

# What is evolutionary theory and how does it inform policy studies?

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The term 'evolution' is used loosely in the policy literature and its meaning is frequently unclear. This article injects clarity into debates of evolution and establishes its ability to describe and explain policy change. It has four main aims. First, it identifies the explicit and implicit uses of evolutionary theory in policy studies. Second, it considers how such accounts relate to each other and the wider literature on public policy. Third, it identifies the causal mechanisms involved in evolutionary accounts. Finally, it considers how to translate abstract theory into a more concrete set of methods and plans for empirical research.

## Introduction

The notion of evolution has intuitive appeal in policy studies, and is used frequently to describe policy change. Its strongest proponents portray 'evolutionary theory' as the solution to a wide range of unresolved debates on endogenous and exogenous change, the nature of institutions, rational choice and norms, and structure and agency (Lewis and Steinmo, 2010). However, the meaning of 'evolution' is not always clear. Indeed, part of its appeal may relate to its ambiguity and our ability to use it to describe many processes. In public policy this includes:

- the cumulative, long-term development of policy solutions;
- major disruptions in the way that policy makers think about, and try to solve, policy problems;
- the maintenance or radical reform of policy-making institutions;
- emergent behaviour within complex systems;
- the trial-and-error strategies adopted by actors, such as policy entrepreneurs, when adapting to their environment;
- the coming together of multiple factors to create the conditions for major policy change.

Further, the last of these can suggest a creative process, such as when policy entrepreneurs exploit the right conditions to make their move during a 'window of opportunity', or a destructive process, in which policy failure or crisis seems to undermine institutions and force policy makers to change their approach radically. These descriptions are central to the study of public policy and 'evolution' is a vital but problematic concept.

The first problem is that many scholars use the term 'evolution' loosely without considering its definition or its nature (Kerr, 2002: 330; Lewis and Steinmo, 2008: 22, fn 46; Lustick, 2011: 205). This loose usage reflects widespread confusion about what evolution generally means (Sementelli, 2007; see Lustick, 2011: 187 on 'descent with modification'). Scholars may also present different understandings of

Key words: multiple streams analysis • punctuated equilibrium • new institutionalism • complexity theory

'evolutionary' processes in a single account of policy change without considering their relationship and compatibility. Evolution can refer, rather confusingly, to slow progress ('gradual, incremental and cumulative'), in which we posit evolution as the *counterpoint to revolution* and/or major disruptive change *akin to revolution* (Hay, 2002: 156–7). It can refer to maturation and movement towards 'advancement' (associated with Lamarck) or to 'directionless movement' in which we make no reference to the 'the idea of progress' without considering the possibility of regress (Sementelli, 2007: 743–5; Steinmo, 2010: 20). It can refer to *natural selection*, describing the 'blind' adaptation by species to their environment, *artificial selection*, describing the ability of 'entrepreneurs' to learn and innovate as they adapt to their environment, or a process in which actors adapt to *and help create* their environment (Kerr, 2002: 336; 2003: 120; Kay, 2003: 108; Room, 2012). It can describe 'pure mutations', perhaps equivalent to major policy change, or 'phyletic transformations', equivalent to incremental change (Durant and Diehl, 1989: 195; and mutation can be 'rapid' or 'protracted' – 1989: 196). It can be used as a metaphor or a description of reality (Curry, 2003; Kay, 2003: 105, 119, 125; Lewis and Steinmo, 2008: 33). Finally, it can refer to the role of individuals and/or their genes, the population as a whole and/or the role of its environment (note, in political science, the ideational equivalent of genes is 'memes' – Dawkins, 1976; John, 2003: 493; Lewis and Steinmo, 2008: 4–5). This potential for ambiguity is not a problem per se, but it prompts us to be explicit regarding our use of 'evolution'.

The second problem is that 'evolution' comes with baggage based on its use, mostly in the past, to compare populations. For example, there is a strong historical link between 'social Darwinism' and racist and sexist arguments (Kerr, 2002: 332; Lewis and Steinmo, 2008: 6; 2010: 238; Steinmo, 2010: 19; Lustick, 2011: 183–4) and a tendency to view some economic models as more advanced than others (Steinmo, 2010: 20–1). Most modern, explicit accounts of evolution do not adhere to a 'teleological' notion of progress towards a predetermined social end (Kerr, 2002: 333, 338; Sementelli, 2007: 743; although see Lustick, 2011: 186 on progress according to agreed aims). However, we still need to be *particularly* clear about what we mean by evolution in public policy because the normative stakes are high.

In this light, the article has four main aims. First, it identifies key evolutionary theories in public policy. It examines their ideas regarding normative issues (do policies progress following evolution?) and their descriptions of time and policy change (are we studying long-term cumulative advance or rapid and major disruptions?). Second, it considers how they relate to the wider policy literature. It cautions against treating evolutionary theory as a revolutionary break from the past. Much of its appeal relates to its potential to combine established studies of policy making. Third, it identifies the causal mechanisms involved in evolutionary accounts: variation, selection and retention. Finally, it considers how to translate abstract theory into concrete methods for empirical research. It cautions against selecting some methods and rejecting others ruthlessly, since evolutionary theory provides the potential to combine a range of methods in innovative ways.

