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Letter from the President

To the Williamstown community,

It is my sincere pleasure to present you with the Fall 2021 issue of the Williams Undergraduate Research Journal (WURJ), the first of its kind at the College and the premiere issue of this periodical. Establishing WURJ in the midst of the COVID-19 pandemic and civil unrest following the homicide of George Floyd was challenging in its own right as students, staff, and faculty—the College—dealt with the social impact and tension inherent in this public health crisis and institutionally inflicted trauma. Notwithstanding these very real challenges, the WURJ staff was able to bind a handful of stimulating, original, and creative works among a heap of submissions produced by the student body during this whirlwind of an academic year. We hope these interdisciplinary selections can serve as an avouchment of the broad and prolific research that has, and continues to, distinguish the undergraduate experience at Williams College.

In the spirit of this Eph experience, the WURJ reflects an immersion into a broad spectrum of disciplines explored by the undergraduates, from materials science to art history, in close proximity. This quality was once aphorized by alumnus James A. Garfield who stated, “the ideal college is Mark Hopkins on one end of a log and a student on the other.” Though the standard of intimate pedagogy alluded to on that 1871 winter night has never left Williams, I find that the occupants of the log have changed since the Williams of Hopkins’ day. In the 21st century, the log may very well be placed across the light partition we know to be Route 2, with a STEM student on the south end, and a humanities student on its northern counterpart. In this very vein, I hope the following collection of articles can bring a greater sense to connectedness to an already close-knit community, and that the WURJ, as an institution, can continue to serve as a platform to surface the wonderful undergraduate research at the College from all fields.

On this note, I would like to acknowledge some of the countless people without whom this publication would not be possible. Firstly, I would like to recognize Samuel Neff of the Dartmouth Undergraduate Journal of Science whose consultation guided the evolution of WURJ from an idea into a reality. On the side of WURJ itself, the willingness and patience of this inaugural editorial board allowed us to navigate

the challenges of an emerging organization with assurance and ease. A special thanks goes out to the chief editors, Zoë Fisher and Nico Coloma-Cook, who were the first to join me in creating this publication, selflessly offering their time to ensure its progress and success. I would also like to acknowledge Dean Marlene Sandstrom for her support and willingness to provide the resources to get the organization off the ground. Finally, I would like to thank Professor Katharine Jensen, the first, and longtime sole, member of the advisory board who guided us through the peer review process and directed the journal in the right path.

From WURJ to you, we hope you enjoy reading the following collection of inspiring works by our peers!

Kindly,

Nicholas Patino

Nicholas Patino
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Review

Methods to Enhance Mechanical Properties of Cementitious Composites: Innovations at the Nanoscale for Humanitarian Impact

Jaya Alagar '22, Emily Kuwaye '23, Amanda Roff '22

Introduction

Ordinary Portland Cement, or OPC, is one of the most common materials employed in construction worldwide. While an attractive choice for its inexpensive production process and accessible raw materials, its manufacture can expose workers to toxic trace metals [1]. Total emissions from the cement industry contribute upwards of 8% of global CO₂ emissions, and OPC implementation, in particular, uses significant amounts of water [2]. According to a 2019 Nature assessment, 75% of the water necessary to produce OPC-associated concrete has been projected to originate in regions expected to experience significant drought and water stress 2050 [3, 4]. Despite these shortcomings, recent research has incorporated carbon nanotubes (CNTs) and superplasticizers into OPC matrices to enhance tensile strength. Although adverse impacts of OPC have been well-established, associated nanoscale level advancements improve mechanical properties of cementitious materials. With the widespread use of consumptive and harmful OPC constituting a major sustainability concern, the development of completely novel, greener alternatives to conventional building materials like OPC have become increasingly imperative.

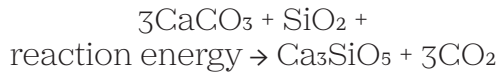
The purpose of this review is to characterize the effects of OPC additives, including various CNTs, surfactants, and superplasticizers, and innovate an alternative additive to enhance existing one-part, geopolymer cement composites. Geopolymer cement composites have emerged as marketable substitutes in place of carbon-rich OPC. Although the incorporation of additives into OPC to produce stronger concrete has been well-documented, little research has considered the

effects of the same OPC enhancers on geopolymer cement. Building off of this context, this review begins by synthesizing current understandings of CNT, surfactant, and superplasticizer properties in relation to cement durability. By summarizing the production process of geopolymer cement, this review underscores the need to develop compatible additives to ensure the material's higher resistance to crack formation, elevated tensile strength, and greater strain-withholding capacity [5]. We propose and devise one such improved nanomaterial based on the chemical characteristics of one-part and two-part geopolymer cement matrices. Through reviewing the resulting cyclic peptides that are equipped with piezoelectric properties, we suggest an application of the technology in homeless shelter design. In doing so, this review also aims to integrate nanotechnology insights from various sectors of the building sciences. By advocating for the implementation of enhanced geopolymer cement in higher-level construction, this review both highlights areas for further research as well as promotes an interdisciplinary approach to tackling social challenges.

OPC Production and Conventional Enhancements

Concrete, whose basic components include cement, water, and aggregates, such as sand, has often been viewed as a marker of economic development. Global per capita consumption of concrete has nearly tripled since the 1970s, a trend that mirrors the increase in the world's population [6]. This rising societal demand has necessitated improvements in concrete manufacturing and processing [6]. Worldwide, concrete has been commonly employed to rehabilitate and repair

existing, damaged structures [7]. A critical component of the concrete that is conventionally used in building construction is OPC, whose production requires high temperature combustion reactions to create calcium silicate “clinker” during a critical manufacturing step [8]. This process, referred to as calcination, also yields a carbon dioxide by-product. The net process is shown in Eq. (1) [9]:



A 2018 estimate attributed nearly half of the 8% of global CO₂ emissions from OPC manufacture to this step alone [3]. Later stages of cement production have attracted similar environmental concerns. The addition of water to OPC yields a chemically hydrated, solid cementitious mass. Although water-laden cement paste occupies only 10% to 15% of this final product, mechanical properties of cement are heavily influenced by the degree and duration of hydration [10]. A 2011 study investigating the effects of a sludge and sawdust composite on mortar stability revealed that high water content was inversely related to the strength of composite-containing concrete [11]. Other research indicates that water facilitates the formation of a three-dimensional structure in calcium-silicate-hydrate gel, a major component of cement-based materials, to influence shear strength [12]; Goracci et al. corroborated these findings in a 2017 study that reported water used to activate clinker into its major, semi-crystalline hydration product remains either chemically bound or otherwise confined within cement floccules [13]. While necessary for strengthening and curing, water also contributes to the physical degradation of OPC in nature. A 2017 publication determined that the interaction between concrete and aqueous media such as groundwater, freshwater, and precipitation can result in the physical degradation of associated structures in the built environment [14]. While further research is needed on reducing the effects of water in relation to enhancing OPC stability and lifespan, anhydrous nanoscale innovations have been shown to contribute to increased mechanical properties of OPC [15].

Studies have demonstrated a way to improve the weak fracture resistance of OPC through the

addition of CNTs [16]. Single-walled carbon nanotubes, or SWCNTs, are made from rolled-up sheets of graphene. SWCNTs can nest within each other to create multi-walled carbon nanotubes (MWCNTs) (Fig. 1) [17].

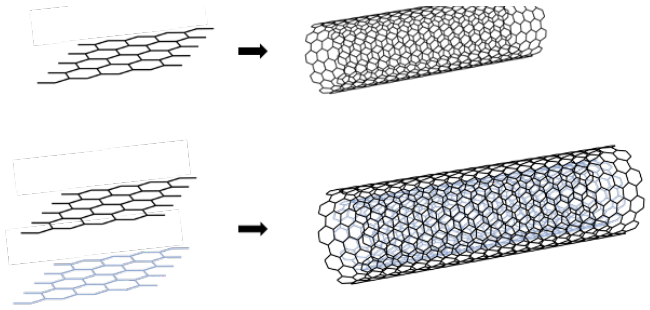


Figure 1: Assembly of carbon nanotubes from graphene. Industrial processes arc single and multiple layers of graphene sheets to produce (A) single-walled carbon nanotubes (SWCNTs) and (B) multi-walled carbon nanotubes (MWCNTs). ADAPTED FROM: https://commons.wikimedia.org/wiki/File:Eight_Allotropes_of_Carbon.svg#/media/File:Eight_Allotropes_of_Carbon.svg

Both SWCNTs and MWCNTs derive much structural stability from their regular, repeating lattices and wealth of electron delocalization. Consequently, CNTs have remarkable mechanical and thermal properties that allow them to effectively reinforce cementitious materials. According to a 2017 assessment, Young’s modulus of CNTs can reach around 1 TPa, approximately five times that of steel [18]. Using theoretical models, Che et al. demonstrated that the thermal conductivities of CNTs are comparable to that of diamond [19]. Because these two attributes also enable CNTs to have high conductivities and inherent piezoelectric properties, CNTs have been utilized as functional filler materials in OPC to sense strain, stress, and cracks, as well as to indicate sites of material disrepair [20]. The roles of such electrically conducting materials in non-conductive, cement matrices have been thoroughly investigated. A 2013 study revealed strong correlations between oscillatory applied axial strain—whose loading frequencies spanned those of typical civil structures—and measured electrical resistance in CNT-containing cement paste [21]. In a recent work concerning flexural behavior of reinforced concrete, Naji et

demonstrated the load-carrying capacity of OPC enhanced with MWNCTs is increased by more than 29% in comparison to unmodified reference materials [22].

While nanomolecular modifications to CNTs have been proposed to improve the electrical and mechanical properties of cementitious materials like OPC, studies have shown limitations to the widespread usage of CNTs as piezoresistive sensors [23, 24]. Although the high aspect ratio (fiber length to diameter) of CNTs, particularly MWCNTs, allows for additional contacts to form between nanoparticles and cement, such CNTs are more difficult to disperse throughout aqueous matrices [25]. Furthermore, because CNTs are highly nonpolar and hydrophobic, the van der Waals forces between the CNTs can cause them to aggregate within the dispersion. Nonrandom, nonhomogeneous dispersion of CNTs in cement can severely compromise the self-sensing ability of the overall material. According to Yang et al., the entanglement of CNTs has been frequently shown to inhibit the formation of a conductive network [26]. This inability of CNTs to reach the percolation threshold, or the minimum filler content necessary to promote conductivity, can yield insufficient changes in electrical resistance when subjected to external force [27].

Other additives to OPC have been found to improve the wettability of these reinforcing nanotubes in polar solution and, thus, facilitate adequate conductive network production and strain detection [16]. Molecular dynamics simulations have indicated that anionic surfactants, including sodium dodecyl sulfate (SDS) and dodecyl-benzene sodium sulfonate (NaDDBS), may form a micellar layer surrounding CNTs to promote their uniform dispersion [28]. Nonionic surfactants have been proposed to stabilize nanoparticles by sterically hindering water-rich portions of cementitious matrices [29]. However, surfactants also have been shown to have disadvantages. For instance, Liu et al. found that cationic surfactants contribute to air bubble formation in cement, a result that has been theorized to complicate cement hydration and stability [30, 31]. To overcome discrepancies between surfactant function and maintenance of self-sensing properties in cement, polycarboxylate based superplasticizers have been employed [32].

Results from Kaur et al.'s 2020 study corroborate prior findings that superplasticizers can improve CNT dispersions in OPC more than ultrasonication and other mechanical methods [33]. Although superplasticizers were designed to enhance OPC rheology, increasing awareness of sustainability challenges associated with OPC production has prompted studies on leveraging these surfactants to enhance alkali activated materials [34]. So-called geopolymers have a production process that is estimated to reduce greenhouse gas emissions by upwards of 70% to 90% relative to emissions linked to conventional concrete manufacture [35]. This reduction largely stems from geopolymer concrete's substitution of limestone - responsible for 60% of CO₂ emissions during OPC production - with industrial by-products already produced in the production of materials in other industries [36]. These by-products are used as precursors that take on the role of OPC, except they are activated by alkali solution rather than water.

Geopolymer cement can be further differentiated from OPC on the basis of mechanical behavior and stability. Generally, studies have signaled that geopolymer cement has higher durability, tensile strength, and compressive strength compared to OPC [37]. Increased amounts of fly-ash, an industrial by-product, has afforded geopolymer cement greater resistance to aggressive environments compared with OPC [38]. While construction commonly utilizes OPC due to the accessibility of its raw materials and overall cost-effectiveness, non-Portland alternatives are garnering more scientific attention and commercial usage. Geopolymer cement, in particular, can be subdivided into two categories: one-part geopolymer composites aim to circumvent challenges encountered by two-part geopolymers, whose formation requires dangerous, corrosive alkali solutions [39]. The low-carbon production process of one-part geopolymers involves polymerization of aluminosilicate substrates in the presence of alkaline solids, followed by the addition of water [40]. For both geopolymer types, alkaline sources are crucial for providing basic cations that promote the dissolution of cement raw materials and hardening [41]. Because empirical evidence has shown that basic reaction conditions

promote the degradation of superplasticizers, alternative methods emphasizing the adequate incorporation CNTs into geopolymer matrices must be investigated [42].

