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Utopian thinking and the collective mind: Beyond transdisciplinarity

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ABSTRACT

The future is frequently presented as a forced choice between human sustainability and human extinction, utopia or dystopia. This paper examines a different option: to develop the full capacity of the human mind to remain open to all possibilities, guided by utopian thinking. An inquiry into the creative potential of the human mind finds that collective thinking from a collective mind goes beyond transdisciplinarity as currently constructed. In collective thinking, knowledge boundaries are reframed as dynamic inter-relationships, and due weight is given to each of personal, physical, social, ethical, aesthetic, sympathetic and reflective ways of knowing. In applying the collective mind in these times of transformational change, there is hope is for innovative solutions to seemingly intractable, aptly labelled wicked problems.

1. Context: a collective mind in a changing world

A rapidly changing world with its major shifts in electronic communication has put the standard 20th century construction of knowledge to the test (Gibbons et al., 1994). In this changing world of global warming, ethnic violence, increasing pollution, and food insecurity, a positive future for humankind has become increasingly hard to imagine. On the other hand, global flows of people, natural resources, finance, and ideas offer a wide range of possible futures, both positive and negative (Falk, 1999). The sum of the changes produces transformational change: business will not be as usual, tomorrow will not be the same as yesterday. The transformational changes in both society and environment mean that the future remains chaotic and uncertain and knowledge about the future is under review (Nowotny, Scott, & Gibbons, 2001).

Yet accounts of the future continue to present contrasting courses of action, moving towards a self-sufficient utopia in which all will be well (Hopkins, 2008, 2012)[1] as against moving to prevent a catastrophic dystopia in which human-initiated changes make the planet uninhabitable (for example, Diamond, 2006). Such futures thinking remains in line with the long-dominant compartmentalised form of knowledge construction, a forced choice between opposites, packaged within the academic disciplines and seeking certainty (Meadows, Meadows, & Randers, 1992). Healing the divisions created by this polarised thinking requires access to a more comprehensive system of thought within a hopeful vision of a world not so divided.

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[1] Transition Towns is an international grass roots network of people working for positive social change.

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A decade ago a special issue of *Futures* journal suggested that such an expansion of thought was emerging under the heading of transdisciplinarity, that is, academic knowledge extended by other ways of knowing. Throughout this paper, knowledge is taken to be consistent with the *Oxford Companion of Philosophy* proposition that knowledge is a form of justified belief (Honderich, 1995).

In spite of the multi-dimensional nature of contemporary change, most research into the changes continues to be restricted to single factors such as climate, water or food, and to a single outcome, the physical consequences for human beings, such as global warming and water wars (Flannery, 2005). Pressures from the complexity and uncertainty of the changes have meant that a broader lens was also emerging, a way of thinking about the future that brings together living and non-living systems, people and their natural environments, different scales of governance, and risks and opportunities in a collective understanding about positive future directions. Under prevailing constructions of knowledge such collective thinking risks being dismissed as impossible (Midgley, 2004).

On the other hand, for at least half a century the future has been influenced through broad-ranging inquiries which meet and even go beyond the current definitions of transdisciplinarity. For instance, Rachel Carson in *Silent Spring* (Carson, 1962) on the widespread effects of pesticide use and Donella Meadows in *Limits to Growth* (Carson, 1962; Meadows et al., 1992) on the cumulative effects of resource extraction brought into being new principles of environmental management. Jane Jacob's *The Death and Life of Great American Cities* (Jacobs, 1972); and Robert Putnam's *Bowling Alone: the Collapse and Revival of American Community* (Putman, 2000) brought a heightened understanding of and influenced social trends.

In the 1960s, multidisciplinary inquiry seemed to promise a more comprehensive understanding of complex problems. However, as Thomas Kuhn forewarned in *The Structure of Scientific Revolutions* in 1962 (Kuhn, 1962/1970), the normal practice of science continued to impose the fixed frameworks that divided the disciplines and the professions. Multidisciplinary initiatives tended to perpetuate the compartmentalisation of ideas and so to act as a barrier to a fresh understanding of the whole. More hopefully, in 1970 Jean Piaget brought to UNESCO the word 'interdisciplinarity' to describe research which could 'reshape or reorganise the fields of knowledge by means of exchanges which are constructive recombinations' (Piaget, 1970/1973).

