AUC Undergraduate Journal of Liberal Arts & Sciences

Open Issue Vol. 13 2020

www.auc.nl

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AUC Undergraduate Journal of Liberal Arts & Sciences

Open Issue Vol. 13 2020

Published by
inprint.

AUC Undergraduate Journal of Liberal Arts & Sciences
Open Issue Vol. 13 2020, published by InPrint
The AUC Undergraduate Journal of Liberal Arts and Sciences is a biannual, interdisciplinary publication showcasing outstanding undergraduate academic papers. The journal aims to demonstrate the strength of undergraduate scholarship at AUC, to reflect the intellectual diversity of its academic programme, to encourage best research and writing practices, to facilitate collaboration between students and faculty across the curriculum, and to provide students with opportunities to gain experience in academic reviewing, editing and publishing. The editorial board of the journal is constituted of members of the InPrint board, a registered AUCSA committee.

Foreword

Throughout the year, AUC students regularly have to research and write papers for their courses. InPrint aims to showcase the hard work and academic rigour of the students by publishing a selection of these papers every year in the Open Issue. This year we're proud to present six papers, two from each major. The papers cover fields as diverse as seaweed farming to ethical education to the use of surveillance algorithms in the everyday, and all make for excellent reading material. They not only demonstrate the skill and unique insight of their authors, but will hopefully give you something to think about and take with you after you're done reading.

All the papers we receive undergo several rounds of selection and editing, and on behalf of the editorial board and myself, I'd like to thank everyone that has contributed to this issue. Producing the publications is never easy, but under the unique and strenuous circumstances of the global COVID-19 pandemic, the dedication demonstrated by authors, peer reviewers, faculty and our own editors has been exceptional. Thank you.

I sincerely hope that in reading this Open Issue you, our dear reader, can once again see the high level of academic achievement of AUC students, their incredible work ethic, and the wonderful variety in interests and topics that is emblematic of the liberal arts and sciences education. Furthermore, I hope that although our lives have largely been turned topsy-turvy and many of us are finding ourselves oddly missing the Academic Building, that in reading this issue you can be reminded of some normalcy as you learn something you may not have known before.

And with that, I welcome you to our 13th publication: the 2020 Open Issue!

Aisha Erenstein, on behalf of InPrint

Contents

Sciences

An analysis of the potential of pesticide optimization via data mining techniques and wireless sensor networks

Lanie Preston

Image Source: Local Futures, 2019

Abstract

The human population is on track to reach 10 billion individuals by 2050, and the associated growth in food demand has prompted the agricultural industry to rely heavily on synthetic pesticides (Carvalho 2017). Data mining is the practice of extracting meaningful patterns from large corpora of data (Siddesh et al. 2018). As the affordability and durability of devices capable of data collection and analysis has grown, farmers have begun to use data mining techniques in the agricultural sector, a practice known as "smart farming" (Bauckhage and Kersting 2013). By means of a literature review, this paper will examine the potential of data mining techniques to be integrated into an autonomous pest management system for the purpose of reducing farmers' pesticide use. Three specific, algorithm-based requirements of this system will be examined: pest threshold establishment, pesticide threshold establishment, and pest classification. The ability of these algorithms to be integrated into Wireless Sensor Networks (WSNs) and ultimately an Internet of Things (IoT) network will then be evaluated. If successfully implemented, such a system would radically change the way pesticides are used, reducing the global prevalence of detrimental human health and ecological effects associated with pesticides.

Keywords and phrases: *Data Mining, Agriculture, Wireless Sensor Networks, Internet of Things, Smart Farming, Integrated Pest Management, Pesticides*

The explosive growth of food demand in the past century has prompted the agricultural industry to rely heavily on the use of synthetic pesticides (Carvalho 2017). Currently, 2.5 billion kilograms of pesticides are used annually on worms, beetles, and weevils, and while their use has improved crop yield, they can also cause detrimental effects to human health and local ecology[1] (Carvalho 2017). Given the understanding that current levels of pesticide use are unsustainable, innovation with regards to reducing pesticide consumption is at the forefront of agricultural research (Bauckhage and Kersting 2013). One promising method is data mining, which identifies meaningful patterns from large corpora of data (Siddesh et al. 2018). Data mining-based components of pest management, such as computerized pest identification, have been developed; however, the global market has yet to see a fully-fledged pest management system with the goal of reducing pesticides (Bhargavi et al. 2018). This research gap will be investigated through a literature review of current studies regarding existing data-mining algorithms and their potential to be integrated into autonomous sensor systems for the purpose of pest management. The successful implementation of such a system would significantly reduce pesticide use and thus the prevalence and severity of pesticide-related health and ecological issues worldwide (Bhargavi et al. 2018).

In the last decade, data science has become increasingly prevalent in a wide variety of fields, and agriculture is no exception (Siddesh et al. 2018). The software necessary for running large-scale data mining algorithms was once prohibitively expensive for the general public and the associated hardware was previously ill-suited for outdoor data collection (Bauckhage and Kersting 2013). However, the development and commodification of smartphones, tablets, and Radio-Frequency Identification (RFID) tags in the last 50 years has made devices capable of data collection and analysis both more accessible and durable (Bauckhage and Kersting 2013). Currently, the use of data mining in agriculture primarily involves measuring climate and crop conditions to optimize crop placement and planting schedules (Siddesh et al. 2018). Hot and Popović-Bugarin, for example, utilized data mining to classify soils and predict crop fertility so as to create an ideal mapping for crop placement to maximize crop yield (2016). The extension of data mining to farming has laid the foundation for technological innovations in the agricultural industry, including drastic changes in pest management.

Since a pest management system requires several intricate, interdependent components, decision-making surrounding pesticide use and application prior to 2010 was almost exclusively handled manually (Connolly et al. 2014). However, the last several years saw an unprecedented rise in the pervasiveness and complexity of data mining algorithms, dramatically increasing their functionality (Atay and Burdur 2018). As early as 2014,

[1] Examples of the effects of pesticides on human health include respiratory problems, infertility, and cancer, while effects on local ecology include killing of non-target plants and insects, threatening biodiversity and the stability of ecosystems (Carvalho 2017).

researchers utilized data mining algorithms to analyze the effects on crop yield of different techniques of pesticide spraying, such as the distance of the sprayer from the plants and the variety of pesticides used (Connolly et al. 2014). Connections between pest levels and weather-based factors have also been evaluated through linear regression, a data mining technique that uses machine learning to model the effects of dependent variables, including temperature and precipitation on an independent variable such as pest population levels (Chinnusamy et al. 2018). Hence, two major building blocks of a pest management system have already been developed. That being said, researchers have not yet identified which specific algorithms would be necessary for this system to become fully automated.

A data-mining-based, automated pest management system must identify several properties from real-time data to make informed decisions, which requires specific algorithms (Bhargavi et al. 2018). In particular, two kinds of thresholds should be identified: a pest level threshold, above which pests begin to cause major crop damage, and a pesticide threshold, above which further application of pesticides becomes detrimental to crop yield (Atay and Burdur 2018, Bhargavi et al. 2018). Naive Bayes algorithms can be trained on existing datasets to identify the pest population level at which pesticide intervention becomes necessary for yield preservation (2018). In terms of a pesticide threshold, Atay and Burder determined the point at which pesticide applications become detrimental to crop yield could be found by programming Decision Tree algorithms with preexisting data on the amount of pesticides used and eventual crop yield (2018).

Notably, the combined advice of both methods suggested reductions both in the number of applications and the amount of pesticide used relative to current patterns. Bhargavi et al. found that farmers often applied pesticides before they were actually needed, and suggested delaying pesticide applications until pest populations reached a critical mass (Bhargavi et al. 2018). Furthermore, Atay and Burdur found that effectiveness of pesticides declines after a certain tipping point, and that a calculated reduction in pesticide use could improve crop yield (2018). In other words, when using traditional methods based on human intuition, farmers tend to apply pesticides both prematurely and excessively. As such, in the proposed system, once the pest level threshold has been found via the algorithm described by Bhargavi et al. (2018), the signal to apply pesticides would be sent only after the threshold has been reached. Furthermore, the appropriate amount of pesticide released by this signal could be determined via the method described by Atay Burdur (2018). Utilizing existing algorithms in this way would both eliminate superfluous pesticide use and control pest populations before they grow out of control, leading to a reduction in overall pesticide use.

In order to appropriately apply threshold algorithms in real-time, a pest management system would also need to actively monitor pest levels (Arshad et al. 2017). This task would require both the ability to ensure that the system can capture the pests' image and that the system has the ability to classify the photographed insects in order to generate accurate data on current pest levels. Inexpensive, small-scale image sensors, such as complementary metal-oxide-semiconductor (CMOS) sensors, are ideal for photographing pests given their small size and long battery life (Chaudhari and Patil 2019). These sensors can easily be integrated into waterproof cameras placed in the vicinity of the crops (Arshad et al. 2017). Once the camera has been placed, farmers must also take steps to ensure that the target pests will be captured within the camera's frame. Chaudhari and Patil determined that pests can be lured into the camera's frame via light attractants or pheromones emitted by a device housed within the camera's bodywork (2019). The ability to photograph pests for the purpose of classification allows farmers to continually keep track of pest levels as cameras capture and keep track of how many pests have been seen within a designated time frame, which would be crucial to a pest management system's ability to compare pest levels against a calculated threshold.

Once images of pests on the target plant have been captured, data mining algorithms can be used to determine to which species the pests belong, which would be used to determine whether their quantity surpasses established pest thresholds. Birch et al. suggest first pre-processing the image to split it into distinct segments, facilitating the process of image analysis (2013). Once the image has been segmented, the K-means algorithm can be used to find characteristic patterns within the image and ultimately identify the insects' species, as

has already been accomplished in previous studies examining algorithmic moth identification (Birch et al. 2013, Ding and Graham 2016). This opens up the possibility for the pest management system to keep track of both the species and quantity of pests on crops in real-time. In conclusion, if pest population data could be generated and paired with the algorithm for pest threshold identification, it is possible to create a system where pests are identified and kept track of until the pest threshold is reached, at which point (and not before) pesticides would be applied.

The next step in implementing an automated pest management system is creating a platform for collecting data and running the algorithms identified above. Chinnusamy et al. identified Wireless Sensor Networks (WSNs), networks of battery-operated sensors that collect and record data in real-time, as optimal for this purpose (2018). WSNs are both relatively inexpensive to produce and adequately durable to be placed outdoors in close vicinity to crops (Elijah et al. 2018). Furthermore, they are sensitive enough to record large amounts of data on ambient conditions such as precipitation, temperature, and air quality (Chinnusamy et al. 2018). Because of these properties, WSNs are already widely used to collect environmental data that can be analyzed in order to optimize crop placement and fertilizer application (Azfar et al. 2015). Azfar et al. determined that this functionality could extend to pest management if threshold algorithms are integrated into WSN nodes that have been fitted with acoustic sensors, which track noises created by the movement of pests, such as wing flapping, to measure pest activity (2015).

The ability of WSNs to measure large amounts of environmental data in real-time makes them ideal for the proposed autonomous system. Specifically, the nodes in the system's WSN could be fitted with an acoustic sensor to check pest levels at set time intervals throughout the day via the aforementioned mechanism (Azfar et al. 2015). If these nodes are additionally fitted with the small camera described above, they could photograph and identify insects present on plant leaves via classification algorithms (Chinnusamy et al. 2018). Nodes can alert farmers if each pest population exceeds acceptable levels once they are programmed with threshold algorithms (Chinnusamy et al. 2018). The flexibility of these algorithms would allow farmers to tailor pest management to specific insects and crops, facilitating the system's use in a wide variety of geographic regions (Chaudhari and Patil 2019). Thus, by equipping WSNs with the appropriate algorithms and hardware, it is possible to create an autonomous pest management system. However, in the absence of a connection between WSNs and a central control point, data collection and analysis would still require significant manual labor.