One way to overcome these challenges is by incorporating nanowires with piezoelectric properties into geopolymer cement. Although studies have reported successful nanowire fabrication in aqueous solution, the carefully controlled reaction conditions under which synthesis must occur are unlikely to be achieved with the natural, raw materials that favor geopolymer formation. By introducing a biochemical method to scaffold nanowires inside water-soluble, cyclic peptide nanotubes, we propose a potential way in which geopolymer cement can attain comparable self-sensing abilities to CNT-enhanced OPC [43].

Proposed Cyclic Peptide Development

Cyclic peptides can form tubular structures from spontaneously self-assembling monomers of circularly arranged amino acids. The resulting constructs are visually analogous to the hollow cylinders of arced CNTs (Fig. 2) [44].

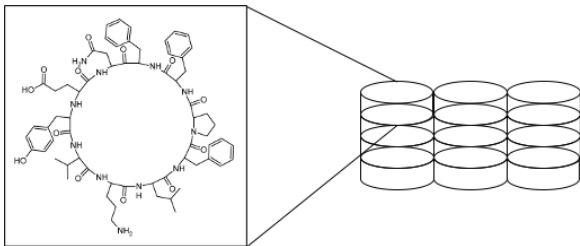


Figure 2: Cyclic peptide Tyrocidin A used to exemplify a general scheme for the spontaneous self-assembly of cyclic peptides into crystalline nanotubes. Quantity and identity of peptides can be adjusted to impact nanotube size and physiochemical properties. Adapted from: https://commons.wikimedia.org/wiki/File:Tyrocidin_A.png.

While cyclic peptide nanotubes have been discovered only recently, they constitute a growing, active area of biochemical and pharmaceutical research due to their alterable polarities, high surface areas, and cellular permeabilities [45]. These constructs have been employed in electronics, studied as versatile drug delivery

vectors, and used in tissue engineering, where nanotubes have been shown to repair injury by encapsulating neural stem cells and directing their differentiation [45, 46].

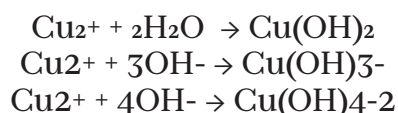
Nguyen et al. have shown that the energy-harvesting capacities of amphipathic peptide nanotubes are heavily dependent on the precise alignment of their electric dipoles [47]. Despite rigid hydrogen bonding networks along amino acid backbones, such proteinaceous structures have been found to have markedly reduced stiffness and stress tolerance compared to CNTs [48]. Accordingly, the utilities of cyclic peptide nanotubes alone as piezoelectric sensors appear limited by their lack of thermostability and mechanical stability. On the other hand, nanowires based on zinc oxide have been recorded to detect strain induced by mechanical deformation [49]. Because of the reported hydrophilicity, high electrical conductivity, and impressive strength of nickel (Ni) nanowires, literature indicates that certain metallic nanowires are promising piezoelectric materials in non-conductive matrices such as those of geopolymers [50, 51]. Xu et al. found that a Ni nanowire/OPC composite displayed higher strain sensing abilities than other cementitious ones, ultimately suggesting applications of nanowires in structural health monitoring provided their suitable dispersion [51].

Because superplasticizer-based additives are inadequate for nanoparticle dispersion in geopolymer matrices, we envision cyclic peptide nanotubes as having two distinct functions. First, polar, hydrophilic regions of cyclic peptide nanotubes can facilitate even distributions of nanowires. Findings from Resches et al. have indicated the secondary role of these constructs as serving as scaffolds for nanowires that are cast within the nanotubes' hollow interiors [52]. Nanowire formation can be aided by the ability of cyclic peptide nanotubes to selectively biomineralize hydrophilic metals at specific binding sites. For instance, proteins that selectively bind copper (Cu) are well-studied and play essential roles in cellular transport [53]. Amino acids that form copper-binding motifs, such as those found to comprise the copper-transporter ATP7B involved in Wilson's disease, can be incorporated into cyclic peptide nanotubes. Binding of Cu-

associated compounds to tubular sites can therefore constitute an effective way of trapping conductive metals. In 2007, Thilak et al. reported utilization of bacterial, peptide-based nanotubes to form cobalt, cadmium, palladium, silver, and copper nanowires [54]. More recent work has synthesized understandings of biologically-synthesized nanowires, made from stacked heme groups of cytochrome compounds, in *Geobacter* [55].

While nanowires have been the subject of much basic scientific research, insights from their applications in other fields are also revealing [56]. Cu nanowires have become a mainstay of the microelectronics industry due to their high conductivities [57]. Indicative of optimal metallic behavior, these reported properties can enable Cu nanowires to act as sensors, which may be able to detect strain, cracks, and damage extents in concrete upon embedment into the geopolymer's hydrophilic matrix. As concrete deformation has been demonstrated to occur—and worsen—at particular places over periods of time, changes in the nanowires' electrical impedance are expected to correlate with changes in mechanical strain due to cyclic compression [58].

Past attention placed on Cu as a component of nanowire and as a target of pharmaceutical drug development suggests precedent for the scaffolding of Cu nanowires within cyclic peptide nanotubes. A proposed reaction scheme involves the sequestration of metal species, such as Cu^{2+} , Cu^+ , and Cu, inside cyclic peptide nanotubes. Through this method, Cu ions are likely to interact with molecules in the geopolymer concrete's aqueous activating solution [59, 60]. Based on our review of the literature, we highlight Eqs. (2-4) as pH-dependent reactions, involving water and the polar charged molecules, that may predominate as a consequence of Cu-based nanowire formation in this manner.



Empirical studies indicate insoluble $\text{Cu}(\text{OH})_2$ is a prominent copper form when NaOH is used as an alkaline activator at basic pH levels of 6.5 to 12 [61].

Cyclic peptide residues that stabilize interactions between Cu^{2+} and OH^- will contribute to $\text{Cu}(\text{OH})_2$ precipitation at pH values ranging from 10.9 to 11.6. Because this is the approximate pH span over which geopolymer concrete synthesis occurs, methods to convert $\text{Cu}(\text{OH})_2$ into a chemically useful form are necessary to develop Cu-based nanowires [62]. As confirmed by Zeng et al., a highly efficient way to reduce $\text{Cu}(\text{OH})_2$ into uncharged, metallic Cu via hydrazine has been well-characterized under extremely high pH and otherwise ambient reaction conditions [46]. Altogether, these mechanisms use peptide nanotubes as a cast for the production of polycrystalline Cu nanowires, which we propose can be separated from the surrounding hydrophobic protein core through enzyme-mediated degradation (Fig. 3) [52].

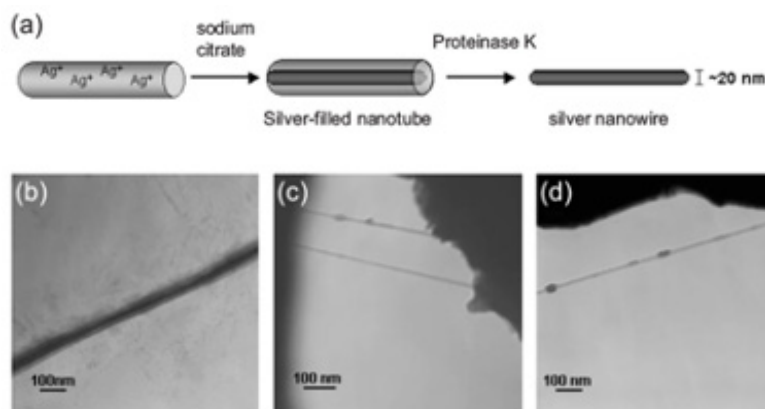


Figure 3: Casting of silver (Ag) nanowires within peptide nanotubes. Filling hollow, nanotubular interiors with metallic ions and proceeding to enzymatically degrade the peptide mold has been demonstrated to construct metallic nanowires. Adapted from Reches and Gazit (2003).

Because negatively charged amino acid side chains contribute to electrostatic repulsion between peptides, we anticipate potential challenges for nanotube formation. Studies have reported the dissociation of peptide-based nanotubes at basic pH. A 2003 study investigating the effects of histidine-rich peptides on Cu nanocrystals growth at variable pH found that higher pH levels corresponded to less nanoparticle formation [63]. While the spontaneous assembly of cyclic peptides may be disfavored at the alkaline pH needed for geopolymer production, chemical tools offer ways to bolster the feasibility

of nanotubular formation [64]. Several methods for generating and screening cyclic peptide libraries exist and can be utilized to understand the effects of pH dependence on nanotube assembly [65]. Furthermore, assessing the peptides' associated crystal structures can also help identify targets for site-directed mutagenesis, where negatively charged residues can be substituted with neutral or positively charged ones to prevent nanotube dissociation [66]. Beyond considering cyclic peptides as nanowire scaffolds, these proteinaceous molecules can be equipped with specialized properties to enhance the sustainable impacts provided to the cementitious material. Slight modifications in peptide identities may lead to the addition of proteins that immobilize heavy metals within geopolymer concrete, thus contributing to environmental remediation efforts. Other possible adjustments can yield water-absorbing concrete that has had utility in flood-prone areas or light-emitting concrete that reduces reliance on electricity [67].

Cyclic Peptide Application

While usage of the engineered peptides and nanowires in construction has not been widely considered, nanoscale biosynthetic innovations are gaining traction and suggest the wealth of research results that can be leveraged towards improving self-sensing materials [68]. A 2012 study revealed that a CNT/OPC composite generally showed higher detection accuracy than strain gauges when installed as pavement and monitored for voltage changes in response to vehicular stress [69]. Other work has similarly emphasized potential applications of sensors in concrete for traffic monitoring and road design [70]. However, few studies have investigated the implementation of nanotubular-based, piezoelectric sensors in cementitious materials involved in higher-level construction. Although scientific innovations have helped create more environmentally friendly building materials, these have been scarcely adopted and employed in mainstream home construction.

OPC-based concrete is used in the majority of new and old construction in the place of greener, geopolymer-based alternatives [71]. Poorly maintained and deteriorating structures, such

as homeless shelters, are thus vulnerable to the adverse impacts of OPC, whose high permeability disadvantages overall structural integrity and contributes to building corrosion [72]. A clear application for utilizing cyclic peptide nanotubes as a geopolymer cement additive appears in improving aged construction and design of buildings or renovations [73, 74]. The self-sensing ability of the material, stemming from nanotubular piezoelectricity, promises to reduce repair costs of buildings in the long-term by pinpointing damaged regions within the structure itself. The enhanced geopolymer concrete also lessens operational costs by detecting structural defects before they begin to seriously threaten building integrity. In the context of homeless shelter programs, this is a crucial consideration. Redistributing funds to support services to uphold the well-being of residents and assist them with reintegration is just one downstream, humanitarian effect of the innovative material [75].

Further Directions and Conclusion

Although many state-of-the-art reviews have underscored the favorable properties of geopolymer-based cementitious materials relative to those containing OPC, the civil engineering and building science spheres have not implemented geopolymer cement on a large, commercial scale. This trend may be explained by the lack of studies highlighting effective methods to promote the uniform dispersion of nanotubular constructs in cement matrices. When homogeneously incorporated, CNTs have been shown to improve stability and equip OPC with piezoelectric, strain-sensing characteristics, the latter of which can be applied towards "smarter" building materials [76]. Capitalizing on findings from studies that have shown the incompatibility of conventional superplasticizers with CNTs in geopolymer cement, this review prompts closer scientific attention on cyclic peptide nanotubes by highlighting their roles as both surfactants and nanowire scaffolds.

We propose a sample reaction scheme for the formation of Cu nanowires within cyclic peptide nanotubes to illustrate the potential uses of highly conductive metals in cement innovations. Furthermore, mere modifications in peptide

identities can lead to drastically altered cyclic peptide nanotube functions and customizable properties. While these attributes appear advantageous, more research into the influence of the micro-level environment on cyclic peptide nanotubes should be undertaken to ensure stable formation of the nanoparticles in response to pH changes. Although real-world applications of nanoscale-based, piezoelectric sensors are scarce, increasing research on cement may spur studies investigating their impacts on higher-order civil structures.

By pointing out the vulnerability of current and planned buildings due to OPC-based construction paradigms, this review underscores the benefits of geopolymers in modern-day building projects for its low environmental impact and potential for strain detection. With the development of usable construction innovations occurring at a relatively slow pace compared to the urgent nature of ecological and social stressors globally, alternative innovations and approaches are necessary to generate stronger, longer-lasting building materials. This review indicates that nanoscale engineering can offer immense support for the adoption of geopolymers in the industry. A myriad of sectors can benefit from geopolymers upon further refinement of and research into its technical attributes.

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Report

Digestible Solutions: A Review of Post-Consumer Food Waste at Williams College

Gus Nordmeyer '23, True Pham '23

Executive Summary

In recent years, work involving food waste at Williams College, such as the Cool Food Pledge and the Real Food Challenge, has focused on sustainable procurement. There has been a paucity of work dedicated to the post-consumer side of food waste, despite post-consumer waste accounting for most of the waste generated. Considering the pandemic and the increased amount of waste generated by the college, many students have been forced to think more critically about the college's waste stream and their own contributions to it. In the dining halls, a rise in single-use materials and transition towards meals to-go has diverted more waste to landfills than in years prior and revealed Williams' capability in adapting to a changing public health landscape. The upheaval brought about by COVID-19 presented an opportunity to reevaluate existing dining and waste systems in terms of sustainability and operational efficiency.

