

## **Encountering Law's Complexity**

This collection introduces the reader to the ways that scholars are using complexity theory to make sense of law. Complexity presents a more productive language for legal theory and a revolutionary way of addressing the problems of descriptive, normative and critical jurisprudence, and of understanding the interconnected operations of law and other social activities. Complexity theory developed in the natural sciences as a way of explaining the ways in which order could arise without the need for a guiding hand or central controller. In a complex system, the structure emerges spontaneously as the result of the interactions of the component elements in the system as they encounter new information. Complexity theory has been used, *inter alia*, to explain the workings of insect colonies and the relationship between the mind and the brain (Waldrop 1994, p.145). It has also been relied on by certain social scientists (for example, Geyer and Rihani 2010; Sawyer 2005; Urry 2003; Walby 2007), and there is now a significant, but disparate, body of scholarly writing that seeks to apply the insights from complexity theory to law (for example, Hathaway 2001; Murray 2006, 2008; Ruhl 1996a, 1996b, 1997, 2008; Vermeule 2012; Webb 2013, 2014, 2015; Webb 2005; Wheatley 2016).

Complexity theory understands law as an emergent, self-organizing system in which an interactive network of many parts – actors, institutions, and “systems” – operate with no overall guiding hand, giving rise to complex collective behaviours that can be observed in patterns of legal communications. The contributions in this volume explore the different ways in which the insights from complexity can be applied to law – addressing such questions as how we understand the idea of law; the function of law as a regulatory tool; and the advantages of an approach to legal questions from complexity, including the academic function of critique. The collection focuses on public policy and administrative law; international law and human rights; business and finance; and the practice of law and legal ethics, because these are the areas in which law has thus far been seen to most clearly encounter complexity. The objectives of this chapter are to introduce the reader to the science of complexity; to explain the basic idea of complexity theory; to outline the ways complexity has been used in the academic discipline of law; and to provide an outline of the chapters.

### **Why Complexity?**

There are no shortages of possible approaches to legal theory. *Lloyd's Introduction to Jurisprudence* includes, for example, natural law, positivism, sociological jurisprudence, realism, critical legal

studies, feminist jurisprudence, postmodernist jurisprudence and critical race theory (Freeman, 2014). The basic claims of this collection are first, that complexity theory offers something qualitatively different to these now-traditional approaches, and so should be added to the list. Secondly, that legal complexity is a fact of the world, and that the tools we currently possess are, on their own, inadequate to the task of making sense of law's complexity, or at least insufficient to understanding the limits of our knowledge about law. The argument for complexity is that law systems are complex systems, and to make better sense of the law we must look to the insights from complexity to develop models that explain what law is and what it ought to be, as well as critical evaluations of the very nature and purpose of law. Simply put: if a research question involves interconnectedness, systemic properties, unpredictability, porous boundaries, some element of bottom-up organisation, and rapid innovations in law and regulation we are concerned with legal complexity, and to make sense of law's complexity, we must engage with complexity theory. This is the case whether we are examining the legal complexity of the governance of global financial markets (Sornette 2017), the regulation of on-street sex work (Carline and Murray, 2018) or anything in between.

The first challenge lawyers face with the application of complexity theory to law is the apparent diversity of understandings available. Indeed, the anthropologist and computational social scientist John Murphy introduces the subject as follows:

‘Complexity theory is a collection of theories and approaches that began to grow to prominence in the 1990s, that attempt to address the behavior of systems not readily understood using traditional approaches... Complexity theory addresses highly nonlinear systems and systems that exhibit emergent, self-organized, and adaptive behavior. Domains include virtually every field of study, from economics, to cosmology, to genetic evolution, to cognition and artificial intelligence. Its appeal is that it proposes that common principles guide the dynamics and evolution of systems across all of these domains, and that these principles reflect a deeper order that profoundly structures the physical and social world in which we live.’ (Murphy, 2017)

Evidently, while there is no general science or philosophy of complexity, no agreed upon final definition of the concept, both the natural and social sciences have looked to the language of

complexity to explain the world we inhabit. Physics and chemistry point to the existence of complex systems like the Great Red Spot vortex of Jupiter (Kauffman 1996, p.20) and Benard cells, Belasov-Zhabokinski reactions, and chemical clocks (Kauffman 1996, p.53), biology to the existence of complex adaptive systems like ant colonies and immune systems (Waldrop 1994, p.145), whilst the social world is seen to be comprised of complex adaptive systems such as those of language and ‘symbolic interactions’ (Sawyer 2005, pp.4-5, 24-25), as well as political systems (Vermeule 2012, p.50), which also evolve creating complex system dynamics. Wherever they look complexity theorists see complex systems, presenting an exciting picture of ceaseless creativity, transformation, order-out-of-chaos, strange attractors, far-from-equilibrium processes, spontaneous self-organisation, non-linearity, emergence, adaptation and evolution.

