Greetings from your Chairman!

Hopefully it’s spring where you are! With spring, we know that the ANTEC®2012 is right around the corner. ANTEC® is again in concert with NPE, but in a new location, Orlando, Florida. “The largest plastics conference dedicated specifically to plastics in the U.S. this year”. The dates for the event are April 2-4th. The Color and Appearance sessions are morning (M3) and afternoon (M21) on Monday April 3rd.

The spring News Letter also delivers a report on recognition over the past year. Sounds odd for March but our SPE CAD operating year runs ANTEC® to ANTEC®. So here you go – (using info at time of print)

- CAD received the Pinnacle Award – Gold, this recognition to a division that creates and delivers exceptional value to members.
- CAD received the Communication Award, this in recognition to a division that is highly effective communicating with their members.
- Tracy Phillips received the Honored Service Member Award, this award is in recognition to a member who has shown a significant contribution to both the division and SPE.

A special congratulation to Tracy! The Honored Service Member Award is truly an extraordinary award! As always Thank You to all involved in making a difference in our division!

My time representing you as Chair will end at the completion of our Board of Directors Meeting. That meeting will take place during ANTEC®. So at this time, I have to say, Thank You for the opportunity to serve as the Chair. It’s been an Honor! I hope to continue my efforts on the board and will see you all at ANTEC® or RETEC®.

Best Regards,

Scott Heitzman
CAD Chairperson
EDITOR’S NOTE

This fall will be the 50th anniversary CAD RETEC® in Louisville Kentucky. For the technical article for this spring’s Newsletter, I thought it would be interesting to go back to the very first RETEC® in 1962 and republish a paper from that conference to see what has changed and what has stayed the same. The paper is entitled: *Can Color Be Controlled* written by T. G. O’Brien from IBM. Certainly a topic that is still of some concern today. Hope you enjoy the look back. The article begins on page 10.

HISTORIC CONFERENCE SEEKS LEGACY MEMBERS

In 2012, the Color and Appearance Division of SPE will celebrate 50 years of coloring plastics. This milestone would not have been reached without the hard work and dedication of many people. While some of these people are still actively involved in the business of coloring plastics, there are many more people who have moved on to other endeavors.

The organizing committee for the 2012 SPE CAD RETEC® would like to reach out to as many legacy members of the color industry as possible. If you know of someone who is a legacy member, we would like to share the conference details and encourage attendance. Please contact conference chairperson, Sandra Davis.

Sandra Davis, sandra.p.davis@usa.dupont.com or 302-999-2540.

UPCOMING EVENTS

Mar 29, 2012  FLEXPO - Houston 2012  
Apr 02, 2012  ANTEC® @ NPE 2012  
Apr 26, 2012  8th European Thermoforming Conference  
May 06, 2012  Rotational Molding® 2012 Conference  
May 16, 2012  2012 SPE Bioplastic Materials® Conference  
Jun 05, 2012  Decorating and Assembly® 2012 Conference  
Sep 10, 2012  TPE TopCon® 2012  
  FOAMS® 2012 Conference  
Sep 11, 2012  Automotive Composites Conference & Exhibition®  
Sep 22, 2012  Thermoforming® 2012 Conference  
Sep 30, 2012  Automotive TPO Conference  
Oct 01, 2012  CAD RETEC® 2012 Conference-50 Years of Coloring Plastics  
Oct 09, 2012  Blow Molding® 2012 Conference  
Oct 22, 2012  Vinyltec® 2012 Conference

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Thank you!
COUNCILOR’S REPORT

The Council meeting on November 12, 2011 was held in Barcelona, Spain in conjunction with EUROTEC 2011; this was the first ANTEC®-style conference sponsored by SPE in Europe. There were 41 section/division councilors/proxies who participated remotely and 48 councilors/proxies present in Barcelona.

Ken Braney spoke to the reinstating of an office in Brussels, Belgium as a customer service support effort in Europe. He also stated that with Susan Olderwald’s departure that they have begun an executive director search and hopes to have someone on board by the first of 2012.

Vijay Boolani presented the 2012 Budget and the Treasurer’s Report and both were approved. Russell Broome committed to get the budget details/money moved to a more transparent format.