The methodology of this research project included a literature review, interviews, and a survey. We gathered resources from numerous academic journals and institutions across the globe. We specifically reviewed previous initiatives undertaken at Williams College that addressed issues of food waste and sustainability. We spoke with many faculty and staff members at Williams College that allowed us to gain an intimate understanding of food, dining, and waste operations at Williams. Interviews were conducted with Williams faculty and staff, including Assistant Director of Custodial Services and Campus Special Events, Dan Levering; Director of Dining Services, Temesgen A. Araya; Assistant Director of the Zilkha Center, Mike Evans; and Director of the Zilkha Center, Tanja Srebotnjak, among others.

I. Survey

For our survey, we wanted to collect information that could directly inform our solutions to food waste at Williams, and we posed questions to Williams students about their habits and opinions regarding food and dining at Williams. The survey questions and structure were crafted through Google Forms under the dutiful guidance of Hana Tomozawa and Professor of Economics Sarah Jacobson, both with substantial experience in this kind of data collection. The survey was distributed through the Williams College Daily Messages,[†] the Economics Department newsletter, the Environmental Studies Department newsletter, and various social media messaging systems. The survey was available from January 22, 2021 until January 29, 2021, during which 232 responses were collected. The survey was structured into four sections. The first section described the survey, and asked students whether or not they had experienced dining on-campus at Williams prior to Fall 2020. These groups were then separated so that certain questions could be asked exclusively to those who had experienced dining on-campus at Williams prior to Fall 2020. The second section asked these students about their opinions and preferences on food and dining. The third section asked students about their habits related to food and dining. The fourth section gathered information on the demographics of our respondents and included an open response section where survey participants could write suggestions or comments about policies regarding food waste.

[†] Daily Messages is a daily email sent to students, staff, and faculty at Williams that contains a variety of Williams-related content.

Some results that depict the habits and opinions of students regarding waste might be skewed favorably because of social desirability bias, which can make some students respond with answers that they think would be perceived as more “socially desirable” [1]. In this case, “socially desirable” behaviors might include composting all of one’s food waste or picking up all meals that are ordered to-go. Additionally, the survey was partially distributed through different newsletters and email listservs that specifically target Environmental Studies students and students interested in sustainability. Due to the demographics, it is possible that our survey responses are skewed towards results that show a more sustainable student body or are more critical of the existing infrastructure regarding food waste.

II. Results

Out of the 232 responses for the survey, 179 respondents (77.2%) indicated that they had experienced dining on-campus at Williams prior to the Fall 2020 semester. 193 respondents (83.2%) were enrolled on-campus for Fall 2020, with the remaining respondents indicating that they were enrolled remotely, abroad, off-campus, or said they did not enroll this semester. The demographics of participants are as follows:

Class Year
232 responses

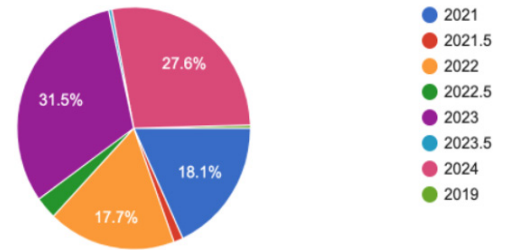


Chart 2: Class year of survey respondents

For Fall 2020, what was your enrollment status?
232 responses

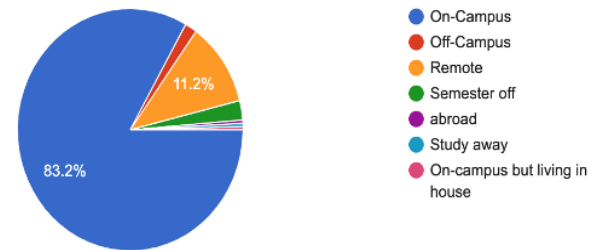


Chart 3: Enrollment status of survey respondents for Fall 2020 semester

Do you play a varsity sport?
232 responses

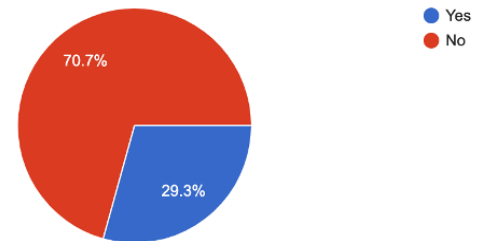
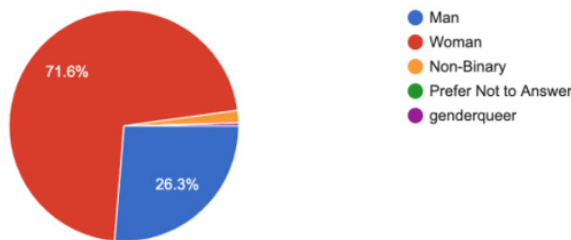


Chart 4: Percentage of survey respondents who play varsity sports

Chart 1: Self-identified gender of survey respondents

Gender
232 responses



Questions meant to survey student habits in dining were not distributed to all participants. We wanted information from some questions to exclusively come from students who had experienced dining on-campus at Williams prior to Fall 2020 because such information would inform our study of dining with a mind toward a post-COVID situation. However, some questions were asked to all participants because they pertained to COVID-specific policies and were exclusively relevant to Fall 2020 dining. Additionally, most questions asked to all participants were required except for questions that were open responses.

For those that had experienced dining on-campus prior to Fall 2020, we asked them how many times they ate their meals in/around the dining halls. 133 respondents (74.3%) said they ate their meals 2-3 times a day on average, with only 8 respondents (4.5%) saying they ate none of their meals in/around the dining halls.

How many times a day on average do you eat your dining hall meals in/around the dining halls?
179 responses

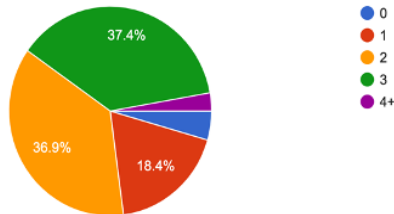


Chart 5: Frequency of students eating meals in/around the dining halls

In response to a question of the number of times dining hall meals were taken to-go, a plurality (47.5%) said they took 1 meal to-go on average each day, with 58 respondents (32.7%) saying they took no meals to-go and the rest of the respondents saying they took at least 2 meals to-go per day.

How many times a day on average do you take your dining hall meals to go?
179 responses

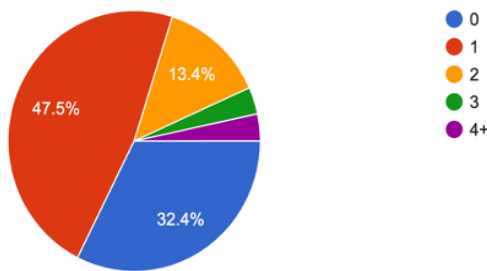


Chart 6: Frequency of students taking to-go meals

When asked how many times per week respondents ordered a meal in advance, 96 respondents (41%) answered ordering an average of 0-3 times a week while 90 respondents (39%) said they ordered an average of 4-7 times a week. We also asked how many times per week respondents ordered a meal and did not pick it up, and we received 188 responses (81%) indicating zero instances and 8 responses (3%) indicating 1 instance on average a week. Dining unit manager

Charlotte Clark noted that there were approximately 25-40 meals that were not picked up each night for the final six weeks of the Fall 2020 semester. We asked respondents to identify the primary reasons they end up with leftover food, presenting a list of reasons to choose. Most respondents listed “I did not like the food” as one of their reasons, and “The food is low quality” as well as “I served myself too much” were widely selected as well, while a mere 12 respondents indicated that they “never waste food”.

When asked how often they disposed of leftover food into the compost bins near the clearing stations within dining halls, 127 respondents (70.9%) said they always disposed of their waste into the compost bins.

If you eat in the dining hall, how often do you dispose of your leftover food and food waste in the compost bins next to the dishes?
179 responses

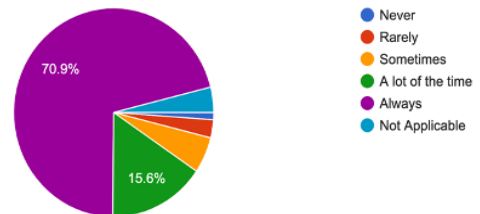


Chart 7: Frequency of composting meals when inside the dining halls

We asked the participants how much food they had left from their dine-in meal on average, and 158 respondents (88.3%) indicated having at least “a little” food left over, with 53 (29.6%) answering “some” and 13 (7.9%) having “a lot” of food left over. Only 16 respondents (8.9%) said they had “none” of their food left from their dine-in meals, on average.

Regarding to-go meals, only 37 respondents (20.7%) said they always disposed of their waste into compost bins. Compared to dine-in meals, the proportion of respondents that finished their to-go meals entirely was greater, with 45 participants (25.1%) answering “none” of their food was left from their to-go meals on average.

If you take your food to-go, how often do you compost the remaining food and food waste?
179 responses

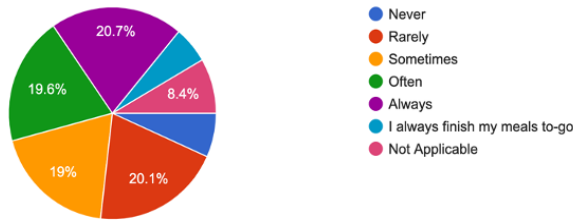


Chart 8: Compost frequency of meals to-go

A series of questions aimed to gauge student attitudes surrounding dining halls and waste processes were directed at all survey participants, regardless of whether or not they experienced dining on-campus prior to Fall 2020. When asked to rate the quality of Williams food on a scale of 1 to 5, with 1 being extremely low quality and 5 being extremely high quality, 125 respondents (54%) rated the food a 3 while 71 respondents (31%) rated the food a 4.

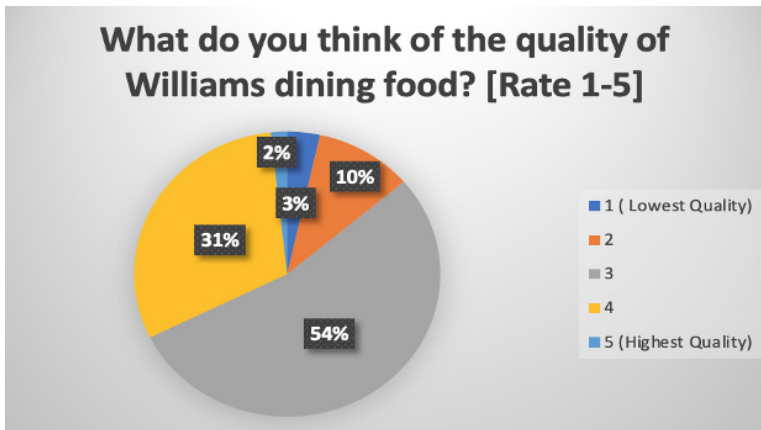


Chart 9: Opinions on quality of dining hall food

When asked about the accuracy of the following statement, “I have a close relationship with the dining staff”, 66 respondents (28%) somewhat disagreed, 58 (25%) respondents were indifferent, and 53 (23%) respondents somewhat agreed.

The respondents were also asked about the accuracy of the statement, “Waste disposal containers are accessible and available at dining halls”, and received 92 (40%) responses somewhat agreeing with the statement and 86 responses (37%) strongly agreeing.

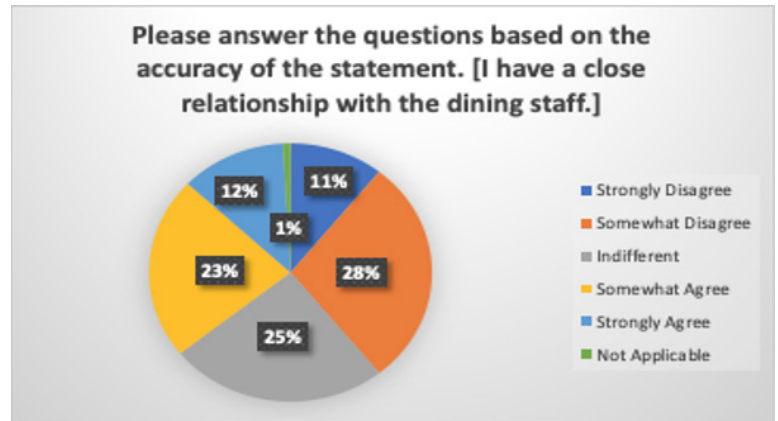


Chart 10: Relationships between dining staff and students

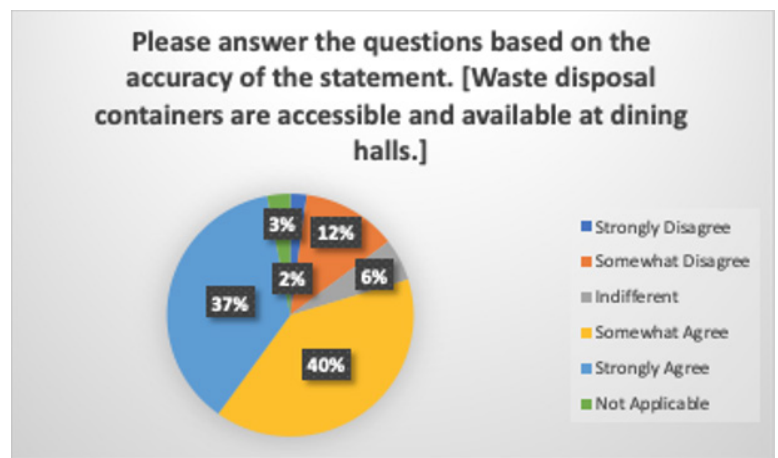


Chart 11: Accessibility and availability of waste disposal containers in dining halls

Respondents were asked the same question about waste disposal containers in their residence, with 72 (31%) respondents strongly agreeing, 65 respondents (28%) somewhat agreeing, and 47 (20%) somewhat disagreeing.

