

# Long-Term Preservation of Photographic Originals and Digital Image Files in the Corbis/Sygma Collection in France

Henry Wilhelm, Wilhelm Imaging Research (USA); Cédric Gressent, Corbis/Sygma (France); and Drew MacLean, Corbis (USA)

## Abstract

*Corbis/Sygma in France is one of the most important documentary photography collections in the world. The Corbis "Sygma Preservation and Access Initiative" project began in 2004 to ensure that the collection's more than 50 million individual objects, including prints, negatives, contact sheets, and color transparencies, will be carefully preserved for thousands of years into the future in a new high-security cold storage facility located in Garnay, France (45 minutes from Paris by train). The second major goal of the project was to make the collection more widely accessible to publishers, the creative community, historians, photographers, students, and others around the world.*

*Beginning in 2005, a team of Corbis editors and archivists became engaged in the initial phases of the project, leading up to the relocation of the collection from its original home in Paris to the new "Sygma Preservation and Access Facility" in Garnay, scheduled to open on May 14, 2009. This process has involved changing the archive classification system to organize pictures by photographer, rather than by theme, and to better systematize tracking and payment of royalties.*

*Corbis has been collaborating closely with the many photographers represented in the Sygma collection to make their work more widely available by researching, identifying, and digitizing the most significant photographs in the collection – and making the images available on the Corbis website. During the period from 2002 to 2008, Corbis technicians digitized more than 80,000 prints, negatives, and color transparencies from the Sygma collection to bring the total number available in 2008 at on-line at Corbis.com to more than 850,000 searchable images.*

*The comprehensive analog and digital preservation program will utilize  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ), humidity-controlled cold storage to preserve the irreplaceable photographic originals in essentially their present condition for many thousands of years into the future. To preserve the high-resolution digital scans of the photographs – and to preserve the digital camera captures made in recent years – Corbis utilizes secure servers which are backed-up offsite and has developed a long-term data format migration strategy. Corbis is a private corporation owned by Bill Gates.*

## The History of the Sygma Photography Collection

In 1973, photographer Hubert Henrotte and other photographers left the photo agency Gamma with their archives and set out to create their own organization. Shortly thereafter they acquired Apis, the agency which gave them access to iconographic material along with the agency's premises and its photographic laboratory, thus giving birth to Sygma.

The Sygma photographers covered most major international conflicts of this century, including the Vietnam War, the Iranian Revolution, wars in Lebanon, Afghanistan, former Yugoslavia, the events of Tiananmen Square, the fall of the Berlin Wall, and the first Gulf War. In the 1980's, a new approach to entertainment photography was inaugurated with 'rendez-vous,' in which dedicated photographers devoted themselves exclusively to photographing celebrities and other famous personalities. It was during this period that Sygma entered into its golden age.

The 1990's witnessed a turning point with the digital transmission of photographs during the first Gulf War. Sygma's own technological evolution continued in 1993, when the agency decided to digitize its images and launch [www.sygma.com](http://www.sygma.com), with about 750,000 images online. Hubert Henrotte left the agency in June 1998. In 1999 Corbis purchased Sygma, thereby adding an invaluable collection to its worldwide archives. The Sygma collection now represents a photographic heritage of inestimable value, grouping together the collections of three agencies:

- *Sygma*: photojournalism, news, editorial, magazine photography, celebrities, and portraits
- *Kipa*: television and movie sets
- *Tempsport*: sporting events

It also includes other collections dating from the late 1940's to the 1960's such as Apis, Universal Photo, Reporters Associés, and Interpress. Together, these collections represent an archive



Henry Wilhelm (June 24, 2008)

Scheduled for completion in November 2008 and formally opening on May 14, 2009, the new Sygma Preservation and Access Facility is located in Garnay, France, about 45 minutes from Paris by train.



Located in the secure Locarchives records storage complex, the new Corbis/Sygma facility will have three separated humidity-controlled cold storage vaults, with a total storage area of 500 m<sup>2</sup>.

of more than 50 million elements, including negatives, contact sheets, slides and prints.

### The Sygma Preservation and Access Initiative

In 2004, Corbis announced its “Sygma Preservation and Access Initiative.” Recognizing the richness of the Sygma archive, Corbis set out to find a suitable site for the long-term preservation of the prints, negatives, and color transparencies that comprise one of the largest photography collections in the world. An ambitious project representing significant long-term investment, the initiative would involve reorganizing and relocating more than 50 million images in a new archiving site designed to provide optimum storage conditions, scanning capability, ready access, and ensure the continuity of the collection.

