

Analysis of Creative Products: Review and Synthesis*

Analyzing creative products has long played an important role in the study of creativity, and continues to be a significant concern of those involved in the assessment of creativity (e.g., Treffinger, 1980). Obtaining a valid assessment of the level of creativeness of a person or a product (referred to as the "criterion problem") has been a matter of importance to some of the earliest researchers (e.g., Drevdahl, 1956) to those presently engaged in the field. Treffinger and Poggio (1972) emphasized the importance of research on criterion-related validity and stressed the need for continued research on this topic. The purposes of this paper, therefore, are:

1. To review the extensive theoretical and research literature concerned with the analysis of creative products.
2. To provide a logical *synthesis* of the many criteria that have been proposed for analyzing creative products.
3. To identify some specific directions for future research on the criterion problem.

PRODUCTS AND
THE STUDY OF
CREATIVITY

The literature on creativity contains many different "strands" or emphases. These include several strikingly different theoretical frameworks (Gowan, 1972; Treffinger, 1980), as well as varying emphases on the characteristics of creative people, the process of creativity, creative products or the social context in which creativity occurs and is recognized.

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The literature itself sometimes confuses the reader by assuming a parallel between the criteria for evaluating creative persons with the criteria for evaluating creative products (Brogden & Sprecher, 1964). Skager, Schultz and Klein (1966), however, stated that the evaluation of the creative product gives "a means for establishing referents for the concept 'creativity'." Brogden and Sprecher concluded that approaching the study of creativity through the analysis of the creative product would come closest to solving the criterion problem (1964). However, Rhodes stated unequivocally that objective investigation could proceed only in the direction from product to person to press (Rhodes, 1961). It is Rhodes' stance that is upheld in this article.

Metaphorically, the creative product may be thought of as a manifest "brain-child." As Rhodes (1961) stated, "Products are the artifacts of thoughts." Products are the tangible result of the creative process. Following the Osborn-Parnes model, they are the "Action," or the solution which is incomplete until implementation has taken place. The classic definition of the creative product was offered by Brogden and Sprecher (1964):

A product may be a physical object — an article or patent — or it may be a theoretical system.... It may be an equation or a new technique.... It is not uniquely bound up with the life of an individual.

The earliest extensive contributions were made by Ghiselin and Lacklen in 1957 at the Second University of Utah Research Conference on the Identification of Creative Scientific Talent (Taylor, 1959). They suggested that the criterion problem might be addressed through studies of creative products and offered definitions of products and criteria (Taylor, 1959). Brogden and Sprecher (1964) stated that only 14 studies offering any substantial research on the criterion problem had been published. Even among these few, most studies dealt with criteria for identifying the creative person, not the creative product. "Value (immediate, long range, social, economic or scientific, informational value)" and the differentiation between personal and social newness were criteria cited in this publication (Brogden & Sprecher, 1964). The single most significant paper since that time is Jackson and Messick's oft-cited article, in which the authors offered four criteria for evaluating creative products:

1. novelty (unusualness),
2. appropriateness of the solution (to both the

- problem and to the solution's various parts),
3. transformation (the ability of the product to actually create new forms rather than to merely improve upon pre-existent ones), and
 4. the power of "condensation" of the product, the combined economy and elegance of the solution which is not simply "right" but "just right" (Jackson & Messick, 1965).

While creativity researchers may have been focusing on other issues, business researchers and practitioners in the field of new product development have been writing and publishing practical criteria for determining the marketability of new products. The Experimental Center for the Advancement of Invention and Innovation at the University of Oregon lists some 33 evaluative criteria including, for example, "product life cycle, durability and investment costs" (Udell & Baker, 1978).

Although the topic of criteria for evaluating creative products has a long history, it is *not* the case that there has been "closure." There is yet no conclusive "set of criteria" for evaluating creative products. Thus, there may be many benefits from continued inquiry in this area.

Our language changes over time, and an occasional effort at stating definitions and gaining consensus of them can be helpful in assuring that researchers are denoting the same qualities by the same terms. Developing a set of testable hypotheses by using one widely applicable set of criteria will also be important in the future. If the yardsticks can be agreed upon, they can be used to measure. If they cannot, independent measurements, however interesting, may not be validly compared. If there really is a group of characteristics which contribute to the creativeness of a product, then it must be possible (albeit difficult) to identify those qualities, to measure the extent of their presence in a product and ultimately to train people to develop their abilities to make their products more creative.

EXPERIMENTAL STUDIES

Several experimental studies are especially interesting in their contributions to our knowledge about standards for judging creative products. Many studies which address the "criterion problem" have been concerned with establishing valid criteria for identifying the creative personality, rather than for evaluating creative products. The present review will be limited specifically to criteria for evaluating creative products.

