

## **The Nature of Creative Development**

## INTRODUCTION

In this book I describe the nature of creative development of individuals engaged in creative endeavors. I define creative development to be the process of development and creative activities of an individual engaged in a creative endeavor, extending over a period of time, usually several years or longer. Creative development encompasses processes, experiences, and structures that lay the foundation for creativity, as well as the generation of creativity in its myriad forms — including ideas, insights, and discoveries, and the engagement in creative projects, leading to creative contributions.

The organizing principle and central theme of this book is that the creative development of an individual engaged in creative endeavors, across a wide range of fields, has a basic structure, which centers on, is based in, and grows out of his creative interests. More specifically, as I describe it, an individual's creative development is based in, centers on, and grows out of his creative interests, his conceptions of his creative interests, and conceptual structures he builds up in the domains of his interests which guide him in his development, are generative of his creativity, and are the basis for his creative projects, thus a fundamental source and basis of his creative contributions to society. Creative interests, as I describe them, are distinctive domains or topics that individuals define for themselves.

I describe and characterize creative interests and conceptions of creative interests; describe the formation of creative interests; and describe fundamental processes through which individuals develop their interests creatively — processes through which their interests and the conceptual structures they build up in the domains of their interests are generative of their creativity and creative projects, including ways in which they are guided in their development

2 by their conceptions of their interests and associated principles and values. Then I extend my description, describing project work, multiple interests as the basis for creativity, patterns of projects rooted in interests, and longer term processes of creative development, including the evolution of creative interests and conceptions of interests, and sequences of interests. Finally, I discuss difficulties of creative development, and the implications of my description for understanding and modeling cultural development.

Woven through my description I present many examples describing the creative developments of individuals whose developments I have analyzed, illustrating the description and providing evidence in support of it. These include individuals famous for their creative contributions whose creative developments I have analyzed drawing upon biographical and primary sources, including Virginia Woolf, John Maynard Keynes, Charles Darwin, Alexander Calder, Albert Einstein, Thomas Edison, Hannah Arendt, Hans Krebs, Galileo, William Faulkner, Ray Kroc, Tim Berners-Lee, Piet Mondrian, Pierre Omidyar, and others; and individuals drawn from several fields, mainly academic but not only so, whom I interviewed about their development, and for whom I also obtained and have drawn upon source materials. In the examples I describe individuals' creative interests and their conceptions of their interests, as they described them or I reconstruct them, and how their interests, conceptions of interests, and conceptual structures they built up in their interest domains were, and in some cases continue to be, the bases for their creativity and creative contributions. I also describe their formation of their interests and paths of development. I discuss the empirical basis for my description, including sources of information and information about the set of individuals I interviewed, later in this chapter, and list the individuals I interviewed and source materials I have drawn upon in analyzing their developments in the Appendix.

In describing creativity as based in and growing out of a process of development I follow and build on the great tradition of biography. I also follow and build on a smaller but important tradition in the literature on creativity describing and tracing individuals in their creative work over time, describing creativity as rooted in and emerging out of a process of development. What I add to both traditions is a conceptual framework for describing creative development — a theoretical structure that manifests and describes general features of creative development. In turn this enables the developments of different individuals, in different fields, to be described within a common framework.

Descriptions of creativity often focus on peak creative moments of insight, idea generation, and discovery, depicting creativity as a sudden flash of illumination or discovery. This continues to be the common view of creativity and dominant focus in the literature on creativity. Although peak creative moments

definitely do occur and are important, they are just one element in a larger process. To focus only on them, and ignore the larger, rich process in which they are embedded and out of which they emerge, skews our understanding of the nature of creativity, specifically its context and conceptual basis. The framework presented in this book delineates specific processes and structures of creative development that are the source and basis of generation of several principal forms of creativity leading to creative contributions. In particular it delineates and thus shows how individuals' ideas, insights, and contributions are rooted in creative interests they form, explore, and strive to develop creatively, including projects they undertake based in their interests, and conceptual structures they build up in the domains of their interests. These roots and bases are by no means evident on the surface: the creative interests that are the basis of individuals' creativity and contributions are often not clearly visible in their contributions, which emerge often through a long process of development, so that the importance of the interests that underlie them is masked. I have as a principal aim to manifest these linkages, to show that creative interests are the basis for creativity generation and creative contributions.

In the conceptual framework presented in this book individuals, through defining their own interests and pursuing the exploration and creative development of their interests, define, at least to a degree, their own paths of creative development. An individual's creative development is thus, at least to some degree, an autonomous activity — an important addendum being the importance of creative collaborations, and another being practical requirements, for example resources. Of course random events and experiences, such as chance encounters, have important roles, which I describe — but within a larger, self-defined, self-guided process. Further, the originality of individuals' contributions is rooted in their interests and the paths they define and follow pursuing their interests, thus in their own self-defined paths of development. As I describe, individuals' creative interests are generally distinctive, even unique — even within a field and a cohort of individuals in a field each individual typically forms a different, distinctive interest; the creative interests I present and describe as examples illustrate this point. In defining a distinctive interest or set of interests, then defining and following a unique path of development pursuing the exploration and creative development of his interests, an individual has a unique set of experiences and encounters, and builds up distinctive conceptual structures in the domains of his interests. These experiences and structures are the basis of his creativity — his ideas, insights, and discoveries, which in turn are the basis of his distinctive, original contributions. Thus an individual's creativity and the originality of his contributions is rooted in the distinctiveness of his interests and the path he follows pursuing their development.

4       The description of creative development in this book includes, as an important facet, channels through which individuals are influenced in their creative development by their culture and the world around them — channels that are not recognized or described in standard accounts of cultural transmission, at least not in the same way. The most distinctive channel of cultural transmission described in the book is that which occurs through individuals' formation of their creative interests. Creative interests originate in individuals' engagement with the world, sparked by specific experiences and elements they encounter. Cultural elements and experiences are the basis for many creative interests, making this a main pathway of cultural transmission and influence. Because these cultural elements and experiences influence an individual at such an early stage in his development, and their influence is transmitted indirectly, by and through his creative interests, their influence, important and pervasive as it is, is nonetheless often not readily apparent in his subsequent projects, ideas, and contributions. To identify these cultural linkages we must trace an individual's development with care, beginning far before his main contributions, at the time when he forms his main creative interests.

Additional channels of cultural transmission and influence I describe arise during exploration and development of interests. Notably, elements and experiences spark creative responses, and individuals build up rich conceptual structures in the domains of their interests out of elements they encounter, that in turn are generative of their ideas and insights.

Beyond describing channels of cultural transmission, the description in this book provides a basis for describing cultural development. Cultural development — the progress of civilization — has its primary source, ultimately, in creative contributions made by people in all walks of life. A well-grounded description of cultural development thus must be based in a description of individual creativity. The description in this book points towards such a description: a model describing cultural development based in individuals' creative developments and creative activities.

#### AN OVERVIEW OF THE DESCRIPTION OF CREATIVE DEVELOPMENT

The core of creative development consists of three steps: the formation of a creative interest, including a conception of the interest; the process of exploring the interest and developing it creatively; and, in the continuation of this second step, the defining and execution of projects rooted in the interest and growing out of its development, leading to creative works and contributions. I focus on describing the first two steps, then extend my description to include the third step and larger patterns of development. In this section I sketch main

features of my description, providing an overview of creative development as I describe it. At the end of the section I outline the organization of the book.

Individuals form their creative interests in and through their engagement with the world around them. In the course of their lives individuals have many experiences and encounter myriad elements of diverse kinds. They have many social interactions and personal experiences, witness and learn about many events, encounter and learn about a great variety of phenomena, are exposed to and learn or learn about a great multitude of concepts, facts, ideas, theories, beliefs, experiments and experimental results, methods, styles, and approaches, and are exposed to, learn about, and study the creative works and contributions of many people, both in their field and their culture. Out of the vast numbers of experiences they have and elements they encounter and learn about, a small number of distinct elements or experiences — or clusters of interrelated elements or experiences, or, in the case of complex experiences and elements, a particular aspect or a few component elements — catch their attention and stand out, spark their interest, and spark a response in them.<sup>1</sup> They form their creative interests in response to and based upon these experiences and elements.

Individuals are most open to forming interests during periods of their development when they are most open to the world and their experiences. Often this is just after they enter their chosen field or a new field, when they are actively learning about the field and encounter many elements in it that are new to them — they often form creative interests during these periods.

In forming their creative interests, especially in the initial stages responding to experiences and elements they encounter, individuals generally respond intuitively and spontaneously to what excites and interests them. Their responses are not rationally planned out, and often they know only a little bit about a topic or set of elements at the time they form an interest in or based upon the topic or elements. Interests are primarily rooted in and generated by intrinsic interest: individuals find their interests interesting, exciting, fascinating, challenging — that is why they form them as interests and wish to pursue them. I describe a variety of sources of intrinsic interest in Chapter 4. Extrinsic factors also have a role in the formation of interests, including individuals' decisions about which interests to pursue. The two main extrinsic factors are (1) the sense of openness and creative potential — the sense that an interest holds opportunities for fruitful creative development, and (2) the sense that an

<sup>1</sup>Registers of meaning individuals have, based on previous life experiences, often contribute to the sparking of their interests. I discuss registers of meaning in Chapter 3.

6 interest is potentially important, that contributions generated through pursuing it are likely to be significant and important for one's field and society.

