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INTER-SOCIETY COLOR COUNCIL

NEWS LETTER NO. 27

JANUARY 1940

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Charles Bittinger, Editor for Art
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ANNUAL MEETING — With this issue of the News Letter you will find a copy of the preliminary notice of the next annual meeting, to be held in New York City jointly with the Optical Society of America and the American Physical Society on February 21-24. The TECHNICAL SESSION, Wednesday afternoon, to be co-sponsored by the Technical Association of the Pulp and Paper Industry, will be under the chairmanship of John L. Parsons. The papers listed under the general subject SPECTROPHOTOMETRY IN THE PULP AND PAPER INDUSTRY are given in the program notice enclosed. These follow an introductory dialogue by "Mr. Papermaker" and "Mr. Meter". The Popular Session, PARADE ON COLOR, on Wednesday evening, will include:

HIGHLIGHTS OF COLOR-REPRODUCTION HISTORY, a radio style presentation.
COLOR-REPRODUCTION FUNDAMENTALS, by F. L. Wurzburg, Jr., Interchemical Corporation Research Laboratories.
SCIENCE VISITS THE ARTIST, by William L. Longyear, Pratt Institute.

At the DISCUSSION SESSION on Thursday morning, the following nine topics are listed for discussion. The individuals named have agreed to give their views.

(1) Applicability of the ISCC System of color names

To microscopic structures (Kelly)
To biological descriptions (Farnsworth)
To soils (Nickerson)
To transparent media (Gage, Kelly)
To translucent and fluorescent media (Kelly)
To opaque ceramic products (Robertson)
To textiles (Pinnell, Scott, Rorke)
To heavily dyed paper (Parsons).

(2) Determination of the ISCC Color Names for all of the samples of the Maerz and Paul Dictionary of Color (Nickerson, Rorke, Robertson, Parsons).

(3) Determination of the ISCC Color Names for all of the standard colors of the Textile Color Card Association of the U. S. (Rorke, Pinnell, Scott).

(4) Definition of the ISCC Color Names in terms of the colorimetric coordinate system recommended in 1931 by the International Commission on Illumination (Kelly, Gage).

(5) Development of color tolerances

For paint (Paul, Hunter)
For tinted papers (Loveland)
For carton and label printing (Beck)

For textiles (Scott, Pinnell)
For ceramic products (Hunter, Robertson)
For photographic film (Dimmick)

(6) Preparation and publication of a list of basic color terms with preferred ISCC definitions (Dimmick, Pinnell).

(7) Terms for uses of artificial daylight (Macbeth, Gage).

(8) Illumination for the detection of small color differences (Taylor, Nickerson, Parsons).

(9) Development of a standard test for ability to discriminate small color differences (Le Grand Hardy, Foss, Scott, Nickerson, Pinnell, Newhall, Dimmick, Parsons, Murray). Mr. Parsons and Miss Murray signified their intention of joining the discussion too late to be included in the printed program, but are expected to be heard as scheduled above.

S.M.P.E. APPOINTS DELEGATES

We are pleased to announce the appointment of voting delegates to the Council from the Society of Motion Picture Engineers, the eleventh member body of the Council. President E. A. Williford has appointed:

Gerald F. Rackett, Technicolor Motion Picture Company,
Ralph M. Evans, Eastman Kodak Company,
Fred T. Bowditch, National Carbon Company.

WASHINGTON COLORISTS

The next meeting of the Washington Colorists, on February 5, will be a "Munsell meeting", planned as a discussion session. The Washington group is unique in having available so many persons who have been actively associated with, or well acquainted with various Munsell activities since its earliest days. It is expected that A.E.O. Munsell, F. C. Carlson, Dorothy Nickerson, Blanche Bellamy, Louise L. Sloan, Geraldine Walker Haupt, Walter M. Scott, Genevieve Becker Reimann and I. H. Godlove will be present, all of whom have been members of the Munsell staff at one time or another, all still working in color; K. S. Gibson and D. B. Judd, who are well acquainted with the work at the Bureau of Standards which was supported during 1924-6 by funds from the Munsell Research Laboratory; K. L. Kelly, who has been working with color names, the limits being specified in Munsell terms; and S. M. Newhall, chairman of the subcommittee of the Optical Society of America which is reviewing the spacing of the Munsell System. There is no idea of describing the system, but rather of conducting a discussion of the development of the system, and the many applications that are being made to practical and scientific problems. Any out of town members of the Council who may be in Washington at that time will be very welcome, providing only that they make dinner reservations with Miss Nickerson prior to the meeting.