Ward and Cox (1974) investigated the evaluation of several thousand "little green things" sent to a New York City radio station in 1969 during a contest to select the best and most humorous entries.

The authors were interested in determining whether sex or socioeconomic status correlated with the evaluated creativeness of the products submitted. In two studies using the contest entries as the products being evaluated, the authors found that by using only the criteria, "originality, infrequency, attractiveness, humor, complexity and effort," significant correlations could be detected between social status and judged creativity in the case of products which showed at least a moderate investment of effort. In the second study, all of the other criteria were defined as being sub-criteria of "originality." The three most important factors making up the judgment were humor, amount of effort and infrequency, which here was defined as "how rare or uncommon this object or objects like it are in this set of objects" (Ward & Cox, 1974). This points out the importance of judging relative creativity on the basis of comparing products within a set or a universe which has at least some common characteristics. Another interesting feature of the studies was their use of lay judges whose "expertness" lay in their agreement to judge according to certain pre-defined and previously agreed-upon criteria.

In a study reported in 1972, Taylor and Sandler used a "*Creative Product Inventory*" to evaluate the creative products of chemists, hoping that they could train the chemists to do more creative work by realizing what characteristics to stress in their products. In this study significant positive correlations were found between the products evaluated on the developed instrument (The *CPI*) and part 2 of *Torrance's Test of Creative Thinking* (Figural Form A and B). In the study the chemists, after a training period, were challenged to make aesthetic products from a variety of materials. The correlations might have been even greater had the chemists' future creative products in chemistry been evaluated. While ratings of products using the *CPI* and the *TTCT's* evaluation of the scientists did not correlate significantly with supervisors' ratings of the level of creativity present in the chemists, this may say more about the supervisors than it does about the judging instrument. Since the criteria appeared to be operating independently, Taylor and Sandler had apparently isolated some valid aspects of varying degrees of creativeness in products.

Another study (Barron, Gaines, Lee & Marlow, 1973) helps explain why some of the early work in establishing criteria for creative products seems to have appeared and disappeared in the literature. Two teams of raters evaluated art products on several descriptive dimensions. On the objective, descriptive criteria there was great interrater reliability, but on the one subjective dimension of "merit," the two evaluating teams' ratings were significantly but negatively correlated. Clearly each of the two teams had quite different definitions for the term "merit." This led the authors to conclude that the basis of choice is often unclear to those who make them. The results might have been clarified, however, had steps been taken to provide more extensive analysis of the meaning of "merit."

In a review of studies on the evaluation of art, Perkins (1979) investigated the relationship of *value* and *descriptive* criteria. He concluded that, with effort, perceptions of art work based upon different kinds of criteria might be accomplished with some agreement. He contended:

Perhaps with effort and practice, common perceptions and evaluation of works of art could be achieved. Perhaps the more fully and sensitively works were observed, the more evaluations would turn out to converge... For if there is to be any hope of finding, or, one might better say, constructing a common aesthetic reality, viewers would need to look more carefully and thoroughly at works, trust initial perceptions less, crosscheck them more with other individuals, attempt alternative perceptions of the work, determine from others what significant features might have been missed, locate and recognize as such ambiguities of a work's appearance, set aside first conclusions that turn out to be attributable to personal idiosyncracies, and so on (Perkins, 1979).

Eichenberger (1972) developed a judging instrument for evaluating physics students' inventive solutions, given the challenge of illustrating certain physics principles. The judging instrument was based upon the characteristics of creative scientists rather than upon the criteria for creative products. Validity along several dimensions was established by computing correlations between rated creativeness of the products and a number of other measures. While not all the correlations were significant, the data indicated that it was possible to evaluate quickly and effectively the products

of the creative process in physics using the instrument.

STUDIES OF
SPECIFIC CRITERIA

In this review, more than 90 sources have been considered, yielding more than 125 specific criteria. Consideration of the similarities among these criteria, with respect to names and definitions, enabled us to group the criteria into 14 general categories. These categories were further classified into three general dimensions: *Novelty*, *Resolution* and *Elaboration and Synthesis*. It should be emphasized that the present classification is an arbitrary attempt to organize the many specific criteria in the literature for more effective description. Neither the 14 categories nor the three general dimensions have been investigated empirically. We hope, however, that the model proposed here will have heuristic value. New directions for research will be described after the model has been presented and criteria described. Table 1 presents a summary of the three dimensions of the model, and the criteria subsumed under each dimension.

All three categories are hypothesized as fundamental dimensions, independent variables of creativeness manifested in creative products. They may be visualized as a three-dimensional matrix as illustrated in Figure 1.