#### Phase 1: From 2005 to 2008

To launch the initiative, Corbis decided to restructure its archiving system, classifying pictures by photographer rather than by theme. The task was daunting, but deemed necessary, as the new system would allow for a regularization of royalties, as well as facilitate the promotion of the collection and its digitization. This sorting was carried out in conjunction with the signing of archive agreements with photographers. Every Sygma image is the property of its author who alone can decide whether it will be entrusted to Corbis or reclaimed. In the last four years, Corbis has contacted more than 10,000 contributors, offering them an “archive agreement” which enables them to entrust the archiving and commercial development of their work to Corbis.

Publishing the core of the Sygma collection is a multifaceted task. Corbis developed a team of editors who work in close collaboration with the photographers, choosing the very best images for digitization, and bringing the collections to life. Since 2002, more than new 80,000 images from the Sygma collection have been added on the [www.corbis.com](http://www.corbis.com) website, revealing once-unknown treasures to the public for the first time, and adding to the wealth of material already available in digital format.

#### Phase 2: 2008 and Forward

Corbis’ commitment to preserve the Sygma archive involved finding a suitable site which would follow strict criteria for long-term preservation and maximum security in a facility dedicated strictly to Corbis, while providing easy access to the archive by researchers and photographers. Corbis decided to entrust its collection to Locarchives, one of France’s leading archiving and record management firms.[1] The site, located in Garnay near Dreux, is only 45 minutes from western Paris, offering easy access by car or train from the capital.

Locarchives managed the construction of the 800 m<sup>2</sup> site for the exclusive use of Corbis. It is equipped with sophisticated humidity and temperature controls, an airtight environment, and has optimal fire safety and intrusion protection.

With such an extensive inventory, the relocation of the archive was indeed complex. For that reason, Corbis again called upon Locarchives for the safe transfer of the archive from the Paris location to the preservation site. The move will take place in two phases. In the summer of 2008, the material will be safely packed into boxes, tracked and stored in a temporary location while the seven linear kilometers of shelving at the Paris office is dismantled and upgraded for the new facility, where it will be reassembled. The archive will then be moved into its new home.

In order to ensure optimal preservation of the Sygma col-



Henry Wilhelm (August 9, 2006)

*Cédric Gressent, project manager for the Sygma Preservation and Access Initiative. The collection consists of more than 50 million prints, film negatives, glass plates, contact sheets, color transparencies, and other items. Preparing the collection for the move from Paris to the new cold storage facility in Garnay required a massive reorganizing and cataloging effort by the Corbis staff.*

lection, Corbis asked Henry Wilhelm of Wilhelm Imaging Research, Inc. to serve as a consultant and advisor on preservation.[2-4] As the Sygma collection is a working collection with high demands on accessibility, the difficulty for Corbis lay in finding the right balance between preserving these archives in an unchanging environment and granting quick and easy access with minimal impact to the material.

To satisfy these conflicting requirements, the preservation facility is divided into three vaults, each of which operates at a different temperature depending on the nature of the material, and the anticipated frequency of access.

- The first section, with a maximum temperature of  $-3^{\circ}\text{C}$  ( $26^{\circ}\text{F}$ ) and 40% relative humidity (RH), houses the oldest collections of negatives and prints, complying in full with the applicable ISO 18911 and ISO 18920 storage standards.[5-6]

- The second section, with a temperature of  $14^{\circ}\text{C}$  to  $16^{\circ}\text{C}$  ( $57^{\circ}\text{F}$  to  $61^{\circ}\text{F}$ ) and 40% RH, is provided for the core of the collection including the original selects, which are often subject to requests for immediate digitization.

- The third section, set at  $18^{\circ}\text{C}$  ( $65^{\circ}\text{F}$ ) and 40% RH, is provided for the rest of the archives, composed mostly of duplicates, prints, and non-selects for which there remains a great deal of work to be done in terms of organization and indexing. These conditions allow the staff to work comfortably for extended periods dressed in normal office clothing.

After organization and indexing are completed, the temperature in the new facility will be gradually lowered to  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) and 40% RH. This will stop the slow but inexorable deterioration of the collection. The color images, prints, and acetate base black-and-white negatives and transparencies will be preserved essentially unchanged – in their original form – for many thousands of years into the future.[7-9]

If the collection had remained in the uncontrolled, room temperature conditions where it had been kept in Paris for so many years, it would have perished before the end of this century.