## Evolutionary theory in policy studies: multiple streams analysis

Our modern history of ‘evolution’ in policy studies begins with multiple streams analysis (although see Lindblom, 1959: 85 on how policy ‘evolves’ through ‘mutual adjustment’). According to Kingdon (1984, 1995), the policy process consists of three separate streams – problems (agenda setting), policies (ideas or solutions) and politics (receptivity to solutions) – and major policy change may only occur when they come together during a brief ‘window of opportunity’ (1984: 177). The problem stream provides the potential for major policy-making disruptions and non-incremental change when there are lurches of attention, often caused by a combination of novelty (including ‘focusing events’) and latent interest (Kingdon, 1984: 103; Durant and Diehl, 1989; Birkland, 1997; Cairney, 2012a: 187–8, 234; Cairney et al, 2012: 222). This shift of attention is a necessary but insufficient condition for major change. Change also requires that a feasible policy solution exists – and solutions cannot be produced at short notice. They often develop over years or decades. To deal with this disconnect between attention and the time it takes to produce solutions, communities of policy specialists develop proposals in anticipation of problems (Kingdon, 1984: 122–4).

Kingdon’s ‘Darwinian’ metaphor describes the time and effort it takes for feasible policy solutions to develop; they whirl around in the ‘policy primeval soup’, proposed by one actor then ‘softened up’ by many participants to ‘recombine familiar elements’ and change their ‘technical feasibility’, ‘value acceptability’ or anticipated costs (1984: 138–46; 1995: 226–7). ‘Evolution’ describes the slow progress of an idea towards acceptability within the policy community. It is complete when policy makers are receptive to the solution and have the motive and opportunity to adopt it (Kingdon, 1995: 165–6; Lieberman, 2002). Policy changes, but only when new solutions are made more consistent with existing practices. The role of policy entrepreneurs is important but limited: they are the well-informed and well-connected insiders who provide the knowledge and tenacity to help bring the ‘streams’ together – but as ‘surfers waiting for the big wave’ rather than people who control policy processes (Kingdon, 1995: 225; 1984: 173; compare with Lustick, 2011: 204 on ‘exaption’ and the ability of entrepreneurs to exploit decisions made by other people).

Durant and Diehl (1989: 201–2) provide two departures. First, they identify a more rapid process, of solution production and acceptance, when there is no disconnect between the policy agenda and the production of solutions. Kingdon’s idea, based on a study of the United States (US) (although these ideas have been applied elsewhere, including the United Kingdom [UK]<sup>1</sup>), is that the process is separated into three separate streams because different people may be most involved in different stages. For example, the President raises issues and the bureaucracy (or policy network) provides the solutions. Durant and Diehl (1989: 201–2) identify some areas, such as foreign policy, in which the President raises issues and has a direct influence on the production and adoption of solutions. Second, they highlight greater potential for ‘pure mutation’ rather than ‘phyletic’ – that is, the adoption of policies (such as the New Deal) that represent the policy equivalent of new species rather than humans with shorter fingernails (although the distinction is not as clear as their two-by-two picture suggests).

## Punctuated equilibrium

Baumgartner and Jones' (1993, 2009; Jones and Baumgartner, 2005; True et al, 2007; Workman et al, 2009) punctuated equilibrium theory suggests that this potential for rapid and substantive policy change is a *general* feature of political systems. Like 'evolution', 'punctuated equilibrium'<sup>2</sup> is only useful as a concept when well defined – a requirement made problematic if the same term is used differently throughout political science. However, in policy studies (at least in the UK and the US) it is generally taken to refer to long periods of apparent political stability and policy continuity punctuated by instability and rapid and profound change (Cairney, 2012a: 177, 273). Baumgartner and Jones (1993: 48) argue that incremental change in most cases is accompanied by seismic change in a small number of cases – an outcome consistent with 'power laws' found in the natural and social worlds (Baumgartner and Jones, 2009: xxii). Both outcomes result from 'disruptive dynamics', which 'are a function of how political systems process information' (2009: 289). Decision makers are boundedly rational (Simon, 1976) and cannot consider all issues at all times, producing two related outcomes. First, issues are subject to parallel and serial processing. Most policy is processed by a large number of small and specialist policy subsystems, which address issues at a level of government not particularly visible to the public, and with minimal involvement from senior policy makers. Only some issues are dealt with at the 'macropolitical' level (True et al, 2007: 158–9). Second, policy makers ignore most issues and promote relatively few to the top of their agenda. This lack of attention to issues helps explain why most relationships within subsystems and policies may not change, while intense periods of attention to some issues may destabilise relationships and prompt new ways to frame policy problems.

Baumgartner and Jones (1993: 35–7) use similar factors as Kingdon to explain attention shift, but also stress the importance of multiple 'venues' and the potential for the losers in policy disputes in one venue to seek more sympathetic audiences in others. 'Policy monopolies' exist in subsystems (networks) when some actors are able to create or maintain institutions whose rules reflect a particular policy image – often when (a) the problem appears to have been solved and (b) actor involvement is restricted to technical details of implementation (1993: 59–82). They are often challenged when groups pursue new policy images and try to encourage greater attention and participation in other venues.

