1 Systems and Relations

This book explores some implications for the discipline of International Relations (IR[1]) of accepting the following propositions.

- Some features of the world can be understood, more or less fully, through knowledge of the elements that compose them.
- Other features can be understood only by also considering the organization of elements into larger systems/wholes and the structured operation of those wholes.
- The biological and social worlds can be adequately understood only by combining "analytic" knowledge of components considered separately and "systemic" knowledge of the organized operations of structured wholes.

I ask readers to accept, for the sake of argument, the systemic perspective sketched by these propositions – to see where it takes us.

In this chapter I define systems, identify a few fundamental features of systemic explanations, and explore some alternative framings for studying "things" that have qualities that cannot be fully explained in terms of their parts.

1.1 Systems

The *Oxford English Dictionary* defines a system as "a group or set of related or associated things perceived or thought of as a unity or complex whole." Most definitions in the natural and social sciences similarly see a system as "an assembly of elements related in an organized whole."[2]

[1] As is conventional, I use IR to indicate the "discipline" of International Relations, which studies the subject matter of international relations – whether IR is understood as a discipline in its own right (which is more common in the UK), a sub-field of Political Science (as is more common in the US), or an interdisciplinary field (often in the US under the label International Studies).

[2] (Flood and Carson 1993, 7).

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"A whole which functions as a whole by virtue of the interdependence of its parts is called a system."[3]

"The most fundamental act of systems theory … [is] distinguishing it [the system] from its environment."[4] A bounded set of components that share "concentrated feedback relationships" is distinguished from what lies outside the system – the environment – "with which the system shares only input and output relationships."[5]

In a system "the organization of units affects their behavior and their interactions."[6] This produces "systems effects" including, most notably, "emergent" phenomena.[7] "A whole can have properties (or powers) … that would not be possessed by its parts if they were not organised as a group into the form of this particular kind of whole."[8]

"System" is often used in a looser sense to refer to any bounded entity. Here, however, I consider only structured wholes with emergent properties: what are often called "complex systems."[9] And I address only systems that are, to the best of our knowledge, "in the world" (not mere analytic constructs).[10]

I adopt the following definition.

> *A system is a bounded set of components of particular types, arranged in definite ways, operating in a specific fashion to produce characteristic outcomes, some of which are emergent.*[11]

This definition emphasizes the operation, not just the organization, of components.[12] Some systems effects arise from arrangement alone.

[3] (Rapoport 1968, xviii).
[4] (Gougen and Varela 1979, 32). For Niklas Luhmann, the leading systems theorist in the social sciences in the last four decades, "a system *is* the difference between system and environment" (Luhmann 2013 [2002], 44. See also 52, 63, 187; 1995 [1984], 5–8, 16–18, 20–23; 2012 [1997], 43–44, 63–64, 121).
[5] (Flood and Carson 1993, 8).
[6] (Waltz 1979, 39).
[7] See §2.2.
[8] (Elder-Vass 2007a, 28).
[9] See §2.3.
[10] Older systems approaches often distinguished "concrete" systems from "analytic" (or "abstracted") systems. See, for example, (Bunge 1979, 1992), (Parsons 1979), (Bailey 1983). Artificial units of investigation, however, do not (unless they happen to correspond to a concrete system) have emergent systems effects. They therefore will not be addressed here.
[11] This is similar to Mario Bunge's definition of systems in terms of "composition, structure (relations among the parts), and connections with the environment"; "composition (collection of parts), environment, and structure (set of bonds or couplings between system components and things in the environment)" (1997, 417, 416. See also 458).
[12] Operations might be considered arrangement across time. The temporal and processual dimensions of operations, however, seem to me worth separate note. See also §§1.6, 10.1–10.3. I avoid the language of "structure and process," though, because it facilitates analytically severing organization from operation and reifying arrangement/structure.

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(Consider the allotropes of carbon – the "same" "stuff" arranged differently to produce diamond, graphite, graphene (a single layer of graphite with unusual electrical properties), char (the amorphous carbon in charcoal), and vitreous carbon (used in certain electrodes), as well as various nanocarbons (e.g., buckminsterfullerenes) and carbon nanofoam (which is ferromagnetic).) Usually, though, especially in the living and social worlds, the operation of the arranged elements is crucial.

This definition also emphasizes the specificity of the components, their arrangement, and their operation. Parts of particular types are organized and operate in specific ways.

Finally, systems are of special interest because of systems effects – irreducible higher-level phenomena that emerge from the operation of complex wholes – which are essential to a comprehensive understanding of the things of the social world. For example, a state or society is more than an aggregation of individuals. The national interest is not the average of (or any other operation performed on) the interests of the individuals and groups that make up the nation. And the reason to study an international *system* is that it has properties that cannot be understood by even the most intensive study of its components and their interactions.

1.2 Systemic and Analytic Explanations

Systems require – and provide – a distinctive type of explanation. This usually is explicated by contrasting "analytic" and "systemic" explanations.[13]

In analytic explanations "the whole is understood by knowing the attributes and the interactions of its parts,"[14] "disjoined and understood in their simplicity."[15] As Nicholas Onuf puts it, "analysis is the procedure whereby someone (the analyst) observes (or causes and then observes, or imagines) and describes the disaggregation of some (actual or hypothetical) unit."[16] This strategy of breaking things down into smaller or simpler pieces often produces epistemically powerful and pragmatically valuable knowledge.

If, however, the object of inquiry has properties arising from the organization or structured operation of its elements "then one cannot predict outcomes or understand them merely by knowing the

[13] In IR, Waltz's account (1979, 39–40ff. See also 12, 37) is hegemonic. (I reject his account, however, in §§5.3–5.6.)
[14] (Waltz 1979, 18).
[15] (Waltz 1979, 39. See also 12, 37, 60, 68, 121).
[16] (Onuf 1995, 42).

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characteristics, purposes, and interactions of the system's units."[17] "Systemic" approaches are required to comprehend "systems effects." What this implies for IR is the central subject of this book.