BOSTON COLOR GROUP

The January meeting of the Boston Color Group was held on Tuesday, January 16, at the usual meeting place, Madame Burguet's in Boston. The speaker of the evening was Mr. Benjamin J. Mayo, Jr., District Manager of the Imperial Paper and Color Corporation, Glens Falls, New York, who spoke on the subject: "Paint and Paint Pigments."

THE ASSOCIATION FOR COLOR RESEARCH OF CHICAGO

The last 1939 meeting of this active group was held at Art Center on December 6. The speaker was Mr. Merlin Enabnit, who spoke on the subject: "The Magic of Color in Advertising Art". Mr. Enabnit is a Chicago painter well-known for his artistry in oils and water-color, and popularly recognized for his brilliant work with the air brush. He expounded his theories of color harmony and illustrated his talk by means of slides.

DRAVES NOW WITH GENERAL DYESTUFFS CORPORATION

Dr. Carl Z. Draves, formerly Chief Chemist of the Ludlow Manufacturing Associates, Ludlow, Mass., and long with the DuPont Technical Laboratory, has recently become Technical Advisor to the Sales Department of the General Dyestuffs Corporation, 435 Hudson Street, New York City. Dr. Draves has been interested in color problems for many years. This year he is president of one of our member-bodies, the A.A.T.C. & C. Dr. Draves has been an official delegate of this society to the Inter-Society Color Council ever since the founding of the Council. Now that he is in New York, and therefore more accessible, we hope that he will be able to take a more active part in Council activities.

WALTER SCOTT'S NEW WORK

The appointment of Dr. Walter M. Scott as Chief of the Cotton Chemical Finishing Division of the Southern Regional Research Laboratory at New Orleans was recently announced by Dr. H. G. Knight, Chief of the Bureau of Agricultural Chemistry and Engineering. Dr. Scott will be responsible for the scientific and administrative work of the Division, which will involve broad research and development work to improve or modify by chemical treatment cotton fiber, cotton yarns, cotton textiles and cotton fabrics. Dr. Scott has had about 25 years of experience in problems connected with the dyeing, printing and finishing of silk, wool, cotton and rayon, as well as in the field of color measurement and specification. He has also done considerable work with cellulose esters and ethers and the various types of synthetic resins. He is the author of more than 40 technical papers and reviews, and has been granted several patents. He is one of the founders of the American Association of Textile Chemists and Colorists and has been a member of its council and research committee for many years. He was also active in the movement which led to the inception of the Inter-Society Color Council and he served as a member of its Executive Committee for a number of years. He is Chairman of the Textile Dyeing and Finishing Committee of the American Society for Testing Materials, a member of the American Chemical Society and a Fellow of the American Institute of Chemists. He is a veteran of the World War and at present holds the commission of Lieutenant Colonel in the Chemical Warfare Service.

ARTISTS OIL PAINTS

We have received, too late for complete discussion in this number, agenda for a General Conference on Artists' Oil Paints, to be held under the auspices of the National Bureau of Standards at 10:00 A.M., Friday, February 9, 1940, at the Museum of Modern Art, 11 West 53rd Street, New York City. Accompanying the notice was a 13-page Proposed Commercial Standard for Artists' Oil Paints submitted by the Paint Testing and Research Laboratory, Massachusetts WPA. It is particularly noteworthy that the paint names proposed are intended to indicate the chemical nature of the pigment or are those which, through usage, have become associated with the pigment. The use of these names for similarly colored pigments is not permitted by the proposed standard.