The services of WSNs become much more valuable when they are remotely accessible via the internet, so WSNs are now frequently integrated into Internet of Things (IoT) systems. This allows WSNs' data to be collected in one place and managed remotely via an internet-connected device, eliminating the need to manually combine data collected from individual WSNs (Elijah et al. 2018). This also creates the option to upload and process massive amounts of agricultural data through a cloud data storage service, allowing farmers to identify long-term patterns in pest levels and conditions (Elijah et al. 2018). Furthermore, this data can be continually processed to update threshold and classification algorithms, allowing the proposed system to evolve dynamically (Siddesh et al. 2018). Because IoT is so widely accessible, multiple open-source data analytics tools that support agricultural services, such as CropX and OnFarm, have already been developed, allowing farmers to store and analyze data for free (Bedord 2016). One downside to the use of IoT for this purpose is that it creates the potential for hackers to be able to install malicious software on WSN devices via an IoT network, sabotaging a community's food supply (Elijah et al. 2018). As such, Elijah et al. found that effective encryption algorithms for data processed on IoT networks must be developed before it can be used on a large scale within the agricultural sector (2018). Once this advancement is made, implementing an IoT system within our hypothetical network would make the latter both more effective in storing and processing data and more accessible to farmers without a data science background.

This paper has integrated the existing data mining concepts of threshold identification and pest classification into an IoT system of WSNs. The proposed system would be an improvement over traditional methods in that it actively generates an overview of pest populations plaguing crops, calculates at which levels these pests become harmful, determines whether or not this level has been

reached, and decides the proper amount of pesticide to spray based on these calculations, all without requiring human intervention. Given the tendency of human farmers to overuse pesticides, the implementation of such a system would theoretically result in a reduction in overall pesticide use. It is important to note that there are several limitations of this system that have not yet been identified. A mechanism for physically spraying pesticide would need to be incorporated into the system in order for it to be truly autonomous. Without this, a small degree of human error is still possible, making it difficult to concretely estimate the system's effectiveness. Farmers would need to be educated about the system itself, its advantages, and its maintenance if the system's implementation is to be successful. Furthermore, additional security measures must be developed so that these systems are no longer vulnerable to malicious hacking attacks. Despite these concerns, this paper has shown that the effective integration of existing data mining algorithms into an IoT system could create an effective, affordable, and durable system whose implementation could eventually diminish major health and ecological issues associated with pesticide use across the globe.

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Sciences

The potential risks of wide-scale seaweed farming on ecosystem and socio-economic health

Iqra Nowshari

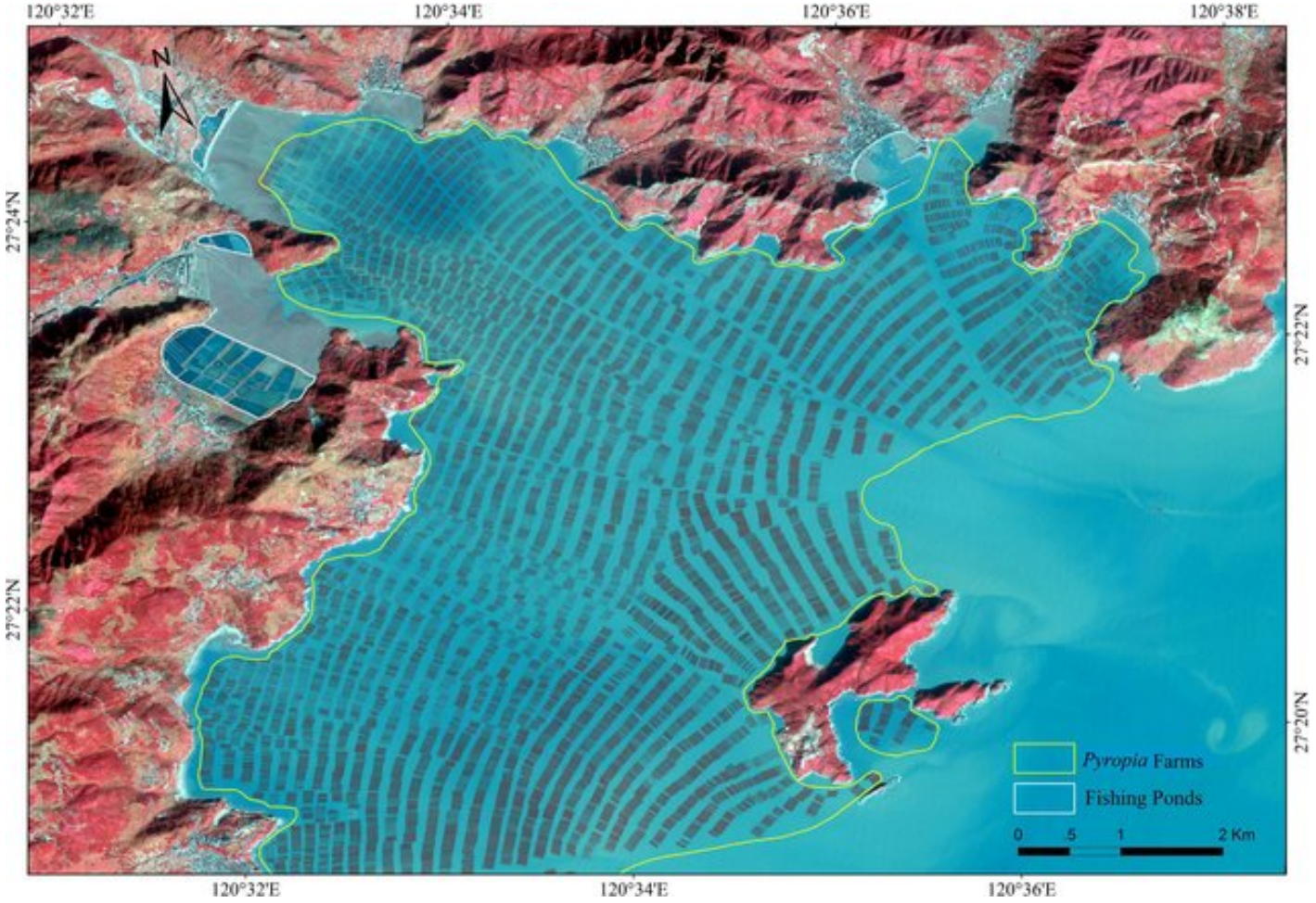

Image Source: Nutrient removal from Chinese coastal waters by large-scale seaweed aquaculture, sd

Abstract

There is a growing interest in wide-scale seaweed aquaculture due to the variety of benefits and uses that seaweed has, and its ability to mitigate and adapt to the effects of climate change. Nevertheless, the environmental risks of seaweed aquaculture on the local ecosystem are minimally discussed in scientific literature. This paper analyses and synthesizes the current literature on risks associated with seaweed aquaculture that are posed to ecosystems and human populations, with a focus on Asian countries. The risks to native ecosystems arise from the effects that seaweed cultivation will have on the chemical, physical and biological characteristics of the ecosystem (such as nutrient concentration, light access, and species distribution). Further risks to the native ecosystem are the potential for invasive species and disease to spread rapidly, subsequently causing crop failure. In turn, crop failure proves detrimental to the social and economic livelihoods of communities dependent on seaweed aquaculture. Further research is needed to specify the socioeconomic risks and the ideal farming methods required to minimize the prevalence of crop failure. A system of advice and aid to local Asian seaweed communities may prove beneficial to safeguard the future of seaweed aquaculture.

Keywords and phrases: *seaweed, risk, ecosystem, coastal communities*

Introduction

As the prevalence of forest fires increases globally, the idea of cultivating fire-proof forests that would still absorb carbon from our atmosphere has been garnering interest from scientists, with particular focus into aquaculture such as seaweed farming (Woody 2019). There are ample studies highlighting the advantages of wide-scale seaweed farming: it can combat ocean acidification (Froehlich et al. 2019), re-oxygenate coastal waters (Krause-Jensen and Duarte 2016), and prevent coastal erosion and habitat depletion (Xiao et al. 2017). Furthermore, seaweed farming can also indirectly reduce the emission of methane gas by livestock (Duarte et al. 2017). It has been shown that sprinkling a particular species of red seaweed into cattle feed reduces the methane emitted by livestock by up to 99% (Machado et al. 2017, Kinley and Fredeen 2015). The production of seaweed could also have a number of socio-economic benefits, for example by providing new opportunities of employment, increased incomes and thus improved the economic livelihood of coastal communities (Cottier-Cook et al. 2016).

On the other hand, however, the risks associated with large scale seaweed farming have been studied less in depth, and the literature regarding seaweed aquaculture hardly mentions the risks involved. Froehlich et al. discuss risks such as entanglements, poor management and nutrient diversions; these risks, however, are only mentioned briefly towards the end of the paper (2019). Likewise, Duarte et al. only sporadically acknowledge the risks or negative impacts of seaweed farming throughout their article “Can seaweed farming play a role in climate change mitigation and adaptation”, and consider the impacts of invasive species “not severe in nature” (2017, pg. 3). This inevitably raises the questions: what are the risks involved in large scale seaweed aquaculture? Why are they frequently underrepresented in the scientific discourse, and what can be discovered about them? This paper explores the risks associated with seaweed aquaculture, focusing on the dangers it poses on the health of local ecosystems and the livelihoods of coastal human populations. To achieve this, the relevant literature will be reviewed using the University of Amsterdam online library and other online academic databases with peer-reviewed articles. Further accounts found opportunistically on the internet of the current seaweed industry in Asia will be critically analysed. Following the assessment of risks, this research then considers the overall implications of large scale seaweed aquaculture and will propose potential measures that can be taken to minimize and avoid these risks.

Risks to the native ecosystem

The cultivation of large-scale man-made seaweed farms could have drastic impacts on the native ecosystem. Seaweed farms may lead to alterations of nutrient availability and other physical needs of species in the ecosystem. Thus, changing the environment can potentially threaten the local species, which in turn can adversely af-

fect the ecosystem. Studies on Chinese coastlines, which are the largest seaweed producers in the world, provide a fitting example of the biogeochemical impacts of large-scale seaweed farming (Xiao et al. 2017). Chinese coastal waters receive large nutrient inputs from the mainland by rivers as well as from the atmosphere, which cause eutrophication, algal blooms and hypoxia (Xiao et al. 2017). Seaweed farming can have positive remedial effects when the removed nutrients come from excess inputs from anthropogenic causes (Campbell et al. 2019). It is possible, however, that the high requirements of seaweed farms could lead to nutrient limitations in the future, causing competition in coastal aquatic species, and may increase the uncertainty of nutrient stressors in the ecosystem (Meerhof et al. 2012). Beyond this, if there are sustained efforts to limit nutrient pollution from the mainland, seaweed cultivation could result in the artificial enhancement of nutrient levels with the use of fertilization or deep water pumping which may result in further eutrophication (Buschmann et al. 2017). Artificial nutrient enhancements like these are already used in Japan, where deep nutrient-rich water from the Pacific Ocean is pumped to the surface, however, using these technologies in nutrient poor areas to create new spaces for cultivation may involve further environmental consequences (Buschmann et al. 2017). Additionally, large-scale cultivation will lead to competition for physical needs, such as the need for light. Seaweed farms are ideally located in shallow coastal areas, which other native aquatic organisms inhabit. Seaweed farms must be located at depths in the water column that optimize growth; excessive light can result in photo-oxidative stress and restricted light will cause low growth (Campbell et al. 2019). The introduction of seaweed farms may interfere with the availability of light, and thereby cause native aquatic species to compete with the seaweed, with the reduction of light possibly being low enough to limit other macroalgal photosynthesis (Gerard 1984). Thus, as a result of the chemical and physical alteration in coastal waters due to large-scale seaweed cultivation, native coastal species may be at risk of losing the requirements necessary for their survival (Campbell et al. 2019).

There is already evidence of seaweed farming impacting the survival of native phytoplankton species through the competition for light and nutrients. A large-scale seaweed farm in Sanggou Bay, China, for example, has shown that the growth and harvesting season of seaweed is correlated with a decrease in the biomass of phytoplankton, indicating that seaweed growth restrains phytoplanktonic growth (Shi et al. 2011). Phytoplankton are important primary producers in aquatic ecosystems and can be credited for at least half of the earth's net primary production of chemical energy through photosynthesis (Roach 2004). A reduction in the abundance of phytoplankton has a direct impact on biogeochemical cycles in the ecosystem (Litchman 2007), and can affect higher trophic levels, which has implications on the aquatic food chain (Campbell et al. 2019). Nevertheless, it is difficult to estimate exact interactions that large scale seaweed aquaculture would have on native marine animals, since these effects will be specific to the location of farming, type of farming, type of seaweed and the local marine species.