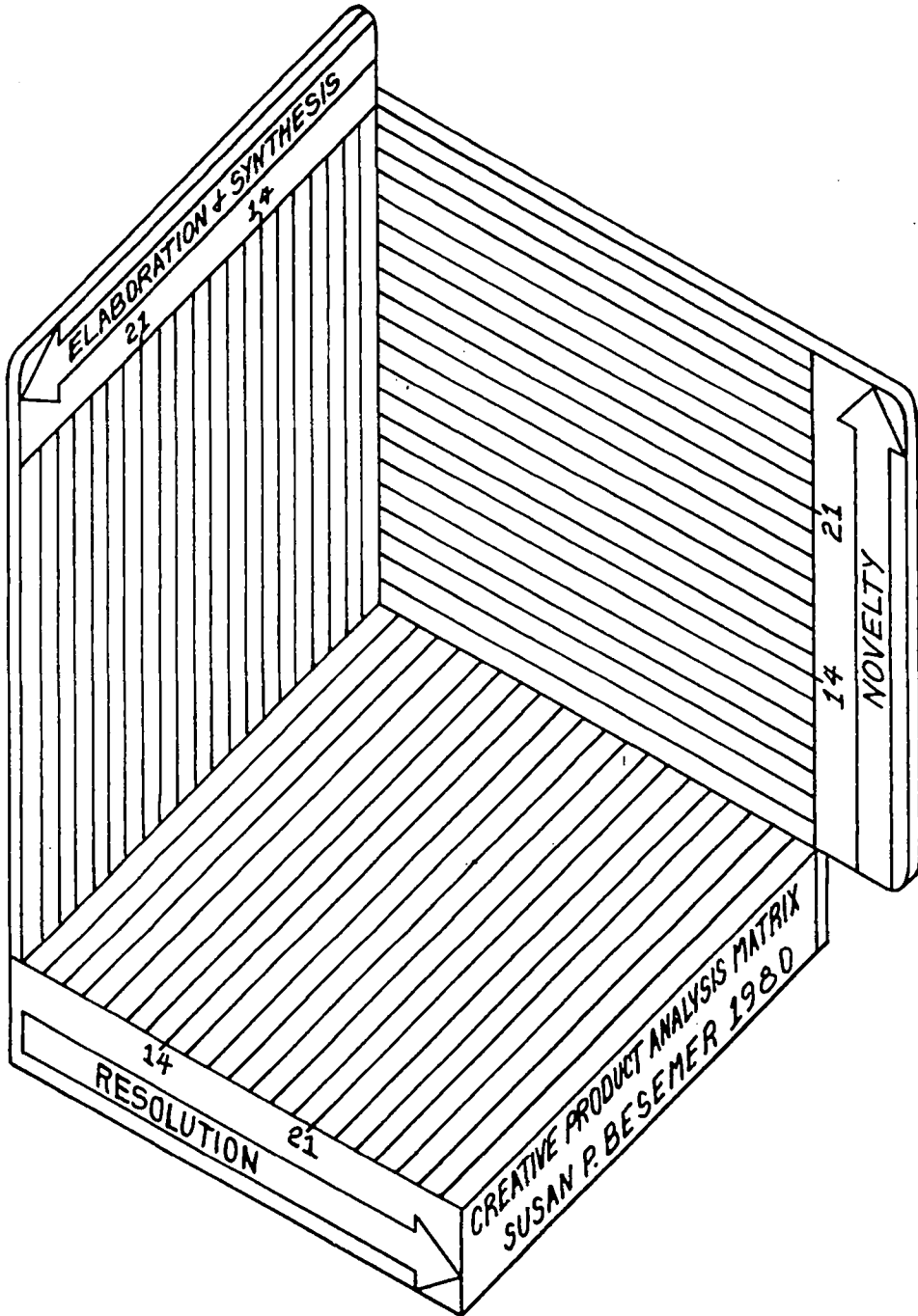
Novelty

Novelty refers to the extent of newness of the product: in terms of the number and extent of new processes, new techniques, new materials, new concepts included; in terms of the newness of the product both in and out of the field; in terms of the effects of the product on future creative products. It includes three of the four specific factors: original, germinal and transformational.

Original. The most often cited criterion of creativeness is originality. Defined by Guilford as "statistical infrequency" (Guilford, 1950), this value may be thought of as newness, novelty, remoteness or unusualness. When thinking of the products of creativity we may better understand the concept of "statistical infrequency" by asking, "In everyday solutions to this problem, how frequently would I find this solution occurring in the natural course of things?" Regarding art works, we might ask, "In a gallery of paintings (or sculptures or whatever other art form) how likely would we be to see a work like this?" In judging the creative work of children or novices, one might measure the originality by considering the frequency with which this kind of solution occurs within a group of children of like-age or like-experience. In essence, here, we are talking about the degree of deviance from the normal incidence of occurrence of similar products in the population at hand.

