A STUDY OF THE INTERRELATIONSHIPS AMONG ARTISTIC ABILITY, SENSITIVITY TO COLOUR, AND AESTHETIC INTEREST IN EVERYDAY OBJECTS

by

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ABSTRACT

This study was conducted to test the hypothesis that artistic ability is positively related to sensitivity to colour and aesthetic interest in everyday objects. Empirical evidence of the degrees of relationship was sought as a contribution to the understanding of the complex nature of artistic aptitude.

The subjects were 100 ninth-and tenth-grade students enrolled in art courses at two junior secondary schools in Cowichan, British Columbia. Individual artistic ability was measured by the Maitland Graves Design Judgment Test; sensitivity to colour by a test especially developed for the purpose by the investigator; and aesthetic interest in everyday objects by Leijonhielm's Interest Questionnaire No. 2.

Pearson product-moment correlation coefficients were computed for each of the three relationships: (1) artistic ability - sensitivity to colour; (2) artistic ability - aesthetic interest in everyday objects; (3) sensitivity to colour - aesthetic interest in everyday objects. A significant, but low, relationship was found between the criterion variable (Maitland Graves Design Judgment Test) and sensitivity to colour; between the criterion variable and aesthetic interest in everyday objects; and between sensitivity to colour and aesthetic interest in everyday objects.

A multiple correlation coefficient was also computed to determine the relationship between the criterion variable and the other two variables of sensitivity to colour and aesthetic interest in everyday objects, taken together as predictor variables. A significant, but low, relationship was found.

The experimental findings are discussed in terms of the instruments of measurement and in terms of possible implications for further research.

EXAMINERS: [redacted]

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

According to Cronbach (1970, p.318) "the nature of artistic aptitude remains an unsolved, and neglected, problem." Artistic aptitude is, however, linked by many people to sensitivity to colour and aesthetic interest in everyday objects within their environment. Artists are described by Sargent (1964, p.3) as possessing a "special sensitivity to colour," and by Werner (1948, p.71) as "especially gifted in susceptibility to physiognomic experience," by which he meant the ability to experience the expressiveness of inanimate objects as if they had an inner life, or character, of their own. This is supported by Cutter & Pepper (1923, p.123) who described artists as "keenly sensitive to colour and all the nuances of colour." In a later article, Werner (1956, p.281) asserted, "The building elements of art and aesthetic experience are physiognomic characters and physiognomic relations...." Leijonhielm (1967, p.8), in his studies in differential aesthetic psychology, quotes two Swedish scholars, Nymen and Carlsson, as subscribing to the hypothesis that "ability to experience the expressive qualities of colours is related to aesthetic appreciation and the like." Conversely, Hartshorne (1934, p.138) held the view that Bullough (1908) and Myers & Valentine (1914) had shown that there are people who do not experience the expressiveness of colours, and characteristic of these people is "little interest in, or aptitude for, aesthetic experience."

Aesthetic interest is defined by Leijonhielm (1967, p.11) as:

> the interest people have in the look of things without considering their use; the attention they pay as to whether things are beautiful or ugly, expressionless or expensive.

The artist Gyorgy Kepes (1959, p.10) assumes such interest to be vitally related to artistic creativeness. His book is an exhortation to artists to reorganize their visual habits in order to perceive not isolated "things" in "space", but structure, order, and the relatedness of events in "space time". Carlson & Parker (1969, p.530) in a study of personality and aesthetic sensitivity, quote a definition of an aesthetically sensitive person as being "remarkably similar to that of a creative artist."

However, despite the weight of opinion supporting the view that artistic ability is related to sensitivity to colour and aesthetic interest in everyday objects, in no instance has empirical evidence been presented to support this contention.

I. THE PROBLEM

Statement of the problem. It was the purpose of this study to determine the extent of the relationship between (1) artistic ability and sensitivity to colour; (2) artistic ability and aesthetic interest in everyday objects, and (3) sensitivity to colour and aesthetic interest in everyday objects.

Importance of the study. If the linking of artistic ability to other measurable attributes could be shown to be true; if sensitivity to colour and aesthetic interest in everyday objects were shown to be significantly related to artistic ability, this would be an important contribution towards identification and better understanding of the variety of components of art talent as declared long overdue by Cronbach (1970, p.318), and described as essential by Murray Thomas (1965) in his paper on measurement in the visual arts.

II. DEFINITIONS OF TERMS USED

Artistic ability. Artistic ability is understood to be of a complex nature and formed of many components. In this study artistic ability is interpreted as being those components of aptitude for the product of art structure as measured by the score made on the Maitland Graves Design Judgment Test (1948).

Sensitivity to colour. "Sensitivity to colour" is understood in this study to be composed of two distinctive elements: (1) sensitivity to the expressiveness of colour, and (2) colour discrimination. By "sensitivity to the expressiveness of colour" is meant the ability to discriminate between different colours in the judgement of their expressive qualities as measured by the score made in Section I of the sensitivity to colour test constructed for this study. By "colour discrimination" is meant the awareness or perception of differences among colours as shown by discrimination between differential threshold values

in each of the colour dimensions and measured by the score made in Section II of the colour sensitivity test designed for the purpose of this investigation.

The "colour dimensions" are those defined by Evans (1948, p.120) and Burnham, Hanes & Bartleson (1963, pp.13-14) as "hue", "saturation", and "brightness". These are the three variables of colour said by Evans to "define completely the qualitative and quantitative aspects of colour as a mental phenomenon," but which are known to others as "colour", "chroma or intensity", and "value"; and to Josef Albers (1963, p.40) as "colour", "colour intensity", and "light intensity".

The "differential threshold values" are understood to be the just perceptible differences (j.p.d.) and equal differences described by Burnham, et al. (1963, pp. 151-156) and Evans (1948, p.120).

Aesthetic interest in everyday objects. This is understood to be the degree of aesthetic interest in everyday objects as indicated by the responses made on Leijonhielm's Interest Questionnaire No. 2.

CHAPTER II

REVIEW OF THE LITERATURE

No source material was found specifically related to the problem under investigation. Information and data have been collected from the various fields of the psychology of perception, the psychology of colour, and the psychology of aesthetics, and are offered in support of the methodology of this study.

I. LITERATURE ON THE PROBLEM

Many studies have been conducted on the expressiveness and dimensions of colour--and will be referred to later in this study--but not on the relationship between sensitivity to colour and artistic ability. Guilford & Guilford (1931) and Walton (1936) constructed tests based on the conception that the experience of the expressiveness of such simple objects as lines and colours is related to skill in art, but in both cases colour expressiveness was conceived as a preference, or affective value, in a continuum extending from greatest pleasantness to greatest unpleasantness.

A work by Leijonhielm (1967) also treated colour as an adjunct of form, but involved colour-mood responses in judgement between two stimulus objects--"the more joyful" or "the calmer." His study, based on the hypothesis that "a correlation exists between the ability to experience the expressiveness of colour and form, and reactions to art

(nine aesthetic variables)" is one of the more valuable studies in this field. Leijonhielm, using 15 to 18 year old high school (Gymnasium) students, found no significant relationship between the variables, the correlation coefficients ranging from 0.04 to 0.13.

Another related study was that of Anwar (1968). His work was based on the hypothesis that "those who are in general more aesthetically sensitive will also be more sensitive to the aesthetic use of colour." Using fourth grade pupils as subjects, aesthetic sensitivity was measured by a test designed by Child (1964) and correlated with scores assigned for colour organization used in completing a creative painting assignment. Anwar found no relationship existing between aesthetic sensitivity and the aesthetic use of colour in painting.

The only other empirical study related to the problem which is known to the author is a doctoral dissertation by Anderson (1968) on "Aesthetic sensitivity, previous art experience, and production of outstanding works of art." Anderson found that, in a sample of 80 art and 114 non-art high school students, the number of entrances in art contests, and the number of awards won, were positively correlated with sensitivity scores at the .001 level of significance.

II. LITERATURE ON ARTISTIC ABILITY

Writing about the creative attitude of artists Maslow (1964, p.4) states:

> The concept of creativeness and the concept of the healthy, self-actualizing, fully human person seem to be coming closer together, and may perhaps turn out to be the same thing.

Lowenfeld & Brittain (1964) postulate the development of artistic ability through several described stages, noting, like Read (1943) that it can be nurtured, but not implanted. Fiedler (1949, p.vii) on the other hand, suggests that it is to a certain degree common to all mankind: "Artistic ability is an inherent attribute of man's mental nature."

On the basis of research studies, Meier (1939) concluded that there are six major factors in artistic ability: (1) manual skill; (2) energy output and perseveration; (3) aesthetic intelligence; (4) perceptual facility--the ability to observe and recall sensory experience; (5) creative imagination--the ability to organize vivid sense impressions into an aesthetic product; and (6) aesthetic judgement, defined as the ability to recognize unity of composition.

This position is not supported by Cronbach (1960, p.318):

> Research on artistic abilities is still in a most primitive stage. No systematic research has been done using modern tests and adequate criteria. Most of the tests have been left as they were when first designed as much as thirty years ago, without follow-up research or revision.

III. LITERATURE ON SENSITIVITY TO COLOUR

Colour expressiveness. In their book on colour, Cutter & Pepper (1923, p.123) state that "every combination of colours is an emotion.... and art could not dispense with one of them." It is safe to assume that the expressiveness of colour has always been exploited by artists. Desroches-Noblecourt (1962, p.8) writing on the stylized wall paintings of Ancient Egypt, claims every work of art was coloured "as a means of making it more expressive and evocative, of endowing it with magical life." In an article on aesthetics and popular art, Kaplan (1966, p.365) noted that "popular art may be characterized by the kinds of emotion involved in it, or by its means of evoking or expressing them." The impact of colour has always been paramount in art. Waldemar George (1960, p.33) credits van Gogh with stating, "I want to express with red and yellow the frightening passions of men," and Kandisky with saying that "each tone translates an emotional state."

Numerous empirical studies have been made in the field of colour expressiveness. Ross (1938) in his studies on the psychology of the theatre, paid especial attention to the general characteristics of audience reactions to colour and indicated the fertility of the field for further investigatigation.

During recent decades the Gestalt theory of expressiveness of colours, which accords to them in an "original" way a certain emotional character, similar to the "physiognomic" concepts of Werner already

mentioned, has been favoured by Kouwer (1949), Campbell-Fisher (1951), Arnheim, (1949, 1955), Pratt (1961), and others. Rickers-Ovsiankina (1960) refers to colour experience as physiognomic, and notes that colour perception has been identified by some with an entity's gestalt character in terms of its "Wesen"--its intrinsic nature or essence, including all expressive, physiognomic features. The theory is supported by arguments on the isomorphism between different phenomena. Arnheim (1955, p.6) speaks of this isomorphism, or identity of form between psychological and physical processes, and suggests that the experiencing of expressive qualities of colour is due to "physiological forces active in the brain center of vision." Leijonhielm (1967, p.34) on the other hand, states that "theories of isomorphism and the like will probably serve better as starting points for research than as explanations of obscure phenomena."

"Synasthesia", however, has long been a topic for research. It is defined by Warren (1934, p.270) as:

> a phenomenon characterizing the experience of certain individuals, in which certain sensations belonging to one sense or mode attach to certain sensations of another group and appear regularly whenever a stimulus of the latter type occurs.

In their book "The Measurement of Meaning", Osgood, Suci, & Tannenbaum (1957, pp. 20-21) discuss how development of many semantic differential techniques for measuring meaning grew out of experimental research on synasthesia. They note important studies in this field,

particularly that of Odbert, Karwoski, & Eckerson (1942) who found significant interrelationships among colour, mood, and musical experiences, and conclude, "There is a great deal of supporting evidence, of course, for consistent relations between colors and moods." Many investigations have centered around the affective values of colours. Campbell-Fisher (1951, p.16) declared that "intrinsic expressiveness (of colour) as a psychological fact has been demonstrated in psychological research."

One of the earliest empirical studies in this field was that by Bullough (1908). Investigating why a colour was liked, Bullough found that the replies he obtained could be classified under four headings: (1) objective type; (2) physiological type; (3) association type, and (4) character type. Noting that no subject was limited to any one class of reply, but responded according to the problem presented, Bullough concluded that the "character" type of reply revealed a greater depth of involvement with the colour presented, and stated:

> The "temperament" or "character" of a colour on the other hand, is strictly and wholly anthropomorphic; it presents itself with all the reality and objectiveness of the temperament of a real being, and it is precisely this reality and objectiveness which render this aspect of colour so interesting from the psychological and especially from the aesthetic standpoint. (p.433)

Schactel (1943) in a paper contributing to an understanding of the connection between colour and affect used as a psychodiagnostic method in Rorschach's test, refers to numerous scientific and non-scientific sources to substantiate his description of the moods and feelings aroused

by different colours.

Literature is replete with statements concerning the relation of colour and emotional states or moods. Graves (1952, p.79); Burnham, Hanes, & Bartleson (1963, p.206); and Schaie (1966, p.513), all claim there is a growing body of research to support the statements. Schaie (1966) noted that empirical evidence from his earlier experiments (Schaie, 1961a) and those of Wexner (1954) was available to support the hypothesis propounded by Goethe (1840) regarding the arousal function of various colours, at least from the point of view of subjective experience as quantified by means of psychophysical judgements. Schaie (1966, pp. 519-520) presents a summary of a dozen experimental research studies attempting to identify the affective meanings ascribed to colours in accordance with the adjectival mood-tones developed by Wexner (1954, p.432). This literature, together with the research findings of Ross (1938), Schaie (1961b), and those already mentioned, was considered by the writer to be empirical support for the quantitative measurement of sensitivity to colour-mood expressiveness as used in this study. Evidence that the affective value of colour is positively related to brightness and saturation (Guilford, 1931, 1934; Allen & Guilford, 1935; Granger, 1955; Wright & Rainwater, 1962; Cochran, 1968) was also taken into consideration, and used where possible to obtain a more objective measure.

