Annika Finne

The Conservation Center, Institute of Fine Arts, New York University

Flora or Folly? Surveying the risks of plant-based art

Art museums are full of dead plants. Some are woven into canvases, others pulped into paper, others ground into adhesives. Live plants are not so readily welcomed. To prevent collections damage from soil, water, and insects, museums generally admit only two categories of botany: plants used as decoration and plants used by artists as an integral part of a work of art.

Museums have long displayed decorative plants. Initially, these plants were distributed throughout the galleries—exhibition photography from the 1930s shows foliage strategically interspersed amongst the collections of major institutions including the Museum of Modern Art, the Walters Museum, and the San Francisco Museum of Modern Art.[1] These plants began to disappear during the 1960s and 70s, just as research into the importance of environmental controls began to inform museum policy.[2] Today, with the exception of the popular "Art in Bloom" temporary installations, museums largely keep plants outside of the galleries.[3]

Installation view, Pablo Picasso, *Guernica.* 1937, San Francisco Museum of Modern Art.

---

[1] See the following exhibition photography: Exhibition view, Early Oriental Rugs, curated by Decorative Arts Curator Wilhelm Valentiner, November 7, 1910, Metropolitan Museum of Art, NYC. Installation view, Pablo Picasso, Guernica. 1937, SFMoMA. Exhibition view, Recent Acquisitions: Painting and Sculpture, February 16, 1965 - April 25, 1965, The Museum of Modern Art, New York.
Pittman, Gene. "Plant as Decorative Element in a Gallery." Web log post. *Centerpoints*. Walker Art Center, 5 May 2010. Web. 24 Feb. 2013.
Sherman, Arden. "Proposal for a Museum: Arden Sherman, Mise en green." Web log post. *Open Space*. SF MoMA. 31 Jan. 2013. Web. 24 Feb. 2013.

[2]Ibid.
Anderson, Maxwell. "Revising the Gold Standard of Environmental Control." *The Art Newspaper*. N.p., 8 Apr. 2010. Web. 24 Feb. 2013.

[3] Art in Bloom, held in 2013 at the Museum of Fine Arts, Boston, Minneapolis Institute of Art, DeYoung Museum, Milwaukee Art Museum, Dallas Museum of Art, John Creek Art Center, Carnegie Museum of Art, New Orleans Museum of Art, Museum of Fine Arts St. Petersburg, Florida

At the beginning of the twentieth century, artists began to consider plants as a potential medium for sculpture. Houseplants became art objects in the 1930s: the Museum of Modern Art displayed Edward Steichen's elaborately crossbred delphiniums for one week in 1936; the Parisian Surrealists placed plants throughout the landmark International Surrealist Exhibition in 1938.[4] Today plants may play any number of roles within a work of art, acting as symbolic objects, performative actors, or even avid television-watchers.[5]

Installation view, "Steichen Delphiniums" 1936. Museum of Modern Art, New York.

In order to display decorative plants and uphold current environmental standards, museums generally allow only certain plant species in certain locations. Amongst an informally collected selection of museums with accessible environmental management guidelines in the United

---

[4] Hartmann, Celia. "Edward Steichen Archive: Delphiniums Blue (and White and Pink, Too)." (Web log post. *Inside/Out: A MoMA/MoMA PS1 Blog*. MoMA, 8 Mar. 2011. Web. 18 Feb. 2013).
Kachur, Lewis. *Displaying the Marvelous: Marcel Duchamp, Salvador Dali, and Surrealist Exhibition Installations*. (Cambridge, MA: MIT, 2001. Print) 70.

[5]Allora and Calzadilla. *Growth (Survival)* 2006. Holler, Carsten. *Lax Habits in Contemporary Flower Societies*. 1994. Paik, Nam June. *TV Garden*. 1974.

States, United Kingdom, and Australia, each employs policies which place restrictions on plants. One prohibited all plants from museum galleries, two prohibited any type of soil, and four limited or prohibited cut flowers and pollen produces.[6]

Plant-based artwork may not comply with these guidelines, raising problems for museums that exhibit or collect modern or contemporary art. Altering plant species or plant placement could compromise the intentions of the artist. Museums now face these problems with greater frequency. At eight major museums in the United States, United Kingdom, and Germany, the number of plant-based installations exhibited from 2007-2013 increased by a factor of three relative to the number exhibited from 2002-2007.[7]

Conservators need to develop a more thorough understanding of how plants can endanger collections. Such understanding will enable the display of plant-based artwork and ensure that this work is only modified when absolutely necessary.

The following paper contributes to that understanding in three ways. First, by assessing the risk of collections damage from soil, water, and insects. Second, by examining strategies to reduce those risks. Third, by using a series of case studies to see how both museums and artists currently reconcile plant life with the museum environment.

Potential damage from plant soil

Soil harbors a whole community of tiny creatures, including fungi, bacteria, and protozoa.[8] Introducing so many new organisms into the museum raises understandable concerns—given an opportunity, soil fungi could damage museum collections. Certain fungal species present in soil,

---

[6] See Appendix 1 for additional detail and identification of museums.

[7] The Museum of Modern Art, the San Francisco Museum of Modern Art, Tate Modern, the New Museum, the Museum of Fine Arts, Houston, the High Museum of Art, the Los Angeles County Museum of Art, and the Hamburger Bahnhof

[8] Ingham, Elaine R., Andrew R. Moldenke, Clive A Edwards. *Soil Biology Primer.* (Soil and Water Conservation Society (SWCS) Soil Biology Primer. Rev. ed. Ankeny, Iowa: Soil and Water Conservation Society 2000).

such as *Aspergillus* and *Fusarium*, have the ability to cause biodeterioration of paintings, paper, and sculptural materials.[9]

To cause collections damage, fungi need to become airborne, travel to the surface of a work of art, and gather enough moisture from the surrounding air to germinate. Controlling the relative humidity will prevent germination. However, plant soil does increase the risk of fungal damage by increasing the number of circulating spores. The more spores in the air, the more likely some will successfully land on a work of art.[10]After a Canadian life insurance company installed 323 square feet of greenery in their Toronto headquarters, the fungal spore count grew slightly above the mean levels of commercial indoor spaces.[11] Potted plants adjacent to recovering chemotherapy patients generated enough additional *Aspergillus* fungi to cause a series of infections.[12]

Comparing the results of three different aeromycology studies indicates that potted plants and museum visitors may introduce roughly the same amount of new fungal life into the museum environment. Although a number of variables change across these studies, including the architectural environments and geographic locations, the spore count increase associated with