At the same time, Michel Foucault (1969) in *The Archaeology of Knowledge* was drawing attention to the construction of knowledge as an artefact of the social era in which it is constructed (Foucault, 1969/2002). While interdisciplinarity was designed to treat disciplinary boundaries as permeable, the outcome was often a fresh discipline with its own boundaries, such as with biochemistry and psycholinguistics. Interdisciplinary research, teaching and publication remained controlled through research grants, academic curricula, and specialised journals that preserved existing disciplinary categories of thought. By the beginning of the 21st century, generating knowledge was more generally accepted as a process as well as an outcome, as a way of reflecting on a changing world as well as a well-defined body of content (Berlin, 1959/1990; Foucault, 1970).

Several fresh approaches to the construction of knowledge expanded the standard ideas of what was included under the rubric of knowledge. Systems thinking (von Bertalanffy, 1976), Post-normal Science (Funtowicz & Ravetz, 1993), wicked problems (Rittle & Webber, 1973), and Mode 2 Science (Nowotny et al., 2001; Rittle & Webber, 1973) sought to bring together any or all of the disciplines in company with other ways of knowing. Systems thinking connected the parts of an issue in order to understand the whole, pioneered by a series of international interdisciplinary forums, the Macy conferences.[2] C. West Churchman, one of the early systems thinkers, wrote in his 1968 *Challenge to Reason* p2, "*How can we design improvement in large systems without understanding the whole system, and if the answer is that we cannot, how is it possible to understand the whole system?*" In his later reflections, *The Systems Approach and Its Enemies*, Churchman begged practitioners to remain faithful to the synthesis-based, self-reflective transdisciplinary and ethical spirit that infused a systems approach (Churchman, 1968, 1979).

Post Normal Science was developed in order to address circumstances where 'facts are uncertain, values are in dispute, stakes are high and decisions urgent' (Brown & Harris, 2014). This called for the inclusion of values, ethics, aesthetics and reflection in scientists' contribution to 20th century knowledge (Ravetz, 1999, 2005). In company with Post Normal Science, recognition of the existence of wicked problems, problems that require changes in the society that generated them, emerged in the 1970s. Wicked problems could have no single definition or final answer, given the multiple interest involved and the commitment to change. This thinking extended the scope of disciplinary inquiry to the political, the diverse and the uncertain. Community, organisational and creative constructions of knowledge were to be included in thinking about wicked problems, as well as the contributions from the expert disciplines (Brown, Harris, & Russell, 2010; Rittle & Webber, 1973).

By 1994 forms of knowledge construction outside the academic disciplines were welcomed by Gibbons et al. in *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (Brown et al., 2010; Gibbons et al., 1994). The authors described a movement away from the dominant form of knowledge construction of Mode 1 science with its disciplinary boundaries, ownership hierarchy, and goal of certainty. Mode 2 science and research were identified as contextualised, heterogeneous, porous and transgressive, a considerable shift. All four of the movements sought to standardise transdisciplinarity as a mode of knowledge construction which included other ways of knowing as well as the

[2] The Macy Conferences of 1947–53, Summary: The Macy Conferences at http://www.asc-cybernetics.org/foundations/history/MacySummary.htm Accessed 25.04.13.

academic disciplines. They also described themselves as transgressive, where transgressive refers to the breaking of prevailing rules of the construction of knowledge. However, many members of each of these movements continued to position all knowledge in science.

By the 21st century, notions of transdisciplinarity had progressed further into practice. In education, Julie Thompson-Klein clarified the overlapping approaches found under the headings of multi-, inter- and trans-disciplinarity (Thompson-Klein, 1996). She considered that being transgressive by crossing knowledge boundaries was the characteristic that distinguished trans- from inter- and multi-disciplinarity (Thompson-Klein, 2000, 2001). Roderick Lawrence explored the challenges in being transgressive when delivering transdisciplinary services in a tightly bounded profession such as public health (Lawrence, 2010). In science, Heather Aslin and Kirsty Blackstock reviewed the considerable costs to the individual's career of embracing transdisciplinarity under the title 'Now I'm not an Expert in Anything' (Aslin & Blackstock, 2010).

In 2001 *The New Production of Knowledge* team produced a sequel *Rethinking Science: Knowledge and the public in an age of uncertainty* in which the idea of Mode 2 science is expanded to apply to Mode 2 knowledge and a Mode 2 society (Aslin & Blackstock, 2010; Nowotny et al., 2001). The authors argue that just as Mode 2 knowledge is characterised by a shift to pluralism, diversity, volatility and transgression, this same shift applies equally to Western society of the 21st century. Knowledge and society are described as interdependent, confirming Foucault's proposition that changes in knowledge match changes in society.

