

ADAPTIVE REGULATION IN THE AMORAL BAZAAR*

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‘And who could heed the words of Charlie Darwin
Fighting for a system built to fail
Spoonng water from their broken vessels
As far as I can see there is no land.’¹

I INTRODUCTION

Oliver Deneys Schreiner was one of our greatest jurists and member of one of South Africa’s most distinguished families. In South Africa’s remarkably rich judicial history, he stands among her brightest luminaries. It is a singular honour to be invited to speak to you this evening in his memory.

Justice Schreiner’s son was Vice Principal of my alma mater, the University of Natal (now KwaZulu-Natal). And Justice Schreiner’s grandson, also named Oliver, was a close friend. We were students together in England when his own brilliant career was tragically cut short in March 1978.² Recalling the triumphs and tragedies of this illustrious dynasty fills me with a bittersweet mix of South African pride and sadness at the loss of what might have been for young Oliver too. I am reminded of the opening words of the poem *Skoppensboer*, penned by Justice Schreiner’s distant cousin, Eugène Marais: ‘n Druppel gal is in die soetste wyn’.

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¹ ‘The low anthem, oh my god, Charlie Darwin’, track 01 (*Charlie Darwin*) (2009).

² See Ellison Kahn ‘Oliver Deneys Schreiner: A South African’ in Ellison Kahn (ed) *Fiat Iustitia: Essays in Memory of Oliver Deneys Schreiner* (1983) 1 at 91.

Yet South Africans are a people who insist on reaching beyond the melancholy darkness brooding within Marais' poem. Out of the stark agony of apartheid emerges the poignant dignity of a blue plastic dress.³ South Africa now holds up to the world a Constitution that presents itself as a bold alternative to that oldest and perhaps most revered of constitutions, the Constitution of the United States. The transformative Constitution embraces a 21st century vision of human dignity richer and warmer than the 18th century conception of liberty embodied in its American counterpart. Contemporary public law scholarship and jurisprudence, emboldened by the knowledge that judges and government leaders do now listen and care, are a joy to read — sometimes almost as in a dream. When they can be heard above the vuvuzela symphony orchestra, South Africans can boast proudly of some of the world's most revered leaders and statesmen.

So when I was invited to deliver this lecture, I wondered what I could possibly say to you in the wake all this wondrous change. Given my own long absence anything would surely seem presumptuous. Yet the interval between my departure for the United States in 1985 and my lecture this evening — the span of a full generation — has been a period of profound change everywhere else too, and this passage of time provides an opportunity to reflect upon the effects of some of these changes on the general theory of administrative law and regulation. Many gradual changes in science, law and society are crystallising to shape a significant transformation in this field. Now the shocks and aftershocks of the global financial crisis of 2008 make this more visible. The doctrinal framework within which Judge Schreiner himself attempted to modernise how law should regulate government and private economic activity⁴ seems from our vantage point to be quite antiquated.

In explaining why, my examples will come from the world of financial services, but they could easily be found anywhere in the arena of law and regulation. First I will outline the basic premises of prevailing doctrine and its growing shortcomings. Then I will describe developments in our understanding of the social ecologies through which law and regulation are transfused. I will consider some of the implications for the way in which we need to think about future regulation in order to be more effective in this complex world. We are moving from a framework of *directive* regulation to one that has to become much more *adaptive*.

³ The reference, of course, is to the depiction by Judith Mason in the South African Constitutional Court, of the blue bags pitifully held together to preserve her dignity by Phila Ndwandwe, murdered by the security police after being held naked in solitary confinement. See Albie Sachs *The Strange Alchemy of Life and Law* (2009) vii–viii (preface by Judith Mason 'The Man Who Sang and the Woman Who Kept Silent').

⁴ See the discussion by Cora Hoexter 'Judicial policy revisited: Transformative adjudication in administrative law' (2008) 24 *SAJHR* 281 at 293 (discussing Schreiner JA's dissent in the infamous *Mustapha v Receiver of Revenue, Lichtenburg* 1958 (3) SA 343 (A) at 347E–H).

While my article will focus on understanding markets as evolutionary social ecologies, and the consequences this has for administrative law and regulation, it is also important that these ‘amoral bazaars’ be grounded on a foundation of moral aspiration and integrity. I will therefore conclude with a reminder that we ignore at our peril the urgent responsibility of re-developing a moral framework within which markets should operate.

II ORTHODOXY

The broad theoretical underpinnings of modern administrative law rest on a static, hierarchical model that has long captured our understanding of the Rule of Law and the principle of legality in a democratic state.⁵ For lawyers, the administrative governance of social and economic activities is to be conducted under legislative authority that emanates from a democratically elected legislature and executive. These organs of government are themselves the creations of constitutions that have been accepted as politically legitimate, and of rules, principles and doctrines developed symbiotically by courts and jurists over many years.

In the modern age, where social transformation and protection of the commons⁶ has required rapid, pro-active governmental action, the executive departments and agencies of government have become dominant. Their actions are nevertheless required under the principle of legality to be authorised by properly delegated discretion. The courts, through the process of judicial review, can then evaluate whether such authorisation has indeed been provided.

Complementing this conception of democratic governance is a view of human action that places great store by the capacity of men and women to shape their domain. The audacious technological and economic achievements (and destructions) of the past two centuries have encouraged this view. There has been a shift from Burkean conservatism to a belief that government can be endowed, relatively safely, with enormous responsibilities ranging from policing to public enterprise to highly complex industrial, economic and social regulation. We have become bold in assuming we can manage the unknown.

At the same time, battles for individual freedom, and the sheer apparent success of capitalism as a generator of material wealth, have also encouraged a taste for competition, free markets, and private enterprise. This we loosely call free market capitalism. A central element of this ideology, ‘*rational choice theory*’, has conceived economic man — homo economicus — as rational, self-interested and value maximising.

⁵ See e.g. Cora Hoexter *Administrative Law in South Africa* (2007) 225–6 (laying out the principles of lawfulness and legality that drive administrative law).

⁶ The classic study is Garrett Hardin ‘The tragedy of the commons’ (1968) 162 *Science* 1243. Nobel prizewinner Elinor Ostrom penned the leading monograph: Elinor Ostrom *Governing the Commons: The Evolution of Institutions for Collective Action* (1990).

The collective activity of such rational beings describes the essence of a market; and their activity leads mysteriously, in the ‘invisible hand’ metaphor of Adam Smith,⁷ to efficient results. Even though individual participants might not have specifically intended such efficient outcomes, we experience and take them for granted every day. So in modern times we tend to express our commitment to free markets by talking, not so much of ‘administration’, but of ‘regulation’ — a concept that conveys the continuous flow of the market subject only to ‘tweaking’ by regulators or ‘administrators’. The phrase ‘administrative law and regulation’ is common as an ideological hedge for statist and free marketeers alike.

We have also seen the development of a highly sophisticated science of economics. Economic models and metrics have been formulated one by one, Nobel Prize by Nobel Prize, in the pursuit of a general theory of equilibrium that might combine into one overarching view the theories of macro- and micro-economics, value, and competition. Economic theory has increasingly informed public policy and, in turn, the frameworks and techniques of regulation. The wisdom of particular policies is routinely evaluated by reference to the formal predictive and diagnostic models of economists.

