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Protest by Print: Radicalism, Ambiguity, and Artistic Exploitation in Additive Manufacturing

It is quite inevitable that advancements intersecting elements of continuous technological innovations and the everyday of human life will be met with some sort of controversy. Of course, the amount of discourse surrounding a given advancement will question its declaration as such, and will toss around the unknowns of contributing factors such as production and distribution costs, ethical and safety concerns, detriment of extended use within future generations, and the like. It's difficult to combat these fears and accusations without proof of established boundaries and protocol within a new technological medium. And even though there will always remain a front that welcomes the grounds of potential within new media, an understanding of public concerns and situational possibilities can assist its affiliates in better understanding the nature of the medium in a social context.

Because technology like 3D print raised so many questions in its early stages, it's important to remember that the concerns of new technology are largely a part of the package, and that the outcomes and objectives of this medium are determined by the user. When artists began to incorporate 3D print into their practice they willingly made the effort to channel the fears and wonders of the public into their products. Art is agitating by nature and it's easy to see how it can play with the practice of 3D print to make sparks fly. The practice has an inclusive aura about it that implies that anyone has the power to create these products as long as they have access to the necessary materials. 3D print as both a functioning cultural tool and artistic medium furthers the divide between luddites and technophiles

through controversial yet productive advancements pioneered by its users.

The 3D printer provides its users with never before seen creative components that allow for a fully realized and functional representation of their own concept. While this may pose somewhat like a gimmick to enthrall the wandering millennial media artist, the scientific perspective of the 3D printer is quite extensive. A shared point of intrigue within the realm of 3D print is the prospect that through calculated properties we will be able to create objects that are “infinite”, or simply works that are able to withstand the conditions and stimuli of the world around us. Active research towards the incorporation of smart materials and evolutional elements of these printers' products seem to fully harness this idea, and is able to successfully overcome the number of limitations met by conventions of a material process. (Zun Khoo and Teoh, 103). The guaranteed lifetime of a tool within production is essential to any creative and ensures both economic value and productivity. The incorporation of polyjet printing has expanded the compositional grounds of the medium, introducing multi-material object creation that successfully incorporates new printable components (with mock metals proving popularity and usefulness). Responsive materials have also been developed and implemented within the practice, using both piezoelectric properties (electricity and shock responsive) and nanofabrication (stress and stimuli responsive actions) to fixate natural structures to the process. This also includes temperature sensitivity, super-elasticity, and regenerative qualities to retain object shape (Zun Khoo and Teoh, 107). Though some may argue the redundancy and wastefulness in recreating pre-existing life-like processes within tools such as the 3D printer, it is to be noted that both time and energy efficiency are also a large part of these efforts in experimentation, and that the precision of the printing process allows for a small margin of error. Additive manufacturing also exempts us from an impending reliance on traditional robotics for ventures within personal creative composition or industrial

construction, and can effectively fill the gray area between the advantages and disadvantages of robotics.

It's not difficult to see the advantages that the 3D printer has in store for a practicing artist. Minimal process time, efficient tool use, and a new avenue for creative ventures are all explored. But there is much more to unpack here than simply printing ceramics to avoid tool wear or the ability to create a high quantity of plaster prototypes in a short amount of time. We're left to wonder: what exactly is the creative potential of development at the hands of additive manufacturing? Though the practice is relatively new, practices in artistry and experimentation with craft have historically helped to pave the way within once-new mediums, not only pushing the boundaries of the medium, but marrying it to a distinct concept by exploring new modes of radical thought. When we consider the 3D printer's steps that helped define its infancy, one of the first points brought up is often the file known as “The Liberator”, a controversial 3D printable file that struck fear in many, primarily due to its swift development and the questions it rose concerning legality and gun ownership both in the United States and outside of it. Though it was a product of amateur manufacturing and didn't quite match the parameters of the standard firearm, the possibility of danger was something that came along with the distribution of the file. Despite numerous safety concerns accompanying personal use and a general lack of functioning ammunition, the file was prohibited across the United States entirely within just weeks its first firing in May of 2013 (Walther, 1436). Of course, this order will not remove the 3D printed gun from personal computers or the internet entirely. It is also safe to say that the development of the weapon doesn't actually add a significant threat to the presence of firearm related crimes throughout the United States (Walther, 1444). These conditions render printed gun legislation to be quite ineffective, and are easy to work around due to the malleable nature of 3D printer file development. Perhaps the most important point

