OHIO STATE UNIVERSITY was held June 18-20 at Columbus. Three of the sixteen topics discussed dealt with chromatic color. Professor Harry Helson, one of our delegates from the American Psychological Association, spoke on the Bezold-Brücke Phenomenon and Color Conversion; Dr. D. B. Judd, our Chairman, discussed Current Research Bearing on Choice of a Standard Color System; and Professor F. L. Dimmick, chairman of our Problems Committee, spoke on A Test of Color Aptitude. Dr. S. M. Newhall, another of our delegates from the APA, introduced the discussion on Simultaneous Contrast. The other speakers included Professor Selig Hecht, Columbia University; Dr. H. K. Hartline, Cornell Medical School; Dr. C. H. Graham, Brown University; Dr. S. H. Bartley, Washington University Medical School; Prof. W. R. Miles, Yale University; Prof. Wolfgang Köhler, Swarthmore College; Prof. J. P. Nafe, Washington University; Dr. W. B. Lancaster, Dartmouth College; Dr. F. K. Moss, General Electric Company; and Prof. Frank A. Geldard, another of our APA delegates, University of Virginia. Prof. Kurt Koffka, Smith College; Dr. David MacAdam, Eastman Kodak Company; and Professors G. A. Fry and Samuel Renshaw, Ohio State University, were among those taking frequent part in the discussions. The opportunity which the conference provided for specialists in visual research with diverse training to air their views informally produced some most interesting argument, optometrist and physiologist against colorimetrist and psychologist, and resulted in an unusually valuable and well rounded-out discussion.

RECOMMENDED
COMMERCIAL STANDARD FOR ARTISTS' OIL PAINTS

Some time ago you all received copies of a recommended commercial standard for artists' oil paints (TS-2926, August 16, 1940), issued by the Division of Trade Standards, National Bureau of Standards, for discussion and possible acceptance. At that time it was expected that the voting delegates would soon be asked to decide by letter ballot whether the Council should approve in principle this recommended standard. Indeed, the executive committee authorized submission of this matter to letter ballot, but delayed after the American Artists' Professional League became a member body until their delegates could be consulted, the League having been active for many years in standards for artists' oil paints. A report presented to the executive committee at the June meeting by Mr. H. C. Parks, Chairman of the delegation from the American Artists' Professional League, was favorable; therefore a letter ballot will go out to the voting delegates in a few days. Delegates will be asked to vote upon the following resolution:

"Whereas, the purpose of the Commercial Standard for Artists' Oil Paints (TS-2926) issued in tentative form by the Division of Trade Standards of the National Bureau of Standards, August 16, 1940, represents an intent to provide helpful information
and to serve as a guide to artists in the purchase of paints that will most satisfactorily meet their requirements, and whereas such purposes, which may result in aiding workers in the field of color, are entirely consistent with the aims and purposes of the Council, we find this standard worthy of endorsement in principle by the Inter-Society Color Council."

Your voting delegates would no doubt be glad to have your advice about this recommended commercial standard, particularly if you know of any reason why the Council should not go on record as endorsing this standard in principle. If you have mislaid the copy sent you in January, write to the National Bureau of Standards for another.

CLEARING HOUSE A number of the delegates and individual members of the Council have been asked recently for information and advice on several color problems arising in the work of the Federation of Paint and Varnish Production Clubs for national defense. It seems appropriate to emphasize now that one of the most effective ways for the Council to promote the practical application of color knowledge to the problems arising in science, art and industry is to act as a clearing house for color knowledge. If any of you are in need of color information, do not hesitate to write to any delegate or member whom you think might be able to supply it. If in doubt whom to address, write either our secretary or chairman, who will undertake to relay your request to the proper person.