BITTINGER SPECTRUM PAINTINGS

Many of our readers are familiar with the paintings of the spectrum executed by our Editor for Art, Mr. Charles Bittinger, who has been president of the Arts Club of Washington and the Washington Society of Artists. For those who have not seen these paintings, it may be remarked that the picture of the normal solar spectrum at the word color in Webster's New International Dictionary is a reproduction of one of his paintings. We recently received a note on a novel use of these paintings, which we reproduce slightly edited. One of the most important requirements of coloring materials, he says, is that they should remain permanent, that is, that the hue, saturation and brightness should not change in the numerous fading tests conducted by the scientist and by nature. It is difficult to establish this factor without permitting some form of destruction. If part of the sample is covered and the remainder exposed to the light (and atmospheric agencies), that part which is exposed is subject to a great many vicissitudes while the covered part is not; such are dust, wind, humidity change, etc. An ideal way to test pigments is to paint a normal solar spectrum and so treat it. Among the millions of variations in nature, one of the few things that do not change is the normal solar spectrum. If an accurate painting of the solar spectrum is exposed to the light, it is very easy to see which pigments are stable and which change. A great many paints are stable by themselves but in mixtures with other stable paints undergo disastrous chemical reactions. If a record is kept of the pigments used in the painting, a record of the change of these mixtures can be immediately observed. One of the anomalies of a colored reproduction of a painting of the spectrum is in the yellows. From a printer's point of view it seems inconceivable that green can be lighter than yellow; but this is the rock on which the reproduction of most spectrums are wrecked. However, the fact remains that the normal solar spectrum is one of the most beautiful things in the world, and a perfect one is a joy forever.

COLOR SURVEY AT THE PEDAC

At our request, Mr. Frederic H. Rahr, our well-known Color Consultant member, has prepared the following note on PEDAC: In the International Building, Rockefeller Center, New York, at the Permanent Exhibition of Decoration, Architecture and Craftsmanship, over 600 visitors each day are seeing and hearing about what's new in the American Home. As the guests of Rockefeller Center, each visitor is free to wander through two floors of exhibits, and ask any question he or she may wish about the many hundreds of articles on display. From every state of the union, and from cities scattered all around the world, come visitors who are interested in building, decorating or furnishing a home. Over 300,000 each year visit this exhibit to satisfy their curiosity about home-making products and materials. It is not surprising therefore, that we find them in the mood to talk about what they have in their homes and what they want next. By the simple devise of arranging related "tones" in a convenient voting machine, we are able to learn what colors are now used in the various parts of the home, and what ones are wanted next. In this regard, it is interesting to note that we are able to get fixed percentages of relative importance for each color in each problem when we have surveyed under 5,000 people. A recent survey of 5,400 consecutive visitors showed that they come from 985 cities and towns, in 47 states. (Nevada was missed in this particular group). Sixty-five percent of the group were female, and all were adult, interested in home finishing and able to buy. Although this method of making a national survey entirely in one spot is, we believe, unique, it has produced some interesting results. With useful accuracy, we have been able to learn, 18 months in advance of market actions, what colors would be most sought in home furnishings in stores as far away as Portland, Oregon. As our members will easily recognize, this method of survey makes no pretense at phychologica

profundity. However, at a cost far below that at which field surveys can be made, we are able to reduce to actuarial figures the past color selection, and present frame of mind with regard to future color purchases. These consumers are the type of people who are the dollar-and-cents backbone of our markets. It is not beyond the realm of possibility that we may soon find ourselves checking designs as well as color, for we find that people appreciate an opportunity to express their preferences after they have visited PEDAC and thought over their entire home. For those who want advance information on the consumer's frame of mind with regard to color in merchandise, it should be noted that actual swatches of as many as 75 colors of any type of material can be displayed and measured simultaneously. Also, where the color of the illuminant must be varied, arrangements can be made so that this factor may be put to work also.