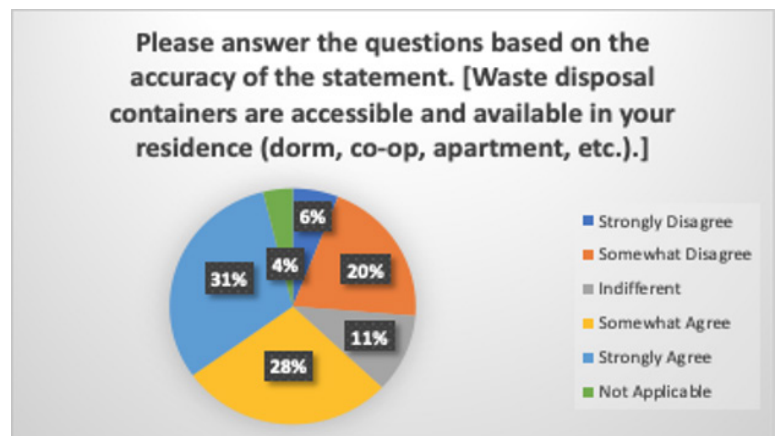


Chart 12: Accessibility and availability of waste disposal containers in residences

Regarding the clarity of composting instructions inside of dining halls, 85 (37%) respondents strongly agreed that instructions were clear, 68 respondents (29%) somewhat agreed that instructions were clear, and 32 respondents (14%) somewhat disagreed that instructions were clear.

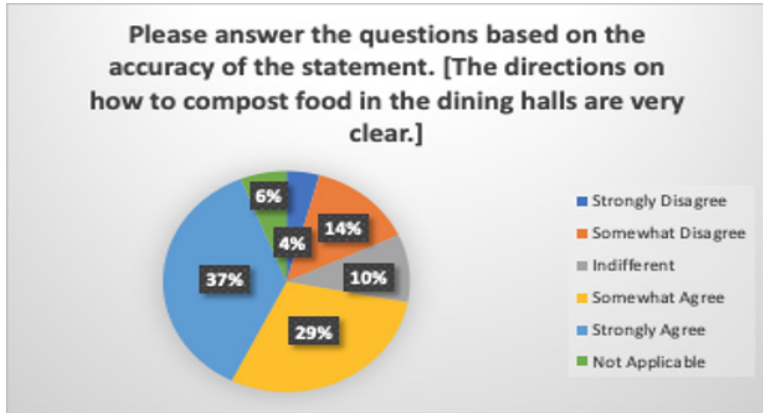


Chart 13: Opinions on composting directions inside of dining halls

Respondents were asked the same question about composting instructions outside of dining halls, with 68 respondents (29%) somewhat disagreeing that instructions were clear, 51 respondents somewhat agreeing (22%) that instructions were clear, and 43 respondents (18%) strongly agreeing that instructions were clear.



Chart 14: Opinions on composting directions outside of dining halls

At the conclusion of our survey, the participants were given an optional question asking if they had any ideas on how to address food waste or improve upon existing policies at

Williams regarding food waste. 94 answers were received from the 232 participants (40.5%) with a number of trends standing out. The most popular idea, by far, was a call for more compost bins across campus. The desired locations ranged from within the dorms to outside the dining halls, but 32 responses (34.0%) made requests for more compost bins. Requests to revert to self- serving in the dining halls, or at least for dining staff to serve smaller portions, received 23 responses (24.5%). Due to the COVID-19 pandemic, health protocols barred self-serving in the buffets, and instead, dining staff served the students. Clearer composting directions, as well as improved education regarding composting and waste separation received 22 responses (23.4%). The responses ranged from calls for clearer signage to increased transparency on the composting process at Williams. Others suggested improving food quality, incorporating student preferences into menu designs, inculcating a culture of sustainability within the student body, expanding the capacity of Williams Recovery of All Perishable Supplies (WRAPS), information on recommended serving sizes, and reforming the meal-swipe buffet system entirely.

III. Discussion

Responses indicated a disparity between the proportion of people who always compost their dine-in meal (70.9%) versus those who always compost their to-go meal (20.7%). This result aligns with variable student accessibility to compost bins depending on campus location. Although there are compost bins directly adjacent to the area that students put their used dishware inside the dining halls, student comments indicated lack of clear directions or access to compost bins outside of the dining halls (i.e. outdoors and inside the dorms). If students took fewer meals to-go, there may be an increase in the rate of compost disposal, though, due to mobile ordering and busy schedules, this change may be difficult to implement. Additionally, further measures could be taken to expand composting directions and access across Williams' campus. To-go meals are often not composted because outdoor and dorm composting bins are often not clearly marked or easily accessible to students. This finding is

supported by the open responses from our survey in which 54 responses (57.4 %) either called for better composting directions or more compost bins. The details and limitations of such policies are explored in our “Recommended Solutions” section.

Consumers are subconsciously motivated to fill the dishware in front of them with food, so if dishware in the dining halls at Williams were reduced, students might end up eating an amount of food they can finish completely [2]. Smaller dishware might reduce the amount of unfinished dine-in meals, and consequently the amount of to-go meals. Coupled with the option of refilling one’s plate within seconds, students would still be able to eat however much they like. Ideally, as little food as possible would end up in trash and compost bins, so reducing dishware sizes could have a significant financial benefit for the college in addition to the positive environmental consequences. According to Mike Evans of Facilities, waste management and transportation costs are calculated by weight, so decreasing the amount of food discarded will directly affect waste management costs.

With regards to student culture and the social space that food service occupies, the survey results indicate a number of issues that could be addressed. When asked whether they had a close relationship with dining hall staff, 64% of respondents in the sample either disagreed or were indifferent to the question. Furthermore, the majority of students cited a dislike for the food (76% of respondents) and the surprisingly low quality (48% of respondents) as the two primary reasons for ending up with food waste. Greater facilitation of relationships between the student body and dining services, as well as a strengthening of communication around students’ individual food preferences must be a priority going forward.

IV. Recommended Solutions

Although we ultimately detail a variety of solutions that fall under the following three categories: “education”, “disposal”, and “operations”, we recommend the following four going forward. Section IV: “Recommended Solutions” outlines these recommendations in greater detail and includes an evaluation of the solutions not included as final recommendations.

IV.i Information Campaign

We propose a two-prong informational campaign. The first piece aims to address students’ relationship with food on campus. A number of sources pointed to a lack of connection between consumers and the food production process as a major cause of food waste [3]. This informational campaign would highlight dining hall workers or possibly local food producers, mimicking the popular blog “Humans of New York” by presenting the stories of subjects alongside a genuine portrait. Perhaps revealing the faces behind the food will encourage students to think more critically about the time and resources that went into the making of their meals.

The second piece of our informational campaign would be a food waste competition utilizing a constantly-updating bulletin. Students would compete as a whole to achieve an amount of food waste below a certain level, perhaps last year’s waste level, and the administration could reward the student body with a prize, such as a pizza party.

IV.ii Orientation

Orientation for first-year students at Williams, known as First Days, is an incredibly formative time. Students are introduced to their fellow classmates, the campus culture, campus traditions, and how to live as a college student. While Root exists as one medium through which students can learn about sustainability, as well as social justice, it is only one of many EphVentures that are offered, with most students electing to do other orientation activities such as WOOLF. Adapted from Ashley Amos’ “A Greener Freshman,” we believe including sustainability education in First Days would inform students about how to behave sustainably during their time on campus as well as build a culture of sustainability into the DNA of Williams students [4].

Sustainability education could come in many different forms throughout First Days. Junior Advisors (JAs) are heavily involved in the frosh’s experience during First Days and are responsible for administering the bulk of dorm-specific education, as well as facilitating student mingling. The JAs could conduct group activities

where the frosh can learn about sustainability on campus. This could be in the form of a poster-making session, or perhaps a scavenger hunt to locate the proper disposal receptacles. The JAs could host informational sessions with the frosh to go over sustainable behavior. Additionally, the JAs' behavior and habits can act as models for the frosh. Incorporating sustainability education into JA training could ensure that the JAs demonstrate sustainable behavior for the frosh to imitate. Class-wide activities could also be tailored to educate the frosh on sustainability at the college and could supplement work from the JAs in inculcating a culture of sustainability.

IV.iii Clean Plate Club

Dining hall food disposal lines are often congested and frustrating for students who don't have food to dispose of, particularly around peak dining times. Adapted from alumni Eleanor Lustig's "Reducing Post-Consumer Wastefulness," The "Clean Plate Club" would expedite the disposal process for students with no food waste, allowing them to drop off their serveware at an additional cart in the disposal area and exit the dining hall quickly [1].

The cart should be clearly visible, so the act of returning serveware to the cart might be a social signal. Also, the cart should be placed in the proximity of the entrance, so the presence of the dining attendant might disway students looking to subvert the honor system. Students have volunteered as "Composting Buddies" in the past to educate their peers about composting etiquette, and their responsibilities could be expanded to address students using the additional cart.

IV. iv Reduce Plate Size

Although many aspects of the food choice environment influence how much food a student deems as the "appropriate amount", studies have shown plate size to be one of the most important factors in determining food intake [5]. Given that a plate replacement in Driscoll dining hall is forthcoming, we recommend that the college reduces the size of their plates across all three dining halls. Unexplored by higher education institutions, for a more cost-effective solution to

address the effects of plate-size on food intake, the college may develop an informational campaign in conjunction with dining services, informing students of the psychological link between plate-size and food intake.

In addition to the four solutions that we have recommended, we also discuss a sustainability course requirement, liquid waste diversion, expanding mobile ordering, and more frequent, focused data collection. We decided not to include them for a variety of reasons, mainly due to difficulties in viable execution, especially when compared to their projected impact on food waste and sustainability.

V. Conclusion

We hope this project contributes to a multi-dimensional culture of sustainability at Williams College. In addition to envisioning new ways the college can mitigate their negative environmental effects, Williams students are influenced by the curriculum and on-campus, direct experiences to become environmental stewards in their post-graduate life. By illustrating multifaceted responses from students, staff, faculty on food waste and sustainability across different time periods, our survey showed the poor quality of student-dining staff relationships, student desire for expanded outdoor composting and more detailed composting instructions, the discrepancy between to-go food waste and dine-in food waste during COVID, and student's perceived negative impact of self-service on food waste. In the same way that prior student work heavily informed this endeavor, we hope that our piece helps lay the groundwork for future student efforts in sustainability and food waste.

VI. Appendix: Survey Questions

Section 1. Students that Experienced In-person Dining Prior to Fall 2020

- What do you think of the quality of Williams Dining food? [rate 1-5]
- Rate the Williams Mobile app [rate 1-5]

- Please answer the questions based on how strongly you agree with the statement [Strongly Disagree, Somewhat Disagree, Indifferent, Somewhat Agree, Strongly Agree, Not Applicable]
 - The Williams Mobile app is accurate in displaying meal options.
 - I have a close relationship with the dining staff.
 - Waste disposal containers are accessible and available at dining halls.
 - Waste disposal containers are accessible and available in your residence (dorm, co-op, apartment, etc.).
 - The directions on how to compost food in the dining halls are very clear.
 - The directions on how to compost food outside of the dining halls are very clear.
 - How many times a day on average do you eat your dining hall meals in/around the dining halls? [0, 1, 2, 3, 4+]
 - How many times a day on average do you take your dining hall meals to go? [0, 1, 2, 3, 4+]
 - How many times per week do you order meals in advance (Fall 2020)? [0-3, 4-7, 8-11, 12-15, 16+]
 - How many times per week do you order a meal and not pick it up? (Fall 2020)? [0, 1, 2, 3, 4+]
 - If you eat in the dining hall, how often do you dispose of your leftover food and food waste in the compost bins next to the dishes? [Never, Rarely, Sometimes, A lot of the time, Always, NA]
 - On average, how much of your dine-in meal is left when you are finished eating? [None, A little, Some, A lot, Most, NA]
 - If you take your food to-go, how often do you compost the remaining food and food waste? [Never, Rarely, Sometimes, Often, Always, I always finish my to-go meals, NA]
- How many times per week do you order a meal and not pick it up? [0, 1, 2, 3, 4+, NA]
- What meal plan are you currently on? [14, 21, no meal plan]
- How many unused meal swipes do you have on average per week? [0-2, 3-5, 6+, NA]
- When you end up with leftover food, what is usually the reason? [The food is low quality, I'm in a rush to finish eating, I served myself too much, I never waste food, I did not like the food]

