

THESIS

ORNAMENT WITHIN STRUCTURE: INVESTIGATION OF CELLULAR
WALL STRUCTURE OF PLANTS

Submitted by

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY AMBER N. DRAKE ENTITLED ORNAMENT WITHIN STRUCTURE: INVESTIGATION OF CELLULAR WALL STRUCTURE OF PLANTS BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF FINE ARTS.

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ABSTRACT OF THESIS

ORNAMENT WITHIN STRUCTURE: INVESTIGATION OF CELLULAR WALL STRUCTURE OF PLANTS

In my recent body of work I have chosen to magnify the cellular structures of plants and modify them into a more concrete and visible state. This process alters the familiar perception of plant cells, reassembling them into a new material and format. I am using the inherent beauty within the basic structure of the plant to express a fresh vision of beauty itself.

By using cellular structures as a means to ornament the body, I'm forcing the viewer to interact with these forms in an unfamiliar way. Manipulating the plant's innate qualities by magnification and modification of materials distorts its original value, fundamentally humanizing it. It is distorted further as I add functionality to the images by fabricating them into jewelry forms. The alteration of the original form creates a new relationship of semblance between plants and humans.

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Complex and beautiful structures are found within the flora of nature that surrounds us daily. These external, familiar forms are often taken for granted, while the internal structures of plant cells are far more intricate and complex. This phenomenon presented by nature establishes an elaborate beauty that is unknown to many people. The inner core of plants and flowers as seen under a microscope reveals complex, interrelated patterns normally invisible to the naked eye. My curiosity about the internal structures of plants drives me to reinterpret these forms on a larger scale. In my work, I translate these magnified cellular structures into tangible objects that are used to adorn the body. Jewelry provides a connection to the body that forms an intimate relationship between the wearer and the piece. The use of plant images as jewelry establishes a direct connection between nature and our body.

The jewelry forms that I focus on are brooches and rings. The brooch format allows for a wider exploration of nontraditional and sculptural forms, while still functioning as jewelry. The designs that I have incorporated into the ring format are also unexpected. These forms push the traditional perception of the ring as adornment for the body through certain design modifications. Certain pieces utilize a stylized T-ring design that enables me to extend the formal boundaries of traditional jewelry. My rings are designed to rest on top of the fingers and hand, creating the appearance that they are hovering or floating rather than being attached to the body.

It is through our body that our perception of scale is determined. By placing these objects on the body, I bring this scale shift into sharp focus. By enlarging the normally invisible cells and transforming them into jewelry, I alter the way people perceive and

interact with plant forms. Once the plant cells are magnified and placed on the body, these structures no longer serve a function dedicated to the life of a plant, but instead are recreated with a new purpose of adornment. By representing plant anatomy as jewelry, I create an awareness of scale through maximizing the forms. In their true scale, our eyes would be denied the opportunity to admire these elegant forms. The difference in scale creates a new relationship between my work, the wearer's body and the viewer.

The three dimensional qualities of plant cells are an important factor within my work. While investigating a plant cell under a microscope, there is an opportunity to view the multiple layers of a cell and study its cellular complexity. Some specimens on the slide are miniscule even after magnification, while others spill out of view of the lens. One can also see the multiple layers and three-dimensional qualities of plant cells when viewed on a molecular level. It is at this instant that one realizes how infinitesimal the interior structures of plants actually are. It is hard to grasp the depth and complexity of their cellular structure from what seems like a simple flat entity.

The development of my work fits into two categories, the first dealing with the three dimensional layers and qualities of plant cells, while the second is an interest in the shadows that are cast from individual parts of plant anatomy. I replicate cross and transverse sections of plant leaves, stems, roots and seed coats in my work. The focus on interior structures within the plant cell becomes a focal point for images that I have referenced. Some of the interior structures that I have investigated are presented in a three-dimensional format, showing the depth and dimensional qualities of plant cells. Other formal elements are investigated as silhouettes of individual plant cell structures,

such as stomata, guard cells, and trichome clusters.¹ These cell structures are imitated in metal so that the viewer can appreciate the beauty of their delicate forms. I embrace this appearance of delicacy, while relying on the structural strength of the metal for the sturdiness that is required of jewelry.