To sum up these changes, transdisciplinary moves to a broader knowledge base have moved on to giving equal respect to the personal, biophysical, social, ethical, aesthetic, sympathetic and reflective domains of knowledge (Brown & Harris, 2014; Nowotny et al., 2001). Collective thinking issuing from a collective mind is now searching for ways to bring together all these ways of constructing knowledge. Writers on the development of a collective mind suggest that, in times of complex changes, knowledge needs to be socially robust and internally coherent in addition to being valid and reliable. Meanwhile, these moves to a broader and more inclusive basis for knowledge continue to meet with the same initial reactionary responses as did the introduction of multi- and inter-disciplinary thinking.

2. Current issues in the collective construction of knowledge

The idea of a mind that follows multiple ways of thinking, individually and collectively, is hardly a new idea. At this point it is crucial to distinguish this idea of a collective mind from a mass mind in which all the participants think alike on a predetermined path, usually with unfortunate consequences.[3] In a collective mind, every individual mind is working independently to its full capacity, while contributing with others to a rich understanding of their society. A collective mind that looks for patterns that connect has been widely applied in urban design by Christopher Alexander and adopted in engineering, education, medicine, psychology and information technology. One of his patterns for addressing a complex issue is to explore the social context before identifying an issue, its possible resolution and examples of the resolution in practice. This is the pattern followed in this paper (Alexander et al., 1977).

The search for a broader understanding of mind goes back to the philosopher Plato and his questions on the relationships between the one and the many, the mind and its constituent forms (Nettleship, 1935/1955). Emile Durkheim invented the term cultural consciousness in1893 (Durkheim, 1893/2011). Even the father figures that helped produce the reductionist Mode 1 knowledge of the scientific Enlightenment recognised the existence of a collective mind. Philosopher of science Karl Popper described scientific thought as the outcome of a collective confluence between three worlds: the social world of ideas, observations of the biophysical world and internal world of the observer and (Popper, 1959/2002). Mathematician, Rene Descartes, known as the father of the scientific era, wrote (Descartes, 1637/1946):

> *the diversity of our opinions does not arise from some being endowed with a greater share of reason than others. . .To be possessed of a vigorous mind is not enough; the prime requisite is rightly to apply it.*
> Rene Descartes 1647.

These seminal thinkers imply that knowledge can be constructed either as parts or as a whole through the decision of the person doing the thinking, not through the structure or the innate nature of knowledge. This conclusion is confirmed by the new Neuroscience, and a cohort of seemingly specialist scholars (Doidge, 2007). Monitoring of the brain impulses reveals that over 85% of human reflection and decision-making takes place within the unconscious mind, the realm of feelings and imagination (Lackoff & Johnson, 1999). A wide range of collective thinkers, while working from within disciplinary silos, draw together their introspective, physical, social, ethical, aesthetic, sympathetic, and reflective ways of thinking (Table 1).

In the 1960s Pierre Teilhard de Chardin, the Jesuit philosopher and expert in mammalian evolution (discovererof 'Peking Man' in 1929) proposed a collective mind as the next stage in human evolution (Teilhard de Chardin, 1955/1975, 1966). He wrote of the emergence of a mind that drew on both conscious and unconscious modes of thought, contributing to knowledge through all forms of understanding. He suggested that individual minds were already being connected in a mind of minds, an all-pervading global web of minds that he called the noosphere. Teiilhard de Chardin's prediction is considerable strengthened through the emergence of electronic technology five decades later.

[3] The Jonestown mass suicide, for example. See http://history1900s.about.com/od/1970s/p/jonestown.htm Accessed 03.06.13.

Table 1
Specialists who are collective thinkers.

Principle sources of understanding	Disciplinary scholars who draw on all the sources[a]	Formal discipline
Introspective reflection	Paul Sartre, Michael Polanyi	Philosophy
Physical observations	Stephen J. Gould, James Watson	Biology
Social norms and rules	Michel Foucault, Pierre Bourdieu	Sociology
Ethical principles	J.S. Mill, John Passmore	Philosophy
Aesthetic responses	Arthur Koestler, Mary Midgley	Arts
Sympathetic feelings	Martin Buber, Arnold Mindell	Psychology, theology
Reflections on the whole	Isaiah Berlin, Gregory Bateson, Henryk Skolimowski, Stephen J. Gould, Pierre Teilhard de Chardin	A collective mind

Adapted from Brown (2008).
[a] The work of each of these authors is reviewed in the *Oxford Companion to Philosophy* (Honderich, 1995) and *Wikipedia*.

