

Creativity and the Agile Mind

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1. Introducing *The Agile Mind*

It is always best to open a volume such as this with a statement that, if not controversial, is at least provocative. After all, this is a volume whose chapters are all dedicated to the topic of creative behaviour, whether in image, word or deed. Moreover, all of the contributions share a common paternity in a 2008 event on creativity hosted by the Flemish Academy of Arts and Sciences in Brussels, whose title – *The Agile Mind* – currently graces this volume as well. With this event and three years of interdisciplinary discussion already behind us, we should surely be able to open this volume with a thought-provoking definition of the object of our study: creativity. Yet the fact is that we cannot, in itself, the provocative opening we desire, for we are about to claim that this lack of a firm definition is entirely to the good of our study here, and of creativity more generally.

Why so? A historical example should illustrate our point nicely. In 1917, the avant-garde artist Marcel Duchamp submitted a urinal to an exhibition of the *Society of Independent Artists* in New York. Signed with the pseudonym “R. Mutt, 1917” in the style of an artist’s signature, and rotated 90 degrees around its normal axis, the piece – titled *Fountain* – was a humble urinal in every other respect. Duchamp’s point was that artistic creativity resides as much in the choices we make as in the artifacts we produce. The *Society* had declared the exhibition open to all submissions, which would be neither judged by juries nor rewarded with prizes. Yet Duchamp’s entry provoked such debate within the *Society* that it was all but rejected from the exhibition; though present, it was effectively hidden from view. Duchamp resigned from the *Society*, disgusted that even a definition of art as all-embracing as the *Society*’s could still be exclusionary and prone to hypocrisy. This failure of even the weakest of definitions still smarts today: in 2004, a pre-Turner-prize poll of 500 prominent artists judged *Fountain* to be the most influential artwork of the 20th Century. Weak definitions over-generate by design, but Duchamp showed us that even the weakest can under-generate as well. What use are definitions of

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creativity then, if all they can do is represent the received wisdom that a truly creative person is motivated to rebel against?

Worse still, definitions of creativity can give false comfort to artists who believe that the essence of creativity, if hemmed into a rule-based definition, can also be corralled into a productive rule for *generating* creativity. That is, one might be able to reverse-engineer any rule-based, algorithmic *recognizer* to obtain the corresponding rule-based *generator*. George Bernard Shaw famously dismissed this possibility with the epigram “The only golden rule is that there is no golden rule”. To be sure, artists often seek to reverse-engineer the definitions implicitly used by critics, to create art that passes muster with the critics but which rarely passes the test of time. How could it be otherwise? Art that follows the definitions of the day cannot also be ahead of its time. Creativity is not an objective property of a process or product, but a perceived quality that emerges from the interplay of actor, process and audience. Moreover, this interplay is located in a specific context and motivated by a specific goal. No definition of any practical use can be expected to marry all of these constraints and perspectives into a single form that is neither obviously vacuous nor easily falsified. Creativity is an elusive phenomenon that thrives in the interstices between our definitions. To define creativity is to identify a creative norm, and as the lexicographer Patrick Hanks describes in this volume, creativity does not follow norms, rather it deliberately and knowingly *exploits* norms. Yet if normative definitions are inherently futile, except in the breach, on what foundations should the study of the creative be based?

2. Understanding The Agile Mind: A Journey

As a perceived quality, the creative act and the products that emerge from it bear certain hallmarks that can be identified and appreciated by an audience. These hallmarks are not definitional criteria, however, at least not in the classical sense of providing necessary and sufficient conditions. Creativity may occur in different guises and accentuate different qualities to differing degrees, and no hallmark is both necessary and sufficient (or, to be more precise, we know of none that has yet been successfully shown to be both). Nonetheless, these hallmarks can serve as valuable guides in our explorations of creativity.

One commonly appreciated hallmark of the creative mind is a certain form of mental agility, so that products that arise from apparently effortless

mental gymnastics are more likely to be perceived as creative. This agility often achieves disruptive ends, for what appears silly or non-obvious before the creative act can appear sensible and blindingly obvious after the fact. An agile thinker appears graceful in his or her manipulation of the relevant concepts, and economic in the use of these concepts to achieve a non-obvious end. In linguistic creativity, this cognitive economy often manifests itself as communicative economy, allowing a simple and concise form to communicate a rich and complex meaning. More generally, it manifests itself as a force multiplier for cognition, allowing an agile thinker to achieve a disproportionately effective result from a deceptively simple action. A recent example of flexible conceptualization – which combines an economy of action with an agility of thought – illustrates this point nicely.

When Tony Blair released his memoirs – titled *A Journey* – to a skeptical public in 2010, public interest was predictably matched with a desire for public protest. Book promotion events posed security dilemmas for police and booksellers alike. At a book signing in Dublin, Blair was pelted with rubber flip-flop shoes, aping the shoe-throwing event that had earlier humiliated George Bush in Iraq. In Britain, a young nursing student named Euan Booth launched a Facebook campaign to kick-start a more original and mischievous form of political protest against Blair's book. Booth encouraged people to quietly move *A Journey* from its shelf in the *Biography* section of bookshops to sections such as *Fiction* and even *True Crime*. He explained himself to *The Telegraph* newspaper as follows:

This is a peaceful and mischievous way of making your point if you feel the same way. It's a non-violent display of anger using the materials given to me – his book and the crime section – they're both there, I just put them together. (*The Telegraph*, September 4th, 2010)

Booth's creative campaign elegantly achieves several related goals at once. For one, it thwarts the sale of a book and the promotion of a political perspective that Blair's detractors find objectionable. In addition, it finds a new and mischievous way of describing a controversial figure as both a liar (by way of the *Fiction* section) and a criminal (by way of the *True Crime* section). Contrast this creative construal with the tiresome and all-too-obvious cries of "Liar!" and "Criminal!" that are regularly aimed at Mr. Blair by his most zealous opponents. Indeed, the campaign turns these categorizations into an understated game that customers are subtly drawn into whenever they see Blair's misplaced book on the wrong shelves. By

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solving the puzzle for themselves, to see the book placement as a deliberate act rather than a careless mistake, casual browsers become complicit in the categorization in a way that louder and more conventional protests could never achieve.