Despite all this sophistication, the resulting framework remains a relatively static and linear structure. It posits one-way direction of authority and legitimacy. Policy is formulated using models that, although omitting important real-world detail, appear to generate usable theories of prediction and evaluation. The framework also presupposes an ability to proscribe undesirable conduct in advance through rules and orders, to monitor conduct under the prescriptive framework, to evaluate breaches by reference to such rules and orders, to authorise private conduct or sanction breaches, and to have the resulting government action tested in independent courts and tribunals.

III CRACKS IN THE FRAMEWORK

Yet this static structure depends on many assumptions that are now known to be simplistic or just plain wrong. It also ignores many other important considerations. So we see symptoms of incoherence all around us.

It is not just neoclassical economics that stands on trial.⁸ To render massively delegated government action more legitimate we have added complicated and sometimes even convoluted rulemaking and adjudicative processes that seem to benefit only the lawyers and bureaucrats who manage

⁷ Adam Smith *An Inquiry into the Nature and Causes of the Wealth of Nations* (Glasgow ed 1776) vol 2a at 456.

⁸ For a sampling of the numerous attacks on traditional, equilibrium economics, see e.g John Quiggin *Zombie Economics: How Dead Ideas Still Walk Among Us* (2010); John Cassidy ‘After the blowup: Laissez-faire economists do some soul searching’ *New Yorker* 11 January 2010; Paul Krugman ‘How did economists get it so wrong?’ *New York Times* 6 September 2009, available at <http://www.nytimes.com/2009/09/06/magazine/06Economic-t.html>.

the process. Because we become frustrated at apparent incompetence and corruption, we restructure and reinforce administrative agencies or simply avoid the problem altogether by ‘deregulating’ in the hope that market discipline alone will provide the necessary ordering. Judicial review is sometimes an amorphous web of spongy principles in which judges are often accused of meddling beyond their competence. Sanctions are formalised and intensified in ever more complicated rules, yet these very rules provide still new opportunities to evade the original purpose of the regulatory endeavour altogether. At the same time, criminal and civil accountability, based on simplistic juristic notions of personhood, have become so dispersed within a labyrinth of private and public corporate complexity that the legal norms barely operate as meaningful constraints at all.

What is happening, I would submit, is that our traditional approach is breaking down in two related though different respects. Rational choice theory, which drives so much of our approach to regulatory policy and implementation, cannot stand alone as a basis for explaining how markets operate, endure, and evolve.

We have also neglected the moral framework and aspirations that ultimately shape market outcomes. The economic approach to understanding markets has tended to draw us away from moral evaluation, leaving us to focus on markets as no more than great, amoral bazaars. Yet many avoidable recent catastrophes remind us that we have been mistaken to treat markets as morally neutral arrangements for promoting economic efficiency.

Allow me to address each of these issues in turn.

IV COMPLEXITY

First, I wish to consider the complexity of markets.

The limitations of traditional regulation became most evident during the global financial crisis. Enormously complex rules and regulations, supposedly enforced by armies of regulators in many countries and facilitated through ever more esoteric modeling of risks, failed miserably to anticipate, let alone prevent or even mitigate, a financial collapse. Similar dysfunction is evident in many other areas of domestic and international governance, where reports of market and regulatory failures are often front-page news. These gloomy results occur, not because we have become collectively stupid. Rather, markets have become too complex to manage and regulate effectively by relying on traditional techniques alone.

Powerful intellectual traditions have indeed warned us of the boundaries of our knowledge. The mystery of markets, the common law, and customary legal traditions, have inspired jurisprudential theories from Adam Smith and Karl von Savigny to Oliver Wendell Holmes and Friedrich Hayek. Even as they celebrated custom, markets and common law, they warned of the limitations on our collective capacity to know and respond to the future and to engage in large scale social engineering.

We have, however, the ability to become much more scientific about our understanding of collective action. I cannot resist mentioning one South

African pioneer whose contribution, in happier circumstances, might have received much greater recognition. This was Eugène Marais, lawyer, poet, and entomologist. Marais is well known to South Africans but he is not always fully appreciated. His greatest passion culminated in a study he entitled *The Soul of the White Ant*,⁹ in which he depicted what he called the ‘psychological life’ of termite communities. At school I was taught that Marais was a great poet but his work on the natural world was only an eccentric curiosity. Yet in many ways Marais’ studies were an extension of the work of Charles Darwin. His work on ant colonies, tragically plagiarised¹⁰ and still largely unacknowledged, has now become a model for the application of modern science to business leadership and strategy.¹¹ I like to think that Justice Schreiner, who was actually related to Eugène Marais,¹² and who had a Holmesian view of the common law,¹³ might have been sympathetic to Marais’ views.

Technology now drives the study of collective or communal activity far beyond the level pioneered by scientists such as Marais. In the span of a generation, the information-acquiring and knowledge-generating infrastructure has exploded. Networks for accessing and sharing information have grown to the point where the Earth is enmeshed on the ground, underwater and in near space by dense webs providing huge data transmission capability. Data storage capacity has escalated beyond wildest dreams. The computer processing power to process this data into usable information continues to double every eighteen to twenty-four months.¹⁴

⁹ Eugène N Marais *Die Siel van die Mier* (1937) (*The Soul of the White Ant*. English translation by Winifred de Kok (2009)).

¹⁰ Marais was the victim of wholesale plagiarism of his ideas and work by the Belgian Nobel prizewinner, Maurice Maeterlinck, whose fame and supposed scientific honesty misled the world into thinking that it was the thief and not the scientist who had done the work. Marais ended his own long and troubled life in despair. See Leon Rousseau *The Dark Stream: The Story of Eugène N Marais* (1982) 522–8.

¹¹ In a cruel twist of fate Marais does not appear to be acknowledged in the modern literature on complexity theory applying his ant colony model. See Deborah M Gordon *Ant Encounters: Interaction Networks and Colony Behavior* (2010) 2 (crediting Maeterlinck with continuing the earlier work of the French naturalist, Réaumur, but not mentioning Marais); Richard T Pascale, Mark Millemann & Linda Gioja *Surfing the Edge of Chaos: The Laws of Nature and the New Laws of Business* (2000); Margaret J Wheatley *Leadership and the New Science: Learning about Organization from an Orderly Universe* (1992) 4n6 (citing naturalists and popular writer, Richard Conniff, but not Marais). See the article by Richard Conniff ‘The enemy within’ 1998 *Smithsonian Magazine* 82.

¹² See P M Nienaber & Ellison Kahn (eds) ‘Regter P M Nienaber in gesprek met Regter Leo van den Heever en haar eggenoot, Chris Neethling, op 13 Januarie 2000 te Kaapstad’ (2004) 121 *SALJ* 1 at 5nn4 and 5 (describing the complex relationships between the Findlay, Marais and Schreiner families).

¹³ See Kahn op cit note 2 at 67–8, 69 (describing Schreiner’s ‘Holmesian’ view of the common law, which, with the ‘life of the law’ being ‘experience, not logic’, fits well with the evolutionary notion of common law as a complex adaptive system).