There is also a profusion of literature reporting studies made on the "non-colour-mood" aspects of colour expressiveness, such as

weight, size, warmth, and distance. Burnham, Hanes & Barleson (1963, pp. 206-219) present a codified outline of the basic facts of colour expressiveness (or colour aesthetics) concerning such derived reactions to colour: Burnham, et al. (1963, p.207) state that "when individual differences are ironed out by averaging, aesthetic norms with some claim to validity are obtained." Supporting their findings are papers by Bullough (1907); Bradford (1913); De Camp (1917); Washburn & Grose (1921); Guilford (1931); Gundlach & Macoubrey (1931); Walton, Guilford, & Guilford (1933); Guilford (1934); Allen & Guilford (1935); Walton (1936); Pillsbury & Schaeffer (1937); Taylor & Sumner (1945) Johns & Sumner (1948); Norman & Scott (1952); Granger (1955); and Wright & Rainwater (1962).

Colour discrimination. According to Burnham, et al. (1963, pp. 188-189) colour aptitude, or the ability to work with colour, although considered a unitary special ability, involves a variety of factors divided into two classes: (1) native or in-born factors, such as intelligence, colour vision, and several types of colour discrimination factors; (2) acquired factors caused by learning, such as specific perceptual skills developed through training in making various kinds of colour judgements. They define colour aptitude as a special aptitude and link it with art aptitude:

> Color aptitude, a species of special aptitude, may include a variety of even more specific aptitudes for particular tasks such as painting (art), color-matching, and decorating. (p.188)

This ability, they state, "may be assessed by comparative scores on tests in which colour judgements are made." They note that individuals are often assessed for colour occupations by the use of these tests.

There are many such tests; some designed to measure native, or inborn, colour capacities and to detect colour-vision defects; others to measure the acquired factors; and some to measure both. Of these only a few can be related to the test of sensitivity to colour used in this study. These are the "perceptual" colour discrimination tests, such as the Farnsworth-Munsell 100-Hue Test (FMT) 1943, and the Inter-Society Color Council Color Aptitude Test (ISCC-CAT) (1953), which are similar in some respects to the colour discrimination items used in Section II. The FMT makes it possible to sort people with normal colour vision into three groups with respect to chromaticness discrimination: superior, normal, and low. The ISCC-CAT is scored in terms of accuracy of saturation matches, and makes it possible to sort people, whether they have normal vision or not, into five groups with respect to saturation discrimination: (1) low; (2) satisfactory; (3) good; (4) excellent, and (5) exceptional. The colour discrimination section of the sensitivity to colour test used in this study is unlike these established discrimination tests, however, in that it is designed to assess general colour discriminatory ability in all dimensions of colour, and is not specific to any one dimension.

The effect of training, as encountered in some studies, such as

Stiles (1961), was not considered a factor in this investigation. Stiles (1961, p.219) in an experiment on the colour-matching functions of a group of fifty subjects, found

> some 25 per cent were practised in colorimetric or photometric observations. The rest had little or no experience in color-matching apart from one day's training on the trichromator.

The ages of Stiles' subjects ranged from 16 years to 55 years, with more than 75 per cent being over 23. The ages of the group of subjects used in this study ranged from 15 to 17 years.

IV. LITERATURE ON AESTHETIC INTEREST IN EVERYDAY OBJECTS

Ducasse (1947, p.167) describes aesthetic interest, similarly to Leijonhielm (1967, p.11), as the interest taken in an object for evaluating it "in terms of the pleasure or displeasure it gives us in the mere contemplation." It is also understood in this study to be the "awareness" spoken of by Lamb (1966, p.14): "Education in art is the inculcation of awareness, of imaginative apprehension and sensitivity of response...."

Such interest - awareness is clearly a pleasurable, or hedonic, experience. Young (1959, p.124), in a paper on affective processes and motivation, differentiates between sensory and hedonic intensity in stimulus response, and, equating hedonic intensity with affective arousal, concludes that "affective processes are motivational in the

sense that they arouse, sustain, regulate, direct, and organize neuro-behavioural patterns." Aesthetic interest is such a neuro-behavioural pattern.

MacKinnon (1962, p.490) reporting studies made with the Allport-Vernon-Lindzey Study of Values (1951) states:

> All our creative groups have as their highest values the theoretical and the aesthetic. For creative research scientists the theoretical value is the highest, closely followed by the aesthetic. For creative architects the highest value is the esthetic...."

Lowenfeld & Brittain (1964) in their book showing how a child's general growth is tied up with his creative development, note that at all stages sensitivity to one's environment is a vital factor in the growth of creative expression. Development at the thirteen to seventeen adolescent level is said to involve growth of aesthetic and emotional characteristics regarding creative design, and increased sensitivity to everyday things such as home, community, and nature.

Leijonhielm (1967, pp. 10-11), in referring to reactions to art, distinguishes between appreciation and interest in art, and aesthetic interest in everyday objects--or, as he puts it, "aesthetic interest in utility goods and the products of nature." He used two questionnaires to attain his purpose, one to measure interest in art, the other to measure aesthetic interest in everyday objects. There are other interest inventories, such as the Kuder Interest Inventory (1951) and Strong's

Vocational Interest Blank (1938), and Leijonhielm (1967, pp. 90-93) reports using the Allport-Vernon (1931) value inventory for the development of his own. The aesthetic interest questionnaire designed by Leijonhielm (1967, pp. 171-172) is, however, the only inventory known to the writer that was specifically constructed for this purpose.

CHAPTER III

THE MATERIALS USED

Three instruments were used: (1) the Maitland Graves Design Judgment Test to measure artistic ability; (2) a test constructed for this study to measure sensitivity to colour; and (3) an interest questionnaire to measure aesthetic interest in everyday objects.

In order to ascertain the reliability of the measurement of the sensitivity to colour test a pilot study was made using 110 students enrolled in art courses at Nanaimo Senior Secondary School and 34 students enrolled in art courses at Cowichan Senior Secondary School. Following an analysis of the test results, the Graves test was retained as satisfactory, the colour test was redesigned to provide a more acceptable reliability, and the aesthetic interest questionnaire constructed for the study was replaced by Leijonhielm's Interest Questionnaire No.2 (1967), for which Leijonhielm claimed a reliability index of .91.

I. TEST MATERIALS AND METHODS USED

The Maitland Graves Design Judgement Test. Many empirical studies of the past, such as Leijonhielm's (1967), have used art teachers' subjective assessments of subjects' art abilities, and have been criticized by empiricists such as Vernon (1935, p.528) for "lack of objective criteria of objective worth," and "dubious and subjective standards, such as the opinion of critics and teachers." The same criticism has been

levelled at art ability and art judgement tests--lack of valid objective criteria.

Murray Thomas (1965) defines the shortcomings of present-day art tests, and claims they can only be overcome when the interactions of all the components of art ability are understood. However, Meier (1939) stipulates aesthetic judgement, defined as the ability to recognize unity of composition, as one of the major factors in artistic ability. Many art appreciation and art ability tests have been based upon this premise, such as those of Lewerenz (1927); McAdory (1929); Knauber (1935); Meier (1942); Varnum (1946); Graves (1948); Welsh (1949); and Horn (1953). After examination of these tests, the writer chose the Maitland Graves Design Judgment Test as the most suitable for the purpose of this study.

In the Maitland Graves Design Judgment Test, ability is evaluated according to eight traditional art principles recognized by all artists and critics as fundamental to the production of art. According to the manual provided with the test (1948 Manual, p.1):

> The Graves Design Judgment Test has been devised to measure certain components of aptitude for the appreciation or production of art structure. The test accomplishes this measurement by evaluating the degree to which a subject perceives and responds to the basic principles of aesthetic order--unity, dominance, variety, balance, continuity, symmetry, proportion, and rhythm.

The test is composed of 90 items, each consisting of two or three designs. In each item, one design is planned to conform to the basic

principles of design, as mentioned above and defined by Maitland Graves (1941) while the other design,or designs, violate one or more of these principles. The scores are the number of items for which "correct" responses are given.

Granger (1955) used the Graves test in his studies in aesthetic psychology "because of its reliability, and the additional advantage that it discriminates between art and non-art students". He reported a reliability coefficient of .90.

According to Leijonhielm (1967, p.61) the Maitland Graves Design Judgment Test is one of the tests used for scholastic and vocational guidance.

The Sensitivity to Colour Test. This instrument consists of two parts: (1) sensitivity to the expressiveness of colour, and (2) colour discrimination. There are forty questions; twenty-six of them in Section I based on the colour-mood adjectives developed by Wexner (1954, p.432), and fourteen in Section II based on "just perceptible differences" as used in colour-vision and colour ability tests, such as the Holmgren Wool Test (1877-1878); the Nagel anomaloscope; the Farnsworth-Munsell 100 Hue test (1943); the Inter-Society Color Council Color Aptitude Test (1956), and the Pickford Four-Colour Test (1957). In view of the singularity of Section I--there being no other (known) similar test in existence--the criterion-related validity of this test cannot be established. It is essentially experimental, designed to

measure the construct of sensitivity to colour as defined in this paper. Construct validity is claimed on the grounds that the literature cited establishes isomorphism between colour and mood (or feeling); and that the test items possess objectivity of modal experience as defined by Leijonhielm (1967, p.40):

> When a colour is judged from one of the aspects saturation agitation, beauty, it is experienced as having, to some extent, the quality judged. The object (colour) is not always experienced as possessing the quality to one and the same extent. Experiencing that occurs oftener than experiencing that the object possesses the quality to other extents. This experience is called the modal experience.

Regarding content validity, the universe of modal experiences represented by the test is clearly shown in Table I, p.22. The samples chosen for the test were selected as those most representative and possessing highest objectivity in terms of the literature cited. The writer submits that: (1) the test items, singly and collectively, are relevant samples of the knowledge and performance which they purport to measure, and (2) the psychometric requirements stipulated for the design of such tests by Norman & Scott (1952, p.219) are met:

> Psychological experience may be successfully measured only when terms are operationally defined. If we can define it in measurable terms, it will then become objective reality.

Further description of this test, (1) construction, (2) design and (3) item description, is given in the Appendix.

The Leijonhielm Interest Questionnaire. Leijonhielm (1967, pp. 171-172) used two aesthetic interest questionnaires in his experimental

study. Both use the inventory method to measure interest and are related to current interests. The first, "Questions on art", is composed of thirteen questions, such as, "Do you like going to art galleries?" The second, "Are you interested?" requires the examinee to indicate degrees of interest in nineteen everyday objects, from houses to landscapes, by the use of four alternative responses--Very little; Not particularly; Rather much; Very much. Responses are scored from 0 to 3, of which 3 indicates the highest degree of intensity.

The second interest questionnaire was considered by the writer to constitute a reliable instrument of measurement for establishing the third variable of this study--aesthetic interest in everyday objects. Leijonhielm (1967, p.9) reported a split-half reliability coefficient (corrected according to Spearman-Brown) of 0.91. The questionnaire, called by the writer "The Leijonhielm Interest Questionnaire No. 2", was found to have great practical applicability. Only a few minutes were required for the responses, and the scoring was easy.

