

NORTH CAROLINA BOTANICAL GARDEN
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Certificate in Botanical Art and Illustration
HANDBOOK



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Cover image: Dot Wilbur-Brooks

FOREWORD

The North Carolina Botanical Garden (NCBG) is pleased to offer a Certificate in Botanical Art and Illustration that enables students to explore the relationship of nature and art. The staff hopes that each student completing this program will come away with not only botanical and artistic proficiency but also a renewed appreciation for the natural beauty of flowers and plants.

The Garden has this mission:

To inspire understanding, appreciation, and conservation of plants in gardens and natural areas, and to advance a sustainable relationship between people and nature.

The Certificate in Botanical Art and Illustration program expands this mission with its goal:

To provide a well-balanced curriculum of scientific and art theory and practice that enables students to explore the relationship of plants and visual art with botanical proficiency and appreciation of the plant world.



Linda Koffenberger

The NCBG Botanical Art and Illustration Certificate program began in 2001, and we are grateful for the contributions of Dot Wilbur-Brooks and Karen Wiley Eberle in making it a reality. This handbook is a collaborative effort by members of the NCBG Certificate in Botanical Art and Illustration program Advisory Committee and includes contributions from Sue Aldworth (a former faculty member), Nancy Easterling, Joanne Lott, Susan Turbak, and Kay Wyche. The illustrations are the work of past and present faculty members Linda Koffenberger, Maryann Roper, Patricia Savage, Emma Skurnick, and Dot Wilbur-Brooks.

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1 INTRODUCTION

The North Carolina Botanical Garden is a university-affiliated botanical garden with an outstanding reputation for integrating a conservation ethic into all of its programs. We are the region's most comprehensive center of knowledge about plants in North Carolina and the southeastern United States, and we provide a broad audience with inspirational experiences, opportunities for health and wellness through outdoor activities, and educational programs within a science-based institution. It is the Garden's vision to have a profound influence on how people value and interact with the environment and the biologically diverse world. The Certificate in Botanical Art and Illustration program helps the Garden realize that vision.

This handbook is organized in seven parts. Sections 1 through 6 provide introductory information and outline the details of the NCBG Certificate in Botanical Art and Illustration program. Section 7 consists of additional information relevant to the program.

1.1 Introduction to Botanical Art and Illustration

The constant interplay between art and science is what most appeals to many students in the NCBG Certificate in Botanical Art and Illustration program.

Since the 1980s there has been a worldwide resurgence of interest in original botanical illustrations and botanical art, not only for private and public collections but also for use in the wider marketplace, such as for home décor and select stationery lines. Renderings of plants are grouped into three main genres: botanical illustration, botanical art, and floral art. The first two can be said to exist along a continuum rather than in separate camps, because both botanical illustrators and botanical artists are challenged with trying to integrate the utilitarian, scientific function of an image (identification, education, information) with aesthetic and visual considerations.

Scientific **botanical illustrations** are usually created to accompany descriptive texts such as journal articles, textbooks, field guides, and popular magazines, where the image functions primarily to provide information and educate the viewer. Accuracy of form, color, and size is imperative, because both professionals and novices need to be able to identify the plant or plant parts from the illustration. The plant is traditionally drawn to scale so that all the parts correctly relate to one another in size. The most conventional scientific botanical illustrations generally appear on white backgrounds to favor true color representation for identification purposes, but some illustrations include plant habitat details or colored backgrounds. A typical botanical plate produced for journal publishing usually depicts a single plant specimen, but the scope of an illustration can range from showing one leaf to including various cross-sections, flowering and fruiting bodies, leaves, bark, roots, seasonal variations (such as autumn colors), and even more than one species.

Although a botanist or horticulturist often dictates which parts of the plant will be illustrated, the illustrator must make careful visual choices to determine how those parts will be rendered and composed on the page. An uncolored line drawing (in graphite or pen and ink) provides the most clarity and detail and is still the best way to describe newly discovered species, but botanical illustrations may also be done in color (watercolor or colored pencil). The illustrator usually has access to live plants, pressed herbarium specimens, and a microscope for viewing small parts such as reproductive structures, capsule chambers, or leaf pubescence.

In **botanical art** more emphasis may be placed on aesthetic considerations, and the artist has more freedom to make personal visual choices, to draw the viewer in and evoke an emotional response. Although the plant parts in the image may be arranged more pleasingly for compositional reasons, the draftsmanship and final artistic representation must remain true to the character and growth habit of the plant. In botanical art the plant is still drawn to scale, and a botanical professional examining the image should be able to identify the species and find no anatomical inaccuracies.

In the third genre, **floral art** (also known as flower painting), the image is created primarily for visual impact and is based on the artist's personal interpretation of the plant, without consideration for accuracy in color, form, size, or other scientific characteristics. This genre, which may include still-life and abstract painting, therefore falls beyond the scope of the core courses of the Certificate in Botanical Art and Illustration program.

1.2 Media Used in Botanical Art and Illustration

Graphite

Graphite is another word for the pencil you use every day and is the first medium needed in the production of a botanical illustration. The illustrator prepares a graphite sketch of the specimen before beginning to translate it into pen and ink, watercolor, or colored pencil. Graphite is easy to use, easy to alter, and a great choice for the beginning stages of creating a work of art. Using graphite and an eraser, the artist establishes a basic outline of the plant specimen, determines the shadows and color zones, and resolves the final composition. Although not traditionally visible in the final artwork, graphite can be used to create beautifully rendered, finished pieces suitable for framing.

Graphite pencils come in a variety of hardnesses, which are measured on a numerical scale from 9H to 9B. *H* stands for hard, and *B* stands for soft (or black). The number preceding the letter *H* or *B* denotes the hardness or softness of the pencil. A 9H is very hard, a 2H less hard, a 2B soft, and a 9B very soft. The softer a pencil is, the blacker a line it can draw. A very soft pencil will create a very dark line; a very hard pencil will make only a light gray line. Other media used in the production of graphite drawings are various types of paper, kneaded and vinyl erasers, and blending stumps (also known as tortillions).

Pen and Ink

Pen and ink is the most commonly used medium for creating scientific botanical illustrations. A drawing rendered in ink is clear, easy to read, and easy to reproduce in printed herbals and field guides. For this reason it is important that all botanical illustrators master a variety of pen styles and techniques.

There are two basic types of traditional pen-and-ink botanical illustrations: the weighted line drawing and the stippled drawing. A weighted line drawing uses a crow quill pen (the type you dip into a bottle of ink) to produce a variety of line thicknesses. The thickness or thinness of each line helps describe the variations in texture of the plant, the way light falls on the specimen, and how near or far each part of the plant is from the viewer's eye. A stippled drawing, on the other hand, uses hundreds, if not thousands, of tiny dots drawn with a technical pen. The relative density of these dots shows the plant's color, shadow, texture, and distance from the viewer.

Pen-and-ink drawings are usually rendered on plate-finish bristol board using waterproof black ink. The artist uses white ink, acrylic paint, or an X-acto knife for corrections.

Watercolor

Watercolor is the medium of choice for many professional botanical illustrators and botanical artists. The qualities of fluidity and transparency make watercolor paints ideal for rendering thin, delicate plant tissue as well as smooth botanical forms. To create effective, realistic botanical watercolor paintings, the artist often applies paint in layers over areas where the paper has first been "primed" (moistened) with clean water. This technique is called wet-in-wet painting and is used to create smooth, graded washes for depicting the form of the plant subject. Final additions of texture, prickles, hairs, and other small details are often applied using a "dry-brush" technique.

Available watercolor papers, paints, and brushes vary widely in quality. The materials selected to create a painting have a pronounced effect on the finished piece.

Colored Pencil

Unlike graphite, pen and ink, and watercolor, which have been available since the Renaissance or earlier, the use of fine art colored pencils is barely 75 years old. This medium is rapidly gaining acceptance in botanical illustration and botanical art because of its versatility, color intensity, and potential for fine detail.

Colored pencils are made like standard graphite pencils with a core and an outer wooden shell, usually of California cedar. The composition of the core, however, differs greatly from a standard pencil. Instead of graphite, the core consists of fine art pigments blended with clay to achieve a desired hardness and then impregnated with a binder, usually wax. The wax holds the pigments in place on the drawing surface. The pigments are highly transparent and can be layered and blended to achieve fine color gradations for naturalistic botanical representation. Because of the high transparency, excellent color matching can be achieved with just

red, blue, yellow, white, and black. Several brands of colored pencils comply with standards for lightfastness and, when used on acid-free paper, will maintain true color for decades.