The work of the collective thinkers in Table 1 provided the entry points for an inquiry into the current status of the collective mind. In 1991 the Local Sustainability Project at the Australian National University undertook action research studies in collaboration with over 300 communities and organisations on five continents. The goal of each study project was their own chosen form of transformational change towards their own particular vision of a just and sustainable future (Brown & Lambert, 2013). Among the findings was a wave of new thinking that brought together the then dominant social constructions of knowledge towards a future different from the present. This meant bringing together the then-current hierarchy of specialised, strategic, community, personal, and creatively generated knowledge (Brown & Lambert, 2013; Nowotny et al., 2001).

The Local Sustainability Project studies consistently found that participants in the social learning projects drew on the full range of their own thinking, which covered all the seven ways of knowing identified for Post Normal Science and Mode 2 society. A further study then re-examined 18 of the case studies to uncover how these ways of knowing were brought together in the collaborating teams (Brown & Lambert, 2013; Nowotny et al., 2001). These proved to be widely diverse, for individuals and for groups a matter of dialogue, meditation, creative imagination and data visualisation. For both, it involved completing the learning cycle of ideals, facts, ideas and actions; actually a learning spiral, since the cycle continues. The project then looked for prototypes that might act as models for other collective minds.

Possible prototypes were selected from collective thinkers responsible for the transformative ideas that shaped the 21st century and some current writers. Those chosen from the past were Charles Darwin with his discovery of the evolution of species by natural selection (Browne, 1995, 2002), James Lovelock and his realisation of a self-organising Earth (Lovelock, 1979, 2000) and Norbert Wiener's contribution to the invasion of the personal computer as an extension of the human brain (Wiener, 1948, 1950/54). Their extensive biographies and autobiographies allowed a detailed review of their thinking processes.

Although they were from different eras, different backgrounds and different fields, the three had much in common. Before they reached iconic status among their own generation, they each had to overcome rejection from their peers. Their colleagues and contemporaries strongly criticised material that fell outside the tight knowledge boundaries of their own disciplines. Darwin's name was read out from pulpits all over Britain as an arch prince of evil, in that he had denied god. Lovelock was humiliated by his colleagues in a seminar purporting to celebrate his work. Wiener found it hard to find suitable employment, in spite of a track record as a genius in mathematics and electronics.[4]

From the autobiographies of each of the three collective thinkers it was possible to confirm that they accessed the seven contributions to the construction of collective knowledge, as follows. All three demonstrated a strong sense of personal integrity and a strategy that allowed them to survive vilification and to continue thinking for themselves. Darwin withdrew into his family, Lovelock remained an independent scientist throughout his life, and Wiener would fall into what appeared to be a trance, lost in his own thought. All three rigorously explored the biophysical aspects of their topic, from Darwin's barnacles and finches, to Lovelock's atmospheric chemistry and Wiener's feedback systems.

All three explored the social context of their work, Darwin in his work on human emotions, Lovelock in renaming the planet Earth after the Greek god Gaia to indicate the social dimension, and Wiener in his ideas on forms of communication as forms of power. Their consciousness of ethical considerations was high, from Darwin's struggle with religion, Lovelock's with his unswerving loyalty to the integrity of Gaia and Wiener's groundbreaking *The Human Use of Human Beings* which foretold the ethical vacuum of the electronic era (Lovelock, 2000; Wiener 1950/54). Their aesthetic sensitivity to their field was reflected in Darwin's lifelong devotion to natural beauty, Lovelock's appreciation of patterns and Wiener's of the elegance of mathematical proofs. All three worked in close partnership with a band of sympathetic colleagues.

Finally, all three encapsulated their findings in a single sharp focus: evolution by natural selection, Gaia as a unitary self-organising planet, and the personal computer as a prosthesis for the human brain. Although their individual collective thinking followed different paths, the similarities were enough to suggest that there were some shared criteria for success.

[4] Acclaimed biographies of Charles Darwin are by Browne (1995, 2002). There is the biography of Norbert Wiener by Masani (1990); Birkhauser and James Lovelock's autobiography is Lovelock (2000).

Table 2
Evidence sources for a collective mind.

Type of question	Sources of answers
Introspective	Personal assumptions, experience, identity
Physical	Observations, measurements and descriptions
Social	Narratives, norms, rules, myth stories, symbols, myths, events
Ethical	Ideals, principles, aims, standards of good and evil
Aesthetic	Designs, visions, standards of beauty and ugliness
Sympathetic	Feelings, relationships, trust, sense of the other
Reflexive	Creative leap, pattern language, distributed networks, dialogue

These included treating opposites as relationships and knowledge as a composite of seven different ways of knowing. However, an established knowledge hierarchy privileged physical and social contributions to knowledge over the ethical, aesthetic and sympathetic. The question remains, how does collective thinking work in practice?