In the social sciences, analytic explanations typically rely on the *attributes*, *actions*, and *interactions* of *actors*. Systemic explanations, by contrast, focus on the *organization* and *operation* of *structured wholes* – which, I argue, require relational and processual explanations.

1.3 Levels of Organization

Systems have "multiple levels of organization … [arranged in] a rough hierarchy, with the components at each ascending level being some kind of composite made up of the entities present at the next level down."[18]

In the life sciences, the standard framing is levels of *organization*[19] or "*compositional* levels – hierarchical divisions of stuff (paradigmatically but not necessarily material stuff) organized by part–whole relations, in which wholes at one level function as parts at the next (and at all higher) levels."[20] (For example, cells, tissues, organs, systems, organisms; alleles, individuals, populations, communities, ecosystems.) As Bert Hölldobler and E. O. Wilson put it, "life is a self-replicating hierarchy of levels. Biology is the study of the levels that compose the hierarchy."[21]

Levels of organization are (understood as) "in the world." "Levels of organization are a deep, non-arbitrary, and extremely important feature of the ontological architecture of our natural world."[22] In a strong formulation, they are "levels of reality."[23] The world "is" a layered system of systems of systems in which parts at one level are wholes on "their own" lower level.

Higher-level "things" are, of course, made up (and obey all the laws) of lower-level "things." The whole, however, is not fully reducible

[17] (Waltz 1979, 39).

[18] (McClamrock 1991, 185). "Hierarchy" in this taxonomic sense, which is standard in the natural sciences, indicates relations of inclusion (not command or control). "Things" at higher levels encompass lower-level things in a graded series of part–whole relations: metaphorically, boxes within boxes (within boxes).

[19] (Eronen and Brooks 2018), (Brooks, DiFrisco, and Wimsatt 2021a), and (Brooks 2021) are good recent overviews of levels of organization in Biology. (Brooks, DiFrisco, and Wimsatt 2021b) is an excellent recent edited volume, including (Potochnik 2021), which reviews and extends recent criticisms of the concept.

[20] (Wimsatt 1994, 222 [emphasis added]). Joseph Needham's (1937) idea of "integrative levels" is an early version of (or precursor to) this framing. And the levels ontology of a chain of being (Lovejoy 1936) was popular in the West for two millennia.

[21] (Hölldobler and Wilson 2009, 7).

[22] (Wimsatt 1994, 225). See also (Floridi 2008, 319).

[23] (Heil 2003), (Salthe 2009), (Poli 2009), (Nicolescu 2010). See also (Grene 1967).

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to – cannot be explained entirely in terms of – its components. Quite the contrary, its distinctive character only emerges in the higher-level whole.

In this understanding – which I adopt for the purposes of this book (which addresses the implications of systemic approaches to IR) – each organizationally differentiated level, because it is ultimately irreducible, has the same ontological status.[24] The world is *organizationally layered* but, as Manuel DeLanda nicely puts it, *ontologically flat*.[25] The things of the world are larger and smaller, simpler and more complicated, aggregated or complex. But no one level is more real, fundamental, or foundational than any other.

Understanding such a world requires not only bottom-up explanations of the large by the small or the whole by its parts but also attention to "downward causation"[26] and top-down explanations. (As Kenneth Waltz puts it, systems "shape and shove."[27]) "The combination of 'top-down' effects … and 'bottom-up' effects … is a pervasive feature of complex systems."[28] And one of the great attractions of systemic approaches is that they not merely allow but require us to comprehend the causal powers of both higher-level and lower-level entities, activities, and forces.[29]

1.4 Relations and Systems

In the social sciences, systems theories were common in the decades following World War II.[30] The failure of such projects, however, led in the 1970s to a marginalization of, and in many circles a strong reaction

[24] Rather than illegitimately sneaking in an important substantive claim, I intend this as a plausible hypothesis or methodological move that is unlikely to impede work on (partially) reductive explanations. (See §2.1.) Assuming that some level is ontologically primary, by contrast, not only commits one to an account that is inconsistent with most scientific practice but encourages empirically baseless "in principle" reducibility claims. Supporting evidence for this position is scattered through this book. For now I ask for a willing suspension of disbelief, in order to pursue the implications of a radically systemic view of the world.

[25] (DeLanda 2006, 28. See also 13). See also (Bryant 2011, ch. 6), (Latour 2005), (Schatzki 2016), (Salter 2019).

[26] The term appears to have been coined by Donald Campbell (1974). See also (Emmeche, Køppe, and Stjernfelt 1997, 2000), (Bedau 2002), (Kistler 2009), (Campbell and Bickhard 2011), (Elder-Vass 2012), (Bechtel 2017b), (Paoletti and Orilia 2017). (Eronen 2021) usefully links downward causation to compositional levels in the context of the tangled hierarchies characteristic of the biological (and I would add the social) world.

[27] (Waltz 1990b, 34; 1997, 915; 2000, 24).

[28] (Holland 2014, 5).

[29] See §2.1.

[30] The leading example in IR was (Kaplan 1957). See also (Rosecrance 1963), (Masters 1964), (McClelland 1966), (Deutsch 1968), (Banks 1969), (Thompson 1973). In Political Science, see (Easton 1953, 1965), (Deutsch 1963), (Almond and Powell 1978).

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against (the excesses and abuses of), "systems theories."[31] And such an attitude remains common today.[32]

In IR, the publication in 1979 of Waltz's *Theory of International Politics* revitalized explicitly systemic approaches – but in a very limited and peculiar way that I argue has been a mixed blessing (if not a pyrrhic victory). As I show in Part II, Waltz's narrow structuralism is not actually systemic. And the only explicitly systemic substantive theory that is widely employed in IR is structural realism, which is extremely contentious. As a result, in much of IR today there is widespread skepticism of, and even hostility to, "systemic theory" – which is usually taken to mean Waltzian structural theory.