TABLE 1 Definitions of dimension categories and criteria.

Novelty	Resolution	Elaboration and Synthesis
<p>The extent of newness of the product: in terms of the number and extent of new processes, new techniques, new materials, new concepts included; in terms of the newness of the product both in and out of field; in terms of the effects of the product on future creative products.</p>	<p>Like the resolution of a musical chord, the degree to which the product fits or meets the needs of the problematic situation.</p>	<p>The degree to which the product combines unlike elements into a refined developed, coherent whole, statement or unit.</p>
<p>Germinal The product is likely to suggest additional future creative products.</p>	<p>Adequate The product answers <i>enough</i> of the needs of the problematic situation.</p>	<p>Attractive The product commands the attention of viewer, listener or user.</p>
<p>Original The product is unusual or infrequently seen in a universe of products made by people with similar experience and training.</p>	<p>Appropriate The solution <i>fits</i> or applies to the problematic situation.</p>	<p>Complex The product or solution contains many elements at one or more levels.</p>
<p>Transformational The product is so revolutionary that it forces a shift in the way that reality is perceived by users, listeners or viewers.</p>	<p>Logical The product or solution follows the accepted and understood <i>rules</i> for the discipline.</p>	<p>Elegant The solution is expressed in a refined, understated way.</p>
	<p>Useful The product has clear, practical applications.</p>	<p>Expressive The product is presented in a communicative, understandable manner.</p>
	<p>Valuable The product is judged worthy by users, listeners, or viewers because it fills a financial, physical, social or psychological need.</p>	<p>Organic The product has a sense of wholeness or completeness about it.</p>
		<p>Well-crafted The product has been worked and reworked with care to develop it to its highest possible level for that point in time.</p>



The extent to which an idea is new then is an important partial indicator of its creativeness. Originality is the prime criterion in establishing patentability. The importance of the criterion is well-stated by Koestler, "The principle mark of genius is not perfection, but originality, the opening of new frontiers; once this is done the conquered territory becomes common property" (Koestler, 1964).

Variations may exist along several dimensions of newness. One may ask "To whom is this idea new?" If it is new only to the creator, it is not as original as an idea which is new to an organization, or new to the culture. One may ask about the extent of novelty within the product itself. Is the product new in only one way? If it is new merely in regard to the materials of construction, the U.S. Patent Office does not consider it new enough to be patentable. The more aspects of the products which are new, the higher is the level of originality seen in the product. A product which is "startlingly" new may verge on the level of "transformation."

Seventeen sources offered criteria related to originality, with variations of degree or language. These included: ingenious (Eichenberger, 1972; Q's and A's, 1979); less than logical consistency with other experiences (Guilford in Jackson & Messick, 1965); novelty (Brogden & Sprecher, 1964; Mednick, 1964; Jackson & Messick, 1965; Martinson & Seagoe, 1967; Carlinsky, 1976; *General Information Concerning Patents*, 1979); original (Maslow, 1959; Maltzman, 1960; Koestler, 1964; Martinson & Seagoe, 1967; Eichenberger, 1972; I.A. Taylor, 1972; Barron et al., 1973; Ward & Cox, 1974; Helson, 1978; Q's & A's, 1979); produced independently (Rhodes, 1957); personal newness (Brogden & Sprecher, 1964); unusualness (Jackson & Messick, 1965; Guilford, 1968; Ward & Cox, 1974); and student's own idea (Eichenberger, 1972).

Germinal. One of the higher level criteria for creative products is that they stimulate applications and more creative activity both in their own field and in other areas. Selye (in Taylor, 1959) and Brogden and Sprecher (1964) called this characteristic "generalizability" while I.A. Taylor (1972) termed it "generation." Gamble in Taylor's 1959 work calls it "breadth of applicability." The word "genius" and "generation" are from the same Latin root which the Oxford Dictionary translates as meaning "to beget or to bring into being." The idea behind the words is that a product is more creative if it has a greater influence on the development of other later products. Brogden and Sprecher (1964) also

emphasized "new implications." Q's & A's)1979) stressed "extent of use."