The success of such challenges is significant in number, but rare as a proportion of government activity, because policy makers must ignore most issues. They also exhibit 'selective attention' – when their existing view of how the world works, and should work, limits further the problems to which they pay attention and the solutions they are willing to consider. Change often requires a critical mass of attention and pressure to overcome the conservatism of decision makers and to shift their attention from competing problems (Jones and Baumgartner, 2005: 19–20, 48–51). If levels of external pressure reach this tipping point, they cause major and infrequent punctuations rather than smaller and more regular policy changes:

- the burst in attention and communication becomes self-reinforcing;
- new approaches are considered;
- different 'weights' are applied to the same categories of information;

- policy is driven ideologically by new actors; and/or
- the 'new' issue sparks off new conflicts between political actors (Jones and Baumgartner, 2005: 52, 69).

Information processing is therefore characterised by 'stasis interrupted by bursts of innovation' and policy responses are unpredictable and episodic rather than continuous (Jones and Baumgartner, 2005: 20).

In other words, Baumgartner and Jones (2009) describe a different type of evolution in which major change follows huge lurches of attention and action. There may be a longer-term process of solution production (as described by Kingdon), but this is less likely to constrain action. Rather, more radical change will be acceptable in venues that are less committed to existing policies (Baumgartner and Jones, 1993: 32–3). Or, the pressure of attention (often associated with the idea of a 'bandwagon effect') will provoke policy makers to accept radically new policy images and solutions. Kingdon's picture of slow progress producing partial mutations is replaced by Baumgartner and Jones' fast, disruptive, pure mutation.

## Punctuated equilibrium and new institutionalism

This distinction between punctuated equilibrium and gradual, cumulative change is a key feature of 'new institutionalism'. For example, for Hall (1993: 279), policy change is generally incremental (first or second order) because there is a set of ideas, about the nature of the policy problem and how it should be solved, that becomes so dominant, that it is institutionalised, taken for granted and reproduced in the language used by policy makers. Major, third-order, change is rare and occurs following a perceived crisis; a profound sense of policy failure that appears to force governments to think about the problem and its solution in a radically new way. The process is associated with profound institutional change as: (a) policy makers are replaced at the next election and/or they seek advice from new experts; and (b), radically new ideas are adopted and institutionalised (1993: 281). Hall (1993) equates this process with Kuhn's (1962) use of 'paradigm shift' to describe scientific advance – produced not by the gradual and linear accumulation of knowledge but, rather, the replacement of one scientific community by another (with profoundly different ideas) following a period of crisis in which new evidence suggests that its theories no longer explain how the world works (although, unlike Kuhn [1970: 160–3], Hall [1993: 280] does not argue that paradigm change should be equated with progress).

This work on punctuated equilibrium in the new institutionalist and policy literatures has several elements in common. Ideas – as paradigms or sources of policy monopoly – generally undermine major policy change. Policy makers establish a language and set of policy assumptions that exclude most participants. However, in a small number of cases when new ideas are adopted, they sweep aside existing monopolies (Baumgartner and Jones, 1993: 237) and cause a complete shift in the way that policy is understood and made within government (Hall, 1993: 287). In both cases, the result may be major disruptive change, but Hall's analysis is a more significant departure from Kingdon's. The process of 'softening' is not necessary because new paradigms bring new ideas. There is no need for new solutions to be

made consistent with existing practices; indeed, their similarity to practices in the past may reduce their attractiveness in this new context where the 'old guard' has fallen out of favour.

## Modifications to punctuated equilibrium

Both approaches can be linked to recent accounts that seek to qualify (but not necessarily contradict) the idea of punctuated equilibrium in accounts of evolution. For example, John's (1998, 1999, 2000, 2003, 2012) 'evolutionary theory' notes the importance of implementation when describing the processes outlined by Kingdon and Baumgartner and Jones. Drawing on rational choice theory, John (1998: 184) suggests that the strategies of actors change quickly over time as individuals learn to cooperate with each other and adapt to their environments (see also Axelrod, 1984). They also learn, and their preferences change, when they formulate and adapt new ideas (a trial-and-error strategy; policy entrepreneurs try out combinations of ideas, 'to find the one that replicates' – John, 1999: 45). This is 'structured evolution' since the institutions, networks and socioeconomic factors that affect behaviour are more static than strategies and ideas (John, 1998: 186).

John (1998: 185) argues that evolution does not end when policies are selected at the formulation stage. Policy changes further as new actors (or actors more powerful at the point of delivery) influence its progress; the implementation of policy is often a form of policy choice (Cairney, 2012a: 37–8). This aspect is less of a challenge to Kingdon, who highlights the analytical separation of processes or stages (such as agenda setting and policy formulation) and the longer-term process in which actors investigate the extent to which a policy is technically feasible (would it work as intended if implemented?). It is more of a challenge to Baumgartner and Jones and Hall, suggesting that a major disruption at the formulation stage does not equate to major policy change. This argument refers not so much to *outputs* (such as the leptokurtic distribution of budget changes identified by the Policy Agendas Project – Jones and Baumgartner, 2005: 111; True et al, 2007: 166; Jones et al, 2009: 861), but the *outcomes* associated with new strategies and choices made at the local level.

Such choices can be linked strongly to the role of ideas as shared beliefs, which may differ at local and central levels. Hall's 'third order' describes profound change based on a complete revision of the dominant ideas underpinning policies and institutions. However, that change may not necessarily translate to the 'street' level in areas (perhaps less like economic policy – Hall's focus – and more like healthcare, social work, education and justice) where much delivery is devolved to people at the point of delivery. Lipsky's (1980) study of 'street-level bureaucrats' suggests that professions and organisations have their own ideas and standard operating procedures. Instructions from the top are to some extent replaced, as the source of explanation for policy change, by standard operating procedures, cultures and practices at the bottom.