Perhaps because of the diversity of contexts to which complexity theory has been applied, many complexity theorists often refer to the approach as a set of tools (Byrne 1998, p.34; Geyer and Rihani 2010, chapter 3; Webb 2005, p.232 ), but it is perhaps more accurately described as ‘a conceptual framework, a way of thinking, and a way of seeing the world’ (Mitleton-Kelly 2003, p.26). That way of seeing the world is predicated, especially in the social sciences, on a concern that the attempt to emulate the natural scientific method of analytical reductionism closes off an expanse of social experience and interaction – the source of complexity – and presents social existence as a quantifiable, essentially knowable, phenomenon. A view of the world as complex regards our models and descriptions as incomplete by virtue of the tension between our own localness and the scale of that which we seek to explain (Cilliers 1998, p.95; Webb 2005, p.235). It is opposed to final destinations, and only provides descriptions and analysis suitable for the moment (Cilliers 1998, p.4; 2001, p.141; Richardson *et al.* 2001; see also Webb 2005, p.237 and n.43 p.237); it is pragmatic. In exposing the deeply interconnected, perpetually interacting, reiterative nature of social existence, complexity theory requires the observer to be more precise in their definition of the scope of their investigation and the contingency arising from their spatio-temporal context. Thus, though there is some variation in language, and while some approaches place greater weight on a particular concept or device of complexity theory, the essence of complexity is to be found in the modesty which it engenders in the observer of society.

Complexity theory has revolutionized many areas of the natural sciences, and its core insights have been adopted by social sciences to provide a better way of thinking about human social existence, emphasizing the importance of connectivity and dynamic network organisation, unpredictability, systemic instabilities and rapid change. Complexity theory came into existence following the

recognition that the Newtonian model of a clockwork universe that could be taken apart and subject to reductionist analysis was unable to explain the workings of certain (complex) systems (Capra & Mattei, 2015). Byrne and Callaghan explain the point this way: ‘the implications of [complexity] is not that the law focused on Newtonian science is wrong but rather that it is *limited in its rightness*’ (Byrne and Callaghan, 2013, p. 19, *emphasis added*). Once we recognize that much of the physical and social world is made up of complex systems, we must accept that these can only be studied through a new complexity paradigm focused on notions of interconnectedness, relationality, non-linearity, self-organisation, dissipative structures, emergence, systemic openness, adaptation, evolution, and transformation. Simply put: complexity and complexity thinking involve a significant modification in how we see and understand our world.

Yet, despite all of this, complexity theory remains largely absent from legal thinking, while systems thinking in legal scholarship is dominated by autopoietic systems theory. Given the influence of complexity theory in the natural and social sciences it is strange that law as a discipline has remained largely indifferent to it. It is even more strange because law systems exhibit all of the features of complex systems, emerging from the actions and interactions of law actors in a networked relationship, but with different characteristics from those law actors. Complexity gives us a way of thinking about law, and a language to describe law systems as never before.

Our view is that complexity presents a view of law and society which is qualitatively different to that of autopoietic theory and, we argue, significantly enhances the value of systems theory thinking in law. This is the case for four reasons.

First, complexity theory is better science. In the natural sciences, little reliance is placed upon autopoiesis beyond the narrow discipline of cell biology; by way of contrast, there are numerous references to complexity theory across all scientific disciplines. Moreover, the literature on autopoiesis draws narrowly on the work of (Maturana and Varela, 1987), notwithstanding that Niklas Luhmann and those after him have developed a highly sophisticated, internally coherent theory of autopoiesis (Luhmann, 2004; Teubner, 1993, 2012). Furthermore, while autopoiesis is presented as an approach founded in the sciences, it does not acknowledge the narrowness of its foundations, nor does it represent the conclusions it draws about the proper order of a functionally differentiated society as being founded in that science. Complexity, on the other hand, is well established in physics, chemistry and biology, and the literature has drawn on a wide range of

sources in these disciplines to produce *inter alia* socially influential metaphors, such as ‘butterfly effects’ and ‘tipping points’ (see Lewin 1992, p.11; Lorenz 1993).

Secondly, autopoiesis asks us to think in terms of communication systems we cannot see, touch, or hear; we must accept, as a matter of faith, their existence. Indeed, the notion of autopoietic, functionally differentiated subsystems is an artefact of autopoietic thinking, not of social observation (Webb 2013, 135-139). There is no particular reason why in autopoietic thought certain definitions and boundaries of system communication, such as law, politics, health and education, are to be preferred, other than that they simply *are* preferred. For autopoiesis, this means that, although individual events can have multiple meanings across different systems (see King 1993, pp.223-226; see also Luhmann 1992a, p.1432), there is no opportunity for those meanings to directly engage one another to create new logics for the system (they may only structurally couple, King 1993 p.225) – functional differentiation perpetuates the status quo, and increases the risk of entropy. Complexity, on the other hand, though it conceptualizes law as an emergent property of the communication acts of law actors like parliaments and courts that we can easily perceive, does not require that communications be framed according a predetermined list of social functions. And, more importantly, it anticipates that the confluence of communications between different actors, institutions and systems – the interface of their respective descriptions strategies, their boundaries of understanding – is the most important aspect of social behaviour to observe for law.