Transformational. A yardstick often viewed as the highest level of creativity is the criterion of *transformation*. This may be defined as the extent to which the product forces a new way of looking at the world. After a profoundly transformational product, the world "will never be the same again." Ghiselin wrote that the criterion of creative products was "their effect in imposing 'new order' within the universe of meanings" (quoted by Gamble in Taylor, 1959). Jackson and Messick described the transformational product as one which has the power to "defy tradition and...yield a new perspective," "to overcome conventional restraints"...or to force a "radical shift in approach" (1965). They echoed the U.S. Patent Office in finding that transformation involves more than obvious improvements. I.A. Taylor (1972) cited a similar criterion "reformulation," and defined it as "the extent to which the product introduces significant change or modification."

Resolution includes criteria which pertain to the correctness or rightness of the solution to the problematic situation. These are: logical, appropriate, adequate, useful and valuable.

Logical. Five authors cited the perhaps surprising criterion of "logical." Not all used that term, but they isolated a concept which was the convergent "answer" that is mathematically or scientifically "correct" (e.g., Eichenberger, 1972). This criterion is defined as the extent to which the product is scientifically "true" or "valid," the extent to which the solution is consistent with the facts, or the extent to which the product follows the "rules of the game." If the product is merely logical, we do not term it "creative." It must also have an element of newness to deserve that appellation. Interestingly enough, the criterion "logical" can also disqualify an invention for patentability (Gilfillan, 1964). If the invention is so logical that it could have been devised by anyone with a suitable background and with the benefits of good hard work (see *Well-crafted*), the invention is denied the patent. The Patent Office demands the ingenuity that the "spark of genius" has traditionally assigned to the creative person.

Jackson and Messick (1965) discussed the logical qualities of a creative solution as an aspect of "appropriateness" while other authors (e.g., Barron, 1969; Battcock, 1973) isolated it as a discrete judgment.

Adequate. This criterion is a very basic one which must

be met before higher levels of creativity may be perceived. Several authors cited criteria which relate to the adequacy of a product (or solution) in meeting a need or in performing a desired function. Gerald Udell's criteria for evaluating new product ideas (Udell, Baker & O'Neill, 1977) contained many aspects of adequacy, including functional feasibility, need and perceived function. While the criterion of adequacy exists at a relatively low level, it is interesting to note that as the need or importance of the problem becomes greater and greater, the creativity of the solution which is merely "adequate" is rated higher and higher. McPherson discusses the concept of "inventilevel" in regard to the difficulty of the problem at hand, the previous failure of the other solutions tried, and even the skepticism of the experts in the field as to the possibility of solving the particular problem (McPherson, 1963). The solution which overcomes these obstacles "adequately" is considered "novel" in terms of the patent law. An interesting merger between the novel and the relevant in one criterion measure is therein demonstrated. Were the problematic situation not so important, the problem would be set aside; or were the need adequately met without much effort (see *Well-crafted*) the creativity rating would be relatively low. Criteria related to this measure, in Brunner's (1963) definition were predictive effectiveness, formal effectiveness or metaphorical effectiveness. Other terms included in this criterion were: correctness (Henle, 1963), providing the solution (Brogden & Sprecher, 1964), adequacy in meeting a need (Barron, 1969), and importance of operation affected (*Q's & A's*, 1979).

Appropriate. Similar to *Adequate*, this criterion measures whether or not a solution fits the problematic situation in a way that makes sense, where "adequate" measures how well the solution fits. This criterion may be defined as the extent to which the solution is suitable to the needs of the problematic situation. I.A. Taylor (1972) called the criterion "relevancy" and defined it as the "extent to which the product satisfactorily provides a solution to problems." Barron (1969) called this criterion "aptness," while Jackson and Messick (1965) discussed the "fit" both "external and internal." This criterion impinges upon the related term "logical" because both criteria call for a solution which meets a certain expectation. Parnes, Noller and Biondi (1977) cited this criterion, termed "relevance," as equally important with "uniqueness" in evaluating the "delicate balance" of

creative action. Other relevant statements of this criterion included: makes sense (Rhodes, 1957) and socially relevant (Nitsche, 1974).

Useful. This criterion was cited in several sources proposed for evaluating very different kinds of products (Mednick, 1964; Eichenberger, 1972; Lawal, 1974; Will, 1979; *General Information Concerning Patents*, 1979). Usefulness is a prime criterion for patentability, yet in practice the word "operable" sometimes replaces the word "useful." Design patents replace this criterion with "ornamental" (Gilfillan, 1964), and interesting crossover of criteria between *Useful* and *Attractive* or *Complex*. Eichenberger cited usefulness as a criterion measure of the creativeness of products of invention in physics. In an article about art products sponsored by corporations, Will (1979) maintained that such products are in fact useful, although popular opinion seldom finds them so. In his comments he spoke of the social usefulness of the works of art in expressing cultural values and emotions. Mednick's definition of creativity was based on the formation in the mind of associative links between elements into new combinations which "either meet specified requirements or are in some ways useful" (Mednick, 1964).

