

Can We Escape the Program? Inventing Possible~Impossible Futures in/for Australian Educational Research

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Abstract

This essay brings together two lines of inquiry. Firstly, I revisit research on futures in education conducted during the 1980s and re-examine some of the propositions and principles that this research generated about 'the future' as an object of inquiry in education. Secondly, I argue that the language of complexity invites us to rethink education in terms of emergence, and potentially destabilises the instrumentalist rationality that 'programs' educational systems to privilege orderly and predictable processes culminating in stable output, a potentiality that may be undermined by a pervasive politics of complexity reduction. I conclude by drawing upon these two lines of inquiry to outline some strategies that might resist complexity reduction and catalyse emergence in Australian educational research as preconditions for inventing possible~impossible futures.

Preamble

When the path is clear and given, when a certain knowledge opens up the way in advance, the decision is already made, it might as well be said there is none to make: irresponsibly, and in good conscience, one simply applies or implements a program. Perhaps, and this would be the objection, one never escapes the program. In that case, one must acknowledge this and stop talking with authority about moral or political responsibility. The condition of possibility of this thing called responsibility is a certain *experience and experiment of the possibility of the impossible; the testing of the aporia* from which one may invent the only *possible invention, the impossible invention* (Jacques Derrida, 1992b, p. 41, italics in original).

The only way to discover the limits of the possible is to go beyond them into the impossible (Arthur C. Clarke, 1962, p. 21).

This essay attempts to bring together, in ways that I hope will be synergistic, two lines of inquiry that might seem to be disconnected from one another – not least because they are separated by 20 years of my academic life. Each line of inquiry addresses, in different but complementary ways, the paradoxical problematics that both Jacques Derrida and Arthur C. Clarke signal in the passages quoted above – paradoxes and problems that puzzle poststructuralist philosophers and authors of science fiction alike, and which necessarily attend the ways that we think, act and responsibly position ourselves in relation to unpredictable, uncertain, unknowable and incalculable futures.

In part 1, I revisit research on futures in education in which I participated during the 1980s and re-examine some of the propositions and principles it generated, with particular reference to the ways in which we understand 'the future' as an object of scholarly inquiry. I suggest that a number of these propositions and principles remain relevant to current explorations of futures in/for¹ educational research. This research disposed me to value alternatives to what Derrida calls 'the program' – the 'clear and given' path that 'certain knowledge opens up... in advance' and that draws us toward a future that we are 'programmed', as it were, to produce. This research also disposed me to distrust categorical distinctions between 'possible' and

‘impossible’ futures and to see generative potentialities in refusing to demarcate them. I now prefer to think of *possible~impossible* futures, where the ~ (tilde) signals a conjoining of complicated notions.² This reconfiguration of Derrida’s expression – ‘the possibility of the impossible’ – is similar in intent to Bill Green’s (2009) recent explication of ‘the (im)possibility of the [education] project’, in which he also is concerned ‘with possibility *and* impossibility’, with the two ‘to be thought together, as co-implicative, or rather, as necessarily, inescapably contaminated each with the other’ (p. 1).

In part 2, I suggest that the language of *complexity* – a heterogeneous assemblage of concepts and metaphors arising from complex systems theorising in a variety of scholarly disciplines – invites us to rethink education in terms of *emergence*. As Jeffrey Goldstein (1999) writes, emergence ‘refers to the arising of novel and coherent structures, patterns, and properties during the process of self-organization in complex systems’ (p. 49). Complex self-organising systems provide conditions in which Derrida’s ‘impossible inventions’³ might emerge because the radical novelty of emergents cannot be anticipated before they actually materialise – they emerge from experimentation with what, *in the present*, does not yet appear to be possible. Complexity potentially destabilises the instrumentalist rationality that, as I will also suggest in part 2, ‘programs’ educational systems (and the agents/agencies within them) to privilege orderly and predictable processes culminating in stable output. However, although complexity offers an opportunity to ‘escape the program’, this potentiality is undermined by a politics of *complexity reduction* – a pervasive tendency in Australian public life to which I briefly drew attention in my 2008 AARE Presidential address (published as Gough, 2009) and have since elaborated elsewhere (Gough, 2010a).

In part 3, I draw upon these two seemingly disparate lines of inquiry to suggest some strategies that might enable those of us who are so inclined to ‘escape the program’ by resisting complexity reduction and catalysing emergence in Australian educational research so as to create conditions conducive to inventing possible~impossible futures.

1: On Futures (in/for Education)

Writing now about futures gives me a distinct sense of *déjà vu*, because exploring the conceptual territory of futures in education was a major focus of my teaching, research and writing from the mid-1970s and throughout the 1980s. From 1975 I taught an elective, Futures in Education, in the secondary teacher education programs offered at the institution now known as Deakin University (see Gough, 1981).⁴ At that time, most of the resources for futures study and research were being produced in the US by institutions such as the Rand Corporation, the Institute for the Future, the Hudson Institute, and the World Future Society. Increasing numbers of undergraduate and postgraduate courses in futures study were being taught in the US and Canada, and a survey by Wentworth Eldredge (1973) revealed that between 1970 and 1972 the numbers of such courses rose from 40 to approximately 200. However, in Australia, as Peter O’Brien (1976) points out, ‘futures researchers [were] few and far between, especially in education’ (p. 51). O’Brien taught what he called a ‘futurological’ course in the School of Education at Macquarie University in 1974 and in 1975 developed an Educational Futures elective in the Diploma of Education program at the University of Newcastle. Others among the few to whom O’Brien refers included a futures-oriented research group in the Australian National University’s School of Social Sciences, led by Fred Emery,⁵ that produced a book, *Futures We’re In* (Emery, Emery, Caldwell & Crombie, 1974), and Ron Browne and Barry McGaw (1974) who were funded by the Australian Advisory Committee on Research and Development in Education in 1972-3 to conduct a Delphi study of alternative policies in teacher education (see also McGaw, Browne & Rees, 1976).

In the early 1980s Australian Frontier, a research organisation concerned with social planning and policy sponsored by the Australian Council of Churches, hosted a Future Directions Conference at La Trobe University (Henry & Thomson, 1980), together with a small number of follow-up meetings and publications (Engel, 1988). Heightened public interest in futures followed the publication of Barry Jones's (1982) popular book, *Sleepers, Wake! Technology and the Future of Work*. As Australia's Minister for Science from 1983 to 1990, Jones provided further impetus for futures-focused discussion, debate and planning by establishing the Commission for the Future (CFF) in 1985. Together with The Australian Bicentennial Authority, the CFF initiated the Bicentennial Futures Education Project, which resulted in the publication and wide dissemination of a number of resources for futures research and study, including the edited collection, *Studying the Future: An Introductory Reader* (Slaughter, 1989). Further ways in which the CFF catalysed futures research in education included cosponsoring the first national conference on Futures in Education (see Noyce, 1986), commissioning a handbook on futures research methodologies (Tydeman, 1987), and commissioning a number of surveys (Eckersley, 1987, 1988) and other projects (Beare & Millikan, 1988).⁶ The CFF also helped to create a hospitable climate for futures-oriented inquiry by other individuals and organisations, including foci on issues such as predicted futures and curriculum change (Griffin, 1986), young people's visions of future worlds (Wilson, 1987), designing future environments (Mochelle, 1986), critical futures study (Slaughter, 1986), and futures in curriculum (Gough, 1986, 1988).