Thirdly, the dehumanised nature of autopoiesis is highly problematic. There is already an established critique and counter-critique to the removal of the person from autopoiesis (Bankowski 1996, Paterson 1996) that addresses this question on autopoiesis’ own terms. Similarly, autopoiesis has also been challenged on the exclusion of the physical, corporeal existence of humanity from autopoiesis both from the compassionate perspective of the concept of vulnerability, and in terms of the implications for the longer-term stability of autopoietic social systems (Phillipopoulos-Mihalopoulos & Webb 2015). For complexity theory, the setting aside of the importance of human agency, and the ascription of volition and the construction of meaning principally to social not – as autopoiesis would say - psychic systems, closes off great swathes of activity which are neither anticipated nor understood at a systemic level. The operational context of any source of meaning, be that an individual, an institution, or a “whole” system, impacts the subject matter with which that source of meaning is concerned. Complex systems operate within

and across many different scales, producing models of understanding according both to their operational context, and the scale to which that context is addressed.

The final problem relates to the assumptions which autopoiesis makes about regulation and the reasons for regulatory failure (See Luhmann 1992b, p.397). First, autopoietic identity (ego) is tied up with self-reference, thus reference to the other (alter) ruptures that relationship. The interdependence of system identity and the processes of self-reference that sustain it means that autopoiesis finds it difficult to countenance using 'law as a means of direct intervention in social systems ... as a means for purposeful intervention in adaptive, open systems' (Teubner 1988, p.219), because this would entail external reference. The second reason is that the autopoietic identity relies upon a binary code. The ability of the system to distinguish itself from its environment, and thus to recognise communications as being part of the system, as having a meaning which it can understand, is wholly reliant on the perpetuation of this functionally derived code. The difficulty with both these explanations for why regulatory failure occurs is that they rest on the assumption that, were perfect communication somehow possible, regulatory failure would not occur. Yet, a complexity theory shows us, it is not a question of misunderstanding incomprehensible communication, it is that there is no perfect form of regulation available. This demonstrates the qualified nature of autopoietic accounts of regulatory failure, they are useful in that they demonstrate the challenges of communicating, but they do not grasp that it is not that regulation seeks to remedy a known problem with a quantifiable solution, but instead that regulatory space is forever being destabilised by events, new actors, and new interactions (see further Geyer and Rihani 2010; Ruhl and Salzman 2002, 2003). A complex version of law will be flexible and adaptable, but it will not provide a *solution* to regulation, only the possibility of failing less frequently and reacting more adeptly.

### **What is complexity?**

The origins of complexity theory can be traced back to early work on cybernetics and information theory (Waldrop, 1994; Woermann, 2016), but the notion of a distinctive theory of complexity is normally credited to the Belgian physical chemist Ilya Prigogine, who won the Nobel Prize for Chemistry in 1977 for his work on far from equilibrium systems, a type of complex system. Prigogine introduced the notion of 'order out of chaos' (Prigogine & Stengers, 1984), which can be taken of a first coherent statement of a theory of complex systems. The story then shifts to the activities of the US Santa Fe Institute (established 1986), which played host to some of the leading

thinkers on complexity theory, including Kauffman and Holland, who each worked on biological complexity (Holland, 1995, 1998; Kauffman, 1993, 1996), and Arthur, on economic complexity (Arthur, 1994, 2014). Complexity theory was, at the time, mostly based in the academic disciplines of physics, mathematics and computer sciences, but there was also an interest in the subject in the continental philosophy of Deleuze and Guattari (Deleuze & Guattari, 1987) and Morin (Morin, 2007).

Whilst there is no agreed definition of a complex system, there is some consensus in the literature on the characteristics of complex systems. First, complex systems are self-organizing. There is no controlling power or central control in a complex system, which is the result of the actions and interactions of micro-level component elements. Second, complex systems have a meso-level of creative organization in which the inter-connections and inter-relations of micro-molecular elements results in another level of complexity. Third, the actions and interactions of component elements at the micro- and meso-levels result in the emergence of macro-system level characteristics with different properties or capacities from the lower level elements. This is normally explained in terms that, in a complex system, ‘the whole is greater than the sum of its parts’. Fourth, complex systems change over time with the flow of new matter, energy, or information into the system, generating novel emergent properties. Fifth, complex systems not only interact with agents and elements in the external environment, but also with other complex systems, leading to the possibility of even higher level emergent properties. Further, complex systems interconnecting and interacting with other complex systems will become nested, with increased complexity. Finally, whilst complex system may remain stable for long periods, their non-linearity means that radical change can happen quickly and unexpectedly, with complex systems existing somewhere between entropy (where the system decays over time) and chaos (where too much activity makes stable structures impossible to maintain) (Capra 2016; Coveney & Highfield 1996; Heylighen *et al.* 2007; Lewin 1992; Richardson and Cilliers 2001; Waldrop 1994, *passim*).

On this view, complexity theory might be alleged to be a postmodern theory in the most extreme sense because of the central importance it accords to contingency and emergence, and thus the empirical unpredictability of social life. That is, the possibility that ‘anything goes’ (Cilliers 1995; 1998, *viii*), that there are no real structures or boundaries to speak of. However, from our perspective this misunderstands the purpose of these concepts in the context of complexity theory. Complexity is not a postmodern theory because it is not concerned with doing away with, or

otherwise transcending boundaries. It is concerned with the means by which those boundaries – of actors’ understanding, of institutions, of systems, of concepts – are constructed, their justifications, and their responses to stimulation by other boundaries. Without being so hubristic as to believe that we can fully comprehend the nature and implications of emergence for law and society more generally, a complexity view of the law should nonetheless be committed to the aspiration of attempting to understand emergence, and to grasp what it means for law in both specific and general contexts.