¹⁴ This rate of growth is known as ‘Moore’s Law’ after Gordon E Moore, co-founder of Intel Corporation, who in 1965 originally projected the doubling of computing power every year for another ten years. In a 1975 paper entitled ‘Progress

A result is that theories, once mere hypotheses, can be tested more quickly and thoroughly than ever before. Previously irreconcilable datasets can be linked to provide the basis for synthetic predictions. Regressions can be run and repeatedly reformulated so that the same data can be processed for widely different purposes. Complex models can be correlated to produce entirely new knowledge. We have learned to exploit incredibly rich repositories of natural, human and artificially synthesised data. Whole new disciplines, once fanciful before these very recent technology developments, have been spawned.¹⁵

The interdisciplinary framework for such studies is *complexity science*, which seeks to identify complex patterns amid apparently chaotic systems.¹⁶ This new framework draws from a range of disciplines and is now the organising principle for some prestigious research centres.¹⁷ Results are becoming evident across the social sciences, including archaeology,¹⁸ economics,¹⁹ sociology²⁰ and law.²¹ We are beginning to understand previously

in digital integrated electronics' (available at http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=1478174&tag=1) Moore revised his projection to expect doubling every 24 months. A Caltech professor, Carver Mead, coined the term 'Moore's Law'. Recent reports indicate that the supposed atomic limits to Moore's law continue to be circumvented by new science. See eg John Markoff 'Computers as invisible as the air' *New York Times* 4 September 2010, available at http://www.nytimes.com/2010/09/05/weekinreview/05markoff.html?_r=1&scp=3&sq=Moore's%20Law&st=cse.

¹⁵ Illustrations of the new ability to mine huge databases in order to develop whole new bodies of useful knowledge (for good and ill) are to be found in the popular book by Ian Ayres *Supercrunchers: Why Thinking-by-Numbers is the Way to be Smart* (2007).

¹⁶ Complexity theory should be distinguished from its sister discipline, chaos theory, in that complexity theory seeks to identify patterns of order within apparent chaos, whereas chaos theory studies randomness. A splendid map to the various elements of complexity studies is depicted in a wikipedia graphic at <http://upload.wikimedia.org/wikipedia/en/5/5a/Complexity-map-overview.png>.

¹⁷ See eg the Santa Fe Institute in New Mexico (<http://www.santafe.edu/>); the Center for the Study of Complex Systems in Michigan (<http://www.cscs.umich.edu/>); and ETH Zurich in Switzerland (http://www.ethz.ch/index_EN).

¹⁸ See eg Joseph A Tainter *The Collapse of Complex Societies* (1988), esp ch 2.

¹⁹ The seminal article is by W Brian Arthur 'Complexity and the economy' (1999) 284 *Science* 107. For a historical review, see David Colander 'Complexity and the history of economic thought' (March 2008) Middlebury College Economics Discussion Paper No 08-04; 'The complexity revolution in economics' in J Barkley Rosser, Richard P F Holt & David Colander (eds) *European Economics at a Crossroads* (2010) 29-39. See also Richard S Whitt & Stephen J Schultz 'The new "emergence economics" of innovation and growth and what it means for communications policy' (2009) 7 *J Telecommunications & High Technology* 217.

²⁰ See eg Marc Schneiberg & Tim Bartley 'Regulating or redesigning finance? Market architectures, normal accidents, and dilemmas of regulatory reform' (2010) 30 *A Res Soc Org* 281.

²¹ A host of law review articles on the application of complexity theory to various aspects of the law has already appeared. For a general survey, see J B Ruhl 'Law's complexity: A primer' (2008) 24 *Georgia State University LR* 885. See also the excellent recent overview on the applicability of complexity theory to global governance by Mark A Chinen 'Governing complexity' in Laurence Boule (ed) *Globalisation and*

inscrutable phenomena in the environment, markets, societies, communities, and legal systems.

The new language of complexity has even entered the popular media. Its terminology has been absorbed, sometimes unwittingly, into mainstream academic writing. It is common to hear historians speak of ‘path dependency’²² and ‘emergence’,²³ while military²⁴ and business²⁵ strategists advocate ‘sense and respond’ techniques, lawyers talk of ‘networks’²⁶ and ‘fragmentation nodes’,²⁷ and investment bankers speak of ‘Black Swans’, ‘convexity’ and ‘robustness’.²⁸ Lawyers, economists, sociologists and even physicists, peering through the lenses of their diverse disciplines, all focus on the events

Governance (2011) 55. Scholars such as Jenna Bednar of Michigan University have been doing extensive research on law and legal institutions using complexity methods. See her research page at <http://www-personal.umich.edu/jbednar/research.html>. My own description of international financial regulation as a complex system is ‘Internationalisation of law — the “complex” case of bank regulation’ in Mary Hiscock & William van Caenegem (eds) *The Internationalisation of Law: Legislating, Decision-Making, Practice and Education* (2010) 3.

²² On which, see Scott E Page ‘Path dependence’ 2006 *Quarterly J Pol Sc* 87.

²³ See e.g. Eric D Beinhocker *The Origin of Wealth: The Radical Remaking of Economics and what it Means for Business and Society* (2006); Mary O Furner ‘From “state interference” to the “return to the market”: The rhetoric of economic regulation from the old gilded age to the new’ in Edward J Balleisen & David A Moss (eds) *Government and Markets: Toward a New Theory of Regulation* (2010) 92 at 93. The Scottish historian, Niall Ferguson, is in the author’s view one of the best historian-prognosticators; his method is very clearly rooted in complexity theory. See e.g. Niall Ferguson ‘Sinking globalization’ (Mar/April 2005) 84:2 *Foreign Affairs* 64; ‘Complexity and collapse’ (Mar/April 2010) 89:2 *Foreign Affairs* 17.

²⁴ See e.g. David J Kilcullen ‘Countering global insurgency’ (2005) 28 *J Strat Stud* 597 (approaching the war against Al Qa’ida from a complexity perspective); Ashley Leonczyk ‘Peacekeeping and counterinsurgency: How US military doctrine can improve peacekeeping in the Democratic Republic Of the Congo’ (2010) 204 *Military LR* 66 (describing the impact of *The U.S. Army/Marine Corps Counterinsurgency Field Manual* (2007)). See also Vicente Valle ‘Chaos, complexity and deterrence’ paper prepared at the National War College (1970), available at <http://www.au.af.mil/au/awc/awcgate/ndu/valle.pdf>.

²⁵ See e.g. Pascale et al op cit note 11; Margaret J Wheatley *Leadership and the New Science: Learning about Organization from an Orderly Universe* (1992).

²⁶ See e.g. Richard S Whitt ‘Adaptive policymaking: Evolving and applying emergent solutions for U.S. communications policy’ (2009) 61 *Fed Comm LJ*.

²⁷ See e.g. Kathryn Judge ‘Fragmentation nodes: A study in financial innovation, complexity and risk’ unpublished working paper on file with the author. The complexity-sociological perspective describes derivatives, for example, as ‘nodes of networks of social relations, products that link assets, asset holders, claims, obligations, and income flows in remarkably complex and evolving systems of interdependence with their own as yet poorly understood emergent properties’. See Schneiberg & Bartley op cit note 20 at 287.