Nonetheless, in IR,[33] Sociology,[34] and most other social sciences,[35] a broadly systemic perspective has emerged under the label of *relationalism*. Relationalist approaches employ a variety of framings, including

In Sociology, Talcott Parsons was a leading proponent. See, for example, (Parsons 1951, 1966, 1971) and (Kroeber and Parsons 1958). More broadly, see (Buckley 1967) and (Buckley 1968).

[31] (Pickel 2011, 4–7) briefly reviews this decline. In IR, see (Weltman 1973).

[32] The principal exception is transdisciplinary complexity science, which has made limited but significant inroads in many social sciences. (Miller and Page 2007), (Holland 2014), (Miller 2015), and (Ladyman and Wiesner 2020) are useful general introductions. More briefly, see (Walby 2007). In IR, see (Bousquet and Curtis 2011), (Byrne and Callaghan 2014), (Cineda 2006), (Cudworth and Hobden 2013), (Gadinger and Peters 2016), (Gunitsky 2013), (Harrison 2006), (Jervis 1997), (Kavalski 2007), (Orsini et al. 2020), (Pickering 2019), (Scartozzi 2018), (Snyder and Jervis 1993), (Wagner 2016), (Walby 2009), (Young 2017).

[33] (Jackson and Nexon 1999) is the seminal programmatic statement in IR. (McCourt 2016) and (Jackson and Nexon 2019) are excellent brief overviews. See also (Kurki 2020, 2022). Among "relational" works published in the 2010s, a good sample might include (Adler-Nissen 2015), (Brigg 2018), (Bucher 2017), (Duque 2018), (Gazit 2019), (Joseph 2018), (Kavalski 2016, 2018), (Learoyd 2018), (Lee 2019), (MacDonald 2014), (McConaughey, Musgrave, and Nexon 2018), (Nordin et al. 2019), (Pratt 2016a, b), (Selg 2016). See also (Schneider 2015).

[34] (Emirbayer 1997) is the classic programmatic statement. Charles Tilly (e.g., 1995, 1998, 2001b, 2015 [2008]) and Harrison White (esp. 1992, 2008) were particularly influential. (Crossley 2011) is a good book-length introduction (useful also because it is rooted in British, rather than American, discussions). See also (Dépelteau 2018), (Donati 2011), (Powell and Dépelteau 2013).

[35] Examples of relational Anthropology include (Ingold 2004), (Jansen 2016), (Salmond 2012), (Stensrud 2016), (Streinzer 2016), (Thelen, Vetters, and von Benda-Beckmann 2018). Anthropology also has a growing substantive literature on relational ontologies (e.g., (Herva et al. 2010), (Lee 2019)). Archaeological literature explicitly using relational frames includes (Betts, Hardenberg, and Stirling 2015), (Collar et al. 2015), (Fowler 2013, 2017), (Harris 2020), (Harrison-Buck and Hendon 2018), (Hill 2011), (Hutson 2010), (Watts 2014). I have also found (Hodder 2012) especially useful for its links to assemblage thinking. In Geography, see, for example, (Bathelt and Glückler 2003), (Bathelt and Li 2014), (Boggs and Rantisi 2003), (Hesse and Mei-Ling 2020), (Malpas 2012), (Murdoch 2005), (Ward 2010), (Yeung 2005). (Gergen 2009) outlines a relational psychology with clear connections to the social sciences more broadly. On

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- networks[36] – patterns of ties between nodes in webs of relations;
- fields[37] – structured "spaces" that induce particular behaviors from entities of particular types;
- practices[38] – sets of shared expectations and opportunities that underlie action-channeling dispositions;
- (con)figurations[39] – long-lived patterns of social relations;
- assemblages[40] – complex combinations of human, institutional, and material entities and forces; and
- "relational institutionalism"[41] – the approach of a group of IR scholars, rooted in both network theory and historical institutionalism, focusing on causally efficacious relational forms.

relational economics, which is only beginning to emerge, see (Biggiero et al. 2022), (Wieland 2020).

[36] (Avant and Westerwinter 2016) is an excellent edited volume that suggests the range of network approaches in IR. (Hafner-Burton, Kahler, and Montgomery 2009) is the standard article-length overview. See also (Borgatti et al. 2009). (Victor, Montgomery, and Lubell 2017) and (Knoke et al. 2021) are comprehensive overviews of political network approaches at varied levels of analysis. (Light and Moody 2021) is a similar extended overview of social networks. Interesting IR applications include (Acuto and Leffel 2021), (Beardsley et al. 2020), (Carpenter 2011), (Dorussen, Gartzke, and Westerwinter 2016), (Eilstrup-Sangiovanni 2014), (Erikson and Occhiuto 2017), (Gade et al. 2019), (Gallop and Minhas 2021), (Goddard 2009a), (Haim 2016), (Kim 2019, 2020), (Kim and Morin 2021), (Legg 2009), (Montgomery 2016), (Mueller, Schmidt, and Kuerbis 2013), (Mulich 2020), (Oatley et al. 2013), (Owen 2010), (Owen 2016), (Sazak 2020), (Sikkink 1993), (Torfing 2012).

[37] In IR, see, for example, (Adler-Nissen 2011), (Berling 2015), (Dixon and Tenove 2013), (Go 2008, 2011), (Guzzini 2013), (Kauppi and Madsen 2013), (Lim 2020), (Nexon and Neumann 2018), (Schmitz, Witte, and Gengnagel 2017), (Stampnitzky 2013), (Steinmetz 2007, 2008). (Bourdieu 1996 [1989]) is a classic empirical case study in Sociology that has had immense impact. See also (Bourdieu and Wacquant 1992, 14–26, 94–115). (Martin 2003; 2011, ch. 7, 8) provides an excellent introduction, stressing analogies with physical fields. (Fligstein and McAdam 2012) presents a more mainstream American sociological approach. (Barman 2016, 445–452) provides a useful brief overview of field approaches in the social sciences. See also §4.6.2 at nn. 74ff.