MUNSELL COLOR DIARY IN BIBLIOFILM

The Executive Committee of the Council, at a recent meeting, voted to follow a policy of depositing bibliofilm negatives with the American Documentation Institute of such research or source material on color as could not otherwise be made easily available to students of color. In the June 1939 NEWS LETTER it was announced that I. H. Godlove's unfinished bibliography on color, containing nearly 2500 references, had been made available in bibliofilm as Document 1162, at $1.39. During more recent months we have received permission to deposit a bibliofilm record of the typed copy (426 pages) made of the color diary kept by Mr. A. H. Munsell during the years in which he was developing the Munsell color system, the first entry being dated 1879, the last one, 1918, just before his death. The diary is complete with all diagrams. Copies of this negative may be obtained by purchase from the American Documentation Institute, 2101 Constitution Avenue, Washington, D. C. The Munsell Color Diary is Document No. 1307, the price $2.50. Since the Institute is a scientific service, operating at cost to the purchaser, it is required that funds for the correct amount accompany all orders, also that the document number be specified. These instructions must be followed if your order is to receive attention.

For those of you not already acquainted with the Bibliofilm service, it should be explained that this service operates to copy manuscript or book pages on 35 mm. film by special copying cameras available in libraries such as the Library of Congress, Army Medical Library, and the U. S. Department of Agriculture Library. The American Documentation Institute, which operates Bibliofilm Service, is the non-profit agency organized by 50 national learned societies and other organizations, its purpose being to advance documentation and make research materials available to institutions, societies and research workers. There are devices in many libraries for easy reading of bibliofilm. An inexpensive device that will enable one to read, though not so easily, may be secured from the A. D. I. for $2.00. At 10 cents a page, such a manuscript as the Munsell Diary would cost over $40.00. The immense importance of a service which supplies this material at $2.50 is easily recognized.

CHARACTER ALALYSIS THROUGH COLOR

This is the title of a recent book by Martin Lang (80 pages plus 12 color samples; the Crimson Press, 40 Gorham Avenue, Westport, Connecticut; 1940).

"What is your favorite color? Answer honestly and this book will reveal the secrets of your personality."

So reads the crimson cover of this product of the Crimson Press. Written in an entertaining style and with a sufficient thread of truth and accuracy in the

generalizations to give the reader some insight into the mysterious emotional content of color. We will back color preferences against astrology, tea leaves, and palmistry anytime. Right or wrong, it is lots of fun. Recommended for your 1940 Christmas list.

COLOR NUT

Under this title we find an interesting article in the January, 1940, Reader's Digest, condensed from an earlier New Yorker. The article describes the effort of Mr. Raymond G. Twyeffort, who is an individual member of the Council, to induce men to wear more chromatic color. According to the article, Mr. Twyeffort is a custom tailor who regards his establishment as "a sort of soul clinic where tired personalities are rejuvenated." He believes that color has a positive therapeutic value. The wearing of red, he claims, makes a man strong and dynamic; yellow makes him gay and green amorous, while blue sooths him. It is inferred that the Northwest Mounted Police always get their man because they wear their brilliant scarlet coats; and it is remarked that the lumber-jacks, cowboys and American Indians, who love color, are not sissies. He is replacing black dinner jackets and tails by ones done in orange and brown, green and red; and for summer he has created dinner jackets in light colors. It is to be remembered that Joseph's brethren envied him the cloak of many colors which was given him by his father as a mark of special favor. The story exhibits the liking that men of all times have had for color. We suggest that our readers will find the article or its condensate interesting reading.

COLOR PRINTING SYSTEMS

Under the title "Reflection Characteristics of Present Day Color Printing Mediums" is a report by Howard C. Colton, Kew Gardens, N. Y., in Photo Technique, August, 1939. This report gives a series of spectrophotometric curves showing how the several printing systems -- Carbo, Wash-off Relief, Chromatone, Duxachrome -- differ in color fidelity, and how all of them fail to be perfect in their color reflection and absorption characteristics.

REVISED COLOR DESIGNATIONS

The table on the next page brings up to date the ISCC color designations reported in previous News Letters in accordance with the recent color names report sent to all members. In this connection, we wish to add that we received a report of a talk presented to the staff of the National Bureau of Standards, January 5, 1940, by Dr. Deane B. Judd, entitled "Establishment of a System of Color-Naming for the Pharmacist." Dr. Judd states a request came to the Bureau as early as 1921 for the "correct" color name for all drugs and chemicals in the United States Pharmacopoeia. He then discusses the use of color names for drugs and chemicals (1) by the pharmacist, and (2) by the drug manufacturer and importer. He shows how color helps in identification, in judging freshness, in assisting to detect adulteration and as an indication to customs officials of attempts to avoid payment of proper duties on refined, as compared to crude, materials. The color names involved in all these uses require scientific definition to give the least ambiguity; these needs have been met by the ISCC color designations.