Beginning from their initial interests, individuals form more defined creative interests, which form the basis for their development going forward. A key step in the process of forming a more fully defined creative interest is forming a conception of one's interest. An individual may or may not form a conception of his interest at the time he forms an initial, incipient interest; if he does, it may well be quite rudimentary, or alternatively, as occurs in some cases, he may have a quite clear conception of his interest from early on. Over time, as an individual thinks about his interest, reflects upon it, makes connections among different concepts, ideas, images, works, phenomena, facts, and other elements that fit with it, and imagines it more fully, he develops his interest conceptually, and it becomes clearer, more integrative and more coherent; as part of this process, and generative of it, he forms a fuller conception of it.

In general an individual's conception of his interest develops together with his interest, each developing in stages. There are different patterns of development of interests and conceptions of interests. Thus, in many cases an individual's interest and conception begin as relatively simple and become richer. In some cases an individual's initial interest and conception are narrowly focused, centering on specific elements and experiences, then expand out to define a broader, richer domain; in other cases his interest begins as more general, then he narrows his focus.

Individuals conceive of their creative interests as domains filled with creative possibilities, filled with promise. They desire to learn about them and explore them, and to develop them creatively. They believe or at least hope that through exploring their interests and striving to develop them creatively they will be able to define and pursue creative projects and ultimately make contributions to their field and society. However, individuals do not at the time they form a creative interest have a clear sense for how they will go about developing their interest creatively, or what they will discover, what ideas they will generate, and what contributions they will ultimately come to make through pursuing it and striving to develop it. There are many possibilities, many possible paths of development they may follow; their interest is defined in a relatively open-ended way. Their conceptions reflect this, conveying, as they describe them, a sense of openness.

Creative interests have a striking combination of characteristics. They are distinctive, even unique. Yet they are also broad, broader than individual projects or ideas, defining domains that can be explored and developed in many different ways. These two characteristics, distinctiveness and breadth, are to some degree in tension with one another. The combination of the two

is central to defining creative interests as a theoretical construct, in particular defining creative interests as intermediate level conceptual structures; I describe what I mean by this in the next chapter. Distinctiveness and breadth are powerful in combination, and jointly they are integral to the central roles creative interests have in creative development. The many examples of creative interests presented in this book, in particular individuals' descriptions of their conceptions of their interests and my reconstructions of individuals' interests, exhibit distinctiveness and breadth, demonstrating that creative interests possess these characteristics.

My description of creative interests to a degree follows and builds upon the commonplace idea of an interest; however, it also challenges conventional ideas about interests and differs in significant respects from them. It is a commonplace that individuals engaged in creative endeavors have creative interests; indeed individuals engaged in creative endeavors frequently mention their creative interests in discussing their creative activities. The commonplace view of creative interests is valuable as a point of departure, in providing an intuitive sense of creative activity rooted in interests. However, it is also misleading and deficient in some important respects, and I believe as a result can hinder — and has done so — our understanding and appreciation of the true nature of creative interests and their role and significance in creative development.

There are two fundamental ways in which my description is distinct from conventional notions and goes beyond them. One is in the idea of a conception of a creative interest. I do not believe it has been widely understood that individuals form conceptions of their creative interests. In fact individuals do form such conceptions; I present many examples of individuals' descriptions of their conceptions of their interests. Further, their conceptions of their interests are central to their creative development, guiding them in their development, and are conceptual cores around which they form conceptual structures in their interest domains which are vital bases of their creativity generation. The other concerns the nature of interests. Conventionally interests are often viewed as being simple, conventional subjects. This intuition is misleading with regard to creative interests. I define creative interests somewhat differently, as distinctive topics that individuals define for themselves, thus inherently more creative. And I show how important such distinctive interests are as the basis of original ideas, discoveries, insights, and projects, leading to creative contributions; appreciating the distinctiveness of interests is thus critical for appreciating their role in creative development.

Having formed a creative interest or set of creative interests, and conceptions of his interests, an individual explores his interests and strives to develop



8 them creatively. His interests are the focus of his attention, thinking, and creative activity, at the core of his creative development.

Through exploring and learning about a creative interest an individual learns of and about many elements that fit in its domain or are connected with it — for example, creative works, ideas, concepts, theories, facts, phenomena, and images. His attention is drawn by elements, aspects of his experiences, and events that fit and connect with his interest, he notices and focuses on them, and forms internal representations of them. Through these processes of learning, attention, and internalization the individual builds up a conceptual structure in the domain of his interest. His conception of his interest sits at the center of this developing conceptual structure, guides his attention and learning, and is important in providing a core structure around which other elements coalesce, building associations and linkages, creating an integrative conceptual structure.

Individuals' creative interests, specifically the conceptual structures that encode their interests and that they build up in the domains of their interests, are a fundamental basis for their creativity generation. During periods when individuals are engaged in exploring their interests and seeking ways to develop them creatively, these structures are the principal basis for their creativity. A main process through which individuals generate ideas during these periods is through creative responses they make, sparked by specific experiences and elements they encounter that connect with their interests, thus responses mediated by the conceptual structures in their minds associated with their interests. Creative responses spark many important ideas and projects, generating creative opportunities individuals pursue. I present a series of examples of creative responses, including responses by Alexander Calder, Tim Berners-Lee, John Maynard Keynes, and several of the individuals I interviewed.

The conceptual structures that encode creative interests and that individuals build up in their interest domains mediate their creative responses through a combination of two processes. First, they guide individuals' attention, leading them to notice and focus on specific experiences and elements — or particular aspects of them — that connect in some way with one of their interests. Second, they are central for individuals' processing in the wake of an initial response, triggering associations and creative links of thinking leading to further creative ideas and insights. Individuals' creative interests, encoded in their minds, provide unique perspectives, enabling them to recognize and respond in distinctive ways to experiences and elements they encounter, to make creative connections that others fail to make, that are thus original. For example, an individual may recognize the importance of a particular aspect of a

phenomenon that others have overlooked, because it connects with one of his interests in an interesting way.

Individuals build up rich conceptual structures in the domains of their interests over time. These rich structures are generative of creativity through a variety of pathways. They are generative of creative responses; for example, Ray Kroc generated a creative response rooted in expertise he had built up over many years of work. They are also the basis for generalizations: noticing and recognizing a general pattern, principle, or relationship among a set of elements in one's interest domain. Charles Darwin's insight that the principle of transmutation of species might be a basis for explaining and modeling patterns of characteristics of allied and related species, and changes in species over time, is a classic example, described in Chapter 10. Finally, rich conceptual structures of creative interests are generative of creative connections among specific elements; a classic example is Samuel Taylor Coleridge's process of creation for his great poems, notably "The Rime of the Ancient Mariner," also described in Chapter 10. I call the rich conceptual reservoirs individuals build up in the domains of their interests creative expertise.

The third phase of creative development is engagement in creative projects. In general individuals develop their projects out of their creative interests. In many cases an individual develops an idea for a project through one of the processes described above. Thus, for example, one common pattern of development is for an individual to generate an idea for a project through a creative response. In some cases an individual develops a project based on an opportunity he uncovers exploring his interest. In other cases an individual is offered a project, for example by a manager or senior colleague, that fits with his interest — or that he modifies to fit with it — which he then pursues. Finally, individuals develop projects in collaboration with one another, in the overlap of their interests; such collaborative projects are often rooted in creative ideas generated through a form of creative response — two individuals encountering one another, their engagement sparking an idea. Making the transition from exploration of interests to projects is crucial and can be difficult, both because of the difficulty in defining a project one wishes to pursue and because in choosing to pursue a project one narrows one's focus and passes over many other possibilities.

Individuals who are actively engaged in projects are generally quite inwardly focused, far more so than in periods when they are forming interests and exploring their interests and seeking ways to develop them — they are focused on tasks and task completion. Thus they are less open to their environment, except insofar as it is useful to them in their projects, for example in solving a problem

10 they confront. Individuals can be extremely creative in project work. I discuss a number of creative processes that are important in project work. One is the generation of creative responses — having a project in mind, then having an experience or encountering an element that has a connection with the project, and triggers an idea for it. Other processes I describe are discovery, creative problem solving, and revisioning. I show by example that in many cases creativity generated through these processes is rooted, at least in part, in the creative interest that is the basis for the project, thus generating a link with the interest.

Projects are crucial to creative work: in the course of pursuing a project an individual is in many cases taken far beyond the interest that was the basis for the project, and beyond his original conception for the project, generating ideas and making discoveries he did not imagine. Yet regardless of how far beyond their interests individuals are led in pursuing their projects, their interests nevertheless are the basis of their projects. Thus, to understand how an individual comes to pursue a given project we must go back further, and identify his creative interest or interests that led him to come upon it or generate the idea for it.

In addition to their creative interests being generative of their creativity and the basis of their projects, individuals' conceptions of their interests are crucial in guiding them in their development. Their conceptions guide them in exploring their interests, and in their decision-making about which projects to undertake and, more broadly, which interests to pursue. Their conceptions also shape the way they conceive and define their projects and are important to their work on projects. Pierre Omidyar's values, connected with his interest in promoting and developing fair systems of exchange, were a vital factor in the way he developed his Internet auction site that became eBay. Piet Mondrian's conception of a new art form, rooted in philosophical ideals and principles, was crucial in guiding him in his artistic development.

In engaging in a creative endeavor an individual undertakes a process of development that is often fraught with uncertainty, following a path that has never been traveled before. To have the best chance of making contributions that fulfill his potential and the potential of his creative interests it is vital in many cases for him to manage his process of development, especially at certain junctures. Management includes decision-making about which interests to pursue and which projects to undertake, as noted above, as well as about when to abandon a line of development or a project. It also includes managing or at least being able to cope with one's emotions along what can be a rocky course.

