Do economists ‘compose’ economics? A comparison of the creative processes of artists and economists

Abstract

The present paper provides a process oriented lifecycle account of creative activity, drawing on testimonial material from the arts and the sciences, and relates the model to the creative work of economists developing economic theory. Are the creative processes of musical composers and academic economists essentially the same, or are there significant differences? The paper finds that there are deep similarities between the creative processes of theoretical economists and the creative processes of artists.

Author: Lauchlan Mackinnon
Copyright © Lauchlan Mackinnon
Email L.Mackinnon@iinet.net.au

Current word count: 10,528 (excluding TOC and references)
Do economists ‘compose’ economics? A comparison of the creative processes of artists and economists

Abstract

A Lifecycle Model of the Creative Process

‘Top down’ and ‘bottom-up’ creative work processes

‘Top down’ and ‘bottom-up’ creative processes in artistic creative work

Top-down and bottom-up creative processes in the creative work of economists

The stages of creative work through the creative process lifecycle

Genesis

Some common geneses to creative work

An anomaly or puzzle in the creative domain

Discussion, debate, intellectual stimulation

Ideas arising from ‘insight’ or ‘illumination’ experiences

External ‘commissions’

Creative projects arising from previous experience and creative activity

Ad-hoc circumstances

False starts and creative exploration

Development

Development of top down vision-driven creative work

Vision or conception of the whole or result

Translation from concept to reality

Creative commitment

Development of bottom-up creative work

Assimilation of creative experience into the creative agent

Development of the creative agent’s ‘creative pallate’

Development and assimilation of learning, experience and skills

Assimilation in the creative process: internalisation and externalisation of creative work

Creative Momentum

Completion

Interactions between the creative agent and the creative field and domain

Conclusions

References
A Lifecycle Model of the Creative Process

The precise starting and end point for creative work may not be easy to precisely identify in practice. From a conceptual point of view, however, every successful piece of creative work starts somewhere, in some specific set of circumstances and with its own specific impetus and, after a period of development, ends at some point with some definite result or outcome. Successful creative work, therefore, may be meaningfully understood and described from a process point of view as a process over time from a set of starting conditions to a given end point. In addition, on completion of the creative work, the creative agent is typically well placed to commence further creative projects, leading to the possibility of a life cycle model of the creative process.

The core proposition of the present paper is that the creative process in artistic work and in the production of economic theory may be usefully described in a life cycle framework, represented diagrammatically as follows:

Figure 1 – The Creative Process Life Cycle

In the above diagram, the creative process begins with a creative agent situated within a creative field, such as within a community of artists or within the professional field of...
economists. Similarly, the creative agent is familiar with, and works in, a creative domain consisting of the set of domain objects studied and the knowledge, theories, ideas, concepts, products, language, terminology and so forth used by the field in relation to that set.

The agent, through his or her prior experience in the field and with the creative domain may have already ‘evolved’ his or her capabilities and skills, cognitive framework used, creative values and dispositions (including aesthetic values and work preferences) and, potentially, through work in the creative field the agent may have also ‘evolved’ the state of the creative field in which creative activity takes place and the repertoire of artefacts the creative domain available to other creative agents in the creative field.

The creative agent is also situated with a range of circumstances and stimuli – problems to solve, ideas for work, various stimuli and demands, and so on. Within that context of prior experience and current circumstances, a particular problem, point of interest, or goal may present itself and focus and capture the attention of the creative agent. If this initial point of interest develops into further work and activity, a creative project can be said to have started – it has had its ‘genesis’.

From that point on, the creative work develops. It may follow its internal logic and the designs of the creative agent, or it may involve a number of interactions with the creative field and creative domain. At some point, however, if the creative work has been productive and a creative product is produced, the creative work is brought to completion, and the creative product is packaged up and released.

It is possible to identify two distinct classes of creative work in the arts generally and within the discipline of economics, which may be called ‘top-down’ and ‘bottom-up’ creative work respectively. In top-down creative work, there is a clear goal or vision for what has to be achieved, and the plan of work is oriented and guided by that vision. In bottom-up creative work, work arises from events, circumstances, problem situations, fragments of work or stimuli of interest and so on, and develops as an extension of that initial point of interest (or points of interest), with a larger theme or outcome perhaps becoming visible only towards the end of creative work.

Whether creative work starts as a top-down or a bottom-up project may have significant implications for the manner in which the creative work develops.

---

1 The notion of creative field as it is used here has been emphasised in the psychology of creativity literature by Csikszentmihalyi (1988; 1990) and others, with the field consisting of the social structure of the profession or members of the community in which the creative activity takes place. Similar notions of field have been put forward across the social sciences, for example in Bourdieu’s (Bourdieu 1977, 1990; Bourdieu and Wacquant 1992) concepts of habitus and field.

2 Such a view of an evolving creative agent has been suggested in the psychology of creativity literature by Gruber (Gruber and Davis 1988; Gruber and Wallace 1989, 1999), while the importance of the social milieu to understanding the creative process has been emphasized by Csikszentmihalyi (1988; 1990; 1997; 1999).

3 As articulated for example in Popper’s (1972) notion of a “third world” of knowledge.
The objective of the present work is to suggest a descriptive account of how successful creative work commonly develops. It is not intended to suggest that all work, or all creative work, always proceeds in the manner described in the present account. Similarly, the objective is not to suggest how creative work should develop in any prescriptive fashion - although the present paper may provide some relevant insights that individual creative agents might find useful in improving creative work. The present work provides a fairly generic account, applicable across a wide range of creative domains, of how successful creative work often unfolds, identifying some common patterns and themes.

To support the framework presented, testimonial material from eminent contributors are regarded by knowledgeable peers in their field as being innovative and productive with significant original works are used.

‘Top down’ and ‘bottom-up’ creative work processes

‘Top down’ and ‘bottom-up’ creative processes in artistic creative work

The concepts of ‘top down’ and ‘bottom up’ creative work in art might best be introduced by reference to an example. Composer Sebastian Currier (1999), described his process of musical composition in the following terms:

-Sometimes I start by searching in the dark for some musical fragment – a few notes, a harmony, a tune – without any preconceived idea about what the piece might be as a whole, while at other times I first form a definite idea about the piece in its entirety and then proceed to work on the details. The former is, I guess, working from the bottom up, the latter from the top down. (Currier 1999: 231, emphasis added)

Following Currier, we may make a general distinction between ‘top-down’ creative processes governed by an ‘architectural’ concept or vision, with subsequent work and development of the parts in relation to the goal or vision, and ‘bottom-up’ creative processes which may start with some particular point of interest or problem situation or one or more fragments or ‘germinal’ creative seeds (for example, a fragment of music, or a premise for a story or play), and then developing gradually in scope and content into a coherent and completed whole without necessarily having had a definite vision or conception of a definite end point for the creative work.

