Chapter 4: Frontiers of Creativity

4.1 The Many Facets of Creativity

Before providing an overview of the current findings and levels of interest in creativity research, **some attention will be focused on the definitional issues surrounding creativity.**

4.1.1 A Multi-Faceted Phenomenon

It is probably most productive to **view creativity as a multi-faceted phenomenon rather than as a single unitary construct capable of precise definition. Guilford's** address provided an impetus to many to undertake creativity research. The address also provided renewed encouragement, to those who were already involved in such research. As the creativity literature began to expand so did the number of definitions used for the concept. Only nine years following Guilford's address, Taylor found an excess of one hundred definitions of creativity in the literature. These definitions are varied and some could be considered conflicting. Welsch reviewed twenty-two definitions of creativity to find elements of agreement and disagreement. She was searching for a definition that would be applicable to a variety of creative activities and stated:

> **The definitions of creativity are numerous, with variations not only in concept,** but in the meaning of sub concepts and of terminology referring to similar ideas. There appears to be, however, a significant level of agreement of key attributes among those persons most closely associated with work in this field. Significantly for this study, the greater disagreements occur in relation to aspects that are less relevant to educational purposes. On the basis of the survey of the literature, the following definition is proposed.. Creativity is the process of generating unique products by transformation of existing products. These products, tangible and intangible, must be unique only to the creator, and must meet the criteria of purpose and value established by the creator.

Of course, not everyone associated with creativity research would agree with this definition.

One of the major reasons for the complexity of the field of creativity research is the diversity of theoretical perspectives upon which the research is based. Many of these theoretical approaches are intertwined which adds to the semantic confusion. For example, the concepts of problem solving and creative learning are frequently

linked together. Guilford defined problem solving as facing a situation with which you are not fully prepared to deal. Problem solving occurs when there is a need to go beyond the information given, thus there is a need for new intellectual activity. Guilford reported that:

> … **Problem solving and creative thinking are closely related. The very definitions of those two activities show logical connections. Creative thinking produces novel outcomes, and problem solving involves producing a new response to a new situation, which is a novel outcome.**

This definition is also very closely related to a framework for **describing the process of creative learning put forth by Torrance and Myers.** They described the creative learning process as:

> ... becoming sensitive to or aware of problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; bringing together available information; defining the difficulty or identifying the missing element; searching for solutions, making hypotheses, and modifying and retesting them; perfecting them; and finally communicating the results.

The fact that there is no widely-held and uniformly applied definition of creativity has added fuel to the argument that creativity is a difficult field to study.

The 4P's of Creativity

4.2 The 4P's of Creativity

About ten years after **Guilford's address**, **Rhodes** responded to the criticism levelled at those attempting to study creativity due to the loose and varied meanings assigned to the word "creativity." **Rhodes** set out to find a single definition of the word by collecting **an excess of fifty-six different definitions.** Despite the profusion of those definitions, he reported:

> … "As I inspected my collection, I observed that the definitions are not mutually exclusive. They overlap and intertwine. When analyzed, as through a prism, the content of the definitions form four strands. Each strand has unique identity academically, but only in unity do the four strands operate functionally."

The four strands Rhodes discussed included information about the: person (personality, intellect, traits, attitudes, values and behaviour); **process** (stages of thinking people go through when overcoming an obstacle or achieving a goal); **product** (characteristics of artefacts or outcomes of new thoughts, inventions, designs, or systems); **and press** (the relationship between people and the environment, the situation and how it affects creativity). Each of these four strands operates as identifiers of some key components of the larger, more complex, concept of creativity.

This classification scheme has been used quite extensively in the creativity literature and helps to provide some frame of reference in studying creativity. **This general approach to the definition of creativity appears to be more fruitful than attempting to specify a single definition which would be appropriate for all contexts.** Keeping the definition rather general does feed the notion that creativity is a complex concept.