M. REA PAUL The chairman of our ASTM delegation, Mr. M. Rea Paul, has accepted appointment as Consultant to the Protective Coatings Section, Division of Purchases, Office of Production Management. The National Lead Company has granted leave of absence to Mr. Paul in order that he can devote his full time to the new activities arising from this appointment. Those of us who learned firsthand of Mr. Paul's organizing and executive ability during his term as Chairman of our Council in 1936 and 1937 will feel that the OPM is to be congratulated upon obtaining his services. Matters pertaining to the Council should be addressed to Mr. Paul at the headquarters of the National Paint, Varnish, and Lacquer Association, 1500 Rhode Island Ave., N. W., in Washington, and all other matters to him at Room 2065, Social Security Building, Washington, D. C.

COLOR HARMONY The following note, as indicated, was written by Mr. Faber Birren at the request of the editors, and accompanied a transmitting letter of June 12, 1941: At the request of Dr. Judd I am happy to present a few notes on the relative merits of color systems, such as those of Munsell and Ostwald, as they apply to color harmony. My chief interest concerns the coloring of products meant to appeal to average humans, and not to highly individualized art forms such as painting. Most color systems have great latitude. What with such principles as opposites, complements and split-complements, adjacents, triads, balanced tones in hues, values and chromas, almost any well-ordered arrangement of color can be planned and justified either with Munsell or Ostwald, and perhaps equally well. However, the vital thing about a system is its viewpoint, its major conceptions of harmony. What main principles does it teach? What roads would it have you trod? How well does it organize colors in terms of the emotional responses of humans? In brief, does it reveal universal qualities, color concords that will sell merchandise and otherwise gratify the public?

The Munsell System, for example, has always made a feature of so-called gray-cancellation. In my experience as a colorist this line of reasoning appears to
sidestep and collide with the natural predilection of humans. The average customer who enters a store, say to purchase a rug, usually has a definite color preference in mind. Assume that this preference is for red. To design a broadloom rug in hues and chromas that will cancel into gray would prove futile. For in such a process the buyer's choice would be more or less compromised. Merchandise is best sold (a) by finding out the key colors most people want and (b) by keeping them in predominance. I fully appreciate that Munsell has many principles to apply, and that gray-cancellation is but one of them, but none the less the gray emphasis, so dominant in the system, becomes something of a hurdle.

The Munsell System, among colorists, is commonly termed the "value" system, inasmuch as it also places vital importance on neatly related lightness steps. Here again, a thinking process is inspired which often leads to discord rather than beauty. In looking at colors people seem to be less conscious of value than of such qualities as pureness, whiteness, blackness, grayness. Women speak of pastels, fall shades, muted tones. An olive green will not be called a pastel, though it may be light in value. A deep lavender will not be called a fall shade, though it may be fairly dark in value. Ostwald, in my opinion, keeps his qualities of purity, whiteness, blackness and grayness under better control. Though his solid may be somewhat distorted in so far as the arrangement of values is concerned, it does respect the psychological significance of pure color, white and black mentioned by Hering and others and so evident in human sensation. To my mind, it leads to better esthetic results because it is better geared to the way in which people react to color. I also feel indebted to Ostwald for his good instruction that white, gray and black are not "neutral." In my early training with the Brewerster theory and the Munsell system I was led to believe the first thing to do was to establish the key color combination and then to work out well balanced values. Practically all my experiments were performed on white drawing-paper. Ostwald, however, corrected the fault. Inherent in his system is the need to work with scales in which hue, white and black contents bear good relationship. White has restricted rather than general utility. In consequence, with Ostwald blackish shades do not occur with whitish tints, unless some sequence is introduced. Yet when value seems to be the chief consideration, such ungainly combinations as tints with blackish colors or shades with whitish colors continually form bad company, even though they may adhere innocently to some legitimate rule of value arrangement.

Also to be remembered is the fact that color effects are more significant than mere color schemes — to draw a distinction. What we like in great works of art are not mere combinations of color, but overall effects, most of them relating to impressions of illumination. We like the mellow glow pervading the canvases of the old masters, the sunny qualities of the Impressionists. Effects such as these are not to be worked out very easily with color systems or to be achieved merely by trying to get some one or more colors to combine agreeably with another. In brief, really high forms of color expression transcend systems, transcend theories of opposites, split-complements, elliptical paths and the like. All color systems have merit. All have some advantages and some disadvantages. Personally, Ostwald has been of great help to me probably because he has taught me new principles — which I have added to those already learned from Munsell. The mistake, to my way of thinking, is to be secular or orthodox. Schools should teach and colorists should learn, not one system, but all. The Republican Party is not all good and the Democratic Party all bad, or the other way around.

