

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

SESSION 1D

ECOLOGY AND EVOLUTION

Session Moderator: Bonnie Becker, Environmental Science (Tacoma)

MGH 234

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Effects of a Turbid Plume on Phytoplankton Abundance at the Mouth of the Elwha River

Brendan Patrick Eickelberg, Senior, Oceanography

Mary Gates Scholar

Mentor: Andrea Ogston, Oceanography

Mentor: Ian Miller, Washington Sea Grant

Mentor: Emily Eidam, School of Oceanography

The Elwha River was dammed between 1911 and 2014 trapping millions of cubic meters of fine and coarse-grained sediment in the two reservoirs created by these dams. Upon dam removal, much of this sediment was re-suspended and transported into the Strait of Juan de Fuca, reducing light availability to photosynthetic organisms. Phytoplankton abundance has not previously been studied near the Elwha Delta, so it is unknown how the dam removal has affected these organisms. Phytoplankton net tows and chlorophyll samples were collected at several stations surrounding the mouth of the Elwha River to determine overall abundance and diversity in and out of the plume. Chlorophyll concentration and phytoplankton abundances were compared to turbidity levels and salinity to determine their location within the plume. Phytoplankton abundance and chlorophyll concentration was reduced in high turbidity, low salinity water, i.e., inside of the plume. The chlorophyll concentrations measured within the plume were less than half the Strait of Juan de Fuca fall and winter average chlorophyll concentrations as documented in Masonn and Peña (2009). The purpose of this study is to provide a foundation for the Elwha dam removals and future dam removals effect on the base of the marine food web.

SESSION 1E

EXCITATIONS: ART AND VISUALITY

Session Moderator: Rebecca Cummins, School of Art + Art History + Design

MGH 238

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Exploration of Intromission

Matthew Charboneau, Junior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

As science progressed, the understanding of optical perception developed. Today, our understanding of how we see turns upon the notion that light is reflected off an object, penetrates the eye and is then processed through rods and cones. This information is then sent to the brain where it is interpreted. Our intellectual interaction with the outside world is based upon a firm boundary between ourselves and an object. In the Middle Ages, things were more fluid. The boundaries between the self and the object were blurred. The reason for this was that the optical mode accepted at the time was intromission. This mode consists of a process where an object be it actual or artistic representation physically penetrates the eye and then, like a wax seal, imprints itself onto the brain. This created an embodied, intellectual experience. When the contemporary view studies Medieval Art they must somehow adopt this older lens. This project explores the concept of intromission through the presentation of Illuminated Manuscripts, Altar Pieces, and Painted Crosses. It considers the short falls of today's science in regards to this older, more sensual experience of sight.

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Landlords of Art, Revealed by Works of Hans Haacke and Christo

Olivia Harris, Senior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

This project discusses Hans Haacke and Christo's works and the limiting effects of landlords. Haacke's *Shapolsky et al. Manhattan Real Estate Holdings, a Real-Time Social System, as of May 1, 1971* (1971) documents the expansiveness of the Shapolsky et al. Manhattan Real Estate Holdings. At the time, this group owned the largest concentration of real estate in New York, primarily in under-privileged areas. Through a series of images accompanied by supporting data, Haacke exposes the exploitation of the slumlords. Furthermore, the exhibition scheduled for the Guggenheim was cancelled shortly before the opening (involving a separate type of landlord—the Museum director, Thomas Messer). In contrast, Christo, the artist himself, recently pulled his proposal for *Over the River*. Christo and Jeanne-Claude, his late wife, designed the outdoor gigantic fabric canopy to span over forty-two miles of the Arkansas River in Colorado. They began planning the project over twenty years ago and, to date, have invested fifteen million of their own funds. Their carefully selected location, however, resides on federal land. Due to the recent presidential election upset, Christo abandoned the project. He refuses to allow President Donald Trump, his new landlord and antagonistic statesman against the arts, any form of ownership over the work. In this project, I explore the relationship between art and politics and the importance of artistic independence.

