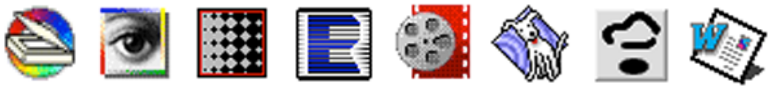
A Guide To
Goethe Graphics



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Abstract

Johann Wolfgang von Goethe (1749-1832) is known as one of the great poets of all time and as one of the few universal thinkers of modern times. My thesis is that his genius is marked by his artwork, specifically that he externalized his ideas initially in artistic rather than linguistic mediums, and secondly that he saw form in motion rather than as images in place. With recent computer graphics, I have examined drawings of his ideas in plant morphology, portrait painting, color formation, rock distribution, volcanic eruptions and other organic processes illustrated by filmstrips of serial change. The project adds to a growing literature on the importance of art as a tool of knowledge and on the value of visual education for eye-hand coordination, gray-scale perception, fixed and motion memory, and other adaptations of the seeing hand. The manual is designed to prepare full graphic narrations of Goethe's perception of form in motion for on-line access, public viewing and scholarly publication.

Part I: Background

Karl J. Fink

Introduction: Following publication of my book on *Goethe's History of Science* (Cambridge, 1991), I began study of Goethe's scientific drawings in the Resource Room at the Academic Computing Center (ACC) at St. Olaf College in preparation for a lecture on "Virtual Images of Goethe's Science" at a Symposium on "Goethe Scienziato" held in Milan in May, 1994. Research for the lecture came just as the computer industry was marketing visual technologies for imaging forms in serial change, a way of thinking at the heart of Goethe's discovery of morphology (Russel, 1982 [1916]). When the software by "Morph" (1992-94) showed up in the Resource Room at the ACC, I decided to focus on Goethe's "graphic thinking" (gegenständliches Denken, Heinroth, 1822), and began scanning and morphing images from collections of his drawings available at Carleton College (Femmel, 1958-) and in my own library (LA, 1947-). For this lecture I prepared transparencies with "QuarkXPress" (1986-93), did line art and image analysis with "Adobe Photoshop" (1994), made quick-time movies with "Adobe Premiere" (1994), and transferred these movies to videotape with RasterOps (1991). With the transparencies, I introduced a video display of organic morphologies and homologies in Goethe's science, arguing the point that Goethe's discovery of morphology was about form as motion

rather than about form as shape. Later the lecture was published in Italian as "Immagini virtuali nella scienza di Goethe" (1998).

Objectives: In reviews of my book on *Goethe's History of Science* (Cambridge, 1991), critics suggested: 1) that I further explore my claim that Goethe had discovered form at kinetic joints rather than in the obvious structures of nature (Tauber, 1993; Simons, 1993; Sepper; 94), and 2) that I find ways to improve illustrations that show how he focussed his science on the thresholds of change and motion (Wetzels, 1994; Koerner, 1995). In response, I began using recent computer graphics to examine kinetic form in the art work with which Goethe illustrated his experiments in physiology, geology, anatomy, botany, color theory and archeology, initially enhancing images with software for line art (Adobe Photoshop, 1994) and then later transforming them into motion with software for quick-time movies (Morph, 1992-94; Elastic Reality, 1993-94). With a digital database of images and quick-time movies, I am visually illustrating earlier claims in scholarship that Goethe's morphology was the study of "form as movement" (Brady, 1987: 279-81). And with computer graphics, I am turning static images of his science into forms in motion, demonstrating his conviction that "nothing stands still" (Nichts ist stillstehend LA,I,6,vii). My aim is to build on a database of digital research that shows how Goethe combined tactile, visual, and mental experiences into experiments that exposed his sensory data to modern brain theory. With this research I hope to correct the tendency of scholarship to fracture his aesthetic sensibilities, to isolate sensory from mental experiences, and to reduce his science to measures of Newtonian success in the physical sciences. The goal of the project is to surround this digital research with explanations of the close association "between fingers and brain" that marks the genius of Goethe's seeing hand (Arber, 1985 [1954]:12;Flannery, 1995:547).

After my digital work on Goethe's graphics became standardized, I began to follow a third objective and gave more attention to analysis and understanding of the context in which Goethe's talents for visual thinking emerged. On a research trip to Weimar in the Fall of 1996, I began to study sources that first recognized Goethe's "visual thinking." This question led me to the emerging fields of anthropology, where Goethe's "object thinking" (gegenständliches Denken, Heinroth, 1822:387) was described as a model for field work in ethnography and explained as a function of neural processes in the brain (Heinroth, 1822:39-74). From study of Goethe's own review of this analysis, published in his journal for the promotion of art education (*Die Propyläen*, 1798-1800), and from his role in founding the "Free Drawing School" (Freie Zeichenschule, 1776), I drafted an outline for a book on *The Fingers of Goethe's Brain* with chapters on 1) "Weimar Graphic Industries," 2) "Goethe's Memory of Vital Signs," and 3) "Goethe's Forum for Art Education." The database on "Goethe's Graphics" supports these chapters with images that show how he first sketched his ideas and then developed them fully in professional illustrations and then surrounded them with textual analysis and explanation.

My fourth objective is to complete research on Goethe's contribution to the "pictorial turn" (Mitchell, 1994:19-25), in which the image began to replace the word in an environment that "is being radically altered by volatile visualization technologies" (Stafford, 1996:3) and is putting a new "reality on your retina" (Rheingold, 1991:193). These plans are outlined in chapters that trace Goethe's influence on 4) "Line art in Landscape Paintings" and 5) "Radical Description in

Cell Theory." The goal here is to prepare specific arguments for a conclusion on the importance of 6) "Goethe's Graphics Today," in which I give new evidence to the old claim that the center of Goethe's science is his art (Heisenberg, 1941 [1952]), and that this visual center links his scientific drawings to organic restoration projects in ecology (Dominick III, 1992:34-36), to new age technologies for study of color in the eye (Crary, 1990:67-74), and to color codes in discourse across academic disciplines (Riley II, 1995:1-3).

Grant Record: The lecture (1994) and the video (1994) on "Virtual Images of Goethe's Science" prepared for the Milan conference was supported by the Italian society for the study of Goethe's science, the "Goethe Scienziato." This presentation included only two movie clips on Goethe's morphology, one on the cluster distribution of rocks in the Fichtel Mountains at Wunsiedel in central Germany, and the other on organic remnants in the volcanic ruins of the temple at Pozzuoli near Naples in Italy. These were completed in the Resource Room in the Academic Computing Center and with an ACC computer grant in October, 1994, I began building a graphics work station in my office with a Mac platform that included an Apple Color I Scanner and a Macintosh Quadra 840 AV. Over the next two years I upgraded the workstation with an optical disk drive for transportation of large files and with more computer memory to accommodate manipulation of the growing collection of quick-time movies. I also added software to complete all phases of the project from copying images to producing a video, installing "Premiere" for making movies, "RasperOps" for translating digital movies to taped video, and a VCR for following and checking video production. By 1996 the project had grown to 350 MB with eight clips on Goethe's studies in morphology.

For my sabbatical in the Fall of 1996, I received a grant from the American Philosophical Society to continue digital research on Goethe's experiments on form, and to expand my inquiry into a study of the graphic industries in Weimar that supported Goethe's visual thinking. With a database of images logged prior to the grant period from various editions of Goethe's collected works (Femmel, 1958-; Goethe, LA, 1947-), I began to search for the original sources of images used in my database, and at the same time to look for illustrations that would demonstrate the process of his thinking from initial manuscript sketches to professional paintings. Many of these professional versions of his sketches are available only as illustrations appended to his scientific writings. This search for original prints resulted in a collection of 54 illustrations from five different archival sources in Germany on the main themes of the movies in the database, including the 1) Isometrics of the Face (5 Plates), 2) Homologies of the Intermaxillary Bone (5 Plates), 3) Morphologies of a Leaf (6 Plates), 4) Clusters of Fallen Rocks (4 Plates), 5) Afterimages in the Eye (10 Plates), 6) Formation of Clouds (8 Plates), 7) The Puzzle at Pozzuoli (6 Plates), and 8) Instruments of Vision (10 Plates). In January, 1998, I returned briefly to Weimar with a St. Olaf Travel Grant to collect twelve additional prints from the collection of portraits of Goethe and with them have made two more movie clips on Goethe's biography, one called 9) "Portraits of Goethe" and 10) "The Other Goethe." This collection of 66 reprints supports the full range of quick-time movies in my database of "Goethe's Graphics."

