Art of the 4th Industrial Revolution and its Contributions to Humankind

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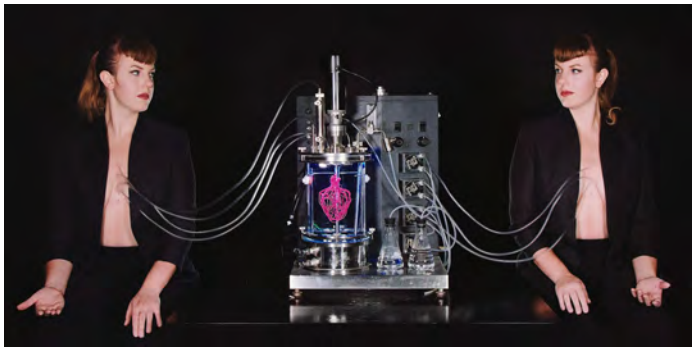
Abstract
Whereas artwork has historically served as documentation, storytelling, for religious ritual, ceremony, propaganda, social commentary, legacy, creative expression, functional craft and beauty; art made with the new tools of the fourth industrial revolution, including 3D printing, digital tools and digital manufacturing serve to positively impact human evolution in ways not previously witnessed. Although the human condition, nature and events continue to capture the attention of artists, the utilization and exploration of these tools in the production of art and design makes advancements and innovations across many fields including scientific, engineering, social, environmental and healthcare in ways that have the potential to influence and make contributions that fundamentally benefit humankind.

Introduction

Art serves to extend and expand our shared common visual language [1] and convey ideas, feelings, concepts, and emotions outside of verbal and written language. Whereas artwork has historically served as documentation, storytelling, for religious ritual, ceremony, propaganda, social commentary, creative expression, legacy, functional craft and creating beauty; the art and design made from contemporary technology and digital tools, including 3D printing, synthetic biology and digital manufacturing have opened new doors to innovation that serve to impact evolution in many fields, and even impact human evolution itself. As Modernism was born out of the industrial revolution as the expression of an urge to embrace the new realities, technologies, materials, and social structures of the new industrial age [1], a new movement of Additivism [2][3] is being born of the realities, technologies and materials of our current times and this 4th Industrial Revolution that we are cascading into.

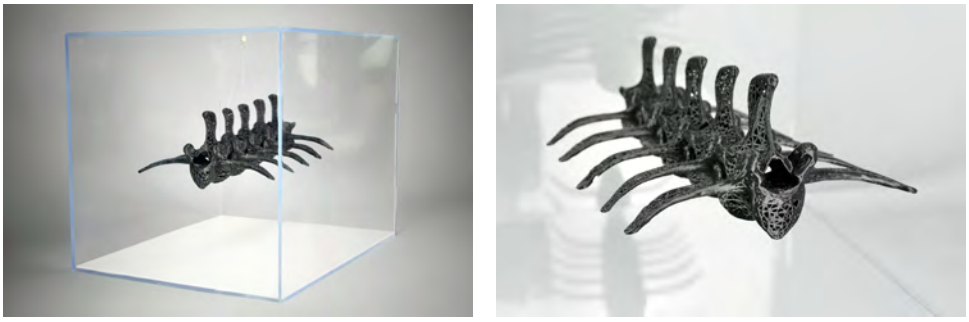
The place that humanity is at in our evolutionary journey is humans and technology merging. The 4th industrial revolution is merging the physical and digital, technological and biological. The 4th industrial revolution is built on the digital revolution of the 3rd but is distinct in terms of scope, velocity and impact. The speed of current advancement is evolving at an exponential pace with no historical precedent, and is impacting almost every industry in every country. This rapid advancement is calling for a transformation of entire systems including management, production, education and governance. [4]



Amy Karle, 2016 Image Credit: Charlie Nordstrom

Some believe the expansion of our technology, digital and artificial intelligences will lead to our demise, while others seek a utopianism through these means. How we choose to use these tools will shape and define this mergence of humans and technology and our successes and failures as humankind.

Artists play a key role in exploring the issues and technology itself, calling attention to challenges and opportunities, and serve a unique role in developing and pushing the technology forward in the process of creating their work. Many contemporary artists and designers in this field focus on and explore the themes of biology and technology merging, biotechnology, infotechnology, Additivism, Transhumanism, Posthumanism, posthuman machines, and hybrid representations and re-embodiments. In the process of using new technologies in creating their work, these artists often develop and drive that technology forward in order to create the work. Many create their work by using design thinking, speculating future scenarios and using the technology that could be used towards the application of those goals, thus creating "art"ifacts of a speculative future in the process. These artifacts serve as specimens of the process of making artwork through digital means and of this time in humanity of infotech and biotech merging.



"Vertebrae" Amy Karle, 2016: 3D printed sculpture made from reality capture 3D scan of bones and generative art.