The Creative Personality

4.2.1 The Creative Personality

The questions within the area of the creative personality include the identification of traits or characteristics to differentiate creative persons from their less creative peers. The major response to this type of question has been research through biographical descriptive and empirical methodologies utilizing readily identified **"creators"** and attempting to distil their attributes. The end products of these investigations are lists and tests of characteristics and traits that have something to do with being creative. These lists do not provide a comprehensive picture of the creative personality. As **MacKinnon** has emphasized … *"There are many paths along which persons travel toward the full development and expression of their creative potential, and there is no single mould into which all who are creative will fit. The full and complete picturing of the creative person will require many images."*

Many psychological theorists have provided a diversity of characteristics of the creative person. **Torrance** *introduced a multi-faceted model for thinking about the search for creative behaviour.* This model takes into consideration, in addition to **creative abilities, creative skills and creative motivations.** He stated that "High level(s) of creative achievement can be expected consistently only from those who have creative motivations (commitment) and the skills necessary to accompany the creative abilities." Other multi-faceted models for dealing with the creative personality have been put forth by **Amabile, Gowan, and Rerizulli**.

Within the scope of research into the creative personality, the questions concerning why people choose to create are central. **Amabile** also refers to a three-faceted model for examining creativity. Hers includes domain-relevant skills, creativity-relevant skills and task motivation. She focuses her attention on the former and promotes the hypothesis that intrinsic motivation is important for creativity.

Another aspect to the study of the creative person **relates to knowing more about the personal orientation toward problem solving and creative thinking. Isaksen and Treffinger** suggest that it is helpful for individuals to have information regarding their learning and thinking style when learning how to use creative problem solving. Some of the current research within this area focuses on studying different styles of creativity and how these styles may affect different

elements of creativity. Certain personality characteristics will influence preferences regarding what type of information people pay attention to, how they collect and analyze that data, and how they choose to use the information. Most previous literature on the creative personality focused upon the difference in level of tendency or achievement. It is the area of style of creativity which provides an entirely new lens to utilize regarding the study of the creative person. The new focus is upon how people differ in their approach to using their creativity, not upon their level of qualitative factors. Selection Twelve provides an overview to this emerging line of style of creativity through the work of Kirton.

The Creative
Process
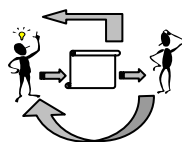
4.2.2 The Creative Process

One of the earliest descriptions of the creative process was provided by Wallas. *He described four stages for this process including:* preparation, incubation, illumination and verification. Research regarding the creative process relied upon retrospective reports, observation of performance on a time-limited creative task, factor analysis of the components of creative thinking, experimental manipulation and study of variables presumably relevant to creative thinking and simulation of "creative" processes on computers.

Some of the questions relating to the creative process include: What are the stages of the creative thinking process? Are the processes identical for problem solving and for creative thinking? What are the best ways to teach the creative process? How can the creative process be encouraged? Is the creative process similar in different contexts?

The usually mentioned description of creative learning is sometimes equated with what is meant by the creative process. In both, there is a description of various stages of thinking and problem solving when an individual is confronted with a challenge or opportunity. These stages provide the basis for the **creative problem solving (CPS)** process. Current thinking about the CPS process describes the process as having two mutually - important types of thinking. **Osborn** originally referred to these as imaginative and evaluative. Current language for these types of thinking is creative and critical, respectively. Creative thinking involves making and communicating meaningful new connections to: think of many possibilities; think and experience in various ways and use different points of view; think of new and unusual possibilities; and guide in generating and selecting alternatives. Critical thinking involves analyzing and developing possibilities to: compare and contrast many ideas; improve and refine promising alternatives; screen, select, and support ideas; make effective decisions and judgments; and provide a sound foundation for effective action. These two types of thinking are seen as mutually important components of effective problem solving. Although much of the historical emphasis within programs which

teach CPS has been on the development of divergent thinking, there is an increasing emphasis on providing a balanced approach including the development of both divergent and convergent thinking skills. This more balanced approach is consistent with recent research in the problem solving and intelligence fields.

Much of the emphasis regarding the creative process involves the teaching or training of explicit methods and techniques in order to help solve problems and think more effectively.

Despite the difficulties inherent in the problem-solving literature (research based on highly artificial problems, a wide variety of tasks and studies, and others), several lines of inquiry appeared fruitful:

> ***First,*** there is some evidence that various heuristics are used by effective problem solvers in many areas of activity when confronted by new types of problems and that these heuristics can be identified. ***Second,*** there are converging lines of evidence that a major role is or can be played by a managerial function that selects strategies and plans attacks on problems. ***Finally,*** the study of how problem solvers within specific fields learn to solve the field-specific problems they face suggests several generic skills that cut across fields.