Elections were held with the following results:

President-elect: Jon Ratzlaff  
Senior Vice President: Dick Cameron  
Vice President: Greg Campbell  
Council of the Whole: Monika Verheij

Scott Owens was nominated for the Vice President position, however, he graciously declined and announced that once his term is up that he will step down and focus his efforts on supporting his local section.

It was announced that an ANTEC® will be held in Mumbai, India on November 29-30, 2012 in an effort to more strongly brand the society overseas. It was stated that the conference in Mumbai would not replace the ANTEC® Conference in North America.

The presentation by Russell Broome was focused on how to offer more value to the society in an effort to grow membership. There has been a drop of membership from 16,000 in 2010 to 15,180 members as of November 12, 2011. Academic Outreach is a new committee that has been established to assist in gaining new society members.

Russell Broome also announced the resignation of Lesley Kyle, in which, Lesley presented her final report to council as follows. Lesley stated that she received over 200 papers which allowed for 28 sessions for EUROTEC 2011. She stated that there were 275 advance registrants and she anticipates a very successful conference. Lesley also reminded everyone about ANTEC® 2012 being co-located with NPE in Orlando, FL on April 2-4 and that the host hotel is the Orlad Hilton. She ended her report by stating that it has been an honor to serve the SPE Society over the past 10-1/2 years.

Respectfully Submitted By

Sharyl Reid  (for Sandra Davis)
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Color and Appearance Division (D21) at SPE ANTEC 2012: The following is preliminary information. Please check final program at the conference.

**CAD Executive Board Meeting** - The executive board meeting is open only to the CAD Executive Committee members.

**CAD Board Meeting** - There will be a Board meeting at ANTEC® 2012 on Tuesday, April 3. The board meeting is open to any CAD division members wishing to attend.

### SPE CAD Technical Paper Sessions - Preliminary Program

**SESSION M3: INNOVATIONS & SOLUTIONS FOR THE COLOR OF PLASTICS**

**Location:** Orlando Convention Center, South Hall

**Monday, April 2 Morning**

**Moderator:** Jamie Pryzbylski, Terra

- **8:00am** Effects of Processing Parameters on Color Mismatch During Compounding
  - J. Alsadi, University of Ontario Institute of Technology

- **8:30am** The Golden Triangle: A Strategy for Implementing Successful Products for the Masterbatch Industry
  - Doreen Becker, Americhem

- **9:00am** Next Generation UV Stabilized, Impact Modified Polyacetal Copolymer (POM) for Automotive Interior Applications
  - Bruce Mulholland, Ticona

- **9:30am** Aluminum Pigment Troubleshooting for Plastics
  - Robert Schoppe, Silberline

- **10:00am** The Newest Anti-Yellowing and Weather-Resistant White Pearlescent Pigment for Plastics
  - Scott Aumann, EMD Chemicals

- **10:30am** TBD-pending review Datacolor

**Monday, April 2 Afternoon**

**Moderator:** Earl Balthazar, Spectro Techs

- **1:30pm** Overcoming Technological Issues Associated with Color Additives in Polymers Via Solid-State Shear Pulverization
  - Philip Brunner, Northwestern University

- **2:00pm** Corrosion Inhibition of Flaky Aluminum by Sol-gel Coatings of MTES and TEOS
  - Kun Chen, South China University of Technology

- **2:30pm** Execution of 3-Level Full Factorial Design to Evaluate the Process Parameters: Polymer Color
  - Usman Saeed, University of Ontario Institute of Technology

- **3:00pm** A Study on the Effect of Small Perturbations in Color Formulation on Output of a Color of a Plastic Grade Compounded with a Single Polycarbonate Resin
  - Sahid Ahmed, University of Ontario Institute of Technology

- **3:30pm** Multi-discipline Problem Solving in a Multi-Faceted Global Technical Structure
  - James Rediske, Lanxess

- **4:00pm** Decision Tree Classifier for Analysis of Parameters Association Causing Polymer Color Mismatch
  - Farid Bourennani, University of Ontario Institute of Technology

- **5:00pm** CAD Division Annual Business meeting - open to all
Dear Members:

Just a reminder that you can view past and current Board Minutes on the SPECAD website. We do not typically publish the minutes in the electronic versions of our newsletter, but they are always available for our members to view from our website. Click here for the link to view:


We will all remember Marge’s smile
We will all remember Marge’s soothing voice
We will all remember Marge’s genuine kindness
We will all remember at least a couple of Marge’s presentations
We will all remember Marge’s technical color skills and professionalism

Marge Stanish recently passed away. Marge influenced us and the color industry for over 30 years. Most recently Marge was affiliated with Penn Color, Inc. Several of you remember her from her time spent with Applied Color Systems or rubbing elbows with the who’s who in color. Her tremendous contribution on the technical side was equaled by her personality. She is missed.