The top-down approach is typically quite architectural, with a vision or concept of the piece orienting and focusing the direction of the creative work out and the parts being articulated piece by piece with ongoing reference to the plan for the work as a whole. Consider for example the creative work processes of composer David Lang:

-I write down everything I can think of that relates to my idea and make little charts and graphs, trying to figure out structures. I also try to figure out the different things instruments can do . . . Once I know the roles of the instruments, once I’ve made some big decisions about how the orchestration
works in each section – how the laws that I’ve made actually work – then the last thing I do is fill in the notes. For me the notes are the least important part, or the least interesting part. (Lang 1999: 224)

While the plan or vision for the parts of a work might be clearly mapped out, the working out of a section however is not always straightforward. Difficulties arise and must be resolved. For example composer Daniel Godfrey recounts:

Even after I know where I’m going, there are little battles I have to fight: how to get to through the next three measures, how to get through a particularly gnarly piece of counterpoint. I don’t want the texture to be too dense . . . the piece has to unfold at a certain rate . . . but it has to incorporate certain ideas, and the ideas can’t be covered up . . . (Godfrey 1999: 102)

While these difficulties may be resolved through hard work alone, such hard work also raises the possibility of subsequent insight or illumination experiences arising, as described in the (1926) Wallas stage model. For example, Godfrey continues:

It’s amazing, though, how the mind works these things out. A lot of composers have the experience of spending literally twelve hours wrestling with a problem that just will not yield . . . you go to bed, sleep, wake up in the morning and suddenly realize, “Of course. How obvious! This is the way the piece should go.” You sit down and the whole thing’s done in an hour and a half. (Godfrey 1999: 102)

Conversely, a creative project can be an organic process of bottom-up development and progression. For example, composer James Mobberly suggests:

. . . I have no grand plans. It’s more of an organic thing. I used to try making blueprints, but I always ended up tearing them up. For me, they were a complete waste of time. (Mobberly 1999: 183)

Top-down and bottom-up creative processes may each involve their own sets of issues. Composer Sebastian Currier highlights some of the different problems natural to these two distinct processes:

In each the difficulty is to reconcile the large-scale structure with the smaller-scale details, the whole with the parts, the global with the local, the general with the specific. When I begin with a musical fragment, I almost always find myself facing a brick wall shortly after coming up with the initial idea. What do I do now? Where does this idea lead? What will be consistent? What will change? . . . it is here that I must figure out how the part relates to the whole, how my little musical kernel will become a larger structure – a movement, section, or piece. . . . As I continue, the form of the whole becomes more and more fixed in my mind, and there is less and less tension between the small and the large.
When I begin with an idea about the whole . . . it’s very much the problem of how to get from the general to the specific, the large to the small, the abstract to the concrete. And the devil is in the details! . . . When I proceed to work on a local level – measure by measure – there are always a thousand little concerns that seem to have little or nothing to do with the broader conception I wish to flesh out . . . these little concerns threaten to send the piece off in some direction opposite to the one I intend. (Currier 1999: 231)

Creative projects may, therefore, develop in markedly different manners in top-down and bottom-up creative processes.

While it is analytically useful to distinguish between top-down and bottom-up processes, there is no reason to suppose that in the real world these processes are always clearly distinct and separate. A bottom-up creative process may develop an emerging goal or larger-scale vision which may gradually take on the features of a top-down creative process, and this goal or larger pattern may only become explicitly or consciously recognised after the creative process is already well developed. Composer Daniel Godfrey for example talks about working with bottom-up germinal fragments or concepts, which develop organically and subconsciously into a coherent theme, which can subsequently be developed in a top-down manner:

. . . when I hit on something that seems to have promise, I begin to work with it. It may be the beginning of a piece, or it may turn out to be the beginning of a middle movement, or the beginning of an inner part of the architecture, or something else. Eventually, the music begins to take on a localized but very specific profile – an unconscious process gradually becomes conscious. Those ideas have been growing and interacting, and a moment comes when they surface and I realize “Ah, this is what is happening.” (Godfrey 1999: 101)

Similarly, a top-down creative process may start with a clear vision and direction, but become more organic and take on more of the features of a bottom-up creative process as the creative project begins to take on a life and momentum of its own and the work begins to take on its own personality and manifest its own logic. Composer Claude Baker discusses starting with an architectural vision but subsequently organically shifting and restructuring the creative situation:

Many times I’ve gone through this process of making diagrams and graphs and realized as I’ve gotten into the piece that it’s just not going to happen that way, while at the same time something even better is suggesting itself. (Baker 1999: 77)

Whether creative work starts in a top-down or bottom-up fashion, there may be an initial stage of creative work leading to the articulation of a definite sketch or vision that may guide subsequent parts of the creative process in an essentially top-down fashion, as creative work proceeds form an initial point of interest in bottom-up creative work and an
initial concept or goal in top-down creative work. In the former case, an initial point of interest needs to be developed in a bottom-up fashion until the direction or vision becomes clear enough to guide subsequent top-down work. In the latter case, an initial concept needs to be developed through a top-down process of exploration and fitting into an initial sketch suitable for guiding subsequent top-down creative work. Thus for example, composer William Bolcom writes:

For a big piece, I pull together a big morgue of sketches – little notations, jottings that will remind me of how a particular passage might go. When there are enough of these things, I’m ready to write . . . [for a specific example] suddenly I realized that I was ready to start, I was ready to get the thing done, after sketching, working on bits and pieces, for quite a number of years. (Bolcom 1999: 28)

Alternatively, top-down creative projects may begin to ‘take on a life of their own’ and develop organically according to the creative logic of the work rather than necessarily faithfully following the initial vision or goals and thus, to a greater or lesser extent, take on the characteristics of bottom-up creative work processes in addition to the guiding top-down goals and vision for the project.

In both top-down and bottom-up creative work, the creative work typically takes shape and is articulated through a series of decisions. For example, composer William Bolcolm suggests:

It’s all decisions: decisions followed by decisions followed by decisions. A work has a kind of logicality, but this logic reveals itself as you’re working. (Bolcom 1999: 24)

Such decisions are necessarily informed by the aesthetic values, experience, judgement, and dispositions of the creative agent, which may in turn be influenced by the creative agent’s exposure to and influences from the creative field and environment in which he or she works.