With photographic reprints of sources and permission of ownership in hand, I received a St. Olaf College Faculty Development Summer Grant (1997) to copy this material into my database with standardized notations, formats, and fonts, and secondly to blend ownership and copyright

information with other forms of entitlement, including acknowledgements for research grants, hardware and software support, and credits for the work of line artists and morphologist, who have assisted me in the production of the database. The objective was to write a manual with procedures for digital graphics that integrate primary reprints with digital variations, recognize textual narratives by the author-artist, distinguish the permutation of images by ownership, standardize titles and labels for file management, constrain digital images by protocol of the broadcast industry, and weigh varied audience-viewer environments. This manual was projected to recover and record the work that various student assistants had done and to set a course of required procedures for future contributions to the database of "Goethe Graphics. With "Cumulus" (1996), a new software for media management, I began a catalog of images distinguished by sources, disciplines, and production. By the Fall of 1997, we had standardized procedures for processing images from print to movie.

Student Assistants: By 1997 several student workers had contributed to the project, including Christopher Höft (1992-94), Kjell Stenberg (1994-96), and Sarah Oswalt (1996-99), each serving as line artist, morphologist, and technical assistant for the production of quick-time movies. From the beginning, there was need for a standard form of notation, as software for movie production does not bring the complete digital value of an image into a file, rather it tracks soft version of the images needed to make a movie. With each new clip, the need for a standard notation system increased, as did a record of the old notations needed to track movies already completed. Kjell introduced numerical schemes into the process as most images came into the project as still photographs for modification needed for constructing a movie. Kjell also began separation of all images into still "documents" and movie "clips," which helped cataloging images by the disciplines, in which Goethe did his morphological studies. Also, by separating the still images from the movie clips, we gave emphasis to the main thesis of the project, which was to show that Goethe's morphology was the study of form in motion.

In 1997 Sarah Oswalt began to re-organize the database with a standardized notation system for all still "documents." She also developed worksheets to track the still images and the projects that supported the production of the movie "clips." At this time software for burning CD-ROMS became available in the Resource Room at the ACC, and the decision was made to quite video production and focus on procedures needed for digital presentations. We burned the first CD-ROM in 1997 as a database back-up disk and in the Spring of 1998 began to prepare the first CD Demo disk. At this time we determined that burning CD's across PC and Mac platforms required that all catalog notations would have to be restrained to the 8.3 characters used in PC file notations. This, too, fell to Sarah, who by the Fall of 1998 had all files labeled and complete with backup disks.

Audience: The first sign of interest in my project came from Milan, Italy, where university scholars and public interest groups organized a conference on "Goethe as Scientist" (May, 1994) and invited me to give a paper on Goethe's discovery of form. Other invitations to lecture on the project followed from the History of Science Department (University of Winnipeg, March, 1994), the Department of Art Collections (Stiftung Weimarer Klassik, August, 1994), the German Department (University of Illinois- Urbana, March, 1995), the National ASECS meeting

in Tucson (Seminar on Organic Transformations, April, 1995), and the Center for Sciences and Humanities Research (Vanderbilt University, May, 1995). With each lecture I prepared new examples of his focus on form in motion, each time expanding the database of digital images and demonstrating Goethe's contribution "the primacy of perception" (Merleau-Ponty, 1964).

Student capacity for training in graphics for courses in language, culture, and history, was explored in two different courses, first in a seminar on "Weimar Today" (Weimar Heute, German 340, Spring Term, 1995)) with nine students, and again in one on "Goethe's *Faust*" (German 380, Spring Term, 1996) with twenty-six students. In these courses I integrated traditional requirements for word processing with techniques for image manipulation, including scanning with calibrations for gray-scale and color balance, sizing images for documentation and entitlement, as well as cropping, enhancing, cutting and pasting images for close analysis. In these seminars students learned to transfer, insert, and rearrange the images for narration in traditional word-processing programs used to write essays in German. In the first course on "Weimar Today," students worked with historical images from the graphic industries in Weimar that inspired the "Bauhaus" movement, and in the one on *Faust*, they compared differing artistic versions of specific scenes and also parsed individual images for metaphoric value as a means to enhance their understanding of this classic text about the aspirations of modern scientific man. And during the Spring Term, 1998, two advanced German majors, Peter Handel and Sarah Oswalt, did independent research courses in "Goethe Graphics," integrating knowledge of Goethe's sciences with skills in computer graphics.

Public interest in Goethe graphics was tested with fifteen high school teachers, who participated in my NEH summer seminar on "Goethe as Poet and Scientists" in 1995 at St. Olaf College. In a graphics lab complete with a dozen stations linked with scanner and internet, these teachers from the sciences, arts, and the humanities explored the interface of text and image by reconstructing Goethe's experiments in color and plant morphology. With this experience, the teachers learned from the genius of Goethe how to follow the mind's eye before prospecting for images from external sites. After learning how to distinguish between passive surfing and creative graphics, these teachers took cues from a broad range of Goethe's drawings and prepared their own images for group insignias, activity badges, T-shirt emblems, silhouette drawings, photo collections, color enhancements, flower displays, and prairie landscapes, in each activity showing "how the mind could paint" (Merleau-Ponty, 1964:163).

Design and validity of the project was reviewed by Goethe specialists at the Stiftung Weimarer Klassik in Weimar, Germany. In September, 1996, I was invited to discuss progress on the project in a seminar format with colleagues from the departments of Art Collections, Museums, Photographic Labs, and Computer Graphics in attendance. The title of the seminar was "Episoden aus Goethes Morphologie-multimedial inszeniert," which I introduced with transparencies downloaded from quick-time movies and with arguments for selecting specific prints from published and archival collections. I concluded the presentation with a twenty-minute video of clips from Goethe's study of form in motion, fielding questions and comments in response to the multi-media presentation. This group served as a sounding board with specific recommendations for movie clips that needed improvement and refinement before broadcast quality could be achieved. These recommendations put few new demands on methods and technology used for the project and tended to follow suggestions for the enhancement of images

inspired by the group's expertise in textual versions of Goethe's scientific ideas. In January of 1998, I made a third presentation in Weimar to a smaller group of specialists including historians of science and art and curators of the Weimar museums. This presentation was done from a CD-ROM without a sound track. Adding a sound track to each movie clip was completed with "SoundEdit 16" (1990-96) in the Fall of 1998 after all clips and documents were proofed for final publication.

Significance: With new vigor, scholars are calling for study of "visual thinking" (Arnheim, 1972 [1969]), for an education in "good looking" (Stafford, 1996), for a neurology of the "knowing hand" (Joseph, 1993: 166-214), and for better understanding of the "innocent eye" (Riley II, 1995: 16-19) that makes a picture worth a thousand words. Inspired by Goethe's "vignette of the eye" (Femmel, 1958: IV,38), scholars continue to look to Goethe in questions about the elusive juncture between "the mind and the eye" (Arber, 1985 [1954]), "between the signified and the signifier" (Arnheim, 1986:214), between "colour and the science of seeing" (Sepper, 1990), between disparities captured by the "eidetic motto" couched in Goethe's dying words: "More Light!" (Wescott, 1978:36). Guided by these studies, we cannot ask of Goethe "how information from the eyes is coded into neural terms?" (Gregory, 1990 [1966]:17), but we can ask "what sort of organization in neuron-like structures could produce the output in question, given the output?" (Churchland, 1986:409). At this slippery edge between neural patterns of seeing in the brain and thoughts expressed in linguistic and visual terms, I began to shape my thesis that in Goethe's collection of drawings (Femmel, 1958-) and scientific writings (LA, 1947-), we have the rare opportunity to study textual and graphic documents that give us evidence of "How Experts Excel" (Druckman, 1991:63-69) and how they "externalize their own mental images" (Shepard, 1978:133).

In his youth, Goethe took lessons on non-verbal communication from a master, Johann C. Lavater (1741-1801), early in life learning to codify signs at the interface of fleshy and sold features of the face. In the course of a long career, he extended the techniques of observation to all walks of life, to mining and engineering, road maintenance, park design, personnel management, acting and staging, and to many forms of leisure activities and hobbies that shaped the habits and pleasures of seeing and drawing. Study of Goethe's experiences as a visual thinker adds to a literature growing more pragmatic as it seeks: to educate new populations in "social and applied aspects of face perception" (Alley, 1988:1-8), to prepare for whole industries run from a "cyberspace in a briefcase" (Rheingold, 1991:184), to assess "`new age' techniques designed to enhance human performance" (Druckman, 1991:vii), to find common ground in images beyond "censorship: an American dilemma" (Long, 1990:64). Perhaps one of the strongest imperatives for developing a "logos of the line" (Merleau-Ponty, 1964:182), comes from the thesis that totalitarian institutions and regimes often find support in the art of deception which has its roots in the entertainment industry of the Enlightenment (Horkheimer & Adorno,1969: 122-25; Stafford, 1994:1-23). Goethe, a child of the era, saw the paradox and risks in images that can destroy as well as edify nature, indeed, in old age calling morphology itself a "dangerous gift" (gefährliche Gabe, LA,I,9,295) that should not be turned into an "artificial procedure" (künstliches Verfahren, 296) for those without an ear that "listens" (ablauschen, 297) to the heartbeat of nature.