The Sygma/Corbis collection will continue to be freely accessible to photographers, iconographers, historians and researchers in the future, with scanning capabilities onsite. The formal opening of the new facility is scheduled for May 14, 2009.

**Table 1 Maximum temperatures and relative humidity ranges for extended-term storage specified in ISO 18911 (2000)**

Image	Base	Maximum temperature <sup>a, b</sup> °C	Relative humidity range <sup>a, c</sup> %
Black-and-white silver-gelatin <sup>d</sup> (see ISO 10602)	Cellulose esters <sup>e</sup>	2	20-50
		5	20-40
		7	20-30
Black-and-white silver-gelatin <sup>d</sup> (see ISO 10602) Thermally or processed silver (see ISO 18919) Vesicular (see ISO 9718) Silver dye bleach	Polyester	21	20-50
Colour (chromogenic)	Cellulose esters <sup>e</sup>	- 10 - 3	20-50 20-40
Diazo (see ISO 8225)	Polyester	2	20-30

<sup>a</sup> See annex H for storage of historic still photographic records.  
<sup>b</sup> Cycling of temperature shall not be greater than ± 2 °C over a 24 h period.  
<sup>c</sup> Cycling of relative humidity shall not be greater than ± 5 % RH over a 24 h period.  
<sup>d</sup> If there is concern about the possibility of silver image oxidation due to atmospheric contaminants, poor quality enclosures, and/or excessively high temperature and humidity levels, a post-process chemical conversion treatment can be used to provide added protection (see ISO 18915).  
<sup>e</sup> This includes cellulose triacetate, cellulose acetate butyrate, and cellulose acetate propionate.

**Table 2 Effect of Temperature on Dye Fading Rates at 40% Relative Humidity\***

Storage Temperature	Relative Storage Time
86°F (30°C)	1/2X
75°F (24°C)	1X
66°F (19°C)	2X
55°F (13°C)	4X
45°F (7°C)	10X
40°F (4°C)	16X
32°F (0°C)	28X
14°F (-10°C)	100X
0°F (-18°C)	340X
-15°F (-26°C)	1000X

\* Derived from: Charleton C. Bard et al., "Predicting Long-Term Storage Dye Stability Characteristics of Color Photographic Products from Short-Term Tests," *Journal of Applied Photographic Engineering*, Vol. 6, No. 2, April 1980, p. 44 (with permission). Fading rates of many dyes can be significantly greater when stored where relative humidities are higher than 40%.

*Older black-and-white and color films and prints, such as those found in the Corbis/Sigma collection, should be stored at a very low temperature to halt further deterioration. ISO 18911:2000 (Informative Annex H "Historic photographic records") states: "Since the colour images of most types of older colour files (for example, incorporated coupler transparency films manufactured prior to around 1980) are intrinsically less stable than the films being manufactured at this time and because of changes as a result of storage over the years, storage temperatures significantly lower than the maximum temperatures specified in Table 1 [above] should be provided to prolong their life. This is also true for older black-and-white films on acetate film base that may be showing evidence of degradation." [5]*

**Table 3 Effect of Relative Humidity on Fading Rates of Certain Kodak Chromogenic Yellow Dyes\***

Relative Humidity	Relative Dye Fading Rate at a Specified Temperature
60%	2X
40%	1X
15%	1/2X

\* Derived from: Charleton C. Bard et al., "Predicting Long-Term Storage Dye Stability Characteristics of Color Photographic Products from Short-Term Tests," *Journal of Applied Photographic Engineering*, Vol. 6, No. 2, April 1980, p. 43 (with permission).

**Table 4 Estimated Number of Years for “Just Noticeable” Fading to Occur in Various Kodak Color Materials Stored in the Dark at Room Temperature and Three Cold-Storage Temperatures (40% RH)<sup>8</sup>**

**Time Required for the Least Stable Image Dye to Fade 10% from an Original Density of 1.0**

**Boldface Type** indicates products that were being marketed at the end of 1992; the other products listed had either been discontinued or replaced with newer materials. These estimates are for dye fading only and do not take into account the gradual formation of yellowish stain. **With print materials in particular (e.g., Ektacolor papers), the level of stain may become objectionable before the least stable image dye has faded 10%.**