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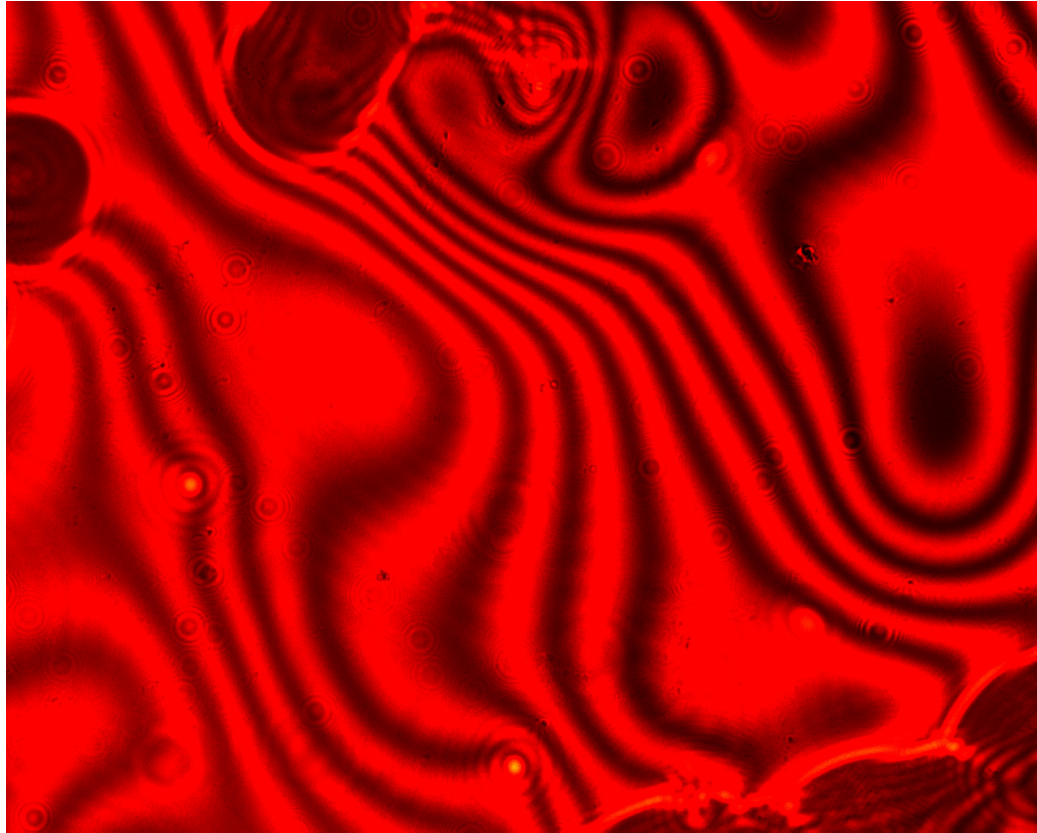
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Section 2. Students that have not Experienced In-Person Dining Prior to Fall 2020

- How many times per week do you order meals in advance? [0-3, 4-7, 8-11, 12-15, 16+]



Viscous fluid flow topography via Linnik interference microscopy
By Nicholas Patino



Short Review

The New “New Age” of Magic Mushrooms

Raphael Rakosi-Schmidt

For as long as humans have had consciousness, we have been trying to find ways to alter it. In fact, the use of psychedelic compounds is older than any written historical account, with evidence of mushrooms from the *Psilocybe* genus, now commonly known as “magic mushrooms,” being used in indigenous rituals in Mexico for millennia [1]. Numerous people have heard of—or experienced firsthand—the purported hallucinatory and euphoric effects of these fungi. However, many of the underlying consequences on our neurobiology have only recently been revealed, in large part due to a loosening of federal policy on research into psilocybin, the main psychoactive component of the drug [2].

When psilocybin is ingested into the body, it spreads throughout the bloodstream and is dephosphorylated into psilocin in the liver, which reaches its maximum blood concentration approximately 80 minutes post ingestion [3]. Psilocin is the chemical directly responsible for the mind-altering effects of magic mushrooms, due to its ability to cross the blood-brain barrier, bind at particular serotonin receptors, and excite the corresponding neurons [3]. In addition to acting as a serotonin receptor agonist, psilocin has been shown to have some minor effects on dopamine receptors. By deactivating the sodium-dependent serotonin transporter, psilocin also delays serotonin reuptake from the synaptic cleft, further increasing the postsynaptic excitability of serotonergic neurons [3].

This increased activation of serotonin receptors, particularly 5-HT_{2A}, is believed to be what leads to the visual hallucinations experienced by so many people under the influence of psilocybin. 5-HT_{2A} is widely expressed throughout the visual cortex, and its expression is heavily dependent on

retinal input, indicating that this receptor plays a role in optical processing [4]. Likewise, increases of 5-HT_{2A} in the temporal and motor cortices are associated with visual hallucinations in Parkinson’s patients [5]. One potential theory for the basis of psilocybin-induced hallucinations postulates that increased excitability in the visual cortex leads to an increase in the “random” firing of neurons, which humans experience as constantly changing geometric shapes and designs [6], though this does not provide an explanation for the effects on downstream visual processing that lead to more complex visions of faces, animals, and people.

We are only just beginning to understand how psilocybin acts on the human brain, but even now policy changes are starting to reflect shifts in public opinion. Thanks to a recently passed ballot measure in Oregon [7] and more moderate decriminalization policies in cities across the United States [8], over the next few years further research will be conducted on the efficacy of this drug for treating psychiatric and neurological illnesses. Despite there currently only being a few studies with small sample sizes, the use of psilocybin in conjunction with traditional therapies has already yielded promising results in the treatment of depression [9], anxiety [10], and substance use disorders [11] [12]. Nonetheless, only time will tell the role that magic mushrooms will play in medicine and society at large. One can only hope that the loosening of restrictions on new research will allow us to further our understanding of how these psychedelic fungi can have beautiful, therapeutic, and potentially life-changing effects on our minds.

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What Do We Want from a Theory of Global Justice?

Sam Thorpe '22

We live in a globalized world. The international exchange of ideas, capital, and people makes national sovereignty weaker and undermines the capacity of individual states to address issues of justice without global coordination, and our interconnectedness continues to grow as financial, diplomatic, and technological integration become more total.¹ Yet our conceptions of justice have not evolved to meet the challenge. Theorists like Amartya Sen and Nancy Fraser acknowledge the necessity of thinking about justice in a global framework but miss the need for a philosophically rigorous transcendental theory, while others look to past ideas about sovereignty or ways of living as an ideal without acknowledging that “going back” is an impossibility. More radical thinkers argue that the entire idea of a theory of global justice is flawed, with its roots in an epistemology legitimated and shaped by power along with a concept of rationality imposed under structures of colonial domination, but provide no explicit path towards a better world. By analyzing these critiques, we can better understand what is missing and what needs revision in a theory of justice for a globalized age. Such a process will illustrate the need for a framework of global deliberation on metatheoretical questions of justice.

This contention raises a number of questions, which will be dealt with sequentially. The most fundamental regards why a theory of global justice is necessary at all. Post-development theorists like Majid Rahnema

argue that one way forward is to return people to their “social-cultural space-times,” centered around small, face-to-face, vernacular interactions that do not require mediation by grand institutional structures. Rahnema and other theorists in his field do not seek to make any concept of global justice work. They instead desire to return to a system in which human beings meet their needs through a more limited “network of human relationships... [and] the many forms of solidarity, co-operation, and reciprocity they develop within their communities.” The post-development theorists are correct on one count: without the aggregation and economization of human social life, a theory of global justice would be unnecessary. But for all its appeal, a return to disaggregated vernacular cultures is impossible in some respects and undesirable in others. The global integration of all human life has become so deep that even catastrophic events like world wars, financial crises, and a global pandemic have not fundamentally changed our international socioeconomic relationships. My assumption for the purposes of this essay is that we *do* exist in a thoroughly integrated world, marked and defined by globalization, and that we require some way of making decisions about the justice or goodness of institutional arrangements under these conditions.

Let us now turn to the question of the unit of analysis. Why does a contemporary theory of justice need to be global, rather than confined to the boundaries of a sovereign “people” as in

¹ See Thomas Pogge, “What Is Global Justice?” in *Politics as Usual* (Malden, MA: Polity, 2010), 10-11. See also Nancy Fraser, “Reframing Justice in a Globalizing World,” *New Left Review* 36 (2005), 69-72.

² Majid Rahnema, “Poverty,” in Wolfgang Sachs (ed.), *The Development Dictionary: A Guide to Knowledge and Power* (London: Zed Books, 1991), 162-168.

Rawls³ and many other 20th century theorists? Any other unit of analysis does not give us the capacity to deal with the staggering inequalities between territorial states. The global wealth ratio between the top and bottom 10% of families currently stands at more than 2800:1,⁴ and citizenship remains the single most important predictor of lifetime earnings, explaining more than 60% of all variation (more than race, gender, parental education, or even parental earnings).⁵ As human beings have no agency over where we are born, it seems *prima facie* unjust that we experience such drastic differences in the opportunities and experiences open to us throughout our lives on this basis. Thus, any theory of justice which fails to account for differences between sovereign states and simply operates within them neglects to address a significant source of injustice.⁶

Some theorists attempt to deal with this issue without making the scope of justice totally global, often by relying on various versions of Nancy Fraser's "All-Affected Principle." This principle holds that anyone "affected by a given social structure or institution" would be considered a "[subject] of justice in relation to it," enabling them to have a voice in deliberations over justice and the good.⁷ However, the usefulness of such a principle relies on clearly defining "affected," which is not a trivial task. In the contemporary world, where global interconnectedness on issues from asset pricing

³ Rawls defines his relevant unit of analysis in *A Theory Of Justice* as "a closed [society] isolated from other societies", and notes that "the law of nations may require different principles arrived at in a different way." John Rawls, *A Theory of Justice* (Cambridge, MA: Harvard University Press, 1971), 8.

⁴ Pogge, "What is Global Justice", 12.

⁵ Milanovic, Branko. "How Much of Our Income Is Determined by Where We Live?" World Economic Forum. <https://www.weforum.org/agenda/2015/05/how-much-of-our-income-is-determined-by-where-we-live/>.

⁶ I am not suggesting that the nation-state system must necessarily be rejected in full. It is possible that a process of global deliberation would see a world composed of sovereign states as the least-bad option, particularly if the alternative is a more fundamentally anarchic global system like that which existed before Westphalia. Yet if we want global justice, the ideas of territorial sovereignty and birthright citizenship must come under critical scrutiny.

⁷ Fraser, "Reframing Justice", 82.

to climate change intensifies the 'butterfly effect,' it could be argued that "anyone is affected by just about anything."⁸ Arriving at a workable conception of 'all-affected' therefore necessitates that we narrow the concept of affectedness until it "becomes an operationalizable standard for assessing the justice of various frames,"⁹ requiring the theorist to make a decision monologically.¹⁰ Such a decision would be subjective, fundamentally influenced by the theorist's own preconceptions about who should "count" as part of a theory of justice. The only possibility that would not represent a subjective judgement is to *not* draw an arbitrary line, and rather to allow the participation of anyone in any way affected. Given the interconnectedness of the contemporary world, this would mean *everyone* has the right to contribute to conversations about justice anywhere. Thus, even if we accept the all-affected principle rather than a more expansive conception allowing people to care about the well-being and dignity of others, we still require a global theory. Only globally can we solve questions of the "how" of justice.¹¹

The only premise of a theory of global dialogical justice that remains unsubstantiated is its dialogical nature. This piece is the hardest to defend in full; it should be acknowledged not as a perfect ideal but as the least-bad option. The most pressing critique of dialogue suggests that fair dialogue is impossible in general, either because human structures of knowing and communicating are inherently shaped by power or because a fair global dialogue is impossible

⁸ Fraser, "Reframing Justice", 83.

⁹ Fraser, 83.

¹⁰ Decisions about who is included in a dialogical framework of justice cannot be made dialogically by their very nature: someone must decide who will be part of the dialogue ('who decides the deciders'), or decide who will decide who will be part of the dialogue ('who decides who decides the deciders'), and so on ad absurdum. Fraser seems to miss this point, acknowledging that the principle is "open to a plurality of reasonable interpretations" but insisting that "its interpretation cannot be determined monologically, by philosophical fiat" and suggesting instead that analyses contribute to a "broader public debate." Fraser, "Reframing Justice", 83.

¹¹ See Fraser on "meta-political justice." (Fraser, "Reframing Justice", 84-86.)

with such culturally variant values and conceptions of the good. This point, as voiced by Anibal Quijano, is premised on the idea that colonial legacies have artificially universalized a particular (Western) conception of reason and thus “repress[ed]... modes of knowing [and] producing knowledge” of the colonized.¹² This has reproduced relationships of “colonial domination” within the epistemological sphere. A mode of reasoning and communication with European roots is highlighted as the only viable option at the expense of alternative modes, rendering communication unequal.¹³ This critique threatens the very foundation of a dialogical theory, suggesting that such a process cannot be fair after centuries of ongoing colonial violence. Yet while it does highlight the need for “another rationality” formed out of a process of epistemological decolonization,¹⁴ this flaw does not render dialogue totally unworkable. One of the key attributes of a dialogical system is its amenability to change and revision on the basis of dynamic understandings. Even the process of dialogue itself can be adapted to reflect the colonial critique; a defensible dialogical theory of global justice will always strive to remove barriers and ensure that all parties can contribute equitably. Ultimately, we still must choose between a flawed dialogical system or a monological one that universalizes a particular conception of the good and the just (that of the theorist). A dialogical theory that perpetually strives to adopt modes of reasoning that are most preferred by most people, thus striving towards its own decolonization, seems the most preferable of these imperfect options.

If this line of argument is accepted, we must face the question of what exactly to do with a theory of global dialogical justice. What should it be concerned with, and how explicitly should it

¹² Anibal Quijano, “Coloniality and Modernity/Rationality,” *Cultural Studies*, 21:2-3 (2007), 169.