(Signed) Faber Birren
COLOR

As a further contribution to a discussion of this field, we cite an experimental test of the application of Ostwald's ideas on color harmony, as given, for example in the English translation of "Colour Science" (1931), published under the title "Psychological Aspects of Colour Measurement". H. J. Eysenck, Nature 147, 682-3 (May 31, 1941). Having noted that J. Guild (Nature 129, 455; 1932), in his review of the book, had severely criticized Ostwald's work "with regard to its physico-chemical foundations," and had refused to deal with Ostwald's psychological and esthetic considerations because they had no relevance to color measurement, Eysenck says that it is just these latter considerations which are of paramount interest to the psychologist. He believes that the great commercial success of the Ostwald system, both in Germany and Great Britain shows that the needs which Ostwald attempted to meet are very real needs among those who have to deal professionally with colors. Though Eysenck's experimental investigation of four of Ostwald's claims failed to support them, he nevertheless says, at the end of the article: "In spite of the disappointing conclusion, I believe that the main aims which Ostwald hoped to reach are eminently worth while, and that a repetition of his work with the proper statistical and experimental safeguards would lead to great progress in those applied arts and sciences which to some degree depend on color, such as art teaching, poster designing, and camouflage."

The four Ostwald claims on which experimental data were obtained were:

(1) that his 8 standard grays, the differences between which are based on the Weber-Fechner law, are equidistant psychologically; (2) that the 24 hues of his color circle are also psychologically equidistant; (3) that triads made up of three grays, the differences between which are equal according to his system, are especially pleasing; and (4) that diads made up of two colors which are 8 steps apart on his color circle are also especially pleasing. These four claims were checked experimentally by using papers produced by the W. Ostwald Farben G. M. B. H., checked against Colour Science scales, giving as Ostwald "himself acknowledges, a very good approximation to the colours intended" since they were made very carefully according to his own formulas. Claim (1) was tested in two ways: (a) by the method of paired comparisons, using 12 observers, and (b) by the method of Barnhart (J. Exp. Psychol. 1939, 25, 506), viz., arrangement on cross-sectioned paper at distances indicating brightness differences, here using 10 subjects. The methods agreed that, while the middle grays are more or less equidistant, gray "a" is too far from gray "b" and the last three grays (1, 2, 3) are much too close together. This result, says Eysenck, is not unexpected in view of several experimental investigations showing the limited applicability of the Weber-Fechner law. Claim (2) was studied by an adaptation of method (b), using 12 observers. Very large changes were advocated by the average subject for the spacing of the hues, especially for the hue differences 12-13, 16-17 and 24-1, and nearly as much for 1-2 and 13-19. Thus, claim (2) is not validated.

Claim (3) was tested by making up 8 Ostwald "harmonies" and 8 "combinations" contravening his claim. The 16 triads were ranked in order of liking by 6 subjects, the average intercorrelation between them being 0.49. Eysenck had previously found that the average order of six would give a correlation of 0.92 with a whole population. On the average, the "harmonies" ranked a little below the average "adverse combinations" (8.7 vs. 8.3). In other words, if anything, the combinations counter to Ostwald are preferred. The best-liked triad is a combination adverse to Ostwald; the least liked, an Ostwald harmony. Eysenck says that the fault may lie only with the
inaccuracy of the spacing of the grays, and that "introspective evidence shows that the combinations and harmonies most preferred are those in which the differences are seen as equal." Claim (4) was tested with 24 diads having a color-circle distance of 3 (out of 24) steps, and 12 diads with a distance of 5 steps and 12 with a distance of 11 steps. Ten subjects arranged the 48 diads in order of liking, using a special grouping system. The results were: 5 steps, 3.8 points; 5 steps, 4.5 points; and 11 steps, 5.2 points; that is, on the average the greater the color-circle distance, the better liked were the diads. This finding bears out Kirschmann's First Law, namely that "combinations are pleasant if they yield a maximum contrast effect" (Kirschmann, Univ. Toronto Stud. Psychol. Series I, 177-200; 1900). Additional experiments involving the ranking of the 24 constituent colors of the diads by the same subjects, confirmed also Kirschmann's Tenth Law; namely, that the pleasantness or unpleasantness of the single colors affects the pleasantness or unpleasantness of the combinations. According to Eysenck, the influence of these two factors seems to be about equal, each contributing some 25 percent to the final ranking. Thus, here too empirical investigation fails to support Ostwald's claims.