Basic pencil strokes are similar to those used when drawing with graphite, and colored pencils can yield finely rendered drawings. Or, by varying the technique and paper surface, the illustrator can create artwork similar in appearance to watercolor, pastel, or finely glazed oil.

1.3 Botanical Art and Illustration Foundations

Painting Foundations: Composition and Color Theory

Composition and color theory together provide a skeleton, or framework, from which a painting emerges. A painting begins with the germ of an image. It might be about the drape and fall of a passionflower vine, or a magnolia's bright red berries against a tan seedpod. The idea begins taking shape as rough pencil and color sketches. Nurtured and developed in black-and-white thumbnail sketches, these compositional "roughs" explore the arrangements and interactions of shapes and spaces. Besides creating a realistic picture, the formal elements of a painting help to capture the characteristics of the plant and direct the viewer's eye.

Paintings ultimately tell a plant's story: how it grows, what insects feed on it, or what color its leaves turn in the fall. This requires careful attention to color, even as the composition emerges. Preliminary color sketches help to find the palette of pigments that portray the correct hues of the subject. These pigments, evolving with the composition, begin interacting with each other, creating lively sparks of color or peaceful harmonies. Careful placement of color directs the viewer's eye and emotionally charges the painting. Color and composition interact with each other and with the compositional spaces they fill.

2 GENERAL PROGRAM INFORMATION

The Certificate in Botanical Art and Illustration is designed to provide comprehensive courses in botanical art and illustration to people who wish to improve their skills in drawing and painting plants in an accurate and technically detailed manner. Studies leading to the certificate will enhance the experience of both the professional and the dedicated amateur botanical artist in producing artistic and scientific images. The program is designed to give students a well-balanced curriculum combining basic scientific background, visual arts theory, and practical experience using various media. Classes are taught by NCBG staff and other area art and botany professionals. Successful completion of the program requires passing grades in 13 core courses and three elective courses—a total of 213.5 hours—as well as submission of a final portfolio and final project. Course offerings and scheduling are designed for graduation within a three-to-five-year period.

The certificate is a valuable addition to the resumes of students in pursuit of professional work in botanical or scientific illustration.

The Certificate in Botanical Art and Illustration is aligned with another NCBG certificate program, the Certificate in Native Plant Studies, with which it shares some courses.

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2.1 Program Policy

The NCBG reserves the right to change the course schedule or fees, withdraw or modify a course, substitute faculty, or revise any other part of this handbook as necessary for the efficient administration of the NCBG Certificate in Botanical Art and Illustration program. In order to earn the certificate, participants shall meet the required prerequisites and shall take all core classes and the required number of electives for credit.

2.2 Semester Course Calendar

- Fall semester: September–December
- Spring semester: January–June
- Summer session: July–August

The NCBG will publish all semester course descriptions in the quarterly NCBG member newsletter. Spring and summer courses will appear in the winter edition (January–April). Fall semester courses will be included in the spring edition (May–August). Courses will be posted on our Web site at www.ncbg.unc.edu following the newsletter publication.

2.3 Program Registration

Students must be at least 18 years of age to register for the program. A registration fee supports program administrative costs. Students may take five years from the date they register for the program to complete all requirements and graduate. If they have not completed the program in five years, a registration renewal fee will be charged.

NCBG members and certificate program students will be given priority for course registration. Registration is on a first-come first-served basis. It is recommended that students register at least two weeks prior to the first day of a course so that the faculty can plan their schedules and, when applicable, books and/or supplies can be acquired. Maximum enrollment for a course is between 12 and 20.

Prior to the start of each course, students will be notified of any supportive materials to be purchased.

2.4 Enrollment Confirmation

Confirmation of course registration will be made upon receipt of a completed registration form and payment in full. If the course is filled, the student will be placed on a waiting list. Confirmation receipts will be sent to students upon request.

2.5 Cancellation Policy

If four or fewer students enroll in a course, the course may be cancelled, and students will be notified by e-mail or telephone. A decision with regard to the cancellation of a class due to insufficient enrollment will be made seven to 10 days prior to the start of the class.

In case of inclement weather, it is the student's responsibility to phone the Garden and listen to the voice mail message or speak to staff regarding class cancellation. If a class is cancelled due to inclement weather and unsafe driving conditions, a make-up class will be scheduled by the instructor.

Instructors are responsible for informing students of class cancellations and rescheduling due to illness, after having obtained permission by the associate director for education.

2.6 Refund Policy

If a class is cancelled due to insufficient enrollment or has been filled prior to receipt of your payment, you will be notified and your payment will be refunded in full. Students who cancel seven or more days in advance of the start of a course will receive an 80 percent refund. Thereafter, the registration fee is forfeited.

2.7 Credit for Previous Classes

With an official transcript or other supportive documentation and permission from the associate director for education, a student can receive credit for one core course and one elective taken at another institution or university.

Before seeking credit, be aware that every instructor brings to a course style, technique, and theory that likely differ from those of any class taken elsewhere. Every course that a student takes is a valuable learning experience.

2.8 Attendance Policy

In order to obtain credit for a course, students may be absent for no more than one class session and must complete the homework assignments for the missed class. If extenuating circumstances require additional absences, allowances can be made at the discretion of the associate director of education in consultation with the course instructor.

3 CURRICULUM

Successful completion of the program requires passing grades in 13* core courses and three elective courses (a total of 213.5 hours*) as well as submission of a final portfolio and final project. The curriculum is structured so that higher-level courses build upon lower-level ones, with minimal overlap of information. This allows a student to acquire the knowledge and skill level necessary to advance to the next level with proficiency. For this reason, some of the core and elective courses have prerequisites. *

***This change from 12 to 13 core courses and 210 to 213.5 total hours is in effect for students entering the certificate program after 9/2011.**

3.1 Core Courses Listing

Of the 13* required core courses, ten* are art courses and three are plant science courses. The art courses provide instruction in achieving finely detailed and highly accurate renderings in both black-and-white and color media. The botany classes instruct the student in plant morphology and identification and provide exposure to the local native flora. The core courses and their instructional hour requirements are listed below.

Introduction to Botanical Illustration (3.5 hours) **Effective 9/2011**

Beginning Drawing (14 hours)

Composition (14 hours)

Botany (18 hours)

Plant Taxonomy (12 hours)

One of Local Flora: Spring, Summer, Fall, or Winter (12 hours)

Beginning Watercolor (14 hours)

Beginning Colored Pencil (14 hours)

Intermediate Drawing (14 hours)

Pen and Ink (14 hours)

Intermediate Watercolor (14 hours)

Color Theory (14 hours)

Advanced Watercolor (14 hours)

Total core courses: 171.5* hours of instruction

3.2 Electives Listing

Elective courses offer opportunities for further development of the skills acquired in the core courses. Specific courses are offered every year or two, with additional options each year through short courses and continuing curriculum development. Elective courses and their instructional hour requirements are listed below.

Field Sketching (14 hours)

Intermediate Colored Pencil (14 hours)

Advanced Colored Pencil (14 hours)

Mixed Media: Watercolor, Colored Pencil, and Pen and Ink (14 hours)
 Portfolio/Graduation Preparation (14 hours)
 Short Courses (3½ hours each, ¼ of a course credit)

In addition, courses in the Native Plant Studies Certificate program can be credited upon approval by the associate director for education.

Total elective courses: 42 hours of instruction

3.3 Consolidated Listing

The chart below lists the courses and their prerequisites.