²⁸ Nassim Nicholas Taleb *The Black Swan: The Impact of the Highly Improbable* (2007). The revised edition (2010) at 305ff contains a lengthy exegesis on ‘robustness’. See also Nicholas Nassim Taleb ‘Convexity, robustness, and model error inside the “Black Swan domain”’, available at http://papers.ssm.com/sol3/papers.cfm?abstract_id=1669317.

of the global financial crisis and speak of ‘systemic risk’,²⁹ ‘extreme interconnectedness’³⁰ and ‘tight coupling’.³¹ Indeed, a substantial literature applying complexity theory to the general subject of administrative law and regulation itself is already developing.³²

Before exploring some of the implications for administrative law and regulation, let us first consider the central characteristics of complex systems.³³ A complex adaptive system is one in which ‘*large networks of components with no central control and simple rules of operation give rise to complex behavior, sophisticated information processing, and adaptation via learning or evolution*’.³⁴ Such systems are self-organising and they possess a number of features that interact dynamically in diverse, often unpredictable ways.

The basic frames of reference of complex systems are themselves subject to constant change: such systems rest on what were elegantly labeled ‘dancing landscapes’,³⁵ which make such systems not merely *complicated* but inherently *complex*.³⁶ Landscapes dance yet the ecologies that depend upon them can become robust because they are diverse, connected, interdependent and adaptive.³⁷ If these elements interact in just the right balance, there emerges a living ecology that, while continuing to evolve and adapt, manages to maintain a systemic equilibrium.

²⁹ See eg Steven L Schwarcz ‘Systemic risk’ (2009) 97 *Geo LJ* 193 and ‘Regulating complexity in financial markets’ (2010) 87 *Washington Univ LR* 211.

³⁰ See eg Randall Kroszner ‘Interconnectedness, fragility and the financial crisis’, testimony to the Financial Crisis Forum, Financial Crisis Inquiry Commission (26 February 2010), available at <http://www.fdic.gov/hearings/pdfs/2010-0226-Kroszner.pdf>; ‘Lost robustness’ in *Naissance* 8 at 9 (ETH Newsletter, April 2008, available at <http://www1.ethz.ch/ccs/news/LostRobustness.pdf>).

³¹ See Schneiberg & Bartley op cit note 20 at 283.

³² See eg J B Ruhl ‘General design principles for resilience and adaptive capacity in legal systems: Applications to climate change adaptation law’ (2011) 89 *North Carolina LR* (forthcoming); Donald T Hornstein ‘Complexity theory, adaptation, and administrative law’ (2005) 54 *Duke LJ* 913; J B Ruhl ‘Regulation by adaptive management: Is it possible?’ (2005) 7 *Minn J L Sci & Tech* 21; J B Ruhl & James Salzman ‘Mozart and the Red Queen: The problem of regulatory accretion and the administrative state’ (2003) 91 *Geo LJ* 757. I have made an attempt to apply the complexity view to international financial regulation in my chapter in Hiscock & Van Caenegem (eds) op cit note 21.

³³ Very useful summaries have been provided by the European scientists Dirk Helbing ‘Managing complexity in socio-economic systems’ (2009) 17 *Eur Rev* 423 and Dirk Helbing & Stefan Lämmer ‘Managing complexity: An introduction’ in D Helbing (ed) *Managing Complexity: Insights, Concepts, Applications* (2008) 1.

³⁴ Melanie Mitchell *Complexity: A Guided Tour* (2009) 13. Ruhl op cit note 32 provides a very nice analysis of complexity and adaptive capacity within the specific context of (environmental) regulation.

³⁵ Stuart A Kauffman *The Origins of Order: Self Organization and Selection in Evolution* (1993) 243–4.

³⁶ John H Miller & Scott E Page *Complex Adaptive Systems: An Introduction to Computational Models of Social Life* (2007) 9–10.

³⁷ See *ibid*, esp ch 2.

Even when seemingly stable, complex systems are also not necessarily 'rational'; rather, they tend to be 'path dependent'. This means that a current state of affairs can only be explained by tracing the (frequently non-linear) development from the past. Complex systems also tend to live precariously on the 'edges of chaos'.³⁸ They can encounter precipitous change from unexpected, initially benign sources, or because a slight change can trigger powerful new forces.

Chaos generated from seemingly benign sources is called the 'butterfly effect'³⁹ because it is theoretically possible (there being no other butterflies!) for the small flapping of the butterfly's wings to cause ripples that ultimately might change the path of a tornado.⁴⁰ Sudden dramatic change might also occur, not so much because of the cumulative effect of a small initial change, but because of newly combined forces called 'power laws'. Power laws generate exponential effects that are entirely unexpected departures from the 'normal' developments one might otherwise have expected.⁴¹

Ominous edges of chaos are alarmingly evident in the financial world. Systemic risk⁴² has of course become an almost household term after the global financial crisis was triggered by the bankruptcy filing of Lehman Brothers on 15 September 2008. Nor is such hazard confined to the occurrence of grand events like the unexpected failures of a very large financial institution. Let me illustrate with two examples, one only a few months old and another occurring right now.

The first is the so-called 'Flash Crash' of 6 May 2010.⁴³ Sudden collapses in trading prices quickly spread from the Chicago Mercantile Exchange to the

³⁸ Archaeologists, describing why a society can suddenly collapse despite being made up of independently stable elements, use the term 'decomposition', and for them such systems are 'nearly decomposable'. See Tainter op cit note 18 at 23.

³⁹ Edward Lorenz, a scientist working on long-range weather forecasting, famously depicted the phenomenon in an accidental computer simulation in the 1960s. He discovered the dramatically variable effects a computer simulation would have if redirected by minute changes in the initial data. Edward N Lorenz 'Deterministic nonperiodic flow' (1963) 20 *J Atmos Sc* 130.

⁴⁰ The idea, already expressed in speculative terms long before Lorenz, took hold of the imagination of the popular culture and, though largely misunderstood, manifests itself in bad movies such as *The Butterfly Effect* in 2004. See Peter Dizikes 'The meaning of the butterfly: Why pop culture loves the "butterfly effect" and gets it totally wrong' *Boston Globe* 8 June 2008, available at http://www.boston.com/bostonglobe/ideas/articles/2008/06/08/the_meaning_of_the_butterfly/.

⁴¹ The prominent role sheer randomness plays in our lives and in markets, and how we try to discern regular patterns that are often nonexistence has been developed in at least two best sellers: Nassim Nicholas Taleb *Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets* 2 ed (2004) and Leonard Molodinow *The Drunkard's Walk: How Randomness Rules Our Lives* (2008).

⁴² See Dirk Helbing *Systemic Risks in Society and Economics*. Working Paper for the Santa Fe Institute, 18 November 2009, available at http://www.futurict.ethz.ch/data/pubs/CCSS_new.pdf. See also Iman Anabtawi & Steven L Schwarz *Regulating Systemic Risk* (2010).