Towards the end of the 1980s I attempted to synthesise what I had learned from my active participation in the development of an Australian futures education field during the previous decade in three essays written for different audiences. The first of these, 'Futures in curriculum: the anticipatory generation of alternatives' (Gough, 1988), explicitly related futures study to Joseph Schwab's (1969) influential work on 'the practical' as a language for curriculum, and was intended chiefly for a higher education audience. The second essay, 'Seven principles for exploring futures in the curriculum' (Gough, 1989), was a contribution to Richard Slaughter's (1989) *Studying the Future: An Introductory Reader* and, because the *Reader* was to be widely disseminated in Australian schools through the Bicentennial Futures Education Project, it was in some ways a less 'academic' version of 'Futures in curriculum'. In both of these curriculum-focused essays I adopted Lawrence Stenhouse's (1975) position that a curriculum should be 'an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation into practice' (p. 4). My essays were, therefore, attempts to communicate principles for developing futures curricula (based on my research and experience) to my school and university teaching colleagues that were open to their critical scrutiny and able to be translated into practice. I will briefly discuss the relevance to education research of a number of the principles enunciated in these two essays later in this section.

The third essay, 'Futures in Australian education: tacit, token and taken for granted' (Gough, 1990), was written as an invited contribution to a special issue of *Futures* on futures for Australia and the Pacific. I examined the portrayal of futures in a range of Australian educational documents – policies, proposed programs, scholarly articles, press releases, polemics, etc. – from which I identified three common types of reference to the future: *tacit*, *token* and *taken-for-granted*. *Tacit futures* are unstated or unexplicated but are nevertheless present. For example, assumptions about futures are tacitly present in any document that contains concepts that refer forward in time (e.g., aims, objectives, outcomes), even if 'the future' is not explicitly mentioned. *Token futures* invoke futures concepts and terminology for purposes which are chiefly rhetorical or used to rationalise choices, decisions or judgments which have been made on other grounds. When 'the future' (or a futures-oriented inference) appears in the title of an educational document it often means much less than might be

expected. One of the more egregious examples of token futures in recent years appeared during Jeff Kennett's premiership of Victoria (1992-99), when the government he led used the forward-looking term 'Schools of the Future' to recreate in the government system the competitive corporatism that had long been the norm for private schools. 'Schools of the Future' reflected the past practices of private education and the economic ideology of the government of the day, so the phrase 'Schools of the Future' was no more than a token gesture, using language which appeared to herald a new and bold vision of education to disguise what was at heart a deeply conservative approach to public schooling. *Taken-for-granted futures* occur whenever a particular future, or range of futures, is described as if there were no alternatives. Discussions of futures framed solely in terms of science and technology, or work and leisure, or an education-led economic recovery, often appear in this category. A scan of the literature of futures research since 1990 suggests that characterising futures in educational discourse as tacit, token and taken-for-granted remains defensible (see, especially, Bussey, Inayatullah & Milojevic, 2008, reviewed in this issue).⁷ For example, David Hicks (2008) reports that 'discussion with teachers and teacher educators in various countries reveals that the future is largely a missing dimension within education' (p. 79).

Educational discourses continue to have a 'temporal asymmetry', that is, the temporal categories of past and present receive more frequent and more explicit attention than the future. For example, the history of education and comparative education are established sub-disciplines of educational inquiry, but there is no forward-looking equivalent of these. Indeed, I suspect that within the worldviews of many educational researchers futures might appear to be categorically 'unresearchable'. But, as already noted, assumptions about futures are a tacit presence in educational inquiry even when the object of study is thought to be located in 'the past' or 'the present'. This is because various kinds of expectations and intentions exercise a powerful (though often unacknowledged) influence on whatever we choose to try to recover from the past or observe in the present.

However, far from being 'unresearchable', futures study can be seen as a forward-looking equivalent of history. History cannot give us *the* past but is an attempt to discipline our *interpretations* of the (or a) past as it appears to us here, now. Similarly, futures study cannot tell us much about *the* future but is an attempt to discipline our *anticipations* of the (or a) future as it appears to us here, now. A common misconception of futures study is to equate it with prediction. But prediction is only one activity among many – and a rather narrow and unrewarding one that offers few opportunities to 'escape the program' – although the products of prediction (hopes, fears, probabilities) are data which can and should be drawn upon for analysis, synthesis and critical evaluation.

Among other things, prediction invests the future with an illusory objectivity – times to come are seen as places to visit, as if they had a material presence 'out there'. But futures exist in human minds and, thus, in an objective sense they are never 'out there' but, rather, are always here, now. Recognising that futures are components of present action and existence liberates the critical and creative imagination. It allows us to explore longer time frames than those usually dared by empiricists and, unlike those who are concerned with prediction and control, to explore possible futures without colonising them. Thus, the types of futures study which can expand the horizons of education are, perhaps paradoxically, located firmly in our present consciousness, in critical reflection on the concepts, values, meanings, images and metaphors that we use to navigate our ongoing journey through time.

With a view to building on the research on futures in curriculum that I (and others) conducted during the 1980s,⁸ I will revisit a number of concepts and principles that I explicated in the three essays to which I have drawn attention above (Gough, 1988, 1989, 1990), and which continue to characterise futures study and inquiry into the present:

- anticipating a plurality of futures

- an eclectic approach to sources and methods
- the rehearsal of surprise
- uses and critique of SF
- critique and negotiation of meanings

I briefly summarise each of these characteristics below, drawing attention where appropriate to their relevance for contemporary research practices and to the ways in which some of them resonate with aspects of complexity discussed in Part 2 of this essay.

Anticipating a plurality of futures

At any given time many futures may be possible and we should be alert for the narrowing of vision that characterises most attempts to predict or prescribe ‘the’ future (singular); futures (plural) thinking is mostly concerned with the elucidation and critique of *alternatives* among which we can distinguish three broad categories:

- *probable*: futures to which probabilities can be assigned by reference to present events and trends
- *possible*: anything that we can imagine is possible (including that which seems ‘impossible’ in the light of knowledge that we presently hold to be ‘certain’), although some possibilities will appear to be more plausible than others
- *preferred*: desirable alternatives among those which seem possible. They are not necessarily probable at present and can also be expressed negatively (as undesirable futures that we would prefer to avoid). Since one purpose of exploring futures is to improve upon past and present policies and practices, we should seek to elucidate preferred futures by imagining and exploring the implications of possible alternatives rather than by choosing among those alternatives which might now seem most probable.

Observers of complex self-organising systems anticipate a plurality of futures because emergent properties and behaviours have features that are not previously observed in the complex system under observation and are neither predictable nor deducible from their components.

An eclectic approach to sources and methods

Images of alternative futures usually arise from four major sources and elucidated by corresponding methods and procedures:

- *extrapolation*: perceived consequences of present trends and events can be elucidated by trend analysis and extrapolation
- *consensus*: opinions about what might or ought to happen can be elucidated by monitoring cultural and sub-cultural consensus using polls, commissions of ‘experts’, search conferences (Emery & Purser, 1996) and variations on Delphi techniques. For an excellent example of the use of a modified Delphi technique in educational research see Walter Parker et al. (1999)
- *creative imagination*: the speculative imagination of creative artists in various media produces images of alternative futures that can be further elucidated by their critique and, to some extent, by emulating their creative practices (for example, scenario-building frequently emulates science fiction)
- *combining* images from extrapolation, consensus and creative speculation produces further images of alternative futures. Combinatory techniques (such as cross-impact matrices, relevance trees, futures wheels etc) are among the most characteristic tools of professional futurists.