We do not claim that this combination of cognitive economy and conceptual agility is a necessary criterion for creativity, much less a sufficient one. Rather, as a hallmark of creativity that is appreciated post-hoc by an audience, it seems interesting enough and widespread enough to be a productive focus for a multidisciplinary study. Thus, it became the touchstone for our 2008 event in Brussels, *The Agile Mind*, as articulated in the position paper that was distributed to participants and contributors prior to the event itself. This paper, a revised version of which is included in this volume, focused on the use of duality – in form, function and meaning – to gracefully achieve non-obvious ends. Given the difficulty of adequately defining creativity, contributors were encouraged to use the notions of duality, economy and agility as starting points for their own explorations of creativity. Though contributors accepted this invitation to varying degrees, the themes of the position paper resonate in the chapters that follow.

In allowing a diverse gathering of academics from different disciplines to discuss a problem as vexing as creativity without terminological confusion, the position paper also addressed a more specific concern of its authors: how to address the fact that creativity must be perceived differently by producers and consumers. After all, producers start from a blank canvas or empty page and work forwards, while consumers start from a finished artifact and work backwards. As we discuss in this volume, it simply is not feasible to imagine that producers reverse-engineer the rules used by consumers, or vice versa. We like to think that George Bernard Shaw, with his distaste for golden rules, would agree on this point.

3. Conceptual Agility in an Abstract Space

A wealth of everyday expressions in English attest to our use of mental agility as a touchstone for clever and creative cognition. We speak admiringly of those who are quick-witted, nimble-minded and who can “think on their feet”, of those who can move gracefully from one topic to another, dodge uncomfortable questions, and generally side-step the obstacles that can thwart the plans of less agile thinkers. We clearly speak *as though* creativity and cleverness are the mental equivalents of physical

proWess, but does this folk model, based on an appealingly productive conceptual metaphor, contain any real substance from an analytical and theoretical point of view? Is it a source of real insight into creativity, or is it ultimately no better than empty platitudes like “thinking outside the box”?

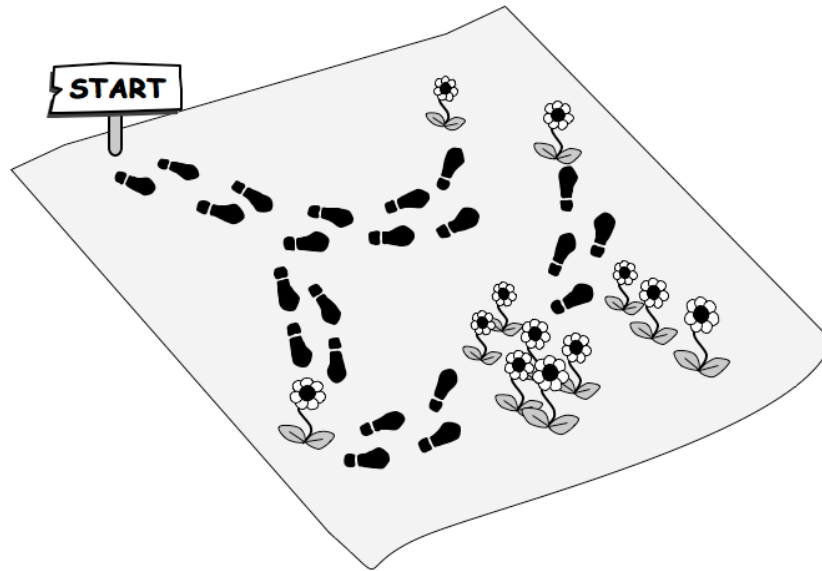
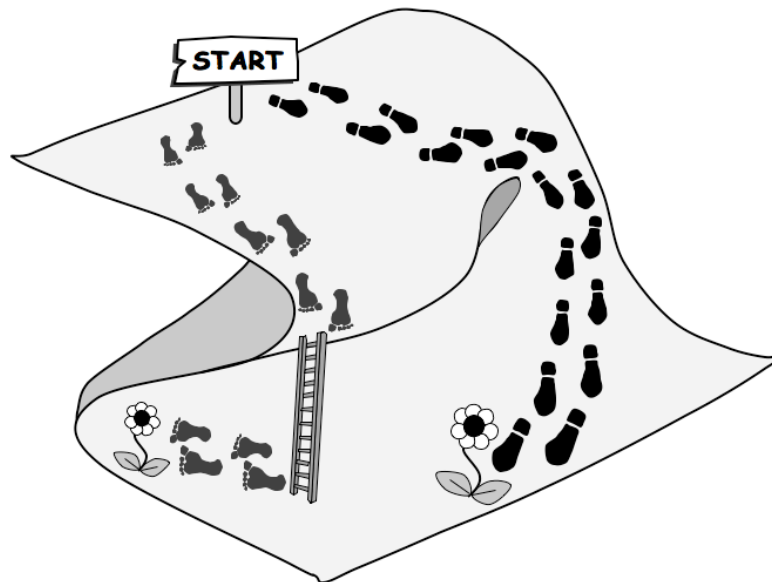


Figure 1. Search in a state-space. (from Veale (2012), *Exploding the Creativity Myth*). Flowers represent acceptable goal-states / solutions, while footprints illustrate the paths pursued via various cognitive agents.

In fact, the folk notion of mental agility does correspond to a conceptual model that has proven itself remarkably useful in the field of Artificial Intelligence, that of intelligent decision-making as *search in a state space*. This view, articulated in the work of Newell, Shaw and Simon, asks us to model a problem as an interconnected network of states, in which each state corresponds to an arrangement of problem elements that might serve as a partial or complete solution to the problem. An intelligent agent enters the state space at a pre-defined start state – the initial state given in the problem specification, such as the starting configuration of a chess-board or an empty crossword grid – and must navigate a path from this start-state to a state representing an acceptable solution by transitioning through a series of connected, intermediate states. The allowable state-to-state transitions are defined either by the problem itself or by unspoken convention, but in

either case, there often exists a sufficient degree of ambiguity and under-specification to allow agile thinkers to navigate the state space more effectively than their literal-minded and convention-bound counterparts.

A visual representation of search in a state space is provided in Figure 1. Flowers denote acceptable solutions – goal states at which the search can terminate – while footprints illustrate the paths taken by different cognitive agents as they search through the space. Since this model projects physical search into mental spaces, we can understand mental agility as the cognitive equivalent of those qualities that are desirable for physical search. For instance, one needs to backtrack gracefully when one encounters a dead-end, and shift smoothly to an alternate avenue of search. One needs to be nimble enough to reach parts of the space that cannot otherwise be reached (one can see the visualization of this idea in Figure 2), and flexible enough to adapt one’s goals when the search is looking increasingly futile.



