of faith, the Church could not be an earthly institution but rather a purely spiritual one, a congregation of the faithful. Moreover, as under solfidianism all believers were thought to possess priestly qualities with the capacity to "help their brethren and assume responsibility for their spiritual welfare" (Skinner 2004, 11), the sacredness of religious practice became symbolically detached from the main territorial governance mechanisms of Roman Catholicism, bishoprics, and priesthood. If the Church and its representatives no longer had a place in "government of the soul," they could also no longer claim jurisdiction over worldly affairs, whether the appointment of bishops, the sanctioning of natural law, sovereign control over land, or the anointment of kings and emperors. Moreover, the appropriation of these (political) attributions by the Pope and canonical institutions could lead them to be portrayed as heretical impostors, usurping the rights of temporal authorities (Skinner 2004, 14; Dixon 2008; Reus-Smit 2013, 86). As Luther (1520) put it, "Forasmuch as the temporal power has been ordained by God for the punishment of the bad and the protection of the good, therefore we must let it do its duty throughout the whole Christian body, without respect of persons, whether it strikes popes, bishops, priests, monks, nuns, or whoever it may be."

The manner in which this symbolic transference of authority unfolded was far from smooth and involved major social and political contention, since the theological proposition that made every individual a priest granted the possibility for every ruler to be an "emperor," that is, to acquire sovereign authority without superior sacramental certification or swearing fealty to a moral superior (Dixon 2008, 87).[9] While a full account of the reasons for the rapid spread of Lutheranism among German political elites is beyond the scope of this article, following Luther's excommunication in 1521 many princes, burghers, and others would use these ideas in questioning the medieval system of moral-dynastic allegiance (Skinner 2004, 83; Lindberg 2009, 218; Becker et al. 2020). While initially these disagreements remained but a "war of words" (Dixon 2008, 43), the conflict escalated first with the turmoil generated by the spread of radical grassroot movements (such as the German Peasants' War), and subsequently in 1529 when the Catholic majority in the Imperial Diet launched an ultimatum for Lutheran and reformist preaching to cease across six principalities and fourteen imperial cities (whose representatives protested, ergo, "Protestants").

The explicit intention of the HRE to reestablish the unity of the Church led Protestant theologians and jurists to re-elaborate the working of a key MC of religious authority, canon law, in relation to two fundamental issues: the relationship between religion and temporal powers, and the pressing matter of active resistance—the extent to which inferior magistrates could disobey and defend themselves against the decisions of an overlord. As explored in Skinner (2004) and Horie (2011), while initially Luther, Calvin, and others maintained their commitment to the "theory of passive political obedience," derived from the strict demarcation between the two kingdoms, by 1530 they had moved to support the notion of "lawful resistance" advanced by jurists associated with the Protestant princes of Saxony and Hesse. Creatively combining canon law with new constitutional arguments and novel private-law interpretations, this new legal position considered that

[9] Many Protestant kings continued the practice of being crowned by bishops, but this rite was more symbolic than "sacramental," representing a pledge from the monarch to God.

as the Emperor was but "the head of the body of the political realm," actions against his subjects on religious grounds exceeded his office, reduced his sovereign status, and made it lawful to resist him (Skinner 2004, 199–202). Not only that, as the "true" Church laid purely in the spiritual realm, the emerging Protestant legal doctrine assigned local rulers the "civic" duty to protect the autonomy of the faithful, considering that in crisis periods "the evangelical prince became an emergency bishop" (Lindberg 2009, 217). This not only legitimized the war Protestant German princes would eventually launch against the Empire (the Schmalkaldic Wars, started in 1546) and that culminated in the 1555 Peace of Augsburg—a provisional settlement that granted local princes the right to reform religious beliefs within their territories, previously a prerogative exclusive of the Pope (Lindberg 2009). More relevantly for our argument, it also outlined the matrix of rule for the new confessional state, "as dioceses and chapters were absorbed into the state and partitioned according to secular boundaries" (Hurd 2004; Dixon 2008, 42) and temporal authorities "overwhelmed the Church's political authority" and appropriated its structures, skills, and resources (Grzymala-Busse 2020, 31).[10]