To date, the anticipation of futures in educational inquiry has depended to a large extent on extrapolation from present trends or on a limited consensus among ‘experts’ and culturally dominant elites. For example, Jim Scheurich and Michelle Young (1997) argue persuasively that ‘all of the epistemologies currently legitimated in [Euro-American] education arise exclusively out of the social history of the dominant White race’ (p. 8) This restricts the range of possible epistemologies and methodologies available to us, and makes non-dominant constructions of knowledge suspect, pathological, sensational, or simply illegitimate. Thus, the extension of consensus techniques to broader and more culturally inclusive publics might be one way to generate multiple alternative futures in educational inquiry.

In *The Wisdom of Crowds*, James Surowiecki (2004) presents numerous case studies and anecdotes that suggest a need for further rigorous research on what we might call ‘collective wisdom’. Surowiecki’s focus is on the aggregation of information in groups; he argues that a diverse collection of independently-deciding individuals is likely to make some types of decisions and predictions better than individuals or even experts. The criteria that Surowiecki cites as separating ‘wise’ from ‘unwise’ crowds have a number of convergences with understandings of complex systems, such as we find in ant colonies that resolve problems of a complexity that far outstrips the information-processing capabilities of an individual ant with very limited data.

Uses and critique of SF

The initials ‘SF’ now signify much more than ‘science fiction’. As Donna Haraway (1989) writes:

In the late 1960s science fiction anthologist and critic Judith Merrill idiosyncratically began using the signifier SF to designate a complex emerging narrative field in which the boundaries between science fiction (conventionally, sf) and fantasy became highly permeable in confusing ways, commercially and linguistically. Her designation, SF, came to be widely adopted as critics, readers, writers, fans, and publishers struggled to comprehend an increasingly heterodox array of writing, reading, and marketing practices indicated by a proliferation of “sf” phrases: speculative fiction, science fiction, science fantasy, speculative futures, speculative fabulation’ (p. 5).⁹

SF is a particularly important resource for futures study. In any given historical period, creative artists have generated some of the most powerful images of possible~impossible futures. These images are communicated to society at large, transmitted from generation to generation through storytelling, and often are significant in shaping people’s expectations, hopes and fears. Thus, for example, the speculative storytelling of the eighteenth and nineteenth centuries, up to and including the utopian fiction of Jules Verne and the early writings of H. G. Wells, presented images of a future (Western) society in which the quality of human life had been vastly improved through science and technology. Such images inspired confidence in the present and hope that the destiny foretold by those images would eventuate.

Much speculative storytelling of the past century has been dystopian rather than utopian. Writers such as Karel Capek (1923), Aldous Huxley (1932), and George Orwell (1949) directed readers’ imaginations towards grimmer possibilities. But their stories were much more than mere warnings of potential dangers: each of these writers also provided conceptual tools – images, symbols, metaphors – which have materially influenced decisions and shaped expectations that we have needed to avoid (to some extent and so far) the possible futures they depict. The vocabulary and concepts they created – such as ‘robot’ (Capek), ‘brave new world’ (Huxley), and ‘big brother’ (Orwell) – have been taken up and used in identifying and responding to the uncertainties and dangers that have accompanied technological progress.

William Gibson's coinage of the term 'cyberspace' in his short story, 'Burning Chrome' (1982), is a more recent example of an SF author imagining possible~impossible futures in terms that have helped to shape them. In Gibson's first novel, *Neuromancer* (1984), cyberspace is characterised in a voice-over commentary to a children's TV show:

'Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts... A graphic representation of data abstracted from banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding...' (p. 51, ellipses in original).

Gibson later commented on his choice of the term in Mark Neale's (2000) documentary film, *No Maps for These Territories*:

All I knew about the word 'cyberspace' when I coined it, was that it seemed like an effective buzzword. It seemed evocative and essentially meaningless. It was suggestive of something, but had no real semantic meaning, even for me, as I saw it emerge on the page.

Gibson's achievement was to create an allusive imaginary, the bare verbal bones of an idea to which many others have added flesh. For example, throughout the 1990s, internet activist communities, such as the Electronic Frontier Foundation (EFF), used the term increasingly in public education campaigns promoting the idea of digital rights, exemplified by the EFF's mission statement (1990) and EFF cofounder John Barlow's (1996) *Declaration of the Independence of Cyberspace*.

Rehearsal of surprise

We can prepare for the possible surprises of the future by rehearsing the experience of surprise. Surprise may be manifested in various ways and can entail, for example, being amused, amazed, bewildered, dismayed or shocked. The rehearsal of surprise may thus include deliberately seeking out, or inventing, images of alternative futures that we perceive to be humorous, fantastic, puzzling or disturbing. A number of recent studies have investigated surprise in terms of the dynamics of complex adaptive systems. For example, Reuben McDaniel et al. (2003) offer a complexity perspective on surprise that generates new questions and understandings in health care management.¹⁰ More recently, Darren Stanley (2009) draws upon principles from the complexity sciences to consider the lived human experience of surprise as an emergent phenomenon that arises from a complex system.¹¹

Much SF rehearses surprise. To take one example that is particularly pertinent to the studies of complexity to which I refer in the next part of this essay, Bruce Sterling (1985, 1987, 1989, 1990) has richly imagined a future in which Ilya Prigogine's account of complex systems in nature has long been a culturally dominant paradigm. In Sterling's (1989) future history, Prigogine is an 'ancient terran philosopher' (p. 50) whose theories of evolution have been borne out by subsequent developments in social, biological and technological organisation. This 'Prigoginic' worldview is so taken-for-granted that it is taught in schools, much as atomic theory is today. There is, however, a subtle (and amusing/surprising) difference, as we learn from a young student in Sterling's (1985) *Schismatrix*:

[The student] pulled a notebook from inside his willow-printed coat. He read loudly, desperately. 'A dissipative self-organizing system evolves along a coherent sequence of space-time structures. We may distinguish between four different dimensional frameworks: autopoiesis, ontogeny, phylogeny, anagenesis.'

'And this is from my *poetry* class!' (p. 244)

For a more ‘academic’ rehearsal of futures that might surprise many contemporary educators see John Weaver’s (2010) simultaneously wonder-full and dread-full *Educating the Posthuman* (reviewed in this issue), which takes readers on what Peter Appelbaum (2010) calls ‘a joyously horrific amusement-park-ride through the constantly shifting oxymorons of posthuman humanism’ (p. viii), including the turbulent intersections of biosciences, fiction and curriculum studies.

Critique and negotiation of meanings

Rehearsals of surprise are useful to the extent that they generate alternatives, but their utility diminishes if they escape critical scrutiny and are allowed to sediment into taken-for-granted futures. For example, the popularity of Alvin Toffler’s (1970) *Future Shock* was at least partly due to its self-proclaimed ‘shock value’, although many of its central ideas would have been known to readers familiar with the literatures of sociology, organisational management or SF. For example, Toffler is often credited with coining the term ‘information overload’,¹² but Bertram Gross (1964) had already used it as a chapter title in his book, *The Managing of Organizations* (p. 857), and Ray Bradbury (1953) was one among many SF writers who dramatised the psychological effects of information overload in his short story, ‘The Murderer’. Toffler raised public awareness of the possible consequences of accelerated rates of technological and social change, but he also popularised an uncritical acceptance of such tortured metaphors as ‘disease of change’ and ‘collision with the future’, which are not so much insightful as they are incoherent. Concepts and guiding images that mediate our interpretations of experience and anticipations of future possibilities require critical analysis, whether they be new offerings by academics or pop futurists or are already embedded in everyday language in the form of inherited meanings, traditions, values, paradigms, myths, metaphors, and other figures of speech.