*Figure 2. An agile searcher (shown here as a bare-footed explorer) finds novel ways to navigate a search space, by e.g., looking in hard-to-reach areas of the space, or by identifying unconventional connections between states that previously did not appear connected. (From Veale (2012), *Exploding the Creativity Myth*).*

Adaptability, in particular, appears to be a highly salient quality of creative people. Margaret Boden offers an intriguing view of adaptive creativity, of a kind that not only delivers surprising solutions to a problem, but also changes the way we view the problem itself. Boden argues that one should distinguish *exploratory* creativity – of the kind visualized in Figures 1 and 2 – from *transformational* creativity. While the former merely explores a space, looking for previously undiscovered states of high value, the latter actively transforms the space, thereby re-defining the very criteria of value that drive the search in the first place.

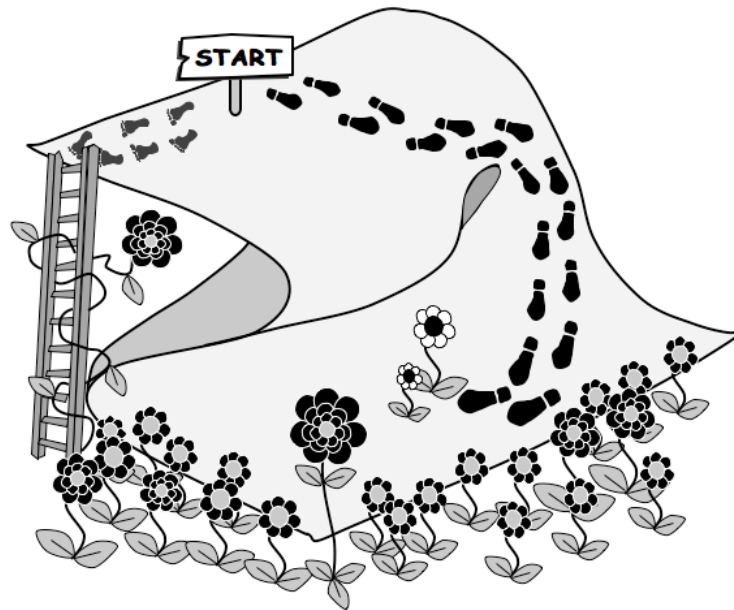
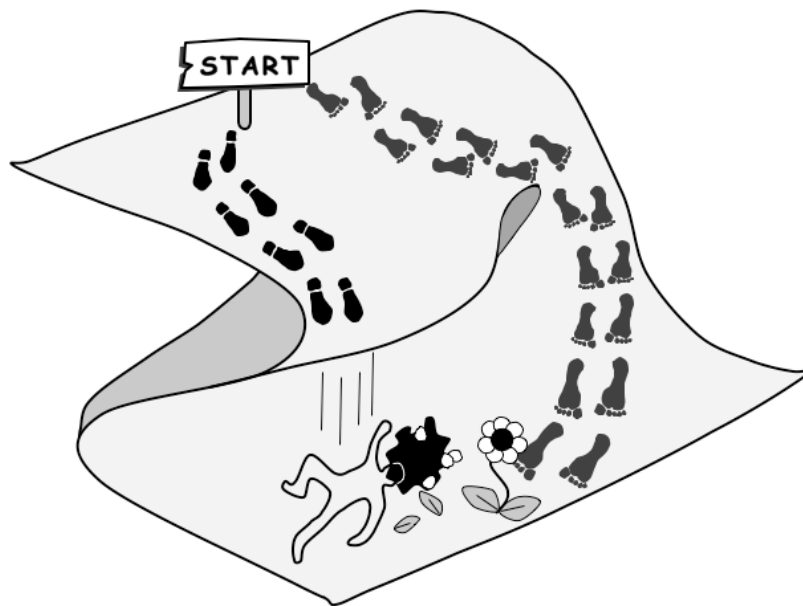


Figure 3. Transformational thinkers alter the very space that they are exploring, to identify high-value targets that lie outside the original space, and which would not have been considered solutions in the original formulation of the problem. (From Veale (2012), *Exploding the Creativity Myth*).

Boden cites the development of atonal music as a dramatic example of transformational creativity, and one can also point to key developments in science, such as the transformational shift from a Newtonian (absolute) to Einsteinian (relativistic) world-view, or from a classical (determinate) to quantum-mechanical (indeterminate) conception of reality. When searching through a space, whether that space is physical or abstract, an agile searcher

can either contort himself to fit the constraints of the space, or contort the space to fit the needs and values of the searcher.

Transformations of the kind analyzed by Boden are the exception rather than the rule in creativity, in either its small-C (everyday creativity on a mundane scale) or big-C (exemplary Creativity on a historical scale) guises. One finds a more commonplace form of agile exploration of a state space in the narrative jokes that are the common currency of social interaction. Jokes exploit the fact that we all navigate through shared state spaces in our everyday lives, to explain the events in the world around us, and to understand the behaviours of our friends and colleagues. These shared spaces have well-trodden pathways that correspond to the common-sense norms of conventional thought processes, but these rutted paths do not always offer the quickest or surest routes to a solution. In some cases, when the true path to a solution is circuitous and non-obvious, mental agility is not a matter of speed but of sure-footedness, for the shortest and most obvious path can lead to incongruity, contradiction and failure.



*Figure 4. Some state-spaces are deliberately constructed to be misleading, and the most obvious or the quickest path to the solution can lead to a surprising dead end. A sure-footed explorer who knows the space will take a more circuitous route. (From Veale (2012), *Exploding the Creativity Myth*).*

Jokes employ state-spaces that have been deliberately warped, so as to fool the unsuspecting explorer into believing that the quickest and most obvious route is also the most intelligent route. In other words, jokes subvert the logic of intelligent search in a state space, and thereby demonstrate the limits of conventionalized thought processes (see Minsky, 1980). The mathematician John Allen Paulos uses the framework of *catastrophe theory* to characterize the kinds of warped spaces that are most used in narrative jokes: as shown in Figure 4, these typically contain an unexpected “kink” or discontinuity that corresponds to a surprising gap in the logic of the narrative (see also Veale and Keane (1996), who offer a state-space interpretation of jokes as mathematical catastrophes). Explorers who jump to conclusions by pursuing the path of the discontinuity can thus be humbled and surprised by their unthinking use of conventional logic.