Course	Category	Prerequisite(s)
Introduction To Botanical Illustration	Core	None (Effective 9/2011)
Beginning Drawing	Core	None
Composition	Core	None
Botany	Core	None
Plant Taxonomy	Core	Botany
One of Local Flora: Spring, Summer, Fall, or Winter	Core	None
Beginning Watercolor	Core	Beginning Drawing
Beginning Colored Pencil	Core	Beginning Drawing
Intermediate Drawing	Core	Beginning Drawing
Pen and Ink	Core	Intermediate Drawing
Intermediate Watercolor	Core	Beginning Watercolor, Intermediate Drawing
Color Theory	Core	Composition, Intermediate Watercolor
Advanced Watercolor	Core	Color Theory
Field Sketching	Elective	None
Intermediate Colored Pencil	Elective	Beginning Colored Pencil, Intermediate Drawing
Advanced Colored Pencil	Elective	Color Theory, Intermediate Colored Pencil
Mixed Media	Elective	Beginning Colored Pencil, Pen and Ink, Intermediate Watercolor
Portfolio/Graduation Preparation	Elective	None
Short course	¼ elective	None

3.4 Sample Course Sequence

Below is one example of a course schedule sequenced so that the student could complete the certificate program graduation requirements in a three-year period.

Course	Category	Prerequisite(s)	Time
<i>Year 1</i>			
Introduction to Botanical Illustration (short course)	Core	None	3½ hours (¼ course credit)
Beginning Drawing	Core	None	3½ hrs x 4 sessions
Botany	Core	None	3 hrs x 6 sessions
Intermediate Drawing	Core	Beginning Drawing	3½ hrs x 4 sessions
Beginning Watercolor	Core	Beginning Drawing	3½ hrs x 4 sessions
Plant Taxonomy	Core	Botany	3 hrs x 4 sessions

<i>Year 2</i>			
Intermediate Watercolor	Core	Beginning Watercolor, Intermediate Drawing	3½ hrs x 4 sessions
Pen and Ink	Core	Intermediate Drawing	3 ½ hrs x 4 sessions
Composition	Core	None	3½ hrs x 4 sessions
Color Theory	Core	Composition, Intermediate Watercolor	3½ hrs x 4 sessions
Beginning Colored Pencil	Core	Beginning Drawing	3½ hrs x 4 sessions
Local Flora: Spring, Summer, Fall, or Winter	Core	None	3 hrs x 4 sessions
Any elective (or multiple short courses)	Elective	Course-dependent	3½ hrs x 4 sessions
<i>Year 3</i>			
Advanced Watercolor	Core	Color Theory	3½ hrs x 4 sessions
Portfolio/Graduation Preparation	Elective	None	3½ hrs x 4 sessions
Two electives (or multiple short courses)	Elective	Course-dependent	3½ hrs x 8 sessions (or equivalent credit from short courses)
Independent Project	Core	All other core classes	As required

3.5 Homework Assignments

Beginning with their first class, students should place all art course materials in a three-ring binder. A section for each core course should be created, with additional divisions for electives and workshops. The appropriate order would be: Beginning Drawing, Composition, Beginning Watercolor, Beginning Colored Pencil, Intermediate Drawing, Pen and Ink, Intermediate Watercolor, Color Theory, Advanced Watercolor, Elective 1, Elective 2, and Elective 3. Students should keep track of their course sequencing and schedule.

The amount of time students are required to spend on homework assignments varies and usually ranges from five to 20 hours per week for each course. Actual practice time in class is limited, so additional hours spent at home are both necessary and beneficial. Time invested in homework will result in personal artistic growth, and satisfactory achievement in any course requires both time and commitment.

Instructors may assign homework extending past the fourth class session of a course. All homework must be completed and submitted to the instructor two weeks after the last class. Homework not received by that time will result in a grade of Incomplete. To receive course credit, all Incomplete homework must be finished by a date assigned by the instructor. Students will be given sufficient time to submit missed assignments in order to ensure success in completing the course.

At the time of completion of a course, each homework and class assignment must be labeled on the back, in pencil, with the following information: name of artist, name of instructor, course name, course week number, and date of completion. Where applicable, the botanical specimen must be labeled with both the scientific and common names. This information will help students keep track of completed assignments and will prove indispensable when they assemble their portfolios.

3.6 Standards for Grades

All class assignments and homework will be graded on these three criteria:

- **Botanical accuracy**—the accurate identification and depiction of botanical structures and plant habits
- **Botanical draftsmanship**—the depiction of fine detail and the illusion of three-dimensionality created through accurate and effective use of line, color, value (in both black-and-white and color work), perspective, focal point, and positive and negative space

- **Artistic sensitivity**—the development and implementation of basic visual arts concepts as applied to botanical illustration. Students will be evaluated on the development of their own personal creative style and their ability to convey the character and personality of a plant artistically through sensitive compositional choices, textural rendering, color temperature considerations, value range, and competent media application.

For each course completed, a student will receive a grade of Excellent, Pass, or Fail. An Excellent will be awarded to students who exhibit extraordinary levels of artistic skill, draftsmanship, and botanical accuracy, and who have explored homework assignments beyond the expectations of the instructor. Students who receive a Fail cannot progress to a higher-level course and may wish to retake the class until they have achieved a satisfactory level of proficiency.

Students will receive final grades from the instructor approximately two to three weeks after the last session of a class. Instructors submit the grades to the NCBG for transcript records, and transcripts are sent to students at the close of the fall and spring semesters.



Patricia Savage

4 COURSE DESCRIPTIONS

4.1 Core Courses

Introduction to Botanical Illustration (effective 9/2011)

Prerequisite: None

Hours: 3.5

This half-day class explores the history of botanical illustration, shows examples of various types of botanical illustrations and botanical art, describes the coursework for the Certificate in Botanical Art and Illustration, and introduces the instructors. It is meant for students beginning the NCBG certificate program.

Beginning Drawing

Prerequisite: None

Hours: 14 (3½ hours x 4 sessions)

This course is the entry course for the certificate program and designed for a broad audience. Students learn the fundamentals of illustration through contour drawing, negative space, perspective, and tone. Limit: 15

Composition

Prerequisite: None

Hours: 14 (3½ hours x 4 sessions)

This course is a broad study in the elements that formulate a good composition. Students learn how to make visual choices and determine how parts of a plant are arranged on the page to balance botanical accuracy and artistic sensitivity. Limit: 15

Botany

Prerequisite: None

Hours: 18 (3 hours x 6 sessions)

This course is introductory in nature and is designed for a broad audience. It is a fundamental core course for students enrolled in either of the NCBG certificate programs. It covers basic principles of botany including taxonomy, anatomy, morphology and physiology. Class time is divided between lectures and examining/dissecting samples. There are also opportunities for making observations of examples in the Garden. Limit 20

Plant Taxonomy

Prerequisite: Botany

Hours: 12 (3 hours x 4 sessions)

This course builds on the fundamentals taught in Botany and prepares students for supplementary material covered in Flowering Plant Families. It is a core course for students enrolled in either of the NCBG certificate programs. Students learn the basic concepts of the taxonomy of vascular plants and how to identify plant families by making observations of selected characteristics. The use of taxonomic keys is introduced. Interesting examples are studied to illustrate current issues in plant taxonomy and nomenclature. Limit: 15

Local Flora: Spring, Summer, Fall, and Winter

Prerequisite: None

Hours: 12 (3 hours x 4 sessions)

There are four separate courses developed to teach students about the common southeastern native plants that are prominent during the respective season. These courses are designed for a broad audience as well as for students who are enrolled in either of the NCBG certificate programs. Field trips and exercises provide experience in the use of identification keys and recognition of plants in a natural setting. Limit: 15

Beginning Watercolor

Prerequisite: Beginning Drawing

Hours: 14 (3½ hours x 4 sessions)

In this class, students are introduced to watercolor and learn basics techniques such as washes. Students learn to paint various simple shapes (spheres and cylinders) and a small botanical subject. Limit: 15

Beginning Colored Pencil

Prerequisite: Beginning Drawing

Hours: 14 (3½ hours x 4 sessions)

Colored pencil is a next step in advancing from drawing to painting, and introduces the full array of fine art pigments. This course is a hands-on introduction to commonly used materials and techniques such as layering, blending, burnishing and tonal gradation. Limit: 15

Intermediate Drawing

Prerequisite: Beginning Drawing

Hours: 14 (3½ hours x 4 sessions)

In this class, students learn the skills needed to produce a clear, accurate pencil drawing. Specifics of the course include; contour drawing, values, tonal gradation, rendering plant anatomy, plate composition, and working with microscopes. Limit: 15

Pen and Ink

Prerequisite: Intermediate Drawing

Hours: 14 (3½ hours x 4 sessions)

In this class, students learn to draw pen and ink using standard techniques and conventions. Students work with both “old-fashioned” dip pens and modern technical pens to create accurate botanical drawings.