These findings are qualified by pointing out that the actual field or context within which the problem solving occurs provides the requisite knowledge as well as the procedures and outlets necessary to implement the generic skills.

The connections which exist between the creative process and teaching for thinking are well-documented in a vast collection of literature. There are many historical antecedents for this type of teaching. One of the earliest spokespersons of the importance of the deliberate development of thinking was **Dewey**. He charged teachers with the responsibility to know the process of reflective thought and facilitate its development, indirectly, in students by providing appropriate conditions to stimulate and guide thinking.
Dewey's work continues to be a focal point for those concerned with the development of thinking skills.

Another emerging line of inquiry within the broad area of the creative process is the concept of mental imagery and its place in creative problem solving. There is a growing amount of information regarding the concept of imagery and visualization.

<div style="float:left; font-size:small;">The Creative Product</div>

4.2.3 The Creative Product

The centrality and importance of studying the creative product has been pointed out by Mackinnon.

Although many researchers acknowledge the importance of this line of investigation, there appears to be a paucity of empirical investigation on the topic of creative products. One of the possible explanations for the lack of research in this area is the opinion that the problem is too easy. In other words, the identification of creative products is "obvious." Everyone knows a creative product when they see one. **MacKinnon** pointed out that this view might account for the scarcity of scientific investigation of creative products.

There are some who have conducted investigations of creative products. Much of this work has dealt with creative products in specific contexts. Very little has been done beyond individual disciplines and contexts to gain a more general picture of the characteristics of creative products. Although much emphasis has been placed on the need for a creative product to be novel; it is interesting to note that the current trend is to include aspects of relevance and appropriateness to the description of the creative product.

A related and more thoroughly-researched area of study dealing with creative products involve the diffusion of innovations. There appears to be a general increase of interest in how new ideas or products are communicated or accepted by others. An increased interest in the process of innovation has also increased concern for studying communication to promote acceptance of new ideas. This area of study is called the diffusion of innovations.

When the book **"Diffusion of Innovations"** was first published in 1962, there were 405 publications about this topic available in the literature. By the end of 1983, there were more than 3,000 publications about diffusion, many of which were scientific investigations of the diffusion process. **Rogers** described diffusion as an information exchange occurring as a convergence process involving interpersonal networks. He asserted that the diffusion of innovations is a social process for communicating information about new ideas. The study of this process has examined specific attributes of innovations (such as relative advantage, compatibility, complexity, trial ability, and observability) and how they influence acceptance.

These attributes of innovations may account for many of the reasons for their acceptance, but there are other variables which must also have an effect on the diffusion of new ideas and inventions. Other variables would include: the number of people involved in making a decision; the type of communication used; the environment or culture; and who is supporting or selling the new idea or product.

The Creative Press

4.2.4 The Creative Press

The term "press" refers to the relationships between individuals and their environments. This facet of creativity includes the study of

social climates conducive or inhibitive to the manifestation of creativity, differences in perception and sensory inputs from varying environments, and the various reactions to certain types of situations. The questions guiding study within this area include understanding the environmental conditions that have an effect on creative behaviour, how these conditions effect creativity and how they can be used to facilitate creativity. The research approaches have included case study, interview and survey techniques with small groups and organizations.

Torrance synthesized the findings of various investigators and listed the following as necessary conditions for the healthy functioning of the preconscious mental processes which produce creativity:
1. The absence of serious threat to the self willingness to risk;
2. Self-awareness ... in touch with one's own feelings;
3. Self-differentiation ... sees self as being different from others;
4. Both openness to the ideas of others and confidence in one's perceptions of reality or ideas; and
5. Mutuality in interpersonal relations ... balances between excessive quest for social relations and pathological reflection of them.

Investigation into creative environments has included attention to the educational and organizational areas. There has been much recent attention to the climate conducive to creativity and innovation from the business and industrial community. The emphasis of this research has been to identify those factors, in certain organizations, that account for creative behaviour. The findings from business and education are somewhat similar in that the climates in both types of organizations appear to be supportive of the intrinsic motivation hypothesis put forth by Amabile.

The popular literature contains many lists of suggestions for creating an environment conducive to creativity. **Van Gundy** identified three categories of factors that determine a group's creative climate. They are: **the external environment, the internal climate of the individuals within the group, and the quality of the interpersonal relationships among group members**. He acknowledged that there would be considerable overlap among these categories and that each category would include suggestions that deal with both task and people-oriented issues.