3.1. Starting Points, Paths and Goals

The state-space view of intelligent and creative behaviour is often dismissed as naïve and out-dated with the acronym GOF AI (good-old-fashioned-AI). Yet many non-computational scholars of metaphor will be familiar with this view of goal-oriented behavior, albeit indirectly, through a notion that still remains highly relevant in the field of cognitive linguistics, that of the *Source-Path-Goal* schema (see Mark Johnson, 1987; Forceville, 2006). These parallels reflect more than superficial coincidence, but are the result of two disciplines articulating the same intuitions in complementary ways. The cognitive-linguistic articulation makes the state-space view relevant to human activities such as love, education and work, and cultural products such as sports, games, books and movies. A good deal of human creativity in the humanities can be understood and partially explained in terms of the *Source-Path-Goal* schema, and though the elements of a complete explication still await a convincing formalization, we feel that the AI notion of exploration in a state-space will have a foundational role to play in this formalization.

So, on one hand, computer scientists have developed rich and varied specializations of the search-in-a-state-space metaphor, to allow computers a significant degree of rational thinking ability, albeit in form that is problem-centric and tightly goal-focused. On the other hand, linguists, semioticians and cognitive scientists have developed a suite of critical approaches to unearthing the metaphoric and image-schematic underpinnings of a wide range of creative works in a variety of modalities.

Separating these two path-based perspectives is a wide creativity gap in which computationalists generally fail to extend their algorithmic search processes to the level of creativity found in the humanities, and in which humanities scholars generally fail to formalize their conceptual insights in the falsifiable, algorithmic detail required of a true scientific theory.

This creativity gap needs to be narrowed from both perspectives simultaneously. By looking to creativity in the arts, we may identify specific and productive uses of the *Source-Path-Goal* schema that can be given a scalable computational realization. Many instances of creativity, both textual and visual, appear to rely on the compression of conceptual pathways between different ideas (e.g., see Koestler, 1964; Fauconnier and Turner, 1998; 2002), while other kinds of creativity (such as humorous metaphors and insults) rely on the tenuous over-stretching of conceptual pathways. An analysis of expressive insults also makes it clear that a creative effect can also be achieved by stretching the conceptual pathway linking the source and goal concepts beyond some conventionally acceptable distance, thereby evoking new intermediate concepts and images (see also McCarthy, 1999). It is thus important that we explore the computational basis of the kinds of creative dualities that arise from the compression and extension of conceptual paths. By considering the further ramifications of computational constraints on production, we may generate falsifiable hypotheses that are testable in the realm of the arts.

3.2. Ambiguity and Choice

The key to agile behaviour in a search space is the recognition that search spaces are all about *choice*: at each step, one faces a range of choices, some more intelligent and insightful than others. One can be overwhelmed by choice and try to narrowly focus on just a small subset of possibilities, or one can embrace choice and perhaps even create new choices of one's own.

It is tempting to say that choice arises from an inherent ambiguity in the specification of an object or situation, and it is certainly the case that some situations (such as the joke space in Figure 4) and artifacts (such as optical illusions) are deliberately engineered to be ambiguous. Yet, from a realist perspective, the world is what it is, and ambiguity is not an inherent quality of things in the world. Rather, it is an emergent quality that arises from the juncture of external reality and the expectation-driven perceptual apparatus of a cognitive agent. Once we accept that ambiguity is created by the act of

perception itself, we can begin to see how creative thinkers actively create ambiguity, to give themselves more choices in the exploration of a space.

As a subjective product of perception rather than an objective feature of the world, ambiguity can be viewed by a cognitive agent as either a problem or as an opportunity. Consider, for example, the ambiguities arising from Edmund Morris's 1999 biography of Ronald Reagan, titled *Dutch*. This book controversially violated a number of entrenched conventions in the genre of biography-writing, by creating fictionalized characters that interact with real people via fictionalized conversations; indeed, even some of the "factual" end-notes in *Dutch* are fictionalized. This creative approach to biography was Morris's response to the essential unknowability of Reagan; the book is as ambiguous as the man, for Morris wants his audience to be as confused by his subject as he himself was. Store owners responded to the ambiguity of *Dutch* in different ways. Some preserved the ambiguity by selling the book as an official biography, while others openly refused to shelve it in their biography sections. In an act of overt disambiguation, some stores even erected signs to direct interested buyers of the book to their fiction sections.

Contrast this dilemma with the opportunity identified by Euan Booth for cross-categorizing Tony Blair's controversial autobiography *A Journey*. While this book created no apparent ambiguity for store owners, protesters like Booth nonetheless felt that Blair's book contained enough self-serving rationalizations to qualify as fiction just as surely as Morris's *Dutch*. In this case, a perceived ambiguity between biography and fiction provided Booth and his cohort with a new choice in how to react to the book: these protesters found an elegant way of publicizing their viewpoint, of engaging the general public in a wittily subversive action (for which one cannot be arrested), and of thwarting the sales of a controversial book. While Morris's author-driven experiment in ambiguity can be judged an expensive mistake, Booth's audience-driven experiment was a remarkably thrifty success.

3.3. Metaphors all the way down?

The *search in an abstract state-space* model of Newell, Shaw and Simon, when combined with Boden's notion of exploration and transformation in a *conceptual space*, provides some theoretical substance for the notion that creative thinkers exhibit mental agility. Within these abstract spaces, we find cognitive correlates for physical qualities like speed, grace, flexibility and nimbleness, yet it can also seem that we are simply decomposing an

appealing high-level metaphor into a set of successively finer metaphors for which we possess linguistic evidence. These metaphors are certainly suggestive, but they beg an important question that they themselves are unable to answer: in what cognitively and algorithmically meaningful sense can a thinker be agile and nimble in an abstract space? In what sense can some parts of a conceptual space be harder to reach than others?