M and P	Common Name	Tentative Name Previously Reported	I.S.C.C. Color Designation
News Letter No. 17			
36 I 3	Academy Blue	Greenish Blue	Moderate Greenish Blue
10 A 2	Alabaster	Pinkish Gray to Pale Orange-Pink	Pinkish Gray to Weak Orange-Pink
12 A 6	Alesan (French Nude, Cafe-au-Lait)	Weak Red Orange	Light Brown
35 G 5	Alice Blue	Blue to Purple Blue, Pale to Weak	Pale to Weak Blue
11 L 5	Amber (Lime Yellow)	Yellow	Moderate Yellow
10 J 3	Amber Yellow (Venetian Yellow)	Yellow	Moderate Yellow
22 A 7	American Green	Dusky Yellow Green	Weak Green
10 J 6	Antimony Yellow (Daffodil Yellow)	Yellow-Orange	Moderate Yellowish Orange
36 L 8	Antwerp Blue (Mineral Blue)	Deep Blue	Dark Blue
4 I 3	Appleblossom (Appleblossom Pink)	Purplish Red	Moderate Purplish Red
19 J 6	Apple Green	Yellow-Green	Moderate Yellow Green
News Letter No. 18			
35 I 3	Aquamarine	Pale Blue to Light Greenish Blue	Pale Blue
7 C 11	Auburn (Gorevan, Tulipwood, Zuni Brown)	Weak Red Brown	Moderate Brown
1 G 10	Aurora (Aurora Orange)	Light to Brilliant Red	Moderate Reddish Orange
3 G 10	Aurora Red (Emberglow)	Red Orange	Weak Reddish Orange
2 E 7	Aurore (Hydrangea Pink, Orient)	Pale to Light Pink	Weak to Moderate Pink
36 K 7	Azurite Blue (Air Blue, Blue Bice, Ceramic, Sanders Blue, Verditer Blue)	Blue	Moderate Blue
1 C 8	Baby Pink	Light Pink	Moderate Pink
7 E 11	Bay (Malabar, Mummy Brown, Trotteur Tan)	Weak Red Brown	Moderate Brown
15 A 6	Beaver (Beaver Brown, Camel, Mushroom, Starling)	Brownish Gray to Weak Brown	Dark Brownish Gray to Weak Brown
33 K 2	Beryl	Light Greenish Blue	Light Blue
33 H 2	Beryl Blue	Light Greenish Blue to Light Blue	Pale Blue
44 J 6	Bishop's Violet (Bishop's Purple)	Reddish Purple	Moderate Reddish Purple
14 K 9	Bismark Brown (Havana Brown, Bunny)	Yellow Brown	Moderate Yellowish Brown
11 A 3	Bisque	Pinkish Gray, Faint to Very Weak Orange	Pinkish Gray, Very Pale Orange to Very Pale Brown

T.C.C.A. Color Name	Tentative Name Previously Reported	I.S.C.C. Color Designation
News Letter No. 23	(by three observers)	
Admiralty, F. '30	Dusky Purple Blue	Dusky Purplish Blue
	Dusky Purple Blue	Dusky Purplish Blue
	Weak to Dusky Purple Blue	Weak to Dusky Purplish Blue
Amber, F. 20	Strong Yellow Brown	Strong Yellowish Brown
	Strong Yellow Brown	Strong Yellowish Brown
	Dark Yellow Orange	Dark Yellowish Orange
Amethyst, 8th Standard	Dusky Reddish Purple	Dusky Reddish Purple
	Medium Purple	Moderate Purple
	Medium Purple	Moderate Purple
Aqua Green, 8th Standard	Pale Yellow Green	Pale Yellowish Green
	Pale Yellow Green	Pale Yellowish Green
	Pale Yellow Green	Pale Yellowish Green
Autumn, 8th Standard	Dark Yellow Brown	Dark Yellowish Brown
	Dark Yellow Brown	Dark Yellowish Brown
	Weak Brown	Weak Brown
Baby Pink, 8th Standard	Medium Orange Pink	Moderate Orange Pink
	Medium Pink	Moderate Pink
	Medium Pink	Moderate Pink
Baby Blue, Summer '30	Pale Blue Green	Pale Blue Green
	Pale Blue Green to Pale Blue	Pale Blue Green
	Pale Blue to Light Greenish Blue	Pale Blue to Light Greenish Blue