---

[9] Garg, K.l., Kamal K. Jain, and A.k. Mishra. "Role of Fungi in the Deterioration of Wall Paintings." (*Science of The Total Environment* 167.1-3 (1995): 255-71. Print) 258.
Ciferri, Orio. "Microbial Degradation of Paintings." (*Applied and Environmental Microbiology* 65.3 (1999): 879-85. *Pub Med*. Web. 14 June 2010) 880-881.
Giani, Elisabetta, Annamaria Giovagnoli, and Maria Pia Nugari. "A Museum Storage Area: Microclimate and Air Quality Short-Term Monitoring Programme." (E-Preservation Science 7 (2010): 55-58. Morana-RTD. Web. 14 June 2010) 57.
Zotti, M., A. Ferroni, and P. Calvini. "Microfungal Biodeterioration of Historic Paper: Preliminary FTIR and Microbiological Analyses." (International Biodeterioration and Biodegradation 62 (2008): 186-194. Elsevier. Web. 14 June 2010) 191.
Ljaljevic Grbic, Milica V., and Jelena B. Vukojevic. "Role of Fungi in Biodeterioration Process of Stone in Historic Buildings." (Institute of Botany and Botanical Garden “Jevremovac" 116 (2009): 245-51. DOI Serbia. Web. 14 June 2010) 247.

[10] DePriest, Paula. Telephone interview. 28 Mar 2013.

[11] Darlington, A., M. Chan, D. Malloch, C. Pilger, and M. A. Dixon. "The Biofiltration of Indoor Air: Implications for Air Quality." (*Indoor Air* 10.1 (2000): 39-46. Print) 41-43.

[12] Lass-Florl, C., P.-M. Rath, D. Niederwieser, G. Kofler, R. Wurzner, A. Krezy, and M.P. Dierich. "Aspergillus Terreus Infections in Haematological Malignancies: Molecular Epidemiology Suggests Association with In-hospital Plants." (*Journal of Hospital Infection* 46 (2000): 31-35. *Idea Library*. Web. 14 June 2010) 31.

both humans and plants remained in the same general area, ranging from only 37 to 71.5 colony forming units per cubic meter.[13]

Strategies to reduce likelihood of damage from soil

Climate control is the first line of defense against fungal damage. Soil-borne fungi will not germinate without access to water or high humidity.[14]

Two further strategies can counter the troubling ability of plant soil to increase the number of circulating spores.

The first involves removing fungi from the soil. Horticulturists routinely sterilize ornamental plant soil, most commonly through steam pasteurization or by using soilless media with both pasteurized and naturally sterile components.[15] Neither of these sterilization methods is preventative, fungi can still grow in the treated soil.[16]

The second involves removing fungi from the air via polarizing air cleaning units. These devices capture and then neutralize the fungi with an electrostatic field and UV radiation.[17] The Dynamic

---

[13] Malloy MA, Levetin E. "Potted plants in hospital as possible sources of nosocomial fungal infections" Symposium of the Pan-American Aerobiology Association, Scarborough College. University of Toronto, 1992. (cited in Li, De-Wei, and Bryce Kendrick. "Indoor Aeromycota in Relation to Residential Characteristics and Allergic Symptoms." Mycopathologia 131.3 (1995): 149-57. Print. 155)
Darlington, A., M. Chan, D. Malloch, C. Pilger, and M. A. Dixon. "The Biofiltration of Indoor Air: Implications for Air Quality." *Indoor Air* 10.1 (2000): 39-46. Print. 43).
Aira, M.J., V. Jato, a.M. Stchigel, F.J. Rodríguez-Rajo, and E. Piontelli. 2007. "Aeromycological Study in the Cathedral of Santiago De Compostela (Spain)." International Biodeterioration & Biodegradation 60 (4) (January): 231-237.) 233

[14] Mitchell, Ralph. Telephone interview. June-July 2010.
Stone, Jeffrey. "Research Inquiry from the Museum of Modern Art." Message to the author. June-July 2010. E-mail.

[15]Robbins, James A. and Michael R. Evans. "Growing Media for Container Production in a Greenhouse or Nursery: Part II Physical and Chemical Properties" (University of Arkansas, Division of Agriculture Research and Extension, 2001) 3.

[16] DePriest, Paula.
On the capacity of soilless media to carry diseases and pests: Tucker, Arthur O., Thomas DeBaggio, Francesco DeBaggio. *The Encyclopedia of Herbs: A Comprehensive Reference to Herbs of Flavor and Fragrance*. (Portland: Timber, 2009. Print) 62, 64.

[17] DePriest, Paula.
Kowalski, Wladyslaw Jan. *Ultraviolet Germicidal Irradiation Handbook:UVGI for Air and Surface.Disinfection*. (Heidelberg:Springer-Verlag, 2009. Print) 435.

Germicidal System, used by the Smithsonian, the San Francisco Museum of Modern Art, and numerous hospitals, can reduce the number of airborne particles in 7 cubic feet of air by three-quarters in several minutes and does not release ozone into the atmosphere.[18] The expense of such systems may prevent their purchase by institutions with tighter budgets.

Potential damage from plant watering

Risks of watering are closely linked to the risks of soil. The moisture necessary to keep plants alive creates a localized environment of increased relative humidity which may provide soil fungi with the opportunity to germinate.[19] Watering also introduces the risk of accidental damage from splashing or spilling.

Water-induced fungal germination can be be controlled through use of particular environments and preparation techniques. In a large, well-ventilated space, water vapor floating above the soil will quickly diffuse.[20] The amount of water needed by the plants to survive can also be manipulated to prevent germination. Plants ration their water supply when placed in large pots and gradually acclimated to a dry, dark, cool environment.[21]

Careful watering techniques will help prevent accidental spillage. The soil, not the foliage, should be carefully moistened and a drainage system should be used to control runoff.[22]

---

[18] Fannin, Kerby F., Ph.D. "Effect of Electronic Filter on 0.3 Mu Size Airborne Particles." (Chart. *Dynamic Germicidal Air Purification Systems: Model G375 Wall Mount Unit and Model GDM 1000 L/R Duct Mount Unit*. Las Vegas: PuriTek, 1994. Web.)
For institutions which use the Dynamic System: DePriest, Paula; "30 of Our Favorites." (*Dynamic Air Quality Solutions Newsflashes* (2012): *Dynamic Air Quality Solutions*. 2012. Web. 30 Mar. 2013.)

[19] Mitchell, Ralph. Telephone interview. June-July 2010.

[20] National Park Service. "Mold: Prevention of Growth in Museum Collections."(*Conserve O Gram* (Aug. 2007): Web) 3.

