TONY VEALE

EXPLODING THE CREATIVITY MYTH

THE COMPUTATIONAL FOUNDATIONS OF

LINGUISTIC CREATIVITY

Exploding The Creativity Myth

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Exploding The Creativity Myth

The computational foundations
of linguistic creativity

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For Hyesook

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Preface

Creativity touches almost every aspect of our daily lives. Linguistic creativity is especially pervasive, both in our communication with other people and in the constant stream of media to which we are continuously exposed. This pervasiveness has lead to creativity being studied in a multitude of forms and in a wide array of disciplines by scholars and practitioners alike. Thus, creativity has been studied not just by psychologists, neuroscientists, linguists and cognitive scientists, but by critics, historians and even management theorists, while creators themselves, whether writers, artists, musicians or entrepreneurs, frequently offer us their own field-tested insights into the creative process. But even in this all-embracing swirl of disciplines and viewpoints, the perspective we apply in this book – the algorithmic perspective of Computer Science – can stick out as something of a gatecrasher to the party.

This is a natural reaction, since we are far more likely to associate computation and algorithms with the rigid, pre-programmed behaviour of machines than with the adaptive, freewheeling behaviour of real human beings. Yet, as I show in this book, the computational perspective is very much suited to the study of creativity. For this to be so, we must simply assume it is possible to meaningfully generalize over specific instances of creativity to arrive at a schematic understanding of what happens when and in which order, and of what resources are used in which stages of the process. This is an assumption that is made in almost every practical study of creativity; just think of all those books and self-help manuals that attempt to explain creativity with anecdotes, or that aim to improve your creative potential by generalizing over case-studies. But this is more or less what we mean when we talk of an algorithmic process: a well-defined sequence of tasks and sub-tasks that allows us to achieve a complex goal in a somewhat orderly fashion. There may well be a great many algorithms that lead to creative results in different contexts, and we should not caricature the computational perspective by assuming that there is a single grand algorithm that reduces the whole of human creativity to a few simple functions and procedures. Rather, we may have to explore many specific forms of creativity before we can arrive at any substantial high-level understanding of the phenomenon. By focusing on novel variation at the level of words and phrases, this book represents just one expedition of the many

that will be needed to fully explore linguistic creativity in algorithmic terms. I hope readers will find the journey to be both rewarding and fun.

Because creativity is so often used to produce surprising results, there is a natural tendency to expect the workings of creativity to be equally surprising and perhaps even mysterious. But we must dispel the myths if we are to see creativity with a clear eye. The real surprise, if we can call it a surprise, is that the algorithmic mechanisms of creativity all follow from a common-sense understanding of how best to maximize the utility of our frequently incomplete knowledge of a topic or domain. This knowledge, in turn, is surprising only in its lack of mystery: as we'll see in this book, linguistic creativity does not rely on privileged sources of knowledge that must be acquired through intense scholarship, but on the kind of mundane, everyday knowledge – of clichés, stereotypes and conventions – that we all possess in abundance and which we all take for granted. We use this familiar knowledge to create familiar surprises for an audience, to concoct novel uses of language that depart from the familiar yet which are understandable only in relation to the familiar. We use linguistic creativity to re-invent and re-imagine the familiar, so that everything old can be made new again.

This constant churn of re-invention in language is nowhere more apparent than on the World Wide Web (WWW). With the aid of a web-browser, we can explore the old and the new and every shade of variation in between. We all rely on intuitions about what is familiar and what is novel to guide us in our explorations of the world, but when our intuitions concern language, a good linguist will seek empirical evidence for these intuitions in a corpus. A corpus is a representative (and usually quite large) body of text from which we can derive quantifiable observations about the likelihood and frequency of different kinds of linguistic phenomena. As a vast and continuously growing body of text and other media, the web certainly meets some of the requirements of a corpus, though it is far from ideal. Nonetheless, in an exploration such as ours, the positives do out-weigh the negatives, not least because readers can easily test the observations in this book for themselves, by firing up their favourite search-engine and then following their own noses on the web.