In managing his development an individual is guided by his conceptions of his creative interests, and values and principles linked to his interests, which provide a context for him to think about his development. This larger context is important in motivating him and giving him a sense of purpose. It is also

important in evaluating the course of his development, which is crucial for guidance. A notable feature of creative development is the way individuals, at certain critical junctures, step back and reflect upon their course of development, for example, their interests or the outcomes of a series of projects they have engaged in, from a broader, meta-level perspective. Such meta-level thinking can be very important. For example, an individual may in reflecting upon his development conclude that he has wandered too far from his initial conception of his interest, and decide to engage in a midcourse correction, to steer himself back towards topics that fit better with it; or he may recognize a larger pattern that triggers an idea for a new approach. I provide examples of such thinking, showing its importance, in Chapter 11. In general I argue and show with examples that individuals engaged in creative development think about their development and manage it from a broader, more overarching perspective than has previously been described — specifically, reflect upon their development from the perspective of their interests, guided by their conceptions of their interests as well as associated principles and values.

Every individual who engages in a creative endeavor follows his or her own unique path of creative development. This path may be described most basically by the interests he forms, the projects he undertakes, the ideas he has and discoveries he makes, and the contributions he makes. More richly described, it includes his experiences and encounters, assessments he makes about his development, his decisions and emotions along his path of development, as well as his creative activities, such as exploration and problem solving and the presentation of his ideas and works to others in his field and society.

Patterns of creative development have a variety of forms. For many individuals, over medium spans of time their pattern of development resembles the branching structure of a tree — their core creative interests are like the trunk and their projects are like branches coming off of this trunk. Individuals whose development fits this pattern develop the ideas for their projects in the course of exploring their creative interests. During the time when they are focused on a project they temporarily set their interests aside; but as their project ends their attention returns to their interests, they resume exploration of them, and their new project generally develops out of their interests, not the project they have just ended. In other cases one project leads to the next, forming a chain. Over longer time spans individuals' creative interests change, as they learn and mature; also, their conceptions of their interests often become more sophisticated. These processes of change and maturation create complex, rich patterns of development. I describe two main patterns of this kind: evolution of interests and the formation of a sequence of linked interests over time. Two outstanding cases I present illustrating these patterns are the

- 12 developments of Hannah Arendt and John Maynard Keynes. Their examples show how through evolution of their interests and forming sequences of linked interests individuals can go far beyond where they begin in their creative development, to make outstanding contributions much later, following a long process of development.

The description in this book naturally extends to developing a description of cultural development. In particular, it provides the basis for describing a core process of cultural development. I sketch this core process here; I discuss development of models of cultural development rooted in the description in this book in Chapter 17.

The elements and experiences that influence individuals in their formation of their creative interests have a deep and pervasive influence on their creative development. Acting by and through their interests, such elements and experiences influence individuals' whole course of development — the paths they follow, what they encounter and learn about, hence the basis for their creativity generation, and the topics, questions, and problems they become interested in and pursue in their projects, leading ultimately to their creative contributions. Among all the different kinds of elements and experiences that influence individuals in forming their creative interests, the contributions and work of other people, especially their predecessors in their field and neighboring fields, are especially important — the main source of their interests in many cases. Individuals in many cases develop their interests out of their reactions to others' work, desiring to extend or apply the work of someone else, to challenge or refute it, or defining their interest in contrast to it, structuring their interest as a topic that is intentionally designed to be different. Even in cases in which an individual's interest develops around other kinds of elements the work of others is likely to have been crucial in exposing him to these elements and helping him recognize their significance; for example, when an individual develops an interest in a particular phenomenon in many cases he first learns about it through a description given by someone else. The adage that individuals "build on the work of their predecessors" is therefore true if it is understood to mean this: "individuals construct their interests and conceptions of interests in and out of their responses to the work of their predecessors."

This link between the contributions one generation makes and the creative interests formed by the next links the creative endeavors of successive generations in a two-step recursive process: the creative contributions made by the members of the preceding generation form the basis for the creative interests of the members of the current generation, who develop their interests creatively, producing their own creative contributions — which in turn become the basis for the creative interests of the members of the following generation.

Thus creative interests and creative contributions form a pair of mutually dependent networks, each formed out of the other, a dynamic recursive system.<sup>2</sup>

In the following chapters I focus on each aspect of creative development in turn, describing it; throughout I present many examples, which collectively give broad empirical support to the basic description.

In the first seven chapters I describe creative interests and their development. In Chapter 2 I define and describe creative interests and conceptions of creative interests. In Chapter 3 I describe the development of creative interests and conceptions of creative interests. In Chapters 4 and 5 I describe sources of interests: Chapter 4 focuses on intrinsic sources of interests, Chapter 5 discusses extrinsic and strategic factors in the development of interests. In Chapter 6 I describe kinds of creative interests. In Chapter 7 I discuss the important characteristics of breadth and distinctiveness.

Chapter 8 is a bridge from the first to the second part of the book: I present a series of examples showing that individuals' creative interests and conceptions of their interests, as they describe them, carry through in many cases and are reflected in their creative contributions. In the following three chapters I describe creativity generation and guidance based in creative interests and conceptual structures of interests. In Chapter 9 I describe creative responses mediated by creative interests. In Chapter 10 I describe individuals' processes of exploration, building up conceptual structures in the domains of their interests, and creativity generation rooted in these structures. In Chapter 11 I describe guidance, decision-making, and meta-level thinking about creative development, focusing on ways in which individuals are guided by their conceptions of their interests and values and principles associated with their interests.

In the chapters following eleven I round out and extend my description. In Chapter 12 I describe creative project work. In Chapter 13 I describe the generation of creativity rooted in combining and linking elements based in different interests. Chapter 14 describes patterns of projects, focusing on patterns of projects rooted in a single core interest. Chapter 15 describes the evolution of creative interests and sequences of linked interests and creativity based in such patterns of development. In Chapter 16 I use the framework of description in the book to describe and analyze difficulties individuals may experience in their creative development. Diagnosing and describing difficulties is not

<sup>2</sup>Other cultural elements and experiences enter into and influence individuals' development during later phases of their development, notably in sparking creative responses and solutions to problems in projects, and as elements in the conceptual structures they build up in the domains of their interests, as described in the preceding text.

14 my main focus, but the description of creative development provides insight about such difficulties, likely to be of interest for many readers interested in realizing their creative potential or helping others to do so. In Chapter 17 I describe channels of cultural transmission and discuss construction of models of cultural development based in individual creative development.

The book concludes with an Epilogue in which I set forth my further aim, to which this book points: the development of descriptions and models of social systems in which individuals are modeled as distinctive and make contributions to their society rooted in their distinctiveness — an approach reflecting and thus supporting the fundamental principle of individualism and our cultural way of life.

#### DATA AND SOURCES

The description of creative development in this book is supported throughout by examples drawn from my analysis of the creative development of individuals engaged in creative endeavors. In part the description was developed inductively, based on analysis of the developments of these individuals; and in part it was developed deductively and has gained further support through clearly fitting, as a description, the developments of many individuals in a range of fields. The individuals are two distinct groups. One is individuals famous in history or well known for their creative contributions, drawn from a range of fields and time periods. The other is individuals I interviewed about their creative development who at the time I interviewed them were in an early to middle period in their creative careers. These individuals are not famous, and represent a very different sample; many have achieved some measure of success in their endeavors, producing creative works, having a sense of accomplishment, and achieving a degree of recognition in their field. I present here basic information about the individuals in the two groups and my sources of information about their creative developments.

In choosing individuals famous or well known for their contributions to study I sought for breadth in terms of field, and also, to a more limited degree, time period and nationality. I focused on individuals for whom materials pertaining to their creative development exist and are accessible, including individuals for whom outstanding biographical scholarship exists describing their development. In selecting these individuals I did not follow a systematic sampling process. However, the sample has a good degree of breadth, and in combination with the sample of individuals I interviewed described below I believe it is compelling that the description of creative development I present, fitting with and providing insight about the developments of a relatively broad

overall sample of individuals engaged in a broad range of creative endeavors, holds the promise of having general validity. 15

I list below many of the individuals famous or well known for their contributions whose development I have studied. The list gives a sense of the number and diversity of individuals. Some are very famous, others are not as famous but are well known for their work; all have made outstanding creative contributions.

|                    |                         |                     |
|--------------------|-------------------------|---------------------|
| Hannah Arendt      | Paul Barran             | Tim Berners-Lee     |
| Ingmar Bergman     | Alexander Calder        | Rachel Carson       |
| Paul Cezanne       | Samuel Taylor Coleridge | Charles Darwin      |
| Walt Disney        | Fyodor Dostoevsky       | Albert Einstein     |
| Thomas Edison      | William Faulkner        | Galileo             |
| Robert Irwin       | James Joyce             | John Maynard Keynes |
| Hans Krebs         | Ray Kroc                | Henri Matisse       |
| Piet Mondrian      | Isaac Newton            | John von Neumann    |
| Pierre Omidyar     | Pablo Picasso           | Jef Raskin          |
| James Watson       | Virginia Woolf          |                     |
| William Wordsworth | Wilbur Wright           |                     |

I have explored the development of many other individuals in a limited manner. Indeed the pool is essentially limitless, which is a challenge and an opportunity in developing a framework for describing creative development.

In researching and analyzing the creative developments of these individuals I have drawn upon two fundamental kinds of sources. One is materials that individuals themselves produce or create; the other is biographical and other scholarly descriptions of individuals' development and creative activities.