Few of us will forget her!!!

The Color and Appearance Division regularly holds Board of Director (BOD) meetings at the ANTEC® and the CAD RETEC®. In addition, a Summer BOD meeting is typically held about 6 weeks prior to the next CAD RETEC®.

The Summer meeting is scheduled in various locations. A Winter BOD meeting is held in January. The Winter meeting is typically held at a site of a future CAD RETEC®.

Any SPE CAD members who wish to attend are welcome at these meetings. If interested in attending the next Board meeting, please contact the Division Chairperson for more information.

INVITATION TO ATTEND OUR CAD BOARD MEETINGS

UPCOMING CAD MEETINGS
Spring Board Meeting - April 3, 2012 - Orlando
Summer Board Meeting - August 2012 - Location tbd
Donald Gail "Don" Deem

Donald Gail "Don" Deem, 73, of Marietta, died Monday (Feb. 6, 2012) at Marietta Memorial Hospital. He was born May 13, 1938, in El Dorado, Kan. to Claremont and Arline Jacobsen Deem.

Don received his BA in Business Administration from Governors State University in University Park, Ill. He had worked as a color specialist at Borg-Warner Chemicals & Plastics for 30 years at Ottawa, Ill and Washington, WV. In 1988 Borg-Warner Chemicals & Plastics was acquired by General Electric. Don joined Ampacet Corp. at its then new Corporate R & D Center in Terre Haute, Indiana in January 1990 as Color Manager. Don retired from Accurate Color in 1995, as vice president. He was a member of St. Mary Catholic Church, where he had served as a Eucharistic Minister.

Don was a member of SPE and the Color and Appearance Division starting in 1961. As a senior member of SPE, Don served on the CAD Board of Directors before becoming an officer of SPECAD. Don served on the Paper Review Committee and the Awards Committee before being elected Division Chairman for 1990-1991. Don is survived by his wife, two grown children and six grandchildren.

William Reginald "Reggie" Dawes

William Reginald "Reggie" Dawes, 77 years old, passed from this life November 29, 2011 at Hospice Notre Dame. Reggie, a retired chemist, computer software programmer, web designer and tour guide/buggy driver lived for much of his life in New Orleans.

Reggie attended Jesuit High School and graduated from Loyola in 1957 with a chemistry degree. He was a 1st Lt in the US Army and served as a Captain in the National Guard. Reggie is well known in New Orleans from his involvement with music and the folk dance group, Crescent City International Dancers. Reggie contributed to the Coloring of Plastics Industry in many ways during his career. He was a long time CAD member, which included a stint on the CAD Board of Directors. Probably his largest contribution to the coloring industry was the website he developed and maintained about coloring, Colorpro.com. From Colorpro.com, Reggie wrote "I was fortunate enough to join the field when the science was young and digital computers were new, and the theoretical work was finally being reduced to practice. Happily, at national meetings of the Inter-Society Color Council and the CAD, I got to meet the creative people who made it a science, as well as workers in color from an amazing variety of technical fields, all bonded together because of color.

YOUR COMPANY, OUR DIVISION

The Color and Appearance Division (CAD) is committed to the publishing of at least three newsletters a year (four, if there is sufficient material to justify the extra issue). To that end, we would like you to think about the financial side of sponsorship of the newsletter. For the small donation of $300 per year, we offer a business card sized (2" x 3.5") mention in our newsletter, which goes out to the nearly 1,500 members of the CAD as well as other SPE division members. These are people active in every aspect of plastic coloring and additive technology. Larger sized spots are available at a commensurate increase in rate.