Color Papers	Years of Storage at: <sup>8</sup>				Color Negative Films	Years of Storage at: <sup>8</sup>			
	24°C (75°F)	7.2°C (45°F)	1.7°C (35°F)	-20°C (-4°F)		24°C (75°F)	7.2°C (45°F)	1.7°C (35°F)	-20°C (-4°F)
Ektacolor 37 RC Paper (Process EP-3) ("Kodacolor Print" when processed by Kodak)	10	95	200	4,150	Vericolor II Prof. Film Type S	6	55	120	2,500
Ektacolor 78 and 74 RC Papers (Process EP-2) ("Kodacolor Print" when processed by Kodak)	8	75	160	3,330	<b>Vericolor II Prof. Film Type L</b>	<b>3</b>	<b>28</b>	<b>60</b>	<b>1,250</b>
<b>Ektacolor Plus Paper</b> <b>Ektacolor Professional Paper</b> (Process EP-2) ("Kodacolor Print") ("Kodalux Print") ("Kodalux Print")	<b>37</b>	<b>350</b>	<b>750</b>	<b>15,400</b>	Vericolor II Commercial Film Type S	3	28	60	1,250
Ektachrome 2203 Paper (Process R-100)	7	65	140	2,900	<b>Vericolor III Prof. Film Type S</b> <b>Ektacolor Gold 160 Prof. Film</b>	<b>23</b>	<b>220</b>	<b>460</b>	<b>9,570</b>
Ektachrome 22 Paper (R-3)	8	75	160	3,330	<b>Vericolor Internegative Film 6011</b>	<b>5</b>	<b>48</b>	<b>100</b>	<b>2,100</b>
<b>Color Transparency Films</b>					<b>Motion Picture Color Negative Films</b>				
Ektachrome Films (Process E-3)	5	48	100	2,100	Eastman Color Negative II Film 5247 (1974)	6	57	120	2,500
Ektachrome Films (Process E-4)	15	140	300	6,250	Eastman Color Negative II Film 5247 (1976)	12	115	240	5,000
<b>Kodak Photomicrography</b> <b>Color Film 2483</b> (Process E-4)	<b>3</b>	<b>28</b>	<b>60</b>	<b>1,250</b>	Eastman Color Negative II Film 5247 (1980)	28	270	550	11,650
<b>Ektachrome Films</b> (Process E-6) ["Group I" types since 1979]	<b>52</b>	<b>500</b>	<b>1,100</b>	<b>21,600</b>	<b>Eastman Color Negative Film 5247</b> (1985 name change)	<b>28</b>	<b>270</b>	<b>550</b>	<b>11,650</b>
<b>Ektachrome Plus &amp; "HC" Films</b> <b>Ektachrome 64X, 100X, &amp; 400X Films</b> <b>Ektachrome 64T and 320T Films</b> ["Group II" types since 1988] (Process E-6)	<b>110</b>	<b>1,000</b>	<b>2,200</b>	<b>45,750</b>	Eastman Color Negative II Film 7247 (1974-83)	6	57	120	2,500
<b>Kodachrome Films</b> (Process K-14) [all types]	<b>95</b>	<b>900</b>	<b>1,900</b>	<b>39,500</b>	<b>Eastman Color Negative II</b> <b>Film 7291</b>	<b>50</b>	<b>475</b>	<b>1,000</b>	<b>20,800</b>
<b>Color Negative Films</b>					<b>Eastman EXR Color Negative</b> <b>Film 5245 and 7245</b>	<b>22</b>	<b>210</b>	<b>440</b>	<b>9,150</b>
Kodacolor II Film	6	55	120	2,500	<b>Eastman EXR Color Negative</b> <b>Film 5248 and 7248</b>	<b>30</b>	<b>285</b>	<b>600</b>	<b>12,480</b>
<b>Kodacolor VR 100, 200, 400 Films</b>	<b>17</b>	<b>160</b>	<b>340</b>	<b>7,100</b>	<b>Motion Picture Laboratory</b> <b>Intermediate Films</b>				
Kodacolor VR-G 100 Film ("initial type") (Kodacolor Gold 100 Film in Europe)	12	115	240	5,000	<b>Eastman Color Reversal</b> <b>Intermediate Film 5249 &amp; 7249</b>	<b>8</b>	<b>75</b>	<b>160</b>	<b>3,330</b>
					Eastman Color Intermediate II Film 5243 and 7243	22	210	440	9,150
					<b>Motion Picture Print Films</b>				
					Eastman Color Print Film 5381 & 7381	5	48	100	2,100
					Eastman Color SP Print Film 5383 & 7383	5	48	100	2,100
					<b>Eastman Color Print Film 5384 &amp; 7384</b>	<b>45</b>	<b>430</b>	<b>900</b>	<b>18,700</b>



Between 2000 and 2008, the Corbis/Sygma collection was stored in rented office space in the Lumiere Building in Paris. Without refrigeration or humidity-control, the storage conditions were not adequate to preserve the films and prints in the collection. Corbis planned to move its office to a new location in Paris in 2009.