Goethe's morphology has become a major tool of science with a prominence formerly reserved for the quantitative outcomes of deductive logic, inductive reasoning, analytical mathematics, and mathematical calculus (Shurig, 1986:9). Art historians (Arnheim, 1974 [1954]), naturalists (Gould, 1986), biologists (Arber, 1985 [1954]), and mathematicians (Gleick, 1987) have reaffirmed the old claim that the center of Goethe's science is his art (Heisenberg, 1952 [1941]), and scientists and artists alike continue to look to Goethe for full description of sensory experiences that followed from the genius of his seeing hand (Crary, 1990; Flannery, 1995).

Part II: Production

Sarah Oswalt

Organization and Saving Techniques: There is a very specific way in which the project as a whole is organized as well as the locations where and names under which all of the files are stored. In order to keep accurate records of the progress of each project, there are special saving techniques to show which application was used to produce the file, to be specific about what is included in the file, and to make the files readable for both Macintosh and PC formats. The project is produced on a Macintosh computer platform, but the CD-ROM is burned in a way which allows it to be used on both Macintosh and PC hardware.

First, a root word, descriptive of the picture, should be chosen to name the file, so that one would be able to infer what is in the picture. This word should be eight characters or less in order to stay within the boundaries of the 8.3 naming technique (eight characters.three characters), making the file also readable on a PC. The three character suffix should describe which kind of file it is and what application was used to produce the file.

Pictures scanned in Ofoto or Photoshop should be saved as *root*.org, which represents the original scan. After transferring the original scans to Photoshop, the file can be saved with the same root as *root*.temp, representing the temporary picture. It is not necessary for this file to remain in the 8.3 format. The 8.3 format is only necessary for files placed on the CD-ROM. If the naming is not done in a 8.3 format, the file will be unreadable on a PC. Once the picture is in the correct dimensions, the color and brightness have been adjusted, and the picture has been "cleaned-up" to its desired appearance, the picture can be saved in Photoshop again as *root*.pre and will be used later in documentation, Elastic Reality, and Premiere. Documents produced for the CD-ROM from the Photoshop temporary pictures should be saved as *root*.txt and *root*.own. Since the morphs and fades from Elastic Reality will not be included on the CD-ROM, they can have longer names. In order to easily tell which two images are being faded or morphed, the Elastic Reality file should be saved as *root1>root2*.morph. Lastly, the movies made in Premiere should be saved as *project name*.mov.

The organization of the Goethe Graphics project's data on the computer is slightly more complicated. All of the project files (colors, bone, rock, etc.) are saved under one folder (Sarah) on the desktop. Within each project folder in Sarah, the following items should be organized according to image: Ofoto or Photoshop original scan, Photoshop temporary image, Photoshop Premiere image, Elastic Reality morphs and fades, and a movie document. They should be arranged with the Ofoto or Photoshop original scanned images across the top of the window in the order that they will be included in the Premiere movie. In the second row, the corresponding Photoshop temporary images should be directly below the Ofoto images. The next row contains the corresponding Photoshop Premiere images. The morphs and fades (project and movie icons) should be at the bottom of the window underneath all of the images. The "movie-doc" icon should be in the upper right hand corner of the window, which is an outline of each movie.

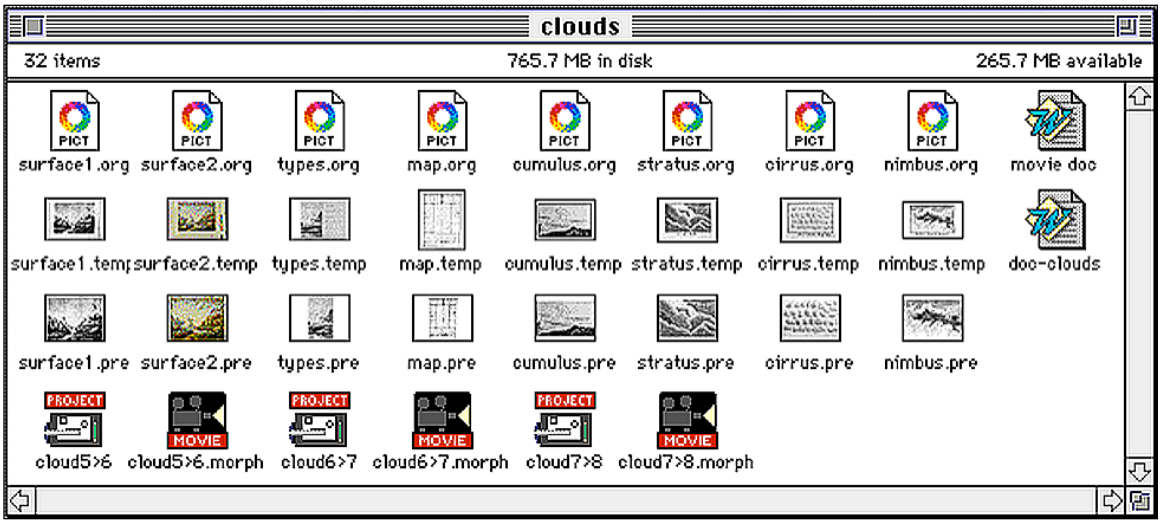


Figure 1: An example of the organization of each project folder located in the Sarah folder.

Another folder located on the desktop is organized exactly as the data will appear on the CD-ROM. This folder, entitled "CD", is organized into folders for each project. Inside each project folder is a "Documents" and "Movie" folder. The "Documents" folder contains all of the Photoshop documentation (*root*.own and *root*.txt images). The project's Premiere movie is inside the "Movie" folder. Also contained in the "CD" folder is the Read-Me text, which explains the history and organization of the project on the CD-ROM as well as how to use the CD-ROM.

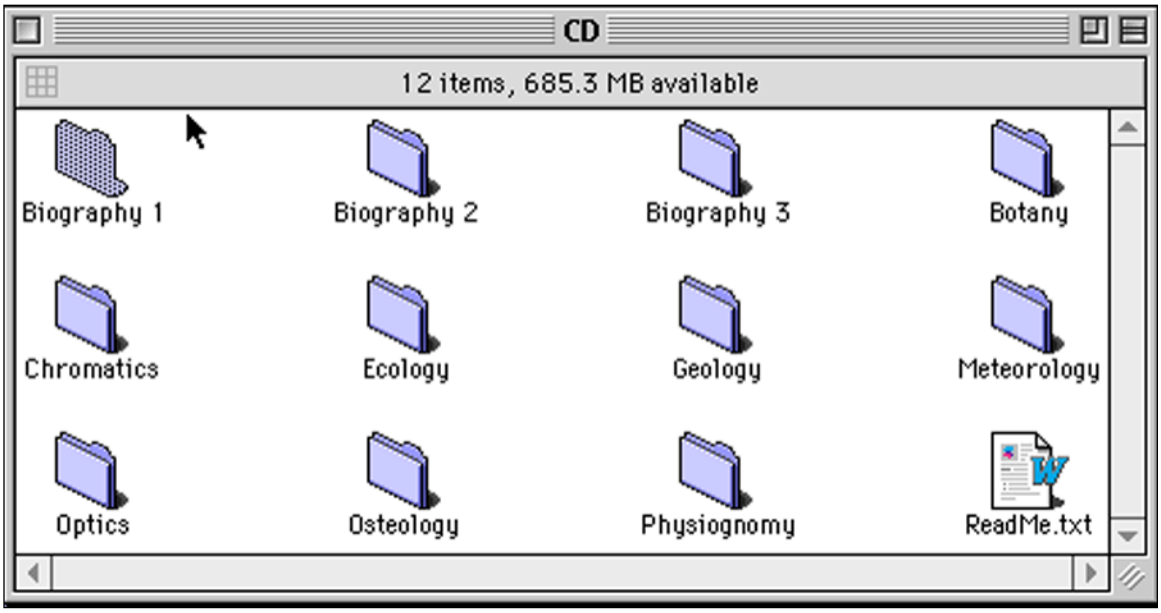


Figure 2: Organization of the "CD" folder on the desktop into project folders and the Read-Me text exactly as it would appear on the CD-ROM.