Source materials produced by individuals themselves fall into three categories. One is statements individuals make at a relatively early stage in their development, in which they describe creative interests, ideas, plans, or designs they have, as well as beliefs, values, and principles, that turn out to be important for their subsequent development and contributions. Such statements are especially valuable. In being prospective, they avoid any issue of an individual reconstructing beliefs, ideas, interests, plans, or experiences to fit with later beliefs or ideas the individual has or contributions he makes, thus demonstrate especially cleanly the logic and validity of the description of creative development I present. Important sources of this kind that I have



drawn upon and incorporate in this book include Virginia Woolf's early journal and Diary, Samuel Taylor Coleridge's notebooks, in particular his "Gutch Notebook," Charles Darwin's *Beagle* Diary and notebooks, Thomas Edison's notebooks, Piet Mondrian's sketchbooks and essay "The New Plastic in Painting," John Maynard Keynes's papers, Hannah Arendt's initial outline for what became *The Origins of Totalitarianism*, and Tim Berners-Lee's original documentation for his Enquire program. I also draw on letters written by individuals early in their development, including letters of Albert Einstein, Henri Matisse, Virginia Woolf, Wilbur Wright, and Coleridge.<sup>3</sup>

A second category is writings, lectures, and creative products produced by individuals relatively early in their development. These do not include direct statements about their development — for example their creative interests — but provide valuable information, indirectly, about their path of development, including in many cases about their developing interests and plans. Examples of such works I have utilized include Virginia Woolf's short stories written prior to her creative break; early writings of Hannah Arendt, including *Love and Saint Augustine*, *Rahel Varnhagen*, and numerous articles; John Maynard Keynes's notes for presentations he made to the Apostles and lectures, as well as early books; Isaac Newton's mathematical papers; Alexander Calder's early sculptures; sequences of paintings and sketches by Henri Matisse, Pablo Picasso, and Piet Mondrian; and Jef Raskin's master's thesis in computer science (Jef is a principal inventor of the Macintosh).

A third category of source materials produced by individuals is descriptions they provide of their creative development retrospectively. Many famous individuals describe their development in autobiographies or memoirs. Such sources are not always reliable, both because individuals often write them late in life when their memory for events and ideas they had when they were younger may be poor, and also because they may shape their account to fit with their later famous contributions and ideas and public persona.<sup>4</sup> However, autobiographies differ markedly — some are candid and very valuable as a source of information. I have drawn upon a number that stand out for their lucidity and seem likely to have a high degree of accuracy. These include Alexander Calder's *Calder, An Autobiography with Pictures*, Ray Kroc's *Grinding It Out*, Albert Einstein's "Autobiographical Notes," and James Watson's *The*

<sup>3</sup>Accounts given by other people of statements individuals make, for example, describing interests, plans, or guiding principles they have, are also valuable, and I draw on these in a few cases; as one example I draw on statements made by Fernande Olivier in her journal about Picasso and his attitudes towards her.

<sup>4</sup>There is a large literature on autobiographical writing and the matter of its reliability or lack thereof; see the references later in this section.

*Double Helix*. Even these are imperfect. Thus Watson's account is at times slanted stylistically; however, there are other sources available to fill in and modify his account. Individuals also make statements describing their development soon after making important contributions, which thus describe relatively recent experiences and thoughts, and are less colored by their later fame, and, for both reasons, are likely in many cases to be accurate. I have drawn upon statements of this kind made by a number of individuals, including notes William Faulkner made, within a few years of his creative break, about the genesis of his work on *Flags in the Dust* and the genesis of *The Sound and the Fury*, and comments by Alexander Calder describing his early abstract sculptural art. Interviews and lectures are a further source of autobiographical information. I have focused on interviews in which individuals speak specifically to their creative development. Interviews and lectures I have drawn upon in this book include interviews with Paul Barran, contributor to the development of the Internet, Jef Raskin, and Ingmar Bergman; and Pierre Omidyar's 2002 Tufts Commencement Address.

The other category of source materials is biographical and scholarly materials. Such materials are a valuable resource; they are also a useful check on my description, for biographers do not have my description in mind or any intent to prove or disprove it in constructing their accounts. For many of the individuals I have studied there is an outstanding biography or body of scholarship that has been invaluable in analyzing their development. Outstanding biographies I have drawn upon include Frederic Holmes's *Hans Krebs: A Scientific Life*, Joseph Blotner's *Faulkner: A Biography*, Elisabeth Young-Buehl's *Hannah Arendt: For Love of the World*, Hilary Spurling's *The Unknown Matisse*, Tom Crouch's *The Bishop's Boys* biography of the Wright Brothers, and the first two volumes of Robert Skidelsky's biography of John Maynard Keynes, *Hopes Betrayed* and *The Economist as Saviour*. There is extensive and outstanding scholarly work describing the development and work of many of the individuals whose development I have studied that has also been invaluable. John Livingston Lowes gives a brilliant description of Coleridge's process of creation in *The Road to Xanadu: A Study in the Ways of the Imagination*; Kathleen Coburn's and Richard Holmes's insights about Coleridge are also invaluable. There is an extensive body of scholarship on Albert Einstein's creative development; I have found especially valuable John Stachel's contributions, including in *The Collected Papers of Albert Einstein*, and Arthur Miller's *Albert Einstein's Special Theory of Relativity: Emergence (1905) and Early Interpretation (1905–1911)*, which sets Einstein's work developing special relativity theory in context. For Galileo I have drawn upon Alexander Koyré's *Galileo Studies*, Stillman Drake's *Galileo at Work*, and work of William Wallace. Beyond these,

18 much more scholarly work has been invaluable for me in constructing my account of creative development; this work is cited and discussed throughout the body of the book.

The individuals I interviewed about their creative development are a group of gifted young people in a number of fields. Most are drawn from three academic fields: English and American literature; neuroscience; and mathematics. In each of these fields I contacted individuals who had recently graduated from one of the top-ranked doctoral programs in their field, as ranked by the National Research Council.<sup>5</sup> I contacted individuals who had earned a doctorate from one of the top three programs in English and American literature in 1995, one of the top four programs in neuroscience in 1996, and one of the top three programs in mathematics in 1997.<sup>6</sup> In each field I contacted all individuals in the programs who had earned their doctorate in that year, with two exceptions: one English program was substantially larger than the others and I contacted one-half of its graduates; and not all the mathematics doctorates were contacted in order to keep that sample smaller due to the technical difficultness of the work. In both cases those contacted were not selected based on any definite criterion and should be representative of the group as a whole. Nearly everyone I contacted agreed to participate in my study, with the overall participation rate at 90%.<sup>7</sup> I interviewed 22 individuals with doctorates in English and American literature, 19 with doctorates in neuroscience, and 9 with doctorates in mathematics. Several of the literary scholars I interviewed also write fiction, and during our interview we discussed both their literary studies and creative writing. Most of the people I interviewed grew up in the United States and are U.S. citizens. Approximately 10% are Canadian, 10% are European, one is Chinese, one Indian, and one Russian; also, one is deaf. Approximately 50% are women and women are well represented in all three fields.

There are two sampling issues to be noted in regards the groups of individuals contacted and interviewed in these fields. I contacted individuals only at top-rated programs. It is possible that individuals attending lower rated

<sup>5</sup>*Research-Doctorate Programs in the United States; Continuity and Change*, ed. Marvin L. Goldberger, Brendan A. Maher, and Pamela Ebert Flattau (Washington, DC: National Academy Press, 1995).

<sup>6</sup>These programs are: Yale, UC-Berkeley, and Harvard in English and American literature; Harvard, Yale, UC-San Francisco, and UC-San Diego in neuroscience; MIT, Princeton, and UC-Berkeley in mathematics.

<sup>7</sup>The percentages of individuals who agreed to participate and were interviewed is 85% in English and American literature, 90% in the neurosciences, and 100% in mathematics.

programs may have systematically different patterns of development.<sup>8</sup> Also, all the individuals I interviewed completed their programs successfully, earning a doctorate. Individuals who enter but do not complete their program may be expected to have at least somewhat different patterns of development. Informal statistics I gathered speaking with program officers indicate that the great majority of individuals who matriculate in the programs I drew from earn degrees — at least 75%, and higher for most programs; thus this issue seems not to be a major concern for my sample.<sup>9</sup>

In addition to the individuals in the fields above I interviewed a small group of filmmakers and playwrights. I interviewed two playwrights who graduated in 1997 from the Yale School of Drama, one filmmaker who graduated from the NYU Tisch School of the Arts in the spring of 1997, and one other person who is a playwright and a filmmaker, whom I gained access to through a contact. The set of playwrights and filmmakers is small and more haphazard in construction and cannot be taken to be representative of any well-defined pool of individuals in these fields. Nonetheless, the interviews I conducted with these individuals were valuable in providing information about creative development in these fields.

Before conducting an interview with an individual I familiarized myself with the main creative products he or she had produced over the preceding few years. For the individuals who had earned doctorates I read their dissertations, as well as published papers or abstracts. For the playwrights I read plays they had written, and for the filmmakers I viewed films they had made. In addition, I familiarized myself with supporting materials that appeared to have been important for an individual in his work, such as articles and books he analyzed or drew upon in an important way in his work. Having a high degree of familiarity with an individual's work greatly facilitated our interview discussion, enabling us to discuss their work, work that in some cases is abstruse and highly specific, cogently. I believe my obvious familiarity with their work also helped the individuals I interviewed feel comfortable speaking with me.

A typical interview lasted somewhat more than two hours.<sup>10</sup> Interviews were conducted by telephone, with the exception of two conducted in person, and

<sup>8</sup>One likely difference is that individuals at lower rated programs can be expected to take longer to complete their degree, in part because of needing to work while attending school. Beyond this, there may well be differences in the nature of their interests and patterns of work.

<sup>9</sup>In my sample there are individuals who earned their degree in three or four years and others who took far longer, thus there was substantial variation in time to completion.