Cédric Gressent inspecting a shelf of new flat file negative and transparency storage boxes, in preparation for packing them for transport to Garnay in 2008. Many thousands of the new boxes were required, and all had to be cataloged, labeled, and entered into the collection's database so that the physical location of each box, and every item in the box, could be tracked.



Henry Wilhelm (June 24, 2008)

In preparation for the move to Garnay, prints, negatives, and color transparencies were carefully removed from the shelves and placed in shipping boxes. A sophisticated barcoded tracking system was developed to make certain that none of the 50 million items involved in the move could be misplaced. The collection consists of more than 7 kilometers of linear shelf space.



To move the entire collection, approximately 14,000 shipping boxes were filled, and information for both the contents and the boxes themselves was carefully entered into the tracking system.



Henry Wilhelm (June 25, 2008)

More than 48 truck loads of boxes were required to move the collection from Paris to the new preservation facility in Garnay.



The Corbis world headquarters and central computer operations are located in a renovated former bank building in Seattle, Washington. Corbis also maintains regional offices throughout the world.

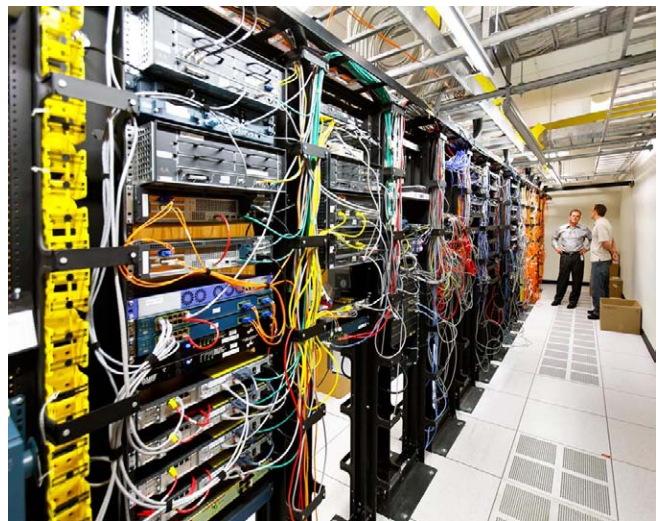


A large-scale EMC data storage system provides on-line storage for high-resolution scans of analog films and prints, as well for digital camera files. Secure, offsite back-up is also provided.



Henry Wilhelm (August 6, 2007)

Drew MacLean (left), Corbis vice president for media services and operations, in the high-bandwidth server facilities at Corbis headquarters. The clustered servers deliver on-line search, image access, and purchase transactions for [www.corbis.com](http://www.corbis.com).



High-bandwidth Internet support systems are housed in this room. These 24/7 systems with backup power supplies serve Corbis regional offices, Corbis customers, and other visitors to the Corbis website throughout the world.

### Long-Term Preservation of Digital Image Data

While Corbis is carefully implementing a sophisticated preservation and access program, it is also simultaneously digitizing and marketing thousands of new images each month. With the consent of the photographers who have signed agreements with Corbis, many of these images are from the Sygma collection.

Corbis is a creative resource for editorial, advertising, marketing and media professionals worldwide, providing high quality photography, video footage, and rights services. Corbis offers a diverse collection of more than 100 million creative, entertainment and historic images, a comprehensive video footage library, one of the world's most wide ranging rights and clearances services, and a sophisticated media management solution. Corbis also operates SnapVillage, an innovative

microstock web site. It is Corbis' mission to not only preserve photography and video footage, but also to digitize, enhance the search metadata, market, and display the images for Corbis customers. The Corbis collection is constantly growing, providing an increasingly broad range of high quality and historically significant photographs to people around the world.

To facilitate this, Corbis follows strict sourcing, production, and archiving guidelines to insure that the photography and footage are available in the most suitable format – and in the highest quality – for Corbis clients. This standards-based process of converting analog images to searchable digital files requires professional editing, high-end scanning equipment, advanced digital imaging software, a comprehensive, controlled vocabulary, and a team of skilled and dedicated professionals. This combination of technology and visual sensitivity to im-

ages enables Corbis to offer to the marketplace images for licensing that meet the needs of diverse clients in advertising, editorial, publishing, web documents, and other applications.