Julia Child, the popular gourmet chef and author reiterated Mednick's point of view:

Strictly speaking, true creation in cookery would be inventing mayonnaise, or ice cream. An entirely new thing. Probably many new things stemmed from accidents of chance, but it is important to be able to recognize that *something* has happened and know what to do with it and be able to repeat it ("Creativity," 1977).

But lest we dismiss too soon an invention like mayonnaise, Virgil Thompson, music critic and composer stated that:

The composer of music is very much like a cook — a classical cook in some cases, in others an inventive cook varying the classical recipes, a diet cook (like the serialists) limiting his output to what he thinks is good for you, or an ingenious housewife-type always running up something out of leftovers (Thompson, 1969).

Lawal's (1974) treatise on Yoruba aesthetics stated the importance to that group of Nigerian people of the criterion of usefulness.

Valuable. This criterion refers to the judged worth of the

product. This seems to be one of the very most subjective criteria which occurs in the literature. It also causes a great deal of difficulty in judging products if the criterion is not carefully and extensively defined in the context of the evaluation taking place. The value may be intrinsic, social, informational, economic or personal. If judges are not aware of which sense of the word "value" is to be considered, inter-judge reliability can suffer. Even the fairly clear-cut criterion "economic value" or "savings affected" can mean savings in investment costs, savings over the long run, short-term savings, or savings in any number of other factors. These points become especially relevant when one begins to evaluate ideas to become new manufactured products.

Specific citations of the criterion "valuable" were found in several sources. These included: immediate, long range, social, economic or scientific value (Brogden & Sprecher, 1964); informational value (Brogden & Sprecher, 1964); intrinsic worth and processing some value beyond the ordinary (Martinson & Seagoe, 1967); merit (Barron et al., 1973); intrinsic worth (Lawal, 1974); worth (Carlinsky, 1976); and resultant savings (Q's & A's, 1979).

Elaboration and
Synthesis

The third dimension of the matrix, *Elaboration and Synthesis*, involves considerations of style. It includes six criteria: expressive, complex, well-crafted, attractive, organic and elegant. Usually thought of as aesthetic qualities, these criteria may also apply to other products. Mathematical solutions are often described in terms that sound aesthetic. Solutions are called *Elegant*, *Complex*, *Attractive*. The category is an interesting one because it illustrates the divergent/convergent aspects which are often cited as making up "balanced" creativity (Parnes, Noller & Biondi, 1977). This stylistic category refers to the degree of manipulation which has taken place in "developing" the solution. While the field from which alternatives are selected is not always readily seen, the "just-rightness" of a solution is often apparent to the observer through the familiar "Aha!" experience. These stylistic criteria are more subjective than some others; they depend for their reliability on a commonality of expression between the creator and the observer. This is the area in which the necessity for expert judges has been a traditional concern, though Ward and Cox managed to avoid the need for expert judges in the laboratory by giving clear definitions of evaluative criteria to lay judges (Ward & Cox, 1974).

Expressive. This criterion measures the success with

which the creator communicates with the observer. With artistic products this criterion relates to the effectiveness of the use of the elements or media. In evaluating inventions, this criterion relates to the ease with which the user interacts with the invention. Koestler discussed the importance of "emphasis" in the artistic product. He maintained that through the selection, exaggeration and simplification the artist is successful in communicating with the observer (Koestler, 1964). Other specific descriptions of criteria in this category include: effectiveness of expression (Martinson & Seagoe, 1967); fluidity and freedom (Skager & Schultz, 1966); socially acceptable affects (Eichenberger, 1972); infection or understandability, expression in communication, and the "individual's perception of himself and his relationship to the universe which surrounds him" (Tolstoy, in Jahn, 1975).

Complex. The criterion of complexity may include several types of complexity: technical, ideational and phenomenal (Barron, et al., 1973). The phenomenally complex work of art is "busy" but it "goes nowhere." One may imagine a Rube Goldberg invention that is complex at that level. Technical or ideational complexity is more than mere "busy-ness." Ideational complexity may be seen to be related to *Transformation*, especially when expressed in a subtle, *Elegant* way. Here three discrete criteria meld to describe a very high level product. In fact, Barron et al. (1973) considered the relationship of complex processes and simple expressions to be the hallmark of creativity. Charlie Mangus, the noted jazz musician, expressed this concern simply:

Creativity is more than just being different... Anybody can play weird: that's easy. What's hard is to be as simple as Bach... Making the simple complicated is commonplace; making the complicated simple, awsome simple, that's creativity ("Creativity," 1977).

The criterion of complexity has also been described as gradation of values and variety in shapes or patterns (Burkhart, 1962) or depth (Helson, 1978).