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The Art of Darkness

Noah Gray, Junior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

Darkness is the focus of many works of art. In this essay I compare two artists works and their exploration of darkness. In *How It Is*, Mirosław Balka asks the viewer to enter into and explore an environment in a physical and figurative

sense. In contrast, Maya Lin beckons the beholder to examine literal and cultural darkness through a historical context, in her Vietnam Veterans Memorial. Though very different spaces, these works also take up a huge amount of space, which makes these experiences unforgettable. Each is deeply and intimately visceral, putting the viewer in a space where they must come to terms with either a corporeal experience or historical sense of darkness. I compare the use of darkness to understand the ways that these works explore themes of loss, fear, death, and strangely, comfort. I will comment on my own experience of these works to dissect these large sculptural installations. Balka's sculpture creates an environment where a viewer must blindly walk forward into a dark void and discover the work through their other senses, while Lin's memorial provides space to contemplate the darkness of war and to grieve for those lost. From their appearance, these spaces seem focused on negative emotions connected to darkness but I found that they create a sense of comfort when experienced. The intense emotions connected to experiencing these works lead me to a place of comfort where I have fully come to terms with each work. In this presentation, I will discuss the notion of safety in darkness, bring in more ancient understandings of the concept, and state how these works re-engage the concept.

SESSION 1F

INVESTIGATIVE REPORTS IN ART HISTORY: FROM THE EPHEMERAL TO THE ENVIRONMENTAL AND FROM THE MULTI-SEXUAL TO THE CROSS-CULTURAL

Session Moderator: Barbara Miller, Art History, Western Washington University

MGH 242

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Exposing New Stories: How Multi-Sexual Identities Narrate Deviant Sensual Images

Josephine Butcher, Junior, Art History, Communications, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

In 1988, 19th century realist painter Gustave Courbet's *The Sleepers* made its first public debut since he painted it in 1866 and was rejected from the Salon, a show for upcoming artists in the 19th century. Since then, in popular culture the work has reached a cult-status. However, it represents a hetero-normative view of Sapphic relationships. This

hetero-normative depiction of Sapphic women has been exploited continuously for the view of primarily heterosexual men. To reclaim these images for the Queer community, artists must depict their own interpretations of deviant sexual intimacy. This often means subverting the dominant narrative, for example in *Je, Tu, Il Elle*, Chantal Akerman's depicts an intensely physical portrayal of intimacy. In contrast, Nicole Eisenman's *Good Morning Studio*, illustrates distorted non-gendered figures melting into each other, resonating with Courbet's *The Sleepers* and offers a divergent sensuality. When Queer artists portray deviant sensual narratives, they transpose hetero-normative views and make them more relatable to Queer identifying people. In this presentation, I will discuss these works and contextualize diverse artists use of 'deviant' sexualities to expose new narratives. I also plan to evaluate how Queer artists depict their expressions of intimacy compared to how a heterosexual man, such as Courbet, portrays Queer intimacy. This research will further how society interprets Queer imagery, using a Queer Theory and Semiotic methodology. With this work, I hope to expose these narratives and increase interest into the study of LGBTQ+ visual art.

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Robert Morris' Steam and Pursuit of Anti-Form

Jody Thompson, Senior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

Robert Morris' steam undermines more traditional sculptural artworks. His Untitled Steam Work for Bellingham (1967) is the best remaining example of his innovative exploration into alternative media. In the piece Morris uses an intangible, anti-sculptural medium — physically tentative, and exuding indefinite permanence. It is located at the remote, northeastern end of Western Washington University's campus. When activated, steam, seemingly inexplicably, rises from the earth's rolling landscape; in cold morning air, steam expands sky-

ward and perpetually dissipates into a hazy fog. More specifically, the nature of Morris' elusive sculpture resists definition and, in definitive ways, is contrary to the works of his contemporary minimalist counterparts. Morris' rebellious fascination with steam informs his philosophical approach to anti-form. He once wrote that he favored "change over continuity" and that his aim was "to shatter the unity of a given subject." Steam resists physical form. Moreover it changes with the local ecology: the outside temperature, time of the day, and the humidity in the climate continually impact the composition of the sculpture. His Untitled Steam Work lacks permanence, only viewable at certain times of the day, as its vapors quickly dissipate. While Untitled Steam Work was not Morris' only anti-form sculptural installation — he explored chance in his 1968 Scatter Piece, using blocks in random forms — Untitled Steam Work's ephemeral qualities became Morris' best example of anti-form. This essay explores Morris' rejection of art that lasts. It compares Morris' various explorations of anti-form to his more known minimalist artworks. It makes a case that Morris' ephemeral, provocative medium of steam is the truest example of his indefinable anti-form. The site-specific sculpture resists its chronological placement, as it moves beyond the prevailing minimalist hard form materials.