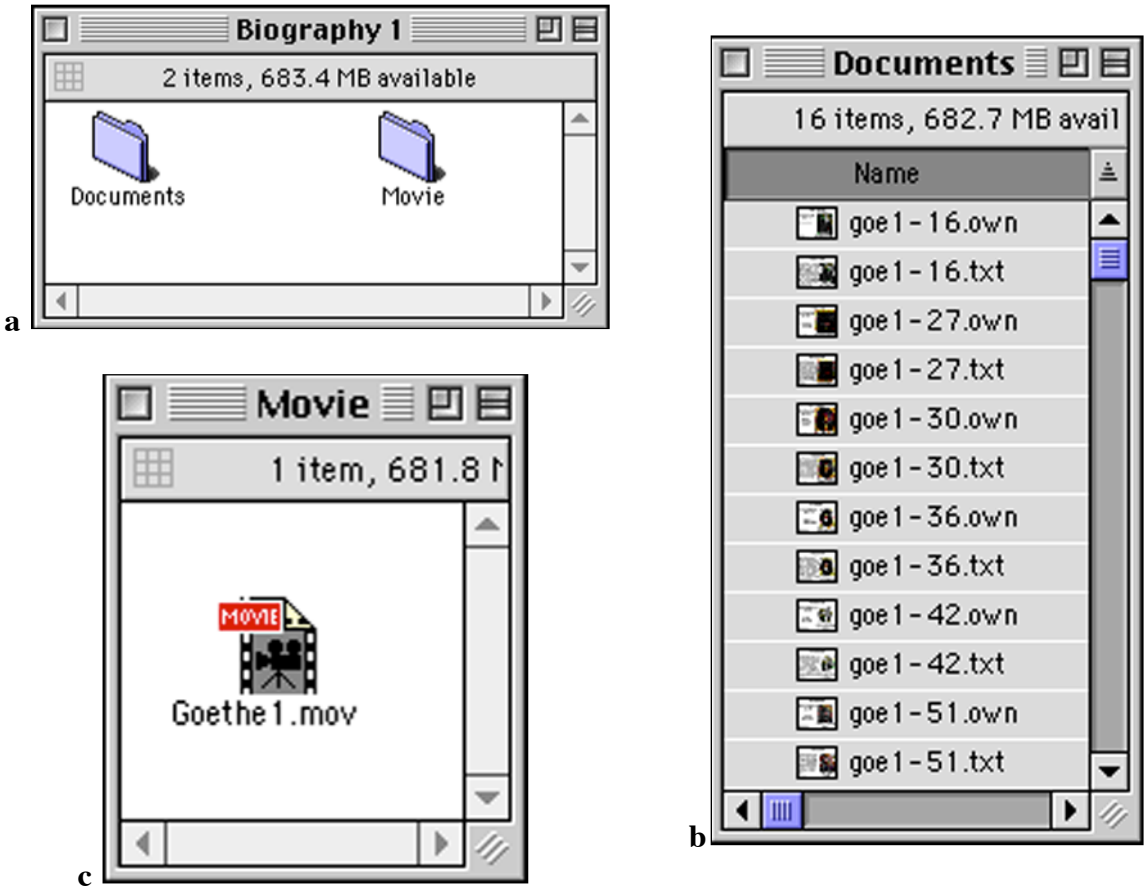


Figure 3: a. The appearance inside each project folder. b. The organization of the images in each project's "Document" folder. c. The movie icon found inside each project's "Movie" folder.

The remaining files which are saved during the movie-making process in Premiere are saved onto an optical disk containing all of the “Premiere-Extras” from all of the projects. They will again be organized in one folder for each project in a general “Premiere-Extras” folder. These “extras” include all of the title pages used to make the movie, the preview files generated during the movie-making process and the Sound Edit files for each project. In the event that the movie would need to be reproduced, all of these files are needed in order to edit any part of the Premiere movie. By saving all of these items, the movie can be easily changed by editing the Premiere movie-project, instead of remaking the entire movie.

Obtaining Original Pictures: The process of identifying an illustration in "Goethe Graphics" is an exercise in reading Goethe, and in reading what critics have to say about him. The images that Goethe produced to enhance his work often follow critical writings and they usually appear in some modified version in new critical editions of his writings. Reading images in this way helps identify the intellectual value of Goethe's illustrations. A second route toward finding significant images is to survey the collected edition of his graphics by Gerhard Femmel (1958-), which provides the source of the image but offers very little context. Once an image is identified, both

copyright rules and scholarship etiquette requires that reprints be made from the original illustration with permission of use by the owner of the original.

Many of the original prints in this database are owned, catalogued, and housed in the various departments and museums of the Stiftung Weimarer Klassik (SWK) in Weimar, including the Kunstsammlungen Weimar (KSW) and the Goethe-Schiller Archiv (GSA). The reprints must be identified by the name of the archive and then it can be ordered through the Fotothek (Photographic Lab) that serves all of the collections, and also has its own catalog of images that they have processed over the years for Goethe scholars. The Fotothek collection is the first stop in the search as they have a track record of the exact location of the original image. However, they catalog only prints in their ownership and the road map to an image can take you to other locations like the Goethe-Museum in Düsseldorf and Frankfurt, as well as to private and state archival collections in most major cities in Germany, including the Stiftung Preußischer Kulturbesitz (SPK) in Berlin and the Freies Deutsches Hochstift in Frankfurt. The road map to a picture found in a work on Goethe is usually documented both by the name of the owner and often by the location, however, usually without addresses or other means of access to the reprint.

After a particular image is identified for a project, archival owners must be contacted both for the use-permission and for the reprint-photos themselves. Reprint size should be standardized at 13 x 18 cm, so that scanning and storage is efficient and sizing for quick-time movies is uniform. Dissimilar images are not easily morphed and standardized sizing assures the best results in the various steps from reprint to broadcast quality production. Reprint photos should be stored and filed according to some project-use definition that conforms to the starting point of the project rather than to an end-value. It is important that the storage file names be consistent with the picture and that tracking names remain consistent with the original image. In the database on "Goethe's Morphology of Motion," all images are filed by disciplines of the sciences to which Goethe applied his study of morphology, including geology, botany, osteology, optics, color theory, physiognomy, ecology and meteorology. In addition this database includes three files of images from portraits of Goethe called Biography 1, 2 and 3. One is on the "traditional", another is on the "other" Goethe, and a third is a biography on "Goethe's Family Album". . The database of "Goethe Graphics" can be expanded with different integration of disciplines and biographies.

Scanning Pictures with Ofoto or Photoshop: The application, Ofoto, was heavily used for scanning in the beginning of the Goethe Graphics Project, and the application is very useful. However, it has since been discovered that using Photoshop to scan an image is easier, since the image is already in Photoshop and is ready to be revised as soon as it has been scanned.

In order for the scanner to operate, it, along with all other extensions, must be turned on before the computer. Thus, if the computer is already on, turn it off, turn on the scanner, and then restart the computer. The scanner should then work properly. Since the original scanned image is the image used in Photoshop, Elastic Reality, and all other following software, it is important to make sure that the picture is properly aligned. Thus, before scanning, the picture should be

placed inside the scanner, upright and as close to the upper right hand corner of the scanner as possible, making sure that the picture is square with the glass bed of the scanner.

Scanning with Ofoto: To begin, Ofoto should be opened. If a new project is not immediately opened, it can be opened under the File menu. A configurations box should automatically open on the right hand side of the screen. This should include:

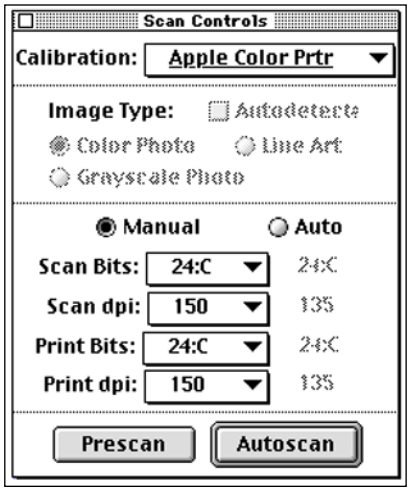


Figure 4: The configurations window which appears after opening the application, Ofoto.

- Calibration: always keep this on "Apple Color Prtr".
- Image Type: If this is a black and white image, it should be set on "Grayscale Photo". Otherwise, always keep this on "Color Photo".
- Manual or Auto: Keep this on Manual with the "Scan Bits" and "Print Bits" as they are set on default. Make sure that "Scan dpi" and "Print dpi" are on 150 dpi.
- Make sure to "Prescan" and not "Autoscan" before the final scan is performed.