3. Resolution: boundaries become interrelationships, parts become wholes

Moving into the second millennium, Western society's knowledge construction followed the path proposed for the integration of Mode 2 knowledge and society. Although boundaries between knowledges were still mainly rigid, closed and certain, for some they had become fluid, open and uncertain. In Gregory Bateson's words, collective minds were looking for patterns that connect rather than boundaries that divide (Bateson, 1973, 1979). Patterns of thought that treated parts and wholes, stability and change, individuals and society and creative and rational thinking as opposites remained. Others, such as Berlin and other collective thinkers in Table 1, had moved to an exploration of these as rich relationships within third spaces beyond the previous dualisms (Bateson, 1979; Brown & Harris, 2014).

An example of moving from confronting opposites to exploring a third space is the treatment of the opposing predictions of utopian and dystopian futures. Philosopher of ideas Isaiah Berlin (Berlin, 1959/1990) writes of utopian thinking as quite a different process from a utopian ideal or a dystopian warning. Rather than looking for an impossible perfection or expecting an inevitable doom, to Berlin utopian thinking is hopeful and imaginative. It is neither pre-determined nor single-minded. In utopian thinking the future may emerge from an unexpected direction, rather than from making incremental changes to either pole or finding a middle way. Utopian thinking escapes the limitations of the risk society predicted by Ulrich Beck (Beck, 1986/1992) to dreams of a future able to deal with uncertainty, diversity, disappointment and surprise.

Futurist Thomas More coined the phrase eutopia to describe a country working hopefully towards the potential for a just and sustainable future, with the full approval of all its citizens (More, 1530/1995). Consider the discovery of the three-dimensional double helix structure of DNA in 1953, often called the building block of life on Earth. Few things have exceeded the social commitment to this particular search, first dreamt of in the 1860s. Without the confidence that such a thing was possible, neither society nor the science community would have allocated the funds nor inspired the searchers. In telling the story of the discovery (Watson, 1968), James Watson draws on his own life story, the highly technical biochemical investigations, the social hierarchy of the individual scientists, his personal ethical drivers, his intense aesthetic satisfaction as he envisaged the double helix, and the closeness of the sympathy among some although not all of the scientists in the team. His reflection on all of these provides a vivid account of how discovery in science emerges from all seven ways of knowing. Its best-selling status ensures that the collective knowledge of this seminal event continues to inform and inspire.

Every application of the collective mind is unique, since it is applied in a particular place and time to a particular issue. By definition the outcome is also unique, in that it contains the synergy of the multiple ways of knowing. Therefore the outcome always contains the promise of innovative solutions to apparently unresolvable issues. Applying the checks listed in Table 2 as an individual decision-maker or a research team, the outcome could meet the Mode 2 criteria of being valid for its time, reliable in its level of comprehension, socially robust, ethically committed, and internally coherent. An example of an unresolved issue at the time of writing is the global concern about the predictions of global warming.

Introspective questions about global warming are answered by self reflection from climate change advocates and deniers. These provide a range of ideas and options well beyond the sober reports of physical and social change. Until most of society are moved to consider the implications of the answers to the rest of the questions, strong responses to global warning are unlikely

Physical questions of the future of the planet are answered by environmental scientists, climatologists and biologists using physical measures of food security, population displacement and risks to health. Social questions have physical dimensions which can be are answered by economists, sociologists, political scientists and anthropologists. Each group respond from their own frameworks, so the field is highly fragmented. A few approaches, such as the annual State of the World Report[5] and the United Nations Millennium Development Program (UNMDP)[6] provide measures of the future as a

[5] Annual reports have been published since 1984 reporting on the state of the world by *The World Watch Institute* documenting the effects of the technological transformations on the social and physical aspects of the planet.
[6] See http://www.un.org/millenniumgoals/ Accessed 30.07.13.

third possibility, the dynamic interaction between the physical and the social worlds as described by James Lovelock in "*Gaia*". The UNMDP was greeted warmly, then criticised for lack of political support, and is now revived in a new guise: an example of the collective learning that arises from collective thinking.

Social questions are answered by the beliefs, festivals, rituals, myths and stories by which a community or group construct their version of reality. All societies have seasonal rhythms which construct the social reality which in turn affects the physical reality. Global warming can be marked socially by summer coming earlier and lasting longer, changing recreational patterns; ocean warming that allows a longer swimming season; Earth Hour when the whole world population is invited to turn off their electricity for an hour; tourism expanding in the arctic and Antarctic; dietary changes from altered food production patterns.