A common thread running through all these suggestions is the encouragement of group involvement and increasing the level of ownership over activity and decisions. Although there are plenty of times a leader would not care to use group resources when making a decision, the climate literature suggests the decision to use or not to use a group should be based on more than personal preference. Situational variables such as: the needed quality of decision; the

amount of information available; the needed level of commitment to the decision; the amount of conflict in existence; and many other factors could have an impact on deciding when and where to use group resources. When examining the many suggestions to establish a creative climate it is important to keep the concept of balance in mind. Taking as many factors into consideration when using those suggestions will help to moderate the many variables affecting their appropriate application.

A related factor to consider when attempting providing a creative climate is the type of leadership role required for the situation at hand. There aree different kinds of leadership appropriate for different kinds of situations. In considering the kind of environment within which creativity flourishes, it becomes apparent that a different type of leadership role is necessary. Some use the term "facilitator" to describe this leadership style. Others use the term "mentor".

Another common theme within the climate literature is that the kind of environment which is supportive of creativity and innovation will allow individuals to be aware of their own blocks to creative thinking. The focus is on providing a climate where these can be minimized. Some of these blocks can be personal (such as the inability to take risks), problem solving (such as working only within a fixed "set"), or situational (like a great deal of emphasis on negative criticism). Taking time within a group or organization to develop an orientation to these inhibitors may provide reinforcement of the ground rules for the creative environment and may reduce the likelihood of the manifestation of blocks.

4.2.5 Stages of Creativity

Stages of Creativity

The first well-known attempt to conceptualize the creative process was by Wallas in 1926. Although Wallas did not identify specific processes, he did articulate different stages that reflect different processes. Although Wallas's stages are crude and global, his four-stage model has helped order our thinking about the creative process. His four-stage model consists of:

Preparation Stage-inform ation gathering

1. *Preparation Stage*-**information gathering**, mastering the knowledge base, identifying the problem. It is in this stage that the basic techniques and knowledge base of a particular domain are mastered. For example, techniques of painting are mastered or the research literature is totally investigated. It is probably in this stage that basic intellectual processes are important in determining the rapidity of learning and the complexity of issues that are tackled.

Incubation

2. *Incubation Stage*-ideas incubate without the individual directly, logically working on the problem. It is in this stage that processes unique to the creative process are so important. It is also in this stage that Wallas and others introduced the concept of the unconscious. Problems are not consciously worked on, but much

restructuring and free associating occurs outside of conscious awareness. There are several descriptions by creative individuals of the subjective experience of the incubation stage. Thoughts are permitted to roam in a free-ranging manner. It is here that affective processes may play an especially important role.

Illumination

3. *Illumination Stage*-the solution to the problem occurs or is recognized. The artistic plan develops. This stage is often referred to as the "aha" experience of the creative scientist. In reality, as many have pointed out, reaching a solution is probably a gradual process in most instances. The sudden illumination occurrence is probably the least frequent manner by which a solution occurs.

Verification

4. *Verification Stage*-the solution must now be evaluated. Is it indeed good? The hypothesis must be tested; the painter must stand back and evaluate and rework the painting. Critical thinking and logical thinking must be dominant in this stage.

In general, the basic cognitive processes of logic, memory, and abstract thinking should be dominant in the first and last stages. Different types of cognitive processes should be dominant in Stages 2 and 3. Stages 2 and 3 are especially important in creative problem solving and creative artistic expression. It is in the incubation stage that affective processes most likely play a major role.

As Gruber correctly pointed out, Wallas's stage model is incomplete. It does not include the early stage of problem finding or the final stage of expansive application of the creative product. However, Wallas' basic stages remain theoretically useful and continue to be the basis for training approaches.

As Vinacke stressed, the stages of this creative process are probably not so ordered as Wallas first proposed. Individuals go back and forth rapidly between the stages, sometimes letting their thoughts roam, sometimes calling on their critical thinking faculties. It is the ability to shift between stages that are important to the creative process, perhaps involving the ability to gain access to or call into play creative cognitive and affective processes (or let them occur). Psychoanalytic theorists refer to this ability as "regression in the service of the ego".

4.2.6 Cognitive Creative Processes

Cognitive Creative Processes

A key theoretical question in the area of creativity is **"what cognitive and effective processes are involved in the creative process?"** Much of the focus in the area of creativity research has been on cognitive processes.