In top-down creative processes, the creative work often starts with ‘architectural’ decisions affecting the character and dynamics of the creative work. For example, composer John Corigliano discusses the key role decisions play early on in the creative process:

. . . I think the earliest decisions are the biggest ones. I don’t even want to accept a commission until I sort of know where I want to go with the piece . . . what are you going to write, a concerto or symphony? That’s a pretty big decision, compared to F-sharp and G. How many movements will it have? What is your orchestration? What is this piece about? Why are you writing it? . . . What’s most important in a piece is shape and direction. . . . The big decision is why you are writing this piece, and that question you have to answer at the start. . . . If you don’t even ask the question, and you just start
composing, you’ll compose in a very limited way . . . you will have given up the most important part of the process. (Corigliano 1999: 38)

Similarly, in bottom-up creative processes, decisions made in relation to the initial points of interest may affect the scope, character, and dynamics of the developing creative project as a whole. Thus composer Sebastian Currier notes that when he begins with a bottom-up creative process, the choices made about how the part relates to the whole are important for the development of the piece. For Currier,

> I don’t think I fully solve this problem before I proceed, but I do limit the number of possibilities or alternatives before me. It’s like being in a maze and marking off the pathways you’ve found to be fruitless, so you may devote your attention to a few of the most promising routes. (Currier 1999: 231)

In either top-down or bottom-up creative work, the creative process must be, to a greater or lesser extent, ‘organic,’ as the parts of the creative work must evolve in relation to each other. For example, composer Eric Stokes writes that composing is much like

> . . . the way I imagine a choreographer thinks of steps. Every “now” that’s in a dance has a before and after, and becomes a before and after. So the dance must be created organically, because everything is related to everything else. There are no parts that aren’t acted upon by all the other moments. (Stokes 1999: 5)

**Top-down and bottom-up creative processes in the creative work of economists**

Top-down and bottom-up creative processes may be also identified in the creative work of economists. For example, Elhanan Helpman (1999) describes a top-down, goal-centred creative work process:

> In my experience, it pays to pursue a far-reaching research agenda, even if the chances of completing it successfully are slim. Setting far-reaching goals releases energies and capabilities of whose presence we are otherwise unaware. With goals like this before us, even partial success often proves more valuable than complete attainment of a simple goal. (Helpman 1999: 138, emphasis added)

Conversely, Ronald Coase and Hal Varian provide examples of bottom-up work processes. Textbook author Hal Varian describes the path that took him to writing his first textbook as follows:

> My first text, *Microeconomic Analysis*, really wasn’t planned; it just happened . . . I was asked to teach a first-year graduate micro course. The text . . . consisted of about twenty pages of notes written by Bob Hall, maybe forty pages of notes from Don McFadden and Sid Winter, and a few journal
articles. The notes were awfully sketchy, and the journal articles were much too advanced for first-year students. So I had to write my own notes for the students. One day a publisher came into my office and asked (as they often do), “Are you writing a book?” I said that would be a silly thing for an assistant professor to do – but as a matter of fact I did have some class notes that I had been working on for some years. Next thing I knew, I had several publishers interested in my notes. Much to my surprise the notes eventually became a book and ended up being widely used. (Varian 1999: 268-269)

Similarly, economics Nobel Prize winner Ronald Coase describes his intellectual journey as a bottom-up process:

I came to realize where I was going only after I arrived. The emergence of my ideas at each stage was not part of some grand scheme. (Coase, quoted in Landes 1999: 172)

The stages of creative work through the creative process lifecycle

As noted in the introduction, creative work has a beginning (it starts somewhere in some set of circumstances), it develops, and – in many cases at least – it comes to a definite conclusion with a specific outcome or creative product that is delivered before the creative agent moves on to other creative work. It is possible to describe creative work using a life cycle model with stages of a beginning, a middle and an end. These stages are referred to in the present paper as genesis, development, and completion respectively.

These stages will be examined with reference to supporting testimonial reports of creative work from the arts and sciences, but primarily from economics. How does creative work in artistic endeavours - and within economic theory production - typically start? How does it develop? How does it come to a conclusion?

Genesis

Some common geneses to creative work

There are a wide variety of potential geneses to creative work. A few common starting points to creative work will be considered in the present section.

An anomaly or puzzle in the creative domain

One common genesis for creative work is in a perceived anomaly, problem, or point of interest in the creative domain.
For example, in physics there is a well-known problem that the frameworks of quantum mechanics and general relativity are known to be incompatible with each other. This has led to a great deal of reflection on and attempts by physicists to resolve the issue by developing a new framework reconciling the two models. In economics, it is similarly recognised that macroeconomic theories are not ‘grounded’ in the choice-theoretic decisions of individual agents - and the consensus of mainstream economists has been that by and large, Macroeconomics should be so grounded (see for example Harcourt (1977), or comments by economists when interviewed e.g. in Klammer (1984) or Snowdon and Vane (1999)). There is, therefore, a perceived problem in the creative domain that generates work in the literature of economics attempting to ‘ground’ Macroeconomics in micro choice-theoretic perspectives. In physics and in economics, therefore, there are widely (‘objectively’) recognised perceived problems in the domain of knowledge that need to be addressed, and these may lead to the genesis of creative work in the field.

While a domain may present a range of problems that scholars may agree are ‘objectively’ significant and important problems, individual researchers may become more personally and ‘subjectively’ troubled by perceived or felt inconsistencies or difficulties in the creative domain. A classic example of this is Albert Einstein’s struggle as a youth to reconcile the ideas of Newtonian mechanics with the notion of riding on a beam of light - a problem situation and felt discomfort with the existing body of theory that engaged Einstein deeply and became the starting point for the development of the special theory of relativity.

