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Mind Tools: Applications and Solutions

How Ideas Take Shape: The Ecology of Creativity

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Introduction

The quest for understanding is a search for order: the order that underlies the physical world about us and the order that underlies the artistic, intellectual, and technological creations of the human imagination. When this order is discovered, descriptions of it are made and passed down from generation to generation to preserve the discovery.

The descriptions of order are neatly packaged into "explanations." Explanations are themselves orderly. They are logically organized so that one point leads smoothly to the next. People follow the logic, and they too come to understand. It is not surprising, then, that explanations are the basic materials of formal education.

Surrounded by all this neatness and order, however, one can jump to an erroneous conclusion. One can assume that the inventors of the creations we study followed the same kind of linear logic in producing them that we use in describing them. In reality the process is altogether different. The flow of ideas does not follow a linear logic. If we are unaware of the difference, the sequence of ideas we encounter during our own creative work can be at such odds with our expectations that we reject the very process that is helping us—and we squelch our own creativity.

"Self shutdown" can be avoided if we learn the unique patterns of thinking that make up the creative process. For once we recognize those patterns in ourselves, we become trusting of our ideas and gather the courage to let them lead us to their fruitful conclusion.

Conscious and Unconscious Processes

Creation occurs when our ideas achieve expression as a novel design in the physical world. A portion of this process is consciously governed. We can activate it by: (1) steadily focusing attention on the problem; (2) calmly observing the ideas that flow into consciousness; (3) willingly accepting *all* those ideas, no matter how inconsequential, fragmented, ambiguous, disruptive, or heretical they seem at the moment; and (4) patiently recording them.

The remainder of the process, however, is spontaneous. We have no control over what specific ideas will emerge, how they will fit together, or what further ideas will arise to improve the fit. For that reason creative work proceeds best when we acknowledge that we are possessed of two completely different minds: one, a *conscious mind*, that fills the role of a dedicated and attentive student; and the other, an *unconscious mind*, that functions like a distinguished foreign visitor who has come to tell us about his exotic country.

While we cannot anticipate what specific ideas will come to us, we *can* know something about the patterns that the ideas will follow as they unfold. The following discussion establishes the basis for those patterns, goes on to describe them in some detail, and then considers the setting in which they flourish.

The Formal Basis of Emerging Ideas

Conceptual Structures

Definition. We carry around in our heads a "cataloging system" of conceptual structures. These are sets of relationships that model the data of our experiences and the relationships arising from that data. Conceptual structures are the foundation of our understanding. They enable us to tell dogs from cats, to predict that a person who has twice stolen our wallet probably is not to be trusted, and generally to go about the business of making sense of the world.

Conservation of energy. Conceptual structures develop as the information we experience is organized in accordance with the principle of energy conservation: *the psyche tries to minimize the energy it uses to process, store, and recall information.* To accomplish this it packages information in an orderly configuration for ease of handling—like packing clothes neatly and snugly in the smallest possible suitcase. The elements of experience are organized into the least costly configurations, taking into account the elements' inherent properties and their relation to the configurations currently operating in one's psyche.

Best-Fit

Ideally speaking, there are two kinds of configurations. One of these is what we might call "intrinsic best-fit"; the other we can refer to as "immediate best-fit." Here is a simple example of these, followed by an abstract description.

Suppose some Saturday afternoon you are getting things straightened up around your place, and you have twenty boxes to store in an empty closet. The arrangement of boxes that you choose to make the best use of closet space (*intrinsic best-fit*) is likely to differ from the arrangement you would end up with if you put the same twenty boxes in the closet one at a time over a period of five years. In the latter case, by settling for a less than perfect arrangement and putting each new box in the place that required the least change in the existing order (*immediate best-fit*), you could avoid the hassle of starting over from scratch and removing all the boxes from the closet each time a new box showed up—something the perfect space saving arrangement would require.

Intrinsic best-fit. Intrinsic best-fit is, then, that configuration of elements which has the fewest structural shortcomings. It is context free and is not influenced by previously established organizational precedents. Intrinsic best-fit minimizes: (1) *gaps*—empty "spaces" that have no role within the form; (2) *redundancies*—two or more elements duplicating one another's role within the form; and (3) *contradictions*—two or more elements negating one another's role within the form.