Depending on the image's aspect ratio and color profile, images are generally captured as a 50MB TIFF format digital file. In this format, and at this file size, the maximum amount of data is transferred from the film to the file, sharply reproducing the film's original detail and grain structure, but without introducing unwanted digital "noise" or other distracting data elements. As a result, the 50MB file size is well-suited for most image applications, up to and including high quality double-truck magazine and book layouts.

As image capture has evolved from analog film to digital cameras, the Corbis processes have also evolved. However, other than the fact that scanning is not needed with digital captures, the digital workflow used by Corbis is not significantly different from the analog workflow and Corbis still maintains the same strict guidelines with each selected image. There is a significant advantage provided by digital capture, however, and that is the embedding of metadata in the digital file that previously had to be manually written by the photographer and/or archivist on a paper reference card or slide mount.

But the master digital image file is only the first step in the access and delivery process. Even in today's high-speed internet society, a 50MB file is still a significant amount of data to be sent around the world via the internet. Corbis employs several techniques to display and market its image collection to the world. First, every image is rendered in several sizes and stored in cache servers strategically placed around the globe for easy access by our customers. In addition to being smaller in size, and therefore requiring much less storage capacity in the caches, these preview files are designed to protect Corbis and its contributors from unauthorized use of the images. These images are embedded with both visible and non-visible security measures. Once it is determined that the full size image needs to be delivered to the client, Corbis converts and compresses the file from a TIFF format to a JPEG format. The level of compression is light enough to prevent permanent image artifacting but high enough to ensure easy digital delivery to the client. The original TIFF master is always carefully preserved.

Corbis has millions of digital masters in its inventory and these files consume a very large amount of storage space. The Corbis technology team has employed a sophisticated Storage Area Network architecture that properly and effectively stores and registers these files for easy access. Corbis also copies the images to dedicated Retrospect tape backup systems for security on a daily basis. In addition to the image tape backup system, Corbis employs advanced corporate data security protocols that include routine system-wide back-ups. The CommVault back-ups are stored off-site in a secure facility as an added layer of protection.

These systems are designed to insure that Corbis is able to support its customers 24 hours a day, seven days a week, with immediate image and video footage delivery. Corbis has made significant investments to develop data migration strategies to insure that the digital images in its collections – including scanned photographic images and original digital camera captures – will be preserved and will remain readily accessible worldwide far into the future.

## A Note on Storage Temperature and Relative Humidity

Because the materials in the Corbis/Sygma collection are relatively recent – with the majority of the photographs made after around 1950 – the overall condition of the films and prints is still reasonably good. The goal of the Corbis/Sygma Preservation and Access Initiative is to keep the collection that way – to preserve the photographers' films and prints in their original form – far into the future. The temperature of the storage environment is the major determinant of the rates of both color fading and degradation of cellulose acetate film base negatives and color transparencies. As shown in Table 2, lowering the storage temperature to  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) and below will drastically slow the deterioration process. Relative humidity also plays a roll in both the fading of traditional photographic color images (Table 3) and in acetate and nitrate film base deterioration, but the gains that can be achieved with controlled RH environments (e.g., 35% RH) are small compared with what can be achieved with very low temperature storage.

For example, as shown in Table 4, Kodak Process E-3 Ektachrome Professional films, which were in widespread use until around 1980, will suffer from a "just noticeable" (10%) fading of the least stable dye in only five years when stored at a room temperature of  $24^{\circ}\text{C}$  ( $75^{\circ}\text{F}$ ) and 40% RH, and are predicted to fade this amount in approximately 100 years when stored at  $1.7^{\circ}\text{C}$  ( $35^{\circ}\text{F}$ ) provided that they are placed in  $1.7^{\circ}\text{C}$  storage immediately after processing. However, by lowering the storage temperature another  $18^{\circ}\text{C}$  to  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ), the predicted storage time for a 10% dye loss increases from 100 years to 2,100 years. In other words, lowering the temperature the additional  $18^{\circ}\text{C}$  ( $39^{\circ}\text{F}$ ) added approximately 2,000 years to the storage time before a 10% dye loss is predicted to occur!

With a well-engineered humidity-controlled subzero cold storage facility, the additional capital equipment and yearly operational costs to lower the temperature from  $1.7^{\circ}\text{C}$  to  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) are relatively small – but the long-term preservation benefits to a collection will be enormous!