The genesis of creative work in a personal dissatisfaction or discomfort with an aspect of the creative domain is well illustrated by Bertrand Russel:

In all the creative work that I have done, what has come first is a problem, a puzzle involving discomfort. Then comes concentrated voluntary application entailing great effort. After this, a period with out conscious thought, and finally a solution bringing with it the complete plan of a book. This last stage is usually sudden and seems to be the important moment for subsequent achievement. (Bertrand Russel, quoted in Hutchinson 1949: 19-20)

Similar accounts may be readily found within the economics literature. For example, Elhanan Helpman recounts that:

My first major research project was undertaken jointly with Assaf Razin. We were both familiar with international finance and with international trade. And we were puzzled by the fact that assets play an important role in the theory of international finance and hardly any role in the theory of international trade. Where did this dichotomy come from? We . . . concluded that trade in assets may interact in important ways with trade in goods and services. As a result it would be interesting to develop a theory that clarified these interactions. If such a theory could be developed, we reasoned, it should also help in understanding the effects of capital-market policies on trade in goods and services . . . The result was a series of papers in which we
constructed such a theory and applied it to a variety of policy problems. Eventually, we wrote a book that synthesized the papers and provided a systematic exposition of the theory. (Helpman 1999: 135-136, emphasis added)

David Colander (1999) describes work having had its genesis in an identification of a felt difficulty in the existing body of knowledge. Colander defines a “yeah criterion” in relation to parts of the domain of economic knowledge as an intuitive sense of a fit, a sense that yes, “that’s the way it works.” Colander noted that in his experience, often parts of or whole bodies of existing theory jarred with his “yeah criterion,” leading him to rework and reconstruct the theory to resolve the felt difficulty with the problem situation. Colander (1999: 40-41) cited two specific examples of creative projects motivated by a felt dissatisfaction with specific aspects of the domain of economic knowledge and theory that did not gel with his intuitive “yeah criterion” and led him to further work resolve that intuitive dissatisfaction: standard cost curve analysis and standard AS/AD analysis.

In economic methodology, Tony Lawson identified the genesis of his critical realist program in economics in a subjectively felt difficulty with the application of “formalistic methods” in economics:

The book constitutes a realist theory of and for economics . . . the project reported here did not emerge from a formal study of philosophy. Having come to economics by way of first studying mathematics I was immediately impressed by, as I saw it, the widespread and rather uncritical application of formalistic methods and systems to conditions for which they were obviously quite unsuited. In consequence, my interests turned fairly quickly to questions of ontology, and specifically to the study of how methods and modes of reasoning might be fashioned to insights concerning the nature of social being. (Lawson 1997: xiii, emphasis added)

Examples may be readily multiplied across all areas of economic theory, and indeed across the social and physical sciences.

**Discussion, debate, intellectual stimulation**

Another genesis for creative work lies in what might be characterized as ‘interaction with sources of intellectual stimulation.’ Discussions with colleagues and collaborators, interactions with students, participation in seminars and conferences, and encounters with the literature may all may trigger an interaction with, questioning of, and reflection on the material in the domain of the discipline, and consequently trigger creative ideas that may form the basis for creative work projects. For example, Richard Schmalensee suggests:

In seminars and conversations, colleagues have given me many good research ideas, and I have gained from productive collaborations . . . I have also gotten good topics from students’ questions to which “I don’t know” is a correct and
honest but unsatisfying answer . . . A number of my better papers address problems uncovered while preparing lectures. (Schmalensee 1999: 246-247)

Gregory Mankiw observes that:

. . . thinking about one topic can generate ideas about other topics. I started thinking about menu costs and macroeconomic price adjustment, for instance, as I sat in a law school seminar that was discussing monopoly pricing and antitrust policy. Research ideas pop up in unexpected places. (Mankiw 1999: 180-181)

Similarly, Schmalensee comments that:

During 1973-74 I was a research fellow with minimal responsibilities at the University of Louvain in Belgium. I had no writing plans, and when not travelling around Europe I spent most of my time reading, attending seminars, and chatting with colleagues. This relaxed and unstructured year produced . . . ideas that ultimately resulted in about a half-dozen published papers! (Schmalensee 1999: 246)

**Ideas arising from ‘insight’ or ‘illumination’ experiences**

Ideas for creative work may also arise as an ‘insight’ or idea that emerges during a relaxed moment (following previous hard work or engagement) in a manner consistent with the description of insight or illumination experiences in the (1926) Wallas stage model of creativity.

For example, Schmalensee discussed fruitful ideas for future work coming to him during ‘relaxed contemplation’ of economic issues:

Ideas for new research projects come to me mainly when I am not concentrating on my current agenda but am rather contemplating economic issues and ideas in a relaxed, open state of mind. (Schmalensee 1999: 246)

**External ‘commissions’**

Just as in art, creative work in economics might have its genesis in external commissions. For example, as noted above in discussing the genesis of Tony Lawson’s *Reorienting Economics*, the genesis for that work lay in a ‘commissioned’ request for a collection of previously published essays. In general, articles, conference papers, book chapters and books may be requested or ‘commissioned’ from participants in an academic field.

Schmalensee (1999), for example, recognized a range of such stimuli for the genesis of creative work, while simultaneously advising caution in relation to such commissions in order to make the best use of one’s creative time:
While good research topics can appear from many directions, I have found it useful to be careful about . . . organizers of academic or near-academic conferences and collections of essays who suggest topics and, often, offer compensation. (Schmalensee 1999: 247)

Creative projects arising from previous experience and creative activity

Another genesis for creative work is found in the continuation of or an extension from previous creative work. Work involved in one research project may naturally lead to a new set of questions and a new program of work that may extend previous work or set forth in new directions. For example, Tony Lawson discusses the genesis of his second book on economic methodology, Reorienting Economics:

. . . not only is it the case that the essays included below were not all initiated with this book in mind, but, to the contrary, this book started life as a response to an invitation by Alan Jarvis of Routledge to put together a collection of previously published papers. In so selecting various papers for this purpose, however, I also felt the need to fill some gaps. As the ‘gap fillers’ became more numerous, individually longer and integrated with each other, as I reworked them (by that stage with his current book clearly in mind), I found I had less and less space for those essays already published . . . many of the previously published essays that I originally intended for inclusion (in fact the majority) have since been dropped . . . It is as much the product of an evolutionary process as one of prior design. (Lawson 2003: xxiv-xxv)

In contrast to such relatively ad-hoc, ‘bottom-up’ creative work, creative work may also be undertaken as a deliberate ‘top-down’ project in the context of an ongoing research program or agenda, with the new work informed by the successes (and, where appropriate, shortcomings) of previous work. Thus, for example, for Philip Mirowski (2002):

This book could thus be regarded as the third instalment in my ongoing project to track the role and impact of the natural sciences on the structure and content of the orthodox tradition in economics . . . The first instalment of this history was published in 1989 as More Heat than Light, and was concerned with the period from classical political economy up to the 1930s, stressing the role of physics in the “marginalist revolution.” The second instalment would comprise a series of papers coauthored over the 1990s with Wade Hands and Roy Weintraub, which traced the story of the rise to dominance of neoclassical price theory in America from early in the century up through the 1960s. The present volume takes up the story from the rise of the cyborg sciences, primarily though not exclusively during World War II in America, and then traces their footprint upon some important postware developments in economics . . . (Mirowski 2002: 8-9, emphasis added)

Ad-hoc circumstances
Many creative projects have their genesis in largely ad-hoc circumstances, or their genesis is influenced by significant accidental or ad-hoc circumstances.