At first blush, the notion of speed offers the most obvious cognitive interpretation. Agile searchers exhibit noteworthy speed in their explorations of a physical space, so we can expect agile thinkers to exhibit comparable speed in their explorations of an abstract conceptual space. In simple computational terms, agile thinkers are quick-witted in the sense that they reach their conclusions quickly, with faster run-time performance than their less agile counterparts. Speed is, after all, the difference between the fizz of sparkling repartee and the fizzle of staircase wit. Yet there is surely more to being quick-witted than merely being quick: computers can perform some complex tasks (like solving equations, or analyzing chess moves) with blazing speed, yet their quickness does not make them quick-witted. The key, of course, lies in the word “wit”, which denotes our ability to size up a problem, determine what choices are available to us, and decide upon an effective course of action. To be quick-witted in a conceptual space is to be quick in recognizing the component states of the problem, in understanding the connections between these states, and in plotting a course through these states to an acceptable solution.

The state-space model encourages us to view the states and transitions of a space as being defined by the problem itself, so that the state-space has a Platonic reality that logically precedes its subsequent exploration. However, creative problems are rarely so clear-cut, and explorers must actively construct the space while the exploration is ongoing. The question of what constitutes a legal state or a viable transition must be constantly posed and answered if one wants to step outside the narrow confines of conventional wisdom, and so creativity can reside just as much in how one constructs a state space as in how one explores that space. Explorers are quick-witted and nimble to the extent that they can quickly identify suitable intermediate states that help them bridge the gap between where they stand and where they want to be in the space. In this vein, AI pioneer John McCarthy has argued that creativity lies in our ability to employ concepts that are neither explicit nor obvious in the specification of a problem.

3.4. Novelty, Utility, Agility

Ultimately, no single criterion can be used to distinguish creative from non-creative behaviour, and any explication of mental agility in terms of the dynamics of search must involve multiple interacting criteria. Newell, Shaw and Simon outline four separate criteria for agile search, some or all of which are pertinent to whether we label an outcome as “creative”:

1. The answer has novelty and usefulness (for either individual or society)
2. The answer demands that we reject ideas we had previously accepted
3. The answer results from intense motivation and persistence
4. The answer comes from clarifying a problem that was originally vague

We can see in these criteria the building blocks of our romanticized and mythicized view of creativity. Neither criterion in isolation is guaranteed to earn us the plaudit of “creative”, but combinations of these criteria – such as (1) and (2), or (1) and (4), or (2) and (3) – yield a nice fit to the romantic ideal. Each criterion tells us something of how creativity can arise from search in an abstract state space: thus, (1) characterizes the goal-state at the end of the search; (4) suggests how we might start a search on the right footing; (2) suggests how we might depart from conventional wisdom in the traversal of a space, and thereby explore virgin areas in the space; and (3) suggests the qualities that are needed to find a solution that satisfies (1).

Some criteria simply enhance our appreciation of others. Criterion (3), if applied with sufficient discipline and speed, can yield results that ultimately satisfy criterion (1), yet we are loathe to attach the label “creative” to the results of an unimaginative search, no matter how rapid or exhaustive it may be. Persistence, after all, is an admirable quality in people, but a rather unappreciated one in machines. Criteria (2) and (4) come closest to capturing what we mean by mental agility. In effect, (2) and (4) encourage us to define a problem for ourselves, to choose our own stock of concepts and constraints, and to not be satisfied with what is conventional or given.

Agile behavior requires flexibility, so when we speak of mental agility, we typically have weaker and more flexible versions of criteria (2) and (4) in mind. Thus, in (2), we rarely reject conventional wisdom in its entirety, but exercise some selectivity in how we use it. For instance, it is an accepted norm in comic strips that speech balloons contain text, because it is also a norm that speech is rendered as text in printed media. However, as

Charles Forceville will show in a later chapter, we can reject the latter while keeping the former, to e.g., put icons, hieroglyphs, and other visuals into our speech balloons (so we might imagine the speech balloons of a deaf speaker containing images of hands making visual gestures). Likewise, criterion (4) can be invoked even in cases where a problem does not seem vague and in need of clarification. Rather, an agile thinker can create additional room to manoeuvre by perceiving ambiguity in a description where others perceive a seemingly rigid and unambiguous specification. For instance, when speaking of speech balloons, one can ask how much or how little speech can be placed in a balloon, since the quantity of speech is not a defining characteristic. In response, one may put so much text into a balloon that it is impossible to read (signifying the small print of a lawyer, or the babble of a bloviator), or no text at all (signifying stunned silence).

In the physical world, agility is not simply a matter of speed of action or of depth of perception, but of perception and action working in concert, to gracefully achieve a goal with a minimum of effort. In an abstract conceptual space, mental agility is likewise a matter of perception and action working in concert, so that an agent may rapidly construe a situation, perceive what choices are available – actively constructing those choices where necessary – and so decide on an effective course of action. Ambiguity is an emergent quality of our expectation-laden perception of the world, but an agile mind sees this ambiguity as an opportunity rather than as a problem. The opportunity is to perceive an unexpected choice where others perceive confusing indeterminism. We expand on this theme in our next chapter, where we show how these choices can allow us to create unconventional pathways through a conceptual space.

Indeed, throughout this volume, we shall return again and again to this notion of flexible contrual – of a problem, a situation, a norm or a resource – that allows a cognitive agent to perform an agile exploration of a conceptual space and thereby achieve creative ends.

3.5. The Agile Dance

There is a significant social dimension to creative behaviour, for much of what we do of a creative nature is influenced by other people, if not designed to be consumed and judged by other people. While we can conceive of solipsistic creativity of the *Robinson Crusoe* variety – in which a marooned person must exercise creativity in a total social vacuum – the

extremeness of this example shows just how hard it is to imagine creativity untied from its social moorings.

We often employ our creative energies to impress others, yet it would be wrong to think of these efforts as the cognitive equivalent of a peacock's strut. When we create in social contexts, even with the self-centred goal of showing off, we are not individuals working alone in front of an audience, but collaborators working together to arrive at a shared state of mutual understanding. As such, every successful act of mental agility in a social context must be reciprocated with a corresponding agile turn by our intended audience. In this respect, it is helpful to think of social interaction as a dance, in which our mundane, everyday interactions are highly-choreographed affairs. Social creativity arises when one or more participants depart from the established sequence of steps, to perform turns that are unexpected yet meaningful within the dance. When one 'dancer' takes the lead, others must follow in step if the integrity of the dance is to be maintained. Thus, every agile turn by the leader must produce a corresponding agile turn by the follower. This leader / follower distinction may be fluidly constructed, since there are contexts – such as improvisation in comedy and riffing in jazz – where participants dynamically alternate between the roles of leader and follower.