However, as I show in this book, it is not just humans that can learn about language by browsing the web. Search engines like Google, Yahoo and Bing are designed for human users, but they can also be used by computers to acquire targeted texts for their own purposes, on a much larger scale and in a much shorter time frame. We'll see here how computers can acquire from the web the familiar knowledge of language and the world that we humans take for granted, so that we in turn can gain a broader appreciation of the foundational role of the familiar in the creative.

Novelty only ever makes sense in relation to the familiar, and as will become clear in the chapters to follow, many familiar influences have inevitably left

their mark on the substance of this book. In particular, the algorithmic view of creativity presented here has been shaped and enriched by many conversations and debates with colleagues and friends in the field, such as Simon Colton, Kurt Feyaerts, Geert Brône, Charles Forceville, Patrick Hanks, Bipin Indurkhya, Marc and Tim DeMey, Bob French, John Barnden, Mark Keane, Diarmuid O'Donoghue, Pablo Gervás, Amílcar Cardoso, Francisco Pereira, Geraint Wiggins, Graeme Ritchie, Tim Fernando, Josef van Genabith and my students Guofu Li and Yanfen Hao. My editor at Bloomsbury, Gurdeep Mattu, has also been a constant source of encouragement and sound advice. I am indebted to them all for their insightful comments and suggestions, which have helped to make the book much clearer in purpose and sharper in execution than it would otherwise have been. Finally, I am grateful to the readers of this book for joining me on this computationally-minded exploration of creative language; I hope that in the process you will gain a new appreciation for the familiar and often disdained elements of language – from clichés to stereotypes to dead metaphors – and see in these habitual forms the means to re-invent the familiar for yourself.

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Creation myths

Separating poetic fiction from prosaic fact

Creativity is a topic that delights in mystery and which invites myth-making at every turn. Our popular conception of creativity is not shaped by any formal definition, but by hand-me-down metaphors and historical anecdotes. It's easy to see why: creativity exists in the interstices between our definitions, where it can circumvent rules and overcome constraints. As soon as we think we've hemmed it in with a tight, rule-based definition, creativity is already hard at work on an escape plan. Our myths and metaphors may be the only constructs that are stretchy enough to keep pace with this restless, genre-bending phenomenon. Yet we must handle these appealing 'creation' myths with caution, for their purpose is not so much the illumination of creativity as the enhancement of our appreciation of it, by emphasizing effect over cause, perception over process and mystery over method. We thus begin our exploration of linguistic creativity by roasting a few popular chestnuts, to find some facts behind the convenient fiction.

Elementary myths

Like the pointy-hatted wizards of children's storybooks, hidden from the world in high towers, modern-day stage magicians have every reason to jealously guard the secrets of their trade. Naturally they possess a strong commercial motive for this secrecy, for a loose-lipped magician can easily put himself, and his colleagues, out of a job. Yet the best magicians have a more profound reason to maintain their silence: magic evokes wonder through illusion, and illusion requires an equal measure of curiosity and ignorance if it is to succeed. All of a magician's virtuosity and training are for naught if their trickery fails to generate wonder.[1] Unless one has a professional interest in the craft, there is no bargain to be had in trading an outsider's wonder for an insider's knowledge.