For example, a number of economists would not have been economists in the first place but for a number of circumstantial and ad-hoc events. Avinash Dixit for example suggests that:

I got my first degree in mathematics and had just started a master’s in operations research, when I was converted to economics by a chance conversation with Frank Fisher. (Dixit 1999: 70)

Similar accounts of circumstantial events bearing on their choice of career paths can be found in the decisions by economists such as Paul Samuelson and John Hicks (among others) to become economists.

Choices that shape career paths within economics may be equally as apparently arbitrary. For example, William Landes recounts:

I had no particular career path in mind when I started graduate school. I chose economics rather than something else because I had taken a handful of economics courses as an undergraduate. I got started in law and economics by chance because I came across a newspaper article on plea bargaining. True, I wanted to apply economics to important social issues, but law was just one of many possibilities. I worked on a wide range of topics in law that, on looking back, evidence a common approach but not an overall scheme to remake legal scholarship. I never thought I was part of a movement, but now it is commonplace to hear about how the “law-and-economic movement” has transformed legal scholarship and teaching. (Landes 1999: 172, emphasis added)

Ad-hoc circumstances can play a similar role in choosing creative work projects. For example, ad-hoc circumstances played a role in Richard Schmalansee’s choice of topic for his doctoral dissertation, and the genesis of his future research career:

I spent some months preparing to do theoretical and empirical work with Ed Kuh on the dynamics of price, production, and inventory decisions at the industry level. That project ended abruptly and painfully when the Census Bureau firmly denied me access to the unpublished disaggregated data I needed.
Walking through the economics department shortly thereafter with no idea what to do next, I saw a small notice to the effect that Evsey Domar and Frank Fisher would be interested in having a student work on the economics of advertising. Though I had not previously thought much about this area . . . I decided to see if I could find a dissertation topic within it.
I talked with Frank and Evsey to learn what they had in mind, and I went to the library to learn a bit about the literature on advertising. It struck me fairly quickly that most writers had implicitly treated advertising as exogenous, even though it is plainly the result of endogenous decisions made by market participants. After a good deal of hard work exploring the implications of this point and numerous important lessons from Frank Fisher on how to execute and present both theoretical and empirical work, I had a Ph.D. and the tools necessary to begin a research career. (Schmalensee 1999: 245)

Edward Fullbrook discusses the genesis of his edited collection on intersubjectivity in economics:

A few years ago, while presenting a paper in a session on mathematical economics at a conference in Brussels, I noticed the most improbable thing. In the third row a very young man was sitting on the edge of his chair, apparently rigid with interest. The discussion that followed confirmed this unlikelihood, so after the session I approached him. He said . . . that he was a graduate student in Paris and that he knew some French economists who would be interested in my paper. So I sent copies of that and another paper . . . He wrote back saying he had sent them to his contacts and was now sending me something that he had written. A few days later my heart sank when a 40,000 word typescript arrived. Titled “Conventions et Fondements de l'Echange Marchand et de la Monnaie”, it had no apparent connection with anything in which I was interested. But for honor’s sake, I decided to give it an hour. That was the beginning of this collection. (Fullbrook 2002)

Paul Krugman describes the genesis of both a particular creative project and a general career direction in a specific set of circumstances:

. . . when I left graduate school I was, in my own mind at least, somewhat directionless. I was not sure what to work on; I was not sure whether I really liked research. I found my intellectual feet quite suddenly, in January 1978. Feeling somewhat lost, I paid a visit to my old advisor Rudi Dornbusch. I described several ideas to him, including a vague notion that the monopolistic-competition models I had studied in a short course offered by Bob Solow – especially the lovely little model by Dixit and Stiglitz – might have something to do with international trade. Rudi flagged that idea as potentially very interesting indeed; I went home to work on it seriously; and within a few days I realized that I had hold of something that would form the core of my professional life . . . within a few months I had written up a basic monopolistic competition trade model . . . what had been a personal quest turned into a movement, as others followed the same path. (Krugman 1999: 144, 146)
Krugman notes:

All in all . . . I’ve been very lucky. A lot of that luck has to do with the accidents that led me to stumble onto an intellectual style that has served me extremely well. (Krugman 1999: 154)

**False starts and creative exploration**

Clearly, the creative process may involve a number of false starts, and a good deal of ‘fishing around’ for an appropriate and fruitful direction to pursue to carry out the work, or to identify what the work or the problem in fact is. Such preliminary work may, naturally, tend to blend into the development of the creative project, so that a hard and fast division between stages of genesis and development of a creative project is not always, in practice, possible or meaningful.

**Development**

Once the creative work is initiated, it develops. Just as there are a large number of potential geneses for a creative project, there are a large number of potential dynamics for development.

In either top down or bottom-up creative work, finding and articulating the central message or insight of the creative product is central to the creative process. For example, composer Stokes (1999: 5) writes that “the process always comes down to finding the substance, the real nugget of the piece.”

After arriving at the core substance of the creative work, however, that substance must be articulated and developed in the using appropriate media and tools for the creative domain. For example, in music:

In the end, there’s what Mozart called “the scribbling,” which is particularising all these thoughts with the notational language we have. Debussy said “I have all these magnificent dreams, and then I have to think about quarter notes!” It’s true, you *do* have to think about quarter notes. You have to ask yourself, is it a quarter note? What kind of quarter note is it? Is it *staccato*? Is it *martelatto*? What is it, and where does it go? (Stokes 1999: 5)

**Development of top down vision-driven creative work**

**Vision or conception of the whole or result**

The defining characteristic of ‘top-down’ creative processes, as considered here, is the presence of a definite plan, a larger vision, goal, or result that is being worked towards, that orients and informs work on the various steps that are needed to accomplish that creative goal.
Such an orienting vision has been highlighted in the psychology of creativity literature. Gruber and Davis (1988) for example write:

There probably are numerous tools available for helping to maintain such a sense of direction. An important one is the “initial sketch” – the rough draft or early notebook to which the worker can repair from time to time – that serves as a sort of gyroscope for the *oeuvre*. . . (Gruber and Davis 1988, pp. 265-266)

This sense of the vision for the project guides the creative work:

I should like to emphasize the fact also that in the stage of elaboration the conception of the project-as-a-whole as previously given in insight is never altogether lost sight of. (Hutchinson 1949: 185-186)

Pablo Picasso, interviewed by Zervos (1952) suggested that, for him at least, the fundamental vision, in its essence, tends to remain unchanged throughout the creative process, even though the forms in which the vision is expressed may appear to vary dramatically throughout the project:

. . . what is really very curious is to see that the picture does not change basically, that the initial vision remains almost intact in spite of appearances. (Picasso, quoted in Zervos 1952: 56)

**Translation from concept to reality**

Given that in top-down creative processes a vision has been conceptualized and - to a greater or lesser extent - committed to as a worthwhile concept or vision to pursue and realize, the task remains of translating a possibly abstract vision into a pragmatic program or agenda to realize the concept or vision. The vision must, therefore, become operationalised into a pragmatically meaningful program of activity.

In testimonial accounts of artistic work, therefore, one may find comments such as that by sculptor and painter David Hare:

Kept as a fantasy, it would have no value, you haven’t produced anything. The part I’m most interested in is the process of translating the fantasy, the idea, into structure and reality. (Hare, quoted in Alexenberg 1981: 89)

Similarly, artist Joyce Cary (1958) comments:

. . . the painter . . . has had his intuition, he has made his discovery, he is eager to explore it, to reveal it, to fix it down . . . And at once he is up against enormous difficulties. He has only his paints and brushes, and a flat piece of canvas with which to convey a sensation, a feeling, about a three dimensional world. He has somehow to translate an intuition from real objects into a
formal and ideal arrangement of colours and shapes, which will still, mysteriously, fix and convey his sense of the unique quality, the magic of these objects in their own private existence. (Cary 1958: 3)

Bratteteig and Stolterman (1997) articulated similar notions for a design team, describing a process of translation from a general concept or vision to a pragmatic and operationally meaningful design specification:

We see the design process as a continuous dynamic interplay between three equally important levels of abstraction—the *vision*, the *operative image* and the *design specification*. The vision depends on the imagination and skills of the designers—it may be personal and explicable only through metaphors. In a design group the operative image is a result of a conversation between several designers, a conceptual formation process aiming at creating an object that can be dealt with from a number of perspectives and in a variety of ways. . . . The specification . . . is a translation of the operative image to a language in which the material conditions for the design are expressed. The description will enact as a prescription for constructing and realising the design. (Bratteteig and Stolterman 1997, emphasis added)

Translating a vision from an abstract concept to an operational program and pursuing the creative work over a period of time may begin to internalise and embody the creative work and ideas into the evolving creative product and into the thinking and work practices of the creative agent, and to externalise it into new relationships with the creative environment.

This may occur in two phases.

Firstly, a process of ‘fitting’ the creative vision to reality may occur. A process of experimentation or trial and error may occur in fitting the abstract concept into a variety of forms that may be meaningful in operational terms.

Secondly, as the vision is progressively internalised into the creative agent, shifts and realignments may occur within and without the agent to progressively align the creative agent with the creative vision. Choices may be made that restructure the creative agent’s beliefs, cognitive frameworks and values, the creative context and environment, and the set of relationships which the creative agent has with his or creative world and professional world.

**Creative commitment**

In the creative process, a creative project does not remain simply a concept or idea: it is developed, put into action, and realized.

There may be a definite point in the creative process or project where a significant and deliberate creative commitment to a creative vision or goal occurs, which we may term a
‘creative commitment.’ For example, an entrepreneur may leave a safe career path to start a new and risky venture providing a product or service fulfilling the entrepreneur’s vision. A scientist seeking to create a new and more powerful theory may need to leave a previously comfortable and widely accepted conceptual framework and commit to working in a paradigm which may appear initially unorthodox and less respectable to colleagues in the field and which may carry a significant degree of professional risk.

Commitment to a creative project may or may not occur explicitly, and may or may not occur at an early juncture in the creative project. It is equally possible that commitment may occur tacitly, that an assent is given by the creative agent - without particular conscious consideration or deliberation - to the developing project and its goals and means as it develops under its own rhythm and pace. Explicit commitment may or may not be made to any specific creative project.

The act of creative commitment may involve internal and external shifts in relationships, orientations, priorities, and allocations of resources. As these relationships change and the creative actor develops new relationships with the world and experiences the world differently, then (in a sense similar to that suggested by Berger and Luckmann (1966) or Kuhn (1962/1996)), the creative agent may actually feel that he or she begins to live in a different ‘world’ or ‘reality.’ While the agent might live in the same ‘objective’ world, their experience of it, how they see it and relate to it, and the possibilities open to them within it may be radically transformed.

Creative work may also, of course, also require perseverance, tenacity, working through obstacles and continuing the project in the face of difficulties. These characteristics are frequently highlighted in case studies of creative work.

**Development of bottom-up creative work**

Bottom-up creative processes are, almost by definition, less structured and ordered than top-down creative processes. Rather than a driving vision, plan or agenda, the starting point tends to be more of an anomaly, a fragment of an idea, various stimuli, or other influences and circumstances out of which the creative activity grows.

A bottom-up creative process might, therefore, be characterized in terms of elaboration, development and growth from a creative ‘fragment’ or problem situation towards a more developed and complete creative work. While there may never have been a definite plan for where the project was going, there may be definite dynamics leading from the initial situation and, as the creative work develops, to the final creative product. The development of the creative project may have its own internal logic, dynamics, rhythm and pace.

Creative work in a bottom-up process might proceed, initially at least, via a series of reactions and responses to various circumstances. The creative agent, therefore, might be quite surprised to, at some point, look back at the pattern of work and the series of events
and *recognise* the *emergence* of a pattern of action and a coherent creative product and internal logic from apparently ad-hoc circumstances.

In a bottom-up creative process, the creative agent may have a sense of working on something or going somewhere that is not quite conscious. They may feel they are ‘groping in the dark’ or have a sense of going somewhere, but definitely with no clear and conscious vision or sense of direction.