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Session Moderator: Barbara Miller, Art History, Western Washington University
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Tomas Saraceno's Artistic Visions of an Ecological Future

Jordan Braun, Senior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

The sheer number of people living on the planet has led to an increase in the burning of fossil fuels and the use of industrialized animal livestock. We are now forceful agents and have caused much of our current planetary ecological crisis. In this project, I use Dipesh Chakrabarty and Timothy Morton to outline key issues within the current debates on global warming and the politics of anthropocenic influences.

Chakrabarty rebels against treating the environment simply as a silent and passive backdrop. His aim is to end the age-old humanist distinction between natural history and human history. Morton takes up Chakrabarty's discourse to show how ecological thought can be used to transcend disciplinary boundaries. He argues that art can help us deal with many of the complex issues that arise from destabilizing environmental conditions. This project focuses on the importance of learning from nature and bio-diversity. Tomas Saraceno uses structures found in spider webs and patterns seen in bubbles to create ecological interactive installations and, in doing so, brings the environment to the foreground. In *Cloud Cities*, he enables the viewer as participant to experience new forms of habitat and envision possibilities for a sustainable planet. Saraceno's radically open use of intelligent design is clearly what Morton has in mind for his work suggests ways that our global community can become a more productive and less destructive ecological agent.

SESSION 10

CANCER BIOLOGY

Session Moderator: Hannele Ruohola-Baker, Biochemistry
MGH 389

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Development of a Renal Cell Carcinoma Kidney-Tumor-on-a-Chip to Mimic Tumor-Induced Angiogenesis

Connor Andrew (Connor) Tsuchida, Senior, Bioengineering
Mary Gates Scholar, UW Honors Program,
Undergraduate Research Conference Travel Awardee,
Washington Research Foundation Fellow
Mentor: Ying Zheng, Bioengineering
Mentor: Chris Miller, Medicine

Kidney cancer is the 7th and 10th most common cancer in men and women in the United States respectively. Renal cell carcinoma (RCC), a cancer of the proximal convoluted tubule, accounts for >90% of these kidney cancer incidences. Most cancers, including RCC, stimulate angiogenesis – the sprouting of existing blood vessels. By upregulating the expression of angiogenic factors, such as vascular endothelial growth factor (VEGF), tumors promote vascular sprouting within their microenvironment. This increased vasculature allows for increased oxygen transport as well as an opportunity to metastasize. This tumor-induced angiogenesis is of particular interest to researchers hoping to continue to develop alternative cancer therapeutics to inhibit angiogenesis, starving the tumor of oxygen, or normalize the vasculature, making drug delivery more effective. Common cancer models like 2D cell cultures and animal xenografts have been shown to be

poor predictors of drug efficacy in patients. A lack of cellular complexity in 2D cultures along with genetic differences in animal xenografts make them insufficient models of the human pathophysiology seen *in vivo*. To address this problem, we are developing a 3D, vascularized, flow directed, microphysiological device deemed a “kidney-tumor-on-a-chip”. To engineer a perfusable microvessel, a 120 μ m collagen channel was lined with human umbilical vein endothelial cells (HUVECs). Primary RCC spheroids that mimic the 3D structure of solid tumors were then introduced into the surrounding collagen, recapitulating the tumor-vessel microenvironment. Initial results have shown no endothelial sprouting in non-RCC control devices, compared to significant endothelial sprouting in devices with RCC spheroids. These results suggest RCC cells may contribute to angiogenic sprouting in our microphysiological device, simulating what is observed *in vivo*. The ability of this kidney-tumor-on-a-chip to mimic the tumor-vessel microenvironment demonstrates its potential to be a more effective cancer model for drug testing.

POSTER SESSION 3

MGH 206, Easel 177

2:30 PM to 4:00 PM

Efficacy of an Atmospheric Pressure Plasma Jet for Spacecraft Sterilization for NASA

Wei Liao, Junior, Psychology, University of Washington
Thinh Pham, Sophomore, Biochemistry, Edmonds
Community College