If you are interested in helping to sponsor the SPE/CAD Newsletter please contact: SHARYL REID

Phone: 864-968-2426 Email: Sharyl_Reid@us.aschulman.com
Louisville Marriott Downtown Louisville, KY
September 30 - October 2, 2012
On-line registration available soon at www.specad.org

Events include:

- Sunday evening reception at Glassworks, a working art glass studio
- Two days of technical programming focused on the hottest topics in plastics coloration
- Exhibit hall with more than 50 exhibitors
- Networking reception – an opportunity to mingle with others involved in coloring plastics
- New Technology Forum – the newest information from suppliers
- Color Tutorial given by SPE Fellow, Bob Charvat

For more information:
Sandra Davis (302-999-2540)
DuPont Titanium Technologies
Sandra.p.davis@usa.dupont.com
INTRODUCTION

The vocabulary of color is undoubtedly confusing to many of the people in the industrial field. This may be one of the greatest single contributing factors to the many color problems that plague us today. All realize full well the importance of an adequate method of communicating when discussing electrical characteristics or mechanical dimensions; however, color seems to be a phenomenon that is taken for granted.

Frequently, you will find color interpreted as a type of destiny that has the strange ability to produce a very pleasing sensation. Few consider color as a physical sensation, with light being the energy that stimulates the eye. The object is nothing more than a mass which has the capability of absorbing or reflecting radiant energy.

FUNDAMENTALS OF COLORIMETRY

There are two basic classifications of color: achromatic and chromatic. The achromatic scale defines the lightness range; i.e., white, black and all the intermediate gray values. The chromatic scale includes the hue sensations and all the mixtures between them and the achromatic range. The achromatic range may be modified in only one direction, as lighter or darker, whereas the chromatic scale can be modified in three directions. First, the hue can be changed, such as yellow made greener or redder; second, any color may be made more or less saturated, which is the change chroma; and third, any of the colors may be made grayer. Figure 1 indicated the psychological or visual aspect of the achromatic and chromatic scale.

The trained human eye is indisputably the most critical instrument for perceiving all colors under all conditions of illumination and reflection. Surprisingly, the eye, despite its sensitivity to small color differences, is nevertheless incapable of analyzing these differences. Frequently, color experts can agree that there is a small difference in a color solid, but cannot agree on the degree of difference, the reason for the difference or the way to correct this difference. With this being true, it is impractical to assume that an inspector could reasonably accept reject parts to a standard visually. Over a period of time, he would either create objectionable mismatches in final assembly or give origin to scrap or rework that is completely necessary.

The inadequacy of color memory limits the inspector to accepting only those parts that appear exactly the same. Any slight noticeable difference in color will cause confusion as to whether or not the material is acceptable. When this happens, the production schedule often becomes the acceptance criterion. If the parts are urgently needed, a confused decision seems proper. The parts are stocked and sent in turn to the assembly line. Here the particular parts involved are placed adjacent to parts that have been produced from a different lot of material, and an obvious mismatch is noticeable. If objectionable enough, extensive rework is required. Once the additional expense has been observed, the Inspection Department is notified and the acceptance criterion is changed. The limits are now closed completely, and only those parts that afford a near perfect match are accepted. Obviously, both conditions stated create additional expense and do not assure a quality product.

MISCONCEPT OF VISUAL TOLERANCE

In an effort to establish a tolerance, the manufacturer habitually requests that the company buying the product establish a high and low chip, indicating a range of color that will be acceptable. This only adds to the confusion of visual color standardization because the tri-stimulus inherent on color itself – namely, hue, chroma, and value – is involved in both the high-limit and the low-limit standard, as well as in the part of being checked.

The average human eye is not capable of perceiving all of the ramifications of a single color standard. The reason is that many changes in the tri-stimulus can take place in a single color solid that may not be visually noticeable. If a part is compared with the high-limit standard and appears visually similar, it is very possible that the part may actually be located higher on the achromatic scale than the standard. At the same time, another part may be compared with the low-limit standard and actually be located lower on the achromatic scale. Although the two parts appear visually acceptable when compared with their respective standards, these two parts could create a very definite contrast when they

continued on page 11
are placed adjacent to one another. If the eye cannot perceive this difference, it is impractical to assume that it can calculate divergence when both standards, as well as a part, are involved.

**INSTRUMENTAL MEASUREMENT OF COLOR**

The Kingston plant of the IBM Federal Systems Division had a unique problem on color matching in both finishes and plastics. At times colored parts were supplied by many vendors throughout the country. Frequently, these parts were placed adjacent to one another in final assembly, revealing that every type of color-matching problem known. It became apparent that color instrumentation was the only logical approach to the problem.