⁴³ *Report of the Staffs of the CFTC and Secretary to the Joint Advisory Committee on Emerging Regulatory Issues: Findings Regarding the Market Events of May 6, 2010* 30

New York Stock Exchange and Nasdaq. The Dow Jones dropped dramatically (by 3.2 per cent) in a matter of minutes. Prices of some stocks oscillated wildly. Accenture, one of the major global consulting firms, saw the price of its stock plunge from \$40 to 1 cent! The prices of other stocks soared from pennies to over \$100 000! Trading had to be suspended in order to stabilise the markets. We have subsequently learned that the cause was a computer-trading algorithm used by a single trader to sell futures contracts. Once this programme generated transactions it triggered a chain reaction that could be stopped only by halting trading.⁴⁴

The second example is occurring at the moment. It might only be a scary aftershock of the American subprime crisis that will just dampen economic recovery, or it could be much worse: another global financial crisis in the making. I speak of the so-called ‘foreclosure crisis’ in the United States.⁴⁵ The courts have stopped foreclosures involving hundreds of thousands of homes because the documents preparing for foreclosure were not properly processed. It turns out that they were executed en masse by ‘robo-signers’ who merely rubber-stamped the huge volume of files passing through their offices. So banks are being required to repurchase mortgages they had sold and reassign their value to the books. In the view of some the impact might become catastrophic because some of the world’s largest banks are implicated very severely.⁴⁶ One might consider this the effect of power laws: imperfect title and collateral, compounded by the extremely complex web of mortgage-backed securities and collateralised debt obligations, are creating

September 2010, available at http://financialservices.house.gov/FinancialSvcsDemMedia/file/key_issues/StaffFindingsregardingtheEventsofMay6.pdf.

⁴⁴ For a fascinating, minute-by-minute display of how this crash took place, see the graphic accompanying the *Wall Street Journal* article by Kara Scannell ‘Report:Algorithm set off “flash crash” amid stressed market’ *Wall Street Journal*, 1 October 2010, available at <http://professional.wsj.com/article/SB10001424052748703859204575525973854203534.html?mod=djemalertNEWS&mg=reno-secaucus-wsj#articleTabs%3Darticle>; and <http://professional.wsj.com/article/SB10001424052748703859204575525973854203534.html?mod=djemalertNEWS&mg=reno-secaucus-wsj#articleTabs%3Dinteractive>. See also Graham Bowley ‘Lone \$4.1 billion sale led to “flash crash” in May’ *New York Times*, 1 October 2010, available at http://www.nytimes.com/2010/10/02/business/02flash.html?_r=1; and the charts provided by Courtney Comstock ‘The “Who Caused the Flash Crash Report” by the SEC’ *Bus Insider*, 1 October 2010, available at <http://www.businessinsider.com/the-flash-crash-report-is-out-heres-what-you-need-to-know-2010-10?utm>.

⁴⁵ See generally Susan Kapner ‘Wells adds to crisis over home seizures’ *Fin Times*, 14 October 2010, available at <http://www.ft.com/cms/s/0/ed4aa856-d70b-11df-9cd5-00144feabdc0.html>; Nick Timeraos & Carrick Mollenkamp ‘Document mess hits Fannie, Freddy’ *Wall Street Journal*, 14 October 2010, available at http://professional.wsj.com/article/SB10001424052748704763904575550472268902454.html?mod=wsjproe_hps_LEFTWhatsNews.

⁴⁶ See eg Gregory White ‘Is Bank Of America the most exposed if there’s a brand new mortgage-bond scandal?’ *Bus Insider*, 13 October 2010, available at <http://www.businessinsider.com/manal-mehta-branch-hill-capital-bac-2010-10> (referring to a doomsday scenario analysis of Bank of America).

havoc throughout the financial market. None of this was anticipated three months ago.

When not plunged into the abyss of chaos, the evolution of complex systems leads to an ‘emergence’ of conditions or states that are not simply the product of their input: the sum is greater than the parts. Just as the ‘wetness’ of water is not merely the accumulation of molecules of H₂O, and ‘mind’ is not merely a collection of brain tissue and neurons, markets are not merely the sum of the actions of market participants, and the ‘common law’ is not just an aggregation of judicial rulings. To use Adam Smith’s metaphor, it is as if an ‘invisible hand’ leads us to a transcendent result. Complexity science seeks to demystify this process.

Viewing markets in this way is not just a theoretical game: complex systems are the product of ‘bottom up’ activity, not ‘intelligent design’. The reorientation in thinking is as dramatic as the contrast between creationist and Darwinian science. A ‘market’, once it is understood to be a complex ecology, embraces not only the activities of market *participants* but also those of *regulators, judges, elected officials, and observers* and has to account for the *reflexive interactivity between all of them*.

V ADAPTIVE REGULATION

This forces us to look at public and private market activity more broadly. The constant, mutual interaction of the participants, or ‘agents’ as they are called, powers the dynamics of an evolving ecology. It does not seem realistic to expect that we can merely establish rules and authority for the purpose of ‘commanding’ desired outcomes. For every ‘command’ there is likely to be a corresponding reaction that creates yet a new situation to which the ‘commander’ must react. One-way direction becomes ineffective.

Here is a current example: the transnational body known as the Basel Committee has been working on improving the regulatory framework for banks around the world. It has just announced the approval of rules designed to strengthen the capital resilience of banks. This proposed regime is known as ‘Basel III’. Yet even before the new rules have been finalised by the G20,⁴⁷ those who will be subject to them — the banks — are with some notable exceptions,⁴⁸ busily figuring out how the rules can be gamed.⁴⁹ Probably no

⁴⁷ Formal approval occurred at the Seoul meeting of the G20 in November 2010.

⁴⁸ See the views of new Barclays CEO, John Varley, who believes that the new capital requirements of Basel III and their implementation timetable are fair, a view described as ‘particularly surprising’. Patrick Jenkins ‘Barclays chief praises “substance” of Basel’ *Financial Times*, 17 October 2010, available at <http://www.ft.com/cms/s/0/6140eabc-da28-11df-bdd7-00144feabdc0.html>. Barclays is majority owner of South Africa’s ABSA.

⁴⁹ For a current example of ‘gaming’, see e.g. John Plender ‘Basel III is priming the big banks to work the system’ *Financial Times*, 21 September 2010, available at <http://www.ft.com/cms/s/0/37bf1f4c-c59a-11df-ab48-00144feab49a.html>. Exactly the same arbitraging behaviour took place in anticipation of the earlier, Basel II, rules. See e.g. Adrian Blundell-Wignall, Paul Atkinson & Se Hoon Lee ‘The current financial crisis:

rule could be written that can prevent this. Regulatory ecologies are inherently in a constant state of flux and regulators have to adapt to the endless unfurling of change. This in turn requires the focus of regulators to move from *direction* to *adaptation*.

What might such an adaptive approach to regulation look like?

Many of the emerging themes will not be surprising because they would be familiar to sophisticated administrative lawyers, judges and regulators. Viewing these themes together, however, perhaps requires us to change the basic orientation from which we would think about the administrative state and its regulation.

Here are a few examples.

First is a deep understanding of the structure and dynamics of the market to be regulated. This involves identifying and monitoring the basic conditions for market resilience and its system dynamics.⁵⁰ The variables will determine which regulatory tools to use and adapt in order to promote continued stability and manage what Keynes called our 'animal spirits'.⁵¹ Examples of such tools ranging from competition rules to self-regulation, absolute prohibitions to experimental variation, are common.