Limit: 15

Intermediate Watercolor

Prerequisites: Beginning Watercolor, Intermediate Drawing

Hours: 14 (3½ hours x 4 sessions)

This course builds upon the knowledge and skills of Beginning Watercolor. Using live botanical specimens, students apply basic drawing and watercolor skills to create detailed, realistic watercolor studies of individual plant structures such as stems, twigs, leaves, petals, flowers, pods, and fruit. Classes cover such topics as creating the illusion of depth and volume and portraying shape, color, and textural details accurately.

Limit: 15

Color Theory

Prerequisites: Composition, Intermediate Watercolor

Hours: 14 (3½ hours x 4 sessions)

In this class students learn the basics of color and the techniques for properly mixing pigments to match a specific color. Concepts of the color wheel and analogous/complementary colors are explored through instruction and numerous exercises. The three attributes of color – hue, value and intensity are also covered.

Limit: 12

Advanced Watercolor

Prerequisites: Intermediate Watercolor, Color Theory

Hours: 14 (3½ hours x 4 sessions)

This course builds upon Intermediate Watercolor. Students independently select a native plant of their choice and designs and completes a full, complex watercolor painting. Instructor is available for consultation and problem solving. Student presents a scientific report on the selected plant. In addition, student learns the techniques of critique. Limit: 12

4.2 Electives

Field Sketching

Prerequisite: None

Hours: 14 (3½ hours x 4 sessions)

Take your sketchbook outdoors and reconnect with plants in their natural environment. In this course, students are encouraged to shed old habits and try new techniques as they travel to a variety of gardens and habitats. Through a combination of guided exercises and free experimentation, students discover new ways of seeing plants, new problem-solving skills, and a refreshing way of thinking about layout and color. Several media are used, from ballpoint pen to watercolor to pencil. Limit: 15

Intermediate Colored Pencil

Prerequisites: Beginning Colored Pencil, Intermediate Drawing

Hours: 14 (3½ hours x 4 sessions)

This course makes use of the techniques and information covered in Beginning Colored Pencil and hones skills in color matching and layering. Students complete an illustration of a botanical subject of choice.

This elective is intended for students who choose to develop a strong, more-advanced-level skill in colored pencil. Limit: 15

Advanced Colored Pencil

Prerequisites: Color Theory, Intermediate Colored Pencil

Hours: 14 (3½ hours x 4 sessions)

Using a live plant and/or reference photograph of their choice, students complete an independent project consisting of a botanical illustration or botanical painting. One-on-one instruction is offered as desired by students. The class is designed to increase skills and confidence in the use of colored pencils by utilizing the instruction from Beginning and Intermediate Colored Pencil. Limit: 12

Mixed Media

Prerequisites: Beginning Colored Pencil, Pen and Ink, Intermediate Watercolor

Hours: 14 (3½ hours x 4 sessions)

This class provides instruction in combining various drawing and painting media for both botanical illustration and floral painting. The four-week course is meant for artists who have a working knowledge of graphite, pen and ink, watercolor, and colored pencil and who are interested in learning to combine them for enhanced effect. Limit: 12

Portfolio/Graduation Preparation

Prerequisite: None

Hours: 14 (3½ hours x 4 sessions)

This course is designed for students nearing completion of the certificate program and covers a myriad of topics to help prepare students for graduation. The course reviews how to assemble a portfolio, options for framing your work, how to approach galleries, publishing, marketing materials, copyright issues, and pricing artwork. Limit: 15

Short-Course Electives

Hours: 3½ (Students receive ¼ of a course credit for each class.) Below are *examples* of short courses from the past. Topics will vary from semester to semester.

Prerequisites: None

Open Studio

This studio session is intended for students interested in getting together with other botanical artists working in a specific area to learn new techniques and obtain in-depth critiques of their work. Sessions are announced each semester.

Short Course: Paint a Petal

Pick a flower. It can be complex or simple; black, white, or a riot of colors. Using the dry-brush watercolor technique, students slowly and carefully layer pigments until the petals look three dimensional and full of life.

Short Course: Light on Form

“The lack of a well-defined scheme of light and dark is ruinous to any pictorial composition” (Henry Poore, *The Composition of Art*). Using pencil and paper, students study how light moves and changes with different types of surfaces.

Short Course: How to Paint a Cast Shadow

Using different-sized objects and various surfaces, students look at how shadows change with shapes and how shadows are affected by the surfaces they fall on.

Short Course: Mixing and Matching Color

Students experiment with mixing colors in watercolor and matching the colors of found plant material.

Short Course: Butterflies in Colored Pencil

Students receive instructions and color selections needed to complete an image of a butterfly species native to North Carolina.

5 PROGRAM COMPLETION

5.1. Graduation Requirements

Upon satisfactory completion of the core courses and electives, each student will be required to

- 1) complete and submit a final project consisting of three new pieces of art created without instructor input;
- 2) prepare and submit a portfolio; and
- 3) participate in the student graduation exhibition.

It is the responsibility of the student to inform the associate director for education in writing when he or she has completed the required coursework and is ready to begin work on the final project. This should be done at least six months before the intended graduation date.

5.2 Graduation Deadlines

- At least six months before graduation, students must notify the associate director for education in writing of their intention to graduate.
- Portfolios and final projects are due eight weeks before the graduation date. They will be returned to students six weeks before graduation.
- Students should contact fellow graduates and the associate director for education well in advance of the graduation date to begin planning for the student graduation exhibition.

Graduation Dates

Graduation ceremonies take place between 2:00 and 4:00 on Sunday afternoon during the second weekend in July.

5.3 Portfolio

General

Students must submit a portfolio to the associate director for education eight weeks before the graduation date.

Presentation portfolios (also called presentation books) can be purchased at office supply or art stores. They are typically plastic notebooks with page protectors bound within and are available in various sizes. Students may need more than one to contain all their portfolio items.

Content

Portfolios will contain the following items:

1. The class and homework assignments required for each course that the student has taken for the certificate program. Students should consult their class notes to determine which items were required for each course.
2. The three independent works required for the final project, as well as support materials for these independent works (composition thumbnails, tonal studies, etc.).
3. In addition, some students like to include "bonus material". These are additional pieces that the student has created independently, and which display their mastery of Botanical Illustration, but which are not among the three pieces the student has chosen for their final project. These are not required, and should be clearly labeled "Bonus Material".

Portfolios must be neatly and cleanly assembled. Artworks in the portfolio must be originals, not photocopies or prints. The one exception to this rule is that students who have taken Field Sketching may submit four photocopied pages of their sketchbook in lieu of handing in their entire sketchbook.

Students will be evaluated on the improvement in their artistic skills, which is usually an incremental process that takes place over the entire period leading up to certificate completion. For this reason, students may not redo homework assignments completed for individual classes when preparing the portfolio for graduation.

Labeling and Organization

All artwork in the portfolio should be clearly labeled. It is difficult for the portfolio evaluators to know which pieces were completed for which class, and which pieces are the student's three final project artworks, unless every piece in the portfolio is labeled.

Each item in the portfolio must be clearly and visibly labeled with the following information: course name, name of instructor, course week number, and date of completion. Where applicable, the botanical specimen must be labeled with both the scientific and common names. Students do not need to write on their artwork. Instead, labels should be typed or written on small pieces of paper and attached to each page of the portfolio where the teachers can see it.

The student's name must appear clearly on the outside cover of each portfolio.

In order for the portfolio evaluators to understand clearly which piece was done for which class, we ask that all portfolios be arranged in the following order: Beginning Drawing, Composition, Beginning Watercolor, Beginning Colored Pencil, Intermediate Drawing, Pen and Ink, Intermediate Watercolor, Color Theory, Advanced Watercolor, Elective 1, Elective 2, Elective 3, Final Project 1, Final Project 2, Final Project 3, and – if desired – any optional Bonus Material (additional pieces created outside of class). The Botany, Taxonomy, and Local Flora courses are not evaluated by the faculty and therefore should not appear in the final portfolio.

5.4 Final Project

For the final project, each student is required to produce three additional pieces of botanical artwork completed without supervision from any of the instructors. These must include:

- one work done in **watercolor** (with no other medium allowed in this piece);
- one work done in **pen-and-ink** (with no other medium allowed in this piece); and
- one work done in **a medium of your choice** (e.g., watercolor, graphite, colored pencil, scratchboard, pen and ink, or a combination).