Creative thinking can generate as much wonder and awe in an audience as a magician's best illusions. It too can be diminished by explanations that emphasize what seems obvious and simple *after* the fact. In trivializing the creative process, such post-hoc explanations can make soft-focus myths seem far more preferable to hard facts, as even Sherlock Holmes learns to his cost in the tale of *The Red-Headed League*.[2] In this short story by Arthur Conan Doyle, the great detective is engaged by Mr Jabez Wilson to investigate the titular league. On first meeting, Holmes performs his usual cold-reading of his new client, to note that 'Beyond the obvious facts that he has at some time done manual labour, that he takes snuff, that he is a Freemason, that he has been in China, and that he has done a considerable amount of writing lately, I can deduce nothing else'. This is false modesty, naturally, for Wilson is suitably amazed (Watson, for his part, knows better by now). But Holmes then makes the mistake of explaining his conclusions, noting for instance that the tattoo of a pink-scaled fish on Wilson's wrist is very much in the Chinese fashion. 'Well, I never!', replies Wilson,[3] 'I thought at first that you had done something clever, but I see now that there was nothing in it, after all'. Holmes ruefully sums up this lesson with the motto 'Omne ignotum pro magnifico', remarking to Watson that 'I make a mistake in explaining . . . and my poor little reputation, such as it is, will suffer shipwreck if I am so candid'. Why seek to provide a factual explanation of the creative act, when what an audience really wants is wonder and illusion?[4]

Jabez Wilson is hardly qualified to judge the merits of Holmes' technique, and Holmes is being kind when he later describes his client as 'not over-bright'.[5] Yet Wilson's response echoes popular sentiments about our appreciation of creative insights. Our most enduring myths suggest that truly creative thinkers should distinguish themselves as very different and unusual kinds of people, with very different ways of thinking about the world. But as

demonstrated in the work of creativity theorists such as Margaret Boden[6] and Keith Sawyer,[7] scholars must look past the myths and metaphors to see the mechanisms that lie behind the popular rationalizations. Sawyer, for instance, identifies a wide range of popular misconceptions that only serve to keep creativity at arm's length, from the mystifying belief that creativity emerges from the unconscious to the romantic notion that children are inherently more creative than adults. Our metaphors of creativity are even more numerous and deeply entrenched in our everyday language. To list just the most popular ones, we like to think of creative people as rule-breakers, groundbreakers, pathfinders, trailblazers and revolutionaries, as child-like and eccentric as they are gifted. These people do not employ linear thought processes, but exploit quick-witted mental agility to pursue a non-linear path to a solution. They do not ploddingly converge on a solution by following rules, but divergently juggle a host of possibilities at once. Last, and definitely least, these people grasp the big picture, see the woods for the trees, think outside the box and colour outside the lines. Some metaphors have more substance than others, but all are perhaps more useful than the historical anecdotes that have assumed mythic status in the study of creativity. In spite of the most appealing legends, one does not need to be an opium fiend, an absent-minded streaker, an infantile vulgarian or an ear-lopping manic-depressive to be creative; neither does one need to be anti-social, unconventional, a high-functioning autistic or an alcoholic. Yet these are the kind of hooks on which – aided by the narrative demands of TV dramas and Hollywood biopics – we so often hang our appreciation of the creative individual.

Of course, if Holmes does suffer reputational damage for a willingness to reveal his methods, he is himself partly to blame, for his explanations are not as revealing as he likes to think. Wilson is right to conclude that there is no real magic in how Holmes arrives at his impressive conclusions, but he is wrong to claim that there is 'nothing in it', just as he is wrong to suggest that it isn't clever. While Holmes' inferences are far from miraculous, they certainly deserve to be called 'clever'. As the detective is always at pains to point out – especially to the long-suffering Dr Watson – his is a technique that anyone can emulate, with the proper dedication and attention to detail. Yet for all that, Holmes offers a most unhelpful account of his reasoning. Despite what he tells Wilson, he does not simply pay attention to the details of a scene to truly see where others merely look. It is more accurate to say that he sifts the mass of available sense data to determine the most telling details from which the most informative inferences can be drawn. What his explanation fails to make clear is how he determines which details are salient and which are not. When Holmes lists the few specific details that lead him to his conclusions about his new client, he makes it seem that the only details are the salient details, and so it seems that every detail is a salient detail. He does not list, or even hint

at, the preponderance of other details from which no useful inference could be drawn. It only seems 'there is nothing in it, after all' because Holmes fails to communicate the most demanding part of the trick.