### **Thinking About Complexity**

The philosopher and sociologist Edgar Morin introduced a well-known distinction in the discussions on complexity between (what he calls) restricted (or modern) writings that look to discover mathematically formulated laws of complexity, and general (or postmodern) scholarship which regards all attempts to produce laws of complexity as a negation of the insight that some systems cannot be modelled perfectly because they are complex systems (Morin, 2007, p. 10). The difference can be seen, for example, in the divergent methodologies of the Santa Fe Institute, which aims to formalize the laws of general complexity, and Morin’s own project, which stayed faithful to the more open and philosophical concerns of general systems theory. Morin argues that the search for the rules or laws of complexity is influenced by the paradigm of classical science, of the need for simplification, but that when the principle of reduction is applied to complex systems some important elements will inevitably and necessarily be missed, meaning that predictions of the future shape and form of the system become impossible to make with any certainty. By way of contrast, general complexity concludes that it is not possible to uncover general laws of complexity and tries instead to make sense of the relationships between the whole and the parts by focusing on notions of order and disorder (Morin, 2007, p. 10).

For Morin and others, the alternative to restrictive complexity and attempts to develop laws of complexity, and indeed the correct way of engaging with complexity, is to develop a philosophy of complexity that is epistemologically modest and ethically embedded (Cilliers, 1998; Morin, 2007; Byrne & Callaghan, 2013; and Woermann, 2016). The general (postmodern) accounts focus on the philosophical insights that result from the realization that complex systems cannot be descriptive or explained because they are the result of the interactions between the system and its component elements, the interactions between the component elements, and their interactions with elements outside of the system, with the result that all descriptions and predictions about the workings of complex systems inevitably involve the exercise of subjective judgment. Woermann and Cilliers

explain the point this way: ‘As soon as we engage with complexity, we have to make certain modelling choices when describing phenomena. .... [in other words] our modelling choices are based on subjective judgements about what matters’ (Woermann and Cilliers, 2012, p. 448; also de Villiers and Cilliers, 2010). The aim of writings within the general (postmodern) complexity school is not to work out the laws of complexity, but to emphasize what we do not know, indeed, cannot know, and thereafter to focus on our own ethical responsibilities as thinkers about complexity theory in law (Cilliers, 2004). To the restricted (or modern) complexity theorists, the writings of the general (postmodern) complexity scholars can be seen ‘as pure chattering, pure philosophy’. (Morin, 2007, p. 27).

Heylighen, Cilliers and Gershenson argue that, given their scientific backgrounds, most complexity researchers ‘still implicitly cling to the Newtonian paradigm, hoping to discover mathematically formulated “laws of complexity” that would restore some form of absolute order or determinism to the very uncertain world they are trying to understand’ (Heylighen, Cilliers and Gershenson, 2007, p. 124). The emergence of computational complexity, associated with the work of the Santa Fe Institute, is the clearest evidence of the tendency to try and capture physical and social complexity with rule-based models, and we see efforts to develop laws of complexity in Holland’s analysis of emergence (1998), Mitchell’s general analysis of complexity theory (2009), and Miller and Page’s work on social complexity (2007). For the postmodern complexity theorist, these efforts are both futile and a rejection of the very notion of a complex system, which is defined by its incompressibility and unpredictability (Richardson and Cilliers, 2001, pp. 8-9), with the consequence that any description of a complex system will fail to capture its full complexity and adaptability, meaning that predictions of the future shape and form of the system become impossible to make with any certainty.

The difficulty for those who argue for a postmodern ethic of complexity (or a postmodern reading of complexity theory) is that one of the central lessons of complexity is that, whilst the functioning of complex systems cannot be predicted with absolute certainty, neither are complex systems completely unpredictable. Complexity theory involves a rejection of both the ambition of modernity to understand and explain everything, and the claim of postmodernity (or at least its characterization) that everything is contingent and nothing can be explained (which appears paradoxically to be another grand narrative!). Marais Kobus expresses the point this way: complexity theory refuses to follow either the claims of modernism to explain everything or the argument from postmodernism that everything is contingent and context dependent and instead

regards ‘the universal and the contingent, consistency and change as constituent factors of reality [and] through this stance, it hopes to do justice to the wholeness and interrelatedness of reality’ (Kobus, 2014, p. 17).