Role of Art / Role of the Artist

The role of the artist is first and foremost that of the creator. Artists make something out of nothing and bring concepts into reality. Throughout history artists and creatives had been viewed as not only holding skill but also a creativity capacity – something from the same source ascribed to the "Creator" and creative energy, from a source beyond perceived or understood realms. Art also holds the power to communicate on various levels, from visual imagery to triggering subconscious thoughts and emotions. Art can mold and influence the mind, influence tastes, perception and preference. Wealthy patrons of the arts understood this power of art and commissioned artists and designers to create documentation, marketing, propaganda and objects of function and beauty. Art also establishes a legacy, and provides for the quest for immortality, being immortalized into a painting or sculpture that can live on thousands of years after the death of the person or idea.

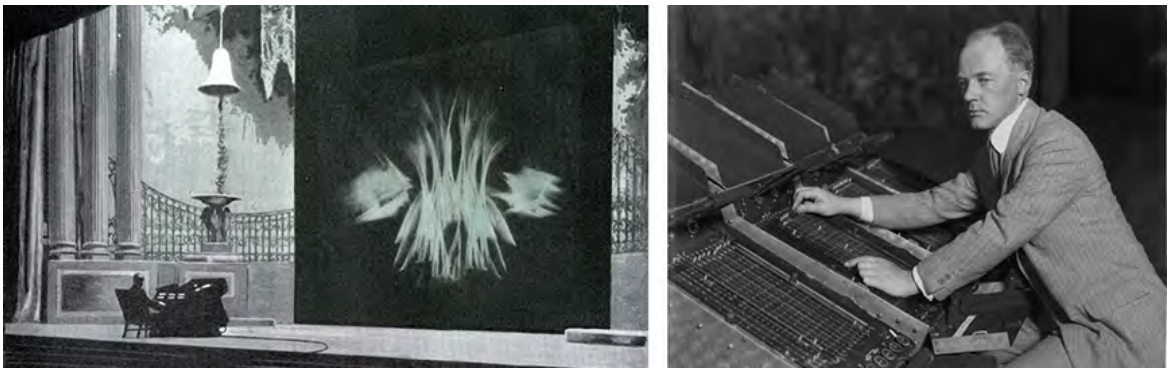
The Avant-garde movement in the early 1800s provided a shift from subject being commissioned to where the artist controlled his own visions. According to the Avant-garde ethic, the artist role was to provide moral and spiritual leadership and to show meaning for the dawning industrial age - to reinvent and expand the visual language for the changing times. In controlling their own visions and content, the artist was seen as class above the rest, as prophetic [1].

Today, the artist can take whatever role they wish in creating their work. Artwork and the method of creation is often a reflection or extension of the artists personality and interests. The artist has many models of working. In order to develop technologically or scientifically advanced projects, the artist and designer increasingly works as a project manager, collaborator, contributor, resident or fellow developing concepts and projects alongside their counterparts in various fields including technology, healthcare, science, mathematics and engineering. The artist becomes a provocateur and futurist, concepting that which has not yet been made and driving advancements to create their visions.

Likewise, different disciplines, companies and institutions benefit from working with artists and designers. Artists and designers provide inspiration, a different way of thinking and approaching challenges, innovation and creativity in their approach and alternative viewpoints and knowledge. The innovation that arises from collaboration across disciplines far surpasses what siloed knowledge can accomplish on its on.

Medium, Conception & Methodology

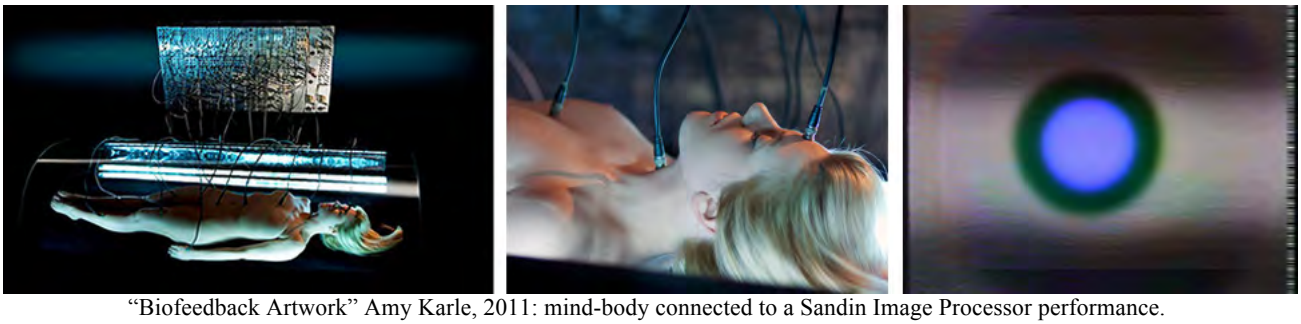
The onset of technology and digital culture has caused technology to become a catalyst, part of the conversation, and media for contemporary art and design. New media, digital media, digital art, hybrid art, bioart, biodesign, cyberperformance, electronic art, generative art and telematic art are some forms that have emerged over the past decade.