My interest in interior structures is not only designated to the inner core of plants and flowers but to the internal crystal structures of metal. The natural qualities of metal allow for the delicate plant cell structures to be imitated in a durable material. Metal provides the structural integrity and strength that enables my work to be both delicate and functional as forms of personal adornment. Through the process of metalworking I alter the traditional perception of plant cells. I am able to place the image of these objects in a new material and format, one that is designed to adorn the body. Through the process of piercing and sawing out negative spaces, creating delicate lines in thin sheets of metal, my work becomes frail and delicate to the touch, representing the fragility but also structural strength of plant cells. The ability to establish multiple layers of metal at unexpected angles allow my work to present modified and abstracted shadows as well as the unseen depth of plant cells. My work casts shadows on and off of the body that further reveal delicate and intricate forms of structure. These change as the wearer interacts with the work, depending on the location of the jewelry, the proximity of individuals to the piece, and the light source.

While interacting with my work in person, I intend for the viewer to investigate the visual elements in terms of space and shadows. Each individual is expected to engage with the work from various angles to experience the effects of moving shadows. The

movement of shadows in my work changes depending on the location and the proximity of the individual to the work. The cast shadows not only imitate the natural forms of the plant cell structure that is represented, but further adds to the appreciation of the delicate and unseen elements of nature.

The investigation of silhouette form and shadows is embodied in the piece *Oscularia deltoidea* (Fig. 1). This brooch is a cross section of the stem in the succulent, Pink Ice plant. This piece references the triangulation of plant architecture, which contributes to the design of the stem and increases the capacity to withstand stress with the support from lignin and other thickened supporting structures.² The triangulation of plant stems results in a strong structure, which I reiterate in my choice of metal as material. The strength of this structure provides the opportunity to build multiple layers at a variety of angles that enforce delicacy and manipulate cast shadows.

Multiple layers build depth within my work as seen in *Convolvulus arvensis*. This brooch concentrates on the adaxial leaf surface with paracytic stomata present in the epidermis of Field Bindweed (Fig. 2).³ Bindweed is often considered to be nauseating as a weed, but when this plant is magnified under a microscope you cannot help but to admire the splendor and beauty of the epidermis of this plant. The delicate appearance of the epidermis when rendered in metal acts as a metaphor for the resilient characteristics of the plant within nature.

In my piece *Chrysanthemum leucanthemum*, I explore the variations of anomocytic stomata on top of veins in an adaxial leaf surface (Fig. 3).⁴ This ring provides a surface view of the epidermis and stomata of the plant *Chrysanthemum*

leucanthemum (Oxeye Daisy), as if you were looking through a microscope lens. The stoma is a pore in the surface of the epidermis, which provides gaseous exchange between the plant and the atmosphere. The classification of stomata is based off of morphology, determining whether or not the stomata have subsidiary cells or guard cells surrounding the stoma.⁵ The design of this ring is intended to allow for this piece to function with and without the body.

It is important that my work can successfully stand alone as sculptural objects without the backdrop of the body, as well as function as beautiful jewelry pieces when worn on the body. As a group of sculptural objects, my work compels the viewer to focus on individual details in each piece, whether this is surface treatment, delicate saw lines or formal elements of the work. The sculptural qualities of the work become more dynamic when transferred from the pedestal to the body through the addition of movement and the alteration of context.

Inspiration for my work is rooted within nature but also comes from the work of contemporary metalsmiths such as Jan Yager, Vina Rust, and Sarah Hood. The work of each of these artists has a connection to nature whether it is through materials, process or imagery. The work of Jan Yager focuses on how nature adapts to an urban environment. In Yager's *City Flora: The Philadelphia Series*, she investigates a variety of plants and weeds that surround her studio in Philadelphia, PA. Her piece *The Tiara of Useful Knowledge*, 2006, focuses on diversity, tolerance and reconnecting the public with nature (Fig. 4).⁶ This piece includes images of ten plants, an ant, and a pebble. *The Tiara of Useful Knowledge* is intended to be worn as a tiara, but each plant can also be separated

from the tiara and worn as a brooch, pins, tie tack, pendant and headband (Fig. 5).⁷ In Yager's artist statement, she discusses why she included certain types of plant species:

“.... **Switch Grass** reminds us that important things are hidden in plain sight such as the renewable sources of fuel for our cars growing freely on the North American prairies. **Sweet Clover, Crab Grass, Plantain, Rye, Prickly Lettuce** were each selected for the food, shelter and/or enrichment of all sorts they offer animals, the environment – and us. The **American Tobacco** blossom refers to the powerful seduction of cash and addictive crops, and **Common Ragweed** the powerful and even deadly allergens, poisons and medicines, found sometimes in the same plant.”⁸

The purpose of using plant imagery within the work of Yager is to recognize the importance of plants, even those widely considered to be weeds, and how they can be used to our benefit.