A recent example illustrates the way in which regulators have begun to learn from the dynamics of markets. In attempting to improve the ability of financial institutions to withstand sudden market shocks, particularly in times of generalised panic, financial regulators have been developing the concept of 'countercyclical regulation'. As adaptive regulators they are attempting to learn to recognise when a financial system gains precipitous momentum so that they can move to counteract that momentum and perhaps reduce the possibility of a plunge into chaos.⁵²

Regulators and administrative lawyers might also find it helpful to refine our understanding of the conditions in which markets emerge through a kind of self-generation. Sociologists use the term *autopoiesis*.⁵³ Despite the exotic

Causes and policy issues' (2008) 6/7 OECD *Financial Market Trends* (ISSN 1995–2864, available at <http://www.oecd.org/dataoecd/47/26/41942872.pdf>) describing how Citibank, along with many other banks, anticipated the new capital rules and adjusted their business to require lower capital.

⁵⁰ For an extensive analysis of the concept of resilience and its application and utility to regulation, see Ruhl op cit n 32.

⁵¹ John Maynard Keynes *The General Theory of Employment, Interest and Money* (1936: BN Publisher's ed, 2008) 161; George A Akerlof & Robert J Shiller *Animal Spirits: How Human Psychology Drives the Economy, and Why it Matters for Global Capitalism* (2010).

⁵² Basel Committee on Banking Supervision, International Regulatory Framework for Banks (Basel III 2010), available at <http://www.bis.org/bcbs/basel3.htm>.

⁵³ Autopoiesis, a concept imported from the biological sciences by the German sociologist, Niklas Luhmann, addresses the self-producing character of law and legal systems and the ways in which other sub-systems, such as the economic and political, communicate across systemic boundaries. See Niklas Luhmann *Law as a Social System* (translated by Klaus A Ziegert, Fatima Kastner et al) (2004); Guenther Teubner (ed) *Autopoietic Law: A New Approach to Law and Society*. See also Colin Scott 'Regulation

name, the autopoiesis of legal systems has, in traditional legal theory, been widely taken for granted as a condition of advanced legal systems. The validity of evolving elements of the law, such as the common law, tends to be explained by reference to preconditions for the validity of legal norms: sources of law are assessed for their validity by secondary laws, for example.⁵⁴ So too, the legal frameworks of markets are often assumed to be stable enough to be self-referential. Knowing when and how a self-sustaining market emerges would help us understand the degree to which regulation should be graduated in consonance with the need to promote resilience and stability.

Another growing field of knowledge is network dynamics.⁵⁵ Open and ever-expanding networks are shaping the behaviour of both market participants and regulatory communities. Terrorists and international money launderers exploit the power of networking; so too does the growing international collaboration by regulators. From network theory we learn both the enormous capability of market agents when appropriately networked and the limitations on what humans can meaningfully monitor and manage, which is important for risk management and its regulation. Network theory thus becomes central to regulatory understanding and risk management. Insights from the sciences provide unexpected applications for regulation. George Miller's 'magical number seven', which suggests severe judgement and memory limitations on the amount of information that we are able to receive, process, and remember,⁵⁶ and 'Dunbar's number', which posits that the size of the cerebral cortex imposes a constraint on the maximum number of social relationships we can meaningfully manage,⁵⁷ both suggest limitations on the scope of our ability to manage complex enterprises and the risks they generate. Furthermore, it is not effective to

in the age of governance: The rise of the post-regulatory state' in Jacint Jordana & David Levi-Faur (eds) *The Politics of Regulation: Institutions and Regulatory Reforms for the Age of Governance* (2004) 145, 150–4; J B Ruhl 'Complexity theory as a paradigm for the dynamical law-and-society system: A wake-up call for legal reductionism and the modern state' (1996) 45 *Duke LJ* 849 at 901–2 (distinguishing the 'open' approach of complexity theory from the "reductionism" to which theorists deploying autopoiesis tend to resort).

⁵⁴ H L A Hart *The Concept of Law* (1961).

⁵⁵ For extensive research on networks, see the Duke Network Analysis Center (DNAC) at <http://econ.duke.edu/people/kranton/networks>, and the Centre for Complex Network Research (CCNR) at <http://barabasilab.com>. See also the 2010 Ulam lecture, 'The connected world', given by Mark Newman at the Santa Fe Institute, 14 September 2010, available at <http://www.santafe.edu/research/videos/play/?id=be501a2f-cc0c-4fb2-b2ea-2994cf1e2320>.

⁵⁶ George A Miller 'The magical number seven, plus or minus two: Some limits on our capacity for processing information' (1956) 63 *Psych Rev* 81 (reproduced with permission online at <http://www.musanim.com/miller1956/>).

⁵⁷ See R I M Dunbar 'Neocortex size as a constraint on group size in primates' (1992) 22 *J Human Evolution* 469. Both Miller's and Dunbar's work have been popularised in the best seller by Malcolm Gladwell *The Tipping Point: How Little Things Can Make a Big Difference* (2000) at 175–81.

charge regulators with managing networks beyond their own ‘networking’ capabilities; so it might be that we can discern some optimal points of scale for regulatory agencies. Sometimes — counter-intuitively — multiple regulators might even be better than fewer, consolidated ones if co-ordination problems can be overcome.

Moving from the way in which market agents are connected to how they actually behave, we are acquiring increasing insight from the behavioural sciences. Unlike observers of complexity in the natural world, regulators of social and economic markets must take into account the fact that humans are *strategic* agents: they ‘game’ their interactions with others; and they prize identity and roles. Work on game theory⁵⁸ and identity economics⁵⁹ casts more light on market activity than does rational choice theory and helps to predict such things as second- and third-order consequences and what might motivate people beyond pure financial compensation.

Indeed, behavioural science is driving a stake through the heart of our assumption that our actions are based on rational choices. It turns out that we are actually ‘predictably irrational’.⁶⁰ We make decisions that are very often driven by interests and impulses we either do not recognise or we did not think might be the motive for acting. And when we act in groups the problem becomes even worse:⁶¹ we swarm, free load and act directly contrary to our interests much more than we like to think. This new knowledge helps us understand the irrational behaviour that seems to generate economic bubbles,⁶² behaviour that in 1720 led Sir Isaac Newton, after he had lost a fortune speculating in the stock of the famed South Sea Company, to lament that he could ‘calculate the motions of the heavenly bodies, but not the madness of people’.⁶³

Innovation is also an important phenomenon in any adaptive market. The financial crisis has been blamed partly on the innovation of dangerous new products. Yet innovation is also highly valued in competitive markets. So regulators must deepen their insights into the factors that generate or drive innovation, both good and bad, and recognise that prohibiting an activity can just as surely generate innovation, either desirable or destructive, as permitting it.

⁵⁸ See Robert Axelrod *The Evolution of Cooperation* (rev ed 2006).

⁵⁹ George A Akerlof & Rachel E Kranton *Identity Economics: How Our Identities Shape Our Work, Wages, and Well-Being* (2010).

⁶⁰ Dan Ariely *Predictably Irrational: The Hidden Forces that Shape Our Decisions* (2008). See also the delightful elaboration on this theme by David Segal ‘The X Factor of economics: people’ *New York Times Week in Review*, 16 October 2010, available at <http://www.nytimes.com/2010/10/17/weekinreview/17segal.html>.