It is difficult to reconcile this agile view of social creativity with the criteria offered by Newell, Shaw and Simon, in part because these criteria seem specifically tailored to eminent big-C creativity in the scientific realm, and in part because they are simply too strong to capture the disposable small-C creativity of social interaction. When a speaker coins a novel pun or invents a new metaphor, one might argue that the speaker is rejecting the conventional sense of the underlying words, though it seems a stretch to view this as the *rejection of an accepted idea* (2). When a speaker invents a novel word from whole cloth, what exactly is being rejected, other than the idea that our existing lexicon should be sufficient for our needs? Every act of creativity is a rejection of some part of the status quo, so in this weak sense every act of creativity will conform to criterion (2).

By using the metaphor of mental agility as a touchstone, the papers in this collection coalesce around a more nuanced set of criteria for creativity than those offered by Newell, Shaw and Simon. For instance, contributions from Bipin Indurkha and Kurt Feyaerts turn criterion (2) on its head, to view creativity not as the rejection of an accepted idea, but as the construction of an alternate construal or perspective. Patrick Hanks, in turn, seeks to flesh out what might usefully be meant by *an accepted idea* in the

realm of linguistic interaction. He argues that language comprises a fluid mix of norms and exploitations; the former are conventions that guide our normative interactions, much like the highly-choreographed dance steps we alluded to earlier; the latter are departures from the norm, which our dance partners must follow if they are to maintain the coherence of the dance. Key to Hanks' conception is the idea that norms are not just behaviors, but a source of tacit knowledge that is shared by the speakers of a language. It is this mutual knowledge that allows a creative speaker to anticipate how a conversational partner will react to an agile turn of phrase.

Several chapters go on to characterize norms and their exploitations in different modalities and domains. Veale and Hao show how a large body of cultural norms can be gleaned from similes and other linguistic forms that encourage speakers to be agile in their use of stereotypes. Exploring the interface between image and text, Charles Forceville identifies a range of normative constructs in the domain of comic strips, while Gert Meesters shows just how far one can knowingly stray from these norms in the most avant-garde forms of comics.

Other chapters take up the notion of creativity as an agile dance, in which the novel actions of one partner are planned with explicit regard for the actions and capabilities of the other. Thus, Elizabeth Zima looks at how parliamentarians exploit mutual knowledge to craft memorable put-downs in an adversarial context, while Geert Brône and Bert Oben are more explicit in their modelling of the turn-taking structure of creative interaction. Tom De Smedt and his co-authors see in this interactivity the opportunity to construct software tools in which humans and computers interact to achieve a creative end. Andreas Langlotz explores how speakers collude with each other to construct playful on-line identities for themselves, while Christian Burgers and his co-authors show how one can push the limits of mutual understanding when constructing an ironic message. The agility of linguistic interaction is given a physical embodiment by Alan Cienki and Irene Mittelberg, who explore how spontaneous gestures can be used to creatively augment spoken communication. Finally, chapters by Kathleen Coessens, Juan Parra Cancino, Paul Sambre, Hendrik Vanden Abeele explore the flexibility and freedom that an agile performer can bring to the interpretation of music.

3.6. Kinds and Degrees

Human creativity takes many forms and manifests itself to varying degrees in different contexts and modalities. Many instances of small-C creativity are so unassuming that they can more accurately be called instances of *micro*-creativity, while others so ostentatiously announce their presence that they demand to be viewed as instances of big-C creativity. Such a large and restless concept as creativity – even in its small-C guise – rebuffs every effort to tame it with a single over-arching definition or to hem it in with a set of necessary and sufficient features. This book represents the belief that creativity is a multi-faceted phenomenon that can only be adequately studied from a multi-disciplinary perspective. To tie all of these facets and perspectives together, we need a flexible metaphor rather than a tight definition, one that is stretchy enough to be relevant in each domain and modality of interest, but one that can always be anchored in cognitive, linguistic and computational foundations.

In short, we need a metaphor that is agile enough to keep up with a phenomenon that refuses to be pinned down. Fittingly, we find this metaphor in the notion of *mental and conceptual agility*. We use this metaphor to denote more than an ability to think on one's feet. Rather, we take it to signify a whole range of related abilities and qualities, such as: the ability to construe an object or situation in unconventional ways; the ability to perceive opportunistic ambiguity where others see only a conventional form or are overwhelmed by indeterminism; the ability to perceive unconventional *affordances* in an object or resource; the ability to dynamically alter one's goals and the criteria guiding one's search in a state space; the ability to alter one's representation of an object or a problem; the ability to exploit ambiguity to achieve multiple goals at once, and thereby achieve a degree of conceptual and communicative economy; and so on. Each of these abilities is suggested by the core metaphor of conceptual agility, and may give rise to linguistic metaphors of its own, but each can be understood as standing for specific qualities and behaviors in the context of a goal-driven search in an abstract state-space.

On this last point, some readers may worry that we cleave too closely to the Artificial Intelligence (AI) world-view. The problem-centric, goal-driven view of creativity may be ideally suited to the optimization problems one typically encounters in a scientific and engineering context, such as building a more accurate missile, a more energy-efficient car, or a more autonomous robot. But perhaps it is less suited to domains where the goals

are not so explicit, and where creators do not naturally think of their activities as problem-solving? After all, what problem was Duchamp trying to solve with his signed urinal, or Michelangelo with his frescoes in the Cistine chapel? To this objection, we simply say that creativity in different domains of different degrees (small-C versus big-C) may be motivated by very different goals, but there are goals nonetheless. In some domains, the goal is mostly an aesthetic one; in others, it may be mostly functional; in others a combination of both, and so on. In each case, however, a creator will strive to achieve an outcome that Newell, Shaw and Simon capture with their first criterion (1): the development of an outcome that exhibits novelty and utility.

In each of the chapters in this volume, contributors explore how creators – whether speakers, writers, artists or musicians – employ agile conceptual mechanisms in a diversity of domains, in a search for outcomes that exhibit some degree of novelty and utility. For the most part, these explorations occur near the small-C end of the creativity spectrum, for this is the kind of creativity we all consume and produce in our everyday lives. The study of big-C creativity can give the impression that the world is divided into two classes of people: those who produce creative outputs, and those that consume them. However, this impression is far from the truth: we are all producers and consumers of creative products, whether an agile turn of phrase or a clever use for an otherwise redundant object. Moreover, the very conception of creativity as a spectrum of behaviors and outcomes suggests that the seeds of big-C creativity are to be found in the fine-grained analysis of our small-C endeavors. We can thus use the same analytical tools to understand every kind of creativity, big or small. This book shows these tools in action on a level that we can all appreciate.