[21] Iljin, W. S. "Drought Resistance in Plants and Physiological Processes." (*Annual Review of Plant Physiology* 8 (1957): 257-74. *Annual Reviews*. Web. 17 June 2010) 258, 260.
Ryan, Michael G. "Temperature and Tree Growth." (*Tree Physiology* 30 (2010): 667-68. Print.) 667.
Sussman, Don. Telephone interview. 16 June 2010.

[22] Eshenaur, Brian, and Robert Anderson. “Managing the Greenhouse Environment to Control Plant Diseases.” (University of Kentucky College of Agriculture, Oct. 2004. Web. 8 Mar. 2013) 1-2.

If aesthetically appropriate, automated watering systems can also water plant installations. The Oasis drip irrigation machine, used by the Walters Art Museum in Baltimore, regularly distributes a customizable quantity of water to the plants under its care.[23]

Potential damage from plant-related insects and pests

The nature of plant-based artwork and the climate surrounding that artwork may vary in any number of ways. As a result, it is difficult to anticipate the equally wide variety of insects and pests which this artwork may attract. Despite this difficulty, the following section offers potentially useful information by outlining two approaches to the question from two complementary research angles. The first considers the plants commonly used in works of art, their associated insects and pests, and the damage that may be caused by these intruders. The second considers the insect species which pose a known threat to objects in museum collections and describe which plants may attract these particularly harmful creatures.

Ornamental potted plants are a staple of both museum decorations and plant-based artwork. These species are easily accessible, indoor-friendly, and can flourish in low lighting conditions. They appear in the work of Marcel Broodthaers, Heidi Norton, and Sarah Sze, among others.[24] Common insects for ornamentals include mealy bugs, aphids, slugs and snails, scale insects, thrips, fungus gnats, white flies, and a variety of mites.[25] Scale insects and spider mites are particularly likely threats as they thrive in dry environments.[26]

---

[23]Walters Art Museum. “Art Blooms at the Walters: Guidelines for Arrangers” (Baltimore: Walters Art Museum, 2010. Print).

[24] Broodthaers, Marcel. *Tapis de Sable* 1974. Ivekovic, Sanja. *Resnik* 1994. Norton, Heidi. *My Dieffenbachia Plant with Tarp (Protection)* 2011. Sze, Sarah. *Tilting Planet* 2009.

[25] Leib, Brian. Telephone interview. 14 June 2010.

[26] "Spider Mites Management Guidelines--UC IPM." (UC Statewide Integrated Pest Management Program. Ed. B. Ohlendorf. IPM Education and Publications, Dec. 2000. Web. 21 June 2010).
Dreistadt, S. H., J. G. Morse, P. A. Phillips, and R. E. Rice. "Scale Management Guidelines-- UC IPM." (UC Statewide Integrated Pest Management Program. IPM Education and Publications, Mar. 2007. Web. 21 June 2010).

The common ornamental insects do not directly consume museum objects. However, these species may cause indirect collections damage by generating sap-like residue after ingesting plant interiors.[27] This sticky, sugary residue is a vehicle for mold growth as well as a potential attractant for wasps and ants.[28]

If given time and opportunity, slugs and snails may also pose a threat to paper objects. During a particularly wet summer in the United Kingdom, slugs and snails were documented creeping into mailboxes across the country and eating the letters inside.[29]

Out of the large number of insects known to consume museum objects, a much smaller group also consumes living plants. This overlap is essentially limited to the Dermestid family of beetles, though woodboring beetles may also become problematic if the artwork involves dying trees.[30] Larval dermestids consume fabric and other keratin and chiten-based materials and adult dermestids consume flowering plants.[31] Adult beetles attracted to a floral installation could lay eggs on nearby objects.[32]

Strategies to reduce likelihood of damage from plant-related insects

---

[27] Florian, Mary-Lou E., Dale Paul. Kronkright, and Ruth E. Norton. The Conservation of Artifacts Made from Plant Materials. (Marian Del Rey, California: Getty Conservation Institute, 1990. Print).
Hall, A. V. "Pest Control in Herbaria." (Taxon 37.4 (1988): 885-907. JSTOR. Web. June-July 2010).
Sussman, Don. Telephone interview. 16 June 2010.
Short, D. E., and J. L. Castner. “Scale Insects Affecting Ornamental Plants” (University of Florida, 1991. Print) 2.

[28] "Insects and Their Injuries to Plants." The Connecticut Agricultural Experimentation Station. (27 Apr. 2007. Web. 21 June 2010).

[29] "Slugs and Snails Eating Post." *The Telegraph*. Telegraph Media Group Limited, 15 Oct. 2009. Web. 27 Mar. 2013.

[30] Drees, Bastiaan M., John A. Jackman, and Michael E. Merchant. "Wood-boring Insects of Trees and Shrubs." (Texas A&M AgriLife Extension Service, 17 June 2008. Web. 22 Mar. 2013.) 5

[31] National Park Service “Chapter 5: Biological Infestations” (Museum Handbook, Part I, Chapter 5. Washington, D.C:National Park Service Museum Management Program:1998, 1-17) 4-7.

[32] Ibid.

The following strategies, based on the principles of Integrated Pest Management, can help prevent damage from plant-related insects. Conservators should work with entymologists to identify insect samples.

Inspection

Routine inspection and maintenance of the plants is perhaps the best way to prevent infestation. Spider mites in particular can be discouraged by routinely removing dust from the foliage.[33] Inspection is the only means of keeping snails and slugs out of the museum; mollusc eggs can lie undetected in potting soil and survive sterilization procedures.[34] Insect traps, such as the widely used sticky trap system, complement and enhance visual monitoring.

Species control and plant selection

Recommending that the artist use only certain plant species can also prevent infestation. Plants covered in short hairs or with particularly waxy foliage should be promoted as these features naturally repel insects.[35] If possible, major pollen and nectar producers should be avoided to prevent attracting adult Dermestid beetles. Particularly beetle-enticing plant species include flowering crepe myrtle, spiraea and buckwheat.[36]

Insecticides provide a particularly aggressive means of preventing infestation. Ornamental plant growers often use both contact insecticides, which are applied with a spray to the foliage, and systemic insecticides, which are absorbed by the plant through the soil. Sprays temporarily repel

---

[33] "Spider Mites Management Guidelines--UC IPM."

[34] Wilen, Cheryl. Telephone interview. 25 Mar 2013.

[35] Dent, David. *Insect Pest Management*. Wallingford, Oxon, UK: CABI Pub., 2000. Print.166-167.