If Holmes is seen as a *producer* of creative inferences, and Wilson and Watson are seen as admiring *consumers*, then Holmes does a very poor job indeed of explaining the producer's perspective, for this is very different to that of the end consumer. A producer starts from the beginning – a blank page, an empty canvas or an unresolved situation – and must reach an as-yet unseen end through a process of creative sense-making. A consumer has the luxury of starting from this now-achieved end, while also possessing a clear view of the beginning. So what seems like a straight line to a naïve consumer like Jabez Wilson can seem more like an arboreal tangle of branch-points, dead-ends, retreats and re-starts to a producer. Were the consumer to truly put himself in the position of the producer, and set aside the benefit of hindsight, a very different view would present itself. As Watson tells us midway through *The Red-Headed League*, 'I had heard what he [Holmes] had heard, I had seen what he had seen, and yet from his words it was evident that he saw clearly not only what had happened and what was about to happen, while to me the whole business was still confused and grotesque'. The real story of creativity then, the story that the enduring myths and metaphors so conveniently overlook, is the story of how creative individuals navigate this frustrating thicket of potentially overwhelming choices. It is this story that will chiefly exercise us here in this book.

Despite his inability to replicate Holmes' results, Watson offers more insight into the detective's methods than Holmes himself can provide. Holmes, he tells us, makes such great leaps of deduction by chaining small-scale insights into a compelling large-scale interpretation: 'It is so long a chain, and yet every link rings true',[8] Watson notes admiringly. Holmes is so practiced at building these impressively long chains of deductions that 'his brilliant reasoning power would rise to the level of intuition, until those who were unacquainted with his methods would look askance at him as on a man whose knowledge was not that of other mortals'. This is an intriguing description, since in the popular imagination the notions of intuition and reason are generally defined in sharp opposition to one another. Intuition is driven by feelings, hunches and gut instincts and is for the most part an ineffable phenomenon. When we invoke intuition as a rationale for anything, we wield it as a black box whose inner workings are largely beyond our understanding or our scrutiny. Reason, in contrast, is driven by rules, laws and logical models of cause and effect, and reasoned arguments stand or fall on our ability to openly scrutinize their internal consistency. Artists and poets rely on intuition to communicate profound feelings and to explore an emotional truth that lies beyond the realm of objective facts. Scientists and mathematicians can also exploit intuition, but only as

a means of speculation; the results of intuition cannot stand on their own in science, but must be buttressed with logical proofs or empirical demonstrations. In spite of such deep differences, the good doctor offers a means of reconciling these two competing modes of thought. Holmes is so practiced and assured at using logical reasoning to build complex chains of cause and effect precisely because the process has become internalized and automatized, so that it can operate without the need for constant, conscious control.

If we cast intuition in the central role in our account of creativity, our account becomes little more than a vague hunch about how other vague hunches might achieve creative ends. Yet if we cast logic in this role, we lose sight of what makes creativity so special, or at any rate *feel* so special. Sensations and emotions undoubtedly have as much a part to play in our understanding of creativity as in our appreciation of creativity. By reconciling these complementary forms of thought – opaque hunches and transparent deductions – we can allow that intuition plays a significant role in the creative process without conceding the ability to explicate this process in logical terms. Watson's belief that 'brilliant reasoning power' can be based on chain-building logical deduction yet still – with sufficient skill and automatization – 'rise to the level of intuition' is thus an appealing means of shifting the focus from intuition to reason, while casting aside all of the myth-making baggage that intuition brings with it. Moreover, Dr Watson's diagnosis also allows for the possibility of creative computers in the not-too-distant future. We'll see hints of what those computers might look like throughout this book.

Old chestnuts and new speak

Whether it is used to solve a crime or simply to impress Watson, Holmes uses his logical technique for essentially creative ends. By linking small but telling details into a coherent big-picture perspective, Holmes creates sense and imposes meaning where previously there was confusion and misunderstanding. His reputation for intellectual wizardry is built on the twin pillars of discipline and automatization: Holmes applies his methods rigorously in a largely automatic manner that is not slowed or interrupted by the dictates of self-conscious, rule-following thought. In the words of contemporary psychologist Mihály Csíkszentmihályi,[9] Holmes achieves a *state of flow*, immersing himself in a challenge without self-conscious concern for how it is to be resolved.