TABLE I

AFFECTIVE MEANING FOUND TO BE ASCRIBED TO VARIOUS COLOURS

Mood-Tones (Wexner, 1954)	Colour	Studies reporting high association value	Colour	Low or no assn.
1. Exciting, stimulating	Red	Karwoski (1938); Lewinski (1938); Ross (1938); Odbert, et al.(1942); Kouwer (1949) Wexner (1954); Murray (1957); Schaie (1961a)	Purple	Schaie (1961a)
	Orange	Lewinski (1938); Ross (1938); Schaie (1961a)	Brown	Wexner (1954); Schaie (1961a).
	Yellow	Karwoski (1938); Schaie (1961a)		
2. Secure, comfortable	Blue	Napoli (1951); Wexner (1954); Schaie (1961a);	Red	Wexner (1954)
	Brown	Wexner (1954); Schaie (1961a)	Purple	Wexner (1954)
	Green	Murray (1957)	Black	Wexner (1954); Schaie (1961a)
3. Distressed, disturbed, upset	Black	Wexner (1954); Schaie (1961a)	Blue	Wexner (1954) Schaie (1961a)
	Orange	Wexner (1954)	Yellow	Wexner (1954)
4. Tender, soothing	Blue	Hevner(1935); Odbert,et al. (1942); Wexner (1954); Murrary (1967); Schaie (1961a)	Red	Wexner (1954); Schaie (1961a)
	Green	Rose (1938); Odbert,et. al. (1942); Wexner (1954)	Orange	Werner (1954); Schaie (1961a)
5. Despondent, dejected, unhappy, melancholy	Black	Karwoski (1938); Odbert, et al. (1942); Bricks (1944); Kouwer (1949); Napoli (1951)	Yellow	Werner (1954) Schaie (1961a)
		Wexner (1954); Hofstaetter (1958); Schaie (1961a)	Red	Wexner (1954)
			Orange	Wexner (1954)
			Green	Schaie (1961a)
	Purple	Lewinski (1938); Kouwer (1949); Napoli (1951); Murray (1957)	Blue	Schaie (1961a)
6. Calm, peaceful, serene	Blue	Hevner (1935); Karwoski (1938); Odbert, et al. (1942); Wexner (1954)	Red	Wexner (1954); Schaie (1961a)
	Green	Karowski (1938); Ross (1938); Odbert, et al. (1942); Wexner (1954); Murray (1957)	Orange	Wexner (1954) Schaie (1961a)

TABLE I (continued)

7. Dignified stately	Purple	Ross (1938); Wexner (1954); Schaie (1961a)	Orange	Wexner (1954) Schaie (1961a)
	Black	Odbert, et al. (1942); Wexner (1954); Schaie (1961a)	Green	Wexner (1954) Schaie (1961a)
	White	Karwoski (1938); Odbert, et al. (1942)		
8. Cheerful, jovial, joyful	Yellow	Ross (1938); Odbert, et al. (1942); Wexner (1954); Murray (1957); Schaie (1961a)	Purple	Wexner (1954) Schaie (1961a)
	Orange	Kouwer (1949); Ross (1938); Hofstaetter (1958)	Brown	Wexner (1954) Schaie (1961a)
	Red	Hevner (1935); Odbert, et al. (1942)	Black	Wexner (1954) Schaie (1961a)
9. Defiant, contrary, hostile	Red	Bricks (1944); Wexner (1954); Murray (1957)	Blue	Wexner (1954) Schaie (1961a)
	Black	Wexner (1954); Schaie (1961a)	Green	Wexner (1954) Schaie (1961a)
			Yellow	Wexner (1954) Schaie (1961a)
10. Powerful, strong, masterful	Red	Odbert, et al. (1942); Wexner (1954); Murray (1957); Hofstaetter (1958); Schaie (1961a)	Green	Wexner (1954) Schaie (1961a)
	Black	Wexner (1954); Hofstaetter (1958); Schaie (1961a)	Brown	Wexner (1954) Schaie (1961a)
	Purple	Karowski (1938); Ross (1938); Odbert, et al. (1942)		
11. Warmth	Orange	Lewinski (1938); Ross (1938); Schactel (1943) Wright & Rainwater (1962); Schaie (1963, 1966)	Purple	Ross (1938) Schaie (1966)
			Blue	Lewinski (1938) Newhall (1941)
	Red	Guilford (1934); Lewinski (1938); Newhall (1941); Wright & Rainwater (1962); Schaie (1963, 1966)	Blue-Green	Newhall (1941) Wright & Rainwater (1962)
			Steel-Blue	Ross (1938)

TABLE I (continued)

12. Coolness	Blue	Guilford (1934); Lewinski (1938); Newhall (1941); Schactel (1943)	Yellow-Red	Guilford (1934); Newhall (1941)
	Blue-Green	Newhall (1941); Wright & Rainwater (1962)	Red	Guilford (1934); Lewinski (1938); Newhall (1941); Wright & Rainwater (1962); Schaie (1963, 1966)
	Green	Guilford (1934); Lewinski (1938); Schactel (1943)		
13. Advancing-apparent nearness	Red	Schactel (1943)		
	Bright Colours	Taylor & Sumner (1945); Johns & Sumner (1948)		
14. Receding - apparent distance	Blue	Schactel (1943)		
	Dull Colours	Taylor & Sumner (1945); Johns & Sumner (1948)		
15. Weight-apparent heaviness or lightness	The Relative Value & Intensity Highest is Heaviest	Bullough (1907); De Camp (1917); Ross (1938)		
16. Size-apparent largeness or smallness	Relative Value & Intensity. Highest is Largest	Gundlach & Macoubrey (1931)		

The property of advancing and receding is never the intrinsic property of a colour, it is the property acquired from the context in which the colour appears. (Taylor, 1969, p.192)

These research papers report that apparent weight is dependent on the factors of relative darkness (value) and relative intensity (saturation).

Gundlach & Macoubrey (1931) found apparent size to be directly related to luminosity (lightness or brightness, light intensity).

Comments:

1. Research findings show considerable overlapping of values in yellow and purple-blue regions.
2. Some greens are considered warm by Schaie (1963, p.533).

CHAPTER IV

METHOD AND RESULTS OF STUDY

I. METHOD

Subjects. The subjects were one hundred 15 to 17 year old students enrolled in art courses at two junior secondary schools in Cowichan, British Columbia. The group was comprised of 52 girls and 48 boys.

Procedure. Test conditions were controlled by the writer personally administering the two tests and questionnaire to all subjects. The tests and questionnaire were given consecutively in a 50 minute period in the order of: (1) Leijonhielm's Interest Questionnaire No. 2; (2) Maitland Graves Design Judgment Test; (3) Sensitivity to Colour Test. The risk of consciously erroneous responses and "response styles" (e.g. the practice of marking a too-high alternative rather than a too-low in cases of uncertainty) were kept to a minimum by the writer avoiding the use of the word "aesthetic" and stressing the fact that no results would be reported to teachers or other persons with whom the respondent would be concerned. To ensure maximum discriminability for Section II of the colour test, it was administered under normal daylight conditions with no artificial illumination, vide Hurvich and Jameson (1966, p.51): "It is found that relative discriminability tends to be best at the test field luminance which approximates that of the surround level." This means that discrimination of diffential threshold

values is best performed in the absence of glare. Definitions of the colour-mood terms "dignity and stateliness", "despondency and dejection", stimulating", "hostility", and "security" were given to the subjects at the commencement of the session and placed on the blackboard. The subjects were also urged to request further clarification of word meanings where necessary to ensure complete understanding of the mood involved. Several of them did so, requesting definition of one or more of the words "exciting", "defiance", and "comfortable". All subjects expressed enjoyment of the procedure and there were no signs of stress or resentment. IBM answer sheets were used for both tests, which were in booklet form.

Technique. To test the hypothesis that artistic ability is significantly related to sensitivity to colour and aesthetic interest in everyday objects a Pearson product-moment correlation coefficient was obtained for each relationship. The variables were defined as:

X = the criterion variable: artistic ability

Y = the variable of sensitivity to colour

Z = the variable of aesthetic interest in everyday objects

The first correlation, r_{xy}, was between the criterion variable and sensitivity to colour; r_{xz}, was between the criterion variable and aesthetic interest in everyday objects; and r_{yz} was between sensitivity to colour and aesthetic interest in everyday objects. A multiple-correlation coefficient ($R_{x.yz}$) between the criterion variable and the other two variables was computed to determine the degree to which, taken together

as predictor variables, they actually predict.

A two-tail critical-ratio z test was used to determine significance at the .05 level for all interrelationships. The null hypotheses were:

$$r_{xy} = 0 \; ; \; r_{xz} = 0 \; ; \; r_{yz} = 0 \; ; \; R_{x.yz} = 0$$

II. RESULTS

Means, standard deviations, and reliability coefficients. The Maitland Graves Design Judgment Test was found to produce a mean of 56.64 and a standard deviation of 12.40 for the group of student subjects. A KR20 reliability coefficient was calculated and a value of 0.88 obtained, indicating a satisfactory reliability for this application. The Graves Design Judgment Test Manual (1948, p.3) reports a mean of 55.80, a SD of 13.8, and reliability of value of .93 for Senior art majors in Yonkers (N.Y.) High Schools, using a group of 46 subjects. No figures are reported for Junior art students.

The mean for the Sensitivity to Colour Test was 22.31 and the standard deviation 4.95. The KR20 reliability value computed was 0.669, which is a little below the minimal 0.80 usually required, but satisfactory in view of the limited number of questions (40).

The mean calculated for results of the Leijonhielm Interest Questionnaire was 29.40 and the SD 9.896. No test-retest reliability coefficients were obtainable. The test-retest reliability of 0.91 reported

by Leijonhielm (1967, p.94) was accepted by the writer as a satisfactory index.

Correlation between artistic ability and sensitivity to colour. The computed value of this correlation was 0.218. A two-tail critical-ratio z test was used and the correlation shown to be significant at the .05 level. The null hypothesis that $r_{xy} = 0$ was rejected.

Correlation between artistic ability and aesthetic interest in everyday objects. The correlation coefficient was 0.197. Positive relationship was shown using a two-tail test at the .05 significance level. The null hypotheses that $r_{xz} = 0$ was rejected.

Correlation between sensitivity to colour and aesthetic interest in everyday objects. The Pearson product-moment correlation coefficient computed was 0.270. Using a two-tail test the obtained z value was significant at the .05 level. The null hypothesis that $r_{yz} = 0$ was rejected.

The multiple-correlation between artistic ability and the two variables sensitivity to colour and aesthetic interest in everyday objects. The multiple-correlation computed according to Bruning and Kintz (1968, pp. 171-172) was 0.261 which is significant at the .05 level. The null hypothesis that $R_{x.yz} = 0$ was rejected.

TABLE 2

CORRELATIONS AMONG ARTISTIC ABILITY, SENSITIVITY TO COLOUR, AND AESTHETIC INTEREST IN EVERYDAY OBJECTS

	Graves Test	Colour Test	Interest Question.	Colour Test and Int. Question.
Graves Test	0.881++	0.218*	0.197*	0.261*
Colour Test		0.669++	0.270*	
Interest Question.			0.91+	

++ KR 20 reliability coefficient

* Significant at the .05 level

\+ Reported test-retest reliability (Leijonhielm)

CHAPTER V

SUMMARY AND CONCLUSIONS

I. SUMMARY

The significant, but low, intercorrelations found in this study between the variables confirm the hypothesis that sensitivity to colour and aesthetic interest in everyday objects are related to artistic aptitude as measured by the Maitland Graves Design Judgment Test; that artists are more sensitive to colour and aesthetically interested in the things around them than non-artists. However, a correlation of .261, while indicating a significant relationship, is not of appreciable value in attempting to predict for individual students. The results also verify conclusions held by researchers concerning the objective stimulus properties of colours, and signify the existence of affective-value colour "norms". Substantial differences in the observed responses of some subjects to the expected responses was considered significant and perhaps worthy of further investigation in the field of personality assessment. Another significant response noted was the group's total acceptance, without question, of the colour test format. Nobody suggested that, for him, the simple colour stimuli presented in Section I did not have an affective value. It was accepted as a "fact of life"--"Why, everybody knows that!" Whether, or how much, these responses were dependent on an aesthetic factor of a biological nature or on experiences associated with colour, it was not possible for this study to determine. Identification

of the variables "sensitivity to colour" and "aesthetic interest in everyday objects" as related factors of artistic ability, indicate that the rationale for measurement of the variety of components that constitute artistic ability by the use of three tests, proposed by Thomas (1965, p.187), could profitably be expanded to include measurements of these attributes.

II. CONCLUSIONS

The main limitation of this study is that the sample used was taken from art classes in Grades 9 and 10 in a rural area of British Columbia. Whether or not the results apply to elementary school age children or to adults taken randomly from the population has yet to be determined. However, based on the evidence from this study the following conclusions are tentatively offered:

1. Colour sensitivity is one of the many special abilities comprising the unitary special ability of artistic aptitude.
2. Colour sensitivity is an ability that can be defined behaviourally.
3. Colour sensitivity is an ability that can be measured quantitatively by psychometric means.
4. Norms of the affective values of colours have been established empirically and are profitable for the measurement of sensitivity to colour expressiveness.

5. Aesthetic interest in everyday object is, to a certain degree, a manifestation of artistic ability.
6. Aesthetic interest in everyday objects can be measured by Leijonhielm's Interest Questionnaire No. 2 with a satisfactory degree of validity if consciously erroneous answers and response styles can be avoided.

Implications for Further Research. Young childrens reactions to colour is a very fertile field for further research. At what age is the response to the affective value of colours, as measured by the colour test, present? To what degree is this response a learned response? and to what degree physiognomic perception? Do older people make a better score on this test? Are the differences in the norms of measurement applicable from one culture to another? To what degree can colour sensitivity be nurtured by the art teacher? and should its development be included in school art courses? The low correlation obtained between artistic ability and sensitivity to colour might be raised by further refinement of the sensitivity to colour test for more precise measurement. Another study using another art ability test such as the Educational Testing Service's Graduate Record Examinations Advanced Fine Arts Test (1951) and an older group of subjects such as first year College of Art Students, might possibly reveal a much higher correlation and result in a battery of measuring instruments of higher art ability predictive value than any existing at the present time. The questionnaire

should also prove of help to future researchers for the measurement of growth in the affective domain as described by Krathwohl (1956, p.37).

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APPENDIX A

SENSITIVITY TO COLOUR TEST

I. CONSTRUCTION

The test is in booklet form with separate answer sheet. It consists of twenty 8 1/2" x 11" pages with two questions on each page, and is in two sections, the first section having twenty-six questions, the second fourteen. Each question in the first section is placed beneath four rectangular pieces of coloured paper (stimulus objects) which in questions six, twelve, and twenty-one are sized 1/2" x 2 1/4", and in the rest of the questions 1" x 1 1/4".

Each question requires the respondent to examine the colours presented and indicate the colour he considers to constitute the "correct" answer by checking the appropriate space on the answer sheet.

In Section 1 the 1" x 1 1/4" stimulus objects are affixed to the white paper in a row 1" above the questions, are lettered A, B. C, and D and spaced 5/8" apart. The 1/2" x 2 1/4" stimulus objects are placed 3/8" above the questions, are lettered A, B, C, and D, and spaced one and one sixth inches apart. In Section 2 many items are provided with a fifth increment above the four lettered stimulus objects, or coloured rectangles, for matching or comparison purposes.