Risk of death, disease and invasivity

The idea of "invasive" species and the effects that seaweed farming would have on the distribution and abundance of invasive species should be taken into consideration. In understanding the potential risk, it is important to define the term 'invasive species', and to briefly discuss the debate surrounding the effects of invasive species. An ever-increasing number of scientists contest the use of language surrounding invasive species, and consider their depiction in scientific literature as unwarranted, more rooted in the fear of the foreign than in scientific evidence (Goode 2016). The idea of the "invasive alien" species also draws from faulty ideas of a balanced ecosystem that can be disrupted by outsiders, with consequences usually being more drastic than they really are (Atkins 2017). It is important to note that along Asian coastlines almost exclusively native species of seaweed are used, and therefore the risks associated with non-native species may be negligible. However, non-native species would be of greater concern when considering the introduction of Asian species to foreign coastlines, for example the introduction of the Asian brown kelp species *Undaria pinnatifida* to the French coast, where it became a dominant biofouling species (Campbell et al. 2019). In Zanzibar, the introduction of South-East Asian seaweed species have been found to

lead to a domination of the species, indicating a shift from native species to the introduced, with the added risk that native populations will not recover (Tano et al. 2015).

While Duarte et al. postulate that the impacts of invasive seaweed species are shown to be lacking in substantial severity (2017, pg. 3), Cottier-Cook et al. (2016, pg. 9) indicate the opposite. In Hawaii, the introduction of an Asian red seaweed species was found to spread to corals that were at a distance of 6 km from the original point of cultivation, where it prompted a number of coral deaths. This case exemplifies the realistic risks of the implementation of large-scale seaweed farming on the native biodiversity along coastlines previously uninhabited by seaweed. These potential risks could be heightened if genetically diverse species are introduced into areas without a thorough inspection of the impacts it may have on other aquatic species. The severity of impacts that introduced seaweed species have on coastal ecosystems would need to be assessed in greater detail before any large-scale seaweed project is started. An impact assessment of the various species of seaweed could also benefit farmers in helping them make crucial decisions regarding cultivation practices, such as the spacing and siting of seaweed beds. Thus, while it is important to keep in mind the questionable nature of the concept of invasive species, it should not be used as an excuse to disregard legitimate concerns of the potential damage seaweed farms may cause in non-native habitats.

The lack of genetic diversity in large scale farming practices and the methods of farming could also make these crops more vulnerable to diseases and bacterial infections (Cottier-Cook et al 2016). Thus, an important concern of stakeholders of this industry is the proliferation of the genetic diversification of species. Genetic diversity refers to the variance of genes within species; a lack of genetic diversity opens a group of seaweeds up to dangers of parasites and pathogens (Buschmann et al. 2017). So-called monocultures of seaweed species that are created via clonal reproductive methods increase the susceptibility of disease significantly within one seaweed forest (Buschmann et al. 2017). An example of this is the “ice-ice” disease that caused drastic declines in the seaweed species *Kappaphycus alvarezii* growing in the Philippines, Madagascar and Tanzania (Cottier-Cook et al. 2016). Promoting genetic diversity or de-incentivizing monocultural farming could be a solution to crop failure. However, the monocultural farming system is more commercially viable due to the lower costs associated with it, and so incentives, such as subsidies from the government should be implemented to aid farmers in making decisions less prone to risks.

A further risk of monocultural stocks is the possibility of new or known pathogens that develop in cultivated forests to transfer to natural populations (Campbell et al. 2019). Responses to these outbreaks of disease aren’t well developed, and usually consist of chemical treatments or simply the removal of the crops in question (Campbell et al. 2019). Further environmental repercussions may arise through the use of chemicals after a disease outbreak. To encourage a responsible cultivation of seaweed aquaculture, it is crucial to provide farmers with genetically diverse and disease-resistant seed-banks or nurseries (Cottier-Cook et al. 2016), and to accurately inform relevant stakeholders of the best method of farming to limit the spread of disease.

Socio-economic risks

This next section evaluates the potential risks of large-scale farming on coastal populations, and the socio-economic implications these have. The seaweed industry has expanded rapidly in Asia, providing hundreds of thousands of families with incomes and employment (Simbahon and Ricohermoso 2001). In South East Asia oftentimes all working-age members of the family are involved in the mainly family-owned businesses that compose the local seaweed industry (Msuya and Hurtado 2017).The greatest socio-economic risks in these contexts could arise either from crop failure caused by inefficient or unsuitable farming methods, or from corporations that aim to overtake coastal space to create large-scale farms. For the latter, one study indicated that Canadian corporations seeking to start large plantations of seaweed farms in the Philippines ended up being unable to compete with the small and family-run businesses already existing (Valderrama et al. 2015). This may raise the question whether or not large-scale seaweed cultivation is even a feasible option for foreigners in Asian economies, where family-run businesses have already established themselves in the global economy. In spite of this, an example of crop failure that had a negative socio-

economic impact is the aforementioned “ice-ice” disease that affected the red seaweed from the genus *Kappaphycus*, which led to declines in the crop in the Philippines, Madagascar and Tanzania (Cottier-Cook et al. 2015). In the Philippines this caused a loss of over $310 million US dollars (Cottier-Cook et al. 2015). To prevent scenarios like this from occurring again and harming the livelihoods of coastal communities, appropriate advisory councils and emergency aid programmes should be created and maintained to safeguard local seaweed farms and promote appropriate farming methods. Furthermore, the seaweed industry in Asia is vulnerable to price volatility, mostly because of a lack of trustworthy market information and statistics (Valderrama et al. 2015). In most cases these local communities depend heavily on the income earned from harvesting seaweed. But with a lack of central governance to control seaweed pricing and monitor the health of the industry, it comes as no surprise that any drastic impacts that could harm large-scale seaweed crops will also have imminent adverse effects on local communities and economies.

Implications and Conclusion

The research at hand identifies implications on the future of aquaculture in Asian countries, and subsequently points to suggestions for future research. Most significant is the need for thorough and reliable assessments on seaweed cultivation projects that are site-specific as well as accessible for local stakeholders. Analyses of previously drastic and harmful crop failures in the seaweed industry must be formulated, shared and made accessible. The reasons behind them should also be identified so as to ensure that crop failure does not occur again in the future. Despite the available research into large-scale seaweed farming, it is important to investigate how viable large-scale and foreign seaweed aquaculture projects are in Asian coastal waters, since larger corporations seem unable to penetrate into the well-established local seaweed producers (Valderrama et al. 2015). An area of potential research could be an anthropological case study of the effects that seaweed farming has in a family or community before, during and after a crop failure occurs, to determine how crop yield affects the social and community dynamics. It should also be noted that the literature on socio-economic risks of seaweed farming indicate a lack of sufficient evidence to conclude that crop failure would actually result in devastating effects on local communities. Further research and case studies would be required to pinpoint the extent of harm that an instance of crop failure in the Asian seaweed industry has on local communities.

The investigation of the risks of seaweed farming on ecosystem and socio-economic health has shown that significant opportunities for adverse effects remain. A major risk is the ability for seaweed to modify native aquatic environments by using up nutrient and light resources that are required by other aquatic life (Campbell et al. 2019). The risks within cultivated ecosystems are primarily found in the potential for seaweed farms to create a genetic monoculture, and subsequently suffer drastically from a disease whilst being genetically defenseless, allowing the disease to spread rapidly and increasing the risk of crop failure. Beyond this, there is a possibility for non-native seaweed species to spread beyond the scope of the farm and to over-consume resources required for other aquatic life, such as corals. While this latter risk remains negligible in the focus area of Asian coasts, since most commercially grown seaweed is native to Asia, it remains an important concern for seaweed farming in the rest of the world. Subsequently, the implications of this research show that a general system of protection and aid for seaweed (and other aquacultural) communities should be introduced in Asia. This may include, but is not limited to, a policy programme that entails thorough awareness programmes to describe various farming practices and their effects. In addition to this, subsidies should be used to promote or jumpstart seaweed farming and safeguard the management thereof. The ongoing concerns of climate change and the desire for expanding seaweed production necessitates a dialogue between the scientific community and the seaweed industry. In the end, improved communication and collaboration between these groups is vital to aid in safeguarding coastal ecosystems for future generations.

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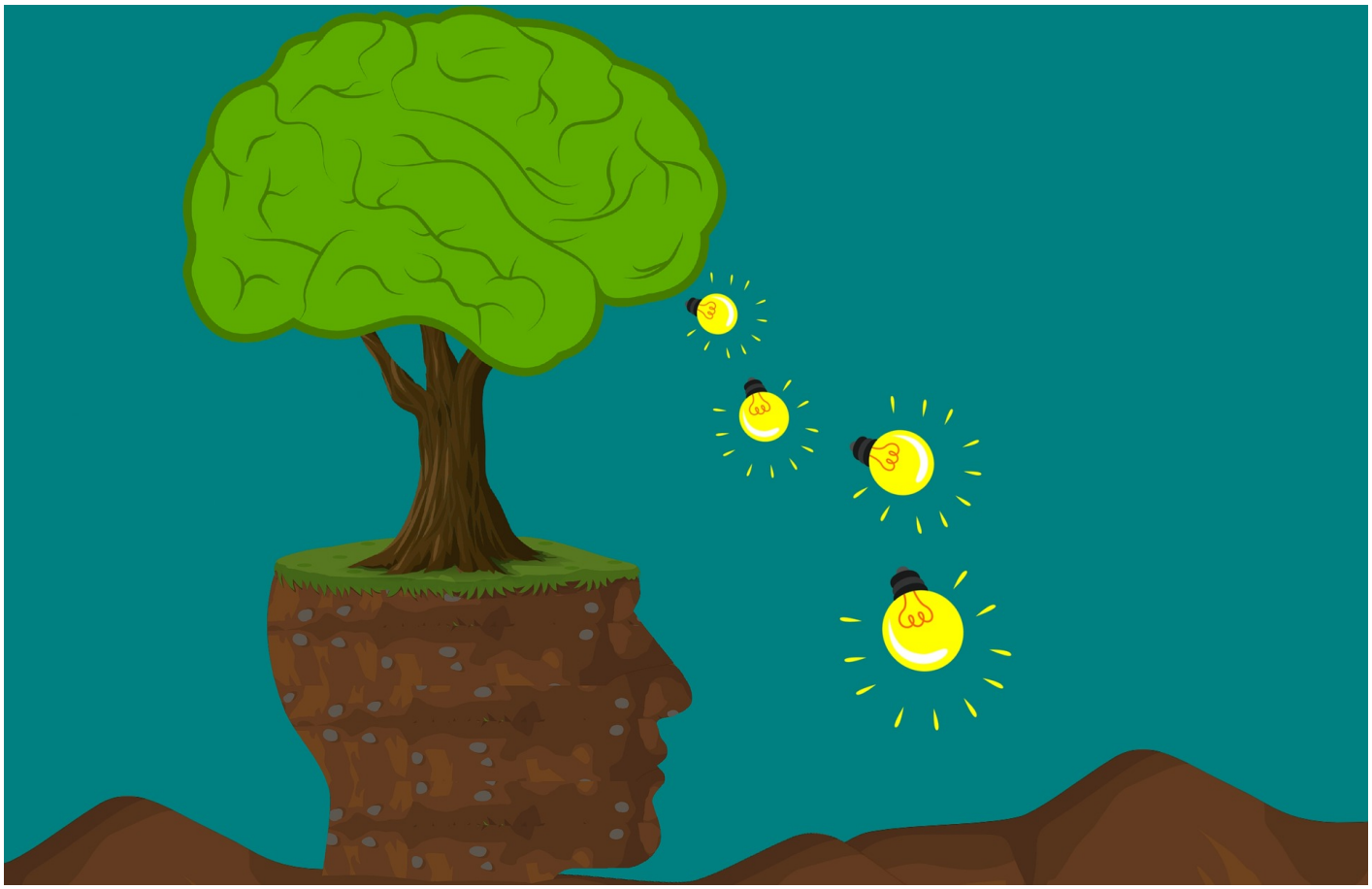
Social Sciences

Defining the way nature can nurture creative development

Sascha Sylbing



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Abstract

Spending time in nature has been found to have a beneficial effect on creativity and cognitive functioning, and various philosophers, psychologists and neuroscientists have praised nature's restorative benefits. However, the effect that spending time in nature has on the development of creative skills in early childhood, until the age of 12, has not been thoroughly examined thus far. Through a review of the existing literature, this paper explores the influence exposure to natural environments in early childhood has on development of creative skills by the means of three theories: the attention restoration theory, mind-wandering, and the development of white and gray matter in areas linked to creative thinking skills. Nature-induced repeated restoration of the attention networks, moments of mind-wandering, and increased development of brain regions such as the prefrontal cortices, the cerebellum, could lead to higher levels of creativity later in life. However, more studies must be conducted in order to determine the precise effect nature has on creative development in early childhood, including the difference in susceptibility to exposure to nature; different effects of direct and indirect exposure to nature; and the persistence of these changes into adulthood.