One way in which talk about futures often fails to penetrate the taken-for-grantedness of meanings embedded in everyday language is exemplified by the use of the cliché ‘in the balance’ to refer to uncertain futures for some present object of inquiry. This encourages a polarisation of possible futures, implying that the uncertainty will be resolved in one of only two ways, which must be ‘weighed’ against each other. For example, *In the Balance: The Future of Australia’s Primary Schools*, is a report of research conducted on behalf of the Australian Primary Principals Association (APPA) (Angus, Olney & Ainley, 2007), which surveyed staff from a sample of 160 primary schools in order to examine the capacity of Australian primary schools to ‘meet the expectations set by governments under the conditions in which they now operate’ (p. iii). In the report’s foreword, the President of APPA asserts: ‘The title, *In the Balance*, suggests that primary schooling has reached a critical moment’ (p. iii), as if predicting that primary schooling has reached some sort of ‘tipping point’ in which it changes irreversibly from one state to another. But the report’s conclusions simply tell readers the unsurprising news that ‘there are large variations among Australian primary schools in terms of almost every practical indicator, including their intakes, their funding and the levels of student academic performance. As a result, some schools are under much more pressure than others’ (p. 105). These are the sorts of conditions that contribute to the generally slow pace of social change rather than hastening it.

How not to ‘escape the program’: Gage’s scenarios for the ‘paradigm wars and their aftermath’

In the course of revisiting my work on futures in education during the 1980s I reacquainted myself with one of the few essays on educational research from that period that explicitly canvassed alternative futures. In 1989 Nathaniel (‘Nate’) Gage addressed the annual meeting of the American Educational Research Association (AERA) as the recipient of the 1988

AERA Award for Distinguished Contributions to Educational Research.¹³ Gage's (1989) address, 'The paradigm wars and their aftermath: a "historical" sketch of research on teaching since 1989', offered alternative scenarios for research on teaching from the perspective of a future researcher reviewing the past. The published version's abstract and first paragraph, quoted in full below, illustrate Gage's rhetorical mode, which skilfully weaves serious scholarship into an entertaining public lecture:

Raging during the 1980s, the Paradigm Wars resulted in the demise of objectivity-seeking quantitative research on teaching – a victim of putatively devastating attacks from anti-naturalists, interpretivists, and critical theorists. Subsequently, the interpretivists' ethnographic studies flourished, enhancing the cultural appropriateness of schooling, and critical theorists' analyses fostered the struggles for power for the poor, non-Whites, and women. Two alternative versions of the aftermath are also conceivable. Pragmatism and Popper's piecemeal social engineering offer paths toward a productive rapprochement of the paradigms, one guided by the moral obligations of educational research.

As I begin this history, we have arrived at the year 2009 – a decade after the turn of the millennium – and are looking back at what happened in research on teaching during the 2 decades since 1989. Why have I chosen 1989 as the year in which to begin this historical sketch and commentary? Because it was in 1989 that what came to be known as the 'Paradigm Wars' had come to a sanguinary climax (p. 4).

Gage equates the 'paradigm wars' with criticisms of 'objective-quantitative' methods by those who adhere to 'interpretive-qualitative' and 'critical-theoretical' worldviews, and describes three scenarios for their aftermath. In the first scenario the critics of the 'objective-quantitative' position (with which Gage clearly identifies) are ascendant:

What happened as a result of this onslaught from the antinaturalists, the interpretivists, and the critical theorists? As you all know, the critics triumphed. During the 1990s and thereafter, the kind of objectivist-quantitative, or scientific, research on teaching that had been done up through the 1980s ground to a halt. The field saw almost no correlational or experimental studies of teaching using structured observation systems intended to enhance objectivity (p. 6).

In Gage's second scenario the 'interpretivists' and 'critical theorists' continued their work and brought about 'the kinds of improvement in curriculum and teaching that their ideas implied':

But what did not happen was the decline in so-called positivistic or mainstream research on teaching. This decline did not occur, because the field of research on teaching, and educational research at large, indeed the social sciences as a whole, recovered from their confusion and came to a great awakening (p. 6).

Gage characterises his third scenario as the epitome of the aphorism, 'the more things change, the more they remain the same':

What happened after 1989 in research on teaching was pretty much the same as what happened before 1989. The invective and vituperation continued. The objective-quantitativists persisted, and the interpretive-qualitativists also carried on. The critical theorists continued to regard both groups as engaged in mere technical work, more or less, on the details of education and teaching while neglecting the social system that determined the basically exploitative and unjust nature of education in capitalist society (p. 9).

I have no interest in contesting Gage's (1989) views on research methodology, but it might be useful to draw attention to the differences between his approach to forecasting alternative

futures and the five characteristics of futures study and inquiry that I discuss above. Gage's essay implicitly accords with the first characteristic – he anticipates a plurality of futures – but thereafter the respective approaches diverge. His approach to sources and methods is not eclectic – he relies on extrapolating scenarios from the consequences of present trends and events (as he perceives them). He ignores the possibility of surprises and the sources that might rehearse them (such as SF) and seems to assume that the meanings he attributes to his key terms (such as the labels he uses for the three paradigms he recognises) will remain fixed for 20 years (rather than being subject to critique, negotiation and reconceptualisation).

The limitations of Gage's anticipatory methods are perhaps best exemplified by their most obvious 'blind spot'¹⁴: in the world that Gage imagines from 1989-2009, *poststructuralism does not exist*. This is not particularly surprising. Although Derrida was well-known to US literary theorists in the 1960s and 1970s (and to US philosophers sometime later), poststructuralism and deconstruction had little impact on US educational theory until the mid-to late-1980s when scholars such as Cleo Cherryholmes (1987, 1988) began to publish 'poststructural investigations'.¹⁵ My point is not that Gage should have anticipated poststructuralism as such but, rather, that he might have considered the possibility that some futures for educational inquiry might be effects of continuities and changes that were already taking place outside the communities of practice represented in AERA.