[36] D.H. Choe. "Carpet Beetles." (UC Statewide Integrated Pest Management Program. IPM Education and Publications, November 2012 Ed. M.L. Fayard. Web. 20 Feb 2013) 1.
Hall, A. V. "Pest Control in Herbaria." (Taxon 37.4 (1988): 885-907. JSTOR. Web. June-July 2010). 887.

insects while contact insecticides linger in the plant to provide a longer lasting insect defense.[37] Naturally derived insecticides, such as plant oils and minerals, can also work preventatively, though these measures typically degrade more quickly than synthesized chemicals.[38]

Hazards of insecticide use

Bringing insecticide-treated plants into a museum raises the question of whether these insecticides could volatilize and harm nearby people or objects. No comprehensive answers to these questions yet exist. A 2009 study found that an ornamental plant emitted insecticide ingredients as late as two weeks after the insecticide was applied. However, these emissions were both non toxic and present in only trace amounts.[39] Certain ornamental plant insecticides can discolor dyes when sprayed directly on an object, but it is unclear whether these insecticides volatilize and whether indirect exposure to volatilized insecticide would also cause object damage.[40]

Conservators should be aware of which insecticides were applied to treated plants and how they were applied. In general, sprayed insecticides are more likely to volatilize than systemic insecticides.[41]

Survey of current practices: case studies

---

[37] Sussman, Don. Telephone interview. 16 June 2010.

[38] Buss, Eileen A. and Sydney G. Park-Brown. "Natural Products for Insect Pest Management." (Department of Entomology and Nematology, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, January 2002, revised June 2009. Web. 10 March 2013) 1.

[39] Insecticide ingredients found: 2-(2-methoxyethoxy)ethanol, 2-ethylhexyl salicylate, homosalate.
Emissions of insecticide ingredients from four potted plants totalled at 400 picograms per hour.
Yang, Dong Sik, Ki-Cheol Son, and Stanley J. Kays. "Volatile Organic Compounds Emanating from Indoor Ornamental Plants" (HortScience 44 (2) : 396-400. April 2009) 396, 398-99.

[40]Dawson, John. "The Effects of Insecticides on Museum Artifacts and Materials." In *A Guide to Museum Pest Control*, ed. Lynda A. Zycherman and J. Richard Schrock. (Washington, D.C.: Association of Systematics Collections, 1988) 143, 146.

[41]Ibid.

The following four case studies describe the installation of two plant-based artworks and the experiences of two plant-friendly artists.

Case study: Sanja Ivekovic, *Resnik*, 1994.[42]

Sanja Ivekovic, *Resnik,* 1994. Overall. The Museum of Modern Art, New York.

Sanja Ivekovic's *Resnik* consists of a darkened room, ten to twenty ornamental plants meant to die over the course of the installation, and projected words and images.

An assortment of twelve ornamental plants, each roughly 6 feet tall, were provided by a landscape design-build company with experience installing decorative plants in the atrium of the Guggenheim Museum.[43] After shipping the plants to New York from the company's Florida

---

[42] Installation with video (color, sound) and live plants, 11:43 min. Artist collection. Exhibited as part of "Sanja Ivekovic: Sweet Violence" at the Museum of Modern Art from December 18, 2011 to March 26, 2012.

[43] Sussman, Don. "FW: MoMA research inquiry." Message to the author. 25 Jan 2013. Email.
Species included: dracena mariginata, dracena mariginata open weave, dracena massangeana, ficus nitida, ficus benjamina, majesty palm, areca palm, dracena lisa, sansevieria trifasciata, pothos gold, natal mahogany, ficus elastica.

nurseries, they were housed in a low-light environment for several weeks to both prepare them for the darkness of the gallery and reduce their water requirements. The plants were treated with both systemic and contact insecticides.

During the installation, the plants were watered less than once a week and visited to check on conditions and confirm that no insects were present. Leaves shed by the plants over the course of the installation were continuously removed.

Over the course of the exhibition, the plants successfully deteriorated with no adverse effects to the surrounding artwork or insect sightings. [44]

Case study: Olafur Eliasson, *Moss Wall*. 1994.[45]

Olafur Eliasson, *Moss Wall,* 1994. Museum of Contemporary Art, Chicago. Photos courtesy the artist; Tanya Bonakdar Gallery, New York; and neugerriemschneider, Berlin; © Olafur Eliasson. Photo credit: Ian Reeves.

---

[44] Ibid.

[45] Installation with Norwegian reindeer moss. Exhibited as part of "Olafur Eliasson: Take Your Time", at the San Francisco Museum of Modern art from September 08, 2007 - February 24, 2008, and at the Museum of Modern Art/P.S.1 Contemporary Art Center from April 20–June 30, 2008.

Olafur Eliasson's *Moss Wall* is a monumental wall covered in undyed reindeer moss, which is technically a species of lichen. It was displayed as part of "Olafur Eliasson: Take Your Time", a traveling exhibition organized by SFMoMA. Though the wall changed in size and dimension as it moved through different venues in the United States and abroad, each edition was large enough to fill the visual field of a museum visitor.[46]

The lichen used for the Eliasson installation came from the Österdalen forest in eastern Norway.[47] Prior to import into the United States, the supplier Norske Moseprodukter removed all traces of soil and applied preservatives so the lichen would retain a pliant workability. The company describes the preservatives as non-toxic though they do not disclose the exact chemical composition.

Upon unpacking the lichen shipment, SFMoMA conservators noticed that these preservatives left the lichen with a strong chemical odor. Rinsing the lichen removed the odor but also caused discoloration and shrinking. After discovering that the smell naturally dissipated after a short time, the conservators simply let the lichen sit in open air before installation.[48]

To create *Moss Wall*, conservators and preparators physically pressed the lichen onto a framework of chicken wire and plywood. Maintenance during the San Francisco installation, which lasted for six months, involved replacing fallen lichen and twice misting the entire wall.[49]

---

[46] The Museum of Modern Art, P.S.1 Contemporary Art Center, Dallas Museum of Art, and Museum of Contemporary Art, Chicago, and Museum of Contemporary Art, Sydney.
Museum of Contemporary Art, Sydney. *MCA Presents First Solo Exhibition in Australia of Danish-Icelandic Artist Olafur Eliasson*. N.p., 8 Dec. 2009. Web. 10 Mar. 2013.

[47] "Norske Moseprodukter About Us." *Norske Moseprodukter,* Rendalen, Norway. 2006. Web. 10 Mar. 2013.

[48] Barger, Michelle. Telephone interview. 6 Mar 2013.

[49] Barger, Michelle. "Re: 'Moss Wall' research inquiry." Message to the author. 11 Mar 2013. Email.