The stimulus objects were cut from 6" x 9" coloured-paper swatches

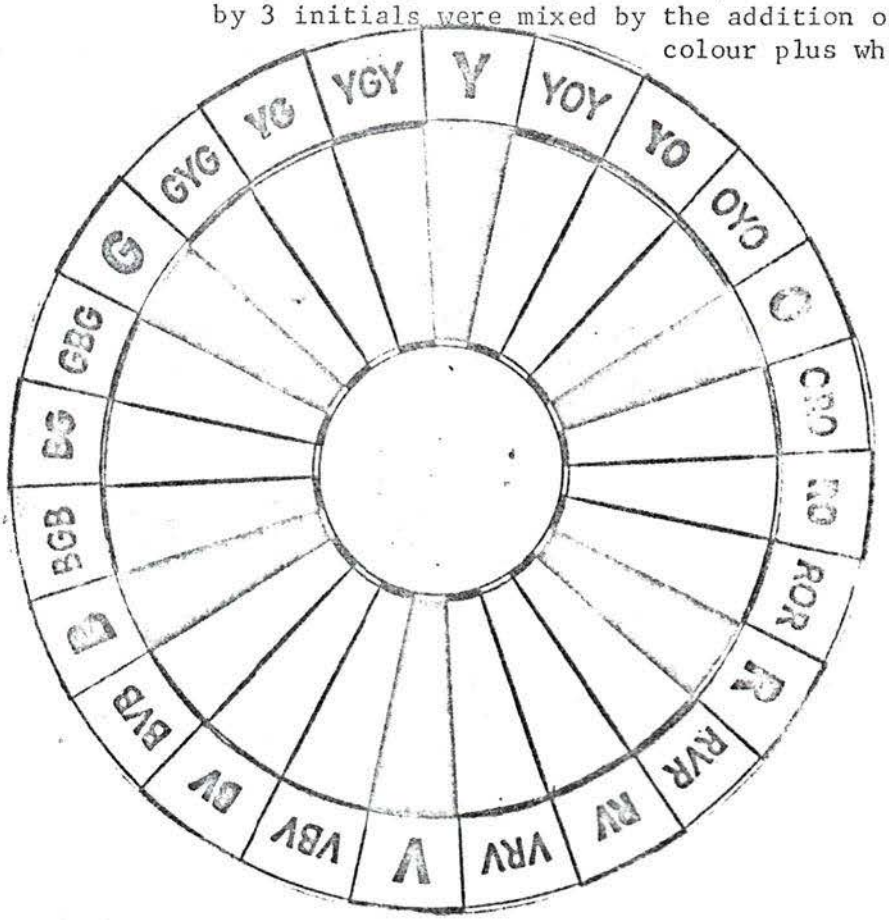
printed and supplied in packets of 202 coordinated colours by Color-Aid Co., 116 E. 27th Street, New York, N.Y. 10016. Sixteen of the 24 different hues were used, plus 135 tints or shades, black and 2 grays. Coordination of the colours is as follows:

	Y	YOY	YO	OYO	O	ORO	RO	ROR	R	RVR	RV	VRV	V	VBV	BV	BVB	B	BGB	BG	GBG	G	GYG	YG		
HUE																									1
T-1																									2
T-2																									3
T-3																									4
T-4																									5
S-1																									6
S-2																									7
S-3																									8

MIXTURE OF COLOURS

Tints -- Hue plus white

Shades -- Hue plus complementary color. (The shades of hues designated by 3 initials were mixed by the addition of the complementary colour plus white).



The initials used are:

Y = Yellow
V = Violet
O = Orange
B = Blue
R = Red
G = Green

T = Tint
S = Shade

APPENDIX A

II. DESIGN

Section I. Sensitivity to the Expressiveness of Colour

Page	Item	Affective value	Colour stimuli A	B	C	D	Answer
1	1	Exciting	RO-Hue	G-T1	YO-Hue	VBV-T1	A
	2	Distance	YOY-T1	RO-Hue	B-T4	YG T1	C
2	3	Dignity & Stateliness	Y-T3	GBG-Hue	V-S1	RO-S1	C
	4	Defiance	RO-T4	B-T1	RV-S3	Black	D
3	5	Coolness	ORO-S1	RVR-T4	GYG-Hue	V-T4	C
	6	Despondency & Dejection	Gray 8	ORO-T4	YGY-Hue	ROR-Hue	A
4	7	Power	YOY-Hue	R-Hue	YG-Hue	B-T1	B
	8	Heaviest	B-S2	B-S1	B-S1	B-S3	D
5	9	Calmness	VBV-T1	B-T2	OYO-T2	RO-S1	B
	10	Nearness	V-S2	BG-S3	ORO-T1	Gray 7	C
6	11	Cheerfulness	Y-Hue	YO-Hue	RV-S2	B-T3	A
	12	Tenderness	GYG-T1	Y-T1	O-S3	RV-S2	A
7	13	Warmth	BG-S1	BGB-S1	VBV-T1	O-S1	D
	14	Comfortable	YOY-T2	O-S3	ROR-T1	Black	B
8	15	Stimulating	VBV-T2	O T1	RO-S3	YGY-T3	B
	16	Largest	Y-T1	Y-T2	Y-T4	Y-T2	A
9	17	Peace & Serenity	VRV-T2	ORO-S1	R-T3	B-T3	D
	18	Distress	GYG-T4	YOY-Hue	ORO-Hue	BG T2	C
10	19	Lightest weight	VBV-T4	BG-T3	GYG-S3	BVB-T3	A
	20	Unhappiness	Y-T3	VRV-Hue	GYG-T3	RO-T2	B
11	21	Strength	Black	YG-T2	Y-T1	O-S2	A
	22	Soothing	Y-S1	RO-T2	VRV-T4	B-T1	C
12	23	Smallness	BVB-T4	GBG-T4	YG-S1	Y-T2	C
	24	Hostility	VBV-Hue	ORO-Hue	BG-T2	YOY-Hue	B
13	25	Joyfulness	BGB-T4	O-S3	ROR-Hue	V-T1	C
	26	Security	OYO-T2	V-S1	RO-T2	B-Hue	D

Section II. Colour Discrimination

Page	Item		Increment above	A	B	C	D	Answer
14	27	Darkest		RVR-S2	YOY-S1	OYO-S1	OYO-T3	A
	28	Most blue		B-S1	BV-Hue	B-Hue	B-S2	C
15	29	Not the same	R-S3	R-S3	R-S3	R-S3	V-S2	D
	30	Is the same	RVR-T4	R-T4	RVR-T4	R-T4	RV-T4	B
16	31	Tint of	OYO-Hue	O-T4	OYO-T4	O-T3	ORO-T4	B
	32	Most red		RO-Hue	R-Hue	RVR-Hue	ROR-Hue	B
17	33	Lightest colour		YOY-T4	Y-T3	YGY-T4	Y-T4	D
	34	Most green		GYG-Hue	YG-Hue	YG-T1	YGY-Hue	A
18	35	Is the same	GYG-T4	YG-T4	YG-T4	GYG-T3	GYG-T4	D
	36	Not a tint	BV-Hue	VBV-T4	BV-T3	BV-T2	BV-T1	A
19	37	Nearest colour	YGY-S3	YGY-S2	YOY-S3	YOY-S2	YOY-S3	A
	38	Is the same	YGY-S2	YGY-S3	YGY-S1	YGY-S2	YGY-S1	C
20	39	Not a shade	VBV-Hue	VBV-S1	RV-T2	VBV-S3	VBV-S2	B
	40	Most yellow		RO-T4	O-T3	OYO-T1	O-T2	C

APPENDIX A

III. ITEM DESCRIPTION

Section I: Sensitivity to the Expressiveness of Colours. The adjectival mood-tones used (e.g. "exciting", "comfortable", etc.) were those used by Wexner (1954, p.432) to determine the degree to which colours (hues) are associated with moods. The other affective-value norms used are those described in page of this study. The colour initials used are: Y = Yellow; V = Violet; O = Orange; B = Blue; R = Red; G = Green; T = Tint (there are 4); S = Shade (there are 3).

Item 1.

Colours: (A) RO-Hue; (B) G-T1; (C) TO-Hue; (D) VBV-T1.

Question: Which ONE of the above colours is the most EXCITING?

Answer: (A) RO-Hue: Biserial correlation 0.292: Item difficulty 0.436

References: Karwoski (1938); Lewinski (1938); Ross (1938); Odbert, Karwoski & Eckerson (1942); Wexner (1954); Murray (1957); Schaie (1961).

Comment: The references given for establishing "norms" are empirical studies. Supportive statements on these psychological aspects of colour are given in many works by students of colour.[1]

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1. Irwin (1923); Sargent (1923); Patmore (1933); Katz (1935); Meier (1942); Evans (1948); Fiedler (1949); Read (1951); Graves (1952); Arnheim (1956); Elliott (1958); Itten (1961); Ellinger (1963); Judd (1963); Renner (1964); Taylor (1964); Smith (1965); Divalentin (1966); Friend (1966); Arens (1967); Fabri (1967); Feldman (1967); Heath (1967); and Birren (1969).

Item 2.

Colours: (A) YOY-T1; (B) RO-Hue; (C) B-T4; (D) YG-T1

Question: Which one of the above colours gives the greatest effect of DISTANCE?

Answer: (C) B-T4: Biserial correlation = 0.457: Item difficulty = 0.663

References: Schactel (1943); Taylor (1969)

Item 3.

Colours: (A) Y-T3; (B) GBG-Hue; (C) V-S1; (D) RO-S1

Question: Which One of the above colours best expresses DIGNITY AND STATELINESS?

Answer: (C) V-S1: Biserial correlation = 0.333: Item difficulty = 0.604

References: Ross (1938); Odbert, et.al.(1942); Wexner (1954); Schaie (1961)

Item 4

Colours: (A) RO-T4; (B) B-T1; (C) RV-S3; (D) Black

Question: Which ONE of the above colours best expresses DEFIANCE?

Answer: (D) Black: Biserial correlation = 0.363: Item difficulty = 0.713

References: Wexner (1954); Schaie (1961).

Comment: The adjectives "defiant", "contrary", "hostile", are given by Wexner (1954) as connotations of the same mood tone. Red and black are reported by empirical research to be highly associated with this mood-tone. They are both used in this study-- black for the required response to Question 4, and red for Question 24.

Item 5.

Colours: (A) ORO-S1; (B) RVR-T4; (C) GYG-Hue; (D) V-T4

Question: Which ONE of the colours above is most expressive of COOLNESS?

Answer: (C) GYG-Hue: Biserial correlation = 0.132: Item difficulty = 0.327

References: Guilford (1934); Lewinski (1938); Schactel (1943)

Comment: The inclusion of other increments with an element of "coolness" was designed to offset the immediacy of green as the required response.

Item 6.

Colours: (A) Gray #8; (B) OYO-T4; (C) YGY-Hue; (D) ROR-Hue

Question: Which ONE of the above colours best expresses DESPONDENCY and DEJECTION?

Answer: (A) Gray #8 (very dark -- almost black, but not as saturated as black) Biserial correlation = 0.473: Item difficulty = 0.505

References: Karwoski (1938); Odbert et al. (1942) ; Bricks (1944); Kouwer (1949); Napoli (1951); Wexner (1954); Hofstaetter (1958); Schaie (1961).

Item 7.

Colours: (A) YOY-Hue; (B) R-Hue; (C) YG-Hue; (D) B-T1

Question: Which ONE of the above colours is most expressive of POWER?

Answer: (B) R-Hue: Biserial correlation = 0.358: Item difficulty = 0.564

References: Odbert et al.(1942); Wexner (1954); Murray (1957); Hofstaetter (1958); Schaie (1961a).

Comment: This is reported as the strongest of three colours having this affective value.- red, black, and purple.

Item 8.

Colours: (A) B-S2; (B) B-S1; (C) B-S1; (D) B-S3

Question: Which ONE of these colours appears to be the HEAVIEST?

Answer: (D) B-S3: Biserial correlation = 0.394: Item difficulty = 0.911

References: Bullough (1907); DeCamp (1917); Ross (1938).

Comment: All investigators agree that the apparent weight of a colour is dependent on two factors: (1) relative darkness (value); and (2) relative intensity (saturation).

Item 9.

Colours: (A) VBV-T1; (B) B-T2; (C) OYO-T2; (D) RO-S1.

Question: Which ONE of the above colours gives the greatest effect of CALMNESS?

Answer: (B) B-T2: Biserial correlation = 0.509: Item difficulty = 0.624

References: Hevner (1935); Karwoski (1938); Odbert et al. (1942); Wexner (1954).

Item 10.

Colours: (A) V-S2; (B) BG-S3; (C) ORO-T1; (D) Gray #7

Question: Which ONE Of these colours gives the greatest effect of NEARNESS?

Answer: (C) ORO-T1: Biserial correlation = 0.366: Item difficulty = 0.614

References: Schactel (1943); Taylor & Sumner (1945); Johns & Sumner (1948).

Comment: Taylor (1969, p.192) states that "the property of advancing and receding is never the intrinsic property of a colour, it is the property acquired from the context in which the colour appears." Schactel (1943) names "red" as having the most apparent "nearness", and both Taylor & Sumner (1945) and Johns & Sumner (1948)conclude the property "nearness" is intrinsic to "bright colours". The writer has attempted to include all these factors in the design of this item.

Item 11.

Colours: (A) Y-Hue; (B) YO-Hue; (C) RV-S2; (D) B-T3.

Question: Which of the colours above is most expressive of CHEERFULNESS?