In contrast to the work of Jan Yager, Vina Rust focuses her work on the visual qualities of plant stamens and stained cells. In her work, *The Stamen Series* and *Stained Cell Series*, Rust investigates and explores the interior structure of plant cells by focusing on certain areas as design detail in her work.⁹ This process is related to the staining procedure used in botany labs to reveal certain qualities of plant cells. The details enhanced through staining would be difficult to see without the use of chemical stains added to the specimen. As stated in Rust's artist statement:

“Referencing such images allowed me to explore the idea of exposing internal structures with devices such as the cross-section or selective staining of cells, and granted me license to generalize or specify certain details in order to create focal points in a design.”¹⁰

Rust replicates this method in her work through contrast of different metals, using gold to classify the areas of interest and importance within her design (Fig. 6).

The direct incorporation of natural elements such as plants, leaves and seeds are often seen in the works of Sarah Hood. In Hood's *Organic Series*, her work is inspired from nature and celebrates the genuine beauty and fragility of her surroundings. Hood includes organic elements as a contrasting feature against her metalwork, and she uses these natural components in traditional jewelry formats (Fig. 7).¹¹ The importance of this integration is better said in Hood's artist statement:

“My organic jewelry comes from a desire to embrace the impermanence of the natural world around me. Rather than lamenting the transience of life, this jewelry celebrates it, transforming decay into beauty and lyricism, fragility into a strength of purpose.”¹²

The work of Sarah Hood embraces all the qualities of organic life, from color to material, making the viewer acknowledge the presence and beauty of nature.

These artists take our impression of nature as adornment to the next step within the field of contemporary jewelry. My work follows this line of inquiry by means of investigating the beauty of structural elements in plant anatomy. As a whole we are familiar with the exterior qualities of plants and admire them for their natural beauty. Although we are aware of the internal structures of plants, very few understand and interact with the structural qualities of plant anatomy. My work modifies the complex beauty found within the internal structures of plants and reveals these images in the more familiar format of jewelry. It is through this process that my work explores the unseen qualities of nature and presents itself to the public in the form of tangible and desirable objects designed for the body.

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Fig. 1, Amber N. Drake, *Oscularia deltoidea*, brooch, 2009
Brass
3 1/2" x 2" x 2"

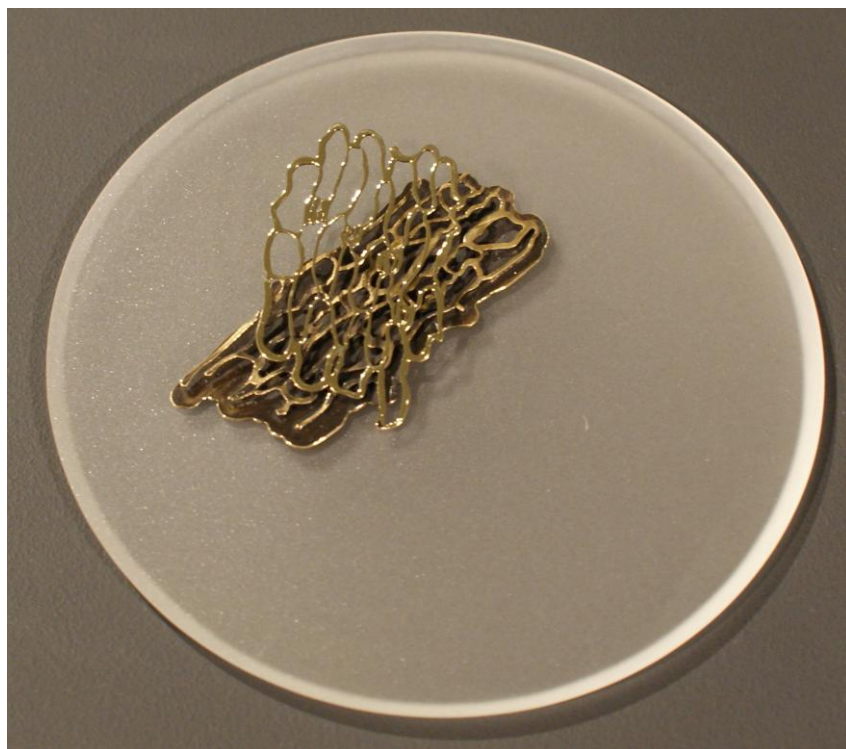


Fig. 2, Amber N. Drake, *Convolvulus arvensis*, brooch, 2010
Brass
2 1/4" x 1/2" x 1/2"



Fig. 3, Amber N. Drake, *Chrysanthemum leucanthemum*, ring, 2009,
Brass, Sterling Silver
2 1/4" x 2" x 2"