4. Collecting The Agile Mind: A Bird's Eye View

The contributions that comprise this volume cluster most naturally into the following sections, though like Morris's *Dutch* and Blair's *A Journey*, some chapters could comfortably reside in multiple sections at once.

4.1. Computers and Creativity

Our first division is **Computers and Creativity**, which opens with a chapter of the same name by Bipin Indurkhya. Indurkhya has long been a

proponent of the relevance of computing concepts to the understanding of creativity. Here he argues that to think anew about an object, much as Duchamp thought anew about urinals and other everyday *readymades*, one must be capable of de-conceptualization. Indurkha's paper explores this idea from a computational perspective, showing that an algorithmic mindset need not be anathema to the realization of creativity. The second chapter in this section was written by Tom De Smedt, Frederik De Bleser, Vincent Van Asch, Lucas Nijs and Walter Daelemans. These authors present a computational system called *Gravital*, which acts as a creative assistant of sorts for graphic designers. Users interact with *Gravital* either through a programming interface (for experienced "power users") or through simple natural language. *Gravital* uses semantic networks to map the latter onto a variety of visual realizations, e.g. by determining apt colors for certain words and concepts. This work has not only produced a practical tool for creative workers, one that continues to be updated, but also allows researchers to explore the productive grey area between creative individual and creative assistant.

The third chapter in this section is by Tony Veale and Yanfen Hao, who discuss the knowledge requirements of a computational system that is capable of creative metaphor. These authors show how such knowledge can be harvested automatically from the World-Wide Web, by targeting linguistic constructions (such as the *as-simile*) that are anchored in stereotypes and which thus convey a wealth of cultural knowledge. Veale and Hao argue that metaphor processing does not exploit just any old knowledge about source and target concepts, but focuses on those aspects that are most salient in everyday conversation. The Web is filled with vast quantities of knowledge of dubious value, but these authors show how the most apt talking points can be acquired by a computational system that looks in the right places. It is worth noting that some of this knowledge is already used in practical systems like *Gravital*, as well as in online metaphor generation systems (see *Afflatus.UCD.ie*).

4.2. Verbal Communication

Language is a medium that readily supports both large-scale and mundane creativity, and so our second division, **Verbal Communication**, looks at linguistic creativity from a variety of different perspectives. The first is by Patrick Hanks, whose perspective serves as a useful touchstone for creativity more generally. Hanks' chapter views linguistic creativity as part

of the inherent dynamism of language, wherein new patterns of usage enter a language, invigorate it for a while, and gradually become established as the old guard. If used habitually by enough speakers, even the most striking new patterns can become norms against which the creative speaker will wish to rebel. But Hanks' point is that creative speakers do not reject norms outright; rather, they exploit norms in a variety of ways – metaphor and simile being amongst the most popular – so that a norm can do useful work for a speaker even as it is knowingly subverted. The second chapter of this section is by Elizabeth Zima, who uses the framework of cognitive grammar to understand the conversational creativity of parliamentary debates. To fully appreciate the cut-and-thrust of lively debate, Zima notes that one must adopt an intersubjective view of proceedings. In particular, one must understand how an interpersonal common ground (of mutual beliefs and assumptions) is constructed and maintained by the participants in a dialogue. The historical exchanges that we remember today as being the most creative (the witticisms of Winston Churchill come to mind here) therefore tend to be those where the interpersonal context is easiest to reconstruct.

The third chapter of this section comes from Andreas Langlotz, who shifts our perspective from the interpersonal to the *hyperpersonal*. Langlotz explores the ways in which speakers creatively use language to construct identities for themselves and their social groups as they interact online (in a computer-supported learning environment). He observes that students in such a setting show remarkable semiotic agility in constructing new virtual realities for their new virtual identities, to e.g. establish and communicate their social positions in an online world. The fourth chapter in this section comes from Geert Brône and Bert Oben, who also look at the creativity that arises from linguistic interaction. In particular, Brône and Oben investigate how speakers align both their linguistic choices and their linguistic representations in turn-taking situations, so that they may build upon (and the sense of Hanks above, *exploit*) what has gone before. They observe that speakers frequently employ repetition, echoing and structural parallelism not just to maintain the cohesion of a dialogue, but to additionally reap humorous benefits from the words of their interlocutors.

The fifth and final chapter of this section comes from Kurt Feyaerts, who sees creativity as the product of inspired construal. Creative individuals achieve unexpectedly effective results, he argues, because they choose to construe the world differently. Feyaerts focuses here on the processes of subjectification, objectification, and de-automatization, to lay

the groundwork for what is a remarkably ambitious research agenda: the elaboration of a cognitive grammar of creativity. This contribution nicely picks up our theme of the producer/consumer dichotomy, and argues persuasively that one cannot understand creativity without first appreciating the inter-subjective nature of human interaction.

4.3. Visual Communication

Art and creative artifice can occur in any medium, but our sense of the visual underpins the most common media for artistic creativity. Our third division, **Visual Communication**, therefore considers a variety of visual media, from gestures to comic-strips to pictorial advertisements. The first chapter of this section is by Alan Cienki and Irene Mittelberg, who note that since face-to-face speakers often use manual gestures as an extra channel of communication, this visual channel can also be used creatively. They observe that gestures are an intriguing basis for creative communication because, unlike other kinds of motor-visual creativity such as dance, speakers are often only semi-aware of what they are gesturing, and often lack explicit communicative intent for their gestures. Because these gestures are usually spontaneous, they allow linguists to not only study the coordination of words and actions, but to study a communicative medium that prizes spontaneity. The second chapter in the section comes from Charles Forceville, who studies the interaction of form and meaning in the text balloons of comic-strips. Whereas gestures provide an additional channel for communicating meaning in spoken language, Forceville here explores the ways in which the visual characteristics of text balloons – the standard containers of language in a comic-strip – provide an additional and often creative channel for agile communication. Forceville's investigation considers dimensions such as shape, size and color, to show how the best comic strips turn language into a visually-enriched multimodal phenomenon. The third chapter in this section, by Gert Meesters, also focuses on the medium of the comic-strip. Whereas Forceville looks at relatively mainstream comic-books, Meesters here explores the output of the *Oubapo* collective, whose goals are primarily artistic rather than commercial. Another important contrast is evident in this chapter: whereas Forceville looks at how creative comics artists expand their communicative reach by the use of additional forms and associations, and thus go beyond the conventional style catalogue of comics, Meesters looks at how *Oubapo* proponents impose explicit – and seemingly quite limiting – restrictions

upon themselves. The final chapter in this section was written by Christian Burgers, Margot van Mulken and Peter Jan Schellens, who also look at how creativity can emerge from the interaction of the verbal and the visual. In particular, these authors focus on the use of images to support and enhance instances of verbal irony. They note that images can be used to not only illustrate the literal meaning of an ironic statement, but to also highlight the humorous incongruity of a literal evaluation.