## References

- [1] Locarchives headquarters are located near Paris at 5, rue Jean Martin, 93582 Saint-Ouen Cedex, France; tel: 01.49.33.78.00; www.locarchives.fr.
- [2] Henry Wilhelm, *The Highest Standard of Care: Plan for the Secure, Long-Term Preservation of the Corbis Sygma Photography Collection – With Special Consideration for the Enhanced Access and Use of This Extraordinary Photojournalistic, Commercial, and Historical Archive*, report prepared for Cédric Gressent, Responsable du Corbis Projet de Préservation Sygma Initiative, Paris France, June 1, 2007.
- [3] Henry Wilhelm has served as an advisor to Corbis on the preservation of its photographic collections since 1997. He has been a consultant on the preservation of the Corbis/Sygma collection in France since 2005. Wilhelm's initial work on preservation of what are now the Corbis collections began in 1994, in response to a request from Els Rijper, who was with the Bettmann Archive before it became part of Corbis. Rijper asked Wilhelm to conduct an examination of the condition of the wide variety of black-and-white and color film and print materials that made up the Bettmann Archive collection – and of the then quite inadequate environmental conditions in which the photographs had long been housed on the 5th floor of a older office building located at 902 Broadway, near the corner of 20th Street, in New York City. After Bill Gates ac-

quired the Bettmann Archive in late 1995, an expanded study of the collection was undertaken with the goal of developing a plan for its very-long-term preservation. This work culminated in a report submitted to Corbis in November 1997 (with minor revisions, the final report was submitted in September 1999) entitled: *A Strategy for the Permanent Preservation of the Corbis-Bettmann Photographic Collections*. Among the key recommendations in the report were that the collection be placed in sub-zero storage as quickly as possible, and that this could best be accomplished by moving the collection out of New York City to the high-security Iron Mountain/National Underground Vital Records Facility (located in rural Boyers, Pennsylvania, north of Pittsburgh) where a suitable humidity-controlled cold storage facility could be constructed for the collection. After considering a range of possible alternatives, Corbis management accepted the plan as the best long-term solution – and also the most cost-effective solution – to the permanent preservation of this historically, culturally, and technologically important collection. The official opening of the new humidity-controlled, sub-zero Corbis Film Preservation Facility took place on April 26, 2002.

- [4] Henry Wilhelm (Wilhelm Imaging Research), Ann C. Hartman, Kenneth Johnston, and Els Rijper (Corbis), and Thomas Benjamin (Iron Mountain/National Underground Storage Vital Records), “High-Security, Sub-Zero Cold Storage for the PERMANENT Preservation of the Corbis-Bettmann Archive Photography Collection,” *IS&T Archiving 2004 Conference, Final Program and Proceedings*, sponsored by The Society for Imaging Science and Technology, San Antonio, Texas, April 20–23, 2004; pp. 122–127. Available as a no-cost download from <www.wilhelm-research.com>
- [5] *International Standard ISO 18911, Imaging Materials – Processed safety photographic films – Storage practices* (First edition: 2000-11-01), International Organization for Standardization, Geneva, Switzerland <www.iso.org> Also available from <www.ansi.org>
- [6] *International Standard ISO 18920, Imaging Materials – Processed photographic reflection prints – Storage practices* (First edition: 2000-07-15), International Organization for Standardization, Geneva, Switzerland. <www.iso.org> Also available from <www.ansi.org>
- [7] Jean-Louis Bigourdan, “Stability of Acetate Film Base: Accelerated-Aging Data Revisited,” *IS&T Archiving 2005 Conference, Final Program and Proceedings*, sponsored by The Society for Imaging Science and Technology, Washington, DC, April 20–23, 2005; pp. 60–66.
- [8] The estimates given here have been derived from data in *Evaluating Dye Stability of Kodak Color Products*, Kodak Publication No. CIS-50, January 1981, and subsequent CIS-50 series of dye-stability data sheets through 1985; *Kodak Ektacolor Plus and Professional Papers for the Professional Finisher*, Kodak Publication No. E-18, March 1986; *Dye Stability of Kodak and Eastman Motion Picture Films* (data sheets); Kodak Publications DS-100-1 through DS-100-9, May 29, 1981; *Image-Stability Data: Kodachrome Films*, Kodak Publication E-105 (1988); *Image-Stability Data: Ektachrome Films*, Kodak Publication E-106 (1988); and other published sources. For many products, including Process E-6 Ektachrome films; Vericolor III, Vericolor 400, Kodacolor VR, Kodacolor Gold (formerly Kodacolor VR-G), Kodak Gold, and Kodak Gold Plus color negative films; and Eastman color motion picture films, storage at 60% RH will result in fading rates of the least stable dye (yellow) approximately twice as great as those given here for 40% RH; that is, the estimated storage time for reaching a 10% dye-density loss will be cut in half. Furthermore, the dye stability data given here were based on Arrhenius tests conducted with free-hanging film samples exposed to circulating air. Research published by Eastman Kodak in late 1992 showed that storing films in sealed or semi-sealed containers (e.g., vapor-proof bags and standard taped