Well-crafted. The criterion of well-crafted relates to the amount of effort expended in the production of creative products and the care with which ideas are developed. When used in evaluating an artistic product the judge may look at the finish of a piece of furniture or the meticulous application of paint in a "hard-edge" painting. In a business action-plan the term *well-crafted* might ask the judge to look at the

level of acceptance-finding and planning for implementation (Parnes, Noller & Biondi, 1977) which has taken place. The notion of the well-crafted product reflects the spontaneous deliberate polarity noted by Burkhart (1962) in art students' styles. In the Yoruba culture, this criterion is described as well-made — "ewa" (Lawal, 1974). Other variations included: carefully done and deliberate (Skager & Schultz, 1966), attention to detail (Eichenberger, 1972) and effort invested (Ward & Cox, 1974; Q's & A's, 1979).

Attractive. The criterion of attractiveness is a categorization of a number of related criteria. This criterion is to be understood as something which attracts the attention of the viewer or observer. This use of the word is something different from its use in common parlance. While the criterion may place a value on beauty, it also places value upon surprise, humor or enjoyment. Twelve authors had something to say about this subjective criterion which relates to the observers' interaction with the product. Notable in artistic criteria is Huxtable's criterion of "beauty." While she cited beauty as a prime criterion in judging architecture, she warned, "Don't look for something pretty. Look again" (Huxtable, 1969). Here, this criterion impinges upon the value of *Elegance* or "condensation," i.e., the power of the product to command the attention and thought of the observer. Specific descriptions of this criterion in the literature included: unexpected (Maslow, 1959), surprising (Selye in Taylor, 1959; Bruner, 1963; Brogden & Sprecher, 1964), humor (Skager & Schultz, 1966; Ward & Cox, 1974), beauty and delight (Huxtable, 1969), hedonics (I.A. Taylor, 1972), enjoyment, entertainment or pleasure (Battcock, 1973), appearance (Udell & Baker, 1978) or charm (Helson, 1978).

Organic. While this criterion may suggest an application in aesthetic products, it was also found used by authors discussing inventions (Battcock, 1973; Eichenberger, 1972). The criterion may be defined as the extent to which a product has an organizational unity or comprehensiveness and completeness about it. The criterion was cited by Burkhart (1962) as the one value which remained constant whether the student worked in a spontaneous or deliberate manner.

Organic has also been described in a variety of specific ways, including: integrative (Maslow, 1959); spatial, organizational unity (Burkhart, 1962); comprehensiveness (Brogden & Sprecher, 1964); balance and proportion (Barnes, 1969); aesthetic sense of unity and organization of complex disorder from nature (Eichenberger, 1972); and a coherent

whole (Battcock, 1973). However, when one creates the organizationally unified product in a refined and economical statement, one verges on the next criterion of style, *Elegant*.

Elegant. Elegance is one mark of the extremely creative product. The criterion may be defined as the extent to which the product provides an understated or economical solution. Synonyms are "subtle," "deft," Jackson and Messick used the term "condensation" meaning the quality of products which "do not divulge their total meaning on first viewing" (1965). They stated that these products are "worthy of pondering." They also mentioned the use of the simple to represent the complex as did Barron in his discussion of complexity (Barron et al., 1973). Koestler pointed out that the Japanese have a word to represent this quality, "shibuyi," which may be translated "economy," "implicitness" or that which "calls for extrapolation, interpretation and transposition" (Koestler, 1964). Henle (1963) referred to this criterion as harmony, while it has been variously described by others as deftness (Barnes, 1969), aesthetic fit (Barron, 1969), efficiency (Huxtable, 1969) or finding the simplest alternative which covers the facts (Eichenberger, 1972).

UNSETTLED AND COMPLEX ISSUES

Throughout the literature on creative products which has been reviewed, some topics seem to recur as problems. These issues were mentioned in the late 1950s and are still mentioned today. Often the problems have semantic bases: problems in definition, aspects of originality, the perceptions of those other than the creator of the product and the practical administration of a judging instrument.

Problems of Definition

If one postulates the criterion *Useful* as a criterion necessary for creativity, then unless one will admit "social usefulness" or "expressive usefulness" one must reject works of fine art as being creative. This points up a problem of logic, since works of fine art are usually considered creative. The three-dimensional model developed earlier, the Creative Product Analysis Matrix, helps to put these semantic problems into perspective. The criteria outlined in the model are intended to "fit" all types of creative products. While it is important that the creative product exists along the three proposed dimensions, it is not necessary for the product to excel on all 14 separate criteria.