4.4. Musical Performance

Our final section, **Musical Performance**, explores creativity from the perspective of the performer and skilled practitioner. All four chapters in this section specifically focus on performance issues in music. The first, by Paul Sambre, explores how multimodal conceptual blends are used to create new meanings and resonances in musical performances. In particular, Sambre examines the use of blends by Swedish trombonist Christian Lindberg, whose distinctive interpretation of themes from Don Quixote is combined with a creative appreciation and exploitation of the historical norms of the trombone concerto. In the second chapter of this section, Kathleen Coessens also uses conceptual blending theory as a framework for exploring musical creativity. Like Sambre, Coessens explicitly adopts the perspective of the creative producer, rather than the much-studied perspective of the consumer as critic or researcher. Though there is an ineffable quality to the actions of a creative performer – we can appreciate what they are doing, but not fully appreciate the subjective cognitive mechanisms that turn competence into action – Coessens argues that researchers must nonetheless develop a discourse with practitioners that allows us to better appreciate the mind of the performer. The next paper in this section is authored by Hendrik Vanden Abeele, who similarly adopts a performer-centric perspective on musical creativity. Vanden Abeele focuses here on plainchant, a form of religious expression that is itself a creative solution to a communication problem in church ceremonies. The plainchant form allows a liturgist to recite a religious text to a large audience by singing the text; singing is an elegant means of injecting volume into an oft-recited text which would otherwise have to be shouted or loudly intoned. Though plainchant is born of creativity, Vanden Abeele shows here that it continues, in turn, to support further creativity on the part of the performer.

The final paper in this section, and of the volume as a whole, comes from Juan Parra Cancino. Given our dualist focus here it seems apt that Cancino's contribution, on the use of computational systems in the production of music, could have just as easily been categorized under **Computers and Creativity**. However, in tackling the issue of producer versus consumer head on, Cancino makes it clear that he sees computer systems as *meta*-instruments that should maintain some sense of real-time autonomy while nonetheless being under the influence of a human performer. Though focused on computer-aided electronic music, Cancino's contribution contains much that will appeal to more traditional students of musical creativity, and of creativity in general. His chapter is rich in historical detail, and offers real insights into the dichotomies of producer vs. consumer, conductor vs. musician, live vs. recorded, performer vs. audience and human vs. computer.

5. Parting Thoughts

If these chapters show that creativity demands a certain agility of thought and expression from creative individuals, they also show that the study of creativity demands an equal measure of agility from the researchers who study it. We believe there is much here to interest the student of creative behaviour, especially one who appreciates that a phenomenon as multifaceted as creativity requires a similarly multifaceted approach. Before we give way to the multidisciplinary analyses to come, it only remains for us here to thank all those who contributed to the development of the current volume. Foremost on our list is Marc De Mey, the director of the *Flemish Academy of Arts and Sciences* (VLAC) in Brussels, with whose support the original *Agile Mind* event was funded and organized. Thanks must also go to the tireless support staff of the academy, in particular Inez Dua. We should also like to thank Tim De Mey, a philosopher and fellow traveller who suggested the wonderfully evocative *Agile Mind* as a title for the event. We also express our gratitude to the contributors to the event, whose revised papers provide the chapters of this volume. Finally, we should like to thank Francisco Ruiz de Mendoza Ibáñez and Gitte Kristiansen, whose encouragement made the current volume a reality, and their appointed reviewers, who provided so much valuable feedback.

References

- Boden, Margaret
1990 *The Creative Mind: Myths and Mechanisms*. Second edition. Routledge.
- Boden, Margaret
1999 Computational models of creativity. In Robert J. Sternberg (Ed.), *Handbook of Creativity*, 351–373.
- Fauconnier, Gilles and Mark Turner
1998 Conceptual Integration Networks. *Cognitive Science*, 22(2):133–187.
- Fauconnier, Gilles and Mark Turner
2002 *The Way We Think. Conceptual Blending and the Mind's Hidden Complexities*. New York: Basic Books.
- Forceville, Charles
2006 The source-path-goal schema in the autobiographical journey documentary: McElwee, Van der Keuken, Cole. *New Review of Film and Television Studies* 4: 241-261.
- Johnson, Mark
1987 *The Body in the Mind*. Chicago, Illinois: Chicago University Press.
- Koestler, Arthur
1964 *The Act of Creation*. New York: Macmillan.
- McCarthy, John
1999 Creative Solutions to Problems. In Proceedings of the AISB'99 symposium on AI and Scientific Creativity, Edinburgh, Scotland.
- Minsky, Marvin
1980 Jokes and the Logic of the Cognitive Unconscious. A.I. memo no. 603, M.I.T. A.I. Laboratory.
- Newell, Allen, J. Clifford Shaw and Herbert A. Simon
1963 The process of creative thinking. In H. E. Gruber, G. Terrell and M. Wertheimer (Eds.), *Contemporary Approaches to Creative Thinking*, 63 – 119. Atherton.
- Paulos, John Allen
1982 *Mathematics and Humor*. University of Chicago Press.
- Veale, Tony and Keane, Mark T.
1996 Catastrophes Of Goal Activation In The Appreciation Of Disparagement Humour. In Hulstijn, J. and Nijholt, A. (eds.), *The proceedings of IWCH'96, the First International Workshop on Computational Humor*, Enschede, The Netherlands.
- Veale, Tony
2012 *Exploding the Creativity Myth: The Computational Foundations of Linguistic Creativity*. London: Continuum.