To the Editors it appears that Ostwald, Birren and Eysenck agree in seeing certain needs, which Eysenck's work shows may not have been fully met by the Ostwald system. Birren too, in fact, has also found it advisable to make certain changes in the application of Ostwald's systematics (see Birren's "Color Dimensions;" The Crimson Press, 1954, page 9). That Ostwald, however, has succeeded to a considerable degree is evident from the enhanced facility in composition and execution which Birren finds the Ostwald system has brought to him, and from the popularity to which Eysenck and many others have attested. The Editors have been impressed more by the similarities in Ostwald's and Munsell's ideas on color harmony, than by the differences between them. For example, the broadest rule of harmonious combination of colors is, according to both, the following of any orderly progression through the color solid. They differ in the detailed choices for the most preferred paths. It may be pointed out that the principle of "gray-cancellation" which in the Munsell system is "so dominant" (Birren) was not emphasized by Munsell (see his "Color Notation"). It was added on to the system by Munsell's followers; for example, T. M. Cleland ("A Practical Description of the Munsell Color System," 1921). Perhaps Birren's experience proves that this addition was of doubtful value. Though Birren speaks of the emphasis on values in the Munsell system, it may be noted that the "Birren Color Triangle" (with "color", white, and black at the corners, tint, shade, gray and tone in intermediate positions) is essentially a representation of lightness, (and saturation) relations and is prominently featured in nearly all of Birren's writings. The essential difference appears to be that Ostwald and Birren stress the importance of "full colors" which are equivalent esthetically, whatever may be their Munsell values. In other words, the Birren color triangles for different hues, while represented generally as more or less equilateral triangles, in the psychological color solid are triangles of varying shape, with the "full color" at varying value levels. For example, full yellow is at a high level, full blue and violet at low levels. And Birren, when he seeks to carry "Ostwald's idea a progressive step farther" (Color Dimensions, page 9) in a paragraph headed "An Ultimate Color System," changes the Ostwald system, which "pays no attention to this attribute of color" (value) in such a way as to make it resemble the Munsell. Though it is not explicitly stated in Birren's writings, there is implied a step which may well be worth consideration. The Munsell system and notation, because of its intimate relation to the psychological color solid, is best adapted to the specification of colors. The Ostwald arrangement and notation, however, may have many advantages in the statement of simple rules of color harmony. Simplicity is here stressed because of Ostwald's own treatment ("Colour Science," translation by J. Scott Taylor, London, 1941).
part II, 1933, pages 133-66). He says merely that conformity to law is equivalent to harmony. But obviously the color-solid positions and notations of any set of colors can be embraced in some law, though in certain cases the law may be complex; and it is evident from Ostwald's discussion and examples that he meant that harmony results from conformance to certain simple laws, easy of comprehension. Readers of the News Letter will recall that Rawlins' theory, reviewed in News Letter No. 33 under the title "Measurement of Art", counts simplicity as positive, and complexity and ambiguity as negative factors in esthetic experience. In relation to the last-named element, we find Ostwald (p. 156) writing: "Adjacent hues are to be applied with caution, for they very easily give the impression of some uncertainty in the colouring, which naturally has an injurious effect." Ostwald may have achieved added simplicity of statement, and perhaps of comprehension, by the form of analysis of colors which he introduced and by failure to put all full colors, regardless of lightness, on the same level half-way between black and white. He recognizes certain complexities in the application of his system; for example, in applying it to pigments he shows in detail that blues, on the one hand, and reds and oranges, on the other, become greener when thinned out; so that the "monochromatic triangles" actually obtained from a single chromatic pigment are not actually "monochromatic." He admits too (p. 156), that "Except in the Bluish Green region the intervals are everywhere sufficiently great for the pairs or triads to be felt as independent harmonies." In other words, that, while achieving theoretical simplicity by his special devices and that of spacings psychologically equidistant, practically some complications intervene. Perhaps it is now possible, with our recently accumulated extensive knowledge of the psychological relations of the Munsell colors to each other and to the ideal color solid, to calibrate and modify the Ostwald system in such a way as to retain the advantages of both systems. And if it does turn out, when the two have been thoroughly interrelated, that the Munsell system has paramount advantages of specification and that relevance to color measurement which most interests Guild, whereas the Ostwald-Birren system has special advantages in the understanding and application of simple rules of color harmony -- in this possible eventuality, no one will be the loser who has made a sincere study of both systems.