Much of the mainstream literature in complexity attempts to navigate this tension between restrictive and general complexity, rejecting the reductionist paradigm of classical modern science, i.e. of the need to explain everything, but without feeling the need to refrain from telling us something about complex systems. Most writings on complexity theory take the view that there is nothing inherently problematic in trying to *better understand* complex systems, but they also recognize it would be a mistake to think we could ever fully understand complex systems because of the limits of our knowledge of their workings and the unpredictable consequences of seemingly small events on the system – from the removal of a keystone species, like the sea star that keeps populations of mussels and barnacles in check; to the attempted coup against Mikhail Gorbachev, and collapse of the Soviet Empire; to the selling of sub-prime mortgages in Florida, and the 2008 financial crisis. The central lesson from restricted and general complexity theory is that whilst we can know some things, we can never know everything, and we should not delegate ethical and political decision-making to computation models of complex systems that must be by definition, and in ways of which we are unaware of, wrong, limited and thus imperfect. If there is one lesson from complexity theory, it is the need for epistemic humility: the certain knowledge that we can never be certain when dealing with complex systems, including the complex systems of law.

### **Complexity Theory and Law**

We are now in a position to reflect on some of the ways that complexity theory may help us to answer some of the questions facing the academic discipline of law and the arena of legal practice. The difficulty, as this collection of essays makes clear, is that there is no standard approach, no jurisprudence of complexity that runs throughout the various contributions, or indeed the wider literature. While there is no paradigmatic ‘jurisprudence of complexity’, there are a number of insights from complexity that can be applied to law and which might influence the way in which legal theory addresses the central questions of jurisprudence. These relate to the unpredictability of legal systems; the idea of the law system as emergent, the result of the interactions between law actors; the ability of law to adapt to changes in its external environment and the functioning of other law systems; the importance of context to understanding the law; the unclear, contested, and open nature of law system boundaries and the way they interface with society; and the fact that

practitioners and scholars cannot avoid ethical responsibility in their work. The consequences of the shift away from the traditional perspective, and the alteration in outlook it requires can be demonstrated by a brief consideration of decision-making in individual cases with the abovementioned insights in mind.

While it is certainly true that legal decision-making on a micro-level is fundamentally unpredictable, this observation is neither useful, nor especially revelatory. Instead, for micro level interactions, complexity theory is useful first in that it requires an acknowledgment of the limits of the seasoned legal observer's predictive capacity, while at the same time accepting that a greater degree of knowledge and experience is important in understanding the probable *range* of possible outcomes that might be available. In the instance of a concrete case, the advocate is equipped to advise their client by virtue of their accumulated knowledge of the field, through their reliance upon a description strategy of legal reality which has been subject to revision and renewal throughout a changing spatio-temporal context – their career. Yet it is clear that notwithstanding this expertise, there is no single answer to a legal question. Indeed, equally eminent commentators, advocates and judges can reach diametrically opposed conclusions on the basis of the same information.

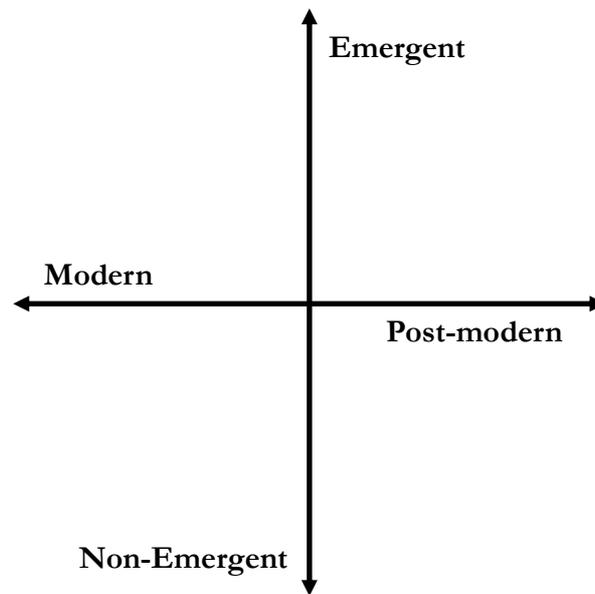
The essays in this collection demonstrate the many ways in which complexity theory thinking can reshape and clarify our understanding of various problems relating to the theory and practice of law. They do not all adopt the construction of complexity theory utilised in the sketch above, and indeed we would argue that the tenets of complexity should be used pragmatically, with explanation, depending on the task at hand.

This collection shows that the literature has developed to a point where the concepts of complexity theory are utilised according to four possible typologies. The first equates complexity with *complicatedness* – the notion that the law system is simply too complicated, or complex, for any mortal lawyer to understand. The literature here highlights the difficulties of capturing every combination and permutation of legal rules and practices. Peter Schuck, for example argues that a legal system is complex 'to the extent that its rules, processes, institutions, and supporting culture possess four features: density, technicality, differentiation, and indeterminacy or uncertainty' (Schuck, 1992, p. 3). Second, and related to complicatedness, is the idea of *computational complexity*, which draws on the mathematical theory of complexity outlined by computer scientists to develop computational algorithms to model law systems (Kades, 1996–1997, p. 403). Third, there is the approach that sees emergence – the idea of 'the whole being more than the sum of the parts' – as

the distinguishing feature of complexity. *Emergence* describes phenomena that arise from and depend on the interaction between underlying phenomena, that are at the same time autonomous from those phenomena: something novel emerges from ‘below’. Understood as a philosophical method, emergence complexity is concerned with understanding and explaining the ways that novel properties emerge from the actions and interactions of the component parts (Humphreys, 2016). Finally, there is the *general (or postmodern)* approach to complexity first identified by the philosopher and sociologist Edgar Morin, which regarded all attempts to produce laws of complexity as a negation of the central insight that some systems cannot be modelled perfectly because they are complex systems.