2: On Complexity (in/of Education)

The terms 'complexity' and 'science' began to be linked explicitly in the 1940s¹⁶, especially in fields such as systems biology and cybernetics, although scientific studies of complex systems appear as early as the 1870s in Willard Gibbs' pioneering research on multiphase chemical thermodynamics (see Weaver, 1948). As a number of science scholars have pointed out (e.g., Casti, 1997), science from Newton's era until the late nineteenth century focused on the material structures of simple systems, but subsequently much scientific inquiry has examined the informational structures of complex systems, such as protein folding in cell nuclei, task switching in ant colonies, the nonlinear dynamics of the earth's atmosphere, and far-from-equilibrium chemical reactions. Because complexity is a quality of many networked systems, it has also been a focus for inquiry and speculation in the social sciences, humanities and arts; noteworthy examples include Katherine Hayles's (1990, 1991) studies of complex dynamics in literature and science, Paul Cilliers' (1998) syntheses of insights from computational theory with those of postmodernist philosophers (e.g., Derrida and Lyotard), and David Colander's (2000) edited collection of essays on the implications of complexity for teaching economics.¹⁷

As Cilliers (2010) points out, 'there is no coherent "complexity theory" which will unlock the secrets of the world in any clear and final way' (p. vii). A number of authors prefer to speak about 'complexity' rather than 'complexity theory', emphasising that complexity is not necessarily (or not exclusively) a theory, but might also be understood as an ontology or methodology (see, e.g., Biesta & Osberg, 2010). For example, Nigel Thrift (1999) suggests that complexity is a rhetorical hybrid that takes on new meanings as it circulates in and through a number of actor-networks and, as it encounters new conditions, generates new hybrid theoretical and rhetorical forms. He further suggests that complexity signals the emergence of 'a new structure of feeling in Euro-American societies, which frames the future as open and full of productivity' (p. 31). In this sense, complexity invites us to understand that many of the processes and activities shaping our 'natural'¹⁸ and social worlds are open, recursive, organic, nonlinear and emergent. Conversely, it also invites a degree of caution in accepting explanations of these processes and activities that are couched in mechanistic and/or reductionist terms – terms that assume linearity, determinism and predictability and, therefore, assume that these processes and activities can be controlled (at least in principle).

William Doll (1986, 1989, 1993) was one of the first education scholars to explore the theoretic and practical implications of reconceiving curriculum, teaching and learning in terms of emergence, disequilibrium, dissipative structures and other concepts associated with chaos theory and complex systems theorising in the natural sciences, with particular reference to Prigogine's (1980) thermodynamics.¹⁹ Doll demonstrates that such concepts make it possible to see the non-linear, unpredictable and generative characteristics of educational processes and practices, and encourage us to value that which is unexpected and/or beyond our control. More recently, Deborah Osberg and Gert Biesta (2007) also have theorised the epistemological and pedagogical implications of emergence by drawing on Prigogine's research on 'irreversible processes' (Prigogine & Stengers, 1984, p. 310) in open and far-from-equilibrium chemical systems that give rise to increasingly higher levels of organisational complexity and which, in Jaegwon Kim's (1999) words, 'begin to exhibit novel properties that... transcend the properties of their constituent parts, and behave in ways that cannot be predicted on the basis of the laws governing simpler systems' (p. 3). Osberg and Biesta (2007) refer to this type of emergence as 'strong', thereby distinguishing it from what Mark Bedau (1997, 2008), among others, calls 'weak' emergence, which includes surprising events in natural systems (such as unexpected weather conditions) that are explicable deterministically by reference to the system's prior state.

Theorising education in terms of complexity offers an alternative to the residual effects (the 'trailing edge', as it were) of previous attempts to model education on simplifications of scientific-industrial systems, such as the so-called 'factory' model of schooling inspired by Frederick Taylor's (1947/1911) principles of 'scientific management', which remained as a powerful force in educational administration, especially in the USA, until at least the late 1960s.²⁰ Although many educational theorists subsequently opposed this crude mechanism,²¹ others refined Taylor's principles by appropriating the language of the nascent science of cybernetics – the study of systems in which both humans and machines are understood in terms of information processing. In the years since Norbert Wiener (1948) coined the term 'cybernetics', it has developed as an interdisciplinary science that interprets the interrelationships of organisms and machines in terms of feedback loops, signal transmission, and goal-oriented behaviour. Within the field of education, some curriculum theorists have appropriated the language of cybernetics, including Francis Hunkins (1980), who asserts that 'the cybernetic principle... permits rationalization of the total managerial activities related to maintaining the program' (p. 324).

But cybernetics is contested conceptual territory and there is more than one 'cybernetic principle'. For example, David Pratt's (1980) application of 'a cybernetic perspective'²² to the problem of 'managing aptitude differences' raises critical questions about *which* cybernetic principles *should* apply to the 'scientific management' of education:

The problem of maintaining consistently high achievement from a group of learners who differ in aptitude and other characteristics can be seen as an instance of the general question of how a system with variable input can be designed to produce stable output. Phrased in this way, the question lies squarely within the field of cybernetics, the study of self-regulation in systems (p. 335).

Pratt uses temperature regulation in a building to exemplify a simple cybernetic system, and temperature regulation in the human body as an example of a cybernetic system 'found in nature'. The unexamined assumption in Pratt's argument is that curriculum systems and cybernetic systems *should* be 'designed to produce stable output'. By his choice of examples, Pratt seems to assume that a particular understanding of 'natural' order – in this case 'stable output' – should inform curriculum work and that cybernetics can help us to achieve it.

However, *homeostasis* – the ability of an organism to maintain itself in a stable state – is just one of several key concepts circulating in the discourses of cybernetics at various times. Katherine Hayles (1994) points out that during the period from (roughly) 1945 to 1960, homeostasis provided cybernetics with meanings that were deeply conservative, ‘privileging constancy over change, predictability over complexity, equilibrium over evolution’ (p. 446). But even in these early years, homeostasis competed with *reflexivity* (‘turning a system’s rules back on itself so as to cause it to engage in more complex behavior’), which led ‘away from the closed circle of corrective feedback, privileging change over constancy, evolution over equilibrium, complexity over predictability’. Hayles (1994) argues that, in broad social terms, ‘homeostasis reflected the desire for a “return to normalcy” after the maelstrom of World War II. By contrast, reflexivity pointed toward the open horizon of an unpredictable and increasingly complex postmodern world’ (p. 446).

In Hayles’s (1994) brief history of three waves of cybernetics since WWII, *reflexivity* displaced homeostasis as a key concept in the period from 1960 to about 1972, after which the emphasis shifted to *emergence*, with interest focused ‘not on how systems maintain their organization intact, but rather on how they evolve in unpredictable and often highly complex ways through emergent processes’ (p. 463). Hayles emphasises that concepts such as homeostasis and reflexivity do not disappear altogether but linger on in various ways and may exert an inertial weight that limits the ways in which newer concepts are deployed.

In the case of Hunkins’ and Pratt’s selective appropriations of cybernetic principles, we might well ask why educational theorists in 1980 continued to privilege homeostatic self-regulation two decades after it had ceased to be generative in the field of cybernetics. If they were interested in the implications of cybernetics for educational theory and practice, why did they not follow cyberneticists in exploring reflexivity, emergence and self-organisation? I speculate that, unlike cyberneticists, educators faced few compelling challenges to the deeply sedimented conceptions of ‘natural’ order to which Pratt alludes – order as stability, predictability, and equilibrium. Such conceptions of ‘natural’ order are pervasive in many disciplines. For example, during the post-WWII period, the US version of systems ecology privileged the concept of the ecosystem as a stable and enduring emblem of ‘natural’ order, but by the late 1970s ecologists had repudiated the portrayal of orderly and predictable processes of ecological succession culminating in stable ecosystems (see, e.g., Worster, 1993, 1995). Although the word ‘ecosystem’ remains in use, it has lost many of its former implications of order and equilibrium (see, e.g., Pickett & White, 1985), and contemporary ecologists, such as Robert Ulanowicz (2009), emphasise that chance, disarray and randomness are necessary conditions for creative advance, emergence and autonomy in the natural world.

There is a long history of criticism of educational bureaucracies and institutional governance that emphasises the debilitating effects of a systematic rationality that privileges orderly and predictable processes culminating in stable output and stifles innovation (see Hartley, 1965, and Murphy, 2009, for two very different examples from different nations and different periods of history). In such systems, educational policies, directives, incentives and disincentives function as homeostatic devices, regulating the diverse inputs of students, teachers and researchers by bringing them within closed circuits of corrective feedback in order to maintain stability and equilibrium.