During the shorter three-month installation at the Museum of Modern Art in New York, maintenance involved only replacing the lichen; misting was not necessary.[50]

There was no fungal or insect damage associated with *Moss Wall* for both the San Francisco and New York installations. Aerating the lichen effectively removed the chemical odor--several reviews actually praised the natural and "funky but not unpleasant" smell of the wall.[51] Lichen seems a particularly well-suited plant for the museum environment; it is capable of surviving without soil and accustomed to seasonal dips in relative humidity.[52]

Artist case studies

Paula Hayes (1958-present)

Paula Hayes links traditional gardening practices with new concepts of art-making.[53] She works primarily with tropical greenhouse plants to create lush botanical sculptures which recall the fetishizing qualities of the first Victorian terrariums.[54]

Hayes prepares the plants for installation with a variety of non-synthetic insect repellants and fungicides, including diatemaceous earth, tea tree oil, and cinnamon. Though diatemaceous earth

---

[50]Wharton, Glenn. "Re: "Plant-based installations research inquiry." Message to the author. 21 Feb 2013. Email
Krueger, Tom. "Re: "Question about Olafur Eliasson's 'Moss Wall'." Message to the author. 25 Feb 2013. Email.

[51]Weinberg, Lauren. "Olafur Eliasson." Rev. of *Olafur Eliasson: Take Your Time*. *Time Out Chicago* 11 May 2009: n. pag. *Art and Design*. Time Out Chicago, 11 May 2009. Web. 10 Mar. 2013.
See also: Englemann, Sasha. "Breaking the Frame: Olafur Eliasson's Art, Merleau-Ponty's Phenomenology, and the Rhetoric of Eco-Activism." *Art&Education* 2008: Web.

[52] Munger.

[53] Nemitz, Barbara. *Trans Plant: Living Vegetation in Contemporary Art*. (Ostfildern: Hatje Cantz, 2000. Print.) 71.

[54] *Behind the Scenes: Paula Hayes, Nocturne of the Limax maximus*. Perf. Paula Hayes. Museum of Modern Art, 2010. Online.

and tea tree oil are useful mainly for the treatment of ornamental insect infestations, cinnamon oil does inhibit some fungal growth.[55]

The maintenance of each work is integral to the sculpture. Each comes with a drainage system , a specific set of tools, and instructions describing caretaking needs.[56] Often she places her work in well-aerated locations separated from other works of art, such as lobbies and enclosed galleries.

Hayes is sensitive to the delicacy of museum collections and the conservation concerns raised by her work. She anticipates that a new type of museum will develop in response to plant-based and organic artwork, where the expertise of institutions like botanical gardens, zoos, and aquariums are combined to create spaces tailored to living artwork and architecture.

Hans Haacke (1936-present)

During the 1960s and 70s, Hans Haacke used living plants to create works which were at once sculpture and autonomous systems. In this period preceding the more explicitly political critiques of his later career, Haacke aimed to present the viewer with "something which experiences, reacts to its environment, changes...which lives in time and makes the 'viewer' experience time".[57]

Haacke used both grass and bean plants and typically grew the 'systems' from seed within the exhibition space. While on display, the plants were watered and maintained by the museum staff. He is not aware of any associated insect sightings, fungal growth, or water spillage.[58]

---

[55] Matan, N., H. Rimkeeree, A.J. Mawson, P. Chompreeda, V. Haruthaithanasan, M. Parker. "Antimicrobial activity of cinnamon and clove oils under modified atmosphere conditions" (International Journal of Food Microbiology, Volume 107, Issue 2, 15 March 2006) 180.

[56] Bedford, Christopher. *Paula Hayes Gallery Guide*. (Columbus: Wexner Center for the Arts, 2011.) Print.

[57] Nemitz 63.
Jones, Caroline A. *Hans Haacke 1967* (Cambridge, MA: MIT List Visual Arts Center, 2011. Print) 5.

[58] Haacke, Hans. Telephone interview. 8 Feb 2013.

None of the exhibiting institutions asked Haacke to alter the location, preparation methods, or species of his plant-based sculptures in order to better tailor them to the museum environment. When asked hypothetically if he would agree to such alterations, Haacke declined to answer in the abstract. His response would be contingent on the specific request of the museum, the nature of the space, and the nature of the sculpture.

Haacke is interested in and conscious of the issues raised by exhibiting plant-based art. He describes the problem as a disconnect between the knowledge of gardeners, experts in the relation of plants to the outdoor but not museum environment, and the knowledge of conservators, experts in the relation of objects but not plants to the museum environment.[59]

Conclusions

In sum, though soil, water, and insects have the potential to damage museum collections, this potential can be dramatically reduced through proper preparation and maintenance. Climate control, air purification and careful watering techniques will address the risks of soil and water. Regular monitoring, species selection, and judiciously applied insecticides will address the risks of insect damage.

Sanja Ivekovic's *Resnik* and Olafur Eliasson's *Moss Wall* demonstrate that a variety of plant types and a variety of plant sizes can be successfully integrated into museums. The artists Paula Hayes and Hans Haacke demonstrate an awareness of the difficulties raised by plants and willingness to work with institutions to display plant-based work. Though a flower will never be as easy to hang as a picture, the growing relationship between museums and plants is more likely to result in artistic achievement than a disastrous upheaval of the museum environment.

Acknowledgements

[59] Haacke, Hans. Personal interview. 16 Feb 2013

My gratitude to the numerous individuals who helped with the research and creation of this paper: Lynda Zycherman, Paula DePriest, Ralph Mitchell, Don Sussman, Brian Leib, Hans Haacke, Paula Hayes, Michele Marincola, Samm Kunce, Vito Acconci, Michelle Barger, Glenn Wharton, Mary Ballard, Hannelore Roemich, Cheryl Wilen, Tom Krueger, Galen Lee, Valentine Talland, Jackie Heuman, Norbert Baer, Nils Finne, Liv Finne, Chrix Finne and my classmates.

A special thank-you to Lynda Zycherman at the Museum of Modern Art, who first asked me to find out "everything that could possibly go wrong" with Sanja Ivekovic's *Resnik* installation.

Appendices

Appendix 1: General Plant Guidelines Implemented by other Institutions

Museums and Galleries Commission Guidelines

The United Kingdom's Museums and Galleries Commission, now Resource: the Council for Museums, Archives and Libraries, published guidelines in 1999 for the display of plants in museums. The pamphlet focuses mainly on temporary displays of cut flowers but also addresses more permanent installations and is summarized as follows:

> Firm petals on blooms, use of cut flower food to minimize bacteria.
>
> Lukewarm water, removal of leaves below the water line, use of clean vases
>
> Modify plant type to environment—use of plants that are pest resistant, able to tolerate low RH and low light levels, conditioning of plants to these levels prior to installation.
>
> No wood/bamboo containers as they could be pest vehicles, use of terracotta, stone, metal or plastic.
>
> All soil used must be sterilized.
>
> No misting or spraying.[60]

Heritage Pest Management Guidelines for museums and galleries in Australia

Heritage Pest Management released the following guidelines as a general plan for art institutions in Australia:

---

[60] Cassar, May. "Using Cut Flowers and Potted Plants in Museums." London: Museums and Galleries Commission, 1999. Print.