**Assimilation of creative experience into the creative agent**

*Development of the creative agent’s ‘creative pallate’*

Creative agents will typically have or rapidly acquire a good *experiential* understanding of the elements and materials pertinent to their creative world: the creative agent will be familiar with their ‘creative materials.’ For example, composer Roger Sessions wrote:

> So, in trying to understand the work of a composer, one must first think of him as living in a world of sounds . . .  (Sessions 1952: 47)

A painter may similarly be viewed as living in a world of images and textures, a physicist in a world of physical concepts, academic literature, and experimental observations, a theoretical economist in a world of economic theory and relevant economic data, an applied economist in a world of economic theory, economic data, and understanding of economic institutions, and so forth. That is, the successful creative professional will typically have, or acquire, an intimate understanding of the creative materials with which he or she is to work and the context in which that contribution is to be made.

For example in economics Schmalensee (1999), quoted above, noted the acquisition of familiarity with the economic theory and tools he became productive with, during the course of the development of his creative work leading to his future career:

> . . . [after finding a research topic and] numerous important lessons from Frank Fisher on how to execute and present both theoretical and empirical work, I had a Ph.D. and the tools necessary to begin a research career.  (Schmalensee 1999: 245)

*Development and assimilation of learning, experience and skills*

The development of a creative project may, and often does, involve learning and skill acquisition. Thus, artist Yasuo Kuniyoshi comments:

> There are numerous problems that beset the artist in his work. Consciously or unconsciously each artist tries to solve them. Lately I have come to the stage where I actually take a problem and try to solve it. For instance, I was interested in painting a dark object within the dark. In order to carry this out successfully took me many years. Once accomplished to my satisfaction,
however, it becomes an integral part of me, enabling me to go on to another problem. (Kuniyoshi 1952)

Paul Krugman (1999) describes assimilation of skills and techniques into his arsenal of creative techniques he naturally can and does apply to economic problems. Having developed a range of techniques in the problems that he addressed, Krugman found that those techniques and skills he had developed and become comfortable and adept at applying could be applied to other creative work:

. . . for whatever reason . . . I allowed my grand project on increasing returns to lie fallow for a few years in the 1980s and turned my attention to international finance. My work in this area consisted primarily of small models inspired by current policy issues . . . In 1990 I returned to the economics of increasing returns from a new direction. I suddenly realised that the techniques that had allowed us to legitimize the role of increasing returns in trade could also be used to reclaim a whole outcast field: that of economic geography, the location of activity in space . . . I expect that my basic research project will continue to widen in scope. (Krugman 1999: 146-147)

Assimilation in the creative process: internalisation and externalisation of creative work

In the (1926) Wallas stage model account of the creative process, extended conscious work on a creative problem or project may lead to internalisation of the problem situation into the subconscious thinking of the creative agent, incubation of the creative problem, and the subsequent possibility of creative insights emerging from the subconscious to consciousness as ‘illumination’ experiences.

With substantial creative work on a creative project taking place over an extended period of time and involving a commitment of effort, there will normally be an extended opportunity for internalisation of creative work into the creative agent. It is not surprising, therefore, that metaphors of internalisation of creative work into organic ‘gestation’ periods in creative work are common in testimonial accounts of the creative process and in the creative process literature. Ghiselin (1952) for example suggested that:

The creative process in its unconscious action has often been compared to the growth of a child in the womb. The comparison is a good one, as it nicely communicates the important fact that the process is an organic development, and it helps to dispel the notion that creation is simply an act of canny calculation governed by wish, will, and expediency. (Ghiselin 1952)

In architecture, architect Gunnar Birkerts (1994) talks of assimilation and internalisation of the creative work into the creative agent when, after a certain point following conscious design and planning, the factors bearing on the design of a building design for a building become internalised and the design for the building begins to “grow like a plant”:
This is the moment that I call organic synthesis – when all the factors affecting the personality of the building come together in the right magnitudes and the building starts to grow like a plant. (Birkerts 1994)

In music, composer Roger Sessions (1952) similarly talks of a similar stage of musical composition where after preparatory work, the creative project becomes internalized, the music shapes itself, and the composer is “allowing the music to grow”:

After inspiration and conception comes execution. The process of execution is first of all that of listening inwardly to the music as it shapes itself; of allowing the music to grow; of following both inspiration and conception wherever they may lead. (Sessions 1952: 48, emphasis added)

Examples of such internalisation of creative work and subsequent organic growth of the creative project as an entity in and of itself separate to but intertwined with the creative agent may also be found within economics. For example, Elhanan Helpman (1999) describes an “incubation” of internalised ideas, where on the surface nothing appears to be happening, in a manner consistent with Wallas’s notion of incubation in his stage model:

One has to get accustomed to the idea that months will pass with no visible progress. This does not necessarily mean that no progress has been made. Sometimes incubation periods for ideas are very long. Then, all we can write on our report cards is that we have been thinking but have no results to report. Nevertheless, these periods are not a waste of time; they are just part of the creative process. When I find myself in one of these moods . . . I read endlessly . . . often something that comes up the reading triggers a thought that helps resolve the difficulty. (Helpman 1999: 138, emphasis added)

It should not however be assumed that such internalization and organic growth necessarily take place in every creative process. Jung (1928) and Hutchinson (1949) distinguished between two modes of creative work. A creative agent might exist in relation to a creative project in one of two modes: the agent might be in full and deliberate control of the creative process; or the creative work or creative project might be internalized or ‘assimilated’ in to the creative agent or (in a team environment) into the creative project, leading to the creative project taking on a life and identity of its own that the creative agent can relate to as something beyond his or her sense of self. In this latter case, the creative process to a greater or lesser extent leads the creative agent rather than the other way around. Both kinds of creative work may occur.