Fig. 4, Jan Yager, *The Tiara of Useful Knowledge*, 2006
Oxidized Sterling Silver, 18K & 14K Gold, Quartz Pebble
Embossed, Pressed, Forged, Fabricated, Cast
Assembled: 9in/24cm x 12in/29cm



Fig. 5, Jan Yager, *The Tiara of Useful Knowledge*, 2006
 Oxidized Sterling Silver, 18K & 14K Gold, Quartz Pebble
 Embossed, Pressed, Forged, Fabricated, Cast
 Disassembled: .25in/.5cm - 5.75in/15cm x .50in/10cm - 7in/18.5cm
 Plants: (Left to Right, Back to Front)
 Common Ragweed, Sweet Clover, Lamb's Quarters, Plantain, Switch Grass, Potato, Rye, Prickly Lettuce,
 Crab Grass, Ant, Tobacco, Pebble.



Fig. 6, *Vina Rust, Pin #1*, 2005
Hand-fabricated, granulation, electroformed
Sterling Silver, 14K gold, liver of sulfur patina
11.9 cm x 2.4 cm x 1.8 cm



Fig. 7, Sarah Hood, *Big Sur*, 2000
Sterling Silver, Eucalyptus Leaves, Wool Yarn
9" inside diameter



Fig. 8, Amber N. Drake, *Matricaria lamellate*, brooch, 2009
Brass, Sterling Silver
2" x 2" x 1/2"



Fig. 9, Amber N. Drake, *Trochodendron*, ring, 2009
Sterling Silver,
3 1/2" x 1 1/2" x 3/4"



Fig. 10, Amber N. Drake, *Delphimium staphisagria*, brooch, 2010
Brass
2" x 1 1/2" x 1/4"



Fig. 11, Amber N. Drake, *Matricaria lamellata*, brooch, 2010
Brass
2 1/4" x 1 1/2" x 1/2"



Fig. 12, Amber N. Drake, *Aristolochia triangularis*, brooch, 2010
Brass
3"x 1 2/8"x 1 1/2"



Fig. 13, Amber N. Drake, *Libertia chilensis*, brooch, 2010
Brass
3 1/2" x 3/4" x 2"

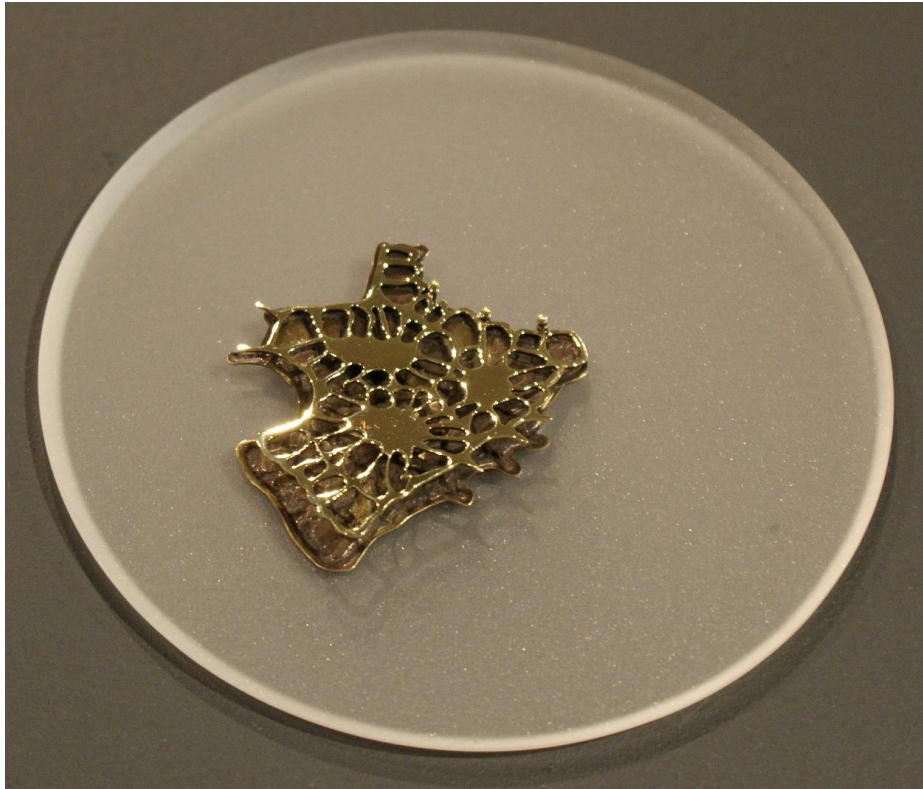


Fig. 14, Amber N. Drake, *Hoya*, brooch, 2009
Brass
1 1/2" x 2" x 1/8"