¹³ Quijano, “Coloniality,” 168-169. Whether the genesis of contemporary rationality is entirely European is not self-evident (see Amartya Sen, “Reason and Objectivity,” in *The Idea of Justice* (Cambridge, MA: Harvard University Press, 2009), 36-39), but the premise will be accepted here for the purposes of argument.

¹⁴ Quijano, “Coloniality,” 177.

address contemporary or future issues? While deliberation could be applied to empirical issues (deliberation on the best way to accomplish some already-specified end) or to theoretical ones (deliberation on what that end should be), its most important application is to metatheoretical concerns (deliberation on how we should decide our ends in the first place). Assuming our end is some particular conception of the good, metatheoretical questions will determine who decides on the “right” conception and how they decide on it. For all the reasons discussed previously, only a global deliberative framework can justly determine answers to these questions. Not all empirical or theoretical questions are necessarily best decided by a global deliberative framework (i.e. they may be more efficiently or accurately resolved through devolution of the process to a sub-global institution or deliberative group), but only by applying a global deliberative framework to metatheory can we identify which issues can justly be devolved in this way. Thus, global deliberative justice must be applied to metatheoretical questions, but should be confined to this space so that the deliberative process can determine the appropriate institutions and groups for dealing with particular theoretical or empirical issues.

This focus on metatheory also dispels the illusion of a convenient comparative theory of justice, which would concentrate exclusively on “ranking alternative societal arrangements” with the aim of figuring out whether “some arrangement is ‘less just’ or ‘more just’ than another.”¹⁵ To comparativists like Amartya Sen, this is the appropriate response to our imperfect human condition: Sen considers the identification of perfect justice neither necessary nor sufficient for approaching “different ways of *advancing* justice in a society (or in the world).”¹⁶ Yet while his understanding is politically convenient for someone seeking to reshape the world through economic development, closer examination illustrates its lack of rigor and the continued need for

¹⁵ Amartya Sen, “What Do We Want from a Theory of Justice?” *The Journal of Philosophy* vol. CIII, no. 5 (May 2006), 216.

¹⁶ Sen, “What Do We Want”, 217. Emphasis mine.

transcendental theory. Sen's own example illustrates the point: he discusses how knowledge of the height of Mount Everest, the tallest mountain in the world, is "neither needed, nor particularly helpful," in comparing the heights of two lesser peaks.¹⁷ What is needed, but goes unmentioned, is a *conception of 'height.'* We need something with which we can measure each mountain and understand what it means to be tall, thus giving us a way to decide which is taller. In discussing social arrangements, no such measure is readily apparent: there is a theoretical question of what our end is, whether it be "justice" or "goodness" or anything else, and how we can advance it. These are not concepts that can be measured objectively, as one could use feet or meters to objectively measure the height of a mountain. Rather, their meaning is constantly subject to debate and change among individuals and groups with different conceptions of the good. Fair comparisons between social arrangements cannot be made without a clear idea of the desired end of those arrangements, and a clear idea of the desired end cannot be fairly identified without a just procedure for its identification. Thus, a metatheoretical approach is necessary even if one contests the desirability of a transcendental theory of justice for its own sake. Without it, we lack even the ability to make fair comparisons between theories or social arrangements.

This paper does not seek to deal explicitly with questions of process, i.e. how exactly global deliberation on metatheoretical questions will yield answers. The most-just process is itself a matter of substantive debate in its own right, and the only thing that appears clear is that it would be democratic in nature: the presentation and substantiation of ideas followed by some form of voting on them.¹⁸ It certainly does not

attempt to speculate on what would be decided, now or in the future, about historically contingent questions evaluated by humans ingrained with the values and prejudices of their particular culture and time. We must accept the fact that the owl of Minerva flies at dusk, and be humble about the capacity of abstract philosophy to fairly decide such questions at the times they are relevant. A dialogical, metatheoretical framework for justice is strong precisely because of its humility: it does not provide historically and culturally contingent answers to questions about justice or the good. Instead, it ensures only that the global community can justly decide on their desired ends and revise these decisions as their values and conceptions of the good change. We cannot reasonably ask for more.

¹⁷ Sen, 222

¹⁸ This again raises the issue of how the voting process would be decided (who decides how we decide), which raises how decisions about the voting process would be decided (who decides how we decide how we decide), and so on, necessitating at some point a monological decision. I would suggest a multi-stage ranked-choice vote among all human beings on the final voting method, in which anyone can suggest a method to be included in the initial round of voting, as a placeholder, but this is not integral to the theory and could be altered if a fairer method is identified.

Understanding Keith Haring Through the World of Ancient Greek Revelry

Benjamin Ward '22

Keith Haring's simplistic yet charged figures have become instantly recognizable, even to those who are unfamiliar with the artist himself. His art is visible everywhere from major art institutions like the MoMA and the Guggenheim to massive retail stores like Urban Outfitters who sell sweatshirts with his designs.¹ In attempts to better understand these figures, connections have been drawn between Haring's forms and the world of archaic art. A host of archaic influences from Aztec art to Egyptian drawings have been identified in his work.² However, one area left surprisingly unmined is the world of ancient Greek art. This paper will explore the art of ancient Greece and the wealth of information that helps to better understand Haring's style.

Born in Kutztown, Pennsylvania, with a penchant for art, Haring quickly outgrew his life at home, getting into drugs and running with a crowd of what he described as "troublemakers."³ In 1978, Haring moved to New York City and enrolled in the School of Visual Arts.⁴ He first gained notoriety as a street artist, creating chalk drawings in empty subway advertisement slots in the winter of 1980.⁵ It was in these drawings

that Haring began to develop the archetypal figures that would define his artwork for years to come: the radiant baby, the dogs, the flying saucers, and his simplistic yet energetic humans.⁶

Within these images, there is one constant theme that permeates throughout. That is the theme of dance and movement. Haring's works, like Haring himself, are full of energy. It is rare to see a drawing or painting that does not contain images of people in motion and dancing together. This is not surprising as dance played an important part in Haring's own life. He was constantly listening to music and moving as he worked.⁷ Just as essential to Haring's life were dance clubs such as Paradise Garage and Club 57. These places offered more than just a recreational activity for Haring - they became his community and his way of life.⁸

Similarly, dance permeated ancient Greek culture; it was used to teach, in funeral and military processions, and celebrations.⁹ These rituals are documented and depicted most frequently on Greek vases created between 700-400 B.C.E. More specifically, it seems that in both depiction and context, it is the Dionysian rituals such as the Dithyramb, and symposiums that have the most similarities to Haring's work.

¹ "Keith Haring Hoodie Sweatshirt," Urban Outfitters, last accessed April 5, 2020, <https://www.urbanoutfitters.com/shop/keith-haring-hoodie-sweatshirt>

² "Keith Haring: New Wave Aztec," Solomon R. Guggenheim Museum, last accessed April 6, 2020, <https://www.guggenheim.org/exhibition/keith-haring-new-wave-aztec>; Keith Haring, *Keith Haring Journals* (New York: Penguin Books, 1996), 48.

³ John Gruen, *Keith Haring The Authorized Biography* (New York: Simon & Schuster, 1991), 1, 18.

⁴ Gruen, 32.

⁵ Gruen, 67.

⁶ Gruen, 65.

⁷ Keith Haring 1978-1982 (Cincinnati, OH: Contemporary Arts Center, 2010), 84.

⁸ Deitch Projects, "Paradise Garage," *Paradise Garage Catalogue*, 2001, http://www.haring.com/!/selected_writing/paradise-garage#.XowWf9NKjGI.

⁹ Lillian Lawler, "The Dance in Ancient Greece," *The Classical Journal* 42, No. 6 (1947): 344.

Dionysus, perhaps best known as the god of wine, is often called upon in festivals and times of revelry. This is the case in the Dithyramb, a wild choral dance performed in the name of Dionysus.¹⁰ The god is also often invoked in symposiums, the male-dominated drinking parties.¹¹

In Ancient Greek depictions of this revelry, the movement and sexuality show a connection to Haring's own artwork. Yet, the connection to the art and dance of ancient Greece goes beyond this low-hanging fruit as these images hold deeper meanings of community, divine inspiration, revelry versus control that are folly to ignore.¹² Just as it would be a mistake to view Haring's own images of dance as independent from the ethos of his life, it would also be a mistake to view the connection between images of revelry on Greek vases and Haring's art without looking at the rituals and customs within the Dionysian dances and symposiums that informed this imagery in relation to Haring's world of 1980's New York. It is the goal of this paper to not only show a connection between Haring's work in the early 1980's and Greek vase imagery of Dionysian rituals, but also to use these ancient Greek rituals of revelry, rebirth, and community to better understand Haring's own world of dance and art in 1980's New York. The foundation of this relationship lies in establishing a visual connection between depictions of Dionysian rituals on Greek vases and Haring's artworks. Once this is established, it is then possible to use Greek rituals to create a lens through which to view the world of Haring's art. For those familiar with Haring's work, the most obvious source of connection with Greek art is Haring's ceramic vases.

¹⁰ Matthew C. Wellenbach, "The Iconography of Dionysiac Choroï: Dithyramb, Tragedy, and the Basel Krater," *Greek, Roman, and Byzantine Studies* 55 (2015): 75.

¹¹ Barbara Graziosi, Barbara Graziosi, Phiroze Vasunia, ed., *The Oxford Handbook of Hellenic Studies* (Oxford, UK: Oxford University Press, 2009), 276-280.

¹² Jane Harrison, *Themis, A Study of the Social Origins of Greek Religion* (Cambridge, UK: Cambridge University Press, 1912), 37.

1. Dithyrambic Vase Paintings and Haring's Art

Especially in composition, it is easy to see the similarities between Haring's vases and the ceramics of ancient Greece. Haring's 1983 vase (fig. 1) contains multiple levels of images; the largest section of images comes right before the bend of the neck of the vase with the second largest section of images directly beneath it. Geometric shapes and wavy lines divide the different levels of images. This is very similar to the archaic krater vase from the 700's B.C.E. (fig. 2) which also sports its largest level of images right before the curve up to the neck and divides its levels with geometric shapes and wavy lines. However, this connection comes as no shocking revelation. Haring himself comments on the creation of these vases saying, "The confrontation between the history of vase paintings and the contemporary approach of drawing with marker and the mixture of contemporary and ancient symbols produces an ironic mixture of opposites."¹³ While not



Figure 1: Untitled Sculpture, 1983, Keith Haring Foundation

¹³ "Untitled Vases, 1984," Keith Haring Foundation, last accessed April 6, 2020, <http://www.haring.com/!art-work/185>.



Figure 2: Terracotta Krater, 750-735 B.C.E. Acc. 14.130.14 Metropolitan Museum of Art

groundbreaking, these vases nonetheless prove that Haring did not turn a blind eye to the art of the classical world and that he was open to dialogue and influence from this era.

A theme within Haring's art that deserves attention in relation to Greek vases are his dancing figures placed besides images of smiling faces. These images first seem to appear in Haring's work during the early 1980's and consist of a procession of dancing or acrobatic figures that are clearly in motion. These images are then either flanked or punctuated by faces with bulbous eyes at the end of the line of figures.¹⁴ An excellent example of this is the now destroyed 1982 Houston and Bowery Street mural (fig. 3). On their own, the images of the dancing figures seem rather unrelated to the bulbous faces that accompany them. However, an interesting parallel can be found in the Kylix eye-cups of ancient Greece.



Figure 3: Keith Haring, Houston Street and Bowery Mural, 1982, Keith Haring Foundation

These cups were used at symposiums for drinking a mixture of water and wine.¹⁵ The symposiums were after-dinner parties where upper-class men would relax and come together in a communal bond of brotherhood. The act of sharing a cup generated strong bonds between members of such symposiums.¹⁶ The Kylix used in these ceremonies often contained images or revelers on the outsides as well as large eyes and other facial features. These details are evident on a Kylix from the 6th century B.C.E. (fig. 4). The eyes were placed on the cup so when the drinker lifted the cup to their lips, the eyes of the bowl would cover the face like a mask. This allowed

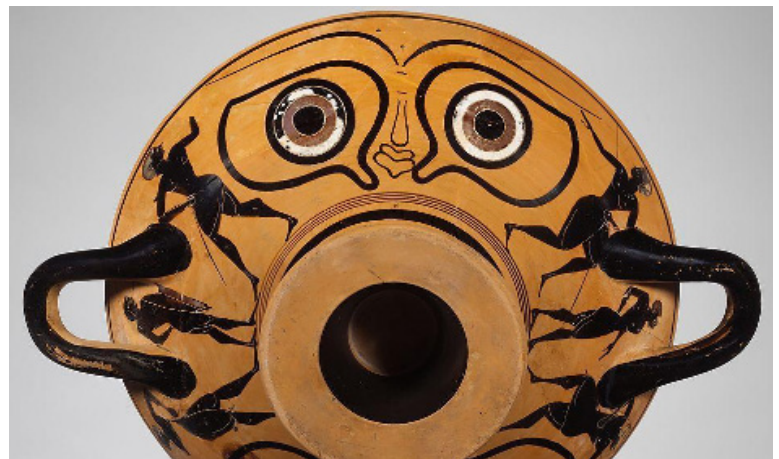


Figure 4: Terracotta Kylix eye-cup (front and back), 520-510 B.C.E. Acc. 96.18.50 The Metropolitan Museum of Art

¹⁴ "Art" Keith Haring Foundation, last accessed April 6, 2020, <http://www.haring.com/!/year/1982>.