With Birren's claim that the average customer is less interested in value relations than in dominant hue, though artists are inclined to stress value, the Editors are inclined to agree. And it is well known that art students need to be educated to evaluate brightness intervals and relations. But the artist is often faced with the problem of condensing the great scale of values presented to him by nature, into the very constricted range available in pigments; and Arthur Pope, for example, has shown the varying ways in which artists have done this (uniform condensation, greater condensation of dark values than of light values or the reverse). In this connection, it is interesting to recall a red-green color-blind case, cited by Professor Walter Miles (Miles & Craig; Personnel Journal 9, 438, 1931; Color Blindness in Dry Goods Salesmen). This man had a very fine record for selling high-priced cravats. Prof. Miles' analysis showed that the color-blind salesman was so successful because he was forced to allow the customer to point out his favorite dominant hue (Birren's principle); and then, not being himself confused by hue, the salesman was able to appraise the value relations more accurately than his co-salesmen, and succeeded better in finding the value contrasts which most pleased the customers. Does not this instance show that the average consumer's primitive interest is in the key hue, but also that there are esthetic experiences which are assisted by educated understanding? Ostwald's system, the Birren Color Triangle, and perhaps certain Munsell "value" relations are devices useful in the process of education. Even Ostwald, after discussing the error of Goethe and his followers, says (pages 146-9): "One of the most fruitful advances which the new colour science has been instrumental in bringing about is the discernment that this dominant position does not really belong to the mere attribute of hue."
It is obvious that when the attention is focused on a key color (not merely a key hue), and it is desired to relate harmoniously other colors to the key one while varying all of the attributes of colors, then the rules of selection must become more complex. Ostwald, for example, suggests passing three lines through the color-point in his double-cone color solid, respectively parallel to the three sides of his monochromatic triangle, along with a horizontal "isovalent circle" through the point. The colors represented along these lines and the circle are said to give harmonious combinations. If the colors of any horizontal Ostwald plane are represented in the Munsell system, they are found on paths that are not simply stated. Munsell described certain of these paths; and it would be of interest to examine the Munsell in relation to the equivalent Ostwald paths. One of the Editors some years ago pointed out a particular kind of harmonious path; and in News Letter No. 16 wrote as follows: "... their (Guilford and co-workers') experimental data and methods can be used to test the validity of a principle of harmony which we enunciated in the third article of our series (I. H. Godlove, Amer. Painter & Decorator; 1935; 12, No. 7, 25-6), and called the Rule of Natural Sequence, which appeared to come out of our experiments. This states that there are certain natural sequences of lightnesses for the most saturated colors of the successive hues of the spectrum as well as in the common pigments; and combinations opposed to these, as dark green-yellow and light blue, are unnatural and unpleasant. This is perhaps one manifestation of an inherent pleasure arising in satisfaction of a sense of order." In this connection, see also Godlove and Laughlin, "The Psychology of Color," Paper Trade J. Ill, TAPPI Sect., 524 (Oct 1940). If there be any truth in this rule, or in the simple rules which Guilford found, using the Munsell system (see J. Opt. Soc. Amer., vol. 30, 455-9; Sept. 1940, where other references are given), then it would be worth while examining the simplicity of their statement in terms of the Ostwald and Birren systems. Finally, it should be pointed out that it is possible that no abstract experiments such as Eysenck's, Guilford's or Godlove's necessarily yield results comparable to the cumulative experience of colorists who in their daily work seek to find mechanisms with which both to stimulate and to discipline their imaginations.