Answer: (A) Y-Hue: Biserial correlation = 0.578: Item difficulty = 0.842

References: Ross (1938); Odbert, et al. (1942); Wexner (1954); Murray (1957); Schaie (1961 a).

Comment: Red and orange are also reported by research to have this affective meaning, but to a lesser degree. Red is not included in the stimulus objects. The inclusion of Yellow-Orange is considered justified as a lesser variable, the Yellow now requiring greater perspicacity of choice.

Item 12.

Colours: (A) GYG-T1; (B) Y-T1; (C) O-S3; (D) RV-S2.

Question: Which of the above colours best expresses the feeling TENDERNESS?

Answer: (A) GYG-T1: Biserial correlation = 0.316: Item difficulty = 0.257

References: Ross (1938); Odbert, et al. (1942); Wexner (1954).

Comment: The mood-tone "tenderness" is ascribed to both blue and green by researchers. Blue was purposely not used in the design for this item, as it is employed for the mood-tone "peace and serenity" in Question 17.

Item 13.

Colours: (A) BG-S1; (B) BGB-S1; (C) VBV-T1; (D))-S1

Question: Which ONE of these colours is most expressive of WARMTH?

Answer: (D) O-S1: Biserial correlation = 0.514: Item difficulty = 0.455

References: Lewinski (1938); Ross (1938); Schactel (1943); Wright & Rainwater (1962); Schaie (1963, 1966).

Comment: The colour stimulus O-S1, being a shade of orange, was chosen for this design in preference to O-Hue in order to avoid immediacy of identification.

Item 14.

Colours: (A) YOY-T2; (B) O-S3; (C) ROR-T1; (D) Black

Question: Which of the colours given above is most expressive of the word COMFORTABLE?

Answer: (B) O-S3 (brown): Biserial correlation = 0.640: Item difficulty =0.178

References: Wexner (1954); Schaie (1961a, 1961b).

Comment: Wexner found blue to be the colour most associated with the mood tone "secure, comfortable", with brown having the next highest frequency. Blue is used in Question 26 in association with the feeling of "security".

Item 15

Colours: (A) VBV-T2; (B))-T1; (C) RO-S3; (D) YGY-T3

Question: Which ONE of these colours is the most STIMULATING?

Answer: (B))-T1: Biserial correlation = 0.316: Item difficulty = 0.347

References: Lewinski (1938); Ross (1938); Schaie (1961a)

Comment: The other colour, red, has already been used in Question 1 for the mood-tone "exciting".

Item 16.

Colours: (A) Y-T1; (B) Y-T2; (C) Y-T4; (D) Y-T2

Question : Which of the above colours appears to be the LARGEST?

Answer: (A) Y-T1: Biserial correlation = 0.004: Item difficulty = 0.574

References: Gundlach & Macoubrey (1931).

Comment: The writer is aware of no other studies made of this particular aspect of colour. Gundlach & Macoubrey (1931, p.111) found apparent size to be "directly related to luminosity (lightness or brighteness, light intensity) of the colours involved."

Item 17.

Colours: (A) VRV-T2; (B) ORO-S1; (C) R-T3; (D) B-T3

Question: Which one of the colours above is most expressive of PEACE and SERENITY?

Answer: (D) B-T3: Biserial correlation = 0.518: Item difficulty = 0.376

References: Hevner (1935); Karwoski (1938); Odbert, et al. (1942); Wexner (1954).

Comment: Difficulty of choice was maintained by using a tint of blue and introducing VBV-T2 in the design.

Item 18.

Colours: (A) GYG-T4; (B) YOY-Hue; (C) ORO-Hue; (C) BG-T2

Question: Which of these colours best expresses the feeling of DISTRESS?

Answer: (C) ORO-Hue: Biserial correlation = 0.425: Item difficulty = 0.584.

References: Wexner (1954); (Schaie (1961b)

Comment: Acuity of choice was rendered possible by inclusion of other colour stimuli known to have very little association, or no association, with the mood-tone "distress" (Wexner, 1954; Schaie, 1961b).

Item 19.

Colours: (A) VBV-T4; (B) BG-T3; (C) GYG-S3; (D) BVB-T2

Question: Which of the above colours appears to have the LIGHEST WEIGHT?

Answer: (A) VBV-T4: Biserial correlation = 0.444: Item difficulty = 0.564

References: Bullough (1907); DeCamp (1917).

Comment: As mentioned under Item 8, related studies report apparent weight is dependent on the factors of relative darkness (value) and relative intensity (saturation). The greater these factors, the greater the apparent (comparative) weight. Of the four stimulus objects presented (A) VBV-T4 has the least of each.

Item 20.

Colours: (A) Y-T3; (B) VBV-Hue; (C) GYG-T3; (D) RO-T2

Question: Which of these colours is most expressive of UNHAPPINESS?

Answer: (B) VBV-Hue: Biserial correlation = 0.350: Item difficulty = 0.525

References: Lewinski (1938); Kouwer (1949); Napoli (1951); Murray (1957)

Comment: The colour "black" has also been found by many researchers to have high association with the mood-tone "despondent, dejected, unhappy, melancholy". (see under Item 6).

Item 21.

Colours: (A) Black; (B) YG-T2; (C) Y-T1; (D) O-S2

Question: Which of the colours given above is most expressive of STRENGTH?

Answer: (A) Black: Biserial correlation = 0.211: Item difficulty = 0.882

References: Wexner (1954); Hofstaetter (1958); Schaie (1961a)

Comment: The adjectives "powerful", "strong", and "masterful" are grouped together by Wexner (1954) as constituents of the same mood-tone. Red, black, and purple are reported in different studies as having this affective value. Red has already been used in Item 7 for this purpose.

Item 22.

Colours: (A) Y-S1; (B) RO-T2; (C) VRV-T4; (D) B-T1

Question: Which ONE of these colours do you consider to be the most SOOTHING?

Answer: (C) VRV-T4: Biserial correlation = 0.279: Item difficulty = 0.495

References: Ross (1938)

Comment: There is ample data available on the affective value of "purple", but the writer is aware of no empirical studies, apart from that of Ross (1938) on the affective value of "violet".

Item 23.

Colours: (A) VBV-T4; (B) GBG-T4; (C) YG-S1; (D) Y-T2

Question: Which of the colours above gives the greatest effect of SMALLNESS?

Answer: (C) YG-S1: Biserial correlation = 0.518: Item difficulty = 0.218

References: Gundlach & Macoubrey (1931)

Comment: This affective value is the opposite of that in Question 16 and derived from the same empirical study. Gundlach & Macoubrey name "luminosity" (white = 100%; black = 0%) as the determining factor.

Item 24.

Colours: (A) VBV-Hue; (B) ORO-Hue; (C) BG-T2; (D) YOY-Hue

Question: Which of these colours best expresses the feeling of HOSTILITY?

Answer: (B) ORO-Hue: Biserial correlation = 0.314: Item difficulty = 0.515

References: Bricks; Wexner (1954); Murray (1957)

Item 25.

Colours: (A) BGB-T4; (B) O-S3; (C) ROR-Hue; (D) V-T1

Question: Which ONE of the colours above is most expressive of JOYFULNESS?

Answer: (C) ROR-Hue: Biserial correlation = 0.277: Item difficulty = 0.416

References: Hevner (1935); Odbert, et al. (1942)

Comment: Also reported by Wexner (1954) as second to yellow in association frequency with this mood-tone. No other of the colour stimuli presented in this item is reported as having any association with this mood-tone.

Item 26.

Colours: (A) OYO-T2; (B) V-S1; (C) RO-T2; (D) B-Hue

Question: Which of the above colours best expresses the feeling of SECURITY?

Answer: (D) B-Hue: Biserial correlation = 0.165: Item difficulty = 0.287

References: Napoli (1951); Wexner (1954); Schaie (1961)

Section 2: Colour Discrimination

Item 27.

Colours: (A) RVR-S2; (B) YOY-S1; (C) OYO-S1; (D)D OYO-T3

Question: Examine these colours very carefully and indicate on your answer sheet the ONE which is the DARKEST?

Answer: (A) RVR-S2: Biserial correlation = 0.241: Item difficulty = 0.564

Item 28.

Colours: (A) B-S1; (B) BV-Hue; (C) B-Hue; (D) B-S2

Question: Which ONE of the colours above contains the MOST BLUE?

Answer: (C) B-Hue: Biserial correlation = 0.315: Item difficulty = 0.446

Item 29.

Colours: (A) R-S3; (B) R-S3; (C) R-S3; (D) V-S2
Increment above: R-S3

Question: Three of the colours A, B, C, and D, are the same as the colour given above. Which one is NOT the SAME?

Answer: (D) V-S2: Biserial correlation = 0.403: Item difficulty = 0.723

Item 30.

Colours: (A) R-T4; (B) RVR-T4; (C) R-T4; (D) RV-T4
Increment above: RVR-T4

Question: Which ONE of colours A, B, C, and D, is the SAME as the colour given above?

Answer: (B) RVR-T4: Biserial correlation = 0.597: Item difficulty = 0.762

Item 31.

Colours: (A) O-T4; (B) OYO-T4; (C))-T3; (D) ORO-T4
Increment above: OYO-Hue

Question: Which of these four colours is a TINT of the colour given above?

Answer: (B) OYO-T4: Biserial correlation = 0.432: Item difficulty = 0.277

Comment: To eliminate the possibility of making this item a test of knowledge of terminology, the examiner ensured that all participants understood the meaning of the word "tint".

Item 32.

Colours: (A) RO-Hue; (B) R-Hue; (C) RVR-Hue; (D) ROR-Hue

Question: Which one of the colours given above has the MOST RED in it?

Answer: (B) R-Hue: Biserial correlation = 0.050: Item difficulty = 0.257

Comment: This item proved a very difficult one. Most testees selected alternative (A) RO-Hue. There seems much confusion in the minds of many as to what constitutes the colour RED.

Item 33.

Colours: (A) YOY-T4; (B) Y-T3; (C) YGY-T4; (D) Y-T4

Question: Which ONE of the colours given above is the LIGHTEST in colour?

Answer: (D) Y-T4: Biserial correlation = 0.421: Item difficulty = 0.733

Item 34.

Colours: (A) GYG Hue; (B) YG-Hue; (C) YG-T1; (D) YGY-Hue

Question: Which of the colours above contains the MOST GREEN?

Answer: (A) GYG-Hue: Biserial corelation = 0.116: Item difficulty = 0.604

Item 35.

Colours: (A) YG-T4; (B) YG-T4; (C) GYG-T3; (D) GYG-T4
Increment above: GYG-T4

Question: Which ONE of the colours A, B, C, and D, is the SAME as the colour given above?

Answer: (D) GYG-T4: Biserial correlation = 0.562: Item difficulty = 0.921

Item 36.

Colours: (A) VBV-T4; (B)B BV-T3; (C) BV-T2; (D) BV-T1
Increment above: BV-Hue

Question: Three of the four colours A, B, C, and D, are TINTS of the colour given above. Which ONE is NOT?

Answer: (A) VBV-T4: Biserial correlation = 0.256: Item difficulty = 0.851

Item 37.

Colours: (A) YGY-S2; (B)B YOY-S3; (C) YOY-S2; (D) YOY-S3
Increment above: YGY-S3

Question: Which ONE of colours A, B, C, and D, is the NEAREST COLOUR to the colour given above?

Answer: (A) YGY-S2: Biserial correlation = 0.562: Item difficulty = 0.653

Item 38.

Colours: (A) YGY-S3; (B) YGY-S1; (C) YGY-S2; (D) YGY-S1
Increment above YGY-S2

Question: Which ONE of the colours A, B, C, and D, is the SAME as the colour given above?

Answer: (D) YGY-S2: Biserial correlation = 0.438: Item difficulty = 0.871

Item 39.

Colours: (A) VBV-S1; (B) RV-T2; (D) VBV-S3; (D) VBV-S2
Increment above: VBV-Hue

Question: Three of the colours A, B, C, and D, are shades of the single colour above. Which ONE is NOT?

Answer: (B) RV-T2: Biserial correlation = 0.420: Item difficulty = 0.465

Comment: To preclude variable of "knowledge of colour terminology" the examiner ensured all testees understood the meaning of "Shade".

Item 40.

Colours: (A) RO-T4; (B) O-T3; (C) OYO-T1; (D) O-T2

Question: Which ONE of the above colours has the MOST YELLOW in it?

Answer: (C) OYO-T1: Biserial correlation = 0.423: Item difficulty = 0.770

APPENDIX B

LEIJONHIELM INTEREST QUESTIONNAIRE NO. 2

Are You Interested?

Sometimes people are interested in the look of things without considering their use. They pay attention to whether things are beautiful or ugly, expressionless or expressive. You must now indicate to what extent you are interested in the look of some things by marking the appropriate answer alternative.

Are you interested in the appearance of	Very little	Not particularly	Rather much	Very much
1. Houses?				
2. Other buildings; schools, castles, churches, etc?				
3. Bridges?				
4. Furniture-tables and chairs, for instance?				
5. Curtains?				
6. Wallpaper patterns?				
7. Furnishing in general?				
8. China, vases, glass?				
9. Knives, forks and spoons?				
10. Book-bindings?				
11. Combinations of colours in clothes?				
12. Spectacles (glasses) on their wearers?				
13. Wrappings and packages for foodstuffs?				
14. Parks and gardens?				
15. Trees?				
16. Flowers?				
17. Leaves - their shape, colour, patterns?				
18. Water-worn stones on beaches?				
19. Lanscapes?				