or non-taped metal and plastic motion picture film cans) could substantially increase the rates of dye fading and film base deterioration. Therefore, the estimates given here for color motion picture films probably considerably overstate the actual stabilities of the films when they are stored in standard film cans under the listed temperature and humidity conditions. See: A. Tulsi Ram, D. Kopperl, R. Sehlin, S. Masaryk-Morris, J. Vincent, and P. Miller [Eastman Kodak Company], “The Effects and Prevention of ‘Vinegar Syndrome’,” presented at the 1992 Annual Conference of the Association of Moving Image Archivists (AMIA), San Francisco, California, December 10, 1992.

- [9] Henry Wilhelm and Carol Brower (contributing author), *The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures*, Preservation Publishing Company, Grinnell, Iowa, 1993. The 758-page book is available in Adobe Acrobat PDF format at no cost from: <www.wilhelm-research.com>. See especially Chapter 9: *The Permanent Preservation of Color Motion Pictures*, pp. 299–344, and Chapter 20: *Large-Scale, Humidity-Controlled Cold Storage Facilities for the Permanent Preservation of B&W and Color Films, Prints, and Motion Pictures*, pp. 687–726.

## Authors’ Biographies

*Henry Wilhelm was a founding member of the Photographic Materials Group of the American Institute for Conservation of Historic and Artistic Works. In 1978, he was one of the founding members of American National Standards Institute Subcommittee IT9-3 (now incorporated into ISO and known as ISO Working Group 5/Task Group 3 [WG-5/TG-3]), which is responsible for developing standardized accelerated test methods and specifications for the permanence of color photographs and digital print materials.*

*Wilhelm has served as Secretary of the ISO group since 1984 and he presently serves with Yoshihiko Shibahara of Fujifilm Corporation in Japan as Co-Project Leader of the ISO WG-5/TG-3 Technical Subcommittee on test methods for Indoor Light Stability. Wilhelm is also an active member of the ISO task groups responsible for storage standards for color and black-and-white films and prints.*

*Wilhelm is the recipient of the PhotoImaging Manufacturers and Distributors Association (PMDA) “2007 Lifetime Achievement Award” for his work on evaluation of the permanence of traditional and digital color prints and for his advocacy of very low temperature cold storage (minus 20 degrees C [minus 4 degrees F] at 40% RH) for the permanent preservation of black-and-white and color prints, color negatives, transparencies, and motion picture films.*

*Cédric Gressent served as the original Project Manager for the “Sigma Preservation and Access Initiative.” In 2008 he was appointed Corbis’ Manager of Services for Europe, Middle East, and Africa (EMEA) region. Cédric joined the photographic industry in 1999 at Kipa Interpress just before the company entered into the Corbis Group, which includes such famous agencies and collections as Sigma and Tempsport. Cédric held various positions in the financial and sales departments of Corbis before becoming Project Manager for the Sigma Initiative. As Manager of Services, Cédric currently leads the Archive Department and Media Production in Paris, as well as the Office Operations of various facilities in Europe. Cédric holds a DEUG in English studies and a BTS in Business Management.*

*Drew MacLean serves as Corbis Vice President of Operations. Drew has been a member of the Corbis team since 2000 and works out of the Seattle headquarters. He is responsible for both media production, film preservation, and all Corbis facilities. Prior to coming to Corbis, Drew was a production manager for the Boeing Company in Seattle where he held various positions in manufacturing and manufacturing support in the Commercial Airplane Division. Early in his career he was a helicopter pilot in the U.S. Marine Corps.*



The abstract for this paper by Henry Wilhelm (Wilhelm Imaging Research, USA); Cédric Gressent (Corbis/Sygma, France); and Drew MacLean (Corbis, USA), entitled: “Long-Term Preservation of Photographic Originals and Digital Image Files in the Corbis/Sygma Collection in France” appeared on page 257 in:

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