The configurations should be set according to the type of picture that you have. Unless the picture is in black and white, in which case, the configurations can be set to grayscale, the setting should be on color. The configuration should also always be set to 150 dpi (dots per inch). This allows for a more dense scan and more detail in the scan. However, the higher the dpi, the more memory is required for the image, so care should be taken in assessing the amount of memory available. If scanning at 150 dpi requires too much memory, 135 dpi is also acceptable and will decrease the amount of memory required to save the scan.

The actual scanning process begins by pressing the prescan button. Be sure to hold the image still while the machine is scanning, or the image will be blurry or distorted. After the prescan has finished, there will be a flashing dashed rectangle, which can be moved to encompass only the area to be included in the scan. Since the image will be cleaned-up and appropriately sized in Photoshop, it is better to have a slight amount of extra space around the image, which can be trimmed in later processes. After the image to be scanned has been selected, press the scan button. If the image scanned is satisfactory, it can now be saved; if it is unsatisfactory, rescan the image using the same process previously described. Save the image using Save As under the file menu, choosing an appropriate root word as previously advised in the organization and saving techniques section. Using the pull down menu, make sure that the image is saved as a PICT file as *root.org* and is placed into the appropriate project folder in the Sarah folder on the desktop. If there has not been a folder previously established for this project, create a new folder for the project inside the Sarah folder. The image is now ready to be transferred to Photoshop to be cleaned-up and sized for later use.

Scanning with Photoshop: The scanning process can also be performed directly using the Photoshop application. Make sure the scanner is turned on, and prepare the image in the scanner as previously described. To perform a scan, select the option to acquire a UMAX VistaScan 3.1 as a part of the Acquire menu under the File menu.

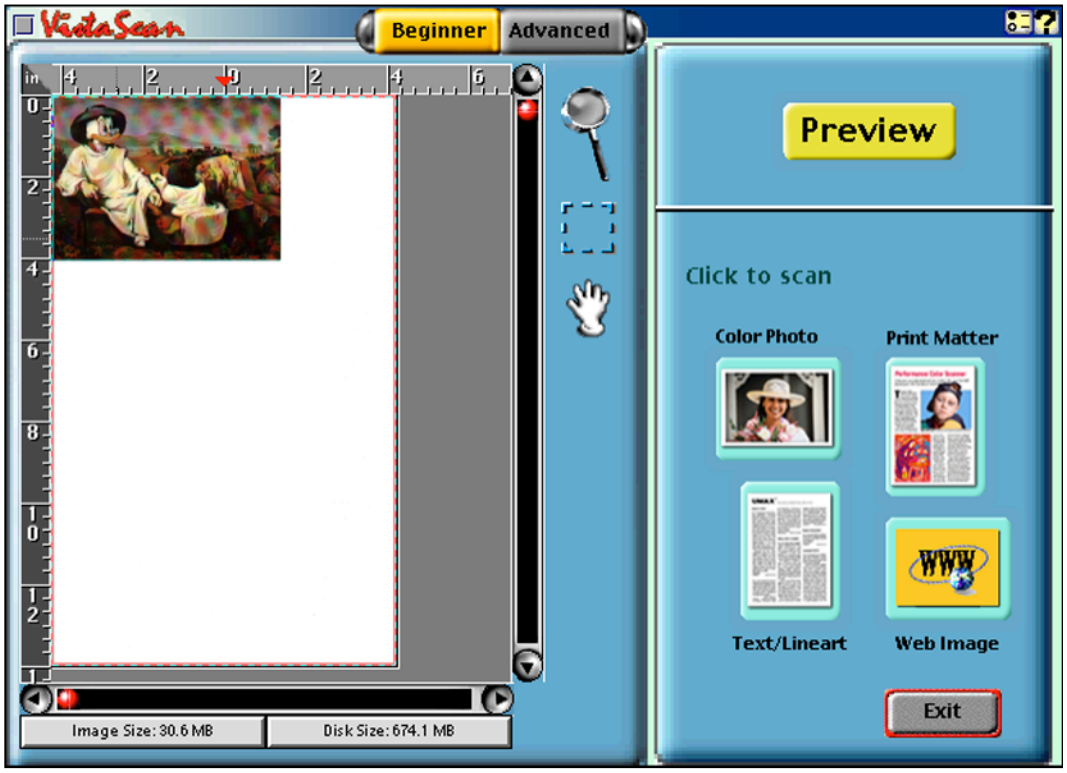


Figure 5: The VistaScan scanning window which appears when directly acquiring a scan using Photoshop.

The default setting for the scan should be on the beginner settings which is adequate for the project's purposes. The flashing rectangle can again be moved to a size more appropriate for the image to be scanned, but this is not necessary. In order to scan the image, select Color Photo from the right menu, and the image will be automatically scanned. The image can then be saved under the Save As menu of the File menu as *root*.org to represent the original scan. The image can then be cropped, appropriately sized and "cleaned-up" for later use in Photoshop.

Revising Images with Photoshop: In order to transfer the original scanned images from Ofoto to Photoshop to be revised, the application, Photoshop, should first be opened. The image to be transferred to Photoshop should then be opened by using the Open command under the File menu. After careful examination of the project, document and clip goals, the type of revising to be performed on the image should be determined.

Sizing Images: Once the selected image has been opened in Photoshop, it is ready to be revised. First, the extra space around the image from scanning should be removed. This is done by

selecting the desired area of the image using the rectangle tool and dragging the rectangle as large as the desired space. After the area is selected, use the crop tool from the toolbar or the Crop command under the Edit menu to remove the extraneous material.

It is now important to make sure that the image is the correct size and has the correct proportions. In order to use the image in the movie making process and in such applications as Elastic Reality and Premiere, the image must be in a 4:3 (width:height) ratio. Thus, more space may be needed to create the 4:3 ratio instead of cutting out some of the image. This space, as a default setting, will be white. The size of the image and the canvas can be manipulated under the Image menu. To change the size of the image, go to the Image Size option. First, make sure that the resolution is set at 150 pixels/inch. Then, make sure that the Proportions Constraint box is selected to ensure that the proportions of the image will be preserved when it is resized. Whichever dimension (height or width) is more important to make sure that the image is the right size should be changed to its desired size. The other dimension will change accordingly. Click OK. Then, if more white space needs to be added to ensure a 4:3 ratio, select the Canvas Size option under the Image menu. Calculate the required dimensions using a 4:3 ratio and change the canvas size accordingly. This option will not constrain the proportions in order to allow for the extra space. Click OK. The image should now be the correct size.

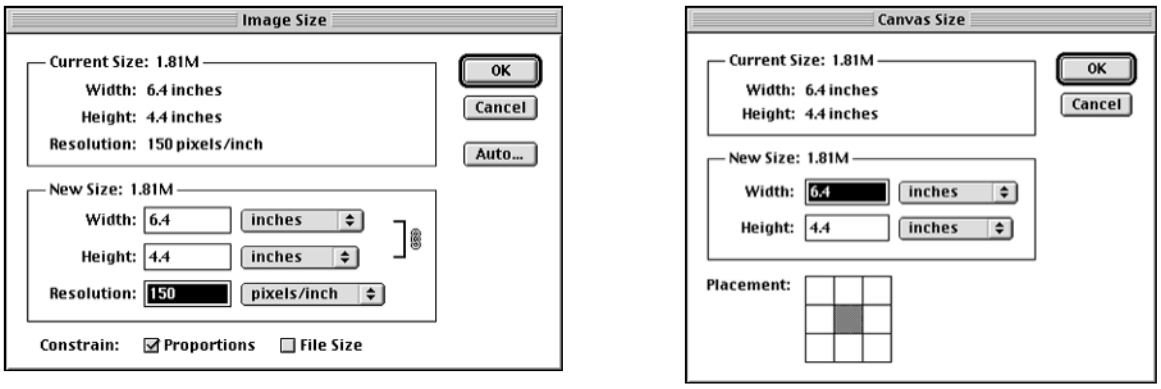


Figure 6: The appearance of the Image Size and Canvas Size windows found under the Image menu.

Adjusting Brightness and Contrast: After the image is sized, it is important to assure that the contrast and brightness are appropriate. The image's colors and contrast can be skewed in the scanning process and need to be corrected in Photoshop. This can be done by selecting the Adjust Brightness/Contrast option from the Image menu. Click on the triangle below the Brightness or Contrast line and drag it to the desired degree of brightness or contrast. In order to see the change in the image, the Preview box must be selected. When the desired image brightness and contrast are achieved, click OK.