COLOR IN PAINTING THROUGHOUT THE AGES VI.

In a previous number of this series, we have referred to the early and frequent use of red coloring by primitive peoples. We pointed out the basis of the use of red in a belief in its life-giving properties. Here we wish to cite a few of the many cases where a red substance, a natural iron earth, red ocher, was used by Paleolithic man.

What we know of the early races of man in the cave-dwelling days in Europe derives from a relatively small number of human remains. The proper names in the following list embrace an important part of these fossil remains. Red ocher was found scattered on the two skeletons at Obercassel and on the funerary furniture buried with them. At Grimaldi, the trench of the triple sepulture in one cave had been bedded with red ocher; and one skeleton had a red coating that would look like a skull cap. In another cave here, the ornaments of the man and a plaque on which his head rested, were colored red. At Paviland, the bones and surrounding materials were so colored as to lead to calling the skeleton the "Red Lady of Paviland", though

final study showed the "lady" to be a man. At Brunn, the same condition was found. At Chancelade, the ocher was spread over the whole body, coloring the bones a brick red, and in certain places violet.

That this use of a red substance was not confined to the early peoples of Europe, may be seen from the Leakey's "Stone Age Africa": "These makers of the last stage of the Aurignacian culture (a non-negroid type) were buried in an ultra-contracted position in the rock-shelter in which they lived, and their bodies were covered in red ocher before being buried, suggesting that the colour red had some ceremonial significance".

Digressing somewhat, we find in Luquet's "The Art and Religion of Fossil Man" potent arguments to prove that the essential attitude of the living toward the dead was fear, and that the funerary practices were measures of protection against them. The ditches and tombs were not shelters for the dead, but prisons. The contracted attitudes of the skeletons is clear from the explanations of living primitive peoples that they bind their dead tightly to keep them from "coming back" to torment the living. The two ideas are not conflicting, as may be supposed at first thought. The dead, who were dead because their life-giving red blood had been spilled, were given continued life through contact with a red substitute. They plagued the living because they resented their deadness. Giving them life might assuage this resentment; but binding them and putting them in funerary prisons was a safer course. Proof was always at hand: let the carcasses remain scattered about in the caves, and mysterious illnesses soon appeared to compete with the ever-present arthritis for the torment of the living.

In view of these facts and explanations, it does not put a great strain on the imagination to suppose that there exists today a real, deep-seated, and moderately potent association of redness with the ideas of danger and excitement. The mere citation of the redness of blood spilled accidently or in war does not carry the analysis far enough. Nor can we see any validity in the frequently quoted connection of redness with fire; to us a fire never looks red except at a very safe distance. Near at hand, it is orange. Red is the exciting or stimulating color. The fact that red is a hue rare in nature, as gold is rare, does not detract from its exciting value. When an old master or a modern painter uses much red on a canvas, he must recognize the associations which may be called forth.

We have cited African evidence to show the geographic extent of the use of red substances. Returning to Europe, we shall mention that a very important element in the Aryan Nordics who dominated early Europe was a people who have been called the "ocher grave folk". They were the destroyers, rather than the progenitors of civilization; they were more familiar with the spilling of blood than the people who spread into Europe from Asia Minor, bringing the cultivation of grain, the potter's art (through the forms and colors of which we trace them) and civilization generally.