to take away from these events, however, is the relationship it highlights between additive manufacturing and the illicit. While the 3D printer's ability to bypass law may not be a thought that strays far from those who have explored the printer in any capacity, this is one of the first recorded events where the public was able to see the discrepancies between the law above the printer and what is still achievable with it. Fortunately, this coupled with the enthusiasm and wonder surrounding 3D print has successfully inspired numerous creatives to take on the challenge of exploring such a vague and open-ended process.

Moreshin Allahyari's work with the 3D printer proves exactly the sort of prosperity that can result from these explorations. After a gradual shift away from working closely with 3D videography, she soon grew fond of the intrusive qualities of additive manufacturing and began incorporating them into her practice. As an Iranian-born artist who has lived in the United States for almost 10 years, her exposure to varying levels of censorship allowed her to understand the nature of the printer on a personal level. This is loosely what birthed the concept of her piece *Dark Matter*, a series consisting of 3D printed objects that are banned in Iran. What makes these objects unique to Allahyari's experience is their deformed and juxtaposed appearances. Each object has been haphazardly fused with another, colored black for an ambiguous appearance that still imitates censorship. *Dark Matter* has a strong standing because of its simple approach accompanied by a multitude of surpassed limits. The work grants us the scope of an informational and physical breach, the fluidity of an object's form and representation, and the variance of banned objects on a global scale (Rourke). It becomes clear after one's exposure to the work that the definition of the “radical” in 3D print is still quite unclear. Does this created bond between banned objects alter their illicit nature? Or better yet, what forces the object alone into a position of illegality to begin with? The plunge into defiance and the road of intent are effectively accessed here, and Allahyari's contribution

is unafraid to spark such a conversation.

It's no coincidence that Allahyari's next project presents as a derivative of *Dark Matter*, ultimately working to expand the same conversation into a new context. Naturally, the prospect of the 3D printer as a catalyst for radicalism grew to assume the roles of societal power and social influence at large. When Moreshin Allahyari and Daniel Rourke collaborated to ask “what is a radical object?”, and later, “what would the 3D printer allow the radical object to look like?”, they created *The 3D Additivist Cookbook* and its accompanying Manifesto. Based upon the influence of the infamous *Anarchist Cookbook*, they birthed an archive of submitted works that met the qualifiers of “radical” objects. This is another simple approach that takes on a great influential power because of its attempt at socializing the 3D printer. The incorporation of public submissions—not even solely artist or engineers—will inevitably establish a community that is centric to a shared interest. In addition, this effect was only multiplied when the final edition of the cookbook had gone live. Now not only are the creatives involved, but the entirety of these printable possibilities are instantly shared with the rest of the world. The accompanying manifesto works to bring the work to full realization, because even though its intent is contradictory and exaggerated, it still holds as a representation of an influential “additivist” body of work (Rourke). The pair's experimental relationship between the small scale and large potential of 3D printed objects is quite uncanny, and effectively creates larger though, even if the products are not created to accompany it.