¹⁵ Matthew Naglak, "Turning the Cup: Thematic Balance in the Greek Symposium," *Inquiry: The University of Arkansas Undergraduate Research Journal* 11, no. 6 (2010): 25.

¹⁶ Naglak, 20.

the drinker to embody the spirit of the reveler and invoke the god Dionysus with which the symposiums were associated.¹⁷

In form alone the connection between Keith Haring's dancing figures and faces is hard to ignore. While the figures featured on the Kylix vase are far more stylized than the figures featured on Haring's mural, the way that movement is conveyed in their limbs is very similar. Additionally, the faces on Haring's mural that flank his dancing figures create a composition comparable to the Kylix, if it was flattened onto the wall with the two masks on either side of the reveling youths. While it would be presumptive to make the assumption that Haring's design is derived from these Kylix eye-cup forms, masks are commonplace in the celebrations and dances of many different cultures and often signify a transformation into the divine through dance.¹⁸ At the very least, then, these Dionysian drinking cups lend a framework through which to view and interpret Haring's works. However, Haring's depictions of dolphins offer evidence that the Kylix eye-cup imagery can be seen as a direct influence on Haring's work.

Haring's dolphin imagery serves as a major motif in his artwork. Sometimes they are shown with just their heads above the water,¹⁹ but most often they are shown in a cycle of transformation from human to dolphin while jumping up and out of the water.²⁰ They are also depicted with human figures riding them.²¹ In ancient Greece dolphins were often associated with Dionysus through a myth where Dionysus, seeking retribution towards pirates who captured him and did not believe he was Dionysus, turns the sailors into dolphins as they jump over the sides of the boat in panic. Not only is this a common myth associated with Dionysus,

but it is also referenced on Kylix eye-cups.²² Comparing one of Haring's depictions of the dolphin-to-man transformation (fig. 5) with an ancient Greek depiction of the Dionysian myth from a terracotta vase (fig. 6) shows inarguable similarities. Interestingly both images show stages of transformation where there is a human on the top half and a dolphin on the bottom, and vice versa. Even the depiction of the dolphins' eyes appears similar.



Figure 5: Keith Haring, Untitled, 1983, Keith Haring Foundation



Figure 6: Metamorphoses of the Tyrrhenian Pirates, Attributed to Micali, 510-500 B.C.E.; 1982.134 Toledo Museum of Art

¹⁷ "Dionysus and the Symposium Wine, Poets, and Performers in Ancient Greece," Museum of Fine Arts Boston, last accessed April 6, 2020, <https://www.mfa.org/collections/featured-galleries/dionysos-and-the-symposium>.

¹⁸ Harrison, 27.

¹⁹ "Art" Keith Haring Foundation, last accessed April 6, 2020, <http://www.haring.com/!/art-work/>, 227.

²⁰ "Art," Keith Haring Foundation, 594.

²¹ Keith Haring 1978-1982 (Cincinnati, OH: Contemporary Arts Center, 2010), 196.

²² Antike Am Koenigsplatz Museum, <https://www.antike-am-koenigsplatz.mwn.de/en/ancient-masterpieces/museum-highlights/archive-of-museum-highlights/dionysos-cup.html>.

However, in addition to being a popular image associated with Dionysian myths, dolphins also played a key role in the Dithyramb, the Dionysian choral dance ceremony. Images of men riding dolphins on the vases have been connected to a more humorous aspect of the Dithyramb through the cult of the dolphins associated with it.²³ Given the prominent role of Dolphins in the Dithyramb and the similarities their portrayals hold with Haring's own depictions, the assumption that Haring drew influence from these images seems well-founded.

Taken together, the vases, the dancing figures with the faces, and Haring's depictions of dolphins make a strong case for Haring's acknowledgement of the Greek vase depictions of dance and ceremonies. When considering the fact that all these images appear between the years of 1980 and 1983, it seems even less of a coincidence. However, whether or not Haring consciously incorporated these designs into his work, or if it was a subconscious absorption of forms and information is difficult, almost impossible to tease out. Remarking on the creation of his own style, Haring simply says, "Out of these drawings my entire future vocabulary was born. I have no idea why it turned out like that. It certainly wasn't a conscious thing."²⁴ With Haring's own claims in mind, it is worth exploring an artwork with less of a clear figural connection to Dionysian ritual.

This Untitled painting by Haring was created in 1983, around the same time as the other works by Haring that have been examined in this paper. Created with vinyl ink on vinyl tarpaulin, the painting stands at seven square feet, certainly not one of his smaller works, but also not of the monolithic size on which he was also capable of working. The color scheme of the painting is kept very simple, adhering to a strict usage of black, yellow, and red across the entire canvas. The tarpaulin is covered in red paint with a yellow border perforated with red dots. The four humanoid figures within the canvas are also outlined in yellow with red dots in an identical scheme to the canvas border.

The yellow lines appear continuous for the most part, consisting of very long brush strokes.

The canvas shows two mirror figures on the left and right sides of the canvas, both have one arm raised in the air and the other arm outstretched so that they connect in the middle of the canvas. These figures appear to be slightly off the ground as a third figure – shown in the middle of the canvas and overlapped by the other two figures – has its feet grounded on the border of the canvas. This figure stands with its legs apart and feet pointing to the edges of the canvas with its arms raised in a "v" shape in the air. Above and between this figure's arms is Haring's signature image of the radiant baby on hands and knees. Surrounding all four figures are yellow lines with red dots, four of which have a circle at the end. Black squiggle lines permeate all parts of the canvas that are within the yellow border and form almost figural images within the bulging stomachs of the two mirror-imaged figures.

This painting can be interpreted to signify creation at almost every turn. The two mirrored figures clearly depict pregnancy, and they appear to be lifted off the floor in dance as the energetic lines emulating off their limbs exude movement. Meanwhile, the stationary figure in the middle is smaller than the two pregnant figures, perhaps symbolizing a younger man or teenager. Bringing the theme of creation full circle are the barely discernible figures in black within the pregnant women's stomachs and the four round balls with tails at the women's backs that can only represent sperm. The theme of birth, life, and maturation is blatantly obvious here, but the composition also leaves the cycle unfinished. The stages of sperm, womb, baby, and youth are present, but nothing beyond this point in the circle of life is. The emphasis is kept on the early stages of life, but the reason is unclear.

The Dithyramb and the legend of Dionysus' own birth can help explain this focus on early maturation. In Dionysus' birth he was taken from his mother's womb and sewed into the thigh of Zeus before being born again.²⁵ In *Themis*, historian Jane Harrison explains that this myth facilitates the Dithyramb initiation ceremony and dance of young men, the Kouretes, changing children into men. While in one sense this means leaving aside that which is feminine, it has a greater meaning in

²³ Wellenbach, 90.

²⁴ Gruen, 57-58.

²⁵ Harrison, 34.

in leaving behind the life of family and being indoctrinated as a member of the community. Through this Dionysian coming of age ritual, it is possible to see this work by Haring as a story of rebirth and rediscovery of himself. The pregnant women dance in ceremony but the younger figure stands slightly apart from them, arms raised up to the baby, ready to be born again as a young man as the pregnant figures leave this younger figure to his new life and prepare to begin the cycle again.

This may seem like a stretch, especially if this interpretation is taken to mean Haring literally recreated this specific ceremony on canvas. However, if the story of the rebirth through the Dithyramb is used as an archetype and a lens through which to view Haring's world, things become much clearer. It is important to remember that Haring was born in the backwater town of Kutztown Pennsylvania, and it was not until he left his hometown and old life behind and moved to New York City 1978 for art school that he began to discover himself. It was in these years that Haring discovered his artistic style and his community within Paradise Garage and other clubs.²⁷ This was the time of rebirth for Haring, and this rebirth occurred, as it did in the Dithyramb, through dance.

2. Haring and Disco

Keith Haring's life as a young artist in the late 1970's and early 1980's is inextricably linked to the nightclub scene of New York. Keith Haring started hanging out in, and then working at Club 57, a breeding ground for the young underground art scene.²⁸ Breeding ground is used here both figuratively and literally because, as Haring notes, "Club 57 not only meant dancing and drinking and sex and fun and craziness, but the beginning. . . of some really interesting art shows."²⁹ Haring began organizing shows at Club 57, and when he dropped out of art school in the spring of 1980 he was offered a job at the Mud Club, a contemporary

to Club 57, in which he also formed a community.³⁰ It was during the summer of 1980 while working at the Mud Club that Haring's signature style -- his saucers, the energy lines, and the simplistic people -- became fully formed, and he began his subway drawings.³¹ Also shortly after quitting school, a high Keith Haring stumbled upon Paradise Garage, a club that in his own words, ". . . was really a kind of family. A tribe."³² Haring was so enamored by the club that he soon after asked to show his art there.³³

In all instances, these clubs gave Haring a place where he could mingle with, learn from and work with his contemporaries, as well as a place where he could show his own art. They provided a community and space for Haring to become an artist in the world. In 1979 Haring wrote passionately in his notebook about how important experiences like listening to poetry readings in Club 57 were to him.³⁴ However, these clubs did not just serve as circles for intellectual sharing; they were, first and foremost, places of dance.

In 1978 and 1979 Haring was working with the ideas of space and performance, painting to the rhythm of music where he "lost control"³⁵ of the process of painting.³⁶ Beyond this early form of painting, it is noted by art historian Raphaela Platow that ". . . Haring's physical capacity - his limber body squatting, bending, shifting balance as he handled the brush with broad movements of his arms-together with his sense of space enabled him to work in an immediate way, without a preconceived plan."³⁷ The idea of Haring moving his body in such a way while being aware of the space within which he was working sounds very comparable to dance. More than paralleling

²⁶ Harrison, 37.

²⁷ Gruen, 50-52.

²⁸ "Club 57, Film, Performance, and Art in the East Village, 1978-1983," Museum of Modern Art, Oct. 31 2017-Apr. 8, 2018. <https://www.moma.org/calendar/exhibitions/3824>

²⁹ Gruen, 45.

³⁰ Gruen, 62

³¹ Gruen, 57, 61-62.

³² Keith Haring, *Keith Haring Journals* (New York: Penguin Books, 1996), 230.

³³ Gruen, 89.

³⁴ KHA NB-6, *Keith Haring Notebooks*, Keith Haring Foundation Archives, New York, NY, 5.

³⁵ KHA NB- 4, *Keith Haring Notebooks*, Keith Haring Foundation Archives, New York, NY, 5, 19.

³⁶ KHA NB-3, *Keith Haring Notebooks*, Keith Haring Foundation Archives, New York, NY, 19. KHA NB-4, *Keith Haring Notebooks*, Keith Haring Foundation Archives, New York, NY.

³⁷ Keith Haring 1978-1982, 84.

Haring's artistic adventures, these clubs served as a source of inspiration for Haring. In 1985, Haring recalls that when he was completely unsure of what to paint on the arches of the Bordeaux museum in France, inspiration struck him while dancing in Paradise Garage.³⁸ There is little doubt that these communities and spaces had a profound impact on Haring, helping him to develop his own style and imagery.

Haring's own experiences at places like Club 57 and Paradise Garage were part of a greater movement in the 1970's and early 80's. These places were born out of disco, both the music and the dance clubs that became extremely popular in the 70's. It is also well acknowledged that disco music and these disco nightclubs had their origins in the gay liberation movement of the 1970s. Because dance was just as integral to disco as the music itself, when discussing disco in this paper, it will refer to both the nightclubs and the music itself unless one is specified.

Following the Stonewall Riots in 1969, the gay rights movement began to spread across the country.³⁹ It is worth noting that while progress was made, the starting point for this progress was extremely low, with homosexuality only being declassified as a mental illness in 1973 and the term homophobia being coined in 1972.⁴⁰ However, this movement and the progress it made allowed for a more open and communal nightlife within gay communities. It was in these nightclubs that disco music began to gain prominence.⁴¹ As disco entered the mainstream, it began to blend the traditional ideas of masculinity and homosexuality, with bands like "The Village" creating songs that played up the idea of camp masculinity.⁴² Songs like "YMCA," "I Will Survive" and "Don't Knock My Love" were not explicitly homosexual, but carried messages and undertones that allowed for gay

communities to take ownership of them.⁴³ Disco came to embody Roland Barthes' idea of "Jouissance" (rapture, bliss, and transcendence).⁴⁴

The music of Julius Eastman is an excellent example of this idea. Eastman's music was played in places like the Lincoln Theater as well as nightclubs such as Paradise Garage.⁴⁵ His music transcended the ideas of high and low culture, a point that held true for many of the artists who frequented New York's Nightclubs in the 70's.⁴⁶ Eastman was part of the larger melting pot of visual, performance, and musical artists that constituted nightlife in areas of New York like the East village.⁴⁷ More specifically to disco, however, as a Black gay man, Eastman's music worked to transform the negative persona surrounding camp culture and homoeroticism from something that was stigmatized into something sacred. As Historian Gillian Frank Notes, in Eastman's work "The Profane aspects of deviant sexuality are recuperated through a dynamic process of resignification and creative juxtaposition of musical signs."⁴⁸

Eastman's work and intentions are worth noting because the ideas of turning camp and homoeroticism into something sacred aligns with descriptions of Paradise Garage. Larry Levan, the Garage's DJ, was considered something of a deity, able to work the crowd into a frenzy screaming his name.⁴⁹ If Larry liked a song, he would play it over and over again until the audience got on board.⁵⁰ The club created a culture where people came to dance, drugs were heavily used, but rarely, if ever,

³⁸ Gruen, 135.