Keywords and phrases: *creativity, cognitive development, attention restoration, mind wandering, natural environment*

Exposure to a natural environment has long been found to be beneficial to human health, and with the growing interest in the practice of 'nature-therapy' and 'forest-bathing', research continues to be conducted on the way spending time in nature can improve one's cognitive and physiological health (Bowler, Buyung-Ali, Knight & Pullin, 2010; Hansen, Jones & Tocchini, 2017; de Keijzer, Gascon, Nieuwenhuijsen & Dadvand, 2015, Yin et al. 2019).

Time spent in nature has been shown to have a positive correlation to a direct increase in concentration (Kaplan, 1995; Berman, Jonides & Kaplan, 2008), restore attentional networks (Berman et al., 2008; Bowler et al., 2010) and provide a subtle form of distraction (van Rompay & Jol, 2016; Williams et al., 2018). Moreover, exposure to greenery was found to influence the development of both grey and white matter in the brain (Dadvand et al., 2018). These benefits have all been suggested to increase creative thinking skills. Since early childhood is a critical period for the development of brain regions and pathways associated with creativity, time spent in nature during that period could heighten the pace of creative development. Hodel (2018) found that environmental factors in early childhood substantially affect neurological development of the prefrontal cortex and Kandler et al. (2016) concluded that although a part of creativity is determined by genetic factors, a substantial remaining part of variation in creative thinking skills can be explained by differing environmental factors.

Bowler et al. (2010) carried out a systematic review in which they found that time spent in nature leads to the short-term augmentation of overall cognitive functioning, including creative thinking skills. But most studies in their review were conducted on young adults, rather than children. The existing body of research on the effects of natural settings on creativity has a strong focus on the short-term effects, rather than on creative development (Gardner & Kuzich, 2017; Wallner et al., 2018).

Thus far, the relation between exposure to nature in childhood and creative development has not been studied to a great extent. This paper aims to elucidate the way spending time in nature in early childhood, from birth until the age of 12 years old, influences creative development. In order to do so, it will connect a multitude of studies and theories concerning the stages of creativity; its neurobiological bases and the effect of natural and green environments on children's development and cognitive functioning. It aims to provide a comprehensive framework of the way nature can stimulate the development of creativity longitudinally, which could lead to the implementation of more contact with nature in creative education in kindergartens and primary school, using nature for educational purposes instead of merely as an environment to play in. Since creativity has many different ways of establishing and expressing itself, it simply cannot be confined to one neurological process or brain region. Thus, this paper will build onto a selection of studies that have measured the expression of creative thinking skills and artistic creativity in behav-

ioral tests, as well as the neuroimaging of regions associated with creativity.

For the purposes of the study at hand, creativity will be understood as the ability to produce a work that is both original and valuable, as defined by de Sourza et al. (2014). It is commonly thought to be exhibited and measured in three ways: *divergent thinking*, *artistic creativity*, and *creative insight* (Dietrich & Kanso, 2010). *Divergent thinking* is a process in which one comes up with a number of potential solutions to an issue based on associations with former experience (Jung, Grazioplene, Caprihan, Chavez & Haier, 2010). Divergent thinkers are good at flexibly (re)directing their attention; they shift their attention to different topics with more ease without losing focus. This results from great cognitive control in the process of shifting attention (Chrysikou, 2018). *Artistic creativity* is generally described as the creation of works of art, such as improvising with a musical instrument or drawing an abstract object. *Creative insight* can be described as the moment connections are made between different concepts, leading to a eureka moment (Dietrich & Kanso, 2010). In all three forms of creativity, connections between different pieces of information are made, leading to an original solution, thought, or work. Although these are three different forms of creativity, the overall creative process is usually outlined as a four-step process, first described by Wallas (1926).

Firstly, the brain gathers information and acquires knowledge in the preparatory step. Incubation follows: attention is directed away from a task at hand, allowing for mental relaxation rather than a conscious focus on a certain problem. Then, following a series of associations, illumination occurs: a new idea is created. Lastly, during verification, the idea is developed and crafted (Torrance, 1993). A study by Plambech and Konijnendijk van den Bosch (2015) presented exposure to nature as a way to enhance the phases of preparation and incubation and heighten divergent thinking abilities and curiosity.

The natural environment influences creative thinking skills in a multitude of ways and three theories are at the forefront of academic literature: the 'Attention Restoration Theory (ART)', the theory of 'mind wandering', and increased production of white matter in the prefrontal cortex as the neurological basis of creativity.

The 'ART' theory, formulated by Kaplan in 1995, explains that exposure to nature contributes to the restoration of the mind by reducing attentional fatigue, psychological, and physiological stress. It does so by demanding involuntary attention: a form of attention in which one's focus is captured by the inherently fascinating nature of an object or event, instead of deliberately being directed towards it. The natural environment does not demand directed attention, which is associated with mental fatigue, as much as the urban environment does (Berman et al., 2008). Instead, it allows the mind to be led by fascination. Hence, according to this theory, time spent in nature stimulates the stage of incubation. Moreover, spending time in nature leads to the replenishment of mechanisms of directed attention, defined by Cohen (2017) as "the allocation of attention in a directed manner to specific information or cognitive processes", often involved with processes such as resolving conflict. This restoration of directed attention could not be merely contributed to the quietness of nature, as found by Berman et al. (2008). Their experiments showed that when a generally peaceful environment was compared to a natural environment, only people exposed to the natural environment demonstrated improved cognitive capabilities. Attention networks and associative capabilities develop as children grow older and so childhood is a critical period for the development of attention mechanisms and associative strength. (Chou, Wong, Chen, Fan & Booth, 2019; Rueda et al., 2004).

The second theory, *mind wandering* also plays an important role in the incubation process, since the subtle distraction it is associated with allows for original solutions to be made, as different pieces of information are brought together. Spending time in nature tends to provide precisely this form of distraction (Williams et al., 2018). Both *mind wandering* and the arising of creative solutions are correlated with activity of the Default Mode Network (Baird et al., 2012; Chrysikou, 2018; Fox, Spreng, Ellamil, Andrews-Hanna & Christoff, 2015; Williams et al., 2018). This is the network that remains active while the brain is considered to be "at rest", and not involved in attention-demanding tasks. Important hubs of this network are to be found in the inferior parietal lobule, the medial prefrontal cortex, and the posterior cingulate cortex (Buckner, Andrews-Hanna & Schacter, 2008, Smallwood & Schooler, 2015). As the Default Mode Network has been found to be active during both creativ-

ity and *mind wandering*, increased *mind wandering* induced by nature is likely to stimulate the arising of creative thoughts and solutions. What's more, Beaty et al. (2014) found that greater connectivity between the inferior prefrontal cortex, involved with planning and spontaneity (Fuster, 2001) and the Default Mode Network was associated with greater divergent thinking skills, a form of creativity. Both the ability to create connections between different concepts through associations, improved by *mind wandering*, and the ability to direct our attention to a specific issue, improved by ART, are quintessential in the creative process since they contribute to the process of divergent thinking.

The third way time spent in nature affects creativity is by influencing brain development. The development of the brain is not only very sensitive to the environment, but also to brain activity originating from early experiences (Kolb, Mychasiuk & Gibb, 2013). Therefore, regular experiences of restoration of attentional networks, as well as repeated activation of the Default Mode Network throughout childhood, could potentially lead to their increased development with the result of further developed creative thinking skills. Both prenatally and postnatally, the brain of a child develops: connections are created and the density of white and grey matter increases, under the influence of both external factors and genetics (Hodel, 2018). Especially in the first five years of a child's life, the brain develops extremely rapidly and the prefrontal cortex has been particularly found to be very sensitive to environmental factors (Hodel, 2018; Cheung, 2010; Qiu, Mori & Miller, 2015). From childhood until late adolescence, the myelination of white matter continues, increasing its integrity in various regions of the brain (Lebel, Treit & Beaulieu, 2017). Takeuchi et al. (2010) found a positive correlation between creativity and white matter integrity in the inferior parietal lobe, the bilateral prefrontal cortices, and basal ganglia. White matter in these areas renders pathways to association and communication pathways, connecting various brain regions (Jung et al., 2010). The development of the prefrontal cortex has been shown to be influenced by both genetic composition and by environmental factors, especially in early childhood (Hodel, 2018; Zhou, 2018). In their study of cognitive development in twins, Chiang et al. (2011) found that the effect of heritability on white matter development decreased as people age. Lenroot et al. (2007) also found a decreasing heritability on the development of i.e. the inferior parietal lobe from the age of 5 until 18. Hence, the influence of environmental factors on these parts of the brain increases as people grow older. What is especially interesting to note is the observed positive correlation between creativity and the inferior parietal lobe, which is associated with the process of *mind wandering* (Buckner et al., 2008), and which in turn is stimulated by exposure to nature (Williams, 2018).

Moreover, the development of the prefrontal cortex, often assigned an important role in creative processes (Chrysikou, 2018; de Souza et al., 2014), is very susceptible to environmental factors, such as the physical environment and environment-induced experiences, in a child's first years (Hodel, 2018). Dadvand et al. (2015) found that long-term exposure to green urban environments stimulated the cognitive development of primary school children more than urban environments that lack greenery. In the children who were more frequently surrounded by greenery, they measured a statistically significant increase of volume and density of grey matter volume in clusters in the bilateral prefrontal cortices and the left premotor cortex and of white matter volume in clusters of the right prefrontal region, the left premotor region, and in both cerebellar hemispheres. The prefrontal cortex is associated with attentiveness and creativity (Owen, McMillan, Laird & Bullmore, 2005) and great white matter density is positively correlated with communication and association capabilities. Furthermore, the cerebellum has been suggested to play a prominent role in creativity (Vandervert, 2016). A greenery-induced increase of attentiveness and of the volume and density of white and grey matter of these brain regions can, therefore, play an important stimulating role in the development of creativity. These results agree with the study carried out by Berman et al. (2008), which suggests that spending time in nature restored attention mechanisms.[1]

The impact of nature on creativity does not only increase associative and *divergent thinking* skills through ART and *mind wandering*: artistic creativity of primary school students was also found to be heightened after they spent time in a natural setting. In a study carried out by Gardner & Kuzich

[1] This study was discussed in further detail on page 3.

(2017), two groups of students were asked to write a poem. One group had gone to a forest beforehand while the other had only been in 'indirect contact' with nature, merely being exposed to a visual of the landscape the first group visited, projected in a classroom. Gardner & Kuzich found that the group of students that had been in direct contact with nature wrote poems that were more imagery-rich than the other group's poems, for they used more original and figurative language. As previously mentioned, originality plays an important role in both divergent thinking and artistic creativity.

Given that long-term exposure to nature improves the long-term development of these brain regions and attentiveness, it might accelerate the development of creative thinking skills and even heighten a person's levels of creativity after they have matured into adulthood. Although the studies discussed thus far primarily show a rise of creativity after spending time in nature, it cannot immediately be deduced that exposure to nature leads to the development of creativity. These results are mostly measured shortly after interaction with nature and therefore they solely imply that spending time in nature has a short-term positive effect on creativity. However, Dadvand et al. (2018) demonstrated in their work that long-term exposure to nature stimulates overall the volume and composition of neural regions, including regions associated with creativity, such as the prefrontal cortex and the cerebellum. Since the development of these areas is especially susceptible to environmental factors in the first years after birth (Hodel, 2018), spending time in nature in a child's early life could have a lasting impact on its functioning and thus on the child's creative skills. Moreover, spending time in nature allows for the mind to wander and attention mechanisms to restore: experiencing this on a regular basis in early childhood would heighten the number of moments in which these brain processes are activated and this could lay down the foundation for an overall more creative mind throughout life.