No live plants in soil allowed anywhere in the building.

No plants or flowers in the Exhibit areas.

Cut or dried flowers allowed in the Gathering Space and Restaurant for events.

Notification and review required before plant materials and decorations are allowed in Gathering Space or Restaurant

Approved floral material should enter the building through the main entrance only.

Cut or dried flowers and plant materials are not allowed in office spaces.[61]

Isabella Stewart Gardner Museum

Plants pre-treated with pesticides, taken from museum's greenhouses.

Plants in pots are regularly changed.

Pest monitoring system within galleries.[62]

Seattle Art Museum, Seattle, WA

Flowers only accepted from registered florists that use insecticides.

No potted plants or straw/hay.

No bark/bark chips; green bark permissible after inspection for insect casings.

No soil.

No dried seed pods save those that have been painted/coated.

No fruit.

No plants with the potential of pollen release, e.g. evergreen branches with pollen stalks, ferns with dusty spores, catkins with the potential to open upon contact with water.

All plants that enter the galleries are thoroughly inspected for evidence of insects.[63]

Tate Britain

Soil sterilized

Flowers ordered from specialized florist (presumably treated with insecticide)

---

[61] Roach, Alex. "Administration Policy: Flowers in the Museum" Integrated Pest Management Plan for museums and galleries in Australia. Heritage Pest Management.

[62] Talland, Valentine. "Research Inquiry Regarding Plants in a Museum Environment." Message to the author. June-July 2010. E-mail.

[63] Seattle Art Museum. "Guidelines for Plant Materials in the Museum." Seattle: Seattle Art Museum. Print.

Visual inspection.[64]

Walters Art Museum, Baltimore, MD

Plant inspected by conservation/registration staff upon arrival

Only fresh cut material.

No fruit except for apples; all other fruit must be dipped in wax.

No artificial material may be used.

Limited use of dried material may be acceptable upon approval.

No soil may be used, including moss or turf.

All plant material must be sprayed/examined before entering the museum.

Stamens must be cut off lilies.

No unglazed, porous pots (e.g. Native American pottery)

No freestanding water in arrangements—Oasis watering system must be used in all containers, no misting permitted.[65]

Appendix 2: Plants particularly suitable for the museum environment

The Museums and Galleries Commission survey of common plants that may be used in exhibition, with general indication of their pest resistance and low light tolerance:[66]

LATIN BOTANICAL PLANT NAMES	LOW LIGHT TOLERANCE (<4000 LUX)	PEST RESISTANCE
Abromeitiella	X	YES
Adenia	X	YES
Aeschynanthus	YES	X
Agave -	X	YES
Aglaonema (cast iron)	YES	YES

[64] Heuman, Jackie. "Research Inquiring Regarding Plants and Conservation." Message to the author. June-July 2010. Email.

[65] Walters Art Museum. “Art Blooms at the Walters Guidelines for Arrangers.” Baltimore: Walters Art Museum, 2010. Print.

[66] Cassar.

Aloe (cast iron)	X	YES
Amorphophallus	YES	X
Anthurium	YES	X
Aspidistra (cast iron)	YES	X
Beaucarnea (cast iron)	YES	YES
Begonia (cast iron)	YES	YES
Brassaia (cast iron)	X	YES
Calathea	YES	X
Calibanus	X	YES
Chlorophytum	YES	X
Cordyline (cast iron)	X	YES
Cryptanthus	X	YES
Cyanastrum	YES	X
Cyanotis	X	YES
Dianella	X	YES
Dieffenbachia	YES	X
Dracaena (cast iron)	YES	X
Ehretia (cast iron)	YES	X
Elaeagnus	X	YES
Equisetum	YES	X
Excoecharia	X	YES
Fatshedera	YES	X
Ficus (cast iron)	YES	X
Fittonia	YES	X
Graptophyllum	X	YES
Guiacum	X	YES
Guzmania	X	YES
Haemaria	YES	X
Hechtia	X	YES
Homalocladium (cast iron)	YES	YES
Kaempferia	YES	X
Leea	YES	YES

Macodes	YES	X
Maranta	YES	X
Mangifera	X	YES
Monstera	YES	X
Myrtus	YES	X
Myrsine	X	YES
Pelargonium	X	YES
Pelliania	YES	X
Peperomia	X	YES
Peresteia	X	YES
Philodendron	YES	X
Pilea	YES	YES
Pittosporum	X	YES
Plectranthus	YES	X
Podocarpus	X	YES
Polyscias (cast iron)	YES	X
Pseuderanthemum	X	YES
Rhoicissus	YES	X
Sageretia	X	YES
Sansevieria (cast iron)	X	YES
Schismaltoglottis	YES	X
Scindapsus	YES	YES
Setcreasia	X	YES
Siderasis	YES	X
Spathiphyllum (cast iron)	YES	X
Yucca	X	YES
Zamioculcas (cast iron)	X	YES

References

"30 of Our Favorites." *Dynamic Air Quality Solutions Newsflashes* (2012): *Dynamic Air Quality Solutions*. 2012. Web. 30 Mar. 2013.

"Garden Court." Collection: Gardens. The Frick Collection, 2013. Web. 10 Mar. 2013.

"Floriculture and Ornamental Nurseries Monitoring with Sticky Traps--UC IPM." UC Statewide Integrated Pest Management Program. IPM Education and Publications, March 2009. Web. 8 March 2013.

"Insects and Their Injuries to Plants." The Connecticut Agricultural Experimentation Station. 27 Apr. 2007. Web. 21 June 2010.

"Norske Moseprodukter About Us." Norske Moseprodukter, Rendalen, Norway. 2006. Web. 10 Mar. 2013.

"Spider Mites Management Guidelines--UC IPM." UC Statewide Integrated Pest Management Program. Ed. B. Ohlendorf. IPM Education and Publications, Dec. 2000. Web. 21 June 2010.

"Vito Acconci." Guggenheim Collection Online. The Solomon R. Guggenheim Foundation, 2013. Web. 10 Mar. 2013.

Acconci, Vito. “Re: Conservation research inquiry.” Message to the author. 2 Feb 2013. Email.

Anderson, Maxwell. "Revising the Gold Standard of Environmental Control." The Art Newspaper. N.p., 8 Apr. 2010. Web. 24 Feb. 2013.

Barger, Michelle. "Re: 'Moss Wall' research inquiry." Message to the author. 11 Mar 2013. Email.