Ethical questions are traditionally anthropogenic, that is, human-centred. The future of the physical planet is often expressed as the need to maintain ecosystem services, that is, humans managing natural systems for positive human ends. Ethical concern for the social state of the world is usually concern for humans living equitably on the planet's resources, and so on the impact of global warming on vulnerable people. Among the Australian Aboriginal people and in Western legal systems, the state of natural systems is now recognised as a human ethical responsibility. The classic paper 'Should trees have (legal) standing?' dates from the 1970s (Stone, 1975/2010; this is the 35th anniversary edition of the original book). This paper became one of the most cited in environmental law.

Aesthetic questions can be answered from different wellsprings of creativity. Predictions of physical doom for the planet are in the form of films such as *An Inconvenient Truth* (see Gore, 2007 for a young person's guide adapted from the award-winning film). The social dystopian side is equally well represented in films of the break-down of the major global cities and stories such as *Watership Down* (Adams, 1972/2005; see also http://en.wikipedia.org/wiki/Watership_Down_(film) Accessed 09.04.14) and *Dune* (Herbert, 1965/1982; see also http://en.wikipedia.org/wiki/Dune_(film) Accessed 09.04.14). In the third space come the total human/environment experience of Thoreau's *Walden Pond*,[7] Aldo Leopold's *Sand Country Almanac* (Leopold, 1949/1981; recently there is Newton, 2006 "*Aldo Leopold's Odyssey: Rediscovering the Author of A Sound County Almanac*", a Shearwater book) and Walt Whitman' *Leaves of Grass* (Whitman, 1819–92), and films such as *The Matrix*[8] and *Babel*.[9]

Sympathetic relationships can become divided between those who regard the state of the world as primarily physical and those who regard it as primarily social. Management of the physical future usually takes the form of a hierarchical administration system led by experts. Governance of the social future is usually a matter of combining different interest groups at different scales. Taking a different path are the emerging discussions on democracy which seek to combine representative, direct and deliberative forms of democracy through deep democracy, with the full commitment of every individual (Mindell, 1992, 2002).

Reflective questions require consideration of the answers to the other six. In each of the examples above, a third space has been filled through reflection on all the other answers to the focus question. It is not a matter of simply lumping the answers together, however. Each answer is based on a different type of evidence, introspection by exploring personal assumptions and preferences; physical questions by taking observations and measurements; social questions through stories, myths and symbols; ethical questions by ideals; aesthetic questions by feelings of delight and disgust; and sympathetic questions by trust and empathy (Table 2). The synergies from difference are constructed by many of the ways identified in the collective learning studies: dialogue, meditation, creative imagination and visualisation.

Table 2 contains a list of standard tests for validity and reliability in each of the ways of knowing. Once each of the ways of knowing are included in an inquiry or a decision, this will have included the subjective as well as the objective, the qualitative as well as quantitative, the logical as well as the creative. Perhaps most significant of all, reflecting on the whole can give the thinker access to the feelings of satisfaction and even delight that accompany aesthetic and sympathetic ways of understanding.

4. Conclusion

This paper has reviewed some of the literature on the collective construction of knowledge, a series of research projects on the current status of the collective mind and some prototypes for collective thinkers. The evidence cited here confirms the emergence of a transformational change towards collective thinking which goes beyond transdisciplinarity to draw on the full capacity of human thought. The potential for that collective thinking has existed as long as the species itself. All human beings share the same genetic language of DNA, inherit a cultural context, can talk to each other, structure their social world, manage their shared resources, rear their young in their image and match their identity to a particular group.

One of the issues faced by those seeking to embrace the scope of the collective mind is the difficulty in finding a constructive space in which to work towards the future. The current thinking of our time places parts and wholes, order and

[7] Walden Pond is a small lake in Concord Massachusetts in USA and a powerful symbol for many conservationists of the importance of living simply, attentively and caring for nature. US writer, activist, poet, philosopher and leading transcendentalist, Henry David Thoreau (1817–1862) lived this 'simple life' close to nature on the edge of Walden Pond for two years from 1845 (Thoreau, 1844/1960). A recent book is Maynard (2004) "*Walden Pond*".

[8] *The Matrix* is a 1999 American–Australian science fiction action film written and directed by Wachowskis. It depicts a dystopian future in a simulated reality called 'The Matrix', created by sentient machines to subdue the human population.

[9] See http://en.wikipedia.org/wiki/Babel_(film) Accessed 09.04.14.

chaos, individuals and environments and logic and creativity in opposition to one another. Social and physical worlds are divided in our thinking and so are disciplinary compartments. Utopias and dystopias are not satisfactory guides: utopias because they seek perfection and humans are not perfect; dystopias because they lead to avoidance of risk rather than working towards a better future; both because they tend to conflict with each other and conform to the standard divisions of knowledge by discipline, by occupation, by power, by gender and by culture.