Fig. 15, Amber N. Drake, *Bauhinia rubiginosa*, brooch, 2010
Brass
1 3/4" x 1 3/4" x 1/4"



Fig. 16, Amber N. Drake, *Hakea scoparia*, brooch, 2010
Brass
1 3/8" x 1 3/8" x 1 1/2"



Fig. 17, Amber N. Drake, *Bignoniaceous*, brooch, 2010
Brass
1 3/4"x1 3/4"x 1 1/2"



Fig. 18, Amber N. Drake, *Anarthriaceae*, brooch, 2010
Brass
2 1/8" x 1/2" x 3/4"



Fig. 19, Amber N. Drake, *Plumbago zeylanicum*, brooch, 2010
Brass
2" x 1 1/2" x 3/8"



Fig. 20, Amber N. Drake, *Pyrus*, brooch, 2009
Brass
3"x 2 3/8"x 1/8"

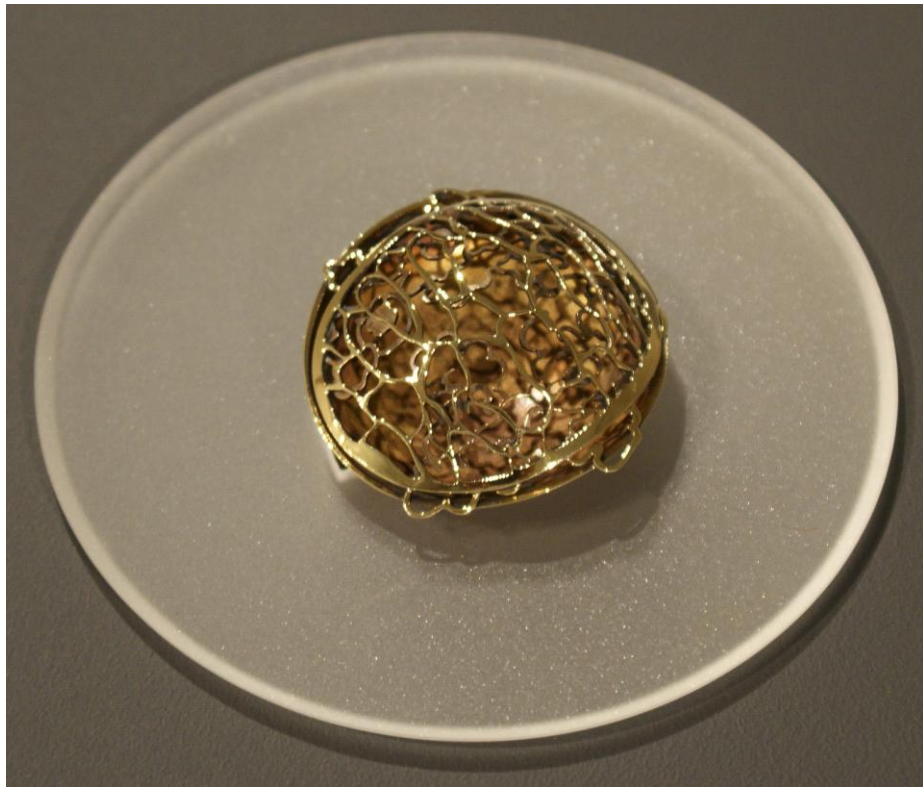


Fig. 21, Amber N. Drake, *Fusticia cydonifolia*, brooch, 2010
Brass
2" x 1 3/4" x 1/2"



Fig. 22, Amber N. Drake, *Bauhinia*, brooch, 2010
Brass
1 3/4" x 1" x 1/4"

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- ¹ Byran G. Bowes, James D. Mauseth, *Plant Structure: A Color Guide* (Sudbury: Jones and Bartlett, 2008) p 35.
- ² D. Cutler, "Plant Architecture: Exploring Functionality and Form," *Plant Architecture*, (accessed 20 October 2008).
<http://anubis.ru.ac.za/Bot3/PlantArchitecture.pdf>.
- ³ David F. Cutler, Ted Botha, and Dennis Wm. Stevenson, *Plant Anatomy: An Applied Approach* (Malden: Blackwell, 2008), p 81.
- ⁴ Ibid, p 85.
- ⁵ Charles B. Beck, *An Introduction to Plant Structure and Development* (New York: Cambridge University Press, 2005), p 144.
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<http://www.sarahhoodjewelry.com/>.
- ¹² Ibid.