To make sense of literature in the emerging body of work on complexity theory in law, we need to ask two questions. First, does the argument in the work under consideration depend fundamentally on the presence of emergent phenomena? The literature that equates complexity with complicatedness, and the related computational models of complexity are not concerned with emergence because they are not looking to explain the novel phenomena that emerge from the actions and interactions of component agents, but to make better sense of the networks of connections between agents and communications in the law system. Second, is the scholar trying to better explain the subject of the research, or is their central insight the unknowability of certain phenomena? Any approach that looks to make sense of the workings of the law system, or to propose reform of the system, looks to restricted (or modern) writings on complexity, whereas the literature that points to the limits of our knowledge, and the ethical responsibilities of lawyers and law academics, looks to the general (or postmodern) scholarship.

Depending on the answers we get to these two questions, we can position scholarly materials on complexity theory and law relative to one another on a plot (fig 1). This approach allows us to account for the tendency of individual contributions to contain characteristics of multiple typologies, and avoids the reductionist, closed nature of the grid.



*Fig 1. A plot-based typology of complexity*

Publications in the first (Modern/ Emergence) zone understands the law as an abstract (but real) entity that results from the interactions and law agents and other actors, and looks to explain the workings of the system and how it can be improved, with a particular focus on law reform in relation to the regulation of other complex systems like the environment. Work in the second (Modern/ Non-Emergence) is interested in explaining the networks of relationships between law actors or law communications, such as court judgments and legislative acts, but is not concerned with emergent properties (such as the abstract notion of the ‘the law’ system) that develop through the interactions of law-making actors. The third (Post-Modern/ Non-Emergence) part of the literature focuses on the lack of certainty in our knowledge of complicated systems of networked relationships, and what they tell us about epistemic humility. It is essentially an argument for accepting the limits of our knowledge about the workings of law. Finally, there is the (Post-Modern/Emergence) work, which is interested in our ethical responsibilities as practitioners, regulators, and scholars when studying the law system. Whilst all writings (and all 4 approaches) use the term ‘complexity’, it is clear they are using it in different ways, for different purposes, and those engaging with the literature on complexity should not make the mistake of trying to read the corpus of material on complexity theory and law (including that reflected in this collection) as a unified body of work of scholarship that shares the same methodology. Instead, we recommend the reader utilise the typology of complexity theory thinking outlined above to anchor their engagement with the collection of approaches contained within complexity theory thinking.

## The Structure of the Book

Following this initial chapter is an essay by JB Ruhl and Dan Katz on ‘Complexity Theory and Law: Where are we and where must we go?’ Ruhl and Katz argue that whilst scholars have begun to use complexity science to examine descriptive and normative questions about the law system, there is a need to move to a more empirical phase to influence the practice of law. They argue that law scholars can draw on the wealth of legal materials, such as court judgments, regulations and statutes, to analyse the effects of introducing and removing materials, allowing policy makers to speculate about the implications of proposed initiatives. In effect, Ruhl and Katz propose that lawyers create a mechanism for monitoring legal complexity through the device of ‘Legal Maps’ to deal with the ever-increasing complexity in the law.

The remaining essays in the collection are organized along traditional subject lines within the discipline of law. The reason for this is that most law scholars work within disciplinary subjects, and *inter alia* identify themselves primarily by discipline as constitutional and administrative lawyers, international lawyers, business lawyers, and legal philosophers operating from a particular theoretical perspective.

Section II looks at Complexity and the State: Constitutionalism and Public Policy. The chapters here examine the implications for complexity theory for our understanding of the formulation and implementation of public policy, and the utility of complexity theory as a tool to understand discussions concerning constitutions.

Neville Harris’ chapter on ‘Complexity: Knowing It, Measuring It, Tolerating It?’ examines the efforts to simplify the taxation and social security systems in the United Kingdom. The perception of complexity has prompted efforts at simplification that aim to counter complexity either by managing it better, for example, through Information Technology systems, or reducing complexity by streamlining the legal and administrative frameworks. Harris argues that complexity is something that can be tested, and that the taxation and social security systems are empirically complex, but he is sceptical about the degree to which complexity can be mapped, arguing there are limits to how much we can know about law’s complexity. The chapter concludes by shifting the focus to the legitimacy-deficit that flows from the fact of complicated regulatory frameworks that are difficult for non-experts to understand and navigate.

Thomas Webb's chapter on 'Complexity and Vulnerability in Administrative Decision-Making' examines the different ways that autopoiesis and complexity ask us to make sense of the refugee crisis in the Mediterranean through the notion of systemic vulnerability. Vulnerability is not only a feature of human existence, but also the existence of social systems. Just as crossing the critical juncture of vulnerability, between the ever-present possibility of vulnerability, and the realisation of that possibility, will be severely detrimental to a human, so too will it harm systems. A system which responds to crisis according to the normatively closed/cognitively open approach of autopoiesis, where both the environment and the system's understanding of it are internally constructed, will find itself unable to maintain its difference to the environment in the face of crises, of catastrophic changes. As a social system only exists by virtue of being able to define itself relative to the environment, a loss of identity is tantamount to systemic death. Conversely, a complex social system, such as law, which acknowledges that social processes – including its own internal operations – are emergent, that complex systems produce and are co-produced by that emergent environment is already orientated in a manner which allows a (co-productive) response to crisis in the real, rather than merely internally reconstructed environment. This does not mean a system will survive crisis, instead it means that the system is not required to maintain an internal reality that is irreconcilable with the external crisis environmental to maintain its identity.