Newer accounts can also be found in new institutionalism. For example, a growing literature challenges the idea that institutions are relatively fixed and only change following major punctuations. Many 'constructivist' accounts follow Hall in describing institutions as ideas that influence policy making, but then describe such institutions as unstable and open to constant challenge and revision (Hay and Wincott, 1998; Blyth, 2002: 7; Schmidt and Radaelli, 2004; Hay, 2006; Schmidt,

2006, 2010; Béland and Cox, 2010). Indeed, Hay (2002: 163) prefers the term ‘punctuated evolution’ to signal the importance of the ‘cumulative nature of often incremental change’ between punctuations. Streeck and Thelen (2005: 9) discuss the need to identify ‘gradual change with transformative results’ to challenge a binary distinction between incremental change within a stable institutional set-up and a radical institutional change associated with punctuated equilibrium (Lindblom, 1964: 157 also challenged this distinction). This agenda is supported by studies such as Palier’s (2005: 129), which identifies ‘gradual but profound’ third-order changes (in French social policy) unaccompanied by crisis (see also Cairney et al, 2012: 221).

Part of the problem is the binary distinction itself, which often seems artificial. In other accounts, the discussion may appear less problematic because there is a more nuanced divide between gradual and abrupt change, often linked to the study of the relationship between power, ideas and policy learning (see Bennett and Howlett, 1992 and Cairney, 2012a: 206–7 on various forms, and meanings, of learning – including governments adapting to their environments or to previous experiences through trial-and-error strategies). For example, the advocacy coalition framework (ACF) (Sabatier and Jenkins-Smith, 1993; Weible et al, 2009) answers Lewis and Steinmo’s (2008: 29) call for studies that recognise that ‘institutions, ideas and the environment change in a co-evolutionary process’:

Policy evolution usually involves multiple, interacting cycles initiated by actors at different levels of government, as various formulations of problems and solutions are conceived, partially tested, and reformulated by a range of competing policy elites against a background of change in exogenous events and related policy issue areas. (Jenkins-Smith and Sabatier, 1994: 177–8)

‘Evolution’ is not defined or discussed extensively in ACF accounts (with the exception of Heintz, 1988), but the ACF conceptualises adaptation. It describes the competition between coalitions of policy participants within a subsystem; coalitions include interest groups, government officials at multiple levels and other sources of ideas (providing ‘enlightenment’), such as think tanks, academics and media (Sabatier and Jenkins-Smith, 1993; Sabatier, 1998: 103). The glue that binds them together is ‘belief systems’, which give people, driven by the desire to translate their beliefs into policies, a reason to cooperate with each other and compete with others. Beliefs range from ‘core’ to ‘policy core’ and secondary aspects. Core beliefs are the least susceptible to change (akin to a religious conversion). Policy core beliefs may only change following external ‘shocks’ to the system (such as sudden changes in socioeconomic conditions). Secondary aspects are more subject to change following policy learning. For example, coalitions may shift their beliefs about the best way to *deliver* policy (note the ACF emphasis on selective learning; new information is assessed through the lens of existing, firmly held, beliefs).

Advocacy coalitions compete for position within subsystems by learning from past policy and revising their strategic positions based on new evidence and the need to react to external events. Change can come from within a dominant coalition, which adapts to its policy environment and engages in learning to protect its position (by, for example, modifying its position on the implementation of policy), or from a shift in power following a ‘shock’ to the political system, which either

forces the dominant coalition to question its beliefs (some people may leave the coalition) or is exploited by a less powerful coalition, which adapts better to its environment (compare with Genieys and Smyrl, 2008, which focuses more on elites who reinterpret their interests or reconsider their motivation). ‘Shocks’ are not necessarily the same as punctuations – they refer to major changes in the way that members of coalitions react or adapt to external events rather than the destruction of old and the creation of new institutions (although this area of comparison is underdeveloped in the literature).

## Complexity theory

A common solution to the search for new evolutionary approaches is the promotion of complexity (or complex adaptive systems) theory. It seeks to explain why system-wide behaviour emerges from the interaction between ‘large collections of simpler components’ (Mitchell, 2009: x). We can identify five key themes (Blackman, 2001; Mitleton-Kelly, 2003: 26; Kernick, 2006; Sanderson, 2006: 117; Mitchell, 2009: x; Geyer and Rihani, 2010: 12; Lustick, 2011: 189; Cairney, 2012a: 125–6; Cairney, 2012b: 348; Geyer, 2012):

- A complex system cannot be explained merely by breaking it down into its component parts because those parts are interdependent: elements interact with each other, share information and combine to produce systemic behaviour.<sup>3</sup>
- The behaviour of complex systems is difficult to predict. They exhibit ‘non-linear’ dynamics produced by feedback loops in which some forms of energy or action are dampened (negative feedback) while others are amplified (positive feedback).
- Complex systems are sensitive to initial conditions that produce a long-term momentum or ‘path dependence’.
- They exhibit emergence, or behaviour that evolves from the interaction between elements at a local level rather than central direction. This makes the system difficult to control.
- They may contain ‘strange attractors’ or demonstrate extended regularities of behaviour, which are ‘liable to change radically’ (Bovaird, 2008: 320; Geyer and Rihani, 2010: 39).