The above snippets from the history of education theory’s selective appropriations of scientific concepts and principles point to the need for two related types of caution. Firstly, if we apply scientific understandings to educational inquiry, then we should do our best to use the understandings that currently represent the ‘state of the art’ in the relevant scientific field or discipline, rather than recycle abandoned or outmoded concepts and principles. Secondly, we should also exercise the kind of caution that is implicit in Green and Bigum’s (1993) critique of attempts to apply chaos theory to the ‘science’ of educational administration, that

is, to be cognisant of the risk that privileging scientific explanations might be interpreted as reifying a one-way relationship between ‘natural’ order and human affairs. I can see no categorical reason for *excluding* the invocation of nature as a ground for judgement, but when propositions from the natural sciences are invoked (even implicitly) to support social and cultural policies and practices, we must ask: *why should descriptions of the physical or ‘natural’ world be prescriptions for social life?* As Andrew Ross (1994) writes, ‘ideas that draw upon the authority of nature nearly always have their origin in ideas about society’ (p. 15). Thus, I am not convinced that the recommendations for educational decision and action put forward by scholars such as Doll, Biesta and Osberg (as cited above) can be justified by reference to the complex self-organising ‘natural’ systems studied by Prigogine or any other scientists. Rather, the value of such studies is immanent in the new ‘structures of feeling’ – concepts, (con)figurations and metaphors – they provide, and the new forms of social imagination that might emerge from their deployment in educational discourses-practices.

3: Inventing Possible~Impossible Futures (in/for Education)

Juxtaposing my positions on futures (in/for education) and complexity (in/of education) leads me not only to accept that there are limits to predictability and control but also that we *should* understand that educational processes *ought to be* characterised by gaps between ‘inputs’ (policy, curriculum, pedagogy) and ‘outputs’ (learning). In Biesta’s (2004) terms, these are not gaps to be ‘filled’ but *sites of emergence*. In other words, what we have previously imagined to be ‘outcomes’ or ‘products’ – knowledge, understandings, individual subjectivities, etc. – emerge in and through educational processes in unique and unpredictable ways. As Biesta (2006) argues, education should aspire not only to qualification (the transmission of knowledge and skills) and socialisation (the insertion of individuals into existing social, cultural and political orders), but should also be concerned for the ‘coming into presence’ of unique individuals. However, we also need to bear in mind the possibility that attributions of emergence reflect our ignorance of non-emergent explanations (see Bedau, 2008), which is precisely why we should entertain, to repeat Derrida’s (1992b) words, ‘*the possibility of the impossible*’ and strive to invent ‘*the impossible invention*’ (p. 41). As Derrida (1989) insists, such an invention is incalculable before it actually appears and must ‘declare itself to be the invention of that which did not appear to be possible; otherwise it only makes explicit a program of possibilities within the economy of the same’ (p. 60).

I agree with Osberg and Biesta (2007) that an ‘emergentist’ understanding of knowledge production converges with Derrida’s account of deconstruction:

Although a comparison between strong emergence and deconstruction is risky, we make this link because we believe there are at least some epistemological compatibilities between deconstruction and strong emergence. Of particular importance is the similarity in the way both deconstruction and strong emergence challenge existing knowledge. Neither strong emergence nor deconstruction challenge existing knowledge by overturning it. Rather, they ask us to imagine a future which is *incalculable* from the perspective (or logic) of existing knowledge. They do this through affirming existing knowledge *without allowing it to overrule what is to come*. By acknowledging but not *following* existing knowledge, both deconstruction and strong emergence seek to negotiate a passage between the knowledge that has been and that which is still to come (p. 45, italics in original).

Osberg (2010) refines this argument by focussing more explicitly on how the respective ‘logics’ of emergence and deconstruction might help us ‘to act responsibly towards an incalculable future – to care enough to do justice to the future’ (p. 162). She argues that although the future is ‘incalculable’, this ‘does *not* mean that we should no longer try to

influence the future by making decisions about it’ or ‘that we should passively accept whatever comes our way’ (p. 162, italics in original). Rather, we can adopt ‘an emergentist understanding of process, which is *not* orientated towards control and closure (choosing what to do) but towards the invention of the new (putting things together differently)’, which allows us ‘the possibility to think about the future in non-teleological terms’ (p. 163, italics in original).

I will conclude by offering three examples of strategies for ‘putting things together differently’ that might assist (or inspire) us to ‘escape the program’.

Escaping the ‘what works’ program

The idea that education should be or become an evidence-based practice is now a widespread and uncritically taken-for-granted assumption in many countries. As Gary Thomas (2010) points out, one of the difficulties with this is that the mere use of the word ‘evidence’ is taken to be enough to clinch an argument. In the UK the push for evidence-based education arose partly in the wake of David Hargreaves’ (1996) Teacher Training Agency lecture and subsequent publications (e.g., Hargreaves, 1997) in which he draws an analogy between teaching and medicine, claiming that ‘the knowledge-base of teachers is less rich than that of doctors’ (p. 410). Two critical reports commissioned by the Department for Education and Employment (Hillage, Pearson, Anderson & Tamkin, 1998, aka the Hillage Report) and the Office for Standards in Education (Tooley & Darby, 1998) provided further impetus to focussing educational research on ‘what works’. Other UK educational researchers were quick to point out why evidence of ‘what works’ is an inadequate basis for educational thought and action. For example, Elizabeth Atkinson (2000) explores the ways in which theories, rather than evidence, provide an essential infrastructure to teachers’ day-to-day thinking and practice, and compares ‘the restrictive effect of a focus on “what works” with the opportunities offered by postmodernism for broadening the scope, purpose and interpretation of the research of the future’ (p. 317).

More recently, Biesta (2007) has criticised the idea of evidence-based practice and the ways in which it has been promoted, focusing particularly on the tension between scientific and democratic control over educational practice and research. Biesta examines a number of assumptions underlying evidence-based education, including the extent to which education can be compared to medicine, the role of knowledge in professional actions, and expectations about the practical role of research implicit in the idea of evidence-based education. Biesta (2009) further notes that many of those who champion evidence-based education also argue that the only acceptable evidence is that which can be produced by large-scale experimental studies (such as randomised controlled field trials) and careful measurement of the correlation between ‘input’ and ‘outcomes’.

Both Atkinson and Biesta (along with many others) take what could be called an *oppositional* stance towards the ‘what works’ program. For example, Atkinson (2000) draws attention to the opposition to an over-emphasis on evidence-based education from ‘those who see both teaching and research as a socio-political act extending well beyond the relatively controllable mechanisms and techniques of pedagogy’ and those who ‘question the power and knowledge bases upon which judgements about “best practice” and “what works” are founded’ (p. 319). Similarly, Biesta (2007, 2009) emphasises the restrictions that evidence-based approaches place on the role of research in educational practice and the ways it distracts us from more important deliberations on the purposes, functions and directions of educational processes and practices.