Changes in legal–political media were accompanied by changes in the functioning of another symbolic medium that communicated Catholic hierarchy, the Bible. As Lutheran solfidianism considered the sacred scriptures (and the institution of the mass) had to be engaged without Latin-reading priests, many Lutheran preachers were among the first translators of the Testaments to vernacular languages in defiance of the RCC. Luther published his German edition of the New Testament in 1522, followed by William Tyndale's English-language edition in 1526, the French version in 1530, and the Dutch translation in 1537 (Lindberg 2009, 87; MacCulloch 2009, 412). The new editions provided a basic mechanism simultaneously to individualize religious practice and to extend the new legal–political logic, as national propagandists "began to use the Scripture as a type of mirror for the self-imaging of the emerging state" and to strengthen ethno-linguistic identities, with Luther himself elevating the use of the German language and directing many of his pamphlets to "the Princes of the German Nation" (Dixon 2010, 88–89). As such, "Bible nationalism" became a relevant instrument for consolidating "national churches" under the jurisdiction of kings, princes, and confessional authorities, such as German and Swedish Lutheranism, English Anglicanism, Scottish Presbyterianism, Swiss Calvinism, and even the quite autonomous French Catholic (Gallican) Church—with its ecclesiastical structure firmly under royal control (Holt 2005; Shah and Philpott 2011; Appelbaum 2013).[11]

The Papacy and the HRE were greatly diminished in this process of differentiation between the spiritual and the temporal realms. While the Empire survived the Reformation, after Augsburg, it ceased to function as the *sacrum imperium* in a substantive way, as "the universal Habsburg empire needed a universal church" (Lindberg 2009, 225). Its sacred status became increasingly secondary to confessional and nationally defined priorities, such that Protestant princes would increasingly consider it to be legitimate to revolt against the Emperor if he became too submissive to a "foreign" (Italian) Pope, while Catholic princes expressed concerns at Charles V's efforts "to force through a religious settlement [that] smacked of Roman tyranny" (Dixon 2008, 58) and pressured his successor, Ferdinand II, to reduce

[10] Given this legal upheaval, legal thinkers such as Hugo Grotius considered that it was necessary to reformulate international law on the basis of state sovereignty and individual rights, and to re-address questions such as navigational and trading rights previously sanctioned through Papal authority. Interestingly, Grotius had been an employee of one of the first European trading companies, the Dutch East India Company (VOC), created in 1602 as "Protestant maritime republics… sought to circumvent Spanish claims based on their right to international trade through rejecting Papal jurisdiction over both European Christendom and 'the realms beyond'" (Blachford 2020, 1236).

[11] Indicative of the complex forms in which different social systems and fields interact, Becker and Woessmann (2009) concluded that the superior economic performance of Protestant countries that would show in the following period was a consequence not so much from a superior work ethic, as claimed by Weber, but of higher literacy rates associated with the Protestant promotion of individual engagement with the Gospels.

the size of the imperial army and moderate demands over Protestant rulers in the 1629 Edict of Restitution (Wilson 2016, 125–26). Following the Thirty Years' War and the Westphalian settlement, the defeated Empire proceeded to operate effectively as a system of federal (German-centric) relations bounded by questions of rule of law, taxation, and defense, increasingly balkanized by internal (Austria, Prussia) and external powers (France)—such that by 1667, Samuel von Pufendorf could refer to the post-Westphalian constitutional structure of the Empire as "mis-shapen Monster" where "none of the German Princes or States will acknowledge that the Dominions which are under them are more the Emperor's than they are theirs" (quoted in Devetak 2015, 70).[12] As for the Papacy, its much reduced moral and territorial influence was exacerbated by the rejection of the Treaty of Westphalia by Pope Innocent X as "null, void, invalid, iniquitous, unjust, damnable, reprobate, inane, [and] empty of meaning and effect for all time" (Shah and Philpott 2011, 32) and the subsequent "Papal refusal to play diplomatic ball" (Thompson 2016, 50), which facilitated the Church's exclusion from European politics.

The transformation of the spiritual and temporal media supporting RCC hegemony dissolved the main integrationist logic in Western Europe, facilitating the differentiation of religion and interstate interactions (Shah and Philpott 2011, 32). Relations within the Empire became increasingly regulated by the notion of parity between German states, such that by the late seventeenth century, political writings increasingly recognized that "the spiritual unity of Christendom has been fractured and replaced by an idea of Europe as a loose political association of independent kingdoms and republics" (Devetak 2015, 71; Albert 2016, 107). In France, following its own period of religious turmoil, a widespread consensus emerged around a project of national statehood accompanied by a foreign policy "seeking a comprehensive design for a community of sovereign states to replace the Holy Roman Empire" (Philpott 2000, 237). At the same time, Thompson (2016, 66) notes how by the mid-seventeenth century, the leaders of predominantly Protestant territories came to see an emergent state system as the best guarantee for their rights and interests, abandoning proposals for holy war against Catholics.