³⁹ Alex Midgely, "Macho Types Wanted: The Village People, Homophobia, and Representation in 1970s," *Australasian Journal of American Studies* 33, no. 1 (2014): 105.

⁴⁰ Midgely, 109.

⁴¹ Gillian Frank, "discophobia: Antigay Prejudice and the 1979 Backlash against disco," *Journal of the History of Sexuality* 16, no. 2 (2007): 284.

⁴² Midgely, 107.

⁴³ Frank, 284; Midgely, 107; Nadine Hubbs, "I Will Survive': Musical Mappings of Queer Social Space in a disco Anthem," *Popular Music* 26, no. 2, (2007).

⁴⁴ Hubbs, 235.

⁴⁵ Ryan Dohoney, *Gay Guerrilla: Julius Eastman and His Music* (Rochester, NY: University of Rochester Press, 2015), 117.

⁴⁶ Dohoney, 117.

⁴⁷ Laam Hae, "Dilemmas of the Nightlife Fix: Post-industrialization and the Gentrification of Nightlife in New York City," *Urban Studies* 48, no. 16 (2011): 3453-3454.

⁴⁸ Dohoney, 123.

⁴⁹ Anthony Haden-Guest, "The Last Party: Studio 54, disco, and the Culture of the Night" (New York: Open Road Media, Kindle Edition), Loc. 4154.

⁵⁰ Jon Pareles, "Paradise Garage, a Gay Club That Forever Changed Night Life," *New York Times*, June 18, 2000, n.p.

did participants overdose.⁵¹ Additionally, while predominantly a gay club, the Paradise Garage community consisted of gay and straight individuals of all races because it was a club singularly geared towards dancing and nothing else.⁵² Through Larry Levan's music, people dancing entered into a trance-like state.⁵³ In short, dancing at the Garage was a communal, almost religious experience. It was something sacred. As the gay community began to make progress in liberation, disco both became a product of, and an instigator for the movement.

In his journals, Haring makes no mention of coming out, although he does mention in a later interview that the first time he slept with a man was in 1977, right before he went to school in New York. This was while he was still dating his high school girlfriend Suzy, who he eventually broke up with as he realized his sexual orientation.⁵⁴ It is interesting that Haring, who spent so much time analyzing himself, his personal transformations, and his place in the world, never wrote in his journals about coming out.⁵⁵ Despite this usually intense analysis, he makes no mention of being gay in his journals until 1979 where he writes that "This sexual energy may be the single strongest impulse I feel. More than art?(!)." There is no direct evidence to suggest how much moving to New York helped him become more comfortable with being gay. However, Haring grew up in the small town of Kutztown Pennsylvania in a time of deep homophobia in America. The disco nightclub culture in New York, linked to gay rights and the emergence of young artistic creativity, certainly could not have harmed Haring's sense of self, especially in comparison to a small town like Kutztown Pennsylvania.

Haring came to New York City just as disco hit America like a storm. Movies like *Saturday Night Fever* with John Travolta and the Bee Gees were a turning point for the mass popularity of

disco with middle class America. Al Coury, the president of RSO Record label, noted that *Saturday Night Fever* "kind of took disco out of the closet."⁵⁶ In 1979 disco music made up 40% of all chart activity.⁵⁷ However, as disco began to reach its fever pitch, suburban parents and heterosexual Americans began to worry about the effects that a genre with such homosexual undertones would have on the youth of America. Additionally, the Rock industry began to worry about the effect disco was having on their sales and began to run slur campaigns against disco, negatively associating it with homosexuality.⁵⁸ They began to drive home the message that heterosexuality and masculinity were threatened by disco music.⁵⁹ This anti-disco/gay backlash culminated in the disco Demolition at the White Sox stadium in 1979, where massive crowds of young white males violently destroyed disco records.⁶⁰ This event marked the end of the disco era as it was known.

The combination of this disco backlash with the AIDS epidemic in the early 1980's led to the downturn of many of the clubs that had thrived in the '70s. Club 57 closed in 1983, as did the Mud Club.⁶¹ The increasing gentrification of areas like the East Village brought on by the success of the artists from the area also contributed to stricter restrictions on nightlife.⁶² However, neither disco nor the club nightlife was completely eradicated in the 80's. Nightclubs at this point were too important as places of artistic exchange and had accrued too great a sense of community to completely die out. One such place was Paradise Garage, which continued to live on until 1987.⁶³ While the Garage incorporated new wave and punk into its musical repertoire, Larry Levan mixed it with techno to make it danceable. While disco music and disco culture may have died out from the mainstream, the ideas behind disco, the community, and the sacredness of the space, lived on.

⁵¹ Paradise Garage, the Oral History of NYC's greatest club, TimeoutIn, August 21, 2018, accessed May 18, 2019, <https://www.timeout.com/newyork/nightlife/paradise-garage-the-oral-history-of-nycs-greatest-club>.

⁵² Pareles, n.p.

⁵³ Haden-Guest, loc. 4148.

⁵⁴ Gruen, 31-2.

⁵⁵ Notebooks, Keith Haring Archives, Keith Haring Foundation.

⁵⁶ Frank, 288.

⁵⁷ Midgely, 107.

⁵⁸ Frank, 286, 289.

⁵⁹ Frank, 294.

⁶⁰ Frank, 276.

⁶¹ "Club 57, Film, Performance, and Art in the East Village, 1978-1983" Museum of Modern Art, Oct. 31 2017-Apr. 8, 2018.

⁶² Hae, 3455.

⁶³ Pareles, n.p.

3. Paradise Garage and the Dithyramb

Paradise Garage is singled out in this paper because it is generally acknowledged as Haring's favorite and most frequented nightclub. He went there almost every Saturday night for five years and would plan his business trips around weekends at the Garage.⁶⁴ He also met both of his long-term partners there, Juan Dubose and Juan Rivera.⁶⁵ The importance that this club and the others he frequented held for him cannot be understated. Through dance, Haring got started with his career, met many of his contemporaries, and found a community. However, the question remains as to how this has any impact on how or why Haring seems to be drawn to Greek depictions of dance. In answer to this, there are certain parallels between aspects of the myths and dances surrounding Dithyrambic processions of ancient Greece that are worth comparing to Haring's own world of dance.

The first aspect to look at is the idea of control versus revelry within the Dithyramb. This dynamic was most often played out between the mythical Dionysian revelers, the silens, and the historical Greek choral performers. Athenian vases often contained a realistic depiction of choral dance on one side and the myth associated with the performance on the other side.⁶⁶ This was due to the fact that while Athenians loved the dance and ritual, they were wary of the unbridled passion that was associated with the silens and mythical Dionysian revelry.⁶⁷ A parallel can be drawn between the Athenian view of the mythical aspects of the Dithyramb and the way white homophobic America viewed places like Paradise Garage. There were aspects of this world they coveted, but only when and how they wanted;

disco music had been all the roar until explicitly connected to homosexual culture. In a similar vein, the fine art world wanted Haring's art and to profit from it, but were loath to elevate it or him to museum status.⁶⁸ Haring's own art seems to recognize this and plays with these ideas, utilizing graphically sexual content combined with reveling figures to his own ends. One specific Haring work, *The Ten Commandments 8*, shows two faces giving oral sex to the ends of a cross, which can be read as playing on the idea of homosexuality as a sin, but at the same time really criticizing those who blindly obey the church.⁶⁹

Another idea from the Dithyramb that feeds into Haring's world is the actual power of the revelry and the idea of acceptance into community. Both Dionysus' return to Athens and Hephaestus' return to Olympia are celebrated through Dithyrambic performances with drunken revelry. Art historian Guy Hedreen notes that "Like Dionysiac processions at Athens, the journey of Hephaistos and his entourage to Olympus is marked by drunkenness, ostentatious display of the phallus... as well as song and dance."⁷⁰ This imagery itself would not be out of place in one of Haring's works of art. However, more than that the idea of acceptance into a community through song and dance is very much in line with the acceptance through dance that Haring and others experienced at the Paradise Garage.⁷¹ This idea is also echoed by Art Historian John Wilkinson, who notes that the Dithyrambic choruses in the city of Dionysia were used to transform young boys into men, separating them from their domestic childhood life.⁷² While the specifics of this tradition hold no bearing on Paradise Garage, the core ideas of acceptance into a tribe through dance still hold. While the specifics of this tradition hold no bearing on Paradise Garage, the core ideas of

⁶⁴ Gruen, 89; Keith Haring Journals, 230.

⁶⁵ Gruen, 89, 139.

⁶⁶ Guy Hedreen, "Mythos of Ritual in Athenian Vase-Paintings of Silens," in *The Origins of Theater in Ancient Greece and Beyond: From Ritual To Drama*, ed. Eric Csapo and Margaret C. Miller (Cambridge, UK: Cambridge University Press, 2007), 163.

⁶⁷ Guy Hedreen, "Ambivalence, Athenian Dionysiac Vase-Imagery and the discourse on Human Social Evolution," *Hermeneutik der Bilder: Beitrage zur Ikonographie und Interpretation griechischer Vasenmalere* (2009): 125.

⁶⁸ Keith Haring Journals, 276-77.

⁶⁹ Sylvie Couderc, "The Ten Commandments: an Interview," Keith Haring Foundation, accessed May 19, 2020, https://www.haring.com/!selected_writing/ten-commandments-an-interview.

⁷⁰ Guy Hedreen, "Bild, Mythos, and Ritual: Choral Dance in Theseus's Cretan Adventure on the François Vase," *Hesperia: The Journal of the American School of Classical Studies at Athens* 80 (2011): 502.

⁷¹ Pareles, n.p.

⁷² John Wilkinson, "The Ephebe's Song: Tragôidia and Polis," *Representations* 1 (1985): 62.

acceptance into a tribe through dance still hold. The Garage holds many of the same connotations of spirituality that these Dionysian rituals did in forming the bonds of community.

Core to the idea of the Dithyramb was the idea of the epiphany through invoking Dionysus. Dionysian dance was meant to transform the dancer, and through this transformation epiphanies were sought from Dionysus. This idea of transformation and epiphany goes hand-in-hand with the idea of the pirates Dionysus transformed into dolphins as punishment for not believing in him and his power.⁷³ This also connected to the seeing eye cups which were used to facilitate the adoption of the identity of a silen.⁷⁴ Both of these images are mentioned earlier as possible influences for Haring's art and now can be interpreted as ideas of divine inspiration through dance. As mentioned earlier, Haring painted the way he danced, and was sometimes struck with ideas for painting while dancing at the Garage.⁷⁵ The idea of Paradise Garage as a sacred place, perpetuated by Larry Levan's disc jockeying that was built out of the disco movement of the 70s, helped give Haring the divine inspiration he needed to paint. In this same vein, this means that Haring's recurring motif of the man-into-dolphin transformation could be a subtle jibe at his critics, those who did not consider Haring a "serious" artist, those who did not believe in the power of his inspiration.

3.1 Kinetic Art

Art Historian Sarah Olsen creates a compelling argument for the idea of Kinesthetic empathy as a mode of communication through choral dance. The idea is that the movement and music of the choral dance allowed for social continuity and cohesion.⁷⁶ More importantly,

however, it also was able to elicit a sense of participation and identification in people of all ages, genders, and races.⁷⁷ The same could very much be said for the disco movement that swept the nation in the 1970's and the spirit from it that survived into the 1980s. Until it was bogged down by homophobia, disco music was spreading across almost every community in America and seemed to elicit the same feelings of kinesthetic empathy.

In a similar way, Haring's art is seemingly universally understood: even people who have no idea who Haring is wear sweaters with his images. Olsen argues that a Simonides vase fragment suggests dolphins jumping out of the water in reaction to the music.⁷⁸ Just as Dolphins are influenced by choral music, Haring's dolphins or any of his dancing figures elicit an energy that is universally accessible regardless of the level of art history education. This then could also give a less cynical meaning to Haring's dolphins – rather than turning men into dolphins as punishment, it could mean that Haring realized everyone has the inherent ability to understand his art: they just need to find that ability within themselves.

It seems certain that at least some of Haring's style came out of the unique period of artistic exchange and dance that swept New York nightclubs. While it is difficult to untangle whether or not Haring drew direct influence from Greek images of the Dithyramb, there are many interesting parallels between the world of Ancient Greece and the world in which Haring was embroiled when he started his career. Some of the similarities in imagery are too blatant to ignore entirely, but the ideas of community, sacredness, and transformation through dance give us a lens through which we can view Haring's art and world. For there is indeed something sacred about Haring's work. Despite, and perhaps because of the simplicity, the graphic sexuality, and the balance he creates between chaos and harmony within his works, the viewer is drawn into the worlds Haring creates. There is indeed something powerful in his revelry.

⁷³ Guy Hedreen, "The Semantics of Processional Dithyramb Pindars Second Dithyramb and Archaic Athenian Vase-Painting," *Dithyramb and society: Texts and Contexts in a Changing Choral World*, ed. Barbara Kowalzig and Peter Wilson (Oxford, UK: Oxford University Press, 2013), 188.

⁷⁴ Hedreen, "Ambivalence," 129.

⁷⁵ Keith Haring 1978-1982, 84; Gruen, 135.

⁷⁶ Sarah Olsen, "Kinesthetic Choreia: Empathy, Memory, and Dance in Ancient Greece" *Classical Philology* 112, (2017): 154.

⁷⁷ Olsen, 160.

⁷⁸ Olsen, 155.

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