After a thorough review of the instruments available at the time, it was determined that tri-stimulus colorimetry offered the greatest potential for our particular application. Tri-stimulus colorimetry means measuring a color by a method which simulated the three responses of the human eye in distinguishing between hue, value, and chroma. **Figure 2** shows the psychological aspect of color. (see page 13 for figure 2)

One instrument that will accomplish this very adequately is the automatic color difference meter. This meter is a null balance system which is capable of translating the qualitative psychological aspect into a quantitative physical measurement. The subjected sample is illuminated in four different directions over the entire exposed specimen area. Light is reflected into a filter-photo cell combination system. Current proportional to the light intensity enters the measurement unit, where the color commutations are performed. Duodial readings give a complete colorimetric identification of the sample is reference to the standard. These values can be computed into actual NBS or $\Delta E$ units.

$$\Delta E = \sqrt{(\Delta L)^2 + (\Delta a)^2 + (\Delta b)^2}$$

In order to simplify the mathematics of the above formula, the following method of calculating $\Delta E$ has been developed so that an inspector can use instrumentation successfully. Although the material in this article is based on the color difference meter currently used, this information may be readily adapted to other types of instrumentation. The $\Delta E$ calculation sheet (Figure 3) is used in the following manner:

1) Place the tolerance specified by the manufacturer in the space labeled “TOL”.
2) Record readings obtained from the manufacturer’s standard in $L$, $a$, and $b$ columns labeled “STD”.
3) Record readings taken from production sample in the $L$, $a$, and $b$ columns labeled “PART”.
4) Subtract differences between “STD” and “PART” and place results in column labeled “DIFF”.
5) Square “DIFF” column $L$ and place result on line labeled
6) Square “DIFF” column $a$ and place result on line labeled
7) Square “DIFF” column $b$ and place result on line labeled
8) Add and record as “TOTAL”.
9) Locate manufacturer’s tolerance on column 1, and read directly across to column 2. If the numerical reading of column 2 is equal to or greater than the numerical value of “TOTAL”, parts are within acceptable limits.

After completion of this instrumental color test, this sheet may be maintained as a record and the information can be readily used for correlation data.

**DEVELOPING A STANDARDIZATION METHOD**

One of the most important elements in the use of instrumentation for color is an adequate method of standardization. Currently, the following system is being used. The Industrial Design Department first chooses a color from either Federal Specification TT-C-595 or the Munsell Book of Color, and then designates a code number to correspond. The notation number and code number are forwarded to the Tool and Gage Department of Quality Control for standardization. Wherever possible, the Tool and Gage Department has the notation converted into ceramic standards. Aged ceramics are used because they are stable in both color and gloss. In addition, if a ceramic becomes soiled, it can be readily cleansed with soap and water or a non-toxic solvent.

*continued on page 12*
Quality control has been using ceramic standards for over two years and has not had to replace a single standard in the field or in inspection departments during this time. Periodic check of all standards by instrumental control has revealed that no change of any kind has taken place in any of the standards currently in use. Realizing that the manufacturers of ceramics need a tolerance much the same as any other standards supplier, the Industrial Design Department furnishes a tolerance that may be used for procurement only. This tolerance may vary according to need and complexity. All colors have been classified into decorative and nondecorative finishes. The type of classification determines the amount of tolerance allotted. The number of standards needed to control a given color is decided prior to placing the order for ceramics. This is done so that all standards can be made at one time, thus eliminating the problem of matching lot to lot in ceramics.

The tolerance specified in making standards would be interpreted as follows: In preparing blue decorative standards the manufacturer may vary a $\Delta E = 0.7$ from the notation supplies, but must keep all the standards on the order within a $\Delta E = 0.3$ of each other. When the standards become available for production use, the blueprint will identify them with a code number as well as an applicable tolerance for production purposes. One thing which must be understood when calling out a $\Delta E$ tolerance on a blueprint is that the $\Delta E$ tolerance may double on a production run. As shown in Figure 4, if the blueprint calls out a $\Delta E = 0.5$, two production parts may vary as much as a $\Delta E = 1.0$ away from each other. A vector diagram for the total color difference in terms of $\Delta E$ is shown in Figure 5.