Thomas (2010) does not oppose evidence. He affirms that ‘we all use evidence of many kinds and forms and the more of it we have, the more confident we can be’, but he also asserts that ‘we should be cautious about claiming that we have better evidence than someone else’

(p. 15). He provides two very clear examples of the abuse of ‘evidence-based’ claims in reporting both educational and medical research. In each case, researchers selectively adduced meagre evidence and transmuted it into ‘unequivocal’ evidence that supported their predetermined theoretical position. But Thomas also affirms ‘existing knowledge’ of evidence by considering how it is understood in another practice-based profession, namely, law:

I stroll through the second floor of the Gower Street branch of Waterstone’s and I happen upon the law section. In one of those delightful moments of serendipity my eye is caught by a bank of shelves containing books on evidence. Not one shelf, but a whole bank of them, and each one on aspects of evidence...

It became humbly clear to me that lawyers approach the notion of evidence with more finesse, deliberation and care than I have ever done. (Inevitable, really, since they have been thinking about evidence for millennia, rather than since 1998.) They have caressed it, nurtured it, problematised it, taxonomised it. They raise issues about its nature: whether it is direct evidence, circumstantial evidence, documentary evidence, collateral evidence, confession evidence, witness evidence (including the definition of ‘witnesses’; the oppression or competence of witnesses). They muse about silence, hearsay, testimony, affirming evidence, character evidence, expert evidence.

They ponder over standards of proof, reverse burdens of proof, standards within standards, presumptions of fact, persuasive presumptions. They worry about bias, corroboration, privilege and interest, admissibility, cogency, prejudice, relevance.

So for lawyers, evidence is a fragile thing. It is not a boulder to be thrown into debate (pp. 14-15).

Although I agree with Atkinson’s and Biesta’s critiques, I interpret Thomas’s (2010) brief serious-humorous critique of the evidence-based mantra as a move towards an alternative to an oppositional approach, because it begins to enact Osberg and Biesta’s (2007) recommendation for ‘affirming existing knowledge *without allowing it to overrule what is to come* [and] acknowledging but not *following* existing knowledge’ (p. 45, italics in original). In retrospect we can interpret the appeal to educational researchers to follow the example of evidence-based medicine – or, I should say, *Western* medicine – as a huge social experiment. With hindsight, I regret that at least some of the energies directed towards opposing this experiment were not also directed towards ‘experimenting’ with other understandings of evidence. Yes, we might have said, let us ‘try out’ (or ‘try on’) understandings of evidence-based education conceived in ways that are analogous to Western medical conceptions. But let us also experiment with conceiving evidence in terms of other disciplines and cultural referents, such as law (for which Thomas has given us a head start), traditional Chinese medicine, divinity, game studies, journalism, irenology, Islamic economic jurisprudence, media studies, silviculture, risk management, psychophysics, or even disciplines that only exist in the imagination of SF authors, such as therolinguistics (Le Guin, 1984). What counts as evidence in these discourses-practices? What else informs decision-making in them? What might their analogs in education be? How would educational research informed by these analogs differ from the current ‘program of possibilities within the economy of the same’ (Derrida, 1989, p. 60)?

Escaping the programs that extrapolate from what *doesn’t* work

As already noted, Gage’s (1989) scenarios for the ‘paradigm wars and their aftermath’ exemplify the taken-for-grantedness of extrapolative approaches to generating alternative futures; his article also exemplifies a particular kind of complexity reduction by collapsing the rich and varied conceptual landscape of educational inquiry into a ‘war’ between three competing tribes. I see some parallels to Gage’s approach among those who now crusade for

‘mixed methods’, some of whom go so far as to represent this approach as a new ‘paradigm’. For example, Burke Johnson and Anthony Onwuegbuzie (2004) assert:

Mixed methods research is formally defined here as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study. Philosophically, it is the ‘third wave’ or third research movement, a movement that moves past the paradigm wars by offering a logical and practical alternative (p. 17).

I would prefer to move beyond the paradigm wars by relocating to what Patti Lather (1991) calls the ‘post-paradigmatic diaspora’ (p. 121), but there is a further difficulty with mixed methods, namely, the uncritical appropriation of ‘triangulation’ – that is, ‘seeking convergence and corroboration of results from different methods and designs studying the same phenomenon’ (Johnson and Onwuegbuzie, 2004, p. 22) – as a major reason for conducting research in this way. But it can reasonably be argued that triangulation does not ‘work’ and that we should therefore cease from extrapolating futures that reproduce it (another way of saying this is that preferred futures include those in which current errors have been corrected).

I have recently reviewed a number of journal manuscripts that use the ‘triangulation’ metaphor as if its meaning was unproblematic and uncontested. For example, one author writes: ‘The accuracy of the coding of the drawings was triangulated by the verbal data from the interviews and group discussions’; another writes: ‘The researcher shared and discussed the data and interpretation so that it could be reflected and triangulated to enhance the reliability of the data analysis process’. Neither author offers any additional description or explanation to justify how triangulation works, what it does, and why it might be justified in their respective research activities.

Norman Blaikie (1991), who was a land surveyor for 16 years before turning to sociology, gives a clear and detailed description of the concept of triangulation in surveying, navigation and military strategy, and its subsequent appropriation by the social sciences. He argues that ‘triangulation means many things to many people and... none of the uses in sociology bears any resemblance to its use in surveying’ (p. 131). He also points out that ‘triangulation’ of social worlds make sense only if the researcher works within a ‘positivistic frame of reference which assumes a single (undefined) reality and treats accounts as multiple mappings of that reality’ (p. 120).

Alexander Massey (1999) builds on Blaikie’s critique to demonstrate that some researchers have mistakenly assumed that the ontological and epistemological bases of certain sociological activities are the same as those underpinning the triangulation methods used in surveying. The result of this philosophical and methodological confusion is that in studies that use mixed or multiple methods, many misleading and invalid claims are made in the name of triangulation. Massey identifies seven common logical errors underpinning methodological triangulation, and concludes that its conceptual basis is flawed ‘to such an extent that generations of researchers and readers have lost their way through their very attempts to improve sociological “navigation” techniques’ (p. 195). The same might be true for education researchers who have uncritically embraced mixed methods.

Escaping the complexity reduction program

Through such operating principles as Occam’s razor, academics in Western and Westernised cultures have a long history of associating reason, learning, and progress with simplification and reduction. In many disciplines and professions, the ‘cutting edge’ of research and practice seems to have changed little since Alexander’s sword sliced through the intractably complex Gordian knot. Contemporary manifestations of complexity reduction include the Australian Research

Council's highly contestable protocols for assessing research quality in Australia, which reduce the complexity of research practices to simplistic metrics and crude classification schemes²³ – not to mention the literal *disintegration* of education research across six separate divisions of *The Australian and New Zealand Standard Research Classification* (Australian Bureau of Statistics, 2008). Similarly, the current Federal government's apparent faith in the merits of research concentration appear to be predicated on monocultural assumptions that ignore the complexities of collaborative relationships. As Geoffrey Boulton and Colin Lucas (2008) put it: 'Innovation systems might best be defined as an "ecology", in which interactions between different actors produce *emergent* behaviour that is highly adaptive to circumstance and opportunity' (p. 12; italics added).

Biesta (2010) offers five theses on the politics of complexity reduction in education, one of which concerns the effects of retrospective complexity reduction:

Complexity reduction in education not only happens prospectively (through the reduction of initial variables) but also retrospectively (through backwards selection of particular trajectories). One of the most explicit examples of retrospective complexity reduction in education is assessment, because assessment validates some learning trajectories and invalidates others but always does so 'after the event.' Because education is a recursive system, the anticipation of assessment also reduces complexity. In this way assessment also functions prospectively in the reduction of complexity (pp. 9-10).