**COLOR AND CLOTHES**

**MAKE THE MAN**

In the May issue of the News Letter, we had a note on the color ideas of Mr. Raymond G. Twyeffort and the Merchant Tailors and Designers Association of America. We have now received a copy of the Sunday, July 6, issue of the Milwaukee Journal, Roto Section, on the front page of which are shown four outfits in colors for men. Mr. Twyeffort himself put them on and posed for the pictures. For casual wear, he selected a double-breasted red blazer with striped flannel slacks, a coconuanot soft straw hat with fancy puggree, white buckskin shoes with black wing tips, cream colored shirt, modernistic tie and a handkerchief of printed Indian silk. A sport outfit has a single-breasted "Jacob's coat," terra cotta slacks, Tahitian soft straw hat with fancy band, terra cotta pebble felt shoes with reverse antelope toe caps, open-neck shirt and a printed scarf with a leather ring to hold it. In a third outfit, the cutting coat, worn with doeskin trousers, is of a hand-made domestic fabric, with the lighter alternate stripes apparently of dusky pink color; the hat is a cocoanut straw, shoes are doeskin mocassins, the shirt is cream colored, and the tie and handkerchief dusty pink. George Washington was the "father" of pastel colors, Twyeffort says, so in the fourth picture he is seen posing before a Washington memorial tablet in a dinner jacket of gulf blue, trousers of Capri blue, straw hat with blue puggree band, and blue flowered dinner tie, buttonniore and studs.

**MILITARY**

We have received a 200-page Special Number of the Psychological Bulletin, vol. 38, no. 6 (June 1941), entirely devoted to the subject of Military Psychology. It contains a 37-page article on "Perception," with 315 references of which many are recent. This article was written by a committee consisting of S. W. Fernberger, chairman; J. J. Gibson,
In the last centuries of the fourth millennium B.C. there developed several cultures important to civilization as we know it today. Though, till the end of the millenium, most of continental Europe was peopled by mesolithic barbarians (Azilico-Tardenoisians, Kitchenn-midden and Forest Folk, etc.), by this time many of the Asiatic sites we have already mentioned had led the way in the neolithic revolution and beyond this into the Copper Age; and Crete and near-by corner of Europe had already followed. In Anatolia, two provinces are distinguishable; a western one in the region of Troy and a central or eastern one revealed at Alisar Huyuk. In Crete, whose culture was largely an offshoot of the Anatolian, but which was favored by its geographical position with influences from Egypt, Syria and Greece, the neolithic culture had already passed into the great and artistic Minoean civilization. In Egypt, the "predynastic cultures" had been followed by the first two (Thinite) historical dynasties. In earlier articles, we have discussed the pottery styles and colors of pre-dynastic Egypt; the Samarra, Tell Halaf, Sumerian and First and Second Copper Age cultures of the Near East and others; and we have distinguished "plain" (self-colored) and "painted" wares. To the list may be added two recently excavated Anatolian sites, Kusura and Sorkele, where were found local "plain" styles unlike others of Asia Minor, and in the latter place, painted pottery as well. At Alisar, below Hittite, Bronze Age and five Copper Age building layers, was found self-colored black to red pottery, generally "muddy" and sometimes parti-colored, black inside and around the rim, but brownish below on the exterior. Parallel to the First City at Troy, which already was a walled trading city, were two or three cities at Thermi, nearby on the island of Lesbos; and from these and a cemetery at Yortan in Mysia we have a good picture of West Anatolian Copper Age civilization. The pottery included self-colored, burnished vases, varying in color from black to brick red, often copying gourd or leather vessels, with decoration effected by means of bosses, ribs, burnished grooves and incisions (and later, at Yortan, thin white paint), the patterns being always rectilinear. The scope of our subject does not permit discussion of the pottery forms or the other interesting items of the Trojan economy.