[38] (Pouliot 2010) and (Adler and Pouliot 2011) were seminal in IR. (Bueger and Gadinger 2018) and (Lechner and Frost 2018) are good book-length overviews. See also (Adler-Nissen and Pouliot 2014), (Bigo 2011), (Brown 2012), (Bueger 2014, 2016a), (Bueger and Gadinger 2015), (Côté-Boucher, Infantino, and Salter 2014), (Davies 2016), (Holthaus 2020), (Kustermans 2016), (Neumann 2002), (Pouliot 2013, 2016).

[39] This is the framing of Norbert Elias (2000 [1939], 1978). See also (Mennell 1998), (Baur and Ernst 2011), (Dépelteau and Landini 2013), (Tsekeris 2013), (Landini and Dépelteau 2014). In IR, Andrew Linklater (e.g., Linklater 2011; Linklater and Mennell 2010) was a forceful advocate for drawing on Elias.

[40] See §1.8 (esp. n. 93 for IR examples) and §10.5.

[41] This is Nexon's label (2010, 112ff.). (Nexon and Wright 2007) is a brilliant application. (Nexon 2009, 39–65) offers a useful medium-length overview. See also (Goddard 2009b), (Jackson 2006), (MacDonald 2014), (McConaughey, Musgrave, and Nexon 2018). One might also include ch. 15–17 of this book.

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The language of systems highlights wholes and emergence. "Relations" highlights ties between elements. But the "sense in which 'the whole is greater than the sum of the parts' is that the parts are, to some degree, constituted as the kinds of entities they are by their relation to the whole."[42] Conversely, relationalists see related elements as parts of larger wholes (systems). And both framings emphasize the organization or arrangement of elements.

I therefore treat "relational" and "systemic" as substantially overlapping. And an important aim of this book is to emphasize the systemic character of relational work in order to bring these two styles of theory and research, which are largely unconnected in contemporary IR, into constructive dialogue.[43]

1.5 Relationalism

Relationalism (like systemism[44]) is not a substantive theory or research program but an orientation to social theory and research. Relationalism focuses on "connections, ties, transactions and other kinds of relations among entities,"[45] stressing the interconnections of the things of the world (rather than their separate substantiality). Relationalists see the world as made up more of configurations (of things) than of things (that stand in various relations).

Relationalists typically oppose themselves to what they call "substantialism," which "maintains that the ontological primitives of analysis are 'things' or entities … Relationalism, on the other hand, treats configurations of ties … between social aggregates of various sorts and their component parts as the building blocks of social analysis."[46]

[42] (Bertolaso and Dupré 2018, 331).

[43] Natural scientists widely employ networks and fields. They almost always, though, use the language of systems to make what contemporary social scientists would call relational arguments. This, it seems to me, reflects the reaction against "systems theories" in the social sciences that I noted at the outset of this section – in sharp contrast to the normalization and naturalization of systems framings across the natural sciences (which, I am suggesting, ought to be a model for IR).

[44] By "systemism" I mean an orientation to social research that emphasizes systems, parallel to established uses of "relationalism." I am *not* adopting Mario Bunge's sometimes idiosyncratic approach to systems, which he (e.g., Bunge 2000) labels "systemism."

[45] (Jackson and Nexon 2019, 583. See also 592). Relationalists typically understand relations in the ordinary-language sense of "a connection, correspondence, or contrast between different things; a particular way in which one thing or idea is connected or associated with another or others." *Oxford English Dictionary*. On conceptualizing relations, see (Crossley 2013).

[46] (Jackson and Nexon 1999, 291–292). See also (Emirbayer 1997, 281), (McCourt 2016, 478–479), (Adler-Nissen 2015, 285–286, 288, 290–295). (Dupré 2020) offers a brief parallel critique of substantialism from a processualist (see §1.6) perspective. William

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Substantialist approaches have predominated in the contemporary social sciences. Individualist substantialism (e.g., rational choice models) treats actors as prior to and generative of relations – or, more modestly, gives methodological priority to interests, identities, or preferences that are treated as given. Holist substantialism (e.g., world systems theory) sees large-scale formations as prior to and generative of the entities that compose them. Variable-based substantialism employs *independent* variables that are treated as separate from and causes of (the values of) dependent variables.[47]

Relationalists do not deny the reality of substances or minimize their importance. They do, however, deny that "things" are essentially substantial or exist prior to (or remain fundamentally independent of) relations. In particular, relationalism rejects the idea of "pre-given units such as the individual or society."[48]

Nothing in the world is purely substantial. "Stuff" (substance) becomes things only when arranged in specific ways. The things of the world are the things that they are – are *real things* – not because of substance alone (or even necessarily primarily) but in part (and essentially) through their relations to other (relational) things.

"Things" *are* other "things" arranged in particular ways. Salt is sodium and chlorine arranged in a particular way. Bureaucracies are complex assemblages of (among other things) offices, office holders, and administrative technologies.

Relationalism is also anti-essentialist.[49] "Every so-called essence appears as a dense bundle of relations."[50] "The question of what something is becomes one of the relational configurations within which it is embedded."[51]

Sewell (2005, 329) makes a similar point when he argues that "a useful way to get a conceptual handle on the social is to think of it in terms of the various mediations that place people into 'social' relations with one another – mediations that may not make them companions but that, in one way or another, make them interdependent members of each other's worlds." ("Mediations," for my tastes, is a bit too actor-centric. But Sewell's point seems to me fundamentally relational.)

47 (Emirbayer 1997, 286) highlights the substantialist nature of mainstream causal analysis, drawing heavily on (Abbott 1988). (Independent-variable explanations explain through the attributes, actions, and inter-actions of entities – not their relations. See §§4.3–4.5.)

48 (Emirbayer 1997, 287). See also (Jackson and Nexon 1999, 293).

49 For example, Stephan Fuchs (2001) frames what is usually called "relationalism" as *Against Essentialism*. See also (Tilly 1998, ch. 1, esp. 17–21), (Jackson and Nexon 1999, 293, 295, 300, 301, 307, 321 n. 18), (Emirbayer 1997, 282, 283, 285, 286, 292, 295 n. 34, 308). For similar arguments in processual philosophy of Biology, see (Dupré and Nicholson 2018, 23–26), (DiFrisco 2018, 79–92).