Still, one must take into account that the development of creativity is also steered by heritable characteristics. Although environmental factors play a noteworthy role in the neurological development of children, including creative development, their reach is limited by one's genetic composition. Many studies on the heritability of creativity have been carried out and since creativity can be measured in many different ways, there is no one single consensus on the role that genetic and environmental factors play. Various studies found the effect of environmental factors on creative thinking skills and creative talent to be larger than the effects of heritability (Coon & Carey, 1989; Sternberg, 2009). However, Piffer and Hur (2014) found a heritability factor of 0.43 to 0.67 on creative achievement in their study on monozygotic and dizygotic twins, the remaining variation in creativity being ascribed to non-shared environmental factors. Penke (2003) stated that 60 percent of creativity can be attributed to a person's genetic composition and 40 percent to their environment. Many studies on the nature of creativity found different outcomes, but a consensus can be reached that around 0.50 of the variation of creative skills linked to certain personality traits stems from heritability, and the remaining part can be attributed to environmental factors (Kandler et al., 2016).

Direct interaction with natural environments seems to be more effective in stimulating cognitive functioning and creative thinking than indirect forms of exposure to nature, such as the mere sight or noise of a forest (Gardner & Kuzich, 2017; Berman et al., 2008). Nevertheless, the effects of both direct and indirect exposure to nature on the development of creativity might open the door to the discovery of more pathways in which nature affects creative development, apart from ART, mind-wandering, and increased development of white and grey matter in the prefrontal cortex and the cerebellum. Further research is warranted on the difference between the effects of direct (multisensory) and indirect (e.g. visual) exposure to a natural environment on creative development.

Another interesting line of query is the variability of nature's effects on creative development in different stages of childhood. Chiang et al. (2011) demonstrate this, showing that in the first years after birth, the prefrontal cortex development is more susceptible to environmental factors, whereas white matter development is more affected by environmental factors as someone grows older. The study carried out by Dadvand et al. (2018) focused on schoolchildren from the ages of 7 to 9, but since part of cognitive development occurs earlier in life, a study on both younger and older children would more clearly outline the extent to which frequent exposure to nature influences creative development all throughout childhood.

In the paper at hand, a first step to uncovering the connection of exposure to nature in early life and creative development has been made, focusing on the effects of frequent experience of *attention network restoration* and *mind wandering* on creative development and on the way nature influences the development and activation of brain pathways and regions that play an important role in creative thinking skills. Hopefully, it sparks the discussion and highlights the importance of the accessibility to green environments for children with different backgrounds and socio-economic statuses for their (creative) development. The future holds many opportunities for research outlining the contributions of different regions in the brain to creative development and the way each of those is affected by exposure to nature. Longitudinal and cross-sectional studies studying the correlation between exposure to nature in early childhood and creative thinking skills are required in order to understand how far the impact of time spent in nature reaches. Moreover, new opportunities arise to determine whether indirect and direct interaction with nature has different outcomes on children's creative development, especially in an age where technology plays more and more of an important role in children's lives. Investigation of the different effects of being exposed to nature through media such as technological objects and directly interacting with natural environments could open the door to new ways to stimulate creative development.

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Social Sciences

Surveillance in the age of algorithms

Spotify, Big Other and the implications of (big) data gathering

Marta Ceccarelli

Image Source: ev, 2018

On the 5th of December 2019, the music streaming app Spotify published on the page of each user a series of playlists and shareable images which summarized their music consumption of the year and of the decade. The feature, called 'Spotify Wrapped', enabled users to share such colourful and aesthetically pleasing images of their summarized music preferences onto their own Instagram story and on their Twitter feed. This event was one of many in which internet users were reminded of the process of data gathering going on behind the scenes of everyday online activities. The response to this feature was overwhelmingly positive, with little worry over the implications of tracking music preferences and listening behaviours. Spotify is one of many digital platforms that has been recording and commercializing user data, a practice set as the digital industry standard by the largest tech companies namely, Google, Apple, Facebook, Amazon, and Microsoft (GAFAM). When looking at big data from a sociological lens, it is possible to see parallels between data gathering (and subsequently, data mining), and surveillance. Michel Focault's work on surveillance is fundamental for this type of analysis, as he focused on the structural elements of the panopticon, originally a prison plan, and further applied them to other processes of power and discipline creation. In the context of Foucault's writing, it is through structure and the threat of data gathering that power is produced, as the mere act of observing in the panoptic sense produces disciplined behaviour among the observed. Similarly, it is through constant big data gathering and mining that ownership of the means of behavioural modification can be acquired, as conceptualised by Zuboff (2015) in her work on Surveillance Capitalism. These two works have become fundamental tools in the understanding of our contemporary situation, as they both address seemingly different, but essentially parallel supply chains of data gathering and use.

Contemporary media has been concerned with cases of surveillance enforced by governments. Particularly notable has been the case of China, where the government's technological abilities and extent of reach allow for surveillance to be performed with incredible accuracy and with a credible threat of punishment if the data gathered questions their authority. Public concern over China's actions has been exemplified by the ongoing media discussions on facial recognition, as well as the many adversarial attacks from Hong Kong protestors (CBS News, 2019; Eherenkranz, 2019.; ReasonTV, 2019), as well as the discrimination and racial targeting of Uighurs in the region of Xinjiang through such technologies (Buckley & Mozur, 2019). As facial recognition technologies improve, new knowledge on their algorithmic vulnerabilities has been produced and shared, contributing to a counterwave to the growing omnipresence of biometric data collection and analysis (Cole, 2019; Ongweso, 2019; Pavlus, 2011; Vox, 2019). However, relatively little concern has been raised thus far about the current incorporation of data surveillance into the everyday experiences of internet users.

There seems to be a consensus against surveillance employed by governments against citizens, the Big Brother, which is framed to be an act of state penetration that takes something away from citizens. However, there's an apparent simultaneous general acceptance of the tracking of our data by tech companies, coined 'the Big Other' by Zuboff, which we experience as a means to improve our online and offline experiences. In the following essay, these two aspects will be linked and discussed, by addressing the implications of moving through urban and digital scapes while under different types of surveillance. This would be done by focusing on the difference in perception of these two distinct yet arguably parallel forms of surveillance. Spotify and its features are only one of the many manifestations of a new age of surveillance, but it is important to keep in mind such seemingly small mundane events as an example when talking about surveillance in the age of algorithms.

Music streaming services have been rapidly growing in recent years, with a small group of companies, namely Spotify, Apple Music, Amazon Music, and the Chinese Tencent dominating the market (Hesmondhalgh, Jones & Rauh, 2019). The acronym GAFAM, widely used in new media studies, refers to the largest tech companies with global reach and massive power: Google, Apple, Facebook, Amazon, and Microsoft. Even though three of these companies own music streaming services (YouTube Music, Apple Music, and Amazon Music), the independent Spotify, however, remains the global leader in the industry, with a 31% share of the total revenue of the market ("Global Online Music Streaming Grew 32% YoY in 2019", 2020). The Swedish company, which started out in 2008,

has been at the forefront of music streaming platforms. Spotify has been evolving, and through platformization, their editorial power and gatekeeping has been augmented by algorithms and big data, giving them more power than their predecessors (Bonini & Gandini, 2019).

Platformization, as described by Helmond (2015), refers to the ascent of platforms as the primary infrastructural and economic model of the Web 2.0, referring to the new phase of modularity of the web characterized by social media platforms and programmability. Platforms are characterized by Application Programming Interfaces (APIs) which allow for user data to be easily exported and acquired by third parties, and have therefore become the tools for the construction of the data market (Helmond, 2015, p. 4). For Spotify, this process has mainly meant two things: enhanced data analytics and the subsequent development into a two-sided market platform business (Vonderau, 2017). This started when the company purchased The Echo Nest in 2014, a data-analytics company which produced a 'preference analytic' which was integrated with the platform (Prey, 2017). Echo Nest gathers data about music preferences in two ways. Firstly, it groups similar songs together through quantifiable data (e.g. pitch, tempo, note order), and secondly, it runs analyses of online conversations (e.g. on blogs, articles, and social media posts) to determine musical similarities in genre, audience, and cultural significance (Prey, 2017). Because of Spotify's large number of users, estimated to be 286 millions as of March 31, 2020 (Spotify — Company Info, n.d.), advertisers could profit from buying such highly reliable data and could subsequently target their ads very efficiently (Vonderau, 2017). This has placed Spotify at the top of the supply chain of programmatic advertising, making it a successful business-oriented platform able to survive in the GAFAM software ecosystem.

Foucault, in Discipline and Punish (1975), also addresses the supply chain of data production and use, but does this by focusing on the theme of surveillance through an analysis of Bentham's Panopticon, originally a design for a prison complex of cells constructed in a circle, all facing a central control tower. This panoptic structure puts prisoners in such a position from which they could be seen at all times, but can not verify if or when they are being watched. Those in power, therefore, appear as if they are always watching and the system that follows is thus automized and deindividualized (Foucault, 1975, p. 212). The panopticon therefore separates the seeing/being seen dyad, and for the prisoners, the possibility of being seen at any given time becomes internalized. The panopticon consequently infiltrates the lives of the people in the cells, and the constant probable but yet unverifiable presence of a watcher instills a paranoia which disciplines the watched. This way the powerful, outsourced discipline is turned into self-enforced control, forming an enhanced method of coercion. According to Foucault, universal juridicism has employed panopticism to operate a simultaneously minute and massive machinery of control which "supports, reinforces and multiplies the asymmetry of power" (1975, p. 217). Foucault recontextualizes Bentham's Panopticon, showing how its functioning is visible in the way power is exerted outside of the prison system, relating to mass society.

A contemporary translation of the panopticon in the urban landscape is the use and distribution of Close Circuit TV cameras (CCTVs) for surveillance purposes. The urban space has been punctuated with these objects for quite some time now, but it is in the light of modern developments in CCTV technology and other similar means of surveillance, that we can see how such urban space is part of a panoptic system of control. The ability to use CCTVs means that there is no need to construct a central tower and circular cell system, as they can be erected virtually anywhere in the urban space. These developments in CCTV technology are mostly relating to their algorithmization, so in how the data collected can be used to more effectively track, identify or find people through facial recognition. The technological advancements of artificial intelligence and machine learning have made it possible for algorithms to conduct such facial recognition with an ever-improving level of accuracy. The best tool for facial recognition in 2010 scored an error rate of just 0.003, improving tremendously from the best tool in 1977, which scored an error rate of 0.54 (Acquisti, Gross, & Stutzman, 2014). This advancement, coupled with the growing trend of sharing personal photographs online with tags of names or places, has made it much easier for surveillance algorithms to correctly identify a face and not only connect it to an age, gender, and ethnicity, but also to a name or location. The algorithmization of surveil-

lance has therefore produced a new architecture for the panopticon, one that is able to acquire vast amounts of biometrics from which the correct identity of a person can be derived, allowing the surveiller to track and record every movement of the surveilled. The information recorded can be used to hold the actors accountable, making the internalization of the paranoia caused by the panopticon even more deeply embedded into the surveilled, as well as making slights against the central power rarer because the surveilled are persistently traceable and therefore more easily punishable.

Surveillance in the contemporary world is also present in the digital space. Zuboff (2015), explores this topic in her work on the 'Big Other', which she conceptualizes as a new expression of power produced by the architecture of contemporary computer-mediated life. Big Other is both the condition and expression of surveillance capitalism, a new form of information capitalism that "aims to predict and modify human behaviour as a means to produce revenue and market control" (Zuboff, 2015, p. 75). Tech companies such as GAFAM, engaging in this type of capitalism record, modify, and commodify everyday experiences, leading to a "dispossession of the quotidian reality" (Zuboff, 2015, p. 81) which is transformed into codified behaviour to be monitored, monetized, and modified (Zuboff, 2016). These internet-based companies engage in a new cycle of commercial production. It begins with the gathering of more users and channels from whom user-behaviour data is extracted and is followed by the application of artificial intelligence and machine learning to make predictions about future behaviour as well as gather feedback to improve their algorithms. The (big) data then is repackaged into 'prediction products', which are ultimately sold in a new market interested in the trading of surveillance capital (Zuboff, 2015; Zuboff, 2016).

In the eyes of companies such as GAFAM, every aspect of human existence is an opportunity for data gathering, and therefore, behaviour modification. Tools for data gathering are persistent, ubiquitous, and often tacit; the exact mechanisms through which they operate are not easily understandable for a large portion of the population. Like in the panopticon, the observer has been automized and deindividualized. And because of our lack of algorithm literacy the surveillance is practically unverifiable but still visible through, for example, the many pop-ups about 'cookie' and 'privacy' settings that appear on almost every website we visit. However, the advent of surveillance capitalism means that we have moved beyond simple panoptic surveillance. As Zuboff explains, the commercial attempt at recording every aspect of everyday life means that there is "no escape from Big Other" because it doesn't rely on a centralized power like classic forms of panoptic surveillance do (2015, p. 82).