The subject of “intellectual property” and the rights to an artist's work are also greatly questioned, and intrigued developers have managed to tease this idea through their own products. Matthew Plummer-Fernandez and Julien Deswaef developed *Shiv Integer* in 2016, a *Thingverse*-hosted program that creates combinations of 3D-printable objects in a way that resembles the composition of Allahyari's *Dark Matter* objects (Feldman). The major difference

that leads *Shiv Integer* to a new point of artistic declaration is its individual components; simply other users' 3D printable designs hosted on the same platform. Even though the program only pulls from designs that are permitted for outside use and the program's products have little to no use, artists and support have struggled in finding a definitive response. *Shiv Integer* has been praised by certain users, excited by their involvement with the project through a generative remix approach. Others have called the program “a nuisance” and explain their discontent with its pattern of faux-remixing and works against the individual designs on their own (Feldman). Again, we are left only with mixed approaches towards the process but are still forced to come to our own conclusions surroundings the ethics of the medium. The idea of formulaic art with or without intent may offend some, but it is evident that there is an allotted space for it within the world of additive manufacturing and its respective exhibitional platforms. In a similar vein, artist Oliver Laric was also able to shake the foundations of traditional art by creating 3D printed replicas of the marble columns that stand outside the Old Summer Palace in Beijing. The originals are considered among relics of the ancient Chinese Opium Wars and were very recently returned to China after spending years in a Norwegian museum. Laric's response involved a proper placement of his own replicas outside the Entreé Gallery in Bergen and readily offering their original file for download on his website (Sayej and Magdaleno). The printer grants the artist the precision to create products that appear exactly as the original, intentionally digging up questions of authenticity. Not only do the replicas remove the necessity of a singular artwork, but they completely erase the finite history of the original from the work's narrative. Does this mean they stand as nothing more than an aesthetic beauty? Perhaps, though they also hold the possibility to gain their own significance through the extent of a continuous shared ownership. Ultimately, it embodies the definition of what it is to “copy, but not steal”, and prioritizes accessibility over value (Sayej

and Magdaleno).

With so many examples of the ways in which artists artists are able to successfully reframe the context of the 3D printer, those who operate within the industrial settings of additive manufacturing may feel as though they are less apt to pursuing similar endeavors. The beauty of the 3D printer and its ability to erase boundaries between practices is that its users are able to create products that may exhibit the outcomes of both an aesthetic work and a functional work. Designers like Ross Lovegrove might do a good job of highlighting the successes of 3D print in terms of design and architecture. Recently holding a solo show at the Paris' Centre Pompidou that featured objects such as functional kitchenware, a solar car, and a generator house, Lovegrove effortlessly utilizes the functions of the printer as a unique bridge between the gaps of futurism and the material. Not only does his *Twin'z* car function as an everyday automobile would, but it includes additional printed elements that allow the object to remain consistent and uniform while also making strides beyond average vehicle capabilities. This includes a singular control pad, embedded rear-view screens (as opposed to mirrors), and an optimized aerodynamic build (Centre Pompidou). It's not to say that these additions are not entirely impossible without the aid of the printer, but it does create a much more feasible tool for these outcomes. This also gives artists and designers alike a chance incorporate a customized sense of craft, and aids the demonstrate innovation within both fields. When these elements are able to intersect, products larger than an individual output become more prominent.

Individualism is able to thrive through additive manufacturing, even when its origins stems from communal resources. 3D print is also able to channel focal points of both radicalism and practicality, which have proven their coexistence within the medium. Creative prospects have already been centric as well, and its tangible form allows for a presence within

industry and other forms of capital. Though it is a tool that is able to garner both positive and negative attention, it's undeniable that additive manufacturing truly depicts the visceral nature of contemporary art practices as well as the fickle body of economics. Perhaps the process of organ transplantation and tissue engineering has yet to be perfected, but the successes during its early stages and a visualized end to an issue existing before the 3D printer is what is most fascinating about the process. Injustice is at the hands of any creative tool, but it is to be accepted along with the imperfections of the practice to prolong its experimentation. Since the printer doesn't exist simply as an artist's loophole, law and order will work around the printer in the same way that it does to other cogs in creative communities. And as always, physical requirements for the additive manufacturing process will restrict a percentage of creatives from exploration, so it is important for innovators to further exemplify the capacity of the medium.

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