50 (Powell 2013, 205).

51 (McCourt 2014, 36).

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Epistemological relationalism holds that whatever the world "really is," only relational "things" (not their essences or pure substances) are accessible to science. Relationalism may also be understood as a methodology for understanding some aspects of the world.[52] And relationalism, whether ontological, epistemological, or methodological, is sometimes embraced as a general "theory" of the world and sometimes as an account of (only) some parts.

Relationalism/systemism is compatible with scientific realism,[53] philosophical constructivism,[54] and pragmatism,[55] each of which can accept

[52] Jackson and Nexon (1999, 292) argue that "the distinction between relationalism and substantialism involves ontological commitments." That, however, need not be the case. "There is an important distinction between an analytical standpoint and an ontological standpoint" (Jackson and Nexon 1999, 320–321) – and relationalism, I am arguing, is sometimes employed (only) as a useful analytical standpoint.

[53] Scientific realism holds that "mature sciences" produce knowledge that we have good reason to believe more or less approximates the way the world "really is" – or at least that over time they move in such a direction. (Chakravarty 2017) and (Lyons 2016) are good brief introductions. (Harré 1986) is dense but wide-ranging and extraordinarily insightful. In IR, (Wendt 1999, ch. 2), (Patomaki 2002), and (Wight 2006) are standard discussions.

It is probably worth noting that I reject Wendt's (1999) privileging of scientific realism. Scientific realism does provide a foundation for a pluralist social science. But it is only "*a* condition of possibility for the argument of the rest of the book" (Wendt 1999, 91 [emphasis added]). Philosophical constructivism and pragmatism also can assure "that *everyone* gets to do what they do" by "block[ing] a priori arguments against engaging in certain kinds of work" (Wendt 1999, 91).

[54] Philosophical constructivism holds that knowledge is dependent on ideas, instruments, or experience; that Reality (with a big capital Germanic or Platonic R), whatever it may be, is not accessible to (and perhaps not entirely independent of) human beings. (Berger and Luckmann 1967) is an influential "classic." Short introductions include (Luhmann 2002), (Mallon 2007), and (Sveinsdóttir 2015). At book length, (Hacking 1999) is wide-ranging and engaging. Out of the huge literature in the philosophy of science, I find (Knorr Cetina 1981, 1999) and (Kukla 2013) especially penetrating. (Hull 1988) is also interesting, reading science as a selection process for ideas.

The boundaries between scientific realism and philosophical constructivism, however, are fuzzy – especially because realists accept that all scientific knowledge is theory-laden (and instrument-dependent). For example, Ronald Giere's "scientific perspectivism" (Giere 2006b; Massimi and McCoy 2020), which he describes as realist, seems to me about equal parts constructivist and realist. And John Searle's *The Construction of Social Reality* (1995) is an influential work that combines realism about (knowledge of) the natural world and constructivism about the social world.

[55] "Pragmatism is a philosophical tradition that – very broadly – understands knowing the world as inseparable from agency within it" (Legg and Hookway 2021, 1). (James 1904, 1907) are still-useful classic introductions. John Dewey's *Experience and Nature* (1925) is a book-length overview. (Thayer 1982) is a good reader. (Kivinen and Piiroinen 2006) directly addresses pragmatism and relationalism. In IR, see (Cochran 2001, 2002, 2012), (Kratochwil 2007a, b), (Friedrichs and Kratochwil 2009), (Pratt 2016a), (Pratt et al. 2021). There are no clear lines, though, between pragmatism and either scientific realism or constructivism. Individual pragmatists tend to lean in either or both directions while emphasizing the distinctively human dimensions of action in and knowledge of the world.

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systems and relations as "real" "things" "in the world" – however much they differ in their accounts of the nature of that reality.[56] But because systems and relations are not objects of sensory experience, systemic/relational approaches are incompatible with empiricism.[57] And systems and relations are, at best, difficult to reconcile with neo-positivism's[58] focus on independent and dependent variables.

1.6 Processes

In the philosophy of Biology, processualism is an increasingly prominent systemic framing.[59] "Essentially, every biologist is engaged in the description of processes."[60] Laura Nuño de la Rosa even argues that "following processes is a – if not the – characteristic activity of science."[61]

In the social sciences, processual approaches are relatively rare.[62] But processes, as we will see in §10.1, appear centrally in accounts of

[56] The best-known relationalist social theorists (e.g., Pierre Bourdieu, Niklas Luhmann, Norbert Elias, Bruno Latour) are constructivists. But Margaret Archer, a leading scientific-realist social theorist, is a strong relationalist. (See (Archer 1982, 1995), (Donati and Archer 2015).) And Mustafa Emirbayer, who played an important role in popularizing relationalism in Sociology (Emirbayer 1997), draws heavily on Deweyan pragmatism.

[57] Empiricism holds that justified knowledge is grounded in sensory experience. In the decades on either side of World War II, "logical empiricism" dominated the philosophy of science. ((Creath 2022) is a useful overview of a huge literature.) The leading version today is Bas Van Frassen's (1980) "constructive empiricism," which holds that science aims to provide true knowledge of observables (but not unobservables). (Monton and Molder 2021) is a good overview. (Churchland and Hooker 1985) presents several scientific realist critiques and van Frassen's reply.

[58] See n. 35 in §4.3.

[59] (Dupré and Nicholson 2018) and (Dupré 2020) are excellent brief introductions. Contemporary processualism, especially in the philosophy of science, is very different from the "process philosophy" of Henri Bergson and Alfred North Whitehead. As Dupré and Nicholson (2018, 7) put it, "for the purposes of our present project we wish to distance ourselves from the association with Whiteheadian metaphysics. …. In fact, we suspect that process philosophy has not received the attention it deserves partly because of its close association with Whitehead's work." (Rescher 1996, 20–23) provides a very brief overview of Whitehead's (arcane) process metaphysics.