<sup>10</sup>No interviews were shorter than 80 minutes; some were significantly longer and conducted over two sessions.

were recorded and transcribed. In the interviews I asked individuals to describe their creative development, broadly defined, typically beginning in childhood and college and moving forward to the present, with the main focus on the preceding several years, often beginning in the last year or two in college. I sent individuals a guideline for the interview a few days ahead of time so they would understand the nature of the interview, and many had assembled materials they referred to during our interview. I guided interviews with an open protocol, for the most part going in chronological sequence, dividing the interview into segments. Thus, for example, for individuals who attended graduate school, during the interview segment in which we discussed their graduate school experience we first discussed specific courses, papers, and projects that were important for them during their first year, then discussed their second year, proceeding in sequence. Often we revisited certain topics later in an interview, as the individual recalled further details or I had questions of clarification. The interview transcripts average approximately 17,000 words in length, with variation from as little as 10,000 to more than 28,000 words; the typical length is 35 to 43 single-spaced pages.<sup>11</sup> The majority of words spoken in all interviews were spoken by the individual interviewed — on average, by rough count, close to 70%. I had email correspondence with many individuals after our interview. In addition, I have reinterviewed several individuals, verifying information and earlier statements they made and obtaining information about their path of development since our interview.

In addition to the interviews I collected source materials beyond the basic materials noted above — dissertations, plays, and movies — for the individuals I interviewed. For the vast majority of the literary scholars I obtained a copy of their dissertation prospectus. I also obtained additional materials for many; for several I obtained a copy of their college honors thesis or senior thesis, for a few who wrote a master's thesis I obtained a copy of or examined their thesis, and a few have shared documents with me from early in graduate school, such as papers, orals documents, and reading lists. For many of the neuroscientists I obtained copies of papers or abstracts they published either before entering their doctoral program or early on in their program. For a few I also obtained orals proposals, college materials, such as an honors thesis or class materials they shared with me, and miscellaneous other materials. For the mathematicians, I have located or obtained fewer source documents dating to years prior to our interview but still some: for one a master's thesis, for a second a pair of honors theses, and for a third a set of lecture notes she coauthored. Two of the playwrights sent me documents describing their work and development; I also obtained reviews of movies and plays, and for one transcripts of other

<sup>11</sup>Approximately 90% have length between 28 and 50 single-spaced pages.

interviews. In addition to these materials, pertaining to the period prior to the interviews, I have followed the subsequent development and contributions of many of the individuals — noted articles and books they have published and films they have made, and gathered information about their current interests and projects listed on Websites.

The Appendix provides more detailed information for my interview sample. It lists the names of the individuals interviewed, and source materials, including creative products and other sources of information about their development I have drawn upon.

In addition to the individuals in the fields described above, I have been able to gather information about the creative development of a number of individuals who are entrepreneurs and in business. These include an entrepreneur I interviewed when he visited Yale, and several students in my classes who wrote essays describing their creative development. These individuals are also listed in the Appendix.

I discuss the creative development of many of the individuals I interviewed in the course of this book. For purposes of illustration I introduce here three whose development I discuss — Azad Bonni, Enid Zentelis, and Robert Kaufman. Azad is a neurobiologist who has done important work on neurotrophin signaling pathways and is now head of his own laboratory at the Harvard Medical School. Enid is a talented filmmaker who was awarded the Grand Marnier Award from the Film Society of Lincoln Center, in association with the New York Film Festival, in 1997 for her film *Dog Race*; her first full-length feature film, *Evergreen*, came out in 2004. Robert is a literature scholar, currently a professor at Stanford University, who has developed original theories about the relationship between ideas and beliefs of Keats and Shelley, expressed in their poetry and other writings, and modern Left critical theory.

Throughout the book I describe and discuss the creative development of individuals I interviewed side by side with the development of individuals famous for their creative contributions. This style reflects my belief that my description is general, that it describes the development of both those who achieve great success in creative endeavors and those who achieve more modest success, and that we all have creative potential that can be realized through a process of development of the kind I describe. In a few places I compare and contrast structures, processes, and patterns of development of highly successful and less successful individuals.

I rely in this book on individuals' retrospective statements as one important source of information about their development. The use of retrospective statements raises concerns, for a number of reasons. In this section I discuss potential flaws in retrospective accounts individuals give of their development,

22 and the relevance for my description. I emphasize that in addition to retrospective statements I utilize as well contemporaneous and longitudinal, prospective sources of information. These sources provide important support for the description I provide, and serve as a useful check on many of the retrospective accounts; see my discussion below.

Inevitably retrospective descriptions individuals give of their creative development are highly selective. They may not be able to recall their past thoughts and experiences clearly, or the chronology of their development accurately. In general they are likely to describe main interests, experiences, ideas, and projects they had, especially those that were fruitful or influenced their subsequent development, and to pass over many other experiences and elements that were more minor or they chose not to pursue or were unable to develop, and thus faded in importance. Obviously an individual cannot possibly describe the rich stream of his daily experiences in full. The lack of daily material is not in itself a crucial problem, as my description focuses on creative development over longer periods of time, on more enduring interests, main ideas, pivotal decisions and events, and projects. Individuals recall and describe all of these. However, the record is clearly quite incomplete.<sup>12</sup> In fact, I believe far more detail can be incorporated within the basic framework I present without fundamentally changing its nature. In particular, it can incorporate more detail about development of interests over time and incipient interests, greater complexity and stagewise development of ideas, more decision points, and more details about activities, for example, exploration of interests, learning, and project work.

Psychological studies of memory raise the concern that individuals falsely remember and reconstruct past events or thoughts in some cases. For my description in this book the greatest concern is that individuals may state in a retrospective account that they had an interest at an earlier time that in fact they had not formed at that time. This is a serious concern to be borne in mind. However it is the case that the context of recollection in this book and kinds of memories that are its focus are different than the kinds of memories that seem susceptible of false memory described in the literature. False memories have primarily been identified for traumatic events, for experiences and aspects of experiential memories that do not have high personal relevancy, and, in an experimental context, as individuals "filling in" short narratives they have been told to recall with elements not present in the original story, or falsely

<sup>12</sup>In interviews I probed individuals to describe background sources and issues they might not otherwise mention. As one example, I probed for areas of work they did not pursue, and many described interests they chose not to pursue and failed projects. Autobiographies are likely to be more selective than interviews in this regard.

recalling an element that has a close association with an element that is part of a memory, for example, falsely recalling hearing a word having a close association with words in a recited word list. None of these cases fits closely with the recollection of creative interests. Creative interests have high personal relevance, they are not traumatic, nor are they tied to public events, thus subject to scripting, for example by media coverage. Further, while they form part of a larger autobiographical narrative, they do not fit in a tight narrative structure, but on the contrary usually are described as forming, and seem to form, well before critical later events like ideas based in them — thus are not “proximal” causes — not linked closely in time or often narratively to later events, but rather bases for them.<sup>13</sup>

Creative interests as I describe them in this book are relatively stable constructs represented in memory as generic memories. Recalling an interest one

<sup>13</sup>For narrative “filling in” and false recall of words in word lists see M.K. Johnson, S. Hashtroudi, and D.S. Lindsay, “Source monitoring,” *Psychological Bulletin* 114 (1993): 3–28. These false memories are of single elements; interests are broader than single elements, and seemingly less likely to arise as the kind of false memory described in this literature, in part because, as noted in the main text, they are not so tightly linked to subsequent events, which is the dynamic that tends to drive false narrative construction in the psychology experimental literature. Research on dramatic public events indicates that memory for such events may be vulnerable to becoming distorted through a combination of shared social memory and lack of personal relevancy; see R. Brown and J. Kulik, “Flashbulb memories,” *Cognition* 5 (1977): 73–99; Ulric Neisser and Nicole Harsch, “Phantom flashbulbs: False recollections of hearing the news about *Challenger*,” in *Affect and Accuracy in Recall: Studies of “Flashbulb” Memories*, ed. Eugene Winograd and Ulric Neisser (Cambridge: Cambridge University Press, 1992), pp. 9–31. Interests are inherently private, not public, thus not vulnerable to the corruption of a wider social memory interfering with an individual’s own memory; and they are personally significant in a way many public events that have been studied are not. It is noteworthy in this regard that public events that have greater personal saliency are remembered far better. A paper by Ulric Neisser, Eugene Winograd, and Mary Weldon (1991), “Remembering the Earthquake: ‘What I Experienced’ vs. ‘How I Heard the News’,” reported in Martin Conway, *Flashbulb Memories* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1995), pp. 49–52, 113, reports that individuals who personally experienced the 1989 northern California Earthquake had very accurate recollection of their experience of it eighteen months later, whereas individuals who did not personally experience it but learned about it were significantly less accurate. In his book Conway emphasizes that personal consequentiality is crucial for good memory. False memory has been shown for events or elements in people’s environment that were not the focus of their attention; see, for example, the discussion by Daniel Schacter in *The Seven Sins of Memory: How the Mind Forgets and Remembers* (Boston: Houghton Mifflin, 2001). This does not apply to individuals’ memories of creative interests: their interests are at the center of their development, thus a focus of their attention.



24 had is like remembering the walk to work one has taken many times — one remembers it as a single generalized event more than as separate instances. Such generic memories are likely to have high general reliability, though with fewer details, as compared with memories of specific events or emotions at a given time, which have detail but are not always reliable. Thus when individuals state interests they had it is likely they did have them, though they most likely will not remember precisely how they thought of their interest at different times.<sup>14</sup> Creative interests have two further characteristics associated with high memory retention: high personal salience, as noted above, and, as I describe them, a high degree of rehearsal, being recalled to mind repeatedly.<sup>15</sup> I note also that individuals' descriptions of their interests are largely self-generated, both in autobiographical contexts and in the interviews I conducted. They do not have to mention having creative interests, especially well before main ideas they had — there is little narrative pressure for them to do so, and certainly they could construct narratives of their creative development without doing so.

