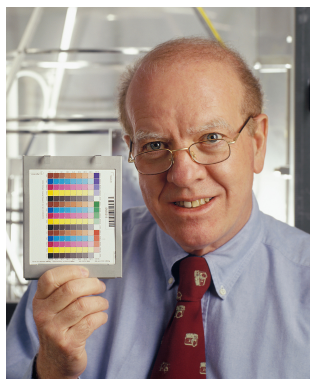


JOHNS HOPKINS UNIVERSITY
MATERIALS SCIENCE & ENGINEERING
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Fall 2014 Seminar Series



Henry Wilhelm
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Grinnell, Iowa U.S.A.

Accelerated Test Methods to Evaluate the Long-Term Permanence Characteristics of Digitally-Printed Photographs, Including Large-Format Images Printed with Newly Developed UV-Curable Pigment Ink Systems on a Wide Variety of Rigid and Flexible Substrates, and Dye-Sublimation Inks Imaged at High Temperatures on Large, Specially-Coated Aluminum Plates

Smaller ink drop sizes, higher addressable DPI, the use of dilute (in addition to full-concentration) primary inks, and the development of white inks and glossy and matte surface “clear inks” have made UV-curable ink technologies practical for high end photographic and fine art prints. These systems are capable of printing directly onto acrylic sheets, aluminum, glass, wood, plywood, uncoated artists papers, traditional gesso-coated artists canvas, flexible and rigid vinyl, and more substrates – many of which have not previously been used as supports for photographic prints. Moreover, improvements in the printers have coincided with a trend toward ever-larger prints in the high-end of the photography art market during the past ten years. UV-curable technology is now poised to play a major role in this expanding market segment.

However, the great diversity of ink compositions and substrates used in this technology, combined with limited field experience, raises the question of how permanent these prints will be. How will they and prints made with other new technologies such as high-temperature dye sublimation stand up to years of light exposure, humidity cycling, and atmospheric ozone? With traditional silver halide color prints by a number of photographers including Andreas Gursky, Cindy Sherman, Jeff Wall, Richard Prince, Thomas Struth, Jeff Koons, Thomas Ruff, and others commanding very high prices – with some individual color prints selling for more than \$3-million – there is great interest in how long prints made with these new imaging technologies will last – and to determine if there may be new modes of deterioration, such as separation of the image layers from the substrate over time – that are specific to these new methods of printing photographs.

Wilhelm Imaging Research has developed a comprehensive suite of eight predictive permanence tests over the past 25 years for photographic prints, including indoor light stability (with and without a UV filter), Arrhenius dark storage tests, resistance to atmospheric ozone, resistance to high- and cycling-humidity environments, and water resistance. These tests have been applied to prints made with pigment inkjet, dye-based inkjet, color silver-halide, dye-thermal transfer, latex pigment inkjet, solvent pigment inkjet, and other types of color prints. In the course of this work, WIR has assembled the “Wilhelm Analog and Digital Color Print Materials Reference Collection,” the largest collection of its kind in the world.

Henry Wilhelm is co-founder (with Carol Brower Wilhelm) and director of research at Wilhelm Imaging Research, Inc. (WIR) established in 1995. WIR test methods have become the worldwide de facto standard for print permanence evaluation and are currently being used by HP, Canon, Epson, Kodak ChromaLuxe, and other OEMs as well as Canson, Hahnemuhle, and Lexjet. WIR also provides consulting services to museums, archives, and commercial collections on sub-zero cold storage for the very long-term preservation of still photographs and motion pictures. Wilhelm has authored or co-authored more than 25 technical papers presented at conferences sponsored by the Society for Imaging Science and Technology (IS&T) and the Imaging Society of Japan (ISJ) in the United States, Europe, and Japan. Wilhelm is a founding member of American National Standards Institute (ANSI) Committee IT-3, established in 1978, now known as ISO Working Group 5/Task Group 3 of ISO Technical Committee 42. Together with Yoshihiko Shibahara of Fuji Photo Film Ltd. In Japan, he serves as co-project leader of the Indoor Light Stability Test Methods Technical Subcommittee of ISO WG-5/TG-3.

Wilhelm received a one-year Guggenheim Fellowship in 1981 for what became a ten-year study of color print fading and staining under low-level tungsten illumination that simulates museum display conditions. With contributing author Carol Brower Wilhelm, he wrote *The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures*, published in 1993. The complete 758-page book is available in PDF/A format at no cost from www.wilhelm-research.com. Since the book was posted on the WIR website in 2003, more than one-half million copies have been downloaded worldwide. Wilhelm is the recipient of the Photoimaging Manufacturers and Distributors Association (PMDA) “2007 Lifetime Achievement Award” for his work on the evaluation of the permanence of traditional and digital color photographs. In 2011, he received an honorary Doctor of Science degree from Grinnell College.

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