[60] (Bapteste and Anderson 2018, 283). See also (Bechtel 2011), (Darden 2013), (Craver and Kaiser 2013, 130).

[61] (Nuño de la Rosa 2018, 264). Glennan (2017, 24) quoting (Levin 1992, 1944) claims that "understanding patterns in terms of the processes that produce them is the essence of science." Mark Bickhard (2004, 122) even argues that "every science has passed through a phase in which it considered its basic subject matter to be some sort of substance or structure. Fire was identified with phlogiston; heat with caloric; and life with vital fluid. Every science has passed beyond that phase, recognizing its subject matter as being some sort of process: combustion in the case of fire; random thermal motion in the case of heat; and certain kinds of far from thermodynamic equilibrium systems in the case of life."

[62] The classic exception that proves the rule is (Elias 2000 [1939]). Charles Tilly is the principal recent exception. See, for example, (Tilly 1984, 1995, 2001a, 2015 [2008]).

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relationalism in IR. And, I will argue, processes merit not only independent attention but emphasis in broadly systemic/relational work.

A process, in ordinary language, is "a continuous and regular action or succession of actions occurring or performed in a definite manner, and having a particular result or outcome."[63] As the philosopher Nicholas Rescher puts it, a process is "an integrated series of connected developments unfolding in programmatic coordination";[64] "a coordinated group of changes in the complexion of reality, an organized family of occurrences that are systematically linked to one another either causally or functionally."[65]

Processualism in effect extends the relational critique of substantialism, adding (and emphasizing) activities.[66] Processes "do things. They are active and so ought to be described in terms of the activities of their entities, not merely in terms of changes in their properties."[67] Such organized productive activities are no less worthy of scientific investigation than the attributes, actions, interactions, and relations of the entities involved.

Processualism,[68] like relationalism, is regularly understood as an ontological,[69] an epistemological,[70] and a methodological stance.

Strong ontological processualists hold that the world is "a matrix of process."[71] "Things" *are* "complex bundles of coordinated processes";[72] "precipitates of processes … what abides, as certain kinds of processes continue and develop."[73] A human being, for example, is not so much

See also (Baur and Ernst 2011), (Fararo 2011), (Demetriou 2012), (Mackenzie 2004), (Renault 2016), (Skalník 1978), (Van Krieken 2001). Note, though, that "process tracing," as typically practiced in the social sciences (see n. 78), rather than treat processes as objects of investigation, examines the pathways between an independent/treatment variable and its causal effects (usually in a single case).

[63] *Oxford English Dictionary*. In the (now rare) sense of "that which goes on or is carried on" (*Oxford English Dictionary*) a process need not occur in a definite manner or have a particular result. (Anything that occurs might, in this broader sense, be considered a process.) In the (standard) sense that I employ, however, a process has a particular kind of order.

[64] (Rescher 2000, 22). See also (Glennan 2017, 26).

[65] (Rescher 1996, 38).

[66] (Jackson and Nexon 2019, 592) make a similar point in somewhat different terms.

[67] (Machamer, Darden, and Craver 2000, 5). See also (Illari and Williamson 2013, 74).

[68] (Rescher 1996, 2000) are excellent, wide-ranging, and readable introductions to process philosophy. See also (Seibt 2011) and, much more briefly, (Seibt 2017).

[69] See, for example, (Austin 2020), (Bapteste and Dupré 2013), (Bickhard 2011), (Galton 2006), (Galton and Mizoguchi 2009), (Guttinger 2018), (Seibt 2018).

[70] See, for example, (Mancilla Garcia, Hertz, and Schlüter 2020), (Pradeu 2018, 105), (Rescher 2000, 8).

[71] (Rescher 1996, 92).

[72] (Rescher 2000, 9). See also (Rescher 1996, 46 ("clusters of actual or potential processes"), 51 ("manifolds of process")).

[73] (Simons 2018, 55). See also (Dupré and Nicholson 2018, 13).

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"a" "substantial" (or even "relational") "thing" as a complex assemblage of physical, chemical, biological, psychological, sociological, and ecological processes. And this is true all the way down to – and is particularly striking at – the lowest physical levels. "Instead of very small things (atoms) combining to produce standard processes (windstorms and such), modern physics envisions very small processes (quantum phenomena) combining to produce standard things (ordinary macro-objects) as a result of their modus operandi."[74]

More modestly, Peter Machamer, Lindley Darden, and Carl Craver argue that an ontological dualism that sees both entities and activities as irreducibly real "capture[s] the healthy philosophical intuitions underlying both substantivalist and process ontologies."[75] Processualism is also compatible with ontological agnosticism. And one may focus on processes simply as a fruitful tool for generating useful knowledge.

In all of its forms, though, processualism is broadly systemic in its focus on the *operation* of *organized* "things."

1.7 Mechanisms

Mechanisms receive special attention in the life sciences. In the social sciences we are also seeing growing attention to mechanisms in work on causal mechanisms,[76] rationalist modeling,[77] and process tracing[78] and in multimethod research designs.[79]

The ordinary-language sense of a mechanism as "a system of mutually adapted parts working together in a machine or in a manner analogous to

[74] (Rescher 2000, 12–13).

[75] (Machamer, Darden, and Craver 2000, 4. See also 8).

[76] (Baird et al. 2019), (Beach 2013), (Bennett 2013), (Capano and Howlett 2021), (Checkel 2006, 2015), (Falleti and Lynch 2009), (Fortna 2004), (Friedrichs 2016), (Gerring 2010), (Hedström and Ylikoski 2010), (James 2017), (Johnson and Ahn 2017), (Kincaid 2012), (Little 2011), (McAdam, Tarrow, and Tilly 2008), (Steel 2004). Note, however, that treating "mechanisms" as intervening variables, which is common in causal inference research designs (e.g., Mahoney 2001, 578, citing half a dozen examples; Beach 2013, 13, citing half a dozen examples; Morgan and Winship 2015, 224; Goertz 2017, 31), strips the mechanism out of "mechanisms." See §§4.3–4.5.