In this era, global flows of populations, resources, finance and information are forcing open boundaries of space and time that have been established over the two million years of human evolution. People are taking part in other cultures in unprecedented numbers, thanks to the gift of global travel and the distress of displacement. Global trade is generating unprecedented distribution of physical and human resources. Information has the possibility of becoming almost a free good thanks to the Internet, open source providers, and on-line whistleblowers. It can be argued that the conditions are in place for the fulfilment of Pierre Teilhard de Chardin's prophecy: an evolutionary move towards a collective mind.

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References

Adams, R. (1972/2005). *Watership down: A novel*. New York: Scribner.
Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A pattern language: Towns, buildings and constructions*. New York: Oxford University Press.
Aslin, H. J., & Blackstock, K. L. (2010). 'Now I'm not an expert in anything': Challenges in undertaking transdisciplinary inquiries across the social and biophysical sciences. In V. A. Brown, J. A. Harris, & J. Y. Russell (Eds.), *Tackling wicked problems: Through the transdisciplinary imagination* (pp. 117–129). London: Earthscan.
Bateson, G. (1973). *Steps to an ecology of mind: Collected essays in anthropology, psychiatry, evolution and epistemology*. St Albans, UK: Paladin.
Bateson, G. (1979). *Mind and nature: A necessary unity*. London: Wildwood House.
Beck, U. (1986/1992). *The risk society: Towards a new modernity* (M. Ritter, Trans.) London: Sage Publications.
Berlin, I. (1959/1990). The decline of utopian ideas in the west. In H. Hardy (Ed.), *The crooked timber of humanity: Chapters in the history of ideas*. Princeton, USA: New Jersey Press.
Brown, V. A. (2008). *Leonardo's vision: A guide for collective thinking and action*. Rotterdam, Netherlands: Sense.
Brown, V. A., & Harris, J. A. (2014). *The human capacity for transformational change: Harnessing the collective mind*. London/New York: Routledge.
Brown, V. A., Harris, J. A., & Russell, J. Y. (Eds.). (2010). *Tackling wicked problems: Through the transdisciplinary imagination*. London: Earthscan.
Brown, V. A., & Lambert, J. A. (2013). *Collective learning for transformational change: A guide to collaborative action*. London/New York: Routledge.
Browne, J. (1995). *Charles Darwin: Voyaging*. Princeton, NJ, USA: Princeton University Press.
Browne, J. (2002). *Charles Darwin: The power of place*. London: Pimlico.
Carson, R. (1962). *Silent spring*. Boston: Houghton Mifflin.
Churchman, C. W. (1968). *Challenge to reason*. New York: McGraw-Hill.
Churchman, C. W. (1979). *The systems approach and its enemies*. New York: Basic Books.
Descartes, R. (1637/1946). *A discourse on the method of rightly conducting one's reason* (J. Veitch, Trans.) London: Everyman's Library No. 570.
Diamond, J. (2006). *Collapse: How societies choose to fail or succeed*. London, UK: Penguin.
Doidge, N. (2007). *The brain that changes itself: Stories of personal triumph from the frontiers of brain science*. Melbourne, Australia: Scribe.
Durkheim, E. (1893/2011). *De la division du travail social (French Edition). A public work*. Kindle Edition.
Falk, R. (1999). *Predatory globalization: A critique*. Cambridge, UK: Polity Press.
Flannery, T. (2005). *The weather makers: The history and future impact of climate change*. Melbourne, Australia: Text Publishing Company.
Foucault, M. (1969/2002). *The archaeology of knowledge* (A. M. Sheridan Smith, Trans.) London/New York: Routledge.
Foucault, M. (1970). *The order of things: An archaeology of the human sciences*. New York: Pantheon Books.
Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the post-normal age. *Futures, 25*(7), 739–755.
Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. New York: Sage.
Gore, A. (2007). *An inconvenient truth: The crisis of global warming*. London: Bloomsbury.
Herbert, F. (1965/1982). *Dune*. London: Hodder & Stoughton.
Honderich, T. (Ed.). (1995). *The Oxford companion to philosophy*. NY: Oxford University Press.
Hopkins, R. (2008). *The transition handbook: From oil dependence to local resilience*. UK: Green Books.
Hopkins, R. (2012). *The transition companion: Making your community more resilient in uncertain times*. UK: Green Books.
Jacobs, J. (1972). *The death and life of Great American cities*. Harmondsworth, UK: Penguin.
Kuhn, T. (1962/1970). *The structure of scientific revolutions*. Chicago, USA: University of Chicago Press.
Lackoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. New York: Basic Books.
Lawrence, R. J. (2010). Beyond disciplinary confinement to imaginative transdisciplinarity. In V. A. Brown, J. A. Harris, & J. Y. Russell (Eds.), *Tackling wicked problems: Through the transdisciplinary imagination* (pp. 16–30). London: Earthscan.
Leopold, A. (1949/1981). *A sand county almanac and sketches here and there*. London: Oxford University Press.
Lovelock, J. (1979). *Gaia: A new look at life on earth*. Oxford: Oxford University Press.
Lovelock, J. (2000). *Homage to Gaia: The life of an independent scientist*. New York: Oxford University Press.
Masani, P. R. (1990). *Norbert Wiener 1894–1964*. Basel, Switzerland: Birkhauser.
Maynard, W. B. (2004). *Walden pond*. New York: Oxford University Press.
Meadows, D. H., Meadows, D. L., & Randers, J. (1992). *Beyond the limits: Global collapse or a sustainable future*. London: Earthscan.
Midgley, M. (2004). *The myths we live by*. London/NY: Routledge.
Mindell, A. (1992). *The leader as martial artist: An introduction to deep democracy. Techniques and strategies for resolving conflict and creating community*. San Francisco, USA: HarperCollins.
Mindell, A. (2002). *The deep democracy of open forums: How to transform organizations into communities: Practical steps to conflict prevention and resolution for family, workplace and world,*. Charlottesville, USA: Hampton Roads.
More, T. (1530/1995). *Utopia* (G. M. Logan, R. M. Adams, & C. Miller, Trans.) Cambridge, UK: Cambridge University Press.