$\Delta E$ is the diagonal of a parallelepiped in a three-dimensional space; therefore it may cause confusion in the interpretation of a blueprint containing only a $\Delta E$ notation. Tolerances may be called out successfully by expressing high and low limits of the three vectors responsible for overall color difference, namely $\Delta L$, $\Delta a$, $\Delta b$. An alternate method is to vary the extracted square root of the sums, in which case the $\Delta E$ value can be readily controlled by calling out half of the variation required from part to part in actual production.

**METAMERIC COLOR CONTROL**

The effectiveness of instrumentation on a metameric color is a very questionable area in instrumental color control. Undoubtedly, spectrophotometry is most adaptable for use in selection of pigments that have similar molecular characteristics; however, a mere inspection of spectrophotometric data will not allow one to predict color differences in a color solid. This, combined with the cost of spectrophotometer, often prohibits the use of an effective instrumental control where a metameric color is involved.

It is possible, when using tri-stimulus colorimetry, to have an instrumental match that will not be acceptable visually under a different lighting condition. With this possibility existing, it is felt that visual evaluation, along with instrumental data, is essential in the initial process of obtaining an acceptable color match. The Macbeth Color Matching Booth is an excellent aid in visual evaluation.

Once a match has been agreed upon, metamericism can be avoided if similar coloring agents are used in the figure reproduction of a particular color.

Generally, a metameric difference occurs when the standard and the sample are made of different materials or colorants. Acceptance of this fact allows the controller to place additional emphasis in establishing adequate standardization when unlike materials must be used adjacent to each other, as may be required in matching plastics to paint. The frequency of a metameric condition depends on the skill of the chemist in formulating a material. After five years of instrumental color control there has been but four occasions where a metameric condition has been noted. These five years include many thousands of color matches, indicating that most companies have the ability to recognize a metameric color problem when it appears. Thus the inability of a tri-stimulus instrument to recognize this condition in all cases does not constitute a serious inadequacy in the use of tri-stimulus colorimetry control.

Instrumentation can be used to the best advantage only when both of the supplier and consumer have similar instrumentation available. Until the time when instrumentation is accepted throughout industry as the most satisfactory method of controlling color, color matching and visual inspection will continue to be governed by personal opinion, which often proves to be extremely expensive and very ineffective.
ACKNOWLEDGMENT

Portions of this paper have been taken from a previous paper written by T.G. O'Brien entitled, "Instrumental Quality Control For Color", published October 1960, Vol. XVII.
Society of Plastics Engineers
Endowment Scholarship Program
For the 2012 – 2013 School Year

The Endowment Scholarship Program offered by the Color & Appearance Division of the Society of Plastics Engineers awards up to five scholarships each year to students who have demonstrated or expressed an interest in the coloring of plastics industry. The students must be majoring in or taking courses that would be beneficial to a career in this industry. This would include, but is not limited to, plastics engineering, polymer science, coloring of plastics, chemistry, physics, chemical engineering, mechanical engineering, industrial design and industrial engineering. All applicants must be in good standing with their colleges. Financial need is considered for most scholarships.

Undergraduate and graduate scholarships range up to $4,000 annually. Scholarships are awarded for one year only, but applicants may apply for a re-award for each year they are enrolled in school.

Scholarship Eligibility
1. Applicants for these scholarships must be full-time undergraduate students in either a four-year college or a two-year technical program or enrolled in a graduate program.
2. All applicants must be graduates of public or private high schools.

Scholarship Criteria
1. Applicants must have a demonstrated or expressed interest in the coloring of plastics industry.
2. Applicants must be majoring in or taking courses that would be beneficial to a career in the coloring of plastics industry.
3. An applicant must be in good academic standing with his or her school.
4. Preference is given to student members of SPE and also to students who have a parent(s) as a member of the Color & Appearance Division of the SPE.
5. Financial need of an applicant will be considered for most scholarships.

Application Procedure
To be considered for a scholarship from the Color & Appearance Division Endowment Scholarship Program, applicants must complete an application available at www.specad.org and return it to the address specified on the application by June 15, 2012. All applications submitted must include:
1. A completed application form.
2. Three recommendation letters: two from a teacher or school official and one from an employer or non-relative.
3. A high school and/or college transcript for the last two years.
4. An essay by the student (500 words or less) telling why the applicant is applying for the scholarship, the applicant's qualifications, and the applicant's educational and career goals in the coloring of plastics industry.
On-Line Plastics and Coloring of Plastics at Terra State Community College

A very distinctive feature of the Terra plastics program is its ability to provide “distance learning” (online) courses to students who may reside too far from the Fremont, Ohio campus to participate in full time day or evening classroom activities. This distance learning program has successfully served students globally, as well as locally, for several years.