If a student chooses to enlarge small plant subjects or parts of plants for clearer depiction, a scale bar (a line drawn in black ink or graphite) must appear next to the enlarged element(s) and must be marked in metric units (5 mm, 1 cm, etc.) to indicate size.

Students will work independently (without instructor supervision) and are encouraged to interact with each other for comments and critiques. Work on the final project will be viewed as representing a student's highest capability in each medium.

Each piece of the final project must be labeled in the portfolio with the title of the piece, Latin name of the subject (genus, species, cultivar where applicable), common name of the subject, and medium. Again, labels should be typed or written on small pieces of paper and attached to each page of the portfolio where the teachers can see it. The artist should sign all pieces unobtrusively on the front.

The final project must be submitted, along with the portfolio, to the associate director for education eight weeks before the graduation date. NCBG Certificate in Botanical Art and Illustration program faculty will evaluate the materials. Evaluation criteria are the same as those for coursework: botanical accuracy, botanical draftsmanship, and artistic sensitivity. The faculty will return the final project with comments six weeks before graduation.

Students who do not meet the criteria for graduation will receive a letter from the associate director for education informing them of improvements that they need to make, based on faculty comments. Students will be responsible for independently acting on the comments about the final project and implementing the suggestions before framing their works for the graduation exhibit. Those unable to complete suggested improvements before graduation will need to resubmit their portfolios and final projects the following year.

5.5 Exhibit Guidelines

Graduating students will hang pieces of choice from their portfolio in a student graduation exhibit at the NCBG. Usually, each student's three final pieces are hung in the exhibit, although students are free to decide which artwork they wish to hang. Depending on the size of the graduating class, the student may need to frame one or two additional homework assignments for the student graduation exhibition. If this is necessary, students will be notified by the associate director for education when the final projects and portfolios are returned after evaluation. Students will have six weeks after the evaluation to get their works framed for the exhibition.

It is the responsibility of the artist or group to hang the exhibit. All the artwork must be original (no prints or photocopies). All entries must be identified on the back upper right-hand corner of the frame (this is the standard way art is labeled) with the artist's name, address, and phone number; title of the piece; medium; date; price (or NFS); and insurance value. Students will receive an exhibition contract that they must sign at least four weeks before the hang date.

Exhibitors must provide a price list for insurance purposes two weeks before the opening of the exhibit. They cannot hang work without this information. The price list should contain each student's name, address, and contact information; title of each piece to be hung; size (original and framed); medium; price or NFS (not for sale); and insurance value (even if the piece is not for sale). Insurance will be covered by the North Carolina Botanical Garden (The University of North Carolina at Chapel Hill) from the time hanging begins until the show is taken down.

The artists will provide individual foamboard labels to attach to the wall identifying each piece. Each label should include the name of the artist, title of the piece, and medium. Due to state law, price information cannot appear on the label. Labels should be attached to the wall using adhesive putty.

The exhibiting artists must provide compiled and photocopied price sheets for viewers to take with them. The price sheets should include the name of each artist, contact information, title of each piece, and price or NFS.

The exhibit will be open in the Arthur DeBerry Botanical Art and Illustration Gallery on weekdays from 8:00 a.m. to 5:00 p.m., Saturdays from 9:00 a.m. to 6:00 p.m., and Sundays from 1:00 to 6:00 p.m. during Daylight Savings Time. (After Daylight Savings Time ends, weekend hours will change to Saturdays from 9:00 a.m. to 5:00 p.m. and Sundays from 1:00 to 5:00 p.m.)

It is the responsibility of the artists to handle all sales. The NCBG will notify an artist of a request to purchase. The NCBG takes a 30 percent commission of total sales. Commission checks should be made payable to the N.C. Botanical Garden.



Maryann Roper

6 BECOMING A PROFESSIONAL

6.1 Framing Your Work

Each piece for the exhibit should measure approximately 11 by 14 inches. However, bearing in mind the cost of custom framing, students may choose to vary the size somewhat to fit standard premade frames.

All entries for the student exhibition must be matted, framed (under glass or Plexiglas), wired, and ready to hang. No sawtooth hangers are allowed. Mats must not draw attention from the artwork and therefore should be colored neutral white, ivory, or light gray. All frames should be simple wood without excessive molding. Students may not use metal frames.

Frames premade or cut to the required dimensions can be ordered from discount stores, art supply stores, or catalogs. Plan ahead and allow ample time for framers to frame work. Consult the instructors for further advice.

6.2 Pricing Your Work

Most artists price their work using their own criteria, and there are many ways to decide on price. One way is to total all costs associated with the piece (materials, framing, marketing, general business overhead, and gallery commission fee) and then add an amount as profit. Because most botanical artists spend a great deal of time on their works, it is usually not feasible to base price on the amount of time spent creating a piece.

Another way of pricing art is to calculate the area of the work (in square inches) and multiply by a dollar amount based on the aforementioned factors. Once the price per square inch for one piece is determined, use this value as a standard to price all your work. That way art will be priced consistently based on size. The artist can always charge slightly more for favorite pieces.

Most professional artists price each painting as if it were going into a gallery. Gallery commission charges can range from 40 to 100 percent. Most galleries charge 50 percent. It is inadvisable to price work lower than the gallery charges. Keep prices consistent so that buyers and galleries know what to expect.

It can be helpful to survey local galleries and exhibitions to determine the range of prices charged by established artists working on similar subjects with equivalent media and techniques. Talk to peers about how much they charge and how they price their work, join affiliated artists' groups, and enter and attend shows.

When people ask how long it took you to paint the image, tell them it took a lifetime.



Emma Skurnick

Paint as you see nature yourself. If you don't see nature right, with an individual feeling, you will never be a painter and all the teaching cannot make you one. A painter must work out his own problems in his art as everyone must work out his own problems in life.

—Claude Monet

7 SUPPLEMENTARY INFORMATION

7.1 Faculty

Christine Davis

Christine received a B.S. in botany from University of Florida and a Ph.D. in botany from Duke University, where she studied systematics and phylogeny of bryophytes. She currently teaches general biology and environmental biology courses at Durham Technical Community College.

Stephanie Jeffries

Stephanie Jeffries is a naturalist at heart and a forest ecologist by training. She has a Ph.D. in forestry from N.C. State, with minors in ecology and botany, and a B.S. in marine science from University of South Carolina. She

has been a Fellow in the Thompson Writing Program at Duke University since 2007 but has taught in a variety of settings, including the Highlands Biological Station, NCSU, the N.C. Museum of Natural Sciences, and the NCBG. She has broad interests in plant conservation, forest dynamics and succession, and plant community ecology, as well as experiential and environmental education and service learning. She loves teaching outdoors and sharing the wonders of the natural world with students of all ages and backgrounds.

Linda Koffenberger

Linda Koffenberger is a national award-winning artist who produces landscapes and portraits in colored pencil and watercolor. She is on the governing board of the Colored Pencil Society of America, a nonprofit organization with 1,700 members founded in 1990 to promote the stature of colored pencil as a fine art form. The work of award-winning colored pencil artists, including Linda, can be seen on the Web at www.cpsa.org.

Milo Pyne

Milo Pyne works as the southeastern senior regional ecologist for NatureServe, an offshoot of The Nature Conservancy. He and others at the Durham office are engaged in the development of ecological classification systems and their use and application by conservation partners. A native of Durham and formerly a resident of middle Tennessee, Milo obtained a B.S. degree in botany from N.C. State University in 1991 and worked from 1993 to 1996 as a botanist for the Tennessee Division of Natural Heritage. His other interests include local land conservation issues; natural landscape gardening; ecology of glade-, barren-, and prairie-related vegetation in the Southeast; and taxonomic issues in *Physalis* and *Liatris*. He has been a board member of the Eno River Association since 1996.

Maryann Roper

Maryann Roper graduated with the first class of students to complete the Certificate in Botanical Art and Illustration program at the North Carolina Botanical Garden. She works in graphite, colored pencil, and watercolor and has won awards for her work on the local and national levels. She is a member of the Guild of Natural Science Illustrators and the Orange County Artists Guild.