Christer Leijonhielm, COLOURS, FORMS AND ART. Stockholm, Almquist and Wiksell, 1967, p.172

APPENDIX C

RESULTS OF TESTS -- RAW DATA

Subject	X	Y	Z	Subject	X	Y	Z	Subject	X	Y	Z
1	82	25	27	35	62	19	32	69	51	20	15
2	78	21	19	36	62	18	23	70	50	15	18
3	78	28	46	37	62	28	34	71	50	18	22
4	76	21	26	38	61	20	37	72	50	26	29
5	76	26	39	39	61	17	23	73	50	28	47
6	75	25	24	40	61	18	36	74	48	19	27
7	75	35	45	41	61	32	22	75	48	24	24
8	75	27	21	42	60	26	16	76	48	16	45
9	74	23	36	43	60	17	13	77	47	16	17
10	73	18	8	44	60	20	34	78	47	25	27
11	73	25	27	45	60	26	36	79	46	15	35
12	72	27	33	46	59	26	16	80	46	24	31
13	72	26	42	47	59	23	30	81	46	20	29
14	71	23	18	48	59	15	35	82	45	22	21
15	71	28	42	49	59	16	19	83	45	14	21
16	70	24	24	50	59	25	33	84	43	29	28
17	70	21	29	51	59	35	26	85	43	24	42
18	69	26	34	52	58	21	42	86	42	24	20
19	69	25	44	53	58	24	38	87	42	33	29
20	68	26	15	54	57	20	29	88	41	30	40
21	68	16	38	55	55	25	41	89	41	21	19
22	67	22	54	56	55	13	15	90	40	24	44
23	67	36	27	57	53	15	38	91	39	20	14
24	67	26	31	58	53	25	36	92	39	25	25
25	67	22	23	59	53	23	31	93	38	20	25
26	67	13	29	60	52	25	37	94	36	18	7
27	66	24	38	61	52	24	34	95	36	20	19
28	65	29	40	62	52	13	25	96	36	20	16
29	64	15	32	63	52	19	44	97	33	19	19
30	63	25	45	64	52	21	36	98	33	26	20
31	63	29	41	65	51	22	36	99	28	20	15
32	63	27	30	66	51	17	29	100	28	28	39
33	63	22	13	67	51	11	29				
34	62	20	28	68	51	20	38				

VARIABLES

X = Maitland Graves Design Judgment Test

Y = Sensitivity to Colour Test

Z = Leijonhielm Interest Questionnaire No. 2

APPENDIX D

TEST OF SENSITIVITY TO COLOUR

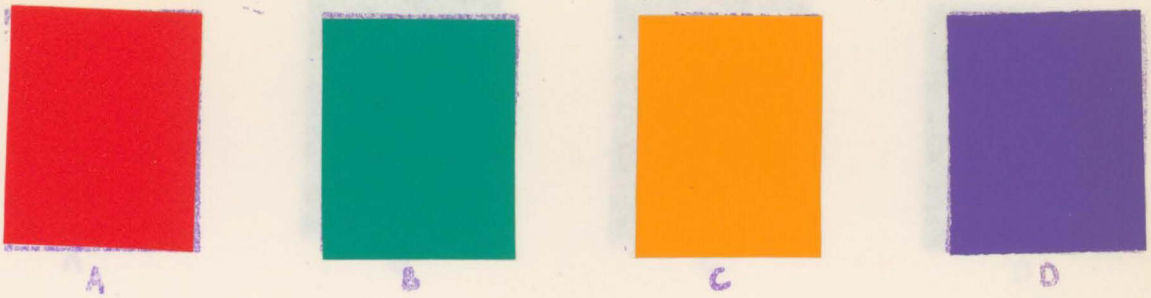
DIRECTIONS

Read each question and examine very carefully the colours presented. When you have decided which colour constitutes the correct answer, blacken the space under the appropriate letter on the answer sheet. Make sure that you mark only ONE SPACE for EACH ANSWER.

PLEASE DO NOT MARK THIS BOOKLET

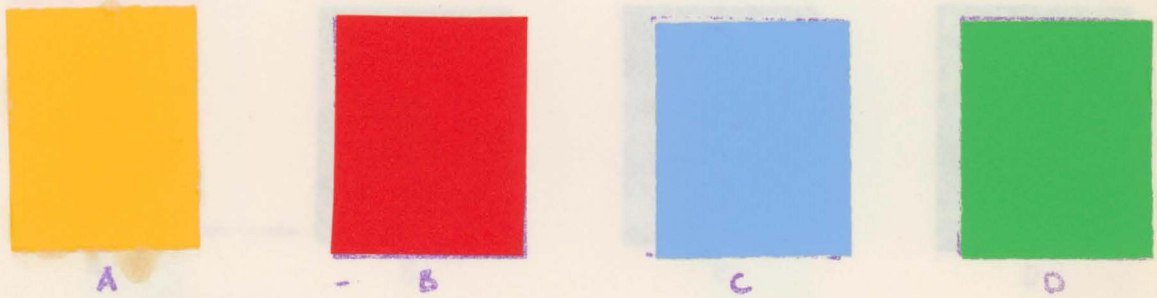
SECTION 1

1.



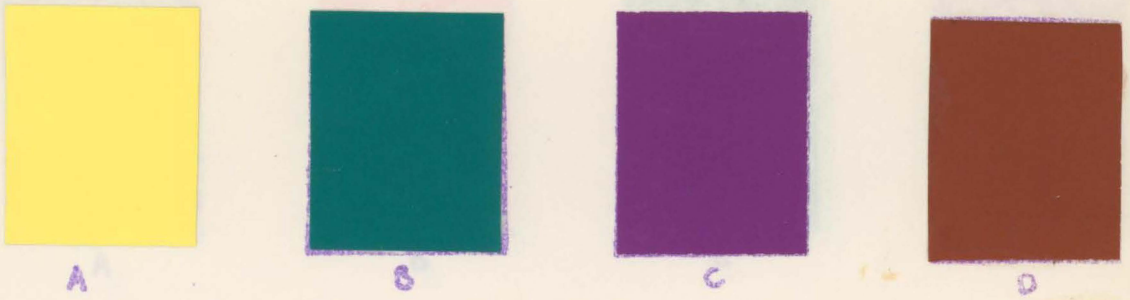
Which ONE of the above colours is the most EXCITING ?

2.



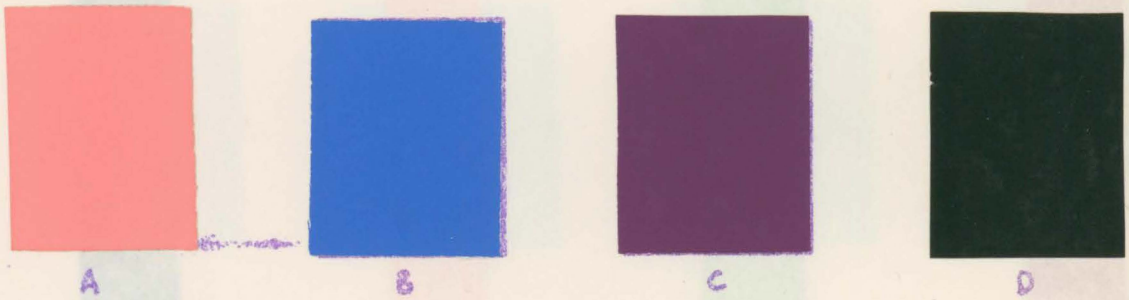
Which ONE of the above colours gives the greatest effect of DISTANCE ?

3.



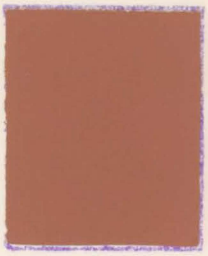
Which ONE of the above colours best expresses DIGNITY and STATELINESS ?

4.



Which ONE of the above colours best expresses DEFIANCE ?

5.



A

B

C

D

Which ONE of the colours given above is most expressive of COOLNESS ?

6.

A

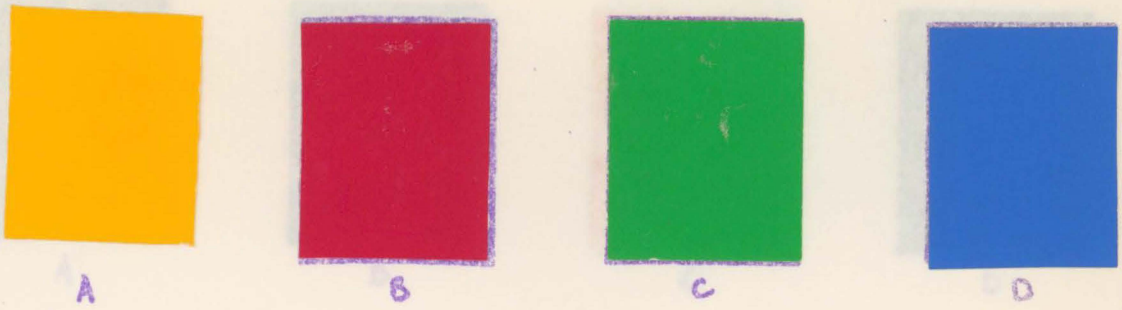
B

C

D

Which ONE of the above colours best expresses DESPONDENCY and DEJECTION ?

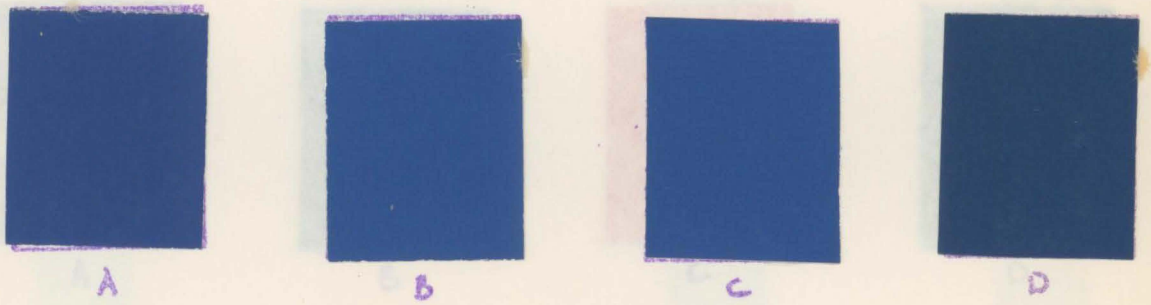
7.



A B C D

Which ONE of the above colours is most expressive of POWER ?

8.



A B C D

Which ONE of these colours appears to be the HEAVIEST ?

9.


A


B


C


D

Which ONE of the above colours gives the greatest effect of CALMNESS ?

10.


A

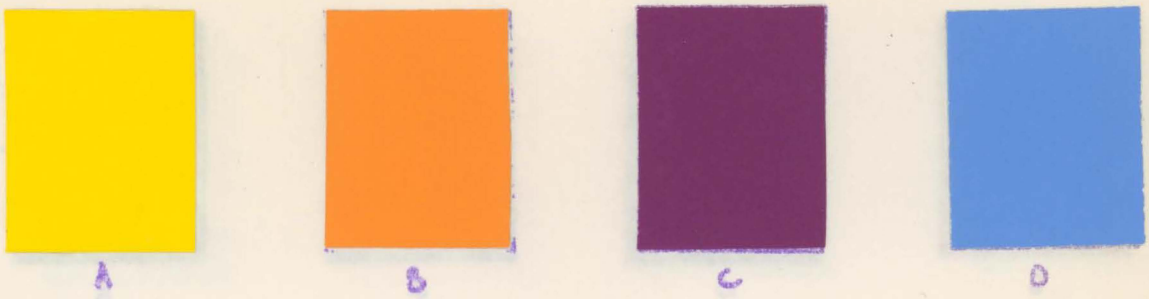

B


C


D

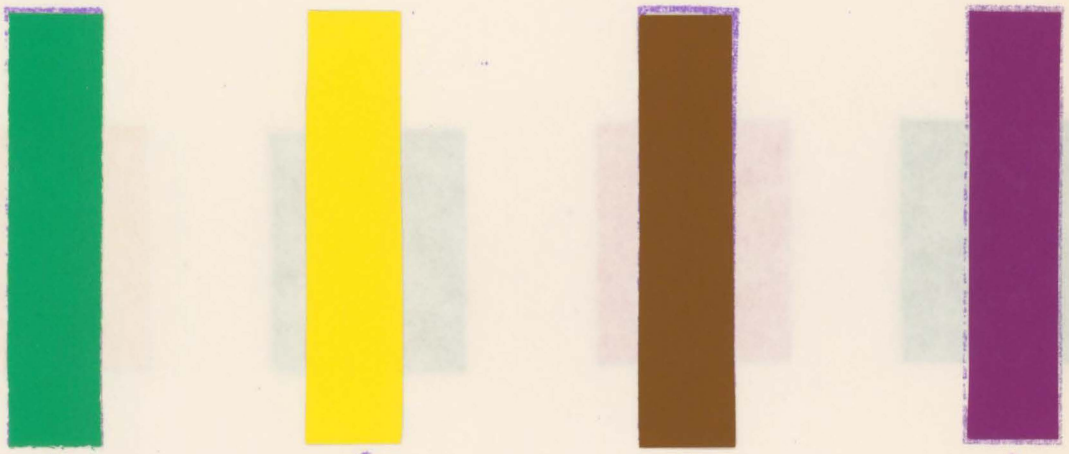
Which ONE of these colours gives the greatest effect of NEARNESS ?

11.



Which of the colours above is most expressive of CHEERFULNESS?