The aim is to identify what types of systemic outputs occur when its members follow the same basic rules, and how sensitive the system is, or what small changes in rules will produce profound changes in systemic behaviour. In policy studies, the literature often focuses on policy advice. The main argument is that behaviour in complex systems is often unpredictable and generally not law-like. Therefore, policy makers should seek to understand the limits to their actions and to adapt to their ‘fitness landscape’ (Blackman, 2001; Kernick, 2006; Sanderson, 2006, 2009; Teisman and Klijn, 2008: 288; Room, 2011).

For Kingdon (1995: 227), complexity theory helps us explore the idea of ‘perpetual novelty’ and a form of evolution in which there may not be a point of equilibrium: ‘These models would emphasise development and adaptation, not inertia and stasis’ (see also Streeck, 2010: 673 on ‘permanent transition’). For Steinmo (2010), evolutionary theory is almost synonymous with complexity theory. Lewis and

Steinmo (2008: 8–10) argue that its focus on interacting elements and emergent behaviour is the key to understanding the ‘evolutionary puzzle’ in which ‘genes, behaviour and environment shape one another in a dynamic process’. In this context, complexity theory represents a way to understand institutional processes in three steps:

- Institutions, as sets of rules and norms, represent ways to retain ideas and behaviours.
- Complex systems represent (partly) the large number of overlapping and often interdependent institutions.
- New behaviours and rules arise from the interaction between multiple institutions and the actors involved.

This process is fluid because: (a) the retention of ideas in particular institutions, and therefore their influence on behaviour, is an imperfect process (for Streeck, 2010: 673 it is ‘stochastic’; for Bevir and Rhodes, 2003, 2006 it is non-existent); and (b), ideas and rules are subject to challenge and revision when actors interact with others who follow different rules (in ways that are difficult to predict).

### **Complexity theory: cumulative knowledge or theoretical punctuation?**

Advocates of complexity theory suggest that it represents a paradigm shift from the science of the past. Further, this revolutionary break from the ‘reductionist’ approach, associated with ‘Newtonian’ physics, is necessary to understand systems that lack the order and stability required to produce universal rules about behaviour and outcomes (Mitchell, 2009: x; Geyer and Rihani, 2010: 5–6, 29; Room, 2011: 15). As Keating (2009: 301) suggests, this tendency towards providing new concepts is widespread in political science, producing a lack of clarity regarding their link to old concepts and the extent to which we are describing new phenomena as well as new ideas. The more interesting and productive discussion may regard how complexity theory relates to, and builds on, existing theories – an important task for evolutionary theory, which considers how the past relates to the present and whether we can provide concepts that help explain both. Cairney (2012b: 350–1; 2012a: 126–8) highlights two literatures (historical institutionalism and punctuated equilibrium theory) that we can relate directly to complexity theory and one (implementation) that shares many of its insights.<sup>4</sup>

‘Path dependence’ and ‘sensitivity to initial conditions’ are key themes in historical institutionalism. Path dependence suggests that when a commitment to a policy has been established and resources devoted to it, over time it produces ‘increasing returns’ when people adapt to, and build on, the initial decision (Pierson, 2000; Room, 2011: 7–8, 16–8). In many cases these ‘returns’ are associated with the maintenance of institutions. Historical studies often define institutions as ‘the formal rules, compliance procedures, and standard operating procedures that structure conflict’ (Hall, cited in Thelen and Steinmo, 1992: 2). The focus of analysis involves a ‘critical juncture’ and the timing of decisions is crucial, because it may be the order of events that sets policy on a particular path. We identify inertia *and* unpredictability,

as relatively small events or actions can have a huge and enduring effect on policy. Pierson (2000: 253) and Room (2011: 16) adopt the same language (the 'Polya urn') and examples (such as the QWERTY keyboard) to describe the unpredictability of events and initial choices followed by inflexibility when the rules governing systemic behaviour become established and difficult to change. Therefore, complexity theory is not necessarily a departure from historical institutionalism. It draws on similar concepts to examine a different object of study; from a single institution to a complex system consisting of multiple interacting institutions (although we need to be careful about the parallels and should not assume a common meaning to shared terms – see Cairney, 2013: forthcoming).

Punctuated equilibrium theory (Baumgartner and Jones, 2009; compare with Bovaird, 2008: 321 and Klijn, 2008: 302) often employs the language of complexity to explain policy change. The 'general punctuation hypothesis' demonstrates, in a study of information processing, that policy processes exhibit non-linear dynamics. Jones and Baumgartner (2005: 7) define information processing as the 'collecting, assembling, interpreting and prioritizing [of] signals from the environment'. Policy makers are effectively surrounded by an infinite number of 'signals', or information that could be relevant to their decisions. Since they are boundedly rational and do not have the ability to process all signals, they must simplify their decision-making environment by ignoring most (negative feedback) and promoting few to the top of their agenda (positive feedback). In other words, this literature allows us to make sense of complexity theory, demonstrating how abstract terms can be operationalised in public policy research.