There is a different aspect that separates these two types of surveillance. The way in which we experience data gathering, and therefore surveillance, is determined by the way in which we perceive the actor conducting data gathering, and by the way we perceive their aim. In the case of surveillance capitalism, the process through which tech companies and platforms record, analyse, repackage, and sell our data is presented to us as a way to improve our 'user experience'. This is what is told to us whenever we enter a new website that uses cookies, with messages that usually follow similar scripts in explaining how they improve the way we navigate the web by remembering our preferences. We like it when Spotify lets us know the recap of our user behaviour because it is packaged in such a way that it is easy to share, which allows for new interactions on social media. These types of interactions should remind users that what they do on Spotify is not anonymous, but that it operates in a field of algorithms that observe and track our experiences. Yet, there seems to be little concern over the underlying workings of the Big Other that made Spotify Wrapped possible.

This lack of concern comes from a perception of agency that users have over the use of services provided by platforms and GAFAM. There is no explicit power forcing us to participate in social media, forcing us to use music streaming services like Spotify, or forcing us to overlook our privacy settings. The tools, services, and 'smart' objects usually associated with data gathering are often those which users have to buy or pay for through subscriptions. There is a perception of consumer/user power over platforms offering such services because of the traditional assumption of a paying customer upon which companies are dependent for profit. But, as explained by Zuboff, in the new

manufacturing process under which surveillance capitalism operates "users are neither buyers nor sellers nor products" but rather a "source of free raw material" (Zuboff, 2016, para. 24).

An alternative explanation as to why there seems to be no evident concern over Spotify Wrapped or other events signaling the constant Big Other surveillance to which we are exposed is that, all things considered, the collection and trade of big data does not harm anyone. There is a difference in severity between the consequences of government surveillance through CCTVs or facial recognition, and in online and offline data gathering through cookies or pattern recognition algorithms. This is exemplified by governments, especially authoritarian regimes as we see in China, which have demonstrated their use of biometric data to recognize, restrict, and sometimes punish their citizens, like in the case of surveillance of the Uighurs in the region of Xinjiang (Buckley & Mozur, 2019). Platforms' equivalent of punishment of users that do not comply with certain rules or norms are not severe, as they are limited to take actions within the realm of their own software architectures. This includes blocking and deleting accounts, or more inconspicuous measures such as 'shadow banning', a partial censorship of an account's content. Instagram, for example, does this by hiding the username in searches, unlinking hashtags, or filtering posts to followers, done when users' posts are not deemed suitable for the global community while still not violating community guidelines (Middlebrook, 2020). Platforms can even work in the opposite way, creating echo chambers that lead to radicalization, as 'filter bubbles' develop based on a user's preferences, often obscuring differing views and leading to segregating echo chambers and political polarisation (Flaxman, Goel & Rao, 2016; Spohr, 2017).

Nevertheless, there is a lot of value in exploring the implications of surveillance capitalism more deeply, especially through the sociological imagination. The feeling of being 'followed' online by oddly specific advertisements the doubts over accepting the privacy settings of our social media and yet doing so without much thought, the general impression of being surrounded by 'smart' objects that can listen to what we are saying: these are all markers of a historical development of our civilization. The 'self' has now been trapped in a situation of constant surveillance. Human behaviour, which constructs the human experience itself, is now recorded and stored in archives available to governments and companies such as GAFAM. The former, with the aim of holding one accountable in front of the juridical system, and the latter to predict our behaviour so as to be able to monetize it. The biggest risk that could come from this development is the overlap of the two fields of surveillance in urban and digital landscapes, when algorithms will attempt to predict our future behaviour for which we might be held accountable for. If this was to happen, the panoptic surveillance would triumph, as the tacit workings of algorithmic data gathering will change our perspective on an individual's past, present, and future field of action.

Our behaviour has been increasingly and almost ubiquitously collected and recorded for different purposes by two actors: the government and tech companies/platforms. The two have differing aims and techniques in their surveillance. The first collects past behaviour to hold citizens accountable, and more generally, to induce discipline. The latter do so to predict future behaviour, producing predictive capital that brings them revenue. Yet, it seems that we experience traditional panoptic surveillance differently than how we experience new forms of data gathering by the 'Big Other', as the latter is seen as generally harmless. However, the perceived agency of the user of services provided by tech companies/platforms, might be a weak one, as the new mode of capital production of surveillance capital does not depend upon their support. Our increasing dependence upon GAFAM has given such platforms great power, and surveillance capitalism has been rewarding companies which adapt to their standards and capitalize over any human behaviour that can be turned into data. This is the case for Spotify, a company that managed to have enough data to hone their advertising capabilities so to expand, eventually leading to an ever increasing capacity to track users preferences with great accuracy. This has put them at the top of the music streaming industry and of the supply chain of targeted advertising, while remaining on the surface, a humble user-oriented platform. The issues arising from these developments are ones of contemporary relevance, and future interactions of the two fields of Big Other and Big Brother might lead to unexpected changes in the way our society functions.

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Humanities

Sailing Close to the Wind

Desire, Violence and Queer Subjectivity in Kenneth Anger's *Fireworks*

Gabrielė Plukaitė

Image Source: Lee, 1941

Abstract

This research paper analyses the short film *Fireworks*(1947) directed by Kenneth Anger to show how this early American underground cult classic depicts queer desire on screen in an experimentally unique - if not revolutionary - way. By way of a literature review, as well as the author's own filmic analysis, it posits that *Fireworks* achieves this effect through an authentic synthesis of experimental cinematic means, a transgressive narrative that intertwines desire and violence, and a play of visual symbols — all resulting in a unique spectator experience of queer cinema. This experience, explained through the phenomenological lens, leads to the film's embodiment of queer subjectivity, its positioning of the viewer in direct relation to that subjectivity, and its experience of desire in a homophobic society. This paper proposes that such means of experimental filmmaking must be rejuvenated in mainstream cinema, as contemporary queer filmmaking is losing its transgressive capacities and fails to truly embody queerness in cinema.

Keywords and phrases: queer cinema, avant-garde, film phenomenology, queer subjectivity, desire

> *Fireworks: "a display of temper or intense conflict; strong feelings of usually romantic or sexual attraction between two people; a spectacular display."* ("Firework," def. 3)

Historically, queer cinema has been present in filmmaking practices for much longer than what is widely recognised, as the manifestation of queer expression had been long suppressed in the cultural discourse and still lacks mainstream acknowledgement. The genesis of queer cinema can be traced to early post-World War 2 practices in the American avant-garde cinema, largely due to the increased accessibility of filmmaking equipment made possible by advancements in technology during the war period (Stevenson 25). This newly-found accessibility helped filmmakers in the USA make their own films independently outside of Hollywood's unofficial practice of censorship, which prevented any allusions to homosexuality (Benshoff and Griffin 108). In 1947, these circumstances allowed Kenneth Anger to release *Fireworks*, the "first gay narrative film ever made in the US," which was shot by Anger at the age of only 17 while his parents were away during one weekend (Hays 46). Filled with surrealist aesthetic and elusive narrative, *Fireworks* tells a dream-like story of desire and violence, interweaving the two in unexpected ways. The film, only 13 minutes long, is structured by a feverish dream-like narration and portrays queer desire in euphemistic, yet satirically explicit visual metaphors. Moreover, through the juxtaposition of action and images, *Fireworks*, suggests a masochistic sexual desire towards figures of (physical) power - in this case homophobic sailors - portraying kink fantasies and complicating queer desire on screen. The present research will analyse how this case study achieves a representation of queer identity unique due to its historical post-World War 2 American context. Furthermore, it will analyse how this film, through its aesthetic choices of framing and editing, not only embodies the expression of queer subjectivity, but also allows the audiences to experience what it is like to desire in non-normative ways and what effect it may have for a queer subject and their experience of the world. This research will use historical, filmic, and philosophical analysis of form and content to do so. To this day, *Fireworks* may act as an inspiration for contemporary queer cinema to continue experimenting with the medium so that it does not conform to classical narrations techniques, thereby preserving queerness of film itself.

Queer cinema may find some traces of its genesis in the pre-World War 2 period of the United States, although these traces are not revolutionary ones. Jack Stevenson writes that the first depictions of queerness on film may be found in early "stag" films, or "smokers", defined as illegal "ten-minute black-and-white silent 16mm [pornographic] films that began to circulate on an underground basis around 1915" (25). However, the audiences for these films were "decidedly straight [and] male" and so male homosexuality was "almost nonexistent," contributing to "only 1.4 percent of all stag films" in the period from 1920 to 1967[1] (Stevenson 25). Queer female sexuality was represented on a much wider basis, but as it was produced by and

[1] the latter being a landmark for theatrical release of pornography

for those same heteronormative male audiences, it may not be considered as truly queer (Stevenson 25). As Stevenson notes, this lack of representation was due to the overt absence of a 'secure' market for people of non-normative desires to view such films (25). Still, Jim Hubbard notes the existence of a few queer films made before World War 2, such as *Lot in Sodom* (1933), *Geography of the Body* (1943) and *Salomé* (1923). However, none of these films portrayed explicit sex - somewhat in accordance with the general lack of such representations in American cinema - and only *Lot in Sodom* alluded to homosexuality per se (5). Nevertheless, they "had a great impact on the landscape" of queer experimental cinema and as such deserve an honorable mention (Hubbard 5). Eventually, it took developments outside of the film industry to make a truly queer cinema possible.

What changed the very landscape of budding queer cinema were the technological developments that followed World War 2 as 16 mm filmmaking equipment became affordable to a much wider range of people in the United States (Stevenson 25). Furthermore, there were changes in societal attitudes of the time as queer representations moved from the underground to the light of day; not only did the first publications of gay magazines begin circulating , but also "physique photographs of tanned and oiled muscle-flexers" appeared on the popular market (Stevenson 25). The convergence of these different factors resulted in amateur filmmaking that breached taboo subject-matter; meanwhile, Hollywood employed its unofficial censorship practice known as the Production Code, which deemed any allusion to homosexuality in cinema too risqué for distribution (Benshoff & Griffin 108). This changed in 1948, when the largest production studios in Hollywood were legally forced to give up the monopoly they held over cinemas in the country, indirectly contributing to the dissolution of the Production Code. This finally permitted American cinemas to show a wider variety of films outside of the censor's reach, allowing a few marginalised underground films to go above-ground (Benshoff & Griffin 108).

As a more diverse and widespread filmmaking practice began in the United States, spectatorship came along with it, and LGBT audiences found their way into cinemas which now offered more than the previous malicious portrayals of queer characters on screen[2] (Benshoff & Griffin 108) Nevertheless, all authors mentioned above note the challenges that early queer cinema faced in the shape of police harassment of the audiences, footage confiscation, and even destruction of the clients' reels by development companies. This made the film circulation and access nearly impossible for decades to come (Benshoff & Griffin 108; Hubbard 6; Stevenson 26). Thus, although advancements in technology and societal attitudes provided grounds for the creation of queer cinema, legal prosecution remained an important obstacle to its spread.

Fireworks, which this essay uses as a case study, was no more fortunate in terms of distribution at the time of its production. The short film is deemed to be "the most aggressively queer film of its era, brimming over with homoerotic signs and symbols, from sailors to public bathrooms to phallic imagery" (Strub 382). The narrative of the film, inasmuch as there is a traceable narrative, follows a man who tries to pick up a sailor and is assaulted by him and his friends instead (see fig. 1 & 2). The imagery that follows suggests cruising in a lavatory (see fig. 3 & 4), the protagonist being picked up by another sailor (not only as a euphemism) (see fig. 5), a Christmas tree being set on fire (see fig. 6). It comes as no surprise that Anger did not dare to screen the film publically for two years. Despite the caution, after its screening in Coronet Theatre in West Hollywood in 1957 (Stevenson 26), when the Los Angeles Police Department became aware of the film's distribution they "leveled an obscenity charge at Coronet operator Richard Rohauer" (Strub 382). Although Rohauer was originally found guilty, the ruling was appealed to the Supreme Court in California and resulted in a revised ruling in Rohauer's favour in 1959 (Strub 383), making homosexuality "a legitimate subject to tackle in art" with a landmark victory for queer cinema (Freeman). This film, moreover, was the first unapologetic queer avant-garde experimentation that drew attention to the possibilities of the film medium: not only did it display an explicitly queer narrative, but it was also revolutionary in its approach of portraying queer desire on screen.