Automatization can lend our actions the assuredness and speed of second nature, yet it does not always lead to creative ends. In the realm of language, for instance, it is possible to write fluently and prolifically while operating entirely on automatic pilot, to produce texts that appear to promise much

more than they deliver. In a state of flow, a challenging task can be accomplished with an almost joyful feeling of effortlessness, yet a creative result must nonetheless bear the fruits, if not the signs, of effort. However one measures 'effort' in creative writing, whether real or simply perceived, the reader expects to see ample evidence of the writer's conscious engagement with the text. Automatization can lend us speed and even fluidity, but it must serve the larger goal of successful communication if it is to produce creative results in language.

Automatic language is often unthinking language, and a sign that words have been chosen more for how well they influence our view of the writer than for how they influence our appreciation of the writer's meaning. This question of whether lazy language promotes lazy thinking, and vice versa, is one that greatly exercised the writer and political thinker George Orwell. In a famously polemical essay from 1946 titled *Politics and The English Language*,[10] Orwell notes that '[language] becomes ugly and inaccurate because our thoughts are foolish, but the slovenliness of our language makes it easier for us to have foolish thoughts'. English, for Orwell, was a language in decline, especially in political circles, but it was a decline that Orwell believed could be halted and even reversed. His well-meaning and entertaining essay presents a prescription – and a few proscriptions – for achieving this reversal, but not without burnishing a few ill-founded myths in the process. Orwell's essay is at its best when it *shows* us how to write, and at its worst when it *tells* us how not to write. He rails against the use of verbal padding and pretentious synonyms for commonplace words, and waves a banner for little England with his plea that we disdain the false grandeur of foreign imports in favour of the 'homely' Anglo-Saxon word-stock. Orwell's distaste for fashionable metaphors is even more caustic, reflecting his suspicion that metaphors like 'toe the line' and 'ring the changes' are popular precisely because they are fashionable, and not because they have proven themselves as effective carriers of meaning. Canute-like, Orwell hopes to rid the English language of the baleful tides of fashion, as though he believed language could be frozen in a golden age, and not allowed to evolve to suit the needs and tastes of its users.

What seems to irk Orwell most about these currents of linguistic fashion is that they rob English of its *Englishness*. In promoting the use of plain, unshowy Anglo-Saxon language that carries its meaning clearly, Orwell's protectionist instincts extend even to language that is ostensibly creative, albeit at a minor level. He notes that finding the right word in the right context can be difficult, as any writer can attest, and suggests that lazy writers who are unequal to the task are sometimes more inclined to invent foreign-sounding new words – like 'de-regionalize, impermissible, extramarital, non-fragmentary' – than to 'think up the English words that will cover one's meaning'. Yet it would be wrong to suggest that Orwell has set his face against linguistic creativity. It is more

accurate to say that Orwell has disdain for showy language that sacrifices clarity to fashion, but that he sees no inherent tension between plain language and creative language. Indeed, for Orwell, creative language is plain language that is made to order, more like a fresh loaf of bread or a homemade stew than a pretentious ready-made meal that comes in a can. In contrast, uncreative language is larded with stale metaphors that have lost not just their freshness, but also their power to evoke vivid imagery in the mind of the reader. Orwell's claims regarding metaphor are supported by some of the most appealing and memorable examples in the essay, where he shows how potent images can be wrung from the apt juxtaposition of the even most mundane objects. Yet it is in his discussion of metaphor that the essential incoherence of his arguments about language becomes most apparent.