Before the end of the millenium, dynasties which we have already mentioned had flourished and fallen at Erech, Ur, Kish and other cities. Both Copper Age settlements at Susa in Elam and the two at Anau in Turkestan, had flourished, with pottery styles which we have described. The Mesopotamian and Elamite cultures had connections, as we have said, clear across Asia, linking up finally with the Harappa civilization of the Indus valley of India, which by 3000 B.C. was probably already well developed. The much later red- and black Jhukar ware has been already described because of its resemblance to Tell Halaf pottery. And similar ware with red and black chevrons and wide red lines between the registers has been found in Baluchistan. Below the Jhukar stratum, the Harappa
culture layer is found at the sites called Harappa, Mohenjo-Daro and Chanhu-Daro. Here were burnt brick houses with bathrooms and drains, copper and bronze implements, bronze and stone cosmetic palettes; a remarkable number of toys, including toy pottery vehicles and rams with the fleece indicated by lines of red paint, and "brightly colored" rattles. The pottery had designs painted in a thick black on a highly burnished red slip, almost like lacquer, a common motive being made up of intersecting circles, another peacocks in file. Rectangular slips of red ocher were probably for face paint, if not actually lip stick.

Below the Minoan levels at Knossos in central Crete were ruins of neolithic villages, where were found spheroid and pear-shaped mace-heads, figurines of the fertility-cult Mother Goddess (as at Troy and elsewhere in the Near East) and fine self-colored gray, black or brown pots, with handles and spouts, often burnished, sometimes so as to produce a decorative rippled effect. The potter decorated her products with incised patterns: triangles and ribbons filled with punctures. Parallel to the Cretan neolithic, there arose a culture on the European mainland known as Grecian "Neolithic A" or Thessalian I. The two most recent British authorities, in books published in 1939 and 1940, respectively, do not agree exactly on the chronology of the mainland cultures of the period; but the main outlines are fairly clear. The oldest settlement of the culture, at Sesklo, Thessaly, may go back even to 3500 B.C. The Sesklo peasants cultivated cereals, vegetables and fruits, and bred cattle, sheep, goats and pigs. They lived in "wattle and daub", mud brick or even stone huts. A textile industry is attested by recovered spindle whorls and spools. There were bracelets of stone or shells, cult figurines and almost no weapons. The peasants had hand-made delicate pots imitating baskets in an extremely fine burnished ware, generally red, but in South Greece sometimes black or mottled, depending on the atmosphere in firing. Decoration was with simple linear patterns of wedge-shaped or round punctuations or by lines in white paint. In northern Greece, the reverse technique of red designs on a white slip was often used. Technically, the Copper Age pottery of the island of Cyprus is very similar to the red-on-white Sesklo ware, and may link the latter with the Tell Halaf culture of Asia Minor. It is believed by one authority, however, that the earliest European neolithic (the Sesklo) culture elements were brought by immigrants from central, not western, Anatolia before the founding of Troy or Thermi.