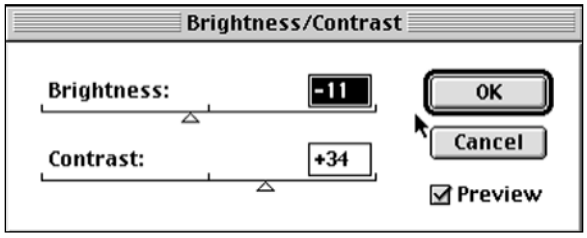
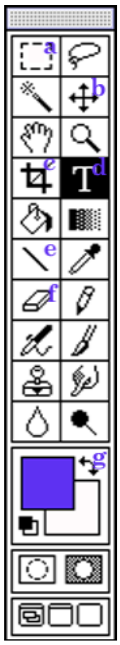


Figure 7: The brightness and contrast window which appears under the Image menu. The brightness and contrast can be altered by clicking on and dragging the triangle below the Brightness and Contrast lines.

General Image Revision: The remainder of the revising to be done in Photoshop can be performed by using the toolbar found on the left side of the screen as shown in Figure 8. Using these tools, portions of the image can be selected and moved, text can be added, part of the image can be erased, lines can be drawn, colors can be changed, etc. This is a description of commonly used tools for the Goethe Graphics Project:

a. This rectangle tool is used to select portions of the image. After certain parts of the image are selected, they can be moved to a different area, deleted, the color can be altered, etc.

b. This arrow tool is used to move parts of the image to another part of the image. First, select the desired part of the image with the rectangle tool (a), and then click and drag that portion of the image using the arrow tool to the desired area of the image to where it should be moved.



c. This is the cropping tool. It can be used to select an area of the image and then crop only that portion of the image.

d. This text tool can be used to add text to an image. Click on the image where the text should appear, and a window will appear. In this window, the desired text can be written, and the font and font size can be selected.

e. This line drawing tool is used to draw lines on the image. Click on the image where the line should begin and drag it to where it should end. The line will appear in that area.

f. This eraser tool can be used to erase undesirable areas of the image. Click and drag the cursor in the area to be erased and that undesirable area of the image will disappear.

g. This tool is used to select the color of the text, background and color which is laid down when erasing an area. The back color (shown here in white) is the color, which will be the background color and the color which appears when erasing an area. The front color is the color of the text and any lines or objects drawn.

Figure 8: The Photoshop toolbar used to select revision tools such as cropping, adding text, erasing, etc. The commonly used tools for the Goethe Graphics Project are indicated in purple.

Choosing a Font: Choosing a consistent font for this project and one which does not have the effect of "aliasing" is very important. The same font should be used throughout every part of the project: from the Photoshop CD-ROM documents to the Premiere movies. This helps to bring each application in the process together as a continuous project. Some fonts cannot be used in these applications, because they show "aliasing", which is when the letters appear to be fuzzy around the edges and begin to move out of focus, especially as the font gets larger. The font found to elude this problem and be easily read in any size is Century Schoolbook and should be used throughout each part of the project's process.

Making Documents for the CD-ROM: The documents on the CD-ROM were designed to give proper credit to the artist and owner of the image and where and when the artist created the image as well as explain a brief history of the image and copyright the text images. They appear as exemplified in Figure 9 for the *root*.own and *root*.txt images.

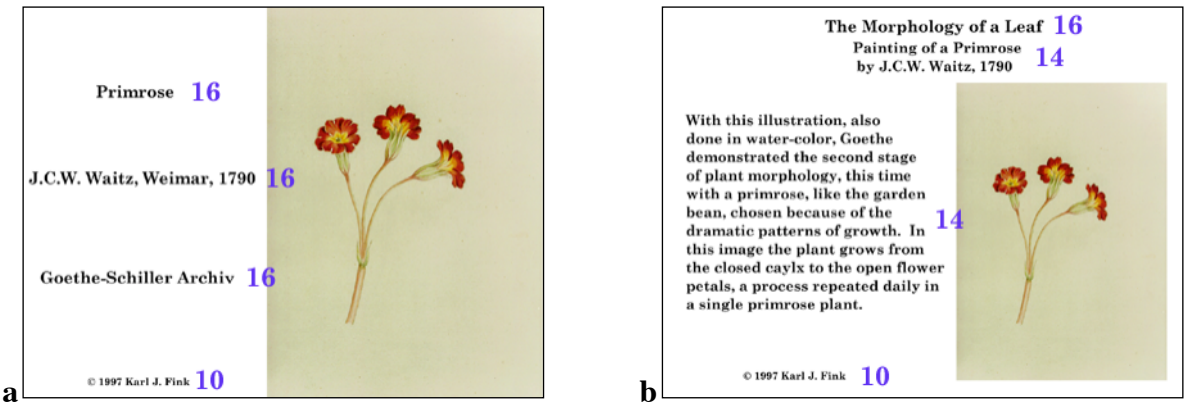


Figure 9 : a. "petals.own" and b. "petals.txt". These are examples of the documents contained in the CD-ROM. The sizes of the appropriate fonts in Century Schoolbook for the specific text items are indicated in purple.

Each text and own image is produced in Photoshop and begins with a white template background with dimensions for the canvas size in the 4:3 ratio of 7x5.253 inches. This template is produced by choosing New under the File menu. Then change the height and width to the dimensions of 7x5.253 inches.

The *root*.own image includes a copy of the image, which is appropriately sized to fill approximately half of the template space, and the other half is used to tell the title of the image on one line; the last name of the artist, where the image was created and the year in which it was created on the next line; and on the last line who has rights to the image (where the original image can be located). After changing the image and canvas sizes of the image to fill approximately half of the space in the template for the *root*.own image, the image should be copied and pasted onto the template. The text can then be added as previously explained using the text icon and using the Century Schoolbook font in sizes as depicted in Figure 9. This image should be saved in its appropriate folder as *root*.own.

The *root*.txt image begins the same way with the 7x5.253 inch white template in Photoshop. The image size and canvas size should be reduced just enough so that, when the image is copied to the template, there is just enough space for all of the text to fit along side the image. The image should then be copied onto the template. As shown in Figure 9, the *root*.txt image should include first the title of the image in bold font (The Century Schoolbook font and appropriate font sizes should be used for these images as well.), Then, in regular font, a brief phrase describing the image, the artist and the year in which the image was acquired should follow. Finally, there is longer, more detailed explanation of the image, why it was created, and what it is attempting to demonstrate. The image should also be saved in its appropriate folder as *root*.txt.

Morphing with Morph: Creating a morph with the application, Morph, was a process utilized in the beginning of the Goethe Graphics Project, but it was later discovered that the software, Elastic Reality is more appropriate for the project's purposes. However, Morph is another application which can be used and is relatively simple to use. Morph has the capability of linking similar patterns, spaces, shapes and lines from one image to another. This creates a morphing of the images, which can be used to show motion in the Premiere movie clips.

To begin the morphing process, open the application, Morph. A box in which to place the two images to be morphed (Figure 10) and a toolbar (Figure 11) will appear on the screen. To place the starting image, double click in the left black box. Morph will then ask for the first image. Select the starting image. Then double click in the right box. Select the end image. Double click on each image to enlarge the images to a size which can be easily edited. The image-linking process is done by setting a number of points on the first image as well as the second image. Morph then links the points from the first image to those on the second image. This creates the morph.

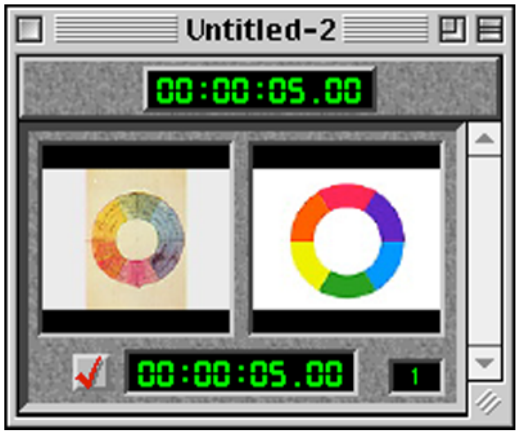


Figure 10: The box which appears at the start of a new morph, in which the two images to be morphed are placed.

This is the toolbar containing the tools used to link the two images for the morph. To place a point on the start image, click on the point tool (second from the top), and click on the start image where the point should be placed. Morph will automatically place a dot on the end image. Use the pointer tool (top) to click and drag the point on the end image to the location where the point on the start image should be linked. If there is not a corresponding object on the end image, place the point on the end image to the location where the object on the start image should be morphed. If corresponding shapes or outlines are to be linked, the line tool (third from the top) can be used. Place two points along the shape or outline and then connect them using the line tool. A box will appear at the midpoint of the line produced. Using the pointer tool, the line can be moved to arc the line or stretch it out to better fit the shape. The more points that are linked, the more accurate the morph will be.

Figure 11: The Morph toolbar which appears on the left side of the screen to be used to join the two images to be morphed.