Section III on Complexity Beyond the State: Human Rights and International Law examines the ways in which complexity theory can inform our understanding of the nature and function of the international law system, with a focus on the way in which human rights functions in the complex environment of world politics. The three essays here all look, in different ways to emergence to enhance our understanding of the doctrine and practice of international law, including human rights.

The opening essay by Steven Wheatley, on 'Explaining Change in the United Nations System: The Curious Status of Security Council Resolution 80 (1950)', looks to complexity theory to explain change in the international law system. Taking as its case study the alteration in the voting procedures in the Security Council that occurred without formal amendment of the UN Charter, the chapter relies on the central insights from complexity – of emergence and evolution, path dependency and change, and the power of events – to explain the evolution in United Nations law. The UN system evolved as member states responded to the "empty chair" policy of the Soviet Union. Whilst an evolution in the plain meaning of Charter provisions can be explained by the

role of subsequent practice in the interpretation of treaties, there remains the problem of the status of the first resolution adopted under the ‘new’ procedure, here Resolution 80 (1950), which was not adopted in accordance with the old (literal) rule, requiring the positive support of the ‘P5’, but nor could there be a new pattern of practice, meaning that only the absence of a veto was needed. Wheatley argues that to make sense of innovations in regulatory practices of complex systems, like the United Nations, we have to foreground the factor of time. By looking to explain change within a timeframe, we can explain how an innovation practice like Security Council resolution 80 (1950) can result in a change of understanding in a regulatory system, as part of a new pattern of practice.

Dimitrios Tsarapatsanis’ paper on ‘The “Consensus Approach” of the ECtHR as a Rational Response to Complexity’ relies on complexity theory to provide a defence for the consensus approach of the European Court of Human Rights, whereby the Court looks to the practice of states to explain the meaning of the convention rights. Tsarapatsanis defends his practice-based account by relying on an argument for practical reasoning in the real-world conditions faced by judges on the Court of Human Rights, and the limited amount of time a judge can give a single case. Rather than substitute her own subjective position on human rights, Tsarapatsanis argues that the judge should look to the actual human rights practice of states as a defensible reasoning strategy in non-ideal conditions, concluding that the emergent position of states parties, reflected in the consensus of states parties gives a non-ideal interpretation of the human rights treaty. He concludes that we should see the ‘consensus approach’ as a collective intelligence device that exploits the presence of patterns of emergent solutions.

Anna Marie Brennan looks to complexity theory to make the case for holding non-state actors responsible for crimes committed by terrorist groups under international criminal law, given the legal paradigm of individual responsibility. In her chapter on ‘Prosecuting Transnational Terrorist Groups before the International Criminal Court: How Complexity Theory Can Explain the Accountability Gap’, Brennan argues that if the whole group commits an international crime, the focus of responsibility should be the group, and not the individual members. The work challenges the ‘command and control’ paradigm of the laws of war, and examines the ways we can think of the actions of non-state actors as an emergent property of the activities of the group. Given that the commission of international crimes by non-state actors is often the result of the policies and practices of the group, it makes no sense, she argues, to focus on the individual and proposes that we align the moral responsibility of the group with the practice of international criminal law.

The fourth section on Complexity and Business and Finance Regulation examines the way in which complexity theory can inform our understandings of the task of regulating dynamic and complex business and financial activities at national, regional, and global scales. The focus here is often the establishing of better models of regulation following the financial crisis of 2008, with policy-makers looking to complexity to make sense of the requirements for effective regulation of the highly interdependent and interconnected architecture of the global financial system.

Mark Chinen's chapter on 'Governing complexity' turns to complexity theory to understand financial regulation in the aftermath of the 2008 financial crisis. Chinen sees international finance and the global economy as complex systems, with networks of heterogeneous agents acting and interacting within a regulatory space. The adaptive nature of these systems makes legal regulation difficult, given the limitations in forecasting the future behaviours of financial systems, or the implications of regulatory interventions, but these challenges should not prevent policy-makers from engaging in financial governance planning, forecasting, or attempting to control systems of international finance and the global economy. Chinen argues for the development of new strategies in which legal regulation co-adapts and co-evolves with the complex systems of international finance and the global economy to promote systemic stability and resilience in international financial systems. But it remains for policy makers to establish the rules for international finance and the global economy. Complexity theory, for Chinen, does not dictate any set of procedural and substantive values for the governance of complex adaptive systems, but focuses on participation, accountability, effectiveness, responsiveness, and fairness.