Patricia Savage

Patricia Savage has been a fine artist since 1989. She was awarded Best and Honorable Mention in Wildlife in the *Pastel Journal's* Sixth Annual Pastel Top 100. She served as artist-in-residence in Denali National Park and expedition artist for The 1899 Harriman Expedition Retraced. Her work has appeared in *Botanical Art: Eden Reimagined*, *The Best of Wildlife Art 1 and 2*, *Focus (Italy)*, *U.S. Art*, *Wildlife Art*, and *Wildlife in North Carolina*. Patricia has exhibited her work at the Leigh Yawkey Woodson Art Museum, the Bell Museum of Natural History, the National Geographic Society, the U.S. Botanic Garden, and Walt Disney World's Animal Kingdom. She is a signature member of the Pastel Society of America and the Society of Animal Artists. She also belongs to the Guild of Natural Science Illustrators and GNSI-Carolinas, Paint N.C., and the Pastel Society of North Carolina. To see Patricia's paintings go to www.psavageartist.com and friend her on Facebook.

Emma Skurnick

Emma Skurnick is a full-time freelance scientific illustrator whose work is published internationally. Her illustrations can be seen in the Brooklyn Botanic Garden, *American Scientist* magazine, the N.C. Aquarium, and the N.C. Wildlife Resources Center. Since 2000 she has been sharing her skills in traditional and digital drawing media, art marketing, and design by teaching at numerous venues throughout the Triangle. Emma received her B.F.A. from Binghamton University in New York in 1995 and her Certification in Science Illustration from the University of California, Santa Cruz, in 2000. She has been a member of the Guild of Natural Science Illustrators since 2000, serving two terms as chapter president. See Emma's work at www.geocities.com/emmaskurnick.

Wade Wall

Wade Wall is a Ph.D. candidate at N.C. State University studying the population demography and genetics of several rare plant species in the Sandhills region of North Carolina. He has taught Introduction to Ecology, Multivariate Analysis of Community Data, and Plant Anatomy at N.C. State to both undergraduate and graduate students.

7.2 Core Courses Learning Objectives

BOTANY

Learning Objectives

Upon completion of this course, students will have an understanding of the following:

- General anatomy and morphology of plants and the main tissue types and organs;
- Characteristics of monocots and dicots, primary and secondary growth in flowering plants, and plant reproduction; and
- Diversity in and classification of the plant kingdom including an introduction to basic taxonomy.

LOCAL FLORA (Winter, Spring, Summer, Fall)

Learning Objectives

Upon completion of this course, students will have an understanding of the following:

- Basic plant morphology;
- Naming conventions for plants and the history of scientific naming;
- How to identify the prominent plants of the season using a dichotomous key and field characteristics; and
- Other information specific to the season.

PLANT TAXONOMY

Learning Objectives

Upon completion of this course, students will have an understanding of the following:

- Procedures used for the identification, naming and classifying a plant;
- Important morphological features of vascular plants;
- Use of a dichotomous key;
- Techniques used to determine plant evolutionary relationships (morphological comparisons, biochemical relationships, genetic analyses, etc.); and
- Diversity of the plant kingdom through direct study of various taxa.

BEGINNING DRAWING

Learning Objectives

Upon completion of this course, students will have an understanding of the following:

- Tools for capturing realism in drawing, including use of contour lines, negative space, relative proportions, values, perspective and foreshortening;
- Conventions of drawing for botanical illustration; and
- Components of a successful critique.

COMPOSITION

Learning Objectives

Upon completion of this course, students will have knowledge/skill of the following:

- How to create a good composition using elements of the artistic process (lines, space, forms, texture, color and value);
- How to draw the viewer's eye to the point of interest;
- Importance of proportions, repetition, contrast, balance and harmony; and
- Components of a successful critique.

BEGINNING WATERCOLOR

Learning Objectives

Upon completion of this course, students will have knowledge/skills of the following:

- Watercolor, paints brushes and papers;
- Flat and graded washes; and
- Use of light and shadow to create shapes.

BEGINNING COLORED PENCIL

Learning Objectives

Upon completion of this course, students will have knowledge/skill of the following:

- Fine art pencils, papers and other materials;
- Commonly used techniques and tips used for most colored pencil drawing/painting methods;
- Recognizing common mistakes and how to correct them; and
- Basic color theory and color matching.

INTERMEDIATE DRAWING

Learning Objectives

Upon completion of this course, students will have a knowledge/skill of the following:

- Use of mapping and layers to work up from a simple sketch to a finished drawing;
- Ability to create even application of tone;
- Use of lighting to highlight botanical features;
- Use of microscopes and dissection tools;
- Measuring and labeling conventions of basic botanical structures and forms; and
- Composition of a full botanical plate, including habit and plant detail

PEN AND INK

Learning Objectives

Upon completion of this course, students will have a knowledge/skill of the following:

- Control of crow-quill and modern pens;
- Use of varied line weight to depict near and far, light and shadow;
- Pen & ink conventions, including broken lines, line weight, and snodgrassing;
- Stippling and the creation of even gradients using stipples;
- Textural marks, including hatching, scribbling, and parallel lines;
- Correction techniques; and
- Care and cleaning of pens.

INTERMEDIATE WATERCOLOR

Learning Objectives

Upon completion of this course, students will have knowledge/skills of the following:

- Layering and color mixing;
- Detailed, realistic watercolor studies of individual plant structures;
- Botanical accuracy and artistic sensitivity;
- Recognizing common mistakes and how to correct them; and
- The process of creating a painting.

COLOR THEORY

Learning Objectives

Upon completion of this course, students will have knowledge/skill of the following:

- Concepts of a color wheel;
- Accurately matching colors; and
- Applying color theory to strengthen composition.

ADVANCED WATERCOLOR

Learning Objectives

Upon completion of this course, students will have knowledge/skills of the following:

- Full complex botanical illustration in watercolor using compositional elements;
- Working independently;
- Writing of a scientific report; and
- Preparing a formal critique.

7.3 Short List of Art Suppliers

Askew-Taylor Paints, 110 Glenwood Ave., Raleigh, N.C., 919-834-4497

Cheap Joes, www.cheapjoes.com

Dick Blick Art Materials, www.dickblick.com

Jerry's Artarama, 3060 Wake Forest Rd., Raleigh, N.C., 919-876-6610

Jerry's Artarama Web catalog (has many more items than the store), www.jerrysartarama.com

Studio Supply, 421 West Franklin St., Chapel Hill, N.C., 919-929-5637

7.4 Some Other Botanical Illustration Programs

Brookside Gardens, Maryland: www.montgomeryparks.org/brookside/botanical_art_school.shtml

Denver Botanic Gardens: www.botanicgardens.org/content/botanical-illustration

Morton Arboretum: www.mortonarb.org

New York Botanical Garden: www.nybg.org/adulted/

Society of Botanical Artists (UK): www.soc-botanical-artists.org/distance_learning_diploma_course.php

7.5 Professional Associations

American Society of Botanical Artists: www.amsocbotartists.org

Guild of Natural Science Illustrators: www.gnsi.org

Guild of Natural Science Illustrators-Carolinas: www.gnsi.org/groups

The Guild of Natural Science Illustrators–Carolinas (GNSI-C) is a local chapter of the national nonprofit Guild of Natural Science Illustrators attracting and serving members throughout the Carolinas and surrounding areas. GNSI-C welcomes anyone interested in scientific illustration. Current membership includes amateur artists, art students, scientific illustrators, botanical artists, wildlife artists, art instructors, book illustrators, authors, and others who have an appreciation of art and nature.

7.6 Brief History of Botanical Illustration

It is interesting to note that humans began to depict plants in earnest only after they had domesticated them. Although Paleolithic people drew images of humans and animals on cave walls, there was little attempt to render plant material. Plants appear in early Egyptian, Greek, and Roman art but mostly as decorations, supplementing art of the human figure. The Great Temple of Thutmose III at Karnak (1450 BC) contained probably the earliest collection of plant images (a “florilegium”), in which—although some were sophisticated drawings of identifiable plants—many of the pictures were highly stylized.