In summary, during the long Reformation the religious domain in this context became functionally distinct from the political field and other social domains, as preexisting religious MC lost much of their symbolic capacity to convey sacredness and moral authority, at least beyond a more circumscribed understanding whereby "communication with God" was a much less public and political affair (Luhmann 1990a, 158). As a result, faith would no longer be considered an urgent *casus belli* among European Christian rulers: while this did not mean that religion ceased to play a role in European politics, especially in relations with non-Christian territories, the region would witness "a vast diminuendo in interventions to alter the governance of religion within the territory of states"—such that with the exception of the 1688 Dutch invasion of England, only three European wars between 1648 and 1713 are understood to have been caused by religion, "all of these between European and Muslim states who were outside the sovereign state system" (Shah and Philpott 2011, 33; Onnekink 2016). By the mid-eighteenth century, the legitimacy of rule and possession became further differentiated from the religious domain, stemming from recognition by international society and from the expediency of the balance of power—with Emmerich de Vattel considering Europe a commonwealth of juridical sovereigns where "no State shall be in a position to have absolute mastery and dominate over the others" (quoted in Watson 1992, 207). As elucidated in the foregoing discussion, this development cannot fully be understood without consideration of the process of lateral retreat within the religious domain that opened up the scope for the functioning of an autonomous political field.

[12] A century later, Emperor Joseph II referred to his imperial appointment as becoming "a ghost of an honorific power" (Wilson 2016, 159).

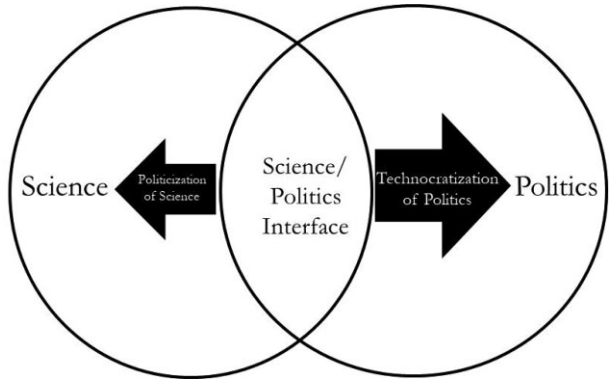

Figure 2. Lateral penetration during the climate change and Covid-19 crises.

Lateral Penetration during Global Crises: Science, Boundary Objects, and Political Priorities

In this section, we explore a second pattern that we denominate lateral penetration, whereby a given system/field and its MC gain epistemic ground and authority over another and restricts its autonomy, even if partially. Whereas traditional field theoretical approaches have emphasized the reshaping of other fields by the field of power, we explore the reverse dynamics by which the MC of other fields help to reshape the international political system. Rather than seeing science in instrumental terms, simply as a source of expertise drawn upon by governments as needed, we consider the outward projection of scientific MC into the political domain. In particular, we consider the lateral penetration of science into politics during two major technoscientific crises, climate change and the Covid-19 pandemic, which were "discovered" and configured by science. Although their long-term consequences for international order remain indeterminate, we explore how these two crises have seen a rapid crossing of scientific boundary discourses and artifacts into the political sphere, a circumscription of political legitimacy and autonomy, and a reshaping of relevant political hierarchies, in terms of legitimacy conditions, priorities, and preferences. In general, we see this process following a four-stage sequence involving (1) the "outward" projection of scientific MC to the political domain, (2) the advance and consolidation of functionally hybrid media of communication, (3) the delegation of authority to science and the reconfiguration of political priorities, and (4) and an eventual process of backfire in the scientific domain due to the "politicization" of hybrid media. In figure 2, the first stage is illustrated in the arrow on the right, and the fourth in the arrow on the left, with the interface of science and politics at the center of the diagram being mediated by boundary objects/hybrid MC, as elucidated in the text ahead.