Orwell divides metaphors into three distinct-seeming categories – *living*, *dying* and *dead* – though the boundaries between these categories are not as sharp as he seems to believe. A living metaphor is a bespoke construction that is freshly minted by a speaker for a particular communicative purpose. A dead metaphor, in contrast, is a fossilized pairing of words and meanings that has become accepted as part of the normal fabric of a language. Such metaphors have earned their own place in the dictionary, and speakers may not even be aware of their frequent uses of dead metaphors. If the 'leg' of a table, the 'neck' of a bottle and the 'body' of a wine are all dead metaphors, then everyday language can be seen as a graveyard for the linguistic creativity of previous generations of writers. As one might expect, Orwell encourages the creation of fresh, bespoke metaphors wherever possible and is even tolerant of dead metaphors, though given their pervasiveness in language he could hardly do otherwise. It is to the immense rump of stale and dying metaphors that lie between these two extremes, neither fresh nor entirely dead, that Orwell most directs his ire.

Politics and the English Language sparkles with metaphors and similes that are fresh and vivid, such as when Orwell frets that 'prose consists less and less of words chosen for the sake of their meaning, and more and more of phrases tacked together like the sections of a prefabricated henhouse'. The image of a 'prefabricated henhouse' seems wonderfully old-world to a modern reader, and certainly quainter than it would have seemed in 1946. If writing today, Orwell might instead use the metaphor of a superstore flat-pack for some self-assembly coffee table, and rail against the IKEAification of language. But it takes effort to concoct your own metaphors, just as it takes effort to build your own coffee tables or, more realistically, to bake your own bread. Only the most zealous amongst us would have the time and energy to make everything ourselves, even in language, and we all rely on the occasional re-use of other people's metaphors. But these re-used metaphors are already in the process of becoming stale, and like a fish plucked from the

sea or a flower picked from the garden are already dying. Of course, the area marked out by metaphors that are fresh and alive on one hand, and dead and buried on the other, is vast: Orwell describes it as 'a huge dump of worn-out metaphors which have lost all evocative power and are merely used because they save people the trouble of inventing phrases for themselves'. By the time a new metaphor becomes fashionable, it has already been allocated a place in Orwell's junkyard of old clunkers.

Choosing an apt metaphor is not like buying fruits and vegetables in the grocery store, and we can't simply prod and squeeze a metaphor to test for over-ripeness, as we would a melon. If you don't grow it yourself, how can you be sure of its freshness? Orwell has the answer: 'Never use a metaphor, simile, or other figure of speech which you are used to seeing in print'. The printed media contain a wealth of commonly occurring dead metaphors, which we can scarcely avoid re-using, so Orwell is really advising against the re-use of metaphors that are still living but which are over-used and stale. But how are living metaphors ever to become dead metaphors if they are not first worked to death? Metaphors rarely suffer a quick death, but age slowly in a process of familiarization and conventionalization that the psychologists Dedre Gentner and Brian Bowdle[11] have memorably named *the career of metaphor*. As we'll see later, metaphors take on new characteristics as they age, and the way they are processed in the brain most likely changes too, as they become more familiar.

Languages grow and evolve by acquiring new words and new word-senses, and so the English we speak today is very different from the English that was spoken in Shakespeare's time. Rather like a garden whose soil is continuously nourished by the re-absorption of dead plants, language is immeasurably enriched by the constant absorption of newly conventionalized senses from once-fresh metaphors. When linguists and lexicographers and even casual dictionary users employ 'sense' to refer to the established, enumerable meanings of a word, they are using a dead metaphor that shares a common lineage with 'common sense' and our 'sense' of touch, sight, smell and so on. For the purposes of this book and others like it, we can all be glad that this once-living metaphor had the decency to die and leave its body to linguistic science. Though Orwell's essay is aimed at all readers who care about English, he seems content to assume that the job of working a metaphor to death is best left to others; we can benefit from the added richness after the metaphor has died, but on no account should we dirty our hands with this unseemly job ourselves.

Orwell believed that English was a sick language that needed to be made healthy again, but his essay conflates the symptoms of this disease with its cause. Yes, lazy writers over-use fashionable metaphors, reach for ready-made canned phrases rather than taking the time to concoct their own, and