It is commonly stated that the colors used by Paleolithic man were essentially yellow, red and black. A more correct statement is probably that these are the colors which have survived. For these are embodied in permanent materials, like yellow and red ochers; and it is not hard to imagine that primitive man used many colors, deriving them from many natural sources of fugitive materials. It is known that the yellows and reds were ochers; the blacks were charcoal and various ground minerals containing oxidized compounds of manganese. These were employed either solid as crayons, or pulverized and mixed with water, oil, marrow or grease. They

were spread on either with a finger or a crude brush. Bone tubes have been found still containing pulverized pigments along with paleolithic implements; also stones serving as saucers or palettes still preserving traces of color. The techniques varied: At first there were only drawings, contours or profiles sketched with thin deep incised lines, sometimes punctuated, then thicker and dribbling, or with black or red lines done with a crayon, but neither with any trace of "modeling". Next, more lifelike incisions, with more detail, and paintings modeled by "shading". This continued until there were well modeled monochrome silhouettes, mostly in black, but with the whole field in color. Then there was regression, the modeling being lost and a "flat" effect being produced by an excessive use of color, which was black, red or brown, and the drawing poorer; but the engraving was admirable. Finally, the foundation engraving became poorer and less emphasized, but the painting reached its zenith. The outlines were usually black, but polychrome and modeling were achieved through complete mixing of red, yellow and black pigments. These four phases correspond roughly to the first and last halves of the Aurignacian and Magdalenian epochs, with the Solutrean an interlude and an invasion without much art.

It has been stated that cave painting began in the Aurignacian epoch. It was long believed that sculpturing is older than engraving, and it is true that sculpture predominated in Aurignacian times and engraving at the end of the Magdalenian, which followed; but it is now believed that painting, sculpturing and engraving appeared simultaneously as early as the start of the Aurignacian. In all epochs we find frequent examples of collaboration between the three arts. From the Aurignacian, traces of painting have remained on wall engravings, reliefs and statues. In the final Magdalenian, the polychromes were first sketched with incisions and then scraped after coloring to produce the effect of "modeling". Possibly some figures found without eyes and mouth were so because these were portrayed with pigments which have disappeared under the ravages of destructive atmospheric agencies, as the polychrome has been lost from classic Greek sculpturing.

The art stages just described are those classically recognized for Stone Age Europe. In Africa, different series have been described. The paintings of Southern Rhodesia, which date back to early Aurignacian times, were first in black, next in white, then successively in ocher yellow, bright red, "dark claret-red", dull yellow and white, and finally polychrome. At sites in Tanganyika, the following series was described, the first ten being of the Stone Age: (1) The whole figure of the animals was red, except for the face, which was outlined only; (2) there were curious human and animal figures in purple, as well as dots made with the fingers; (3) figures, mostly of ostriches and giraffes, outlined only in a purplish red; (4) indistinct black outlined figures; (5) naturalistic, finely drawn, detailed animal figures in a claret-red thin outline; (6) curious, badly-drawn yellow and orange human figures; (7) dark claret-red animals with less detail; (8) animals in thick red outline, the animals being commonly elephants; (9) conventionalized animals in brick-red outline; (10) curious human figures in solid orange; (11) figures in "dirty" yellow and white; (12) orange lines and hands; and (13) black, very conventionalized human figures.

In view of our attribution of the flowering of art in Europe to hybrid vigor, and the fact that the great-brained Cro-magnons were probably the hybrid race responsible for the Stone Age art of Europe, it may be asked who were responsible for the African art and whether there were any connections. The latter art is rather generally attributed to ancestors of the Bushmen, whose later-day representatives are known to have considerable artistic ability. The beautiful polychrome

paintings of South Africa are due to the people of the so-called Wilton culture, who were ancestors of the Bushmen. One form of the culture derived from the Aurignacian, another from the so-called Stillbay, itself a mixed culture. There is positive evidence to connect African art with the latter; further, the "Fishhoek skull", found in a South African cave, is associated with this culture, and the skull represents an ancestor of the Bushmen. There is some evidence connecting African art with the cave art of Eastern Spain; and at Singa in Northern Africa was very recently found a type close to the Bushman. Space does not permit description of all the types recently found which show the derivation of the strains in the Bushmen; but we may state merely that various anthropologists regard the Bushman, too, as a hybrid race.

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