Barger, Michelle. Telephone interview. 6 Mar 2013.

Bedford, Christopher. “Paula Hayes Gallery Guide.” (Columbus: Wexner Center for the Arts, 2011.) Print.

Behind the Scenes: Paula Hayes, Nocturne of the Limax maximus. Perf. Paula Hayes. Museum of Modern Art, 2010. Online.

Blanchette, Robert A. "A Review of Microbial Deterioration Found in Archaeological Wood from Different Environments." International Biodeterioration and Biodegradation 46 (2000): 189-204. Elsevier. Web. 22 June 2010.

Bodycomb, Michael, and Valery Chen. "Virtual Tour Map." Map. Virtual Tour. The Frick Collection, 2013. Web. 10 Mar. 2013.

Buss, Eileen A. and Sydney G. Park-Brown. “Natural Products for Insect Pest Management.” Department of Entomology and Nematology, Florida Cooperative Extension Service,

Institute of Food and Agricultural Sciences, University of Florida, January 2002, revised June 2009. Web. 10 March 2013.

Cappitelli, Francesca, and Claudia Sorlini. "Microorganisms Attack Synthetic Polymers in Items Representing Our Cultural Heritage." Applied and Environmental Microbiology (2008): 564-69. Web. 22 June 2010.

Cassar, May. “Using Cut Flowers and Potted Plants in Museums.” London: Museums and Galleries Commission, 1999. Print.

Child, R. E., and D. B. Pinniger. "Insect Trapping in Museums and Historic Houses." Proc. of First International Conference on Urban Pests, St. John's College, Cambridge University, Cambridge. 3 July 1993. Web. 8 Mar. 2013.

Ciferri, Orio. "Microbial Degradation of Paintings." Applied and Environmental Microbiology 65.3 (1999): 879-85. Pub Med. Web. 14 June 2010.

"Collection Policies and Protocols." *International Plant Science Center Steere Herbarium*. The New York Botanical Garden, 2007. Web. 22 June 2010.

Cranmer, Dana. Personal interview. 15 Feb 2013.

D.H. Choe. "Carpet Beetles." UC Statewide Integrated Pest Management Program. IPM Education and Publications, November 2012 Ed. M.L. Fayard. Web. 20 Feb 2013.

Darlington, A., M. Chan, D. Malloch, C. Pilger, and M. A. Dixon. "The Biofiltration of Indoor Air: Implications for Air Quality." *Indoor Air* 10.1 (2000): 39-46. Print. 41-43.

Dawson, John. "The Effects of Insecticides on Museum Artifacts and Materials." In *A Guide to Museum Pest Control*, ed. Lynda A. Zycherman and J. Richard Schrock. Washington, D.C.: Association of Systematics Collections, 1988.

Dent, David. *Insect Pest Management*. Wallingford, Oxon, UK: CABI Pub., 2000. Print.

DePriest, Paula. Telephone interview. 28 Mar 2013.

Drees, Bastiaan M., John A. Jackman, and Michael E. Merchant. "Wood-boring Insects of Trees and Shrubs." Texas A&M AgriLife Extension Service, 17 June 2008. Web. 22 Mar. 2013.

Dreistadt, S. H., J. G. Morse, P. A. Phillips, and R. E. Rice. "Scale Management Guidelines-- UC IPM." (UC Statewide Integrated Pest Management Program. IPM Education and Publications, Mar. 2007. Web. 21 June 2010).

Englemann, Sasha. "Breaking the Frame: Olafur Eliasson's Art, Merleau-Ponty's Phenomenology, and the Rhetoric of Eco-Activism." Art&Education 2008: Web.

Eshenaur, Brian, and Robert Anderson. “Managing the Greenhouse Environment to Control Plant Diseases.” University of Kentucky College of Agriculture, Oct. 2004. Web. 8 Mar. 2013.

“EU Recommendation from the Scientific Committee on Occupational Exposure limits for Aerosols of 2-(2-methoxyethoxy)ethanol” European Commission, Employment, Social Affairs, Inclusion: Sep 2001.

Fannin, Kerby F., Ph.D. "Effect of Electronic Filter on 0.3 Mu Size Airborne Particles." Chart. *Dynamic Germicidal Air Purification Systems: Model G375 Wall Mount Unit and Model GDM 1000 L/R Duct Mount Unit*. Las Vegas: PuriTek, 1994. Web.

Florian, Mary-Lou E., Dale Paul Kronkright, and Ruth E. Norton. *The Conservation of Artifacts Made from Plant Materials.* Marian Del Rey, California: Getty Conservation Institute, 1990. Print.

Garg, K.l., Kamal K. Jain, and A.k. Mishra. "Role of Fungi in the Deterioration of Wall Paintings." *Science of The Total Environment* 167.1-3 (1995): 255-71. Print.

Giani, Elisabetta, Annamaria Giovagnoli, and Maria Pia Nugari. "A Museum Storage Area: Microclimate and Air Quality Short-Term Monitoring Programme." E-Preservation Science 7 (2010): 55-58. Morana-RTD. Web. 14 June 2010.

Haacke, Hans. Personal interview. 16 Feb 2013.

Haacke, Hans. Telephone interview. 8 Feb 2013.

Hall, A. V. "Pest Control in Herbaria." Taxon 37.4 (1988): 885-907. JSTOR. Web. June-July 2010.

Hartmann, Celia. "Edward Steichen Archive: Delphiniums Blue (and White and Pink, Too)." Web log post. Inside/Out: A MoMA/MoMA PS1 Blog. MoMA, 8 Mar. 2011. Web. 18 Feb. 2013.

Heuman, Jackie. "Research Inquiring Regarding Plants and Conservation." Message to the author. June-July 2010. Email.

Homosalate MSDS; Spectrum Laboratory Products Inc: Gardena, CA, Sep 30 2009. Acc. Mar

30, 2013.

Iljin, W. S. "Drought Resistance in Plants and Physiological Processes." Annual Review of Plant Physiology 8 (1957): 257-74. Annual Reviews. Web. 17 June 2010.

Ingham, Elaine R., Andrew R. Moldenke, Clive A Edwards. *Soil Biology Primer.* (Soil and Water Conservation Society (SWCS) Soil Biology Primer. Rev. ed. Ankeny, Iowa: Soil and Water Conservation Society 2000).

Jones, Caroline A. *Hans Haacke 1967*. Cambridge, MA: MIT List Visual Arts Center, 2011. Print.

Kachur, Lewis. *Displaying the Marvelous: Marcel Duchamp, Salvador Dali, and Surrealist Exhibition Installations.* Cambridge, MA: MIT, 2001. Print.