Already the anticipation of Excellence in Research for Australia (ERA) ratings and the league tables that will no doubt be constructed from the data on the forthcoming 'My University' website (Gillard, 2010) is prospectively reducing the complexity and diversity of research activity in Australian universities.

The language of complexity theorising encourages us to see education as work that anticipates and welcomes unpredictable futures in education. Rather than seeing disturbances to business-as-usual as 'problems' to be 'solved', we should look forward to the evolutionary (and revolutionary) opportunities that states of disequilibrium present to us. A homeostatic view of education suggests that there is something intrinsically desirable about working in a state of stability and equilibrium, in much the same way that a means-ends (or process-product) model of curriculum development gives us a false sense of security when we achieve our ends. We do not resolve practical educational problems in the hope that we will eventually have fewer such problems to deal with, any more than sudoku addicts hope that, by solving each puzzle, they will reduce the number of puzzles left to solve. I place little value on the 'stable outputs' of a homeostatic education system. As a teacher, I prefer to be pleasantly surprised by what learners achieve; as a researcher, I prefer to be pleasantly surprised by the 'narrative experiments' that I perform (see, for example, Gough, 2008). From such surprises, possible~impossible futures might emerge.

Notes

¹ I am aware that using constructions such as 'in/for' is not to every reader's taste (including a reviewer of this paper). However, the slash in common usage has long denoted both 'and' and 'or', and in academic writing is widely understood to denote 'and/or', liminality, blurring boundaries, and/or collapsing categories. As such, it is a convenient shorthand for writers who tolerate ambiguity and wish to accommodate all of these possibilities. Futures *in* educational research can clearly signify something different from futures *for* educational research, but there will also be circumstances in which these categories collapse and their boundaries blur.

² I follow Warren Sellers (2008) in using a tilde (~) between words to show them involving each other in a non-linear continuum: 'like chicken~egg, I see no hierarchical or structural order in their arrangement, they always-already co-exist. My adoption of the tilde is adapted from its use in mathematics to represent equivalence relations and similarity' (p. 6).

- ³ Elsewhere, Derrida (1992a) makes it clear that what he means by ‘impossible’ is that which cannot be foreseen as a possibility (p. 16).
- ⁴ Although I taught Futures in Education until 2004, I did not continue to research and write in the field of futures study *per se*. However, futures perspectives informed much of my subsequent work on narrative and intertextuality in curriculum inquiry, especially in relation to the generativity of speculative fiction (see, e.g., Gough, 2004, 2007, 2010b)
- ⁵ Emery and his team made a significant contribution to futures research by refining the technique that eventually became known as the ‘search conference’ (see Emery & Purser, 1996).
- ⁶ See also Slaughter’s (1992) account of the CFF’s first six years.
- ⁷ Other works consulted include Holbrook (1992), Beare & Slaughter (1993), Hutchinson (1996), Eckersley (1997), Hicks & Slaughter (1998), Slaughter (1999), Inayatullah & Gidley (2000), Milojevic & Inayatullah (2003) and Inayatullah, Bussey & Milojevic (2006).
- ⁸ I very much appreciate a reviewer of this paper observing that it not only ‘constructs a welcome framework of building on earlier work’ but also ‘[demonstrates] the development of ideas across an academic career’.
- ⁹ To which I add, SF = serious~fun.
- ¹⁰ See also Len Duhl (2001) for a more personal perspective on the future, complexity and surprise in relation to community health.
- ¹¹ See also the essays collected by Reuben McDaniel and Dean Driebe (2005) in their edited volume, *Uncertainty and Surprise in Complex Systems*, which bring together work in the ‘hard’ sciences (including physics and thermodynamics), business management and organisation theory.
- ¹² See, e.g., the definition of ‘information overload’ at WordIQ.com: <http://tiny.cc/lnjj4> (accessed 15 August 2010)
- ¹³ Gage edited the first handbook of research on teaching, to which he contributed a chapter on research paradigms (Gage, 1963). He specialised in educational psychology and championed the application of empiricist scientific methods to education research. The approaches to science that he privileged are captured in the title of one of his books, *Hard Gains in the Soft Sciences* (Gage, 1985).
- ¹⁴ Jon Wagner (1993) distinguishes two types of ignorance in educational research: ‘blank spots’ are what we ‘know enough to question but not answer’ and ‘blind spots’ are what we ‘don’t know well enough to even ask about or care about... areas in which existing theories, methods, and perceptions actually keep us from seeing phenomena as clearly as we might’ (p. 16).
- ¹⁵ Poststructuralism was, however, on the radar of US education scholars who were willing to look beyond the boundaries of nation and language. For example, US curriculum theorists William Pinar and William Reynolds (1992) drew attention to two Francophone Quebecois scholars – Jacques Daignault and Clermont Gauthier – who were ‘working post-structurally’ (p. 245) during the 1980s.
- ¹⁶ See Brian Castellani’s (2009) map of complexity science and the sociological scholarship that informs it (Castellani & Hafferty, 2009).
- ¹⁷ A reviewer of this essay suggested that my historical overview ‘would benefit from being re-written as a history of ideas rather than a history of people’, noting that ‘it made me feel I was being given a simplistic history lesson (a bit like old-fashioned “kings & queens” school history)’. I do not accept that ideas can exist apart from the people who think them, and I therefore prefer to foreground the identities of those who do the thinking rather than relegate them to parenthetical ‘sandbags’ following statements of their ideas.
- ¹⁸ I use ‘scare’ quotes here to signify that I read terms such as ‘natural’ and ‘nature’ *sous rature* (under erasure), following Derrida’s approach to reading deconstructed signifiers as if their meanings were clear and undeconstructable, but with the understanding that this is only a strategy (see, e.g., Derrida, 1985).
- ¹⁹ Other ‘early adapters’ of chaos theory to education include Daiyo Sawada and Michael Caley (1985), Catherine Ennis (1992), Bill Green and Chris Bigum (1993) and me (Gough, 1991). Some of these early studies focus almost exclusively on chaos theory, which explains one cause of complex behaviour in a dynamical system, namely, the sensitivity of some systems to variations in initial conditions. Chaotic systems are deterministic, but they are not predictable, because small differences in initial conditions (such as those resulting from rounding errors in numerical computation) can produce widely (and even wildly) divergent outcomes. Complex systems are not predictable because they are not deterministic: self-organisation (i.e., what we perceive as patterns or order) *emerges* from a multiplicity of interactions.
- ²⁰ For example, George Beauchamp (1968) devoted a chapter of *Curriculum Theory* to ‘curriculum engineering’, characterising school superintendents, principals and curriculum directors as the ‘chief engineers in the curriculum system’ (p. 108). Smith, Stanley & Shores (1957) also had a chapter titled ‘Curriculum development as educational engineering’ in *Fundamentals of Curriculum Development* (first published in 1951).
- ²¹ Prominent critics of mechanistic curriculum models include the ‘deliberative’ curriculum scholars influenced by Schwab’s (1969, 1971, 1973) germinal essays on ‘the practical’, together with the authors

(and their affiliates) represented in William Pinar's (1975) edited collection, *Curriculum Theorizing: the Reconceptualists*.

²² Pratt's reference to 'a cybernetic perspective' suggests that he recognises more than one – but he does not state *which* 'cybernetic perspective' he privileges.

²³ See, for example, James Allan's (2010) account of how the ARC has gone about ranking law journals.

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