**Creative Momentum**

In both top-down or bottom-up creative processes, creative actions and events may build on one another, leading to a ‘creative momentum.’ For example, in the psychology of
creativity literature, psychologist Mihalyi Csikszentmihalyi (1997) recounts the experience of one of his interview subjects (a writer):

As [writer] Grazia Livi was struggling to find words to describe her character, the words themselves suggested new emotions that were sometimes more "right" to the personality she was trying to create than ones she had initially envisioned. These new feelings in turn suggested actions, turns of the plot she had not thought of before. The character became more complex, more nuanced, as the writing progressed; the plot became more subtle and intriguing. (Csikszentmihalyi 1997: 80, emphasis added)

In musical composition, composer John Adams describes of one idea leading to another in the creative process:

Once a piece gets going, I’ll have ideas about what’s coming on later . . . that opening gesture leads to something else, which leads to something else, which leads to something else. I know that once I get going, a piece will take on forward energy and pick up steam as it moves along. (Adams 1999: 66-67)

Similarly, composer Eric Stokes describes a piece ‘pulling’ him forward:

[Composer] Martin Bresnick said that there comes a time in the composing of almost every piece when you pass the center of gravity, and the piece starts pulling you toward the end. It’s as if you get to the top of the hill and can finally see the other side. Reaching that point isn’t so much of a relief as a satisfaction. The piece is making itself clear, and you know what to do to fulfil it. (Stokes 1999: 5)

Momentum can also be found in the creative work processes of economists. For example, Paul Samuelson described a transition from a more ‘analytic’ design of his economic papers before the age of 35 to a more organic process after 35 where a natural development and building of creative momentum played a greater role:

Poets testify that their lines gush up from within. They merely write down what their muse is dictating. That sounds rather highfalutin, but there is something in it . . . When I was young I used to explore a topic; write down equations and syllogisms dealing with different aspects of it; then outline the final work . . . Increasingly after the age of 35 that is not how I have in fact operated. Instead, I have often let the paper write itself. A problem is posed. One begins to solve it, writing out the steps in the solution. One development leads naturally to another, as one exposits in writing. Finally, what can be solved of the problem is solved. The paper is finished. What has been finished is not something that has ever been envisaged, waiting only to be written down. (Samuelson 1992: 245-246, emphasis added)
Creative work, therefore, may develop its own momentum, and a given step may suggest or engender subsequent steps. This is not to suggest that creative work always exhibits such momentum: indeed, many creative individuals recount how difficult and laboured parts, or the whole, of particular creative projects were.

Completion

Completion is the last phase of the creative process, where the creative work is brought to a conclusion and, typically, a creative product is released and made available.

Completion may be divided analytically, for the purposes of the present discussion, into five aspects or stages: *structural completion, product completion, transmission, acceptance* and *integration*.

Structural completion involves bringing the creative product to a state of completion in and of itself. The artist's vision is made manifest in an artistic work, the problem situation is resolved, the creative work is *structurally* complete, and the logic or need or emotion underlying the creative work is satisfied.

However, the creative work may or may not be in a form ready for *transmission* - for example publication of an article in a journal. The work needs to be brought to a state of *product completion*: for example, the article or book may need to be written and proofread.

When product completion is reached, the creative product may be *transmitted*. In many cases this amounts to publication, but the term publication is not appropriate for all creative products. The term transmission is intended to denote a range of mechanisms involving releasing the creative product to a wider audience.

That audience may or may not, however, *accept* the innovations embodied in the creative product. Some ideas will be readily accepted and diffused in a given field, others may not.

Finally, when a creative product is brought to structural completion, packaged into product completion, transmitted, and accepted, there is a further stage to the creative process as the creative agent may need to come to terms with, *integrate*, and assimilate the consequences of the creative work such as critical acclaim or rejection, new professional opportunities, and so forth into the creative agent’s professional life and identity.

**Interactions between the creative agent and the creative field and domain**

At each stage of the creative process –genesis, development and completion– there may be interaction with the external environment and systems within which the agent is located. Thus for example Csikszentmihalyi (1988; 1990; 1997; 1999) emphasises
creativity as taking place in the context of an evolving interaction between a creative field, a creative domain, and a creative agent.

It is therefore possible and useful to extend the global stage model of the creative process to highlight interaction and exchanges between the creative agent and the institutions and resources of the field and domain, as represented in figure 2:

<table>
<thead>
<tr>
<th>Stage of creative process</th>
<th>External inputs/outputs to creative process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genesis</td>
<td>➔</td>
</tr>
<tr>
<td></td>
<td>• external problems and opportunities in the domain</td>
</tr>
<tr>
<td></td>
<td>• review existing domain knowledge in the academic literature</td>
</tr>
<tr>
<td>Development</td>
<td>➔</td>
</tr>
<tr>
<td></td>
<td>• interaction with ongoing developments in field</td>
</tr>
<tr>
<td></td>
<td>• discussions with colleagues</td>
</tr>
<tr>
<td></td>
<td>• opportunities, accidents, circumstances</td>
</tr>
<tr>
<td>Completion</td>
<td>➔</td>
</tr>
<tr>
<td></td>
<td>• external review (journal referees, book editors)</td>
</tr>
<tr>
<td></td>
<td>• publication (books, journal articles)</td>
</tr>
<tr>
<td></td>
<td>• critical reception</td>
</tr>
<tr>
<td></td>
<td>• new professional opportunities, connections</td>
</tr>
</tbody>
</table>

*Figure 2 – Interactions of the creative agent with the external field during creative work*

Figure 2 is by no means exhaustive, but serves to illustrate that at each stage of the creative process there are interactions between the creative agent and process and the external systemic environment in which the creative work takes place, and that each stage (genesis, development and completion) tends to entail different kinds of interactions with the external systemic environment pertinent to that stage of the creative process.

It has been noted above that in creative work there may be internalisation of creative work and assimilation of creative skills into the creative agent. It may be noted also that in various stages of the creative process – but most particularly during completion - creative work may be *externally* assimilated into the *external* world the creative agent is relating to. For example, if a researcher began a long term research project into the dietary habits of a particular breed of tree frogs, the preliminary reading of the literature and initial field work internalizes a sensitivity for the field and the creative goals into the creative agent, constituting an initial internal assimilation of the creative content. On the other hand, publishing initial results in a paper however may ‘brand’ the creative agent as the person who is particularly interested in the dietary habits of that particular species of tree frogs, attracting the attention of a range of parties who may contact the creative agent.
on a range of issues, potentially presenting more opportunities and experience. The creative work has been externally ‘assimilated’ into a wider field – the academic literature. Clearly this external assimilation may play a greater role in creative projects involving other people.

Conclusions

The present paper provides a life cycle account of the creative process. The framework is well supported by testimonial accounts from both economists and artists, indicating that the creative process has considerable similarities across domains. It is suggested that the account of the creative process provided above is also well suited to describing creative activity in other domains such as creative work in business, design, and scientific research. These are topics for separate papers being written by the author.
References


Hutchinson, E. D. (1949), *How to Think Creatively*, Abingdon-Cokesbury, NY.

Jung, C. G. (1928). 'On the relations of analytic psychology to poetic art' in *Contributions to Analytic Psychology*, Harcourt, Brace, NY.


Wallas, G. (1926), The Art of Thought, Cape, London.