On the legacy of Anger, Alice L. Hutchinson writes, "few have come close to distilling his

[2]The only representations of homosexuality allowed by the Production Code were reserved for villains or similarly "sinful" characters who would necessarily be punished by legal or 'moral' law.

[Anger's] style and renegade attitude," making him as exceptional and relevant as he was when he started off his career during the post-war period (61). In his debut *Fireworks*, Anger did not choose a transparent, classical Hollywood narration and instead opted for a type of filmmaking that, indeed, fires off like fireworks. Hutchinson further notes that Anger's use of "hermetic symbolism, mythological iconography, quick-cut montage editing, juxtaposition and counterpoint of image and soundtrack [in *Fireworks*] - remains inimitable" (61). The aforementioned juxtaposition is not only utilised within the visual aspects of the film; the story itself is full of contrasting elements.

Harry M. Benshoff and Sean Griffin comment on the complexity of sensuality in a scene where the protagonist (played by Anger himself) is beaten up and humiliated by homophobic sailors; by stating that although *Fireworks* is undoubtedly "humorous and erotic," it goes beyond the playful facade and depicts queer desire as "highly conflicted and violent" (118). The fragmented images that follow one after the other in this scene appear to suggest a tension and equalisation between humiliation and pleasure (see fig. 7-11). Moreover, the image of a sailor in itself contains a paradox, as he acts as "an emblem of desire and anxiety, a kind of sex symbol on one level, and on another level the carrier of a great deal of ambivalence and hostility, latency and fear" that is reflected by the juxtaposition of violence and shelter contained within the sailor figures in the film (Hutchinson 61) (see fig. 2 & 5). Benshoff and Griffin express this ambiguous juxtaposition, remarking the "brutish masculinity" of the sailors, and that their attack on the protagonist "appears to be a sort of gay bashing—or is it meant to symbolize an all-male orgy?" (118). It is unsurprising, then, that Whitney Strub regarded *Fireworks* to be "the most aggressively queer film of its era" (382). What should be stressed, however, is that the film privileging "connotative imagery over linear narrative" played as much of a role in the aggressively queer energy elicited in the film as the subject matter (Strub 384). The language of symbols and euphemisms in *Fireworks* is abundant and furthers the transgressive capacities of the film through its campy style.

The ritualistic atmosphere in *Fireworks* has been directly tied to its expression of queer desire. Libbie Rifkin notes that *Fireworks* is filled with "homoerotic ritualism" of the "submissive male body" and that the film's "pagan reclamation of Christian symbolism [of a Christmas tree], and the climactic trajectory of the film's initiation ritual" into queer bonding creates a transgressive vision of desire (415-6). According to Benshoff and Griffin, the film's central theme, indeed, is an "initiation into the sadomasochistic world of male bonding and male sexuality" (118). Daniel Kane stresses "Anger's role as a pioneer in depicting homosexual desire through [such] a ceremonial form," which makes *Fireworks* a bizarre coming-out story, a story of rejection, and a story of assault, but also one of hope (39). Although it never really shows sex between men explicitly, it alludes to it in such a way that made authorities consider it pornographic (Stevenson 24). However, the ways in which it does so are ridiculously tongue-in-cheek: a sailor setting off *Fireworks* on his crotch is only one of undoubtedly "outlandish visual metaphors"in the film (Benshoff & Griffin 117; see fig. 12). Vincent Brook argues that these symbols belong to "modern camp", reflected through "abrupt shifts in tone from the sublime to the ridiculous," regarding the film as a campy comedy of sorts (5). There seems to be no either/or for *Fireworks* as the film is simultaneously layered with horror, humour, and sex.

This "dazzling repertoire of visual metaphors" and taboo subject-matter of "rough-trade fantasy" are not the only aspects that stand out in *Fireworks* (Hutchinson 60; Stevenson 26). What this film achieves is a lot more revolutionary than any isolated component within the film. *Fireworks* successfully positions the audience within the seams of the film itself, i.e. it makes the audience *experience* the subjective experience of transgressive desire. As Hutchinson puts it, Anger "creates a realm of visual pleasure and abstract eroticism that exposes, positions and reconstructs a cinematic gaze" (61). The cinematic gaze is exposed through an unusual framing of the male body, which is presented fragmented, chaotic, submitted to forces outside of one's own control (in this case by off-screen blows and bodily liquids landing on the protagonist's body). This is comparable to a queer experience of the world, an experience in which one's desire is as much out of control as it is subjected to scrutiny and oppression by a homophobic society, an experience reflected in the aforementioned fragmented and chaotic shots of the protagonist's body. The tension between an experience of transgressive desire and the external denial of

such an experience creates an internal conflict that is rarely portrayed on screen in specifically cinematic terms. However, Anger manages to do so by using avant-garde editing and a mise-en-scène inspired by surrealism. The director uses associative dream-like images and the aforementioned means of body/image fragmentation to embody the violence of this internal conflict not only on a narrative level, but also on the level of creating a subjectivity that merges with the audience (Hutchinson 60). This cinematic interaction between the spectator and the film can be explored further through the lens of phenomenology. Vivian Sobchack proclaims that cinema is "an expression of experience by experience," meaning that the audience's *experience* of the film is as vital to this interaction and the meaning-making of the film as the film itself (3). Moreover, Sobchack posits that cinematic language consists of "modes of embodied existence" consisting of "seeing, hearing, physical and reflective movement" (4). *Fireworks*, through its experimental framing and editing, achieves a portrayal of the conflicted experience of erotic desire (including that of extreme violence), in a way that enables the viewer to embody it as well (Sobchack 4). *Fireworks*, although made more than seven decades ago, achieves its cult status not only because of its transgressive subject matter, but also because of its embodiment of queer subjectivity and of a relentless confrontation between the expectations of the audience and the unapologetic desires on screen.

This research paper has aimed to show that the very first queer film in the United States, *Fireworks*, is a study of transgressive desire that goes well beyond its historical significance and is as innovative as it seemed to its American post-WW2 society. This film, which "marked the beginning of the American gay Underground/ Avant-garde movement," not only plays with audience's expectations, but also with the audience itself through its interaction with the viewers' embodiment of the filmic experience (Stevenson 26). It achieves this goal through its avant-garde framing and editing, inspired by surrealism. Combined with its defiant narrative that intermixes queer desire with masochistic violence, *Fireworks* presents queer subjectivity that invites the viewer to experience and embody it. Hutchinson summarises Anger's achievements as follows: "Anger has provided an elegantly subversive alternative to mass cultural representation, mainstream film and contemporary art . . . in mesmerising and beguiling oneiric visualisations" (61). Indeed, *Fireworks* resisted hegemonic classical style narrative techniques and aesthetic as much as it resisted censorship-approved representations of queerness, to the extent that to this day it remains revolutionary in its filmmaking approach and should serve as an inspiration to be discovered and re-discovered by queer filmmakers. Queer cinema did not start off as normative, and it need not become so. *Fireworks* shows that telling of a queer experience of the world is not enough: what cinema is uniquely capable of achieving is embodying that very experience, and making the audience do so as well. For this reason, *Fireworks* serves as a much-needed inspiration - you could call it 'going back to the roots' - for a queer cinema that should not lose its queer edge.

Appendix A

Figure 1: Protagonist is assaulted after hitting on a sailor. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 2: Sailors with chains attacking the protagonist. Anger, Kenneth, director. Fireworks. Cinema 16, 1947

Figure 3: Protagonist, naked between pissoirs. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 4: Following image confirms cruising. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 5: Protagonist being picked up by a sailor à la Pieta after the attack. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 6: A Christmas tree on fire. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 7: Protagonist under attack - in pain or pleasure? Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 8: Fragmented body. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 9: Bathing in blood. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 10: Unspecified liquid being poured down by off-screen force. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

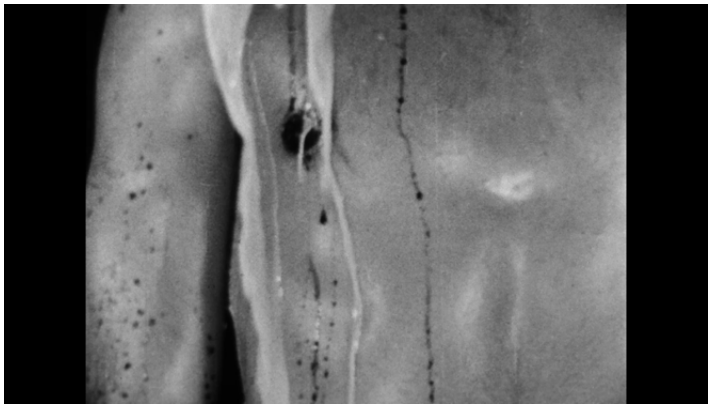

Figure 11: Fragmented body. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

Figure 12: Setting off the fireworks. Anger, Kenneth, director. Fireworks. Cinema 16, 1947.

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Humanities

Ethics at the Core

For the Inclusion of an Ethics Course in the Academic Core of Liberal Arts Colleges

Patrīcija Keiša

Image Source: Amano, 2018

Abstract

Liberal arts education is being actualized globally as a result of a rethinking of the purpose of undergraduate education with the aim to reach beyond specialized vocational learning outcomes. Liberal arts is thus an educational philosophy that, apart from aiming for academic excellence, strives to cultivate general social and character-related traits in its students. Three particular educational goals outlined in theoretical writings are: citizenship, leadership, and well-roundedness. However, it is challenging to ensure the fostering of these traits because, for example, in Dutch liberal arts colleges, the curriculum model is such that the study path depends largely on each student's particular subject choices. In this paper, I argue that a way of meeting this challenge would be to include an ethics course in the academic core that is mandatory for all students. I support this addition by showing how the study of ethics promotes fundamental skills such as inquiry upon the good life, reconsideration of foundational values, awareness of oneself as an individual embedded in a society, and accommodation of a diversity of viewpoints, which all relate to the learning outcomes associated with citizenship, leadership, and well-roundedness. My analysis concludes that an ethics course in the academic core would offer a curricular strategy for cultivating these traits. Moreover, I suggest that the study of ethics in general should be considered of essential importance in liberal arts education.

Keywords and phrases: *education, liberal arts, ethics, citizenship, leadership, well-roundedness*

The recent prevalence of liberal arts programs around the globe, with 59 percent of current liberal education programmes having been established since 1990, points to an emerging change in the understanding of the objectives of undergraduate education (Godwin, "The Worldwide Emergence" 3; Godwin, "The Counter Narrative"[1] 227). As opposed to a specialized degree training for particular employment, a degree in liberal arts strives to provide a more general, multidisciplinary education, which additionally cultivates social and personal capabilities (Goldenberg 15). Its promises are to rear students into well-rounded cultured individuals, socially responsible and engaged democratic citizens, and future leaders and problem solvers (Godwin, "CN" 227; Goldenberg 16; Peterson; Nelson Laird et al. 65; University Colleges Deans Network). Through the delineation of these general goals, the liberal arts proposes an educational philosophy, but no particular consensus upon the curriculum and the method (Godwin, "CN" 226; Goldenberg 15; Peterson). One model for liberal arts colleges, commonly employed in The Netherlands, is a program structure that mainly leaves the curriculum's content up to the individual preferences of each student (University Colleges Deans Network). Such a model raises the issue of how to foster the aforementioned general capabilities in students if their study path is predominantly a matter of personal choice. The cultivation of skills necessary for social responsibility, democratic engagement, future leadership, and character development should thus be included in the parts of liberal education undergone by all students. In Dutch university colleges, such as Amsterdam University College (AUC), this shared part of the curriculum is called the 'academic core'. But since the academic core of AUC mainly focuses on very specific skills such as academic writing, logic and foreign language acquisition or on experiences that are highly individual to each student[2] ("Academic Core – AUC"), it is unclear how these particular social and character-related goals are promoted[3]. I would like to suggest that a common denominator for these three aforementioned general capabilities is the study of ethics, elaborating on the idea that no aspect of private or civic life can be carried out without a consideration of ethics (Callahan

[1] Abbreviated as "CN" for future reference.