⁶¹ See eg Mancur Olsen *The Logic of Collective Action: Public Goods and the Theory of Groups* (1971).

⁶² See Gary Stix ‘The science of bubbles’ *Scientific American*, 22 June 2009, available at <http://www.scientificamerican.com/article.cgi?id=the-science-of-economic-bubbles>.

⁶³ Quoted in Charles P Kindleberger & Robert Z Aliber *Manias, Panics, and Crashes: A History of Financial Crises* 5 ed (2005) 47.

Viewing a market ecology as a whole, we also cannot ignore the dynamics of the *regulators* involved. The regulators are, after all, agents in the market themselves. For more than four decades the debate over regulation has focused on which is worse, ‘market failure’ or ‘regulatory failure’. Yet these concepts are interdependent: tackling difficult issues such as ‘regulatory capture’, for example, requires more than just taking sides: very often regulators are not ‘captive’ but rather reactive agents just responding to buffeting forces of conflicting interests. Polar extremes, such as ‘regulation’ or ‘deregulation’, ‘government-regulation’ or ‘self-regulation’, though representing ends on spectrums, are sometimes not sensible as mutually exclusive or binary options: markets seldom, if ever, faithfully track one to the exclusion of the other.

There are many other examples of the impact an adaptive approach would have on traditional regulation. I will mention only one more because it has intriguing implications for general jurisprudence as well. This is the fact that the legal framework from which authorisation of administrative action is drawn might be more complex than our traditional models suggest. We are used in jurisprudence to identifying the validity of rules by reference to so-called secondary rules that determine their pedigree. Yet the ‘authorisation’ to act and react with ‘governmental’ force ‘seeps’ continuously from many sources, some of which are highly visible and formal, such as legislation and regulations, and some of which are the product of separate power bases such as locally-elected councils or other organised groups that have an interest in imposing structure and regularity.⁶⁴ I call this ‘multipollency’ to indicate the various fonts of political authority underlying legality.

One important source is judges themselves. Consider how important multipollency has become in South Africa where it is now the explicit duty of judges to engage in ‘transformative constitutionalism’. Cora Hoexter has described this new set of options for judges as ‘an entirely new bargain’ struck under the Constitution.⁶⁵ So a full understanding of when and how regulators can act requires a more dynamic or complex approach to questions of legality.

⁶⁴ At the grand constitutional level, every elected tier of government draws from the very fact of its election some authority that cannot realistically be described as ‘delegated’ from a central power. In the world of international financial regulation, on the other hand, ‘transnational regulatory networks’ such as the G20, the Financial Stability Board, and the Basel Committee provide structure without politically coherent authority. We cannot ignore the fact that such ‘governmental’ centres of power have a *de facto* authority that ultimately translates into real legal impact on agents within the global financial ecology — and that such agents influence these very governmental agents (for better or worse) themselves. So we need a science of ‘polity dynamics’, which would help us understand the ways in which variegated political authority mobilises, informs and validates market activity.

⁶⁵ Hoexter *op cit* note 4 at 284.

VI MORALITY FOR THE AMORAL BAZAAR

Allow me to turn now from the complexity of markets and their regulation to the importance of an overarching moral framework. No matter how sophisticated we become in understanding the various dimensions of regulated markets, we cannot ignore the moral values these markets are informed by and ultimately reflect.

To view the market as *amoral*, in the sense that each agent will be operating from his or her own moral perspective and not necessarily on some shared moral code, can sometimes help us see more clearly what incentives are at stake. Moral perspectives are only some of the many factors shaping emergent conditions.

Yet one of the most important regulatory mechanisms of all — indeed the glue that holds markets together — is a sense of mutual understanding among the participants and the critical *self*-regulation this induces. And mutual understanding endures only on the basis of a deep and widespread commitment to moral integrity within a market. So even though it has lately been unfashionable to focus on market morality and ethics, we ignore the moral dimension at our peril.

The modern economic conceptualisation of markets as ‘amoral’ has an ironic provenance. Those who would disparage the predictive capabilities of economists famously mock economics as a ‘dismal science’. But the label was originally coined to depict a science devoid of any moral core. It was Thomas Carlyle who, in 1849, first labeled economics a ‘dismal science’. He was an apologist for slavery, espousing an idealised notion of a society in which slaves would be happy if kept in their ‘proper place’. He despised economics because, in his view, theories of “supply-and-demand” and reduc[ing] the duty of human governors to that of letting men alone’ lacked moral principle. He took the ‘amoral’ arguments of great economists such as John Stuart Mill to be something ‘abject and distressing’.⁶⁶

Around the same time the 19th Century economist, Francis Edgeworth, began to emphasise that, as a discipline for scientific economic analysis, the ‘first principle’ of economics is that self-interest is the primary motivator of ‘every agent’.⁶⁷ Amoral utilitarianism became the sole measure of the wisdom of economic constraints. Later extremes in rational choice theory created the impression and perhaps even promoted an entire cultural disposition that market values should not be driven by moral values. Even now we read strictly ‘amoral’ defences of the behaviour of market participants during the subprime bubble that led to the Global Financial Crisis.⁶⁸

⁶⁶ See David Levy ‘150 years and still dismal! Thomas Carlyle’s problem with economics was its opposition to racial slavery’ (2000) 50:3 *The Freeman*, available at <http://www.thefreemanonline.org/featured/150-years-and-still-dismal/#>.

⁶⁷ See Amartya Sen *The Idea of Justice* (2009) 184 (discussing Edgeworth).

⁶⁸ See eg Robert T Miller ‘Morals in a market bubble’ (2009) 35 *Univ Dayton LR* 113. Cf Arnold Kling ‘The financial crisis: Moral failure or cognitive failure?’ (2010) 33 *Harv JL & Pub Policy* 507.

Such 'clear-eyed' logic bereft of moral compass is coming under attack by those who believe the financial crash reflects as much a deficiency in moral character as miscalculations of supposedly rational market participants.⁶⁹ Indeed, in criticising economists, Carlyle had apparently overlooked the fact that morality had deeply informed the views of economists from ancient times. It should be remembered that well before Carlyle's time the founder of modern economics, Adam Smith, had published not only his famous *Wealth of Nations*⁷⁰ but also the *Theory of Moral Sentiments*.⁷¹ In *Moral Sentiments* Smith displayed great concern for human welfare and the importance of a global moral framework for any successful economy.⁷² He never confused 'self interest' with the 'selfishness' of our latter day Wall Street anti-hero, Gordon Gekko.⁷³ On the contrary, Smith could hardly have been clearer about the connection between morality and prosperity:

[R]eal and solid professional abilities, joined to prudent, just, firm, and temperate conduct, can very seldom fail of success . . . success . . . almost always depends upon the favor and good opinion of . . . neighbors . . . we may generally expect a considerable degree of virtue; . . .⁷⁴

Yet Smith is constantly invoked by those who would assert that moral principle is only marginal to market analysis. As Amartya Sen has put it, Adam Smith 'has had much smallness thrust upon him'!