It is relevant to note that these two crises have taken place in a distinct society to the previous case: whereas medieval European society was initially structured by the comparatively undifferentiated character of religion and core sociopolitical institutions, we now live in a world where both politics and science are highly differentiated. This does not prevent science and politics from interacting: science and scientists continue to serve national political interests, scientific research has been guided by government funding and political priorities, and over the last centuries scientific cosmologies have shaped new political utopias and legitimized new understandings of the international order (Allan 2018; Stroikos 2018).[13] However, the science system now largely monopolizes the production and validation of advanced

[13] The differentiation of science and politics shares roots in the lateral retreat of religion analyzed before, as the very ideas shaping the emerging Western scientific tradition were fundamental for the "erasure of hierarchy in Renaissance

knowledge and the logic of science is relatively autonomous from politics and other social logics, becoming more secular and transnational from the eighteenth century onward (Crawford, Shinn, and Sörlin 1993; Somsen 2008).[14]

In relation to the first crisis, it has been established that the initial outward projection followed the consolidation of "the climate" as a global ontological system that was more than the aggregation of the "weather" (Miller 2004, 54; Allan 2017). While already in the sixties and seventies, scientific bodies such as the US National Academy of Sciences reported that human activity "could" change the climate and impact on local communities, it was only in the eighties that new climate models started conceiving the climate as a unitary whole at risk from the human emission of greenhouse gases. As the constitution and problematization of this new geophysical entity advanced new expert fields started to emerge, such as climate science and climate economics, with a series of technical reports dimensioning the nature and scale of the problem, shaping new rationalities, technologies, and movements that "thrust climate change into the political realm" (Allan 2017, 147) and that made clear "the necessity for, and the possibility of, a global politics of climate" (Miller 2004, 55). As such, the global climate system became the central (boundary) object behind the work of the IPCC, an expert body created in 1988 by the United Nations Environment Programme and the World Meteorological Organization to produce consensus in climate science, understand the impacts of climate change, and "have the best possible knowledge on which to base policy debates and decisions," and which rapidly became established as the voice of global science on the issue (Miller 2004; Moore 2017, 136; Beck and Mahony 2018).

In the following decade, as scientific consensus on the reality and dynamics of anthropogenic climate change consolidated and scientific advise globalized, an extensive even if fragmented "regime complex for climate change" crystalized, with the mushrooming of boundary organizations, regimes, and regulatory institutions that brought together networks of experts, governments, and intergovernmental actors, with business and civil society organizations (Keohane and Victor 2011; Abbott 2012). The work of these organizations gave further visibility to a range of increasingly salient boundary artifacts, from greenhouse emissions and the ozone layer, to the tone of carbon dioxide equivalent (tCO_2), the 350 ppm ratio, and 1.5–2°C temperature limits, which translated abstract computerized models and findings into visible measures that "revealed" an aggravating global crisis (Oreskes 2004).[15] By late 2000s, an MC substitute emerged to aggregate these impacts, "carbon" or the "carbon footprint," facilitating the lateral penetration of climate science across politics and society (Wiedmann and Minx 2008). Beyond technical definitions of what it is and how it is measured, as a media substitute carbon facilitated the translation of climate change considerations and effects into the operation of politics and other social systems and fields, for instance, serving as a tool to assess policy efficacy, a pricing mechanism to commodify or to tax emissions, and a part of ethical assessments about the greenness of social practices, from air travel and owning a car to eating habits and consumption patterns. Hence, on the basis of carbon footprint, virtually all spheres of human activity could become re-cast in terms of their contribution to the climate change crisis, so that we can now talk of a low-carbon economy, low-carbon technologies, low-carbon lifestyles, and moving toward "a low-carbon future" (Giddens 2009, 11).

cosmology and political discourse" and for the consolidation of an increasingly rationalized conception of nature and society (Larkins 2010, 115).

[14] Differentiation does not deny that science and politics are coproduced, only that they have distinct functional logics. For a detailed discussion on this point, see Guggenheim and Nowotny (2003).

[15] Moore (2017) distinguishes scientific consensus as the unforced convergence about the status of a putative fact, from active expert consensus, when experts need to speak as one in conditions of uncertainty and urgency. The latter can also be considered a boundary object, located "in the domain of ill-structured problems, where scientific knowledge is necessary but not sufficient for decision-making" (Moore 2017, 135).