Guilford made major theoretical contributions to the area of creativity in that he identified and investigated cognitive processes not previously focused on in tests of intelligence. **In general, Guilford** believed that creativity was made up of many different components.

He discussed both cognitive processes and personality traits as contributing to creativity. His research, however, focused on cognitive processes. **Guilford's work** was based on several principles that continue to be the basis for creativity research today.

The first principle was that creative abilities fall on a continuum. **Guilford** did not hold to the view that only a selected number of eminent individuals were creative and should be studied. All individuals possess creative abilities to some degree, "creative acts can therefore be expected, no matter how frequent or how infrequent, of almost all individuals". Thus, creativity can be studied in normal populations.

A second principle was that creative thinking is something different from what intelligence tests measure. Intelligence tests measure logical thought processes that reflect convergent thinking. *There is one best answer for a problem,* not a variety of responses as in creative divergent thinking. Research has supported the concept that creative abilities are separate abilities from what we define as intelligence. Most studies find low to moderate positive correlations between creativity tests and intelligence tests. Until recently, it was widely accepted that a certain amount of intellectual ability was necessary for creativity to occur. Studies show that in the upper ranges of intelligence, the correlation with creativity is zero. This has been known as the threshold theory. However, work by Runco suggested that the relationship between creativity and intelligence is a function of the measures used and the samples studied. He concluded that the threshold theory is "at least partly a psychometric artefacts".

Guilford's third principle is that creativity is really a form of problem solving-not a magical, mysterious process. Guilford also stated that Wallas' four-stage model of creativity is consistent with other models of problem solving.

Guilford identified cognitive processes that were unique to creativity. He concluded that two major categories of cognitive processes were important in the creative process. First, "divergent production abilities" were uniquely important in the creative process. **Guilford** thought that the key concept underlying divergent production abilities is variety. One can generate a variety of solutions to a problem or associations to a word. Divergent thinking is thinking that goes off in different directions. For example, a typical item on a divergent thinking test would be "how many uses for a brick can you think of?" As **Guilford** stated "divergent thinking is a matter of scanning one's stored information to find answers to satisfy a special search model". A broad base of search and free-ranging scanning ability increases divergent thinking production. Wallash stated that divergent thinking is dependent on the flow of ideas and the "fluidity in generating cognitive units". He stressed the importance of the ability

to "ride the associative currents". Divergent thinking should be especially important in the incubation stage of Wallas' stages of creativity.

The second category of abilities relevant to creative ability is what Guilford termed ***"transformation abilities"***. These abilities enable the individual to transform or revise what one knows into new patterns or configurations. A flexibility to reorganize and break out of old sets is important here. The individual reorders, redefines, or reinterprets what is currently known. One sees a new solution to a problem that is different from the usual approach. Much of Guilford's research focuses on identifying cognitive processes that make up these two categories of abilities divergent thinking and transformation abilities and devising tests of these abilities.

Guilford conceptualized these abilities as cognitive abilities. Although he felt that personality characteristics were important to creativity, he believed that they were separate from these cognitive processes. However, recent research suggests that effective processes influence divergent thinking abilities and transformation abilities.

Currently, major work on the cognitive processes involved in creativity has been carried out by a number of researchers stressed the importance of insight in creative thought. **Sternberg and Davidson postulated that three types of insights are involved in creativity. Selective encoding** involves separating relevant from irrelevant information. **Selective combination** entails synthesizing isolated pieces of information into unified wholes. Information is organized in new ways. **Selective comparison** involves relating new information to old information. These three types of knowledge acquisition **set the stage for creative insights.** One might speculate that divergent thinking abilities and transformation abilities partially underlie these types of knowledge acquisition and insight abilities.

Weisberg viewed creativity as another form of problem solving that involves matching what one knows with the situation. **He stressed the incremental nature of problem solving.** There are few real leaps of insight. Rather, novel products evolve in small steps that utilize local memory searches. **The incremental nature of problem solving is true in both science and art.** Weisberg would agree with Guilford that creative thinking does not involve extraordinary abilities, but rather ordinary cognitive processes that are found in all individuals.

On the other hand, **Metcalfe** presented evidence that some insight problems are different from memory retrieval tasks. She used a **"feeling of knowing"** paradigm to determine whether similar processes were involved in an insight problem and a memory-based trivial problem. In two studies, she found that people could predict

memory performance fairly well, but could not predict performance for insight problems. She concluded that insight problems do involve a sudden illumination that can not be predicted in advance.