NASA Space Grant Scholar

Cali Drake, Sophomore, Nursing, Edmonds Community
College

Mentor: Jonathan Miller, Biology, Edmonds Community
College

NASA confronts a forward contamination problem with the launch of spacecraft and probes into extraterrestrial environments with potential for detection of life. Earth-origin microbes risk threatening planetary systems, compromising the data obtained, and require implementing microbial control for planetary protection from cross contamination. While generally effective, currently approved decontamination methods are costly, involve high heat and chemical treatments, and risk damaging thermally sensitive spacecraft materials and components. Alternative methods, including atmospheric pressure plasma jets (APPJs), show promise as effective technologies for microbial control. Researchers at Edmonds Community College partnered with Eagle Harbor Technologies (EHT) of Seattle, WA to test the capabilities of an APPJ developed by EHT, performing characterization of killing efficacy. *Bacillus atrophaeus* endospores were spread on tryptic soy agar plates to quantify killing efficacy of over 900 combinations of APPJ parameters including pulse width, frequency, voltage, distance, time, electrode placement, jet configura-

tion, gas composition, and flow rate. Unprecedented independent control of APPJ pulse width, frequency, and voltage allowed researchers to identify combinations of these parameters resulting in greater than 4-log reduction of endospores. A decimal reduction time (D-value) was additionally determined at an average of 160 seconds on aluminum. High humidity and low concentrations of O₂ were identified as conditions that enhanced killing of endospores. Further characterization of higher voltage, frequency, and humidity, as well as variable pulse width and low O₂ should lead to improved APPJ killing efficacy with decreased exposure time and allow for development of an APPJ optimized for microbial reduction for large-area spacecraft.

POSTER SESSION 3

MGH 206, Easel 178

2:30 PM to 4:00 PM

Proof of Principle of an Atmospheric Pressure Plasma Jet for Spacecraft Sterilization for NASA

Christopher (Chris) Nguyen, Junior, Microbiology, University of Washington

Stephani Bernard, Junior, Nursing, Edmonds Community College

Mentor: Jonathan Miller, Biology, Edmonds Community College

NASA confronts a forward contamination problem with the launch of spacecraft and probes into extraterrestrial environments with potential for detection of life. Microbial control is required in order to avoid cross contamination that would compromise data collected. Currently approved decontamination methods are costly and involve high heat and chemical treatments which risk damaging thermally sensitive spacecraft materials and components. Alternative methods, including atmospheric pressure plasma jets (APPJs), show promise as effective technologies for microbial control. Researchers at Edmonds Community College partnered with Eagle Harbor Technologies (EHT) of Seattle, WA to test the capabilities of an APPJ developed by EHT, performing characterization of killing efficacy and demonstrating proof of principle for large-area spacecraft sterilization. Research demonstrated killing capabilities of APPJ when applied to various conditions including different surface materials, meshes, tapered and elevated holes. The plume of the APPJ traveled through tapered and elevated holes yielding greater than 99% killing of endospores. Application of APPJ as a “brush” demonstrated greater than a 6 log reduction of endospores over 56.75 cm²/10 minute exposure. Findings suggest a brush composed of multiple jets could be effective for spacecraft sterilization over large surface areas of differing materials with capability to penetrate unusual shapes and surfaces. Anticipated improvements in killing efficacy resulting from better characterization of increased voltage, frequency, humidity,

and the inclusion of low O₂ concentrations should lead to the development of an APPJ brush effective at spacecraft sterilization.

POSTER SESSION 4

Commons East, Easel 53

4:00 PM to 6:00 PM

Dam Removals and Implications to Organic Matter Transfer

Madeline Rose (Maddy) Savage, Senior, Oceanography

Mary Gates Scholar

Mentor: Andrea Ogston, Oceanography

Mentor: Ian Miller, Washington Sea Grant

Mentor: Emily Eidam, School of Oceanography

Rivers are conduits for transporting sediments and organic material through the watershed and to the ocean. The Elwha River recently was involved in the largest dam removal in history within the USA. Studies of the dam removal impacts have never been done as extensively as they have for the Elwha River Restoration project. Now, the river is no longer blocked, and 21 million m³ of sediments have been made available for erosion, and it is not fully known where the sediments are depositing and how they are affecting the ecosystem. In order to quantify where organics are being stored in the river system, sediment samples were collected along the river and shoreline, and grain size and loss on ignition (LOI) analysis performed on them. Most of the samples with more than 2% organic content were at sites in the reservoir and side channels, and organics less than 1% were retained on the beach and riverbank. Therefore, finding organic matter in the river and shoreline systems can inform us how the ecosystem is recovering, and whether overtime organics are fully transported to the ocean, or whether organics will be consumed, transformed, or altered along the way.