In the first century AD, the purpose of botanical illustration was purely to serve science, and physicians studied plants for their pharmacological properties. Physicians relied on books called herbals for descriptions of healing plants. The oldest known surviving illustrated botanical book, the *Codex Vindobonensis* (ca. AD 512), was presented to the Byzantine princess Juliana Anicia in Constantinople. An illustrated version of an herbal text originally written by the Greek physician Dioscorides in the first century AD and translated into Latin as *De Materia Medica*, it contained nearly 400 full-page paintings of plants, many done by the artist Krateus. It became one of the main resources for botanical illustration used throughout the Middle Ages. Because the Middle Ages (ca. AD 500 to 1300) brought a halt to cultural development in Western Europe, botanical illustration went into decline for 1,000 years. During that time, botanical drawings were badly copied and often stylized beyond recognition.

Around 1390 a new naturalism suddenly appeared simultaneously in art in Germany, Italy, France, and Flanders. Prayer books and books of hours were hand-painted for personal use by the wealthy aristocracy. Between 1410 and 1416, three Flemish miniaturists, the Limbourg brothers, painted a book of hours for the duc de Berry, brother of the king of France. This document, for which the Limbourgs carefully observed and painted nature, was done in the International Gothic style. It marked a new realism in painting, and its influence spread throughout Europe.

During the Renaissance (ca. 1300 to 1500), art and science had not yet become separate disciplines. Artists and scientists alike recorded the natural world. Innovative artists such as Leonardo da Vinci (1452–1519) and his contemporary Albrecht Dürer (1471–1528) discarded the old formulas for depicting stylized and idealized plants and instead produced detailed and exact studies of nature.

As technology advanced, artists were able to reproduce and distribute their work. The printing press was developed in Germany soon after 1450, and illustrated herbals became widely available. Botany began to emerge as a separate discipline only in the late 1500s. In 1530 the herbal *Living Portraits of Plants*, by Otto Brunfels, was published. For it Hans Wieditz, a student of Dürer, created exquisitely detailed wood engravings of plants exactly as they appeared in nature, including natural blemishes. In an ambitious herbal called *De Historia Stirpium*, published by Leonhart Fuchs in 1542, more than 500 plants appeared life-sized, making Fuchs the first author to regard the image as equal to the text in importance.

In the 1560s an influx of new flowers from the Turkish Empire began, and crocuses, cyclamens, hyacinths, and tulips were subsequently bred and sold in Europe, providing a wealth of subject matter. During the Protestant Reformation in the early 1600s, religious paintings fell out of favor, and artists began to paint flowers and fruit instead of religious images. Still-life painting became popular in the Netherlands and was recognized for its subtle compositions, perfectly rendered objects, and interesting lighting effects.

During the Age of Exploration, which had begun in the 15th century, world trade expanded, and many voyages of discovery required scientific documentation. By the late 17th century, trade routes to the Americas were firmly established, as well as those around the southern tip of Africa. Some American plants had reached Europe as early as the Renaissance period, but the real surge of plants from the New World began in the 1620s.

Although entomology was still in its infancy in the 17th century, Maria Sibylla Merian (1647–1717) became one of the first artists to focus on painting insects with their host plants. At age 29, she published the

first of three volumes of engravings showing European insects. She later spent two years in Surinam collecting and painting insects and flowers, and in 1705 she published *Metamorphosis of Surinam Insects*.

In the 18th century, Carl Linnaeus introduced a new system of scientific classification based on the sexual organs of plants, which changed the focus of botanical illustration away from the medicinal parts of plants to the flowers. During the middle part of that century, George Dionysius Ehret (1708–1770) dominated the botanical art scene because of his single-mindedness and dedication to his subject, and the prolific body of beautiful work he produced for published books. He translated Linnaeus's classification system into diagrams, which were published and widely distributed. A wealthy physician, Dr. Christoph Jakob Trew (1695–1769), became his lifelong friend and patron, and soon Ehret was giving botanical drawing lessons to members of the aristocracy and receiving painting commissions. He painted on vellum and preferred gouache (opaque watercolor) to transparent watercolor. Ehret produced his best works between the ages of 32 to 42, which pieces are now in the Victoria and Albert Museum in London. His later works are at Kew Gardens.

Pierre-Joseph Redouté (1759–1840) was probably the most popular of botanical artists. Empress Josephine (1763–1814), wife of Napoleon Bonaparte, hired him to be the artist at her estate of Malmaison. The famous volumes of *Les Liliacées* (1802–1816) and *Les Roses* (1817–1824) resulted from Josephine's patronage. Redouté pushed the boundaries of his techniques and sometimes broke with tradition to try new methods. He used watercolor on vellum, which he sometimes touched up with gouache. What made Redouté great, author Wilfrid Blunt suggests, were good luck (which brought him royal patronage), tireless energy, and a team of talented stipple engravers and printers.

Other important figures in Western botanical art history include Robert Thornton, Sir Joseph Hooker, Walter Hood Fitch, and the Bauer brothers, Francis and Ferdinand. The “grandmother” of contemporary botanical artists in America was Anne Ophelia Todd Dowden, best known for her intricate watercolors of flowers. In spite of the challenges it brought, she always insisted on working from live plant specimens. Probably the next-most-recognized name in contemporary botanical art is that of Margaret Mee, who studied art in London and moved to Brazil in the early 1950s, where she made 15 solo trips into the Amazon rain forest to paint plants in their natural habitat.

Many of the artists discussed above became well known because their work was reproduced and made available to a wide audience. Today, with digital printing, archival inks, and personal Web sites, botanical artists have revolutionized the way they approach their art, largely because their audience is now the global community. Working with the challenges presented each day by nature (their favorite subject matter) and art (their passion), they are fortunate to have an ever-expanding repository of historical and contemporary botanical artworks available to them for inspiration, education, and personal enrichment.

Sources

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Janson, H.W. *History of Art*. 3rd ed. Thames and Hudson, 1986.

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Saunders, Gill. *Picturing Plants: An Analytical History of Botanical Illustration*. University of California Press, 1995.

7.7 History and Mission of the North Carolina Botanical Garden

The North Carolina Botanical Garden is a unit of the University of North Carolina at Chapel Hill. We further the University's mission of teaching, research, and public service through our mission:

To inspire understanding, appreciation, and conservation of plants in gardens and natural areas and to advance a sustainable relationship between people and nature.

The concept of the conservation garden was developed at the North Carolina Botanical Garden in the early 1990s to represent the many conservation-related activities that the NCBG is pursuing. The Garden has the following eight program themes within its mission.

1. Conservation through propagation of native plants, which ensures that wild populations are not damaged by direct use.
2. Seed banking and reintroduction, an ex-situ conservation program that protects germplasm reserves as a last resort against extinction in the wild and for use in reintroduction of wild populations.
3. The protection and restoration of natural areas.
4. The elimination of invasive species and replacement with noninvasive alternatives.
5. Gardening in nature's context, which seeks to promote plants that support native biodiversity.
6. Sustainable gardening, which seeks to promote environmentally friendly gardening practices.
7. Supplying critical information on conservation of the flora of the southeastern United States and on the Garden's conservation programs.
8. People-nature relations, which describes how important plant diversity and natural areas are to the physical and psychological health of all of us.

The history of the North Carolina Botanical Garden is a history of the people and the botanical legacy of the University of North Carolina at Chapel Hill.

In 1903 William Chambers Coker, the University's first professor of botany, began planting a teaching collection of trees and shrubs on the central campus. This collection was to become the Coker Arboretum. Starting in the late 1920s, Coker and his student Henry Roland Totten proposed a more complete botanical garden south of the main campus. Although some plantings were done by the 1940s, it was in 1952 that the trustees dedicated 70 forested acres for botanical garden development. To this tract were added 103 acres of dramatic creek gorge and rhododendron bluffs donated by William Lanier Hunt, a horticulturalist and former student of Coker and Totten.

Hunt also helped to found the garden's membership support organization, the Botanical Garden Foundation, in 1966. In 1961 Dr. C. Ritchie Bell was appointed the Garden's first director. The Garden's first public offering was the Nature Trail, opened on Arbor Day in April 1966. The first state appropriation came five years later, when the first employee, J. Kenneth Moore, was hired.

Director Bell, a professor of botany and tireless promoter of the flora of North Carolina, enlisted the support of the Botanical Garden Foundation and the Garden Club of North Carolina to publish a book of photos by William S. Justice. *Wild Flowers of North Carolina* filled a need among wildflower lovers and students of natural history, and it brought valuable attention to the fledgling North Carolina Botanical Garden. Dr. Bell also enlisted many students to help at the Garden, even before he hired its first employee.