Simon greatly influenced the field with his work on models of information processing and problem solving as they apply to creativity. *He also led the way in the area of computer simulation of creative problem solving. His work on selective forgetting and familiarization* **in memory helps explain the insight process.** **Langley and Jones** developed a computational model of scientific insight. They stressed the importance of use of analogy in creative problem solving. Insight involves the recognition, evaluation, and elaboration of analogies. Memory processes are important in recognizing appropriate analogies for new situations.

Personality
Traits

4.3 Personality Traits

A climate that is conducive to evoking creative behaviour can be established in a number of ways, and they are based upon principles of creative behaviour that research has confirmed. *Climate, or atmosphere, takes into consideration three major factors: the physical, the mental, and the emotional.* Knowing what we do about individual styles of learning and the variety of ways a teacher employs motivational strategies to reach different kinds of students, it is desirable to account for all three of the major factors.

In giving attention to physical, mental, and emotional aspects of climate, we set a stage for both intended and unintended learning (and motivation toward learning) to occur, in other aspects that should and will revolutionize educational practices. J.P. Guilford's recent book, Way Beyond the I.Q., is a marvellous contribution to our knowledge of human intelligence.

Personality
Traits of the
Creative
Individuals

4.4 Personality Traits of the Creative Individuals

Numerous studies have been conducted on personality traits that tend to help or hinder creative output. Among those traits most commonly identified as helpful toward one's creative productivity are:

Openness to experience
Independence
Self-confidence
Willingness to risk
Sense of humour or playfulness
Enjoyment of experimentation
Sensitivity
Lack of a feeling of being threatened

Personal courage
Unconventionality
Flexibility
Preference for complexity
Goal orientation
Internal control
Originality
Self-reliance
Persistence
Curiosity
Vision
Acceptance of disorder
Tolerance for ambiguity
Motivation
Inclination to the off-beat

Personality traits that have been identified as characterizing creative individuals are often thought of in the light of Thoreau's person who hears a different drummer. The person is generally a nonconformist but not necessarily in an abrasive way. In fact, timidity is often a trait attributed to a creative person. A number of the characteristics seem to be juxtaposed to others. **Are these traits innate, or are they acquired?** If they can be acquired, the question for educators, then, is how can these traits be developed?

That question leads directly to the influence of one's environment on his or her ability to perform creatively. **Most often we think of the environment that will nurture creative behavior as one that is supportive of the individual. Support here is not false praise,** but rather honest support that dignifies the individual. Environmental support allows mistakes and encourages experimentation, openness, and risk taking. It provides a climate for one to explore his or her potential.

Is it always the warm nest, though, that evokes creative behavior? In initial exposure, perhaps it is. But extreme human suffering, which necessitates the need for expression into a creative product, is often grist for the mill for later on. Some of the world's greatest literature evolved in times of human crisis. And the saying "Necessity is the mother of invention" is not goes through in creating is the same for all people, while others think there are as many creative processes as there are individuals. With respect to personality traits, some insist creative people are born, not made; others feel strongly that creative thinking can be taught. Advocates of environmental factors that nurture creative behavior are strong in their beliefs; their adversaries feel the creative person will perform regardless of the environment he or she is placed in.

Personality
Results

4.5 Personality Results

A review of the literature by **Stein** yielded the following fist of personality characteristics that have been found associated with the creative individual.