12.



Which of the above colours best expresses the feeling of TENDERNESS?

13.

A

B

C

D

Which ONE of these colours is most expressive of WARMTH ?

14.

A

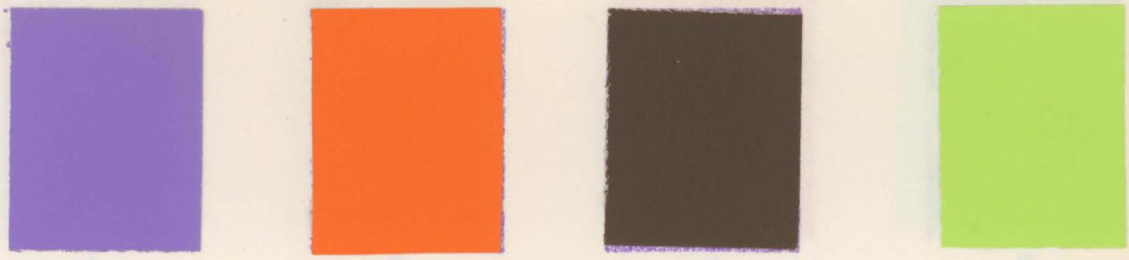
B

C

D

Which of the colours given above is most expressive of the word COMFORTABLE ?

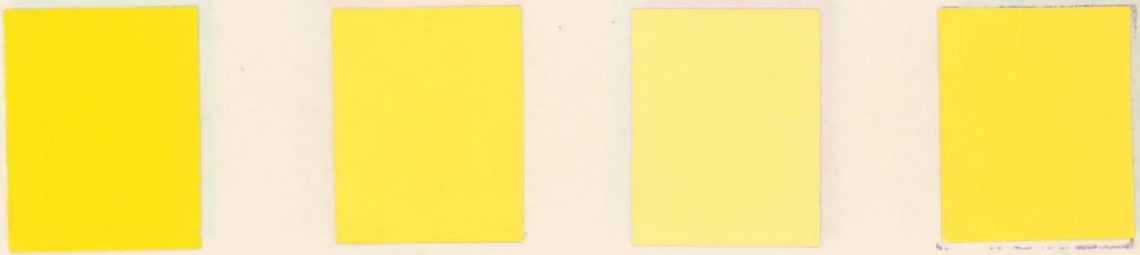
15.



A B C D

Which ONE of these colours is the most STIMULATING ?

16.



A B C D

Which of the above colours appears to be the LARGEST ?

17.

A

B

C

D

Which ONE of the colours above is the most expressive of PEACE and SERENITY ?

18.

A

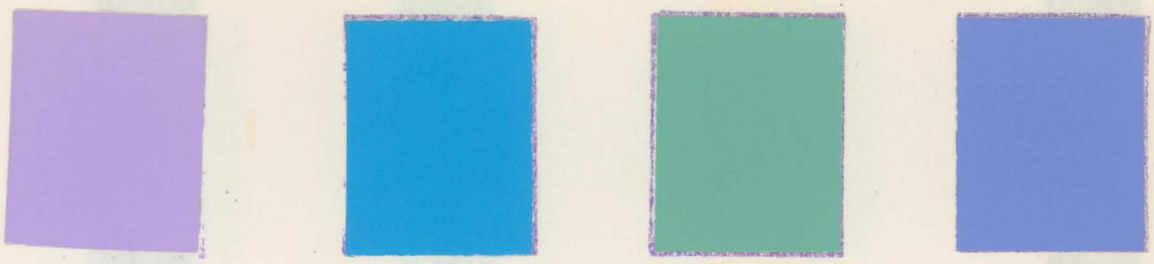
B

C

D

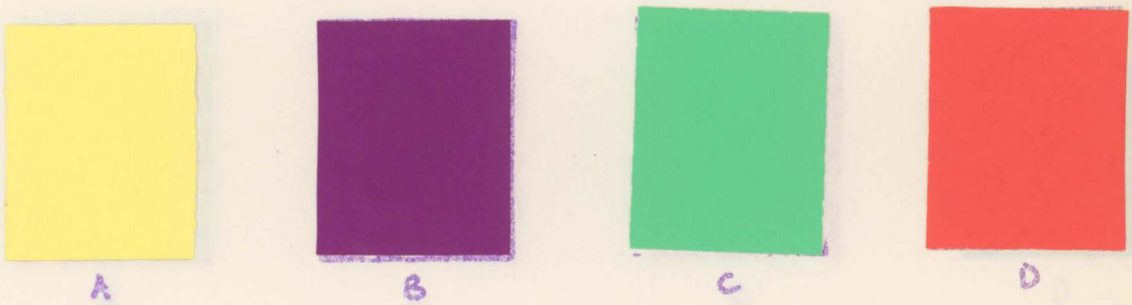
Which of these colours best expresses the feeling of DISTRESS ?

19.



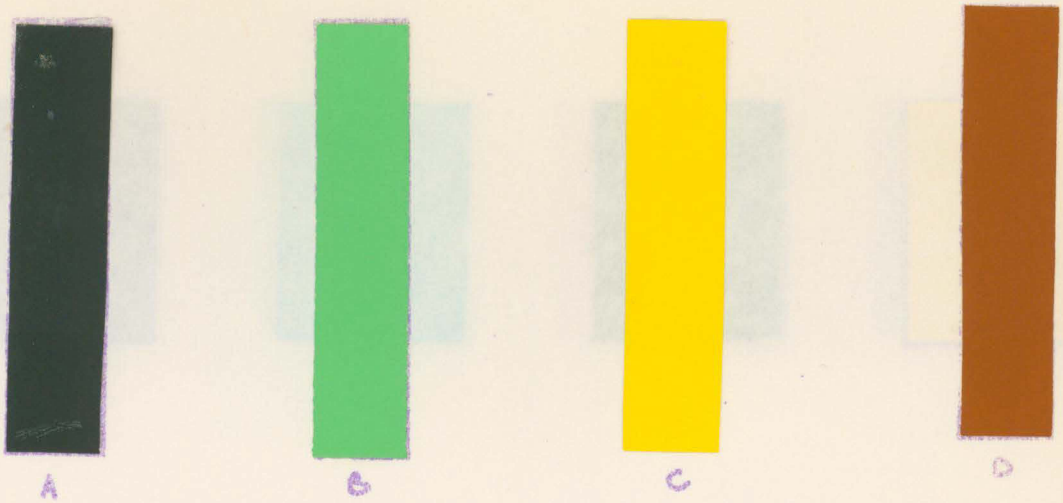
Which of the above colours appears to have the LIGHTEST WEIGHT?

20.



Which of these colours is most expressive of UNHAPPINESS?

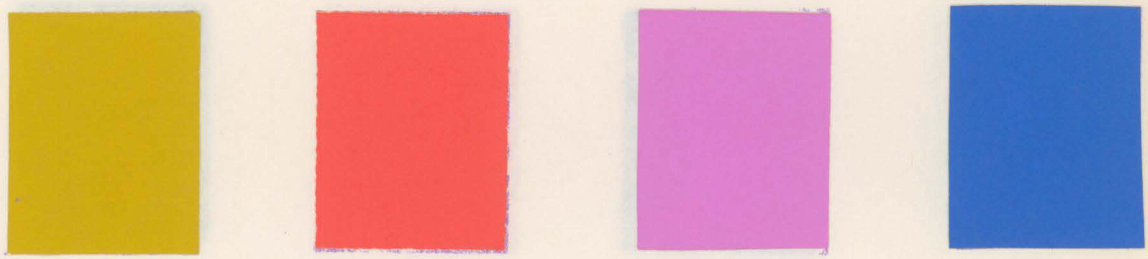
21.



A B C D

Which of the colours given above is most expressive of STRENGTH ?

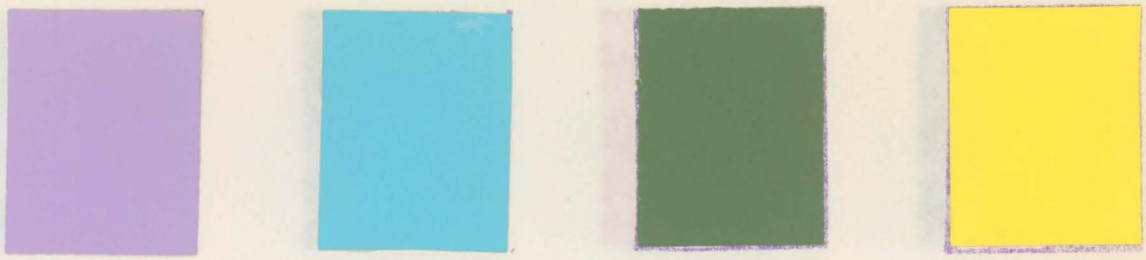
22.



A B C D

Which ONE of these colours do you consider to be the most SOOTHING ?

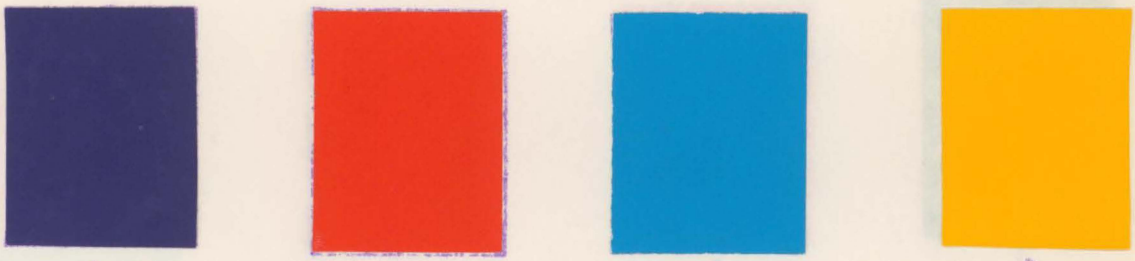
23



A B C D

Which of the above colours gives the greatest effect of SMALLNESS?

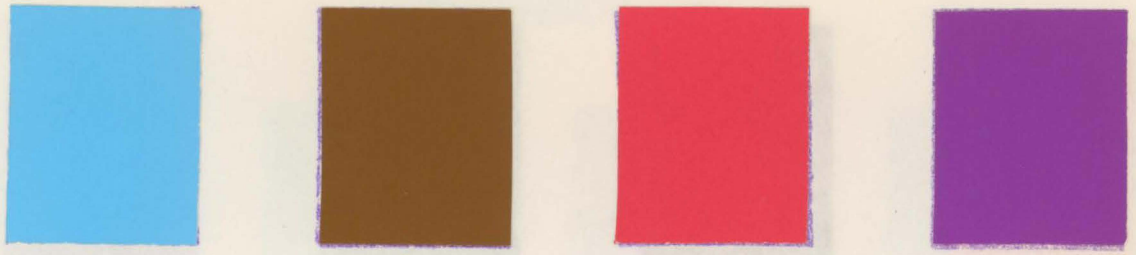
24



A B C D

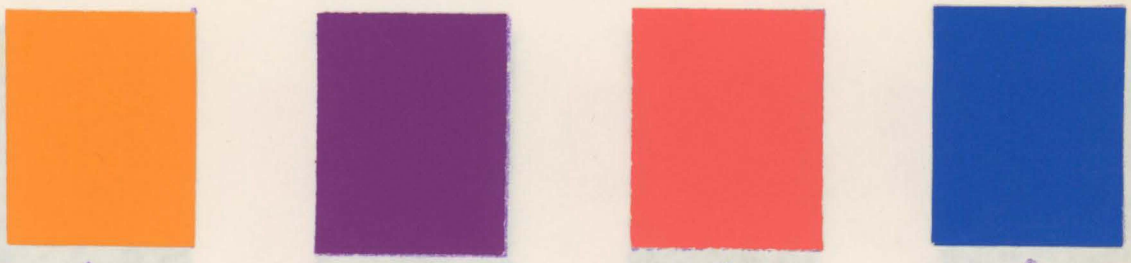
Which of these colours best expresses the feeling of HOSTILITY?

25.



Which ONE of the colours above is most expressive of JOYFULNESS?

26.



Which of the above colours best expresses the feeling of SECURITY?

SECTION II

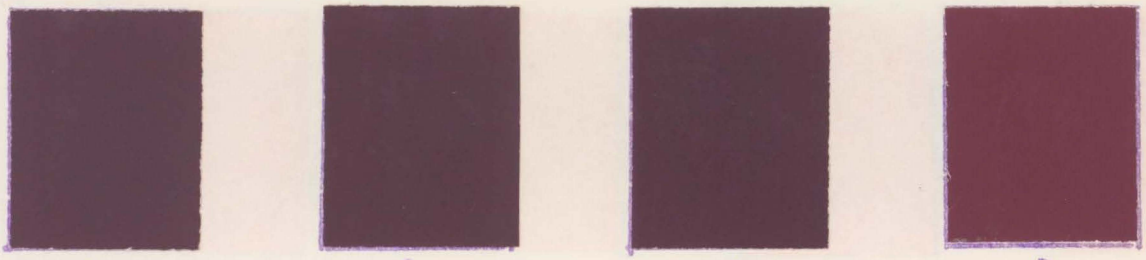
27.

Examine these colours very carefully and indicate on your answer sheet the ONE which is the DARKEST.

28.