An outpost of the Thessalian culture was a settlement at Servia in western Macedonia, which was violently destroyed and followed by another due in part to the invaders. The mixed people spread all over Macedonia and up the Vardar valley and across the Balkans toward the Middle Danube basin. The resulting "Vardar culture" was similar to the Sesklo in many respects. The red and painted Sesklo pottery was replaced, however, by black polished wares, decorated by fluting, striped burnishing, incision, or white paint, with geometric designs including spirals. Other wares from the region will be mentioned later. The roughly contemporary civilization of Ur and other Near Eastern cities has been described. Soon the "Red Crown" of the Libyans of Lower Egypt was united by a warlike family with the "White Crown" of the Osiris-worshiping grain-growing Armenoid Asiatic invaders from Syria and Anatolia, who were probably already present in smaller numbers in late pre-dynastic times. Thus a real change took place both in the people of Egypt and in their art at the start of the resulting early (Thinite) dynasties. At this time there is seen no essential difference between painting and relief; both were often treated as outlines filled in with color. Also, in relief the effect of modelling was often lost by the practice of using strong colors, such as saturated red, for outlines without regard for light and shadow. In a subsequent number, we shall see that it was probably refugees fleeing from Egypt before the armies of the conquering "Scorpion" and his successor, who united Egypt, that are responsible for the advent of the Mincan civilization of Crete; and in the next number we shall treat of this civilization and the early Egyptian art.
BLACK

We have received offprints of papers by Dr. F. L. Dimmick (Amer. J. Psychol. 54, 286-9; April 1941) and by Dr. D. B. Judd (ibid, 289-94) on these colors and their definition. The former had proposed (Dimmick and Hubbard, ibid, 52, 242-54, 348-53; 1939) that colors in all modes of appearance (surface, film or aperture, etc.) be specified by reference to four of seven primaries (red, yellow, green, blue, white, gray and black), taken as two chromatic and two achromatic at a time. Judd (J. Opt. Soc. Amer. 30, 2-32; 1940) had proposed to call "lightness" the variable attribute of achromatic surface colors ranging from black to white; and "brightness" the variable attribute of achromatic aperture (film) colors ranging from very dim to very bright. (I. H. Godlove had introduced the term "lightness" in a series of three articles on color harmony exemplified in the colors of pigment surfaces; see Amer. Paint J. 19, No. 4, p. 60, Nov. 5, 1934 and 19, No. 8, p. 48; Amer. Painter & Decorator 12, No. 5, p. 23 and 12, No. 6, p. 28 (1935). The two sets agree in having, as the other attributes, hue and saturation. Judd now defines black and white tentatively as the two extremes of the series of achromatic surface colors, of zero glossiness and transparency, which differ in lightness only; and he reproduces his equation for the lightness L of a surface in uniform illumination in terms of the luminous apparent reflectances of the surface (A) and of the whole field (A_1). Dimmick points out that Judd's black, gray and white are perceptual terms referable only to the surface mode of appearance. He then discusses the ideas of Ward, Titchener, Gates, G. E. Müller, Katz and M. F. Martin in this field and contends that Judd's definition of the conditions for black and white should refer to the "aereal quality" (Titchener) or film color (Katz, Martin) because it is the mode of appearance that shows the least perceptual complication. He prefers "film color" to "aperture color" because the latter contains the implication of a primary source. He argues that there is no reason why Judd's (1940) equation should be restricted to surface colors. Judd's equation implies that, in uniform illumination (and normal photopic vision), the sufficient condition for the appearance of white at an achromatic, matt, opaque surface is that A be unity; and for black that A be zero (and A_1 greater than zero). He now expands his equation to take care of the cases where there are no surfaces in the field having luminous apparent reflectances as high as 1 or as low as 0. He thus includes the more common cases in which observers report "white" or "black", with certain provisos, for whatever terminal members of the achromatic series are actually experienced in the scene. Besides A and A_1, the additional quantities introduced are A_2, the maximum, and A_0, the minimum, luminous apparent reflectances of any surface present in the field; also a constant K (usually lying between 0.1 and 0.01) such that k A_2 is greater than A_0. He then describes the necessary and sufficient conditions for the appearance of black and white perceived as belonging to uniformly illuminated surfaces, in accord with his tentative definition. The former equation becomes a special case of the expanded one with A_0 equal to zero and A_2, unity; and another special case with closely similar values of these reflectances is compared with some experimental data (Judd, 1940). Judd next discusses scenes including surfaces perceived as unequally illuminated, and black and white experienced as qualities of color in non-surface modes of appearance. Our available space does not permit review of these paragraphs, except to say that Judd discusses the question whether there can be black or white volume, film (aperture) or luminous colors.
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