As a result, the tenets of climate science have permeated policy priorities at both international and national levels, as well as political cleavages across civil society, with UN Secretary General António Guterres referring to climate change as "the defining issue of our times" (UN 2021). In 2021, the European Union announced the European Green Deal, aiming to achieve no net emissions by 2030, while the Chinese government committed to do so by 2060, with the 19th Party Congress of 2017 incorporating "ecological civilization" as a cornerstone of the country's development philosophy (Teng and Wang 2021). The UNDP (2021)'s People's Climate Vote, reportedly "the world's biggest ever survey of public opinion on climate change," indicates that two-third of the people in fifty countries considered climate change a global emergency (a percentage rising to 74 percent in high-income countries), while the World Economic Forum (WEF) has environmental risks topping its global risk ranking since 2016, based on the opinion of business, government, and civil society elites—except in 2021 when the Covid-19 pandemic brought "infectious diseases" to the top. New anti-climate change movements, such as Fridays for Future led by Greta Thunberg, have been noted to explicitly link moral duty with call "the exaltation of the *vox scientifica*," a stance where people's demands are legitimate as long as they convey science-based data about the environmental crisis (Zulianello and Ceccobelli 2020), and even Pope Francis (a chemist by training) in his 2015 *Laudato Si'* encyclical letter aligned Catholic social doctrine with socioenvironmental stewardship—emphasizing scientific consensus and devoting entire paragraphs to discuss the carbon cycle (Francis 2015).

With a different velocity, a similar sequence is observable during the onset of the Covid-19 pandemic. Quite rapidly, since the detection of the first of symptoms on December 1, 2019, scientists were able to alert authorities about the threat posed by the new disease. Initially diagnosed as viral pneumonia, by early February 2020, whole-genome sequencing revealed a new coronavirus as the agent that the International Committee on Taxonomy of Viruses (ICTV) designated as SARS-CoV-2. On March 11, 2020, as the virus rapidly spread from China to other Asian and European countries, the World Health Organization (WHO) made the official assessment of Covid-19 as a pandemic, coordinating expert collaboration to understand the outbreak and inform global response efforts (WHO 2020a). As part of this, the WHO Director-General called for countries to implement decisions that were evidence-based and consistent, stating that "this is the time for facts, not fear; this is the time for science, not rumors; this is the time for solidarity, not stigma" (WHO 2020b).

Here, contrary to the more top-down institutionalization of climate science, no global technical body was formed but the pandemic immediately galvanized collaboration across the biomedical and pharmaceutical research community at a more grassroots level, with initial efforts to isolate the virus and then to rapidly develop, test, and manufacture vaccines, to the extent that "never before have scientists and clinicians united with such scale and singular focus" (EbioMedicine 2020). The full genome of Covid-19 was published in an open-access article by Chinese scientists in *The Lancet* a month after the first patient was admitted to the hospital, and on January 2020, 117 scientific organizations, including journals, funding bodies, and centers of research prevention, committed to "open science practices." Major scientific MC, such as journal publications and clinical studies, were reorganized to "accelerate science": for instance, editors simplified publication requirements, setting "fast-lanes" or waiving requests for additional experiments during revisions, while the use of open data sets and of "preprint" servers became increasingly common, and regulatory agencies enabled emergency protocols for vaccine development to shorten the vaccine development pathway (Horbach 2020; Excler et al. 2021). As a result, publication times shortened by around 50 percent while dramatically increasing the number of submissions—during 2020 the biomedical library PubMed listed 74,000 Covid-19-related papers, in contrast to a total of just 9,000 papers in existence concerning Ebola, a disease discovered in 1976 (Yong 2021)—while vaccine

development was reduced from five to ten years to less than three hundred days (also facilitated by massive government funding and private sector involvement).