Nettleship, R. L. (1935/1955). *The theory of education in Plato's republic*. London: Oxford University Press.
Newton, J. L. (2006). *Aldo Leopold's Odyssey: Rediscovering the author of a sound county almanac*. Washington, DC: Island Press.
Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-thinking science: Knowledge and the public in an age of uncertainty*. MA: Blackwell and Polity Press.
Piaget, J. (1970/1973). *Main trends in interdisciplinary research*. London: George Allen and Unwin.
Popper, K. R. (1959/2002). *The logic of scientific discovery*. London: Routledge Classics.
Putman, R. D. (2000). *Bowling alone: The collapse and revival of American community*. NY: Simon & Schuster.
Ravetz, J. (1999). What is post-normal science? *Futures, 31*(7), 647–653.
Ravetz, J. (2005). *A no-nonsense guide to science*. UK: New Internationalist.
Rittle, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*, 155–169.
Stone, C. D. (1975/2010). *Should trees have standing? Law, morality and the environment* (3rd ed.). New York: Oxford University Press.
Teilhard de Chardin, P. (1955/1975). *The phenomenon of man* (R. Hague, Trans.) New York: Harper & Row.
Teilhard de Chardin, P. (1966). *Man's place in nature* (R. Hague, Trans.) St James's Place, London: Collins.
Thompson-Klein, J. T. (1996). *Crossing boundaries: Knowledge, disciplinarities, and interdisciplinarities in the series on knowledge, disciplinarity and beyond*. Charlottesville, VA: University of Virginia Press.
Thompson-Klein, J. (2000). A conceptual vocabulary in interdisciplinary science. In P. Weingart & N. Stehr (Eds.), *Practicing interdisciplinarity*. Toronto: University of Toronto Press.
Thompson-Klein, J. (2001). Transdisciplinarity: Joint problem solving among science, technology and society. In J. Thompson-Klein, W. Grossenbacher-Mansuy, R. Haberli, A. Bill, R. W. Scholz, & M. Welti (Eds.), *An effective way for managing complexity*. Basel: Birkhauser Verlag.
Thoreau, H. D. (1844/1960). *Walden and civil disobedience*. Boston: Houghton Mifflin.
von Bertalanffy, L. (1976). *General system theory: Foundations, development and applications*. New York: George Braziller.
Watson, J. (1968). *The double helix: A personal account of the discovery of the structure of DNA*. Harmondsworth, UK: Penguin.
Whitman, W. (1819–92). In F. Murphy (Ed.), *Walt Whitman: The complete poems*. London: Penguin Classics.
Wiener, N. (1948). *Cybernetics: Or control and communication in the animal and the machine*. MA, USA: MIT Press.
Wiener, N. (1950/54). *The human use of human beings: Cybernetics and society*. Boston, USA: Da Capo Press.