[2] Such as the 8 different Big Questions courses, out of which the student takes one, as well as the community project/internship requirement, which the students can fulfill in a myriad of different ways.

[3] It is not in the scope and the purpose of this paper to scrutinize the curriculum of AUC or other university colleges. It could be argued that, for example, the mandatory Global Identity Experience course offered at AUC touches upon the traits of citizenship, leadership and well-roundedness. I do not intend to suggest otherwise, but I wish to propose that there could be a better and perhaps more essential (even if additional to all that is currently in place) way of fostering these general skills.

[4] While I do mention particularly Dutch liberal arts colleges and, more specifically, AUC, these institutions only serve as initial background to my research and argument. In other words, my inspiration for this paper was drawn from being a student at AUC,

62). Taking this into consideration, I will put forth a proposition to include a course of ethics in the academic core of liberal arts colleges[4].

There appears to be a general consensus on what liberal education should cultivate in students. Apart from specific academic learning outcomes, Patti Peterson cites a broad knowledge of culture, science and society, problem-solving skills, and well-informed responsible citizenship as the goals of liberal arts schooling. Along similar lines, other authors suggest that liberal arts education should bestow students with a profound sense of self, humanity, and citizenship as well as skills for problem solving and effective leadership (Godwin, "CN" 227; Goldenberg 16; Peterson; Nelson Laird et al. 65, 67). The development of "attitudes and skills for active participation as citizens in society, including . . . social skills and a will to contribute to solving societal issues" is equally listed as a learning goal in a joint statement by University Colleges Deans of the Netherlands. Marijk van der Wende, the founding dean of AUC, positions the importance of educating well-rounded persons, responsible citizens, and capable leaders as a major argument in favor of a liberal arts education in the 21st century (297, 301). Overall, these three essential learning outcomes emerge – citizenship, leadership, and well-roundedness. I will proceed by briefly outlining these goals.

In relation to democratic citizenship, Angela C. Miceli Stout underlines liberal arts education "as an opportunity to instruct younger generations about the importance of living the noble, heroic life rather than allow the democratic tendencies to form a citizenry of mediocrity" (65). Therefore, in the context of liberal arts, citizenship is to be seen as more than the mere possession of the status of a citizen. A more suitable understanding here would be James Banks' conception of transformative citizenship: "a transformative citizen takes action to actualize values and moral principles beyond those of conventional authority" (qtd. in Sheppard et al. 70). In a similar vein, Van der Wende writes about concerned citizenship, which involves an understanding of the major issues of our society and a commitment to its betterment (303). Such a commitment, according to Sheppard et al., requires the capability of engaging in public debate and of reconciling a diversity of opinions (72). Overall, citizenship as a liberal arts learning outcome appears to require an active (re)consideration and a communicative enactment of the core principles of democracy.

Leadership is a common keyword when discussing the essence of liberal arts education (Van der Wende 301; Godwin, "CN" 232). According to Goldenberg, good leadership requires certain qualities: the ability to carefully select goals, the aptitude to see problems from a multiplicity of perspectives, but also the capacity to empathize with a diverse group of people and to motivate them to work towards common goals (18-19). Guthrie and Callahan argue that liberal education "is fundamentally related to the themes of leadership" and can "help create leadership capacity to be responsive to and responsible for discovering meaning and truth in our lives and belief" (23). For Goldenberg and for Guthrie and Callahan, leadership and citizenship appear to go hand in hand, as their understanding of a leader is one who is an engaged, critical, and responsible citizen. Thus, leadership is also defined in terms of engaged responsibility, of (re)consideration of goals and values, but puts a specific emphasis on defining goals for the common good, problem solving, and effective group communication.

Well-roundedness can be expressed in relation to educating a whole person as opposed to providing specialized vocational schooling (Van der Wende 195; Godwin, "CN" 232). This concept also refers back to the initial definition of liberal arts – "the arts that craft the soul of the free person" (Cohen de Lara and Drop 14). It ultimately involves reflection upon the nature of the good life (Cohen de Lara and Drop 14) and about the fulfillment of human potential (Wren qtd. in Guthrie and Callahan 21). Well-roundedness also entails the ideas of citizenship and leadership; Guthrie and Callahan summarize it well by writing that liberal arts "is a course of study designed to prepare individuals to act as citizens and leaders in serving something beyond themselves and to live life to its fullest" (21-2). Overall, this goal encompasses a thorough examination of and a true engagement within humanity, pursued simultaneously on an individual and a societal level.

In this outline of the three goals, I see a strong connection with the subject of ethics, a connection in favor of which I will subsequently argue. Ethics, often also referred to as moral philosophy, is a field of study that inquires about how we ought to live

but that is no reason to presume that my argument does not pertain to any liberal arts college of a generally similar model.

(Shafer-Landau, *The Fundamentals of Ethics*[5] 1). In "Goals in the Teaching of Ethics", Daniel Callahan contends that "ethics forces a confrontation with basic premises about human nature and life" (63). Generally, it addresses the guiding ideals and motivations for our life choices and inquires upon the kind of a life that is worth living by ourselves and among others. More precisely, ethics approaches questions of value, virtue, happiness, duty, moral rules, justice, and interpersonal relations (Shafer-Landau, *FE* 2). Considering the fundamental nature of these concepts, Callahan argues that no aspect of life can be carried out without ethical stakes and underlying moral values (62). Thus, it appears reasonable to suggest that any student, regardless of their specific study path, should be exposed to and taught in a subject that inquires upon such general and essential matters of human life, as outlined above. In other words, the study of ethics would entail the general exploration of humanity, which is essential to the educational goal of well-roundedness. Reflecting upon the good life in particular, which Cohen de Lara and Drop mention as essential for the formation of the person as a whole, is a direct concern of ethics. I will proceed by analyzing how the other two core values of liberal arts, namely citizenship and leadership, can be fostered through the teaching of ethics.

With regards to citizenship, I will start by simply looking at the general notions associated with it – duty, rights, responsibility, freedom, belonging, and relating to a group. There is an evident overlap with the issues that are addressed by the study of ethics. Moreover, the mere fact of being a citizen relates to being adherent to a particular social contract (Freeman 14-15), and social contract theory is an ethical theory. As introduced by Hobbes, social contract theory argues that morality entirely depends on what is "permitted by rules that free, equal, and rational people would agree to live by" (Shafer-Landau, *FE* 194). Such a definition, of course, raises many questions about the foundations of the state one is citizen of; about the definitions of freedom, equality, and rationality; and about whether law alone and the particular law one lives under suffices to provide moral guidance in life. Inquiry of this kind appears essential for understanding the nature of citizenship in general and for gaining awareness of oneself as an engaged citizen of a particular state.

To continue, in relation to liberal arts colleges, citizenship means democratic citizenship, for this is the political regime within which this kind of education exists. Sheppard et al. argue that a central feature of democracy is controversy and disagreement (70) and, therefore, "classroom discussions of controversial issues are powerful tools for fostering more active democratic citizenship" (79). David Callahan outlines "tolerating – and reducing – disagreement and ambiguity" as an important goal in the teaching of ethics (67). Generally speaking, ethics, which addresses questions of what is right and wrong, is bound to lead to debate. An ethics course also commonly covers deeply controversial moral dilemmas and topics, such as euthanasia, death penalty, abortion, poverty, moral status of animals, and environmental issues (Shafer-Landau, *The Ethical Life* vi). Callahan argues that it is exactly this potential for disagreement that allows students to develop argumentative skills. Consequently, students can learn to reduce misunderstanding and ambiguity to the extent where some agreement can be reached (68). It appears reasonable to say that this is a fundamental skill for a democratic citizenship and that the "tools for effective citizen engagement" (Kretz 341) can indeed be provided by the study of ethics.

Educational theorist and philosopher Nel Noddings also asserts the need for ethics education in the context of a 21st century democracy, arguing that schools should engage in "thoughtful analysis of what it means for individuals to live a full life, and how we might induce a renewed commitment to personal integrity and moral concern for the welfare of others" (11). Such a suggestion underlines the role of ethics in understanding humanity as an interplay between a particular subjectivity and a socially embedded existence – that is, between the individual and the society they are part of. Callahan writes, "human beings live their lives in a web of moral relationships" (65). In other words, the nature of any society is inherently moral. Yet these omnipresent moral features can go unnoticed and hinder an individual's understanding of the society if one's moral imagination has not been developed, and such imagination requires the use of emotion such as empathy, which can be stimulated in the study of ethics (65). In a democracy, which is based on the principles of freedom, equality, and tolerance, the ability to empathize carries a particu-

[5] Abbreviated as FE for future reference.

lar importance. Nevertheless, Callahan approaches emotion with high prudence, quickly juxtaposing it to analytical skill and reason. Kretz, on the other hand, specifically makes the case for emotion as essential to moral empowerment, which she sees as indispensable for engaged citizenship (341). Be it through moral reasoning or emotional moral empowerment, overall, it is clear that ethics education can provide tools for understanding citizenship and one's relation to their society.

As I pointed out previously, for Goldenberg, as well as for Guthrie and Callahan, leadership is inherently linked with citizenship. Therefore, most of what has been argued in relation to citizenship and the study of ethics applies equally to leadership. This interrelation of concepts works in both directions because the engaged, concerned, transformative citizen is clearly expected to take lead when it comes to reflecting, evaluating, and bettering the world around them. Conversely, the leader is also envisioned to be an engaged citizen, able to understand "different approaches and perspectives" (Goldenberg 18), as well as capable of reflecting on and challenging the status quo (Dess and Picken 30), and of working towards the common good (Grandy and Sliwa 427). A large aspect of leadership is adaptable and skillful problem solving (Guthrie and Callahan 25), and Sharaf N. Rehman holds that learning ethics provides students with the tools and skills to evaluate the best choice in any given situation (15). Furthermore, writing about education for business leadership, Rehman advances the argument that the common status of ethics as an optional course implies that ethical considerations per se are optional and not required (15). She deems that the absurdity of this claim brings forth the indispensable nature of ethics education. To continue, the launch of the Oxford Global Leadership Initiative (OGLI) in 2014 advances a particular emphasis on the necessity of developing ethical qualities in future leaders in order for them to serve the common good (Brooks et al. 167). Based on students' experiences, the initiative is described as catering to "the desire of ambitious students to integrate their will to effect change within a wider context of personal formation, moral purpose, and common good that many universities are not currently delivering" (170-1). The OGLI programme is based particularly in the Aristotelian virtue ethics of character development, but it undeniably actualizes the essential necessity for an ethical approach to leadership education. Moreover, the research in relation to this initiative suggests that people in their twenties, the age most people pursue undergraduate education, are willing to submit their values, motivations and behaviors to scrutiny (173). This means that directly addressing ethics in university has the promise of having a significant impact on the way students continue on with their lives as leaders, citizens, and individuals.

Ultimately, I have shown how the study of ethics fosters the learning outcomes of leadership, citizenship and well-roundedness, which literature points to as being essential goals of liberal arts education. In the analysis of those three traits, I have noted that well-roundedness is the most general of the three – in its conception of educating a whole person, it encompasses both citizenship and leadership. Furthermore, it appears that the traits associated with citizenship are also related to leadership. These would entail reconsideration of foundational values, accommodation of controversy, and ability to consider different perspectives. In relation to leadership, a larger societal grasp of issues is required to engage in problem solving, for which an understanding of ethics can provide a set of tools. Overall, I wish to re-emphasize that the learning outcomes in question are of general importance to every human and that the study of ethics is essential to these outcomes. Subsequently, I argue for the inclusion of a specific ethics course in the academic core of liberal arts universities because ethics is fundamental to the development of the student as a whole person. An immediate response to my suggestion could be about whether an ethical approach cannot be simply included in every course taught within the already existing curriculum. My answer to this is that although this, undeniably, is an attractive option and perhaps something we can strive for, adapting every single course to rigorously and thoroughly discuss the ethics of its subject-matter would be a considerably more complex implementation than a single mandatory ethics course. Additionally, in my personal student experience, whenever ethical considerations are part of a course, they are treated as marginal and as immeasurably less important than the primary contents of the course. Another alternative to a general ethics course would be to develop a specific course to address the ethics-related goals of a liberal arts education, akin to the Oxford Global

Leadership Initiative. At any rate, I hold that there is a necessity for the study of ethics in liberal arts, although there is space for discussion in regards to its content, form, and method.

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