Sen and others,⁷⁵ including complexity theorists,⁷⁶ have recommenced the difficult task of working out how a coherent moral framework for complex markets might be articulated. This is a new moral jurisprudence that is essential to the orderly functioning of markets. Economic law does in fact rest on many deep traditions of moral principle upon which stable markets have long depended. Obvious examples include obligations of fiduciary duty, insurable interest, good faith and honest dealing.

⁶⁹ See Kevin T Jackson 'The scandal beneath the financial crisis: Getting a view from a moral-cultural mental model' (2010) 33 *Harv J L & Pub Policy* 735.

⁷⁰ Smith op cit note 7.

⁷¹ Adam Smith *A Theory of Moral Sentiments* (1759).

⁷² See Sen op cit note 67 at 185–6; Amartya Sen 'Capitalism beyond the crisis' *New York Review of Books*, 26 March 2009, available at <http://www.nybooks.com/articles/archives/2009/mar/26/capitalism-beyond-the-crisis/>.

⁷³ Sen op cit note 67 at 186. See also Gavin Kennedy 'Adam Smith and the invisible hand: From metaphor to myth' (2009) 6 *Econ J Watch* 239. Gordon Gekko is the leading character (Michael Douglas) in the movie *Wall Street* (1987), famous for asserting that '[g]reed, for lack of a better word, is good'.

⁷⁴ Smith op cit note 71 I.iii.3.5 at 63. See also VII.ii.4.13 at 312–13, rejecting Dr Mandeville's 'favourite conclusion, that private vices are public benefits'.

⁷⁵ See e.g. Kling op cit note 68; Jackson op cit note 69.

⁷⁶ Complexity theorists have indeed begun work on trying to link the dynamics of markets to the public values we can require regulators to promote. See Chinen 'Governing Complexity' op cit note 21 at 55. Professor Chinen suggests a fruitful link between economic analysis, complexity theory and public morality, and cites to Iris H-Y Chiu 'Enhancing responsibility in financial regulation — Critically examining the future of public-private governance' (2010) 4 *Law & Fin Markets Rev* 170 (part I); and 4 *Law & Fin Markets Rev* 286 (part II).

Doctrinal conceptualism sometimes stands in the way and enables rogue agents to engage in arbitrage, avoiding legal accountability by exploiting doctrinal limitations in existing jurisprudence.⁷⁷ Personal responsibility, for example, has become too diluted in modern commercial law. Insights from complexity science and specific social sciences such as criminology suggest rethinking principles of corporate criminal liability so that personal accountability, and therefore real accountability for corporate decisions, might be restored to the markets.⁷⁸

VII CONCLUSION

Let me conclude by acknowledging that the exciting possibilities for adaptive regulation in markets are not without their dangers.

There is understandable skepticism about any ‘new’ science, no matter how deep its antecedents, because its efficacy is not proven by long experience, its disciplines are not fully developed, and because it threatens the high priests of orthodoxy. In America recently a physicist at the Santa Fe Institute, the nation’s leading center for complexity studies, wanted to apply complexity methods by using advanced computing power to map human economic behaviour in ways similar to how weather and climate change is tracked. He was initially denied funding by the National Science Foundation when lower-level neoclassical economists opposed the proposal because it did not fit their requirement that such models tend to general equilibrium. The physicist received his grant only after a sympathetic higher-level officer overruled the objections.⁷⁹

⁷⁷ As always, Niall Ferguson brings astute historical insight to bear in observing that: ‘The real lesson of history is that regulation alone is not the key to financial stability. Indeed, over-complicated regulation can be the disease it purports to cure, by encouraging a culture of box-ticking “compliance” rather than individual moral judgment. The question that gets asked in highly regulated markets is not: “Are we doing the right thing?” but “Can we get away with this?” What is more important is to instill in financial professionals framework that was the basis of Siegmund Warburg’s life and work. “Success from the financial and from the prestige point of view . . . is not enough”, Warburg told his fellow directors in 1959. “What matters even more is constructive achievement and adherence to high moral standards in the way in which we do our work.”’

Niall Ferguson ‘To do “God’s work,” bankers need morals’, available at <http://www.niallferguson.com/site/FERG/Templates/ArticleItem.aspx?pageid=234>. Ferguson is the biographer of the great financier. See Niall Ferguson *High Financier: The Lives and Time of Siegmund Warburg* (2010).

⁷⁸ See eg the work being done by Bill Black: William K Black ‘When fragile becomes friable: Endemic control fraud as a cause of economic stagnation and collapse’ in K Naga Srivalli (ed) *White Collar Crimes: a Debate* (2007) 162–78; ‘“Control frauds” as financial super-predators: How “pathogens” make financial markets inefficient’ (2005) 34 *J Socio-Econ* 734 and ‘Testimony before the Financial Crisis Inquiry Commission’, 21 September 2010, available at <http://www.fdic.gov/hearings/pdfs/2010-0921-William-Black.pdf>.

⁷⁹ Michael Hirsh ‘Our best minds are failing us: With America in deep trouble, our economists are AWOL, and our scientists are still off “financial engineering”’ *News-*

The overall discipline is indeed new and methodologically immature. So the principles of cautious development that Justice Schreiner urged when addressing the common law⁸⁰ and its development by the courts remain as apposite as ever.

Some of the intellectual contributions over the past century and a half have also become associated with discredited policies, programmes and beliefs. It is easy to conclude that a population approach to markets implies 'survival of the fittest' and, even worse, some kind of eugenics.⁸¹ Modern science is demonstrating why these conclusions are simply wrong. An objection might be heard that to embrace Hayek's or Von Savigny's understanding of the evolution of law and policy would entail also embracing Hayek's rejection of government regulation as a dangerous threat to freedom, or Savigny's *volksgeist* as later distorted by the Nazis. There are dangerous connotations to many of the breakthroughs in scientific understanding, but they occur when the science is abandoned and ideology is substituted instead. This counsels rigorous adherence to the scientific basis for regulatory policies.

Last, but equally important, while understanding markets to be 'amoral' for analytical purposes is sometimes probative, this should not lead us to neglect the moral dimensions of both markets and regulatory policy. Markets cannot long survive without moral precepts. Recent events have seen a sad shortage of ethical behaviour and a considerable degree of hubris. Former Chairman of the United States Federal Reserve System Alan Greenspan famously described the mood as one of 'irrational exuberance', though even he failed to understand the complex implications at the time. We are reminded that we would do well to remember that orderly markets also depend on the kind of humility, self-restraint and rectitude that made Judge Schreiner the great jurist he was.⁸²

week, 16 September 2010, available at <http://www.newsweek.com/2010/09/16/our-best-economic-minds-are-failing-us>.

⁸⁰ See Kahn *op cit* note 2 at 67–9, describing Schreiner's 'Holmesian' view of the common law, which, with the 'life of the law' being 'experience, not logic', fits well with the evolutionary notion of common law as a complex adaptive system.

⁸¹ Cf J Wes Ulm 'Cachet of the cutthroat' (2010) 16 *Democracy* 58, available at <http://democracyjournal.org/article.php?ID=6740>, describing the damaging impacts of 'social Darwinism'.

⁸² See Kahn *op cit* note 2 at 22, describing the time Justice Schreiner refused to pull rank or permit a traffic policeman to discard a ticket that was about to be written up for Schreiner's speeding, even though the Justice felt that the speed limit in that area was unfair.