The chapter by Michael Leach on 'The Complex Regulatory Space of Banking' examines the implications for law and regulation of understanding banking as a complex system. For Leach, banking is quintessentially a complex system, even in its most basic form of deposit-collecting and lending, and his primary concern is the ways that law can regulate complex systems like banking and finance. This chapter outlines a sketch of the regulatory space of a simplified, but still complex, banking system to highlight how we might understand the role of complexity in legal regulation. Leach concludes with a preliminary evaluation of the utility of blending complexity theory with regulatory theory to explore the complex space of banking regulation.

Jamie Murray's chapter 'Regulating for ecological resilience: A new addenda for financial regulation' outlines the fundamental shifts that have taken place in financial in the years since the global financial crisis, with a transformed understanding of systemic risk in financial systems the

development of a new ‘macroprudential’ approach and tolls to regulating systemic risk in complex financial systems. The work argues that, against a financial regulation centred on systemic risk and consequent regulation for engineering resilience, a complexity theory understanding of ecological resilience should now become central to regulating complex financial systems. The chapter explores the concept of ecological resilience, and how financial regulation could seek to regulate complex financial systems. In doing so, the chapter draws on established complexity jurisprudence that has developed in relation to the problematics of governing for ecological resilience in adaptive management, assisted self-organisation, and reflexive regulation self-management. Taking both an understanding of ecological resilience to complex financial systems, and an understanding of the complexity jurisprudence for regulating complex systems for ecological resilience, the chapter sets out a new agenda for financial regulation.

The final section on Complexity and the Ethics of Law and Regulation discusses the challenges facing legal practitioners, academics, and students in view of their complex operative context.

Lucy Finchett-Maddock’s chapter on ‘Speculative Entropy: The Beauty of Time, Chaos and the Unknown in Environmental Law’ examines environmental law through a speculative approach to complexity theory, whereby new understandings of temporal ontologies (speculative entropy) may assist us in understanding the practical task of ethics in systems of law, ecosystems, and the protection of the environment in relation to environmental rights. This chapter focuses on social centres – an emergent corner of social organisation that exists outside of formal legal structures that are reliant on an absolute understanding of time and space as essentially linear. Finchett-Maddock takes the example of these centres as a case study to examine the implications of nonlinearity for how lawyers and society in general think about and respond to law and legal complexity. The chapter is especially concerned with the tension between the reality of social existence as essentially complex, nonlinear, and emergent, as compared with the constructed reality of law as largely determinate and thus predictable. It is argued that it has not always been the case that legal and social realities were so at odds with one another. Instead it is contended that, whereas law originally emerged as a product of communal interaction, the increasing influence of private property and the protection of rights in it over time, forced law – and by implication, our understanding of law – into a more linear, spatially limited form. The consequences of the dominance of an absolute conception of linear time have been to positively deny the existence of alternative forms of social organisation, for example decentralised, leaderless, emergent networks. By demonstrating the viability of social centres as a form of organisation not defined by this

linearity, but nonetheless quite capable of existing coherently, Finchett-Maddock seeks to return legitimacy to these alternative, autonomously emerging forms of social organisation.

Minka Woermann's chapter on 'Complexity and the ethics of law' commences with an argument for why ethics is critical to any serious engagement with complexity. Briefly stated, models are indispensable for rendering complex systems meaningful. However, these models are necessarily limited, exclusionary, and the outcome of normative evaluations. Ethical considerations are, therefore, ever present. Acknowledging the ethics of complexity requires constant and critical engagement with the status and implications of our models. The implications of these observations are explored in the second part of the chapter in terms of the constant reinterpretation, establishment, implementation, policing, and transformation of law. For Woermann, law engages in this reinterpretation as an organisationally open, yet operationally closed system – though this is not a simplistic dichotomy. The law maintains its own processes, while also actively engaging in the life of the social environment. In this way, the complex legal system witnesses the entry of the environment into the system as an integral part of its sustained existence, rather than the mere re-entry of the system's own internal construction of the environment as seen in autopoietic constructions. This process, Woermann reasons, means that we can never achieve a perfect model of law if we accept first, that the world onto which it is grafted is inherently, irreducibly, and uncontrollably complex, and secondly that law's efforts to understand it are co-produced by that environment. Instead, the codification of law is needed to produce legally useful understandings in the moment, accepting that it will not, indeed cannot, account for all of the complexities of the social interactions which law regulates, and can aspire only to producing 'just' outcomes

In his chapter 'Playing with the Rules: On agency and entropy in legal ethics', Julian Webb, argues that the regulation of legal ethics operates through a relatively stable and clearly bounded system of rules and principles. It thus provides an interesting and potentially useful model for considering the nature of 'ruleness' and the ways in which a system is at risk of regulative 'entropy': that is, the decay of rule-described behaviour and hence of the predictive value of the rules ascribed. Webb argues that legal formalist and legal positivist accounts, remain insufficiently sensitive to the significant and complex operation of agency in multi-agent systems. Webb offers an alternative representation in his paper arguing that we should see 'ethical' practice as a process of agentic (i.e. self-organising and self-regulating) 'playing with the rules', which serves to normalise minimal consistency, and perhaps even inconsistency, between informal (cultural) and formal norms of practice. The chapter concludes by considering ways in which insights from complex systems

theory might help us design systems of regulation that are negatively entropic and better able to impede ethical fading and creative compliance.

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