To begin the movie-making/morphing process, select the Compression option under the File menu to chose the compression settings; the Compression should be set at Video and Color. The quality can be moved to the highest setting; and the Motion should be set at 15 frames per second (fps). Once the compression has been set, the movie can be made. Select Export Movie under the File menu. Make sure the box is set to QuickTime movie, and select the project's destination

folder. The process is then complete, and the movie can be opened by using any movie player application by clicking on the play (arrow) button in the lower left corner of the display screen.

Morphing or Fading with Elastic Reality: Elastic Reality is a slightly more complicated application used to morph or fade two images, but the end result is smoother motion between the two images than using the application, Morph. To begin, open Elastic Reality (ER). A window will appear (Figure 12) into which the start and end images can be placed as well and where the length of the morph or fade can be set.

To insert the start image, choose under the File menu to Import Roll A Image. Select the start image, and then repeat the process by inserting the end image by choosing Import Roll B Image under the File menu. Now, set the length of the fade or morph. The length which has been most successful in showing the motion without being too drawn out is five seconds. There are fifteen frames per second, so the majority of the time, the length of the morph is 75 frames. To set the length, click on the box directly under the first image. Type in the length of the morph and click OK.

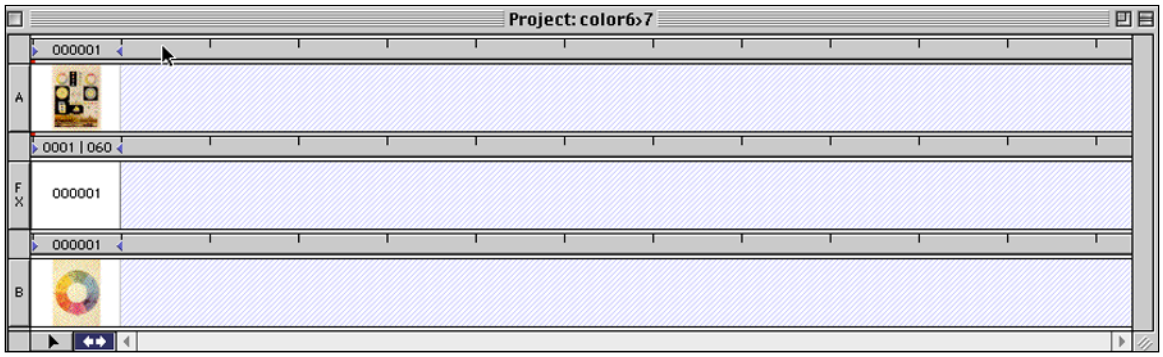


Figure 12: The Project window which appears at the start of a new Elastic Reality project. The start image is to the right of "A", and the end image is to the right of "B". The length of the morph is shown in the box directly beneath the start image.

Once the start and end images are imported, the images can be linked to one another using the Edit window (Figure 13). Double click on the box in between the two images in the Project window to produce the Edit window. To edit the start image, click on the A button on the top far left tool bar. Click on the B button to edit the end image. To check the process of the shapes being linked, click on the A/B button in the middle of the A and B buttons. This screen shows the start and end images on top of one another to more easily visualize the objects being linked.

Figure 13: The Elastic Reality editing window. This window can show the start image (A) or the end image (B) by themselves as well as both images simultaneously.

If the objective of the motion between the two images is merely to fade the start image into the end image with no shapes being linked ("a fade"), proceed to setting the constraints and rendering the morph. Otherwise, objects from the first image must be linked to the second image, producing "a morph".

First, select either the start or end image from the Edit window. To produce an outline around an object, use the left toolbar. Select the tool, which looks like the tip of a calligraphy pen (not shown in Figure 13). This tool will set the points. Click once on the image where the outline should begin. Then, click and drag the mouse for a short distance where the next point should be placed. This point-setting tool is one, which can produce arced lines. In order to edit the arc of the line after the entire outline has been drawn, the mouse must be drug to produce the capability to move the arc later. Set all of the points around the object. The outline can then be edited by using the second tool from the top. Select this tool. Now, each point can be moved by clicking on the point and dragging it to the desired location. After clicking on the point, the arc of the line through that point can be moved by clicking on the point and then moving the points and line which will appear above that point.

Once the object has been successfully outlined, outline the object on the other image, to which the first object should be linked, and edit that outline. Click on the A/B button to link the outlines from both images. Using the arrow tool, highlight the outline from one image by clicking on it. Then, while holding down the shift key, highlight the corresponding outline on the other image by clicking on it. Under the Shape menu, choose Join to join these two shapes together. Both outlines should now be surrounded by a flashing, dotted rectangle. Continue outlining and joining shapes from both images until all desired objects from both images have been joined.

Before rendering the morph, the settings must be correct. Again, most of the default settings are sufficient, but there are a few that must be correct. Under the Morph menu, the Output File Settings asks for a Render Root Name. This should be *root1>root2*. The Output Compression settings under the Morph menu are also important. The settings should be on Video, Color, the appropriate quality for the morph, 15 frames per second, and the key frame every 30 seconds. The morph can now be rendered by choosing Render Morph under the Morph menu. After it has been rendered, the morph can be viewed by choosing Movie Clip: Morph under the Window menu and pressing the play button. Both the project and morph must be saved before closing Elastic Reality. The morph is automatically saved with the Root Name from the Output File

Settings, but the project must be saved with the same name using the Save As command under the File menu.

Making Movie Clips with Premiere: Making a Premiere movie clip is the most complicated process in the project, because it brings together all of the pieces of the project: title pages, still images, morphs, fades, and sound. The first task in the movie clip-making process is to produce a Construction Window, from which a script can be written. Then, sound can be recorded and finally added to the construction window before producing the final movie clip.

Begin by opening Premiere and choosing to create a New Project under the New and File menus. A presets window for the movie clip will appear. Choose Presentation - 320x240. Then, two windows will appear: a Construction Window (Figure 14) and a Project window (Figure 15). The project window contains all of the possible pieces for the movie, and the construction window contains all of the pieces, in the exact order and length in which they will be shown in the movie clip.

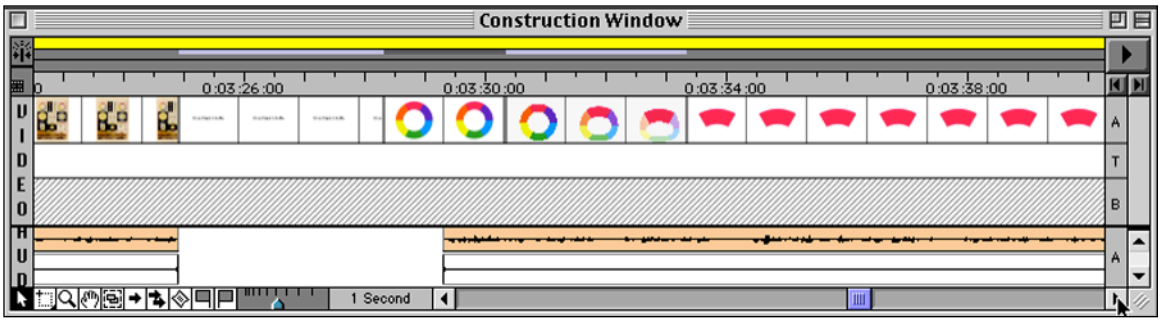
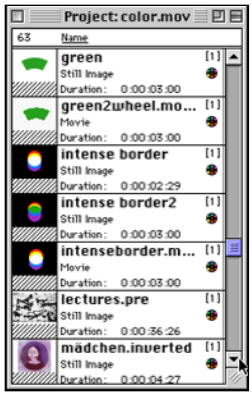


Figure 14: The Construction Window which appears at the start of a new project into which all of the pieces of the movie are placed in their exact order and lengths. This window is printed and used as a guide to writing the movie scripts.

Begin by creating all of the title pages for the movie clip: the title page for the project, the credits page, the title pages for the stills, and the title pages for the morphs and fades. This is done by choosing New Title under the File menu. A window will appear similar to that in Photoshop. Choose the Century Schoolbook font. Click on the page and type the title. The title can be moved around while it is selected by moving it with the arrow tool. The first title page should just be the name of the project (i.e. Afterimages in the Eye). The second title page should be the credits page containing the Morphologist, Technical Assistant and © year Karl J. Fink all equally spaced and in that order on the page. Save all of these title pages in the project's folder as t=*descriptive name*, so that it is obvious that it is a title page and to what it is entitling.