I have carefully analyzed the language individuals used to describe creative interests they formed. Overwhelmingly, for those who explicitly describe having an interest (not for those, in particular some of the individuals famous for their contributions, for whom I have reconstructed what I believe their interest to have been) their descriptions are stated in language in which they

<sup>14</sup>Generic events are the most basic level of autobiographical memory. See M.A. Conway and D.A. Bekerian, "Organization in autobiographical memory," *Memory and Cognition* 15 (1987): 119–32; Lawrence W. Barsalou, "The content and organization of autobiographical memories," in *Remembering Reconsidered: Ecological and Traditional Approaches to the Study of Memory*, ed. Ulric Neisser and Eugene Winograd (Cambridge: Cambridge University Press, 1988), pp. 193–243; William F. Brewer, "Memory for randomly sampled autobiographical events," in *Remembering Reconsidered*, pp. 21–90; and Martin A. Conway and David C. Rubin, "The structure of autobiographical memory," in *Theories of Memory*, ed. Alan F. Collins, Susan E. Gathercole, Martin A. Conway, and Peter E. Morris (Hillsdale, NJ: Lawrence Erlbaum Associates, 1993), pp. 103–37. For a recent review see D.L. Greenberg and D.C. Rubin, "The neuropsychology of autobiographical memory," *Cortex* 39 (2003): 687–728. It is implicit in much of the literature that generic memories are quite accurate, while memories for details of specific events may be less so.

<sup>15</sup>Ulric Neisser discusses the accuracy of generic memories, and rehearsal, in his study of the memory of John Dean; he argues that Dean's memory of generic facts was very good but his memory for specific events was less accurate. Ulric Neisser, "John Dean's memory: A case study," in *Memory Observed: Remembering in Natural Contexts*, selection and commentary by Ulric Neisser (San Francisco: W.H. Freeman & Company, 1982), pp. 139–59.

unequivocally state that they had the interest at the earlier time. Further, in a considerable number of cases, an individual states that he had a conscious conception of his interest at the time. For my interview subjects I have been able to verify this by explicitly asking them whether they were consciously thinking about their interest at the time — many stated that they were. Thus for individuals to have reconstructed interests falsely they would have had to do so in direct opposition to the language they themselves used to describe their interests.

Overall it seems likely that subjects' descriptions of their creative interests are real. I believe the greatest danger in the retrospective accounts individuals give describing their interests is that they represent their early interests as more coherent than they really were; often an interest begins as more fragmentary and fleeting, then becomes more formed over time, and in a retrospective account an individual may describe it more the way he thought of it later. My description takes this into account: in Chapter 3 I describe the formation of creative interests and emphasize that they are often fragmentary, fleeting thoughts at first, then become more formed later. Further, I describe individuals building up conceptual structures in their interest domains over time.

Contemporaneous materials are very useful in providing a check on what individuals state in retrospective accounts of their development. I have described the contemporaneous sources I rely on for the sample of individuals famous for their creative contributions above. Here I note that contemporaneous materials I collected for my interview sample are very useful in confirming what individuals told me in interviews. These materials both confirm what individuals stated in our interview and in many cases show that an individual had formed his or her main creative interest, as stated in the interview, prior to entering graduate school or early in graduate school. Thus, for example, for the literary scholars their dissertation prospectus generally shows that they had formed their main interest by the time they began work on their dissertation, thus in many cases before they had the main ideas in their dissertation, which they developed after writing their prospectus. For several individuals additional materials, such as a college honors thesis or notes the individual shared with me, confirm what the individual stated in our interview, including specifically about forming a creative interest. A number of individuals had written materials in front of them during our interview, for example notes they had kept or an undergraduate thesis, providing a check on their own memory. Also, a pair of individuals I interviewed mentioned a professor who had direct knowledge about an important phase in their development. In each case this individual confirmed my research subject's account and provided some additional details.

26 I found few discrepancies between archival materials and statements made in interviews.

The main area in which I have found individuals to make mistakes in memory was in dating, usually fairly minor discrepancies, for example, in which term a class was taken. But of course there are many statements individuals make that cannot be checked.<sup>16</sup> For many individuals, as stated above, I have followed their development since our interview. In a number of cases an individual's later contributions and activities show that an interest he had that he described in our interview has been the root of his creative work and contributions since that time, providing further, prospective evidence in support of the description in this book.

The literature on the self suggests that individuals construct autobiographical narratives in light of their present self, their present needs, desires, and attitudes, and self-management.<sup>17</sup> Individuals may be driven to try to create a sense of coherent self-identity through time, in particular in self-narratives of their development. One way conceivably they might do this is through constructing creative interests retrospectively that fit with their later work, or extending interests back further in time beyond when they actually formed them. I believe that the evidence, both linguistic and supporting materials, makes it implausible that the many individuals whose development I studied who described creative interests all or mainly constructed interests they did not have, though they may describe them as more fully formed or more central in their development during an earlier time than they were in reality at that time. As a second possible effect, the drive to construct a coherent self-identity might lead individuals to block out and not describe interests, ideas, and projects not related to the main line of their development and

<sup>16</sup>As noted above, I am mainly concerned with accuracy of generic memories. Minor dating mistakes are not a major issue for my description; thus, exactly when someone first formed a creative interest is not crucial. However, if an individual actually formed an interest after other important events that he describes as occurring after forming the interest, such as having ideas or beginning projects that I take as based in the interest, that runs against the description I present. The descriptions individuals gave, many of which are presented in the following chapters, and the archival materials, do not support the view that this was common.

<sup>17</sup>Useful references on self-narratives in general, of which narratives of creative development are a particular kind, include *The Remembering Self: Construction and Accuracy in the Self-narrative*, ed. Ulric Neisser and Robyn Fivush (Cambridge: Cambridge University Press, 1994), *Remembering Reconsidered*, cited above, and Michael Ross and Anne E. Wilson, "Constructing and appraising past selves," in *Memory, Brain, and Belief*, ed. Daniel L. Schacter and Elaine Scarry (Cambridge, MA: Harvard University Press, 2000), pp. 231–58.

current work. Again, I have not found much evidence for this, in particular among my interview subjects, who described many interests, ideas, and projects they did not pursue or that were quite different from their current focus. It may be more of an issue for famous individuals concerned to describe their development in a way fitting their public persona. Interestingly, turning these arguments around, the description in this book is in fact supported by self-psychology arguments. In their drive for coherence individuals will naturally tend to strive to define what their creative interests are, as a way to form a clearer sense of their “creative identity” — and thus will form conceptions of their interests as I describe.

Notwithstanding the potential problems with retrospective accounts of creative development, I note, finally, specifically with regard to the interview sample, that the data collection process employed had definite strengths. Conducting interviews retrospectively as I did within a year after individuals had passed through the end of the period of development we focused on had advantages. The interviews mainly focused on a period that was fresh in individuals’ minds — not the distant past, which is the focus in many autobiographical accounts, for which memory is more likely to be poor, but rather the preceding several years. They were given by relatively young individuals whose memory was intact, and focused on topics that were, and in most cases continued to be, at the center of individuals’ lives and activity. At the same time, because the interviews were retrospective, individuals were able to reflect upon their development, placing experiences, activities, interests, and ideas in perspective. They were not engrossed in the events they described to the point that it interfered with their ability to describe them clearly. They also were comfortable talking about creative interests they had, which are inherently less sharply focused than ideas or projects. An interview focused on current activities might well lead, through a desire to show the present self in a positive light, to an excessive focus on elements viewed as demonstrating success, definite accomplishments like current ideas and projects, with it being more difficult to gain access to information about inherently more open-ended, less definite interests. Individuals freely shared ideas and interests they had had; I believe their openness was enhanced by the fact that the interviews were focused on the past, not their current ideas.<sup>18</sup>

For individuals famous for their contributions I had far less control over the nature of the data available, including when retrospective accounts were

<sup>18</sup>Individuals could speak openly about issues they may have been hesitant to speak about while still in graduate school, such as ideas and interests they had thought of but not yet had the chance to pursue, and their relationship with their advisor.

28 given — many are given very late in life, thus undoubtedly more prone to error and bias. This makes it especially important to gather and use contemporaneous and prospective sources of information for this sample, and to reconstruct individuals' interests using all available information.

This discussion of retrospective accounts of development leads on to one further issue to note with regard to the description in this book: causality. I present the model in this book as a causal structure, using language in which creative interests and conceptual structures in interest domains are described as generative of creativity and guiding individuals in their development. Causality is always an inference. Here the inference is complicated further in cases in which the data are primarily retrospective. Also, it is to be noted that the causal mechanisms I describe are not proximal, but extend over longer time periods. Set against these concerns, the mechanisms are highly intuitive. I put them forward as hypotheses, as mechanisms that generate a coherent description of creative development.

Ultimately, the approach in this book relies on convincing the reader with the weight of the evidence. The reader who approaches the description and cases presented in the following chapters with an open mind, taking note of the many different individuals whose development is described, and the many different forms of evidence and quantity of material presented, will I believe be convinced by the description. There remain significant gaps and many flaws, as I am only too well aware, and future work, with different data, may well modify the description significantly. But I present it in the belief that it will stand in its fundamentals.