The creative individual:
1. **Is an achieving person**. He scores higher on a Self-Description Test of need achievement than in a projective (TAT) [Thematic Apperception Test] measure of the same variable, possibly because his achievement is fulfilled in actuality and need not be converted into fantasy.
2. **Is motivated by a need for order**.
3. **Has a need for curiosity.**
4. **Is self-assertive, dominant, aggressive, and self-sufficient.** He leads and possesses initiative.
5. **Rejects repression, is less inhibited, less formal, and less conventional,** is bohemianly unconcerned, is radical, and is low on measures of authoritarian values. However, MacKinnon finds that the creative individual is not "bohemian."
6. **Has persistence of motive**, liking and capacity for work, self-discipline, perseverance, high energy-output, is thorough.
7. **Is independent and autonomous**.
8. **Is constructively critical**, less contented, dissatisfied.
9. **Is widely informed**, has wide ranging interests, is versatile.
10. **Is open to feelings and emotions**. For him feeling is more important than thinking, he is more subjective, he possesses vitality and enthusiasm.
11. **Is aesthetic in his judgment and value orientation**.
12. **Is low in economic values** or is a poor business man, however, found with the all port-Vernon-Lindzey Scale of Values that their more creative industrial research chemists did have higher economic values than their less creative colleagues.
13. **Possesses freer expression** of what has been described as feminine interests and lack of masculine aggressiveness.
14. **Has little interest in interpersonal relationships**, does not want much social interaction, is introverted, is lower in social values, and is reserved.
15. **Is emotionally unstable** but capable of using his instability effectively, not well adjusted by psychological definition but adjusted in the broader sense of being socially useful and happy in his work.
16. **Sees himself as creative**. He is also more likely to describe himself in terms that investigators have found to be related to creativity than is true of less creative individuals. For example, MicKinnon in his study of architects found that his **more creative** group described themselves more frequently as **inventive, determined,**

independent, individualistic, enthusiastic, and industrious," while his **less creative** group described themselves more frequently as "**responsible, sincere, reliable, dependable, clear thinking, tolerant, and understanding**". In short, where creative architects more often stress their inventiveness, independence, and individuality, their enthusiasm, determination, and industry, less creative members of the profession are impressed by their virtue and good character and by their rationality and sympathetic concern for others. Considered in terms of their ideals, MacKinnon also found that the more creative group would like to be more sensitive, while the less creative groups would like to be more original and, at the same time, more self-controlled and disciplined.

17. **Is intuitive and empathic.**
18. **Is less critical of himself**. He is less inclined to use negative and unfavorable adjectives.
19. **Makes a greater impact on others.**

These findings do not characterize any single individual. *No creative individual has all these characteristics, but a creative person probably has more of them than does a less creative person.* Evidence for personality factors characteristic of creative persons comes from studies of individuals in a wide variety of different scientific and professional fields: biology, psychology, chemistry, engineering, architecture. Just as these individuals differed from each other in field of endeavor, they also differed from each other in age, educational status, administrative status, etc. And in the studies in which they participated, there were also differences in the psychological tests and techniques used to gather data as to their creativity.

Guilford's
Intellective
Factors

4.6 Guilford's Intellective Factors

One of the more important developments in the field of creativity has been Guilford's works on intellective factors. Work began out of both theoretical and statistical considerations that led him to be critical of traditional intelligence testing procedures. It would take us too far a field to consider all the issues involved; hence we shall limit ourselves to what he has to say directly about the relationships between intelligence testing and creativity.

In 1950 Guilford said, "we must look well beyond the boundaries of the I.Q if we are to fathom the domain of creativity" and he voiced the belief that the idea "that creative talent is to be accounted for in terms of high intelligence or I.Q ... is not only inadequate but has been largely responsible for lack of progress in the understanding of creative people."

To arrive at a conceptualization of the different possible factors involved in the structure of the intellect, **Guilford used a technique called morphological analysis.** This is a technique for stimulating creativity and therefore as an aside Guilford's work is a good illustration of this technique's use and value.

Guilford's morphological model consists of three dimensions or parameters operations, contents, and products. Each of these dimensions consists of several categories. Operations, which as its name indicates, is the operation performed on material, consists of the following categories: cognition, memory, divergent production, convergent production, and evaluation. Contents, or the medium in which the thought occurs, consists of four categories: figural, symbolic, semantic, and behavioral. And Products consists of the results of the combinations of both operations and products and includes six categories: units, classes, relations, systems, transformations, and implications. All of these are more fully defined in Table 4.1.

Table 4.1: Definitions of categories in GuilFord's structure of intellect

Operations

> ## Operations
>
> Major kinds of intellectual activities or processes; things that the organism does with the raw materials of information, information being defined as "that which the organism discriminates."
>
> *Cognition.* Immediate discovery, awareness, rediscovery, or recognition of information in various forms; comprehension or understanding.
>
> *Memory.* Retention or storage, with some degree of availability, of information in the same form in which it was committed to storage and in response to the same cues in connection with which it was learned.
>
> *Divergent Production.* Generation of information from the given information, where the emphasis is upon variety and quantity of output from the same source. Likely to involve what has been called transfer. This operation is most clearly involved in aptitudes of creative potential.
>
> *Convergent Production.* Generation of information from the given information, where the emphasis is upon achieving unique or conventionally accepted best outcomes. It is likely the given (cue) information fully determines the response.
>
> *Evaluation.* Reaching decisions or making judgments

concerning criterion satisfaction (correctness, suitability, adequacy, desirability, etc.) of information

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Broad classes or types of information discriminable by the organism.