After all of the title pages have been made, import all of the title pages, stills, fades, and morphs into the project by choosing to Import Multiple files under the File menu. All of these images will go to the Project Window. Once they are all contained in the Project window, they can be selected by clicking on the image. The project's title page is to be inserted into the Construction Window first, followed by the credits page and then the rest of the images as directed by the movie.doc outline of the project's movie clip. Drag the image to the construction window in order to insert it into the clip. In general, the title pages are held for three seconds, and the still images are held for five seconds. The morphs are the length at which they were produced. Except for the morphs and fades, the stills and title pages are inserted at one second for a default. They can be lengthened by

Figure 15: The Project window which appears at the start of a new project, into which all of the possible pieces of the movie clip are placed.

clicking and dragging on the arrow tool to the right of the title page or image to its appropriate length (each frame represents one second). Make sure that the yellow arrow to the top of the construction window spans all of the pieces in addition to three extra seconds. Print out the construction window for use in script writing by changing the Page Setup under the File menu to Landscape and then changing the Reduce/Enlarge to 80% will provide for an appropriate guideline from which to write the script. Select Print from the File menu.

Writing and Editing Scripts: The script is written in segments that correspond to the frames in the construction window used to make the movie. After the movie has been made, hard copies of the construction windows are printed and laid out so that the sequence of images and the number of frames per image would guide statements to be recorded for digital sound. These statements are typed in Microsoft Word and are numbered in sequence with the images in the movie. The numbers are then recorded on the hard copy of the construction window as a reference point for the beginning and end of each statement recorded in Sound Edit.

It is important that the script be concise and that statements are written with a minimum of subordinate clauses and prepositional phrases. It is also important to write statements that do not make obvious comments about images and that they add to the images information not otherwise available to the viewer. Usually the script is longer than the first edition of the movie made as a Premiere project construction window, which makes it important to keep statements concise and to reference them to the construction window. The script is given the same title as the movie, is printed in hard copy, is attached to the copies of the construction window, and is stored in desk files on each project.

Creating Sound with Sound Edit: Once the script has been written and each statement has been assigned to its appropriate image or morph in the movie, the sound can be recorded. First, check the settings in the Monitors and Sound as part of the Control Panels underneath the apple in the menu bar. The sound should be on (make sure that the mute box is not checked), the

Sound Monitoring Source should be set on Sound In, and the Sound Output Quality should be set on 22.050 kHz. Also make sure that the microphone is operating properly before recording.

Open Sound Edit. Four windows should appear. One is the window where the sound spectrum appears (Figure 16.a). Another is a Controls window used to record, stop, pause and play the sound (Figure 16.b). The other two windows are not as important and are rarely used. These are the Cue Points and Labels windows. In general, the only setting that should be checked is the Sound Format option under the Modify menu. The Sample Rate should be set on 22.050 kHz, matching the Sound setting in the Control Panels. The Sample Size should be set at 8 bits, and the Compression should be set at None. The rest of the settings can remain on default.

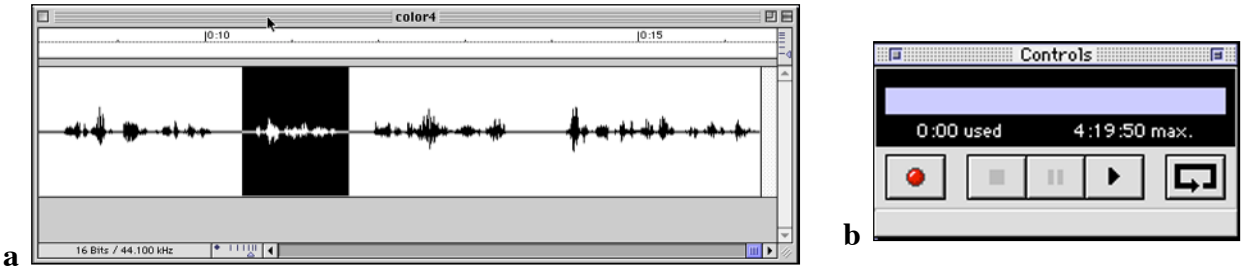


Figure 16: a. The sound spectrum window which shows the recorded sound. b. The Controls window used to record the sound. These windows appear when a new Sound Edit file is opened.

To begin, test the quality of the sound by doing a sample recording. Hold the microphone approximately three inches from the mouth and speak slowly and clearly. The sound can be recorded by pressing the red, round record button (left) on the Controls window (Figure 16.b). To stop recording, press the black, square stop button (second from left). The recording can also be paused and then resumed by pressing the pause button (middle). After the sound has been recorded, press the black, arrow play button to hear the sound.

It is possible that the sound will sound "tinny" or "fuzzy" in the background. The way to best rid the sound of this quality is to record at a lower volume. This can be done by adjusting the volume in the Sound Control Panel. Recording at a lower volume will produce a clearer sound, and the volume can always be increased when playing back the sound. Keep testing the sound and adjusting the recording volume until the sound is clear. The script-recording process is now ready to begin.

The recording process is performed as previously described with the sample recording. When recording the script, it is best to read through the whole script, producing a more flowing text, rather than breaking the script up into individual statements. Clapping between statements will make it easy to see the separation between statements by producing a large fluctuation in the sound spectrum. If a mistake is made, that section can be removed by highlighting the section (shown in Figure 16) by clicking and dragging across the undesirable section and pressing the delete key on the keyboard.

Once the entire script is recorded, it should be broken down into individual statements. This is best performed by first labeling the statements. Move the cursor to the beginning of the statement and then chose to insert a Label under the Insert menu. It is best to label the

statements by project and number. For example, the fourth statement for the color project would be "color4". Type the name of the statement and press return. Now, highlight each statement and copy it to a new Sound Edit file. These files should be named identical to their labels and be saved in a sound folder for that project. This sound separation and labeling technique will make it much easier to insert the sound into the Premiere project construction window.

Inserting Sound into a Premiere Project and Making the Movie: Once the sound has been recorded, it can be inserted into the Premiere Construction Window. Open the project's construction window. Import all of the sound files to the Project window by using the Import Multiple files option from the File menu.

As a general rule, the sound statement should begin during the last second of the title page, and the image should be lengthened according to the length of the statement, so that when the statement stops, the image ends. Statements referring to a morph should be inserted corresponding to the appropriate images in the morphs.

Insert the sound files using the process previously described. Using, the tools shown in Figure 17, lengthen the images to fit the sound statements. The first arrow on the left lengthens the image. The fifth arrow moves everything to the right, so that the image can be lengthened.

Figure 17: The toolbar at the bottom of the construction window, which is frequently used when inserting sound and editing the length of the movie pieces to fit the length of the sound.

After all of the images have been adjusted to fit the sound, the presets for the movie must be set. First, choose Presets under the Make menu. Make sure that the Time Base is set on 30 fps. Next, choose Compression under the Make menu. This should be set at 15 fps. Finally, to make sure that the sound will be included in the movie, choose Output Options from the Make menu and made sure that both Video and Audio boxes are selected. The remainder of the presets should be sufficient with the default settings.

Finally, the movie can be made by choosing Movie from the Make menu. Save the movie as *project.mov*. The movie will automatically open after it has been made and again can be played by pressing the arrow (play) button. The project must also be saved in Premiere and should be saved as *project.proj* with the Save As command under the File menu.

Inserting Images into Word Documents: It may become important to include pictures in a text document for illustration, instruction or for use as examples. This can be done by using Microsoft Word and Adobe Photoshop simultaneously. Once the Microsoft Word document has been opened, and the position of the image to be inserted has been chosen, the image should also be opened from Photoshop. The Photoshop image should be sized to the appropriate dimensions for the project and size of the paper on which it is to be printed. As a general rule, if the image is

to be printed on standard 8x11" paper, the image should be a maximum of 6" wide, or the image cannot be inserted and printed in the Word document. Once the image has been sized, the whole image should be selected and copied from the Edit menu. Then, go back to the Word document, and position the cursor where the image is to be placed. The image is treated as one character, so it can be centered, positioned left, or right, etc. The image can then be inserted by selecting from the Insert menu and Picture option "From File". Find the folder in which the Photoshop image is located, select it, and then insert it into the Microsoft Word document. The spacing can then be further adjusted using common Word techniques.

Part III: Resources

Software:

Adobe Photoshop, 3.0. Mountain View, CA: Adobe Systems Inc., 1994.

Adobe Premiere, 4.0. Mountain View, CA: Adobe Systems Inc., 1994.

Cumulus Media Management System, 3.0. San Francisco, CA: Canto Software, 1996.

Elastic Reality. Madison, WI: Elastic Reality Inc. 1993-94.

Morph, 2.5. San Diego, CA: Gryphon Software Corp., 1992-94.

Ofoto. 2.0.2. Light Source Computer Images, 1991-1993.

QuarkXPress. Denver, CO: Quark Inc., 1986-93.

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