Complexity theory's focus on emergent behaviour in the absence of central control also evokes the literatures on implementation and governance. Both examine the problems that central governments face when they do not recognise the extent to which policy changes as it is implemented (Butler and Allen, 2008; Klijn, 2008; Cairney, 2009). The level of interdependence that governments share with implementing organisations has prompted the identification of 'self-organizing networks' (Rhodes, 1997: 50) and images of 'bottom-up' implementation through self-selecting clusters of organisations in which a variety of public and private organisations cooperate (Barrett and Fudge, 1981; Hjern and Porter, 1981). While there is scope for central governments to control implementation, most notably through cross-cutting targets linked to the control of public expenditure (Richards and Smith, 2004), Lipsky's (1980) analysis of 'street-level bureaucracy' suggests that, since public sector professions are subject to an immense range of (often unclear) requirements laid down by regulations at the top, they are powerless to implement them all successfully. Instead, they establish routines and use rules of thumb to satisfy a proportion of central government objectives while preserving a sense of professional autonomy necessary to maintain morale.

These issues of implementation are central to complexity theory. For example, Geyer and Rihani (2010: 23; see also Geyer, 2012; Little, 2012) suggest that policy makers in the UK have been too driven by the idea of 'order' – by maintaining rigid government hierarchies, producing top-down, centrally driven policy strategies and adopting New Public Management reforms, which 'required a radical increase in performance indicators so that the centre could oversee and direct what the local and decentralised actors were doing'. Yet, policy making defies such simple

solutions. Complex systems have ‘self-organising capacities’, making them difficult to control; the effect of an internal or external force may be large or small and this is impossible to predict from the force alone (Teisman and Klijn, 2008: 288). Since complex policy-making systems are not amenable to such control, the outcome may be policy failure and demoralised policy makers (Room, 2011: 7). Complexity theorists often provide an alternative approach: to use pilot projects and employ ‘trial-and-error’ strategies that are open to constant adaptation (Sanderson, 2006: 118; 2009: 707; Bovaird, 2008: 326; compare with Lindblom, 1959: 86 on incrementalism). This often involves giving implementing officials more discretion to adapt policy in response to this dynamic process (Bovaird, 2008: 339). The ‘fitness landscape’ (the ‘surroundings in which living beings exist and behave’) is unstable and often changes rapidly and the policy process is ‘guided by a variety of forces’, suggesting that X will only have an effect on Y under particular conditions that are difficult to specify. Therefore, agents or organisations must be able to adapt quickly and not rely on a single policy strategy directed by the centre (Teisman and Klijn, 2008: 289; see also Mitleton-Kelly, 2003: 35–6).

### **From metaphor to reality? What are evolutionary theory’s causal mechanisms?**

In some cases, ‘evolution’ is used loosely to describe change or as a metaphor to describe familiar themes in the policy literature. It may have no direct explanatory value. In (rather few) others, there is an attempt to use evolution in a more direct way. For example, Dowding (2000: 74) discusses the potential for evolutionary theory to predict the success of particular behaviours in response to particular environments, but primarily to reject John’s (1999) use of evolutionary theory to explain short-term events. Dowding (2000: 79) favours a focus on institutions (as rules that advantage some and disadvantage others), noting that the timescale required to analyse evolution is ‘decades or centuries’.

Lewis and Steinmo (2008: 15–6) focus on ‘universal’ evolutionary mechanisms – variation, selection and retention – to combine two related propositions: ‘all living things – including humans – want to pass on their genes’ and they ‘inherit powerful instincts to follow social rules’ (this trait is often linked in ‘evolutionary psychology’ to the need for our ‘hunter-gatherer ancestors’ to cooperate to secure scarce food and find fair ways to distribute it – Smith and Larimer, 2009: 217). In other words, they are driven by self-interest *and* a desire to cooperate (by following common rules), to ensure their own survival and that of their ‘kin, family, or clan’. ‘Variation’ refers to the different rules adopted by different social groups to foster the collective action required to survive. ‘Selection’ describes the interaction between people and their environments; particular environments may provide an advantage to some groups over others and encourage certain behaviours (or, at least, some groups may respond by adapting their behaviour to their environment). ‘Retention’ describes the ways in which people pass on their genes (memes) to ensure the reproduction of their established rules (see also Lustick, 2011: 190 on variation, *competition* and retention). For Lewis and Steinmo (2008: 20), this process is often inefficient, producing examples of imperfect ways to pass down memes and instances in which institutions fail to adapt to new environments (compare with the trait in many

humans to eat high-fat diets and not adapt well enough to the now-plentiful supply of food – Lustick, 2011: 199). In other words, ‘evolution’ does not describe social or political progress. Rather, new forms of behaviour are constantly developing as groups adapt to their environments and respond to the actions of other groups who create and maintain different institutions.

In this light, complexity theory becomes a way to examine the often unpredictable outcomes of this interaction. We examine the outcomes of interaction between interdependent actors who share information. We explore the importance of past behaviours that created institutions with a long-term effect on behaviour, as well as new behaviour that emerges from interaction. We identify the ways in which groups adapt their behaviour and institutions in response to their environments (in some cases by changing their environments). The expectation is that ‘gradual evolutionary change is the norm’ because actors and institutions are constantly adapting and interacting; people may follow rules for long periods, only to change their behaviour (perhaps, in some instances, dramatically) when they reinterpret rules following their interaction with others and their adaptation to changing circumstances (Lewis and Steinmo, 2008: 24).