[77] See, for example, (Abell 2011), (Boudon 1998), (Demeulenaere 2011), (Hedström and Bearman 2009a). Rationalist "mechanisms," though, usually are "as if" models that provide, at best, "how possibly" (not "how actually") explanations. They do not attempt to identify and understand the productive processes that in fact produce results in the world – which are the focus of work on mechanisms in the natural sciences.

[78] (Beach and Pedersen 2019), (Bengtsson and Ruonavaara 2017), (Bennett 2010), (Bennett and Checkel 2015a), (Collier 2011), (Hall 2013), (Kay and Baker 2015), (Mahoney 2012, 2016), (Saylor 2020), (Waldner 2012), (Zaks 2016). But cf. n. 62.

[79] (Beach 2020), (Goemans and Spaniel 2016), (Goertz 2017), (Hesse-Biber and Johnson 2015), (Seawright 2016, 2021), (Stolz 2016).

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that of a machine" or "an ordered sequence of events involved in a biological, chemical or physical process"[80] is also standard in the philosophy of Biology, especially "the new mechanical philosophy."[81] Machamer, Darden, and Craver in their seminal article "Thinking about Mechanisms" define mechanisms as "entities and activities organized such that they are productive of regular changes from start or set-up to finish or termination conditions."[82] William Bechtel and Adele Abrahamsen similarly define a mechanism as "a structure performing a function in virtue of its component parts, component operations, and their organization."[83]

Entities and activities are the interdependent elements of mechanisms.[84] Organization into productive processes makes elements parts of mechanical wholes.[85] What mechanisms "do" is produce particular phenomena. ("Mechanisms are always 'for' something, and they are identified by what they are for."[86]) The "doing" is central to the mechanism.[87] And the essence of mechanismic[88] research is discovering such productive processes and explicating their operation.

Mechanisms are "composite hierarchical systems"[89] in which "higher-level entities and activities are … essential to the intelligibility of those at lower levels, just as much as those at lower levels are essential for

[80] *Oxford English Dictionary*.

[81] (Machamer, Darden, and Craver 2000) was seminal. (It is widely cited not only in the philosophy of Biology but also in the social sciences. See, for example, (Hedström and Bearman 2009b, 4), (Waldner 2012, 72), (Morgan and Winship 2015, 238–239), (Stolz 2016, 258–259), (Beach and Pedersen 2019, 3, 30, 31, 38, 69, 70).) Excellent overviews include (Glennan 2017), (Glennan and Illari 2018), and, more briefly, (Craver and Tabery 2019). The label underscores the rejection of early modern mechanical philosophies (e.g., Hobbes, Descartes, Newton, Laplace). (Glennan 2017, 5–11) briefly distinguishes "new" and "old" mechanical thinking.

[82] (Machamer, Darden, and Craver 2000, 3).

[83] (Bechtel and Abrahamsen 2005, 423). See also (Bechtel 2016, 705–706), (Darden 2008, 965, table 1), (Glennan 2017, 1, 17, 19–20, 66), (Illari and Williamson 2012, 123), (Illari and Russo 2014, 134), (Love 2020, §1.3), (Povich and Craver 2017, 107–111), (Steel 2008, 40–42).

[84] (Machamer, Darden, and Craver 2000, 3), (Machamer 2004, 28–30, 32–34), (Darden 2008, 961–964), (Illari and Williamson 2012, 125), (Glennan 2017, 20–22, 29–36).

[85] (Machamer, Darden, and Craver 2000, 3), (Bechtel and Abrahamsen 2005, 430), (Illari and Williamson 2012, 127), (Bechtel 2016, 719), (Glennan 2017, 23).

[86] (Glennan 2016, 789). See also (Machamer, Darden, and Craver 2000, 5), (Illari and Williamson 2012, 130). On the functional nature of mechanisms, see (Craver 2001), (Craver and Darden 2013, 23–24), (Garson 2019, ch. 10), (Machamer, Darden, and Craver 2000, 6).

[87] (Machamer 2004), (Illari and Williamson 2013). See also §10.1.

[88] I use "mechanismic," following Bunge (1997, esp. 462), to underscore that "one should not think of mechanisms as exclusively mechanical (push–pull) systems" (Machamer, Darden, and Craver 2000, 2).

[89] (Wright and Bechtel 2007, 45. See also 54–61). On levels of mechanisms, see (Kuorikoski 2009), (Glennan 2010), (Ylikoski 2012), (Craver and Darden 2013, 21–25).

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understanding those at higher levels. *It is the integration of different levels into productive relations that renders the phenomenon intelligible and thereby explains it.*"[90]

"Mechanisms" and "processes" have very similar definitions and often are used interchangeably, both in ordinary language and in professional jargon. When carefully distinguished, one usually is taken as broader than the other. I am inclined to say that all mechanisms are processes but not all processes are sufficiently organized to be considered mechanisms. Charles Tilly, however, argues, no less plausibly, that "mechanisms compound into processes."[91]

The key point, though, is that structured productive activities – mechanisms and processes – are *modular*,[92] *multilevel*, and *extend across time*. They therefore need to be studied with attention to their organization *and operation*.

1.8 Assemblages

Assemblages are a type of system of special interest for the social sciences.

In assemblages, parts are related *extrinsically*, in the sense that they retain a certain separateness or separability.[93] For example, an archaeological assemblage ("an associated set of contemporary artefacts that can be considered as a single unit"[94]) is the product of "extrinsic" "logics" of deposition, preservation, excavation, and analysis. The assembled whole has properties and meanings distinct from those of its constituent elements. The elements, however, although transformed by their assembly, retain some separate identity (or at least a potential to be re-divided or re-assembled). They are more or less tightly linked into a still-heterogeneous entity.