The science–politics interface became increasingly porous and fluid: many governments set up new boundary institutions in the form of hybrid expert committees, such as the British government's Scientific Advisory Group for Emergencies (SAGE) and the US Physicians Advisory Group, while scientific spokespersons gained visibility as "honest brokers" that represented "scientific understandings in the context of the smorgasbord of policy options (Pielke Jr. 2007, 17). At the same time, highly regarded scientific publications actively encouraged political elites to pursue transformed political priorities, including the subordination of economic reason to public health concerns. Already in January 2020, the *British Medical Journal* urged the necessity of swift political action (Flear, de Ruijter, and McKee 2020), followed a week later by an article urging public health control measures such as lockdowns (Mahase 2020), stating that "public health should take priority" despite the "catastrophic effects on the Italian economy" (Paterlini 2020). Similar approaches were advocated in the pages of *The Lancet*, with contributors in early 2020 calling for "extraordinary public health measures at great socioeconomic cost" such as the "extreme measures" taken in Wuhan province, China, which were considered "successful," and which the contributors urged to be adopted around the world wherever widespread community transmission was present (Fisher and Wilder-Smith 2020, 1109). Editorial letters in these journals also openly challenged leaders who failed to consider their scientific advice, or who sowed confusion or misled the public, with *The Lancet* stating that "while we might not expect them to become true experts in an emergent crisis, the minimum expectation is deference to the deep evidence-based knowledge of those who do" (The Lancet 2020a). Moreover, *The Lancet* and *Nature* published editorials openly supporting the Biden campaign against the re-election of President Trump, considering the latter to be "isolationalist and anti-scientific" (Nature 2020; The Lancet 2020b).

While this lateral penetration process was contextual and contentious, and assumed different forms in different locations, it is evident that as both these crises took form, scientific knowledge, discourses, and boundary media objects increasingly circumscribed the autonomy of political authority, making it difficult for climate change or the pandemic to be ignored or dismissed. During the pandemic, even where there were uncertainties and competing views within the scientific community, political authorities felt obligated to adopt "scientific" justifications for their actions and inactions (e.g., herd immunity, zero-covid, and "following the R"), while the space for denialist, inconsistent, or alternative political justifications based on tradition, democratic mandate, or economism shrank considerably. Thus, French President Emmanuel Macron announced a national lockdown by considering that "we'll have to adapt, in line with the clarifications given by the scientists" (Macron 2020), while UK Prime Minister Boris Johnson stated that "we will be driven not by mere hope or economic necessity. We are going to be driven by the science, the data and public health" (Johnson 2020). Upon victory, Joe Biden's campaign team declared that this result was because "the American people . . . chose science and truth" and highlighted how the new administration's priorities would be led "by science and by experts" (Barrow and Borenstein 2021). Similarly, as with climate change, scientific warnings intertwined with new moral positions in relation to diverse social practices (e.g., wearing masks, shaking hands, family gatherings) while the clash between technocratic and different socio-political visions inputted into conflict cleavages (lives versus livelihoods, anti-vaxxers, anti-maskers, anti-lockdown, etc.) and fueled political polarization, turning a public health crisis into a political one (Dodd 2020; Green et al. 2020).

The final stage in the process of lateral penetration relates to the above, but considers "backfiring" effects when the new MC facilitate the reverse intrusions of politics into science, which are decoded as politicization or political

interference. Backfiring is a structural consequence of the generalizable character of MC and boundary objects and represents the reverse side of lateral penetration. As such, it has been a constant issue in relation to both climate change and the Covid-19 pandemic. In the former case, discussions about the relationship between science and climate science can be divided between "one-world" and "two-world" positions that, correspondingly, see the problem as being either too much or too little proximity between the two spheres, often discussed in relation to the functioning of the technocratic IPCC or its relationship with the policy-makers at the United Nations Framework Convention on Climate Change (UNFCCC) (Sundqvist et al. 2018). Similar discussions about what Pamuk (2021, 2) called "the paradox of scientific advice"—how to avoid the over- and under-politicization of the advisory process and balance scientific knowledge with moral values and "usefulness for democratic purposes"—revived with the pandemic (Moore and MacKenzie 2020; Neblo and Wallace 2021). Thus, scientists' role as spokespersons and involvement in advisory committees were subjected to a range of critiques. The United Kingdom's SAGE committee, for example, has been criticized for compromising on scientific standards in its admission of nonscientific participants, and caving to political influence, such as Boris Johnson's early skepticism about an epidemic occurring in Britain (Freedman 2020). At the same time, many voices criticized "pandemic research exceptionalism" and the compromises made as rigorous research practices confronted political, economic, and public health priorities (London and Kimmelman 2020).[16] Several studies indicate that the quality of publications in top biomedical journals decreased in the "race to publish" on Covid-19, pointing to the potentially grave consequences of "a 'double-whammy' of lower-quality literature and high dissemination potential" for medical practice and health policy (Zdravkovic et al. 2020, 12; Quinn et al. 2021). Moreover, it has been claimed that "vaccine hesitancy" among certain sectors of the public may be partly attributable to public concerns about the political motivations accelerating vaccine development and approval processes (Wouters et al. 2021, 1030).