The Garden's formative period coincided with a surge of interest in plants and conservation fueled by Earth Day celebrations and the environmental movement. The Garden's early era was characterized by limited resources and unlimited idealism and energy. During the 1970s and 1980s, students, volunteers, and a growing staff under the leadership of superintendent Ken Moore constructed habitat gardens—displays representing the major plant communities of the state and illustrating the theme of botanist B.W. Wells's *The Natural Gardens of North Carolina* (published by the University of North Carolina Press in 1932 and revised in 2002). The Totten Center, named for UNC botanist Henry R. Totten and his wife, Addie, opened in 1976.

The 1960s saw the initiation of field research on a contiguous 367-acre tract of old farmland and native woodlands dedicated by the UNC trustees in 1984 as the Mason Farm Biological Reserve. Today the reserve provides research facilities (greenhouse, cultivation beds, and natural areas) for diverse projects in disciplines such as ecology, bird behavior, population biology, genetics, and developmental biology.

Encouraged by the North Carolina Wild Flower Preservation Society (now the North Carolina Native Plant Society), whose members had helped start the Garden, superintendent Moore promoted "conservation through propagation" as an alternative to the unethical collection of native plants from their natural habitats. He recruited a growing corps of volunteers who provided valuable assistance to staff in welcoming visitors, leading tours, conducting "plant rescues," propagating plants, and constructing the Mercer Reeves Hubbard Herb Garden. In partnership with the Botanical Garden Foundation, the Garden became a steward of natural areas near Chapel Hill and elsewhere in the state.

As the Garden matured and added staff with expertise in other areas, it developed programs and collections of national significance, such as the Southeastern Carnivorous Plant Collection. In 1984 the North Carolina Botanical Garden became one of the founding members of the Center for Plant Conservation, a

network of gardens and arboreta responsible for the collection of propagules and for research about and protection of our nation's rarest plants. Staff members and volunteers were motivated to undertake this work by a desire to practice conservation and demonstrate a high standard for all public gardens. The same year, in order to focus their efforts, staff members drafted a long-range plan for the Garden. In 1985 more than 15 years' work at the Garden was summarized in the book *Growing and Propagating Wild Flowers*, written and illustrated by NCBG staff and published by UNC Press.

Dr. Bell retired as director in 1986 and was succeeded by Peter White. Dr. White led a review of the 1984 long-range plan, resulting in the "Report on Mission, Goals, and Objectives" (1988). Next came the completion of a new master plan by the firm Jones and Jones, approved by the University trustees in 1990. In 1997 the North Carolina legislature granted funds for design of the Herbarium Botanical Library building, one of two new facilities described in the master plan. Then in 2000, with support from a \$2.7 million bequest, the staff launched the design of the master plan's Education Center by Frank Harmon Architects, approved by the state in 2003. The Education Center, designed as a Platinum-level structure within the Green Building Council's LEED rating system, opened in November 2009.

In the years since its founding, the Garden has acquired responsibility for the four additional major units described below.

Coker Arboretum (part of the Garden since 1982)

Coker Arboretum, fondly known by many as a quiet haven in the middle of the busy University of North Carolina, lies at the heart of one of the most beautiful campuses in the nation. Managed by the NCBG, it is one of the Garden's oldest tracts.

In 1903 William Chambers Coker, the University's first professor of botany and the first chair of the University Buildings and Grounds Committee, began developing a five-acre boggy pasture into an outdoor classroom for the study of trees, shrubs, and vines native to North Carolina. Beginning in the 1920s and continuing through the 1940s, Dr. Coker added many East Asian trees and shrubs. These species, closely related counterparts to many North Carolina native plants, enhanced the beauty and education value of the arboretum. Today the collection consists of a wide variety of plantings including flowering trees and shrubs as well as bulb and perennial displays. The arboretum has something unique to offer during every season of the year.

In April 2003 the Coker Arboretum celebrated its 100th anniversary with exhibits and activities throughout the University's campus and Chapel Hill. Part of the celebration was the production of a book, *A Haven in the Heart of Chapel Hill: Artists Celebrate the Coker Arboretum*, that depicts scenes and specimens one might see on a walking tour of this special garden.

Mason Farm Biological Reserve (1984)

Mason Farm Biological Reserve (MFBR) protects natural areas, supports academic research and public education, and provides a place for contemplation and appreciation of the natural world. Mason Farm Biological Reserve and contiguous undeveloped tracts create an approximately 900-acre natural area that connects with the 41,000-acre New Hope Game Lands to the south. MFBR itself encompasses 367 acres and contains a combination of forests and old fields that support approximately 800 species of plants, 104 species of lichens, 216 species of birds, 29 species of mammals, 28 species of fish, 23 species of amphibians, and 67 species of butterflies. In fact, more different species of animals have been recorded at the reserve than in any other comparable-size area in the entire North Carolina Piedmont.

The University received the Mason Farm land in 1894 through the bequest of Mary Elizabeth Morgan Mason, one of the last descendants of the Morgan family who settled in the southeast corner of Orange County in the 1740s. Much of the area has reverted to woodlands, and some of its forests are at least 150 years old, with some trees exceeding 300 years in age.

During the 1960s and 1970s, several portions of this tract were set aside by the UNC Board of Trustees specifically for biological uses. The Mason Farm Biological Reserve was officially established in 1984, and today it is administered by the North Carolina Botanical Garden as both a natural area and a biological field station.

Battle Park (already a well-loved natural area in the late 1800s and part of the Garden since 2004)

On July 1, 2004, at the request of UNC chancellor James Moeser, the Garden assumed responsibility for Battle Park, a distinctive wooded tract on the east side of the University campus and downhill from Coker Arboretum. The tract includes one of the most awe-inspiring legacies of the University and a symbol of the important connection between nature and art: the stone amphitheater known as Forest Theatre.

Although the tract is not a pristine forest, much of the 93-acre Battle Park consists of woodland that predates European settlement in the area ca.1740. The Garden has restored trails there with funding supplied by the University. The park is named for Kemp Plummer Battle, president of UNC from 1876 to 1891. Battle laid out the original trail system and spent many happy and contemplative hours within the forest.

University of North Carolina Herbarium (founded in 1908 and part of the Garden since 2000)

On June 18, 2000, the Southeast's premier herbarium, the UNC-Chapel Hill Herbarium, officially became part of the North Carolina Botanical Garden. The facility, used by students, botanists, taxonomists, and other professionals from across the Southeast and the nation, currently contains more than 750,000 specimens of plants, algae, fungi, and fossils. Though some specimens in the collection date back to 1835, the herbarium was actually founded in 1908 by Dr. William Chambers Coker. It resided in Davie Hall from that year until 1957 and then moved to Coker Hall. In 2008, the herbarium celebrated its 100th birthday with a gala in Coker Hall.

A herbarium is a museum collection of plant specimens and associated label and research data. Herbaria constitute the fundamental documentation of plant diversity. The herbarium specimen is the unit of botanical knowledge. A herbarium is the only authentic source for identification of plants and their present and past distribution. It helps us understand the changing landscape and serves as the court of last resort for plant identification and distribution issues, including

- new weeds and their spread;
- species poisonous to people, livestock, and pets;
- hay fever-inducing plants;
- blooming and fruiting times;
- medicinal plants and their availability;
- the historical distribution of endangered plants;
- wildflowers and trees; and
- plants of state parks, national parks, seashores, riverways, and wildlife refuges.

Such information is crucial for planning North Carolina's future as our state and region continue their fast-paced development.

The UNC Herbarium spearheads the identification and study of the distribution and history of plants in our diverse state and is the largest collection of its kind in the Southeast. The National Science Foundation has designated it one of 25 National Resource Centers and one of 105 National Resource Collections and has ranked it third among university collections. The herbarium holds the results of over 150 years of botanical observation and documents the work of hundreds of collectors and botanists. It is a rich archive of field notebooks, maps, photographs, and illustrations. The facility serves all 16 campuses of the University of North Carolina as well as a wide array of other institutions and users, and it has supported the education of hundreds of students at UNC and elsewhere.

Today the lands of the NCBG have grown to comprise some 700 acres, not including 210 acres of nature preserve held by the Botanical Garden Foundation. The Garden is nationally known for its conservation initiatives, educational collections, and diverse programs, including native plant studies, botanical illustration, and horticultural therapy.