#### RELATED LITERATURES

There are a number of literatures in the field of creativity studies in which aspects of creative development are discussed, in general from perspectives that are somewhat different but complementary to mine in this book. There are also related, relevant literatures on the social environment of creativity and cultural development. In this section I introduce these literatures; they are discussed further where appropriate later. I do not provide a general review of the field of creativity studies.<sup>19</sup>

The fundamental approach in this book is to study creativity as a process of development, unfolding over relatively long periods of time. My description is

<sup>19</sup>For general reviews see *Handbook of Creativity*, ed. Robert J. Sternberg (Cambridge: Cambridge University Press, 1999); Mark A. Runco, *Creativity Research Handbook* (Cresskill, NJ: Hampton Press, 1997); and *Handbook of Creativity*, ed. John Glover, Royce Ronning, and Cecil Reynolds (New York: Plenum Press, 1989).

thus most closely linked with literatures in which creativity is also viewed as based in a process of development. The largest and most diverse literature in which our creativity is viewed in this way is the biographical literature about the lives and creative work of individuals recognized for their creative accomplishments. I draw upon this literature extensively, as discussed above. A second literature in which our creativity is viewed as a process of development is the evolving systems approach, associated with Howard Gruber.<sup>20</sup> The evolving systems approach shares with my approach an emphasis on the distinctiveness of each individual in his process of development, and a careful attention to the rich details of development unfolding over time. Howard Gardner also views creativity as a life developmental process, in *Creating Minds*. He, and Mihaly Csikszentmihalyi in *Creativity: Flow and the Psychology of Discovery and Invention*, focus on the experiential nature of creative work. In their work and the evolving systems literature there is a focus on motivational and affective as well as cognitive processes.<sup>21</sup> What I add to the evolving systems approach and

<sup>20</sup>Howard E. Gruber, *Darwin on Man: A Psychological Study of Scientific Creativity* (Chicago: University of Chicago Press, 1981). See also *Creative People at Work: Twelve Cognitive Case Studies*, ed. Doris B. Wallace and Howard E. Gruber (New York: Oxford University Press, 1989); I note especially the chapter by Margery B. Franklin, "A convergence of streams: Dramatic change in the artistic work of Melissa Zink," pp. 254-77. There was a festschrift and special issue of the *Creativity Research Journal* devoted to Gruber in 2003 (Vol. 15); relevant articles are: J. Vonèche, "The changing structure of Piaget's thinking: Invariance and transformations," pp. 3-9, M.F. Ippolito and R.D. Tweney, "The journey to *Jacob's Room*: The network of enterprise of Virginia Woolf's first experimental novel," pp. 25-43, R. Brower, "Constructive repetition, time, and the evolving systems approach," pp. 61-72, and F. Vidal, "Contextual biography and the evolving systems approach to creativity," pp. 73-82. Joy Amulya has like me engaged in a study of creativity in the doctoral research process; she presents her analysis in *Passionate Curiosity: A Study of Research Process Experience in Doctoral Researchers*, diss., Harvard University, 1998; her approach and findings in a number of ways fit with mine. Frederic Holmes, in his last work, *Investigative Pathways: Patterns and Stages in the Careers of Experimental Scientists* (New Haven, CT: Yale University Press, 2004), presents a general description of experimental scientific work unfolding over long periods of time.

<sup>21</sup>Howard Gardner, *Creating Minds: An Anatomy of Creativity Seen Through the Lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Gandhi* (New York: Basic Books, 1993) (see also his *Extraordinary Minds* (New York: Basic Books, 1997)); Mihaly Csikszentmihalyi, *Creativity: Flow and the Psychology of Discovery and Invention* (New York: HarperCollins, 1996). *Creativity and Development*, ed. R. Keith Sawyer, Vera John-Steiner, Seana Moran, Robert J. Sternberg, David Henry Feldman, Jeanne Nakamura, and Mihaly Csikszentmihalyi (New York: Oxford University Press, 2003) contains discussion of creativity as a developmental process. Particularly of interest are Gardner's comments on p. 233, and R. Keith Sawyer's comments in his "Introduction," pp. 3-11, and Chapter 1, "Emergence in creativity and development," pp. 12-60.

30 other descriptions of creativity as a developmental process is a more structured description, rooted in creative interests, conceptions of interests, the formation and growth of conceptual structures centering on and based in domains of creative interests, and explicit descriptions of forms of creativity and patterns of development rooted in these structures. A third literature consists of statistical analyses of creative development, including especially analyses of rates of production of creative products over the course of creative careers.<sup>22</sup> Work in this tradition is important, and certainly fits with my description, but is less closely related to my approach. A fourth literature is psychoanalytically based and more general approaches viewing creativity as rooted in processes of transmutation, based largely in the unconscious, whereby individuals transmute their personal experiences into creative products. Such a process is quite different — or at least is described differently — than the processes I describe. I discuss the relationship between my description, in particular of the formation of interests, and theories of transmutation in Chapter 3.

Beyond the literatures discussed above, in which creativity is viewed as an extended process of development, there are also literatures focusing on creative processes over shorter time periods, on the order of days and weeks. The most relevant of these for my description is the literature on problems and problem finding. The importance of problems in motivating creative activity is discussed in many accounts of creativity. For example, obstacles that individuals encounter in the course of their work are frequently described as important factors spurring them on to greater creative accomplishments. Problem recognition has been linked with need perception and dissatisfaction with existing conditions.<sup>23</sup> Problem finding is a more exploratory and constructive process. Useful references are the classic work of Getzels and Csikszentmihalyi, and *Problem Finding, Problem Solving, and Creativity*.<sup>24</sup> In some respects

<sup>22</sup>Dean Simonton has published the best known work of this kind in modern times; see his *Scientific Genius: A Psychology of Science* (Cambridge: Cambridge University Press, 1988), and “Creativity from a historiometric perspective,” in *Handbook of Creativity*, ed. Robert J. Sternberg, pp. 116–33.

<sup>23</sup>See Subrata Dasgupta, *Technology and Creativity* (New York: Oxford University Press, 1996), Chapter 3, “The birth of technological problems,” pp. 20–28. This view is echoed in many accounts.

<sup>24</sup>Jacob W. Getzels and Mihalyi Csikszentmihalyi, “Discovery-oriented behavior and the originality of creative products: A study with artists,” *Journal of Personality and Social Psychology* 19 (1971): 47–52, and *The Creative Vision: A Longitudinal Study of Problem Finding in Art* (New York: John Wiley & Sons, 1976); *Problem Finding, Problem Solving, and Creativity*, ed. Mark A. Runco (Norwood, NJ: Ablex, 1994). Albert Einstein and many others have emphasized the importance in scientific research of asking the right question or a good question. For a Gestalt psychology approach see

questions and problems have a similar role in creative development as creative interests, in defining a creative direction. But there are important differences. Many problems and questions are relatively briefly defined, and many, especially many problems, are quite specific and involve narrow, precisely defined goals. In contrast, creative interests and conceptions of interests are broader and often more richly conceived. They are also inherently open-ended — viewed as potentially able to be developed creatively in many different ways, defining rich domains for exploration, and involving goals that are more open-ended. As described in this book individuals may seek to define problems within interest domains; conversely, beginning from a defined problem they may form a broader interest centering and growing around it. Thus creative interests often center on and involve questions and problems, especially ones that have a degree of breadth and are relatively open-ended. Narrower questions and problems enter into development separately, for example, in defining projects. I compare and contrast relatively narrow problems and questions with creative interests in Chapter 7.

The most widely described form of creativity is making a connection between or combining two elements that have not previously been connected or combined.<sup>25</sup> A theory of creativity that builds on this principle is the Darwinian model of random variation and selection, associated with Donald Campbell, and the basis of many modern accounts of creativity, as well as theories of cultural innovation.<sup>26</sup> As a theory of creative development this theory has a minimal structure. Individuals randomly learn many elements, perhaps focused

M. Wertheimer, *Productive Thinking* (New York: Harper & Brothers, 1959). For cognitive science approaches see Margaret Boden, *The Creative Mind: Myths and Mechanisms* (London: Routledge, 2004), and *Creativity, Cognition, and Knowledge: An Interaction*, ed. Terry Dartnall (Westport, CT: Praeger, 2002).

<sup>25</sup>For creative connections see S.A. Mednick, “The associative basis of the creative process,” *Psychological Review* 69 (1962): 220–32. See also Arnold Koestler, *The Act of Creation* (New York: Macmillan, 1967). For recent work on conceptual combinations see *Creative Thought*, ed. Thomas B. Ward, Steven M. Smith, and Jyotsna Vaid (Washington: American Psychological Association, 1997). A related process is blending; see G. Fauconnier and M. Turner, “Conceptual integration networks,” *Cognitive Science* 22 (1998): 133–87.

<sup>26</sup>Donald Campbell, “Blind variation and selective retention in creative thought as in other knowledge processes,” *Psychological Review* 67 (1960): 380–400. An earlier model, focused on chance configurations as a means of solving problems arising in creative work, is set forth by Henri Poincaré in “Mathematical creation,” in *The Creative Process*, ed. Brewster Ghiselin (Berkeley: University of California Press, 1952), pp. 33–42; it was extended by Jacques Hadamard, *An Essay on the Psychology of Invention in the Mathematical Field* (Princeton, NJ: Princeton University Press, 1945).