These uses of ‘evolution’ as metaphors or to describe real processes are not too far apart, and we are not at the stage where we can reject one approach in favour of another. Rather, both approaches describe familiar processes of rule-influenced actions, actors adapting to their environments, and actors seeking to change the rules and their environments – in other words, the concept of ‘dual causation’ when ‘agents interact and co-evolve with their environment’ (Lewis and Steinmo, 2010: 238; see also Lustick, 2011: 201 on the familiar study of path dependence mixed with ‘leadership, policy choices, and new ideas’).

Both approaches are also generally unclear on the magnitude of change and the time it takes to occur – a common problem that limits our understanding of causation. This uncertainty is a feature of most policy analysis (Cairney, 2012a: 26–30). The *specific* problem is that ‘evolutionary change’ may conjure up an image of a process that can take hundreds or thousands of years to complete – yet few accounts have this in mind. Instead, gradual and punctuated accounts present similar ideas about the relationship between major change and time. For example, in punctuated equilibrium accounts we can identify a range of rapid processes, from annual budget punctuations (True et al, 2007: 170; Jones et al, 2009: 861) to the 10-plus years it took to break down and replace the UK’s economic paradigm (Hall, 1993 and in correspondence) and the decades it took to produce a complete shift in government policy on issues such as tobacco (Baumgartner and Jones, 2009: 269; Cairney et al, 2012: 221–7). Kingdon’s (1984: 122–36) timeframe for the more gradual evolution of ideas is similar, from ‘a while’ to ‘a few years’ to ‘25 years’. It is also not clear whether modern institutionalist accounts of ‘gradual but profound’ third-order changes really contrast with Hall’s image of punctuated equilibrium, since the latter draws on Kuhn (1970: 150) who often identifies gradual paradigm change as one generation of scientists grows and another dies.

A partial solution to this disconnect between the intuitive notion of evolutionary change in nature, and more rapid change in policy making, is to recognise that we are talking about change that takes place over multiple *generations*. Further, we should depart from the intuitive notion of evolution as a means to describe the shift from

homo sapiens or hominids to humans (anything from 100,000 to six million years). For example, the paradigm shift described by Kuhn (1970: 150–1) may be complete in the space of a single generation, when a new breed of scientists replaces the old – a process that may be quicker in politics when new generations of politicians and experts replace the old (Hall, 1993: 280). A more current and relevant analogy, since it retains the idea of change over multiple generations and it maintains our focus on the importance of memes (which are sometimes ascribed virus-like properties – Richardson, 2000), might be the evolution of fruit flies (months), viruses or bacteria (days or weeks). These analogies may be more useful to describe the highly fluid trial-and-error strategies of actors. Complexity theory also portrays institutions as relatively fluid sets of rules, which change as they interact with other institutions and are challenged by actors. The new analogies will never make our analysis crystal clear, but they at least address the need to distinguish between evolution over one year and one hundred years.

## From theory to method

Evolutionary accounts draw our attention to specific policy processes but often remain rather vague. They may take us beyond metaphor but also describe a complex system that defies simple explanation. They identify multiple institutions, sources of rules and a variety of behaviours, but not the way to select the most relevant or important. In other words, this is a developing field of study that appears to be wide open for anyone to use. In this light, it seems unfortunate that evolution is often linked to a particular way to understand the world. We can identify three main attempts to reject certain approaches. First, Lewis and Steinmo (2008: 15–20; 2010: 237) argue that rational choice theory, assuming fixed preferences and equilibrium points, is unable to capture the real world characterised by more nuanced behaviour and disequilibrium. Such criticism often seems to be based on a caricature of early post-war rational choice (Dowding, in correspondence). As the work of Axelrod (1984) and John (2012) suggests, modern accounts can be adapted to apply to evolutionary studies (see also Smith and Larimer, 2009: 217 on evolutionary psychology and ‘wary cooperators’). Second, Steinmo (2010: 13) describes fundamental differences in the natural and social worlds, and recommends that our research projects follow suit. Yet, complexity theory is often described as a new way for natural and social scientists to collaborate (Mitchell, 2009).

Third, complexity theory is often accompanied by a rejection of past scientific practices. The main object of criticism, in both the natural and social sciences, is the ‘Newtonian’ approach to science in which we can reduce a complex world into its essential elements and monitor their independent effects. ‘Positivist’ quantitative methods or ‘sophisticated comparative statics’ are ‘out of sync with the way the world actually works’ (Steinmo, 2010: 7–9, 12; Lewis and Steinmo, 2010: 236). ‘Quantitative and reductionist methodologies’ may be useful to explain topics such as elections with ‘rules and orderly structures’, but not issues that contain unpredictable political events, significant levels of uncertainty and ambiguity (Geyer and Rihani, 2010: 74–5) or factors outside of the control of policy makers (Klijn, 2008: 314; Room, 2011: 6–7). Lewis and Steinmo (2010: 239) argue that, in the absence of a world that obeys universal laws, science should not be built on the idea that we can make

reliable predictions of the future. Rather, we should look to the past, using historical narratives to explain it (a point expanded by Pollitt, 2008). Yet, few modern scientists would subscribe slavishly to a *naïve* version of reductionism and prediction (Curry, 2003: 114). Instead, they highlight the need to reduce the world into something more analytically manageable. The world is too complicated to study unless we simplify it.