Immediate best-fit. Immediate best-fit takes context into account. The formal outcome is mediated by previously established organizational precedents and saves energy by fitting new elements into the existing structure instead of dismantling it to arrange both old and new elements into a perfect form.

Sooner or later, however, there is likely to appear some new element which the present configuration cannot handle—a box that won't fit into the closet as it is currently arranged. In that case either the element must be rejected, or the existing configuration must be taken apart and restructured into some approximation of intrinsic best-fit to include it.

Form and Aesthetic Perception

The world as structure. We interact with all sorts of phenomena—tangible and intangible. Each phenomenon is the manifestation of a set of structural relations, which constitute its particular form. Some phenomena are physical, lie outside us, and are experienced through one or more of the "five senses." Others are mental, lie within us, and are only indirectly related to the senses.

The aesthetic sense. Because we are predisposed to model data, organizing it into a best-fit configuration, we have a sensitivity to the structural relations of phenomena, a kind of "aesthetic sense." When we experience any phenomenon, whether it originates within us or outside us, we automatically compare its perceived structure to our idealized criteria for best-fit—like a woodworker testing the accuracy of his shape against a template. The result is an awareness of the shortcomings within the phenomenon's structure that violate our intuitions about best-fit.

The Pattern of Emerging Ideas

Ideas as a Response to Structure

The unconscious mind, in response to the structural shortcomings that we perceive, spontaneously generates into consciousness ideas for improving the fit. Unless the situation we are trying to improve is a simple one, the idea that corrects the bad fit we have perceived will also introduce a different bad fit somewhere else in the system. That shortcoming then becomes the focus of attention, and more ideas are generated to make an improvement there. In turn, that improvement creates yet another weakness and so on.

Our ideas for improvement are of two types. Some of these are ideas for *changing the form* to better accommodate the contents. In such instances we keep the elements, but we reorder them to create new associations and to alter or eliminate old associations. Others are ideas for *changing the contents* to better accommodate the form. Here we keep the configuration, but we improve its balance by adding, subtracting, or substituting elements.

Balancing Form and Content

The solution seesaws back and forth between improvements in form (which lead to shortcomings in content) and improvements in content (which lead to shortcomings in form) until at last harmony is achieved between the two and the structure attains balance. If the problem is a complex one the process begins within one of its subsystems, and as a balance of form and content is attained there that subsystem becomes part of the contents of a larger system.

Roundaboutness

The solution process does not follow a linear sequence of steps (A,B,C,D,E, . . .). Rather the path is circuitous, returning to previous steps to make additional adjustments to compensate for the imbalance the intervening corrections introduced (for example, A,B,C,A,D,C,E).

A parallel example to this, although much more regular, is the process of changing a flat tire. You put on the new tire and begin to reattach the lug nuts. You tighten the first lug nut securely, screw the remaining nuts into place, and return to the first one only to find it loose again. You tighten it more and then find that the second one requires further tightening, and so on around the wheel. The adjustment of each lug nut affects the entire structure. Idea systems evolve in a similar way.

Limited Visibility

Because each idea for improving the structure is also the source of the next bad fit that will emerge into awareness, we can normally see ahead just to the next step of the process. Subsequent weaknesses of fit (and the ensuing ideas for repair elicited by those weaknesses) will only become apparent *after* the current corrective action is taken. Each move brings the next move into view.

Unconscious Wisdom

There is evidence that the unconscious mind, in offering up solutions to the shortcomings at hand, may introduce elements of bad fit calculated to direct us to the unexpected solution of a problem completely different from the one we thought we were working on. This has happened so much in my own work that I no longer even consider it unusual, and others working creatively in a variety of disciplines have reported the same thing. Such surprises are most likely to occur when we are able to suspend our presuppositions about the nature of the problem before us.

The Setting in Which One Is Most Creative

To begin this part of our discussion, let us take an example drawn from field sports. A field game is constrained by the characteristics of the field on which it is played. Nine innings of baseball played on a sidewalk will not achieve the richness that can be found when the game is played on a regulation diamond. To realize its full potential, baseball must be played on a field compatible with its fundamental operations. So too with the generation of ideas. Imaginative thinking must take place in a spatial, temporal, and emotional setting compatible with its underlying psychical processes.