We all know people within the industry (technicians, sales staff, new hires, etc.) that have no color education to speak of. One aspect of Terra’s program that can benefit many of the newer, or under-educated, members of our industry is this internet based, three course certificate program. It is a relatively low cost, no travel, flexible program that the employee can complete anywhere, on their schedule. The three courses provide solid background knowledge for anyone working in the many segments of the coloring of plastics industry. The three courses are:

- **Introduction to Color**
  - Introductory course on color theory
  - Basic background knowledge for anyone working with color
- **Colorants for Plastics**
  - The study of colorant types and their incorporation into polymer materials
  - More in-depth treatment than in Intro Class
- **Introduction to Plastics**
  - Introductory course on plastics
  - Polymer types, properties and processing

Courses are an excellent opportunity for newer color matchers, quality control technicians, production technicians, and others to learn more about the coloring of plastics. These courses are also good for people with industry experience, since many of them have learned on-the-job. This is a good opportunity for them to learn the theory behind what they do every day. Students completing this certificate can expect benefits including:

- Quicker color matches
- Better understanding of pigments and their use
- Prevention color problems
- Solve color problems quicker
- Quicker batch corrections in production
- Better understanding of color at processors
- Cost savings

For more information, contact Jamie Przybyski, Program Professor at 419.559.2459 or toll free 866.AT.TERRA, ext. 2459 or email jprzybyski@terra.edu

**Distance Learning Courses Offered**

Section VI. **PET 1100 Introduction to Plastics** (3 Credits)

- Fees: $400 Ohio students/$600 out-of-state
- Books: approximately $200
- Offered Fall 2012: (August 20—December 14)
- Offered Spring 2013: (January 14—May 9)

Section VI. **PET 1240 Introduction to Color** (3 Credits)

- Fees: $400 Ohio students/$600 out-of-state
- Books: approximately $200
- Offered Fall 2012: (August 20—December 14)
- Offered Spring 2013: (January 14—December 14)

Section VI. **PET 2320 Colorants for Plastics** (4 Credits)

- Fees: $500 Ohio students/$790 out-of-state
- Books: approximately $150
- Offered Spring 2013: (January 14—May 9)
Customers visiting a plastics operation like to tour the laboratory, specially a color lab. One reason is that regardless of the customer’s technical color vision acuity, everyone is their own color expert so they feel more comfortable. Another reason is it’s one of the few places in a factory where one can actually see something colorful happening. This is not to imply that technicians in the laboratory are the only ones in the plant that move around and do anything! It’s because out on the operating floor all one would see are the outsides of a cluster of machines. In the lab one would see exciting colorful parts or test specimens.

On one of many lab tours given by a well-respected company noted for its automotive color matched plastics, a tour guide asked the visitors which surface of a part was lighter; the top or the bottom. The observations were made at a light booth. The part was shaped like a clam shell space ship demonstrating geometric metamerism. The visitors responded, “The top!” The guide reversed the part top to bottom and answered “you’re right!”

When Wang Laboratories introduced Word Processing [we’ve come a long way since June 1976] they designed a display something like this drawing:

Geometric metamerism caused the housing (sloping down) and the bezel (sloping up) to mismatch in appearance. The 2 parts came together like a house roof so light reflected more to the front or back depending on where the illuminant was positioned. To make matters more complicated, the parts were textured and (a) the depth was different on the housing versus bezel and (b) the texture orientation was different on each. Wang was trying to blame the appearance difference on the molding compound. When pieces were cut from both parts and pressed into one high gloss flat “pressout” specimen, one could not see where the two halves joined. The parts were exactly the same color and appearance in press-out form.

Since the texturing on the Housing and Bezel were different, there was no orientation of the molded assembly where both parts appeared to match. If the texturing had been the same on each of the two parts, viewed from either position the assembly pieces would have visually matched.

Geometric Metamerism: (A typical definition)
The perceived color difference between two samples is the result of the two objects having different shapes, gloss, texture and/or viewing angles and source position.

Look for more Color Mischief in the next CAD Newsletter!
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Group Name: SPE Color & Appearance Division
Group ID 152108

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