The parts of a living organism, by contrast, are *intrinsically* related to – fundamentally inseparable from – the whole. A human heart, for

[90] (Machamer, Darden, and Craver 2000, 23 [emphasis added]).
[91] (Tilly 2010, 56). See also (Tilly 2001a, 25–26).
[92] I am not sneaking in a new element here. Modularity is implicit in and central to both processes and mechanisms. On the importance of modularity in complex systems, see §2.3.5.
[93] (DeLanda 2016, 2, 10, 11–12). This conception derives from "assemblage theory," based on (Deleuze and Guattari 1987 [1980], ch. 3, 4), as developed in (DeLanda 2016, 2006). See also (Buchanan 2020) and, coming to assemblage through the arts, (Brown 2020). IR applications of varied assemblage frames include (Puar 2017 [2007]), (Sassen 2008 [2006]), (Abrahamsen and Williams 2009), (Acuto and Curtis 2014), (Schouten 2014), (Bachmann, Bell, and Holmqvist 2015), (Dittmer 2015), (Wilcox 2015, ch. 4, 5), (Bueger 2018), (Collier 2018), (Fisher 2018), (Carter and Harris 2020), (Fox and Alldred 2020), (Savage 2020), (Ankersen 2021), (Hope 2021). See also §10.5.
[94] *Oxford English Dictionary*.

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example, can be a part of only one kind of whole.[95] It *is* a human heart; a particular kind of part of a particular kind of whole.

"No [assembled] object is a seamless whole that fully absorbs its components."[96] An assemblage is both a multiplicity and a unity. Niklas Luhmann's description of a system as a *unitas multiplex*[97] is especially apt for assemblages.

An assemblage perspective highlights the simultaneous irreducibility and inseparability of individuals and social groups; their dialectical or recursive relationship. Social groups, as systems, are not reducible to their individual parts. But as assemblages they do not reduce individuals to parts of social wholes. For example, a family is "more than" the sum of its members. Family members, however, are also "more than" just parts of a family.

Because there are irreducible phenomena at all levels, one might say that most of the things of the world are assemblages. (This is indeed the view of some advocates of "assemblage theory."[98]) I think, though, that (except when speaking of ontology) it is more profitable to use the term only when we want to draw attention to the act or fact of assembly, the possibility of re-division or re-assembly, or the presence of one entity in multiple assemblages – all three of which are often important in thinking about social groups and the social world more broadly.

1.9 Treating International Systems *as* Systems

This book emphasizes the need to study systems *as* systems; relational wholes with important features that cannot be explained solely in terms of their parts. I begin to sketch what that implies in the remaining chapters of this Part. In Part II I show that, superficial appearances to the contrary, the predominant "systemic" approach in IR (Waltzian structuralism) is in fact thoroughly analytic. Part III then suggests some possible paths forward toward truly systemic/relational theory and research in IR.

In making these arguments, I recurrently draw parallels with Biology, which has undergone a systemic/relational transformation over the past quarter century. "Twenty-first-century biology is fundamentally different from twentieth-century biology. It is a biology of relationships rather than entities."[99] This book aims to push IR in a similar direction.

[95] Although not strictly true – imagine a collage of preserved hearts (which, not coincidentally, is an assemblage) – this is close enough for our purposes here.
[96] (Harman 2010, 172).
[97] (Luhmann 1990b, 409–410, 418–419; 1995 [1984], 18).
[98] See, for example, (DeLanda 2016).
[99] (Gilbert 2018, 123).

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1.10 Postscript: Waltz and Jervis on Systems

Isn't this old hat in IR? Haven't we understood the distinctive nature of systems and systemic explanation at least since Waltz's *Theory of International Politics*?

In a certain sense, yes. But, more fundamentally, no.

Even if we accept Waltzian international political theory as genuinely systemic, which I argue in Chapter 5 it is not, its narrow two-variable structuralism differs fundamentally from systems approaches in the natural sciences – which I will argue have much to teach us about studying the social world. Waltzian structuralism has also obscured the systemic character of relational approaches – which, I am arguing, are likely to prove especially fruitful if understood in broadly systemic terms.

Jervis' *Systems Effects* moved the discussion in IR forward by introducing a complexity perspective.[100] His work, however, proved not to be transformative because, as we will see in Chapters 3 and 4, he retained Waltz's levels of analysis (rather than levels of organization) approach and was inclined toward variable-based social science (which is fundamentally incompatible with the systemic/relational explanations based on the organization and operating of complex wholes).

Furthermore, Jervis' work did not encourage – and through treating Waltz as a model of systems thinking discouraged – seeing the deep and promising connections between relational and systemic approaches. Elaborating those connections, as I have begun to do in this chapter, seems to me a major justification for this book.

In other words, although I have similar starting points as Waltz and Jervis, I try to push systems approaches in different directions. And I am doing this in what seems to me a more conducive disciplinary environment, given the rise of network, field, and mechanism approaches and the spread of more sophisticated and open-textured views of science.

Third time's the charm?[101]

[100] I am effectively treating Waltz as the culmination of the first wave of systems theories in IR, bracketed at the front end by (Kaplan 1957). (See also n. 30 above.) This phase was rooted in a cybernetic approach to systems, which emphasizes "control and communication in machines and in living organisms" (Wiener 1948, 14). (Ashby 1956) and (Wiener 1961) are classic works in cybernetics that Waltz explicitly notes (1979, 40 n. *) as influences. Although Waltz (1979, 12) does mention Warren Weaver's (1948) "organized complexity," which is an early precursor of contemporary conceptions of complexity, I show in Part II that Waltz was not really interested in complexity. Jervis' *Systems Effects*, taking advantage of the transformation of systems science in the late 1970s and 1980s (the Santa Fe Institute was founded in 1984) moved IR away from cybernetics toward complex adaptive systems (see §2.3.4) – but, I argue below, not far enough in that direction.

[101] I say this fully aware that I am nowhere near the caliber of scholar of Waltz or Jervis. I do, however, claim to have some important things to say about systems and how to study them in IR that push the conversation in new directions.

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