Figural. Information in concrete form, as perceived or as recalled possibly in the form of images. The term "figural" minimally implies figure-ground perceptual organization. Visual spatial information is figural. Different sense modalities may be involved, e.g., visual kinesthetic.

Symbolic. Information in the form of denotative signs, having no significance in and of themselves, such as letters, numbers, values musical notations, codes, and words, when meanings and form are not considered.

Semantic. Information in the form of meanings to which words commonly become attached, hence most notable in verbal thinking and in verbal communication but not identical with words. Meaningful pictures also often convey semantic information.

Behavioural. Information, essentially nonverbal, involved in human interactions where the attitudes, needs, desires, moods, intentions, perceptions, thoughts, etc., of other people and of ourselves is involved.

Products

Products

Forms that information takes in the organism's processing of it.

Units. Relatively segregated or circumscribed items of information having "thing" character. May be close to Gestalt psychology's "figure on a ground."

Classes. Conceptions underlying sets of items of information grouped by virtue of their common properties.

Relations. Connections between items of information based upon variables or points of contact that apply to them. Relational connections are more meaningful and definable than implications.

Systems. Organized or structured aggregates of items of information; complexes of interrelated or interacting parts.

Transformations. Changes of various kinds (redefinition, shifts, or modification) of existing information or in its function.

> ***Implications***. Extrapolations of information, in the form of expectancies, predictions, known or suspected antecedents, concomitants, or consequences. The connection between the given information and that extrapolated is more general and less definable than a relational connection.

Guilford regards the combination of any three categories from the three dimensions as consisting of a psychological factor. ***For example,*** cognition of figural systems is called spatial orientation; cognition of semantic implication is conceptual foresight; divergent production of symbolic units is called word fluency; and divergent production of semantic units is called ideational fluency, etc. For each of these factors tests have been developed.

Relating his own studies of intellect to creativity, **Guilford says,**
> *"Although the most obvious aspects of creative thinking appear to depend on the abilities to do divergent-productive thinking and the abilities to effect transformations of information, with the abilities of fluency, flexibility, elaboration, and redefinition playing significant roles, with creative thinking put in its larger context of problem solving, we see that any or all kinds of abilities represented in the structure of intellect can play their useful roles, directly or indirectly."*

To illustrate Guilford's factors and the tests used to get at them, let us consider the divergent production factors. A factor that Guilford calls word fluency (divergent symbolic units) consists of thinking up and writing out words containing a specified letter, e.g., the letter "g"; two of the tests for ideational fluency (divergent semantic units) are Plot Titles (nonclever) in which the subject is asked to list "possible titles for a given short story" and the score is the number of nonclever titles produced. And another is the Utility Test in which the subject is asked to list "uses he can think of for a common brick, or a wire coat hanger." The score is based on "the total number of relevant responses." When the uses for the common brick and lead pencil given by a person are scored for the number of shifts in classes in consecutive responses, it becomes a measure of semantic spontaneous flexibility.

Guilford's tests, especially those designed to measure divergent-production factors, have been used, as indicated previously, in various ways by researchers investigating creativity. Some have used the tests to study differences between creative persons, selected in terms of some criterion and others who are less creative or who have not manifested any creativity. Other investigators have used **Guilford's tests** to differentiate between two groups of persons. One group scores significantly higher on these tests than does the other, and so the investigator has a psychometric criterion to differentiate between his groups. He then proceeds to

study the groups with other psychological tests. Still another third group has used the tests to measure the effects of programs designed to stimulate creativity. And a fourth group has adapted or altered some of Guilford's original tests for specific purposes. These tests are referred to later as "Guilford-like" tests. Many of Guilford's tests and the Guilford-like tests are regarded as tests of creativity by some investigators, not because they have the evidence that the tests correlate with independent measures of manifest creativity, but because the tests appear to measure psychological functions that are assumed to be involved in the mental operations of creative persons during the creative process.