As the matrix illustrates, a product may be high on the dimension of *Novelty*, low on *Elaboration and Synthesis* and high on *Resolution*. For example, a plan for a new office procedure may be quite new to the office, address needs effectively, but still contain some flaws to be remedied in an

action planning phase. Likewise a work of art (visual or performed) might be a careful and beautiful expression of the artist's established style at that point in his or her career, but lower on the *Novelty* scale than some of the artist's earlier works. The artist, at that point, might have been working more on the resolution of the problem, or on developing the style than on the novelty of the work. One hypothesis open to testing is:

It is impossible to develop a judging instrument which is applicable to many fields based upon the three dimensions of 14 criteria outlined above. (For information about the preliminary form of such an instrument, readers are invited to write to the authors.)

One might argue that the product is not "creative" if it does not rate high on the *Novelty* scale. While it is true that the greatest creative works could be conceived of as rating at the highest point on all three scales, it is also possible for a work to be less than uniformly creative on all dimensions. That is, in fact, the case with most creative products. These less-than-perfectly-creative products are, happily, found often in the lives of most people. Maslow expressed this when he said that "a first-rate soup is more creative than a second-rate painting" (Maslow, 1959). Table 2 provides a brief illustration of how various products might be classified with respect to the 14 criteria discussed in this review.

Aspects of
Originality

Another question which will certainly become more visible in the development and validation of judging instruments revolves around the several aspects of originality. These questions consider whether or not the product is to be considered new to the creator even if it is not new to the sociological context within which the creator worked. Judgments always must be based on norms for the population within which the creator lives and/or works. Maltzman (1960) stated clearly that uncommonness must be established for each given situation. It might also be possible to hypothesize evaluating the products of certain individuals over time to detect and develop creative ability. By expanding the number of criteria considered, it becomes possible to make more accurate judgments of the various factors. At the same time, by categorizing the factors into the three dimensions: *Novelty*, *Resolution*, and *Elaboration and Synthesis* (style) the schema becomes easier to grasp. It becomes easier for the creator for purposes of self-training and easier for the researcher for purposes of generating hypoth-

TABLE 2 Illustrative examples of the cited criteria.

	CRITERION	LOWER LEVEL	MEDIUM LEVEL	HIGH LEVEL
NOVELTY	transformational	bow and arrow	gun powder	nuclear bomb
	germinal	buggy whip	phonograph	quartz chip
	original	carbon paper	microfilm	Xerox process
RESOLUTION	valuable	crutches	aspirin	pacemaker
	useful	button	snap	zipper
	adequate	user-made paper cone	paper cup	glass tumbler
	appropriate "What's half of twelve?"	twe	1	6
	logical	blank verse	haiku	sonnet
ELABORATION & SYNTHESIS	elegant	adding machine	T. I. 55 calculator	T. I. programmable 59
	organic	chimp painting	paint by number	"Mona Lisa"
	attractive	Timex	Bulova	Seiko
	well-crafted	my backyard	park	formal garden
	complex	house	neighborhood	city
	expressive	John's Cage's "Harpsichord"	Beethoven sonata	Lutheran hymn

eses to be tested. One hypothesis implied is that it is possible to improve the level of creativeness evidenced in the product of the creator by training him/her as to the dimensions and criteria which are cited as desirable for creative products. Taylor and Sandler (1972) did this with some success.

Others:
Perceptions of
Creative
Products

Another complex issue involves the perceptions of those other than the creator of the creative product. Establishing the *Novelty* of a product within its given context may be not nearly so difficult as agreeing upon the degree of *Resolution*, and that not so difficult as gaining consensus regarding the degree of *Elaboration and Synthesis* or style. These latter issues are so difficult, in fact, that many have argued that agreement is impossible. Beck (1969) contended, for example, that "art evaluation is a nebulous, often specious activity." Others (Skager et al., 1966; Thompson, 1969) believed that while it is possible to evaluate art products, the evaluation must be done by highly trained judges. Still, Skager et al. (1966) concluded that even when different criteria are used by different groups of expert judges, standards by which products can be accepted or rejected by a group do exist. Thus, a way of stating the standard is "Visible improvements... which do not threaten established ways" (*Publishing in Education*, 1971). While this definition clearly excluded the *Transformational*, it pointed up the importance of the acceptance by some group. One might wonder, does the size of the group accepting the innovation serve as an indicator of the level of creativeness of the product?

While Thompson stressed the need for expert judges, Barnes (1969) stated, "With dancers it never ceases to surprise how accurate is common opinion."

CONCLUSION The analysis of creative products has been a challenging problem in the study of creativity for more than two decades. We believe that the mode described in this review may be useful for generating hypotheses that can be tested in a planful, systematic manner to advance our understanding of the complex phenomenon of creativity.

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