Kowalski, Wladyslaw Jan. *Ultraviolet Germicidal Irradiation Handbook:UVGI for Air and Surface Disinfection*. Heidelberg: Springer-Verlag, 2009. Print.

Krueger, Tom. "Re: "Question about Olafur Eliasson's 'Moss Wall'." Message to the author. 25 Feb 2013. Email.

Kunce, Samm. “Re: Art conservation research inquiry.” Message to the author. 29 Jan 2013. Email.

Lass-Florl, C., P.-M. Rath, D. Niederwieser, G. Kofler, R. Wurzner, A. Krezy, and M.P. Dierich. "Aspergillus Terreus Infections in Haematological Malignancies: Molecular Epidemiology Suggests Association with In-hospital Plants." Journal of Hospital Infection 46 (2000): 31-35. Idea Library. Web. 14 June 2010.

Lee, Galen. Telephone interview. February 22 2013.

Leib, Brian. Telephone interview. 14 June 2010.

Levin, Kim. "Gaining Ground: A Retrospective View of Art in Nature and Nature as Art." *Trans Plant: Living Vegetation in Contemporary Art*. Ed. Barbara Nemitz. Ostfildern: Hatje Cantz, 2000. 10-20. Print.

Ljaljevic Grbic, Milica V., and Jelena B. Vukojevic. "Role of Fungi in Biodeterioration Process of Stone in Historic Buildings." Zbornik Matice Srpske Za Prirodne Nauke, no. 116, pp. 245-251, 2009. Web. 14 June 2010.

N. Matan, H. Rimkeeree, A.J. Mawson, P. Chompreeda, V. Haruthaithanasan, M. Parker.

"Antimicrobial activity of cinnamon and clove oils under modified atmosphere conditions" International Journal of Food Microbiology, Volume 107, Issue 2, 15 March 2006.

Mitchell, Ralph. Telephone interview. June-July 2010.

Munger, Gregory T. Cladonia spp. In: Fire Effects Information System. (U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory 2008. Web. http://www.fs.fed.us/database/feis/ March 9 2013.)

Museum of Contemporary Art, Sydney. "MCA Presents First Solo Exhibition in Australia of Danish-Icelandic Artist Olafur Eliasson." N.p., 8 Dec. 2009. Web. 10 Mar. 2013.

National Park Service. "Chapter 5: Biological Infestations" *Museum Handbook*. Washington, D.C:National Park Service Museum Management Program:1998, 1-17.

National Park Service. "Mold: Prevention of Growth in Museum Collections."*Conserve O Gram* (Aug. 2007): Web.

National Pesticide Information Center. "Pyrethrins and Pyrethroids." Oregon State University, Dec. 1998. Web. 8 Mar. 2013.

Nemitz, Barbara. *Trans Plant: Living Vegetation in Contemporary Art*. Ostfildern: Hatje Cantz, 2000. Print.

Octyl Salicylate (ethylhexyl salicylate) MSDS; American International Chemical, Inc: Framingham, MA, October 2012. Acc. Mar 30, 2013.

Pittman, Gene. "Plant as Decorative Element in a Gallery." Web log post. Centerpoints. Walker Art Center, 5 May 2010. Web. 24 Feb. 2013.

Roach, Alex. "Administration Policy: Flowers in the Museum" Integrated Pest Management Plan for museums and galleries in Australia. Heritage Pest Management.

Robbins, James A. and Michael R. Evans. "Growing Media for Container Production in a Greenhouse or Nursery: Part II Physical and Chemical Properties" University of Arkansas, Division of Agriculture Research and Extension, 2001.

Ryan, Michael G. "Temperature and Tree Growth." Tree Physiology 30 (2010): 667-68. Print.

Seattle Art Museum. "Guidelines for Plant Materials in the Museum." Seattle: Seattle Art Museum. Print.

Sherman, Arden. “Proposal for a Museum: Arden Sherman, Mise en green.” Web log post. Open Space. SF MoMA. 31 Jan. 2013. Web. 24 Feb. 2013.

Short, D. E., and J. L. Castner. “Scale Insects Affecting Ornamental Plants” (University of Florida, 1991. Print.

"Slugs and Snails Eating Post." *The Telegraph*. Telegraph Media Group Limited, 15 Oct. 2009. Web. 27 Mar. 2013.

Stone, Jeffrey. "Research Inquiry from the Museum of Modern Art." Message to the author. June-July 2010. E-mail.

Summerbell, R.C. , Staib, F. , Dales, R. , Nolard, N. , Kane, J. , Zwanenburg, H. , Burnett, R. ,

Krajden, S., Fung, D. and Leong, D. “Ecology of fungi in human dwellings.” Medical Mycology, 30: 6, 279-285. 1992.

Sussman, Don. “FW: MoMA research inquiry.” Message to the author. 25 Jan 2013. Email.

Sussman, Don. Telephone interview. 16 June 2010.

Talland, Valentine. "Research Inquiry Regarding Plants in a Museum Environment." Message to the author. June-July 2010. E-mail.

TateShots: Vito Acconci. Perf. Vito Acconci. Tate, 2011. Online.

Trevors, J. T. "Sterilization and Inhibition of Microbial Activity in Soil." Journal of Microbial Methods 26 (1996): 53-59. Elsevier. Web. 14 June 2010.

Tucker, Arthur O., Thomas DeBaggio, Francesco DeBaggio. *The Encyclopedia of Herbs: A Comprehensive Reference to Herbs of Flavor and Fragrance*. Portland: Timber, 2009. Print.

Walters Art Museum. “Art Blooms at the Walters: Guidelines for Arrangers.” Baltimore: Walters Art Museum, 2010. Print.

Weinberg, Lauren. "Olafur Eliasson." Review of Olafur Eliasson: Take Your Time. Time Out Chicago 11 May 2009: n. pag. Art and Design. Time Out Chicago, 11 May 2009. Web. 10 Mar. 2013.

Wharton, Glenn. "Re: "Plant-based installations research inquiry." Message to the author. 21 Feb 2013. Email.

Wilen, Cheryl. Telephone interview. 25 Mar 2013.

Wilson, Walter R. “Wax and Capsaicin Based Pesticide.” Wilder Agricultural Products Co., assignee. Patent 5,466,459. 14 Nov. 1995. Print.

Yang, Dong Sik, Ki-Cheol Son, and Stanley J. Kays. “Volatile Organic Compounds Emanating from Indoor Ornamental Plants” HortScience 44 (2) : 396-400. April 2009.

Zotti, M., A. Ferroni, and P. Calvini. "Microfungal Biodeterioration of Historic Paper: Preliminary FTIR and Microbiological Analyses." International Biodeterioration and Biodegradation 62 (2008): 186-194. Elsevier. Web. 14 June 2010.