Dynamics of backfiring reveal misalignments and dilemmas emerging from the interaction of different field/system logics, for example, as experts become entangled in political debates that may evolve faster than the production of scientific evidence and the generation of scientific consensus (or vice versa). Thus, while lateral penetration from science-to-politics can be decoded politically as scientific reductionism and surplus technocracy, the same media facilitate the backflow politicization of scientific debates and standards (Neblo and Wallace 2021). Interestingly, these misalignments not only are usually invoked by skeptics and "anti-science" movements pushing back against the legitimacy of scientific communications beyond their systemic boundaries (Hotez 2020), but also have led to increasing academic discussions regarding the position of science in a globalized, post-truth world where boundary objects and organizations are constantly exposed to a variety of public judgments, public truths, and producers of "alternative facts" (Jasanoff and Simmet 2017; Eyal 2019).[17]

[16] The US National Institute of Health estimated that 80 percent of clinical trials on other topics were stopped or interrupted during 2020 (The Lancet 2020c).

[17] For instance, this has led to significant soul-searching within STS. Bruno Latour (2004, 227) reflected critically on his work's contribution to delegitimating science as an objective consensual endeavor at a time when "dangerous extremists are using the very same argument of social construction to destroy hard-won evidence that could save our lives. Was I wrong to participate in the invention of this field known as science studies?" These discussions continued in light of more recent post-truth attacks on science (Collins, Evans, and Weinel 2017; Lynch 2020). We thank Alfred Moore for pointing our attention to these discussions.

Conclusion

This article has sought to advance relational understandings of how world political structures and institutions may interact with other social sectors, fields, and systems beyond power and established hierarchies. As indicated in the introduction, this is a question linked with canonical IR debates, insofar as it is concerned with constitutive understandings of the international political order and the relationship this has with other social domains, more or less international, and more or less differentiated. Advancing on Donnelly (2019, 910)'s projection of relationalism as "the systems theory for a new generation," we propose a distinct relational modality of inter-field relations where local and international systems and fields may interact and wield influence beyond and alongside political power, elaborating the notion of MC to operationalize a lateral relations approach.

As with the hegemonic orders discussed by Nexon and Neumann (2018, 679), we consider that lateral relations have the potential to have major constitutive downstream effects, as our two case studies intended to illustrate. In the case of the Reformation, these effects are rather clear and long-lasting, considered to be largely constitutive of contemporary world politics. While the Covid-19 pandemic may have passed without major "third image" lateral effects over the international system (Drezner 2020, 15), the same confidence cannot be had in relation to the unravelling climate change crisis. Here, one might anticipate that if primary systems (be this politics or science) were to fail in providing solutions to climate change, world politics, the global economy, and even science could undergo enduring systemic transformations, potentially involving new processes of differentiation and de-differentiation that could be highly contentious and disruptive (for instance, if the differentiation of political and religious authority were to be reversed, or if the economy would be "greened" by force).

In elucidating two models of lateral relations, this article has opened up an area for further research considering other forms of lateral relations that may exist, and the role of different MC and substitutes in these processes. For instance, whereas the war in Ukraine that commenced in February 2022 has often been considered as heralding the return of geopolitics and an era of de-globalization, we consider that it may also point to intriguing underinvestigated lateral relations dynamics. For example, the manner in which private businesses in the West suspended activities in Russia beyond the requirements of official sanctions, and the way in which social media-circulated information about death and destruction in Ukraine seems to have catalyzed moral outrage in Western public opinion and pressured politicians to act, each suggests a pattern of lateral amplification whereby external pressures may induce other systems to respond beyond expectations given established security and economic risk logics. We consider that our framework opens innovative possibilities to explore and theorize interactions such as these.

In summary, by looking more closely at the role of MC, we can explore in a more nuanced manner how existing and emerging fields and subfields develop, coevolve, and impact one another without necessarily overriding their field-specific logics. For Ulrich Beck (2009, 12) this was precisely the political challenge of modern society, devising a "politics that enable communications between different information flows without reducing them to the logic of one system only." In our view, for IR scholarship to be able to better inform this challenge, the task is to continue developing theoretical and analytical tools that address the complex, constant, and dynamic interactions between different social structures, institutions, and media, while avoiding the tempting reductionism of characterizing world politics simply in terms of hierarchy and anarchy.

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