Creativity and Space

Conceptual space. The more novel our ideas are, the more our conscious conceptual structures must yield to modification (or even complete destruction and reconstitution) to admit the emerging material. Ideas spring from the unconscious, but to surface into the outer world they must pass through the gate of human consciousness. The ticket for passage is *congruence*. There must be congruence between the ideas and the conceptual structures that are to house and express them. Without this correspondence ideas cannot make it through the gate and remain trapped outside consciousness. To create is to understand in a new way—to alter the habitual conceptual structures through which we interact with the world and clear the way for the emergence of new kinds of thinking. In one of history's greatest conceptual "retoolings," Isaac Newton invented the calculus, which enabled him to articulate his theory of universal gravity.

Physical space. As we have seen, the organized whole into which our ideas will ultimately fit is seldom apparent in the early stages of work. It only makes itself known gradually as the ideas are experimentally ordered, reordered, and modified. The flow of ideas is enhanced by recording them in a flexible layout. An ideal format allows us to move them around and see them in new relationships, and lets us change one idea in a configuration without having to recopy or reconstruct the entire configuration.

A composer once told me that the size of the manuscript paper on which he worked affected how easily his musical ideas evolved to their natural conclusion. He found it helpful to compose on very large paper, placing his germ idea in the middle of the page and radiating out from it in different directions to record the possible evolutionary paths it might take. Thus when the evolutionary process was completed, he could see all the possible avenues of transformation at once and choose the one most appropriate to his purpose.

Creativity and Time

Creativity is closely tied to one's concept of personal time. I like to think of personal time as falling into three categories: *maintenance time*, *free time*, and *creative time*.

Maintenance time is that part of our day spent to keep ourselves, our environment, and our social relations in good order—time devoted to things like making a living, paying the bills, going to the grocery, taking out the garbage, and helping a neighbor shovel his car out of a snow bank. Free time is a completely unstructured period when the mind can wander where it will, unfettered by "shoulds," "oughts," and imposed values—a time when all obligations are suspended and the psyche is free to gravitate in its own natural direction. Creative time is that portion of our hours when we take up the problem we have set for ourselves and turn our attention inward to the spontaneous flow of ideas offered for our conscious consideration. Creative time stands at the end of a path that passes through maintenance time and free time, a path that eliminates from the psyche the distractions of the outer world that diffuse our focus of attention and inhibit the rise of unexplored materials into consciousness.

We need a balance among the three kinds of time. One cannot retain the fire of creativity without refueling it by keeping one's life in order. The most imaginative people I know exhibit the same thoroughness in the mundane tasks of their day-to-day existence as they do in their creative work. By the same token, one cannot expect to be creative without taking the time to do "nothing." One of the lamentable facts about our culture is that it holds free time in such low esteem and subtly chides those who engage in it. Probably this value more than any other passed down to us blocks the avenue to creativity.

Creativity and Emotion

At the heart of creativity are passion and optimism. The flow of ideas is activated by a strong feeling that a solution is possible, that finding the solution is important, and that making the effort to find it—however tedious that effort might be—is itself of value, even if the solution should not be found.

Paradoxically, the flow of ideas is maintained by a dispassionate acceptance of (and noninterference with) whatever thoughts arise. One is simply to observe and record them while remaining emotionally neutral toward them.

Perhaps it was the contradictory requirement of passion for the problem and detachment from the solution process that the author of that ancient and wise Chinese classic, the *Tao te ching*, had in mind:

*Oftentimes, one regards life with passion
to see its manifest forms;
Oftentimes, one strips oneself of passion
to see the Secret of Life.*

The Problems Most Worth Solving

The number of problems surrounding us is infinite; our time here is finite. What problems shall we choose? I believe the problems most worth solving are those that address personal and societal needs simultaneously, problems that offer the challenge of meaningful work to the thinker and hold the promise of a fuller life for others.

It does not matter whether our efforts serve only one additional person or the entire human population. When we are motivated by strong feelings of community and are striving for benefits that extend beyond ourselves, we call forth the imagination's finest work and awaken deep within us a sense of who we are.

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