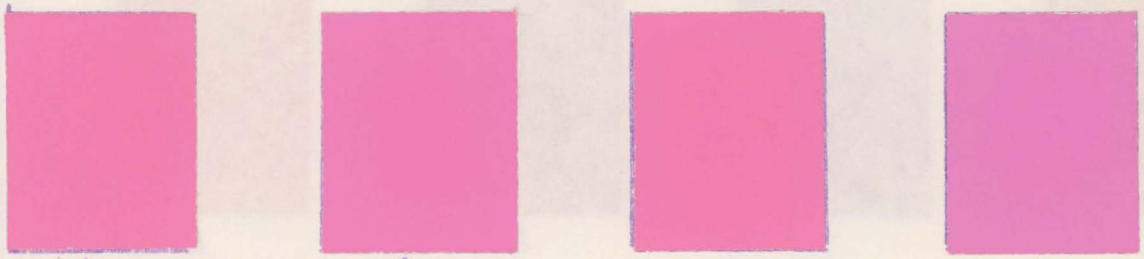
Which ONE of the colours above contains the MOST BLUE ?

29.



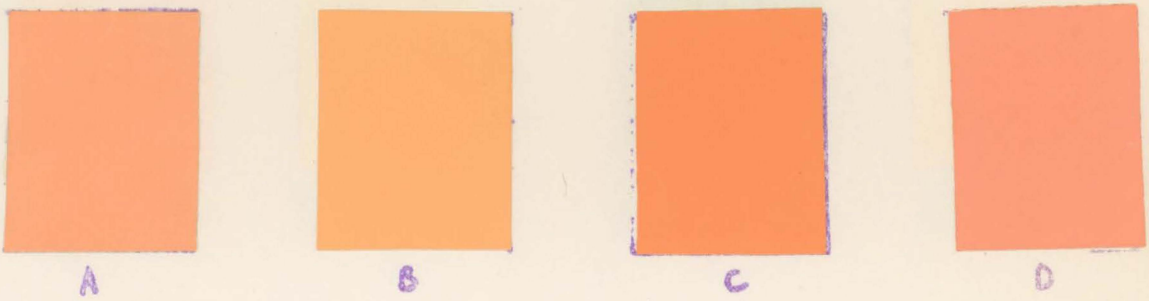
Three of colours A, B, C, and D are the same as the colour given above.. Which one is NOT the SAME?

30.



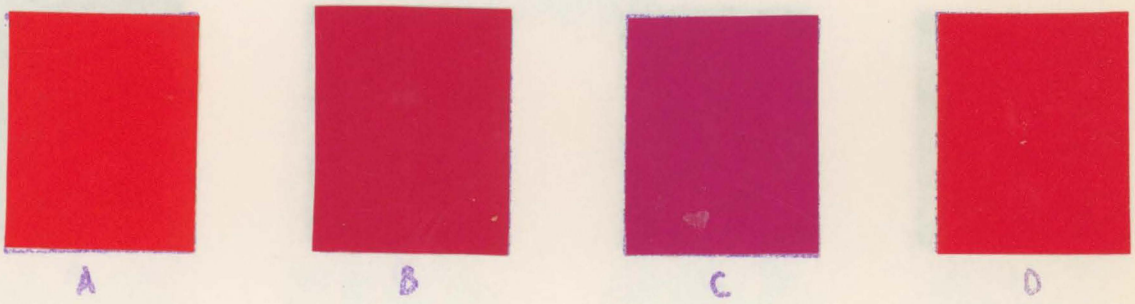
Which ONE of colours A, B, C, and D is THE SAME as the colour given above?

31.



Which of these four colours is a TINT of the colour given above?

32.

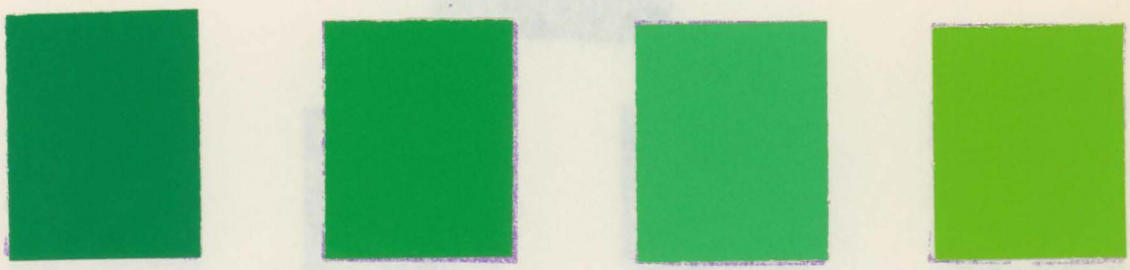


Which ONE of the colours given above has the MOST RED in it?

33.

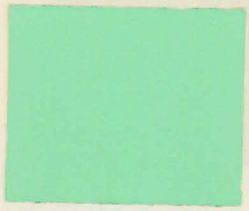
Which ONE of the colours given above is the LIGHTEST in colour ?

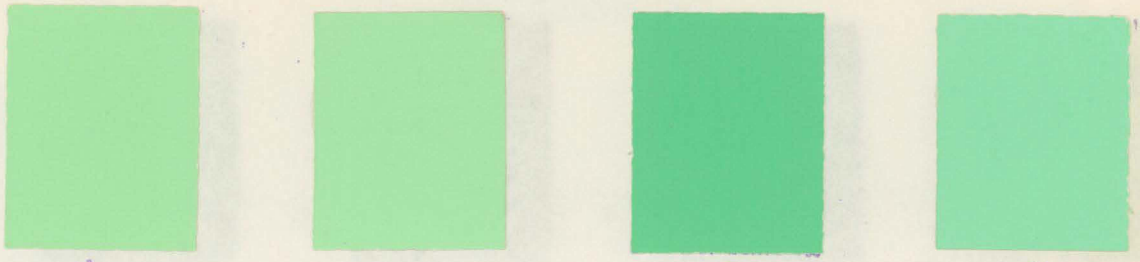
34.



Which of the above colours contains the MOST GREEN ?

35.

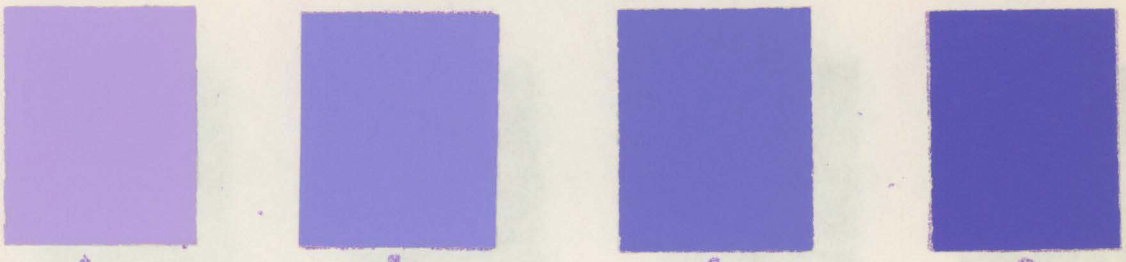




A B C D

Which ONE of the colours A, B, C, and D, is the SAME as the colour given above?

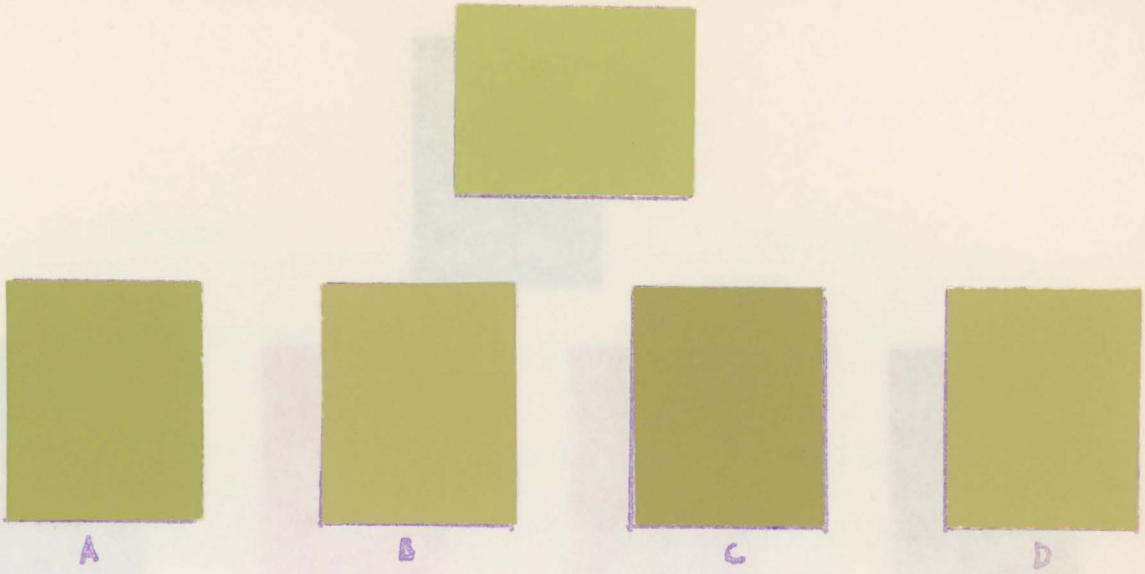
36.



A B C D

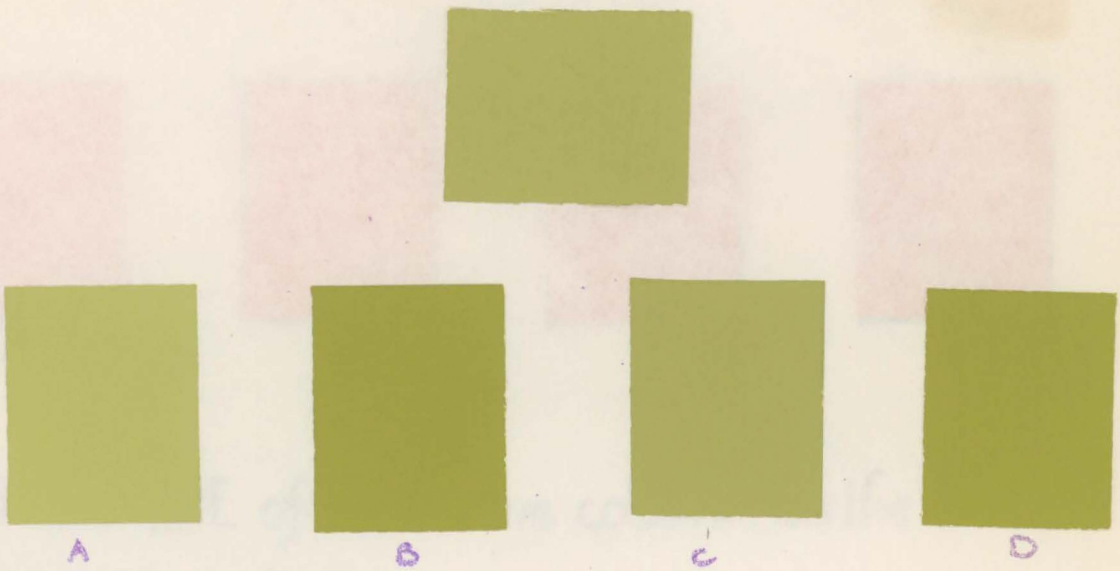
Three of the four colours A, B, C, and D, are TINTS of the colour given above. Which ONE is NOT?

37.



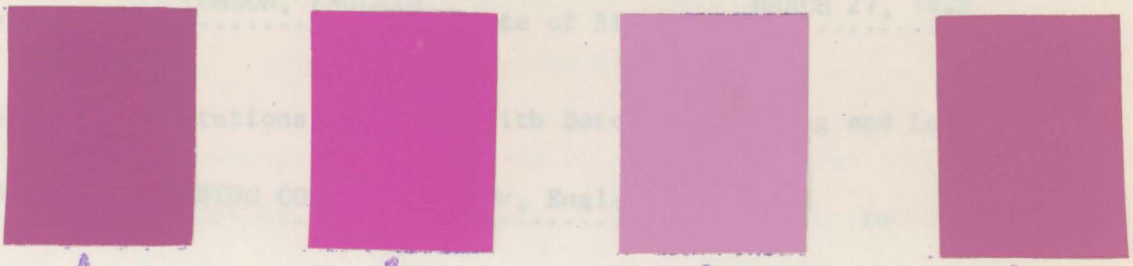
Which ONE of colours A, B, C, and D is the NEAREST COLOUR to the colour given above?

38.



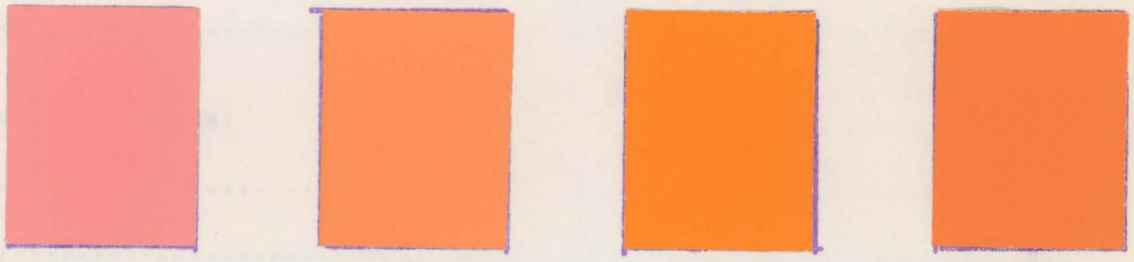
Which ONE of the colours A, B, C, or D, is the SAME as the colour given above?

39.



Three of the colours A, B, C, and D, are shades of the single colour above. Which ONE is NOT?

40.



Which ONE of the above colours has the MOST YELLOW in it?

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..... to .....

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