The benefit of complexity theory is that it offers the chance for a wide range of sciences to produce comparable research programmes, and for a range of approaches to come together under one banner within a single discipline. For example, in policy studies we can usefully see interpretive work, to help understand how actors adapt to their environments, working alongside quantitative methods and/or mathematically generated computer modelling, to aid our comprehension of 'systemic behaviour' or the outcomes when large numbers of actors and institutions interact (Cairney, 2010). Much depends on our interpretation of complexity. For example, first, Teisman and Klijn (2008: 289) describe the potential for actors within complex systems to create 'their own perception of what they want and how to behave in the landscape they are in'. This suggests that it would be valuable to observe and interview policy makers to examine how they make sense of environments; to identify which heuristics (eg, how they gather information) or rules of thumb (eg, who they trust and/or consult most) they use to respond to their environment; and to examine the extent to which such practices are based on rules passed down through generations (eg, when UK governments are associated with 'departmental views').

Second, Mitleton-Kelly (2003: 41) places more emphasis on self-organisation and emergent behaviour as it relates to the whole system. We are not just talking about individuals adapting to their environments because 'a system may need to be studied as a complete and *interacting whole* rather than as an assembly of distinct and separate elements'. This suggests that it would be valuable to mathematically model a complex political system to explore, with computation, the interaction between actors; to identify shifts of behaviour prompted by, for example, the evolution of strategies after 'generations' of interaction (and much of the information required to make realistic models may come from initial qualitative research).

Third, complex systems often exhibit 'strange attractors' or demonstrate extended regularities of behaviour. This suggests that quantitative methods exploring relationships between X and Y may still be valuable, even if the relationship only holds in certain circumstances. Indeed, they might usefully be supplemented by 'experimental' methods (informed by the literature on psychological experiments) that enable us to modify the environments of actors and identify how they act and interact in different circumstances.

Finally, the development of 'evolutionary psychology' (Smith and Larimer, 2009: 217–21), as an explanation for why people follow rules and norms, seems to dovetail with modern accounts of institutional rational choice, which use multiple methods and collaborate regularly with scholars in multiple disciplines (see Poteete et al, 2010; Cairney, 2013: forthcoming). It may be more useful to give some credit to quantitative researchers and rational choice theorists, and invite them to consider issues of complexity, than to reject their understanding of the world and their methods out of hand – since the latter limits our field and our ability to share insights.

## Conclusion

There is considerable variation in the use of 'evolution' to describe policy making. Kingdon describes the cumulative, long-term development of policy solutions. Baumgartner and Jones describe long periods of political stability and policy continuity interrupted by major changes in the way that policy makers frame policy problems. Hall describes a process in which policy-making institutions, as paradigms, are maintained for long periods but, in rare cases, replaced completely following periods of crisis. John describes a process of trial-and-error adaptation of policy strategies at multiple stages. The ACF presents an image of policy making based on the beliefs of participants and the interactions within and across coalitions. These approaches have a lot in common. For example, almost no accounts suggest that evolutionary change equates to advance in the 'social Darwinian' sense. There are clear differences in the way we understand the likelihood and extent of instability and major policy change, but also a common desire to move beyond explanations of change that rely on a major external effect – to consider the importance of change from within. However, 'evolution' is still generally used as a metaphor to describe quite different things, such as: periods of stability/continuity *and* instability/change; and, the opposite of *and* parallel to revolution. Further, no account of evolution helps us to measure the size of policy change or identify the most appropriate timeframe. Rather, evolutionary theory allows us to articulate, in a new way, the longstanding academic compromises regarding structure and agency, endogenous and exogenous change, and behaviour based on self-interest and norms.

Complexity theory has emerged as one possible way to advance our study of evolution. It has significant and increasing support in the literature and builds on the insights associated with historical institutionalism, punctuated equilibrium theory, implementation and governance studies. For some, it may provide the potential to develop a general theory of policy systems that Smith and Larimer (2009: 15–17) argue has eluded policy scholars. Yet, it is not a panacea or a direct replacement to the more established literature. Indeed, the work has only just begun to establish whether complexity, as a general theory across the sciences as a whole, has a meaningful contribution to make to our current knowledge (or whether it can *challenge* the way that we currently understand public policy). In the meantime, the field is still wide open. In this light, it would be inappropriate to decide that, since complexity allegedly invokes a particular ontology, we should necessarily adopt a particular approach to epistemology and methodology and reject other accounts with different ideas and methods. There is often a tendency to use the worst offenders in each approach to reject an approach altogether, rather than seeking points of agreement on which we can work. Few researchers adhere slavishly to one understanding of the world over another. Evolutionary theory should therefore not be used simply as another way to reject some approaches and limit the field.

## Notes

<sup>1</sup> The original description of multiple streams was Cohen et al's (1972) garbage can model, based on a study of university decision making. Kingdon's analysis has also been extended to other political systems such as France and the UK (Zahariadis, 2003, 2007; Cairney, 2009; 2012a: 239–42; Cairney et al, 2012).

<sup>2</sup> Used by paleobiologists Eldredge and Gould (1972) to ‘describe gaps in the evolutionary record’ (Baumgartner and Jones, 1993: 19; see also Hay, 2002: 160).

<sup>3</sup> See Lewis and Steinmo (2010: 239): ‘Just as genes at the micro-level interact to form a unique individual, individuals within a population interact to replicate institutions. The character of the whole institution is thus distinct from a simple aggregation of the constituent units.’

<sup>4</sup> Note that few accounts link complexity to older systems theories associated with Easton and others (see Cairney, 2012a: 113, 128–9).

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