32 in a conventional subject domain; then they randomly make combinations among them, either in their unconscious or more consciously. If a combination they make is a “good” one, that is original and potentially valuable, they retain it and may then develop it further. Thus creativity arises out of a rather general learning process followed by random combinations and selection. In this book I propose a theory in which individuals are significantly more directed in their development; they guide themselves by forming creative interests, distinctive to them, defining distinctive, individualized domains they explore, leading them to build up distinctive conceptual structures in their interest domains which are in turn generative of their creativity. Randomness has a role in my description, for example in random encounters sparking creative responses, but in the context of a self-directed, developmental process. In my view this description fits the facts, biographical and others, better. My description forges a bridge to literatures on self-determination and, in a broader way, the literature on the self as a self-organizing, constructed entity.<sup>27</sup>

Another branch of literature within the field of creativity studies with which my description is connected is the literature concerning the influence of environment on creativity.<sup>28</sup> A wide variety of environmental factors and conditions have been described that may influence creativity, including incentives, feedback, critical reception, mentoring, and organizational and institutional structure and environment. Teresa Amabile has made important contributions

<sup>27</sup>Edward Deci and Richard Ryan, *Intrinsic Motivation and Self-Determination in Human Behavior* (New York: Plenum, 1985), and “The ‘what’ and ‘why’ of goal pursuits: Human needs and the self-determination of behavior,” *Psychological Inquiry* 11 (2000): 227–68; Richard Ryan, “Agency and organization: Intrinsic motivation, autonomy and the self in psychological development,” *Nebraska Symposium on Motivation: Developmental Perspectives on Motivation* 40 (1993): 1–56. On the self see Roy Baumeister, *The Self in Social Psychology* (Philadelphia, PA: Psychology Press (Taylor and Francis), 1999). There is an interesting literature on the self as formed historically and culturally; see Charles Taylor, *Sources of the Self: The Making of the Modern Identity* (Cambridge, MA: Harvard University Press, 1989), and R.F. Baumeister, “How the self became a problem: A psychological review of historical research,” *Journal of Personality and Social Psychology* 52 (1987): 163–76. In embedding randomness in a model of development I find some resonance with the work of James H. Austin, *Chase, Chance, and Creativity: The Lucky Art of Novelty* (New York: Columbia University Press, 1976). To the extent I describe individuals managing their development my description also has resonance with the theory of self-regulation of Michael F. Sheier and Charles S. Carver, *On the Self-regulation of Behavior* (Cambridge: Cambridge University Press, 1998).

<sup>28</sup>For an excellent review see the introduction to *Social Creativity*, 1, ed. Alfonso Montuori and Ronald Purser (Cresskill, NJ: Hampton Press, 1999).

in this area in her study of the influence of external reward systems on intrinsic motivation and creativity.<sup>29</sup> There is also much ongoing work studying creativity in the context of organizations. This work is relevant for many of the individuals whose development I describe in this book, but not my focus, though organizational issues and context do arise in places. There is also interesting work on collaborative creativity, mentoring, and more generally, the interpersonal context of creativity. Mentoring and collaborative creativity in particular are relevant for many of the individuals whose development I describe, especially my interview subjects, and enter into my description in places, but again are not my focus.<sup>30</sup>

More directly related to my approach is a growing body of work situating creativity in the field in which it is based and the broader social-cultural environment. Csikszentmihalyi and his collaborators have described what they call the domain-person-field interaction, situating individuals in their creative work in the context of the conceptual or symbolic domain in which they work as well as the interpersonal field of environment of their work. One particular focus is on the collective judgement made in evaluating the value and creativity of individuals' work.<sup>31</sup> Silvano Arieti adapts systems concepts, including the notion of feedback loops, to describe the relationship between individuals engaged in creative endeavors and the social-cultural systems in which they are embedded.<sup>32</sup> Robert Sternberg and collaborators have developed a propulsion theory of creativity focusing on how individuals make decisions and orient their creative activities in relation to their field and their view about how it

<sup>29</sup>Teresa M. Amabile, *Creativity in Context* (Boulder, CO: Westview Press, 1996); see also her review of the literature on motivation and creativity with Mary Ann Collins, "Motivation and creativity," *Handbook of creativity*, ed. Robert J. Sternberg, pp. 297–312.

<sup>30</sup>For recent work on collaborative creativity and relationships in the context of creative work see the references in *Social Creativity*. See also Vera John-Steiner, *Creative Collaboration* (New York: Oxford University Press, 2000); R. Keith Sawyer, *Group Creativity: Music, Theater, Collaboration* (Mahwah, NJ: Lawrence Erlbaum Associates, 2003); and Howard Gardner, *Creating Minds*, especially pp. 43–44. For a discussion of creativity as an organizational activity see Warren Bennis and Patricia Ward Biederman, *Organizing Genius: The Secrets of Creative Collaboration* (Reading, MA: Addison-Wesley, 1997).

<sup>31</sup>Mihaly Csikszentmihalyi, "Society, culture, and person: A systems view of creativity," in *The Nature of Creativity: Contemporary Psychological Perspectives*, ed. Robert J. Sternberg (Cambridge: Cambridge University Press, 1988), pp. 325–39; and David Henry Feldman, Mihaly Csikszentmihalyi, and Howard Gardner, *Changing the World: A Framework for the Study of Creativity* (Westport, CT: Praeger, 1994).

<sup>32</sup>Silvano Arieti, *The Magic Synthesis* (New York: Basic Books, 1992).

34 should develop.<sup>33</sup> My description here has some resonance with these descriptions, but the creative interests and conceptual structures I describe are distinct, and I describe cultural linkages through specific channels of cultural transmission and influence not described in them.

Finally, also relevant for this book is the literature on cultural development. This literature is vast and is not reviewed in detail here; I discuss the literature further in Chapter 17. In fact the study of cultural development has developed almost entirely separately from the study of creativity. Thus traditionally cultural development has been studied mainly from historical, social, and economic perspectives, and, with some exceptions, there has been little emphasis placed on describing the creative development of individuals who have contributed to this development. In one important approach cultural development is described as an evolutionary process. This literature dates back at least as far as the pioneering study by Augustus Henry Lane-Fox Pitt-Rivers, *The Evolution of Culture*, published in 1906.<sup>34</sup> A striking feature of this literature is that the fundamental focus of analysis is not individuals, but cultural forms, such as lineages of weapons, crafts, and tools, and discrete cultural units, often called memes, as defined by Richard Dawkins in *The Selfish Gene*.<sup>35</sup> The evolution

<sup>33</sup>R.J. Sternberg, "A propulsion model of types of creative contributions," *Review of General Psychology* 3 (1999): 83–100, Robert J. Sternberg, James C. Kaufman, and Jean E. Pretz, *The Creativity Conundrum* (New York: Psychology Press, 2002), and Robert J. Sternberg, "The development of creativity as a decision-making process," in *Creativity and Development*, pp. 91–138. These descriptions focus more on individuals directed in their development by a definite sense of the kind of contribution they wish to make, whereas I focus more on individuals forming interests they are intrinsically interested in, with less immediate thought about the ultimate contributions they will make through pursuing them; there is overlap in my discussion of the role of extrinsic and strategic factors in the formation of interests in Chapter 5.

<sup>34</sup>Augustus Henry Lane-Fox Pitt-Rivers, *The Evolution of Culture, and Other Essays*, ed. J.L. Myres (Oxford: Clarendon Press, 1906). He describes the evolution of several different cultural forms among the Australian Aboriginal peoples and other peoples whose cultures were pre-modern at the time. Since his work was published many further studies have been published. George Basalla discusses the literature and gives many references to studies of the evolution of specific technologies in *The Evolution of Technologies* (Cambridge: Cambridge University Press, 1988). Payton Usher provides synopses of the development of several dozen important inventions in *A History of Mechanical Inventions* (Cambridge, MA: Harvard University Press, 1954). There are recent attempts to integrate individual creativity with evolution in design; see C. Eckert and M. Stacey, "Adaptation of sources of inspiration in knitwear design," *Creativity Research Journal* 15 (2003): 355–84.

<sup>35</sup>Richard Dawkins, *The Selfish Gene* (New York: Oxford University Press, 1976). I provide additional references in Chapter 17.

of these forms and units of meaning is described almost as if it happens spontaneously, with the role of individual creativity deemphasized. Sociologists have in some cases considered the role of individuals in the process of cultural development, but not consistently, and have not developed a comprehensive model linking individual creativity with cultural development. In his description of scientific revolutions Thomas Kuhn scarcely mentions processes of individual creative development. Economists who have discussed technological development have typically focused on forces that transcend individuals, like market dynamics, demographics, and the evolution of institutions; and when they do discuss the role of individuals or present models of the generation of innovations, these are highly simplified, with little connection with the literature on creativity.<sup>36</sup> Even the branch of literature that focuses on the importance of individual freedom and action, which is one inspiration for my own work, associated with Friedrich Hayek and with roots extending back to John Stuart Mill and far further, does not model the individual creative process.<sup>37</sup> The description in this book, in common with a number of the studies listed in the paragraph above, situates individuals in their creative development in their cultural environment. One of my objectives is to contribute, with these studies, to the development of a new approach for studying cultural development, rooted in a model of individual creativity and creative development.

<sup>36</sup>In a famous passage, Joseph A. Schumpeter describes how capitalism unleashes a “gale of creative destruction” in which new innovations are continually being introduced into markets, disrupting the established order. See *Capitalism, Socialism, and Democracy* (New York: Harper & Row Publishers, 1942), Chapter 7. But he does not discuss the sources of innovation in creative processes. Economists certainly recognize the importance of technological change for economic development; see, for example, David S. Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge: Cambridge University Press, 1969), and Joel Mokyr, *The Lever of Riches* (New York: Oxford University Press, 1990). There is a large recent literature on technological innovation, as well as microeconomic models of the research and development process; but these models are not linked to the literature on creativity. See my discussion in Chapter 17.

<sup>37</sup>Classic works are Friedrich A. Hayek, *The Constitution of Liberty* (Chicago: University of Chicago Press, 1960) (see also his *Individualism and Economic Order* (Chicago: University of Chicago Press, 1948)); John Stuart Mill, *On Liberty* (Indianapolis: Hackett Publishing, 1978 (originally published 1859)); and Alfred Marshall, *Industry and Trade; A Study of Industrial Technique and Business Organization; and of Their Influences on the Conditions of Various Classes and Nations* (London: Macmillan, 1919).