"Clavilux" Thomas Wifred, 1930: performance of visual organ, and (right) at his consol. Image credit: Sound+Visual+Movement

Avant-garde ideals of the 1800s led to the birth of Modernism and modernist movements of the 1900s, the expression of an urge to embrace the new materials and the new realities and materials of the industrial age. Underlying most of the modernist movements were impassioned efforts at social engineering, utopianism for the new industrial state that was taking shape. [1] We are again at a time where many artists leverage the expansion of our technology to explore these concepts and many seek utopianism through these tools.

The human condition, nature and events continue to capture the attention of artists who use technology and themes and tools of digital culture and the 4th Industrial Revolution in their work, while some contemporary artists who work with technology use it as the subject and medium itself.



"Biofeedback Artwork" Amy Karle, 2011: mind-body connected to a Sandin Image Processor performance.
Right: still of video art output in the process. Image credit: Andre LaRoche Stage 3

As with net art and virtual reality, some artwork remains in the digital environment and require digital tools to show it, while other digital and technological works are made into performances, sculptures, machines, installations, garments / wearables and other forms. Getting work from the digital realm in a digital manufacturing process is akin to the artists' concept to creation process: the idea starts in the ethereal realm and then through defining, adding parameters and the use of tools, it comes to form through a creative process of working with complex tools and time based elements to get artworks into the real world.

"Sculpture of Time" Akinori Goto, 2016: 3D Printed Kinetic Zoetrope. Image Credit: Akinori Goto

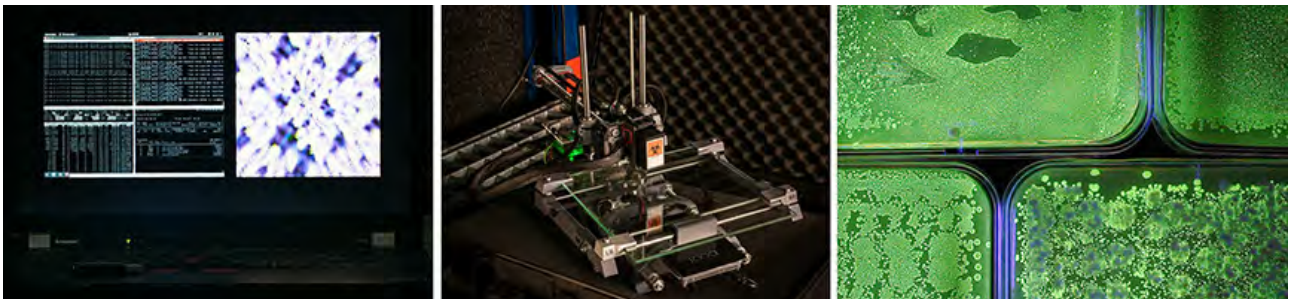
The Use of Tools and 3D Printing

Artists who work with tools of the 4th Industrial Revolution, Computer Aided Design (CAD), Digital Manufacturing, and or biotechnology can leverage these technologies to bring their ideas into concrete form, working from the real world to the digital realm and back.

3D scanners, computer numeric control (CnC), including laser cutters, milling machines, and additive manufacturing including 3D printing and bioprinting enable artists and designers to carry an artifact of their process in the digital realm into the tangible, real world. Akin to a time-based media, the artifacts that come into the real world are a still from that process.

The 3D Additivist Manifesto states: "We want to encourage, interfere, and reverse-engineer the possibilities encoded into the censored, the invisible, and the radical notion of the 3D printer itself. To endow the printer with the faculties of plastic: condensing imagination within material reality… Just as a glitch can un-resolve an image, so it [3D printing] can resolve something more posthuman: manifold systems – biological, political, computational, material. We call for… using Additivist technologies to corrupt the material unconscious…We call not for passive, dead technologies but rather for a gradual awakening of matter, the emergence, ultimately, of a new form of life." [2]

New inventions, new aesthetics and new ideas come with learning new tools. Many of these tools have the potential to create work that otherwise could not be created in any other way.



"Metabol.A.I." Ippolit Markelov and 18 apples, 2017: AI creates new life forms through bioprinting. Image credit: Ippolit Markelov

Using different tools not only affects aesthetics and new opportunities of what can be created, it also effects how the user thinks and invents. There is a design thinking that comes with the process of creating using digital tools and additive manufacturing, to think through why it is important to use those tools, and what those tools could create that couldn't be created in any other way. When one learns a tool so intimately, the brain starts to work a different way and the user comes up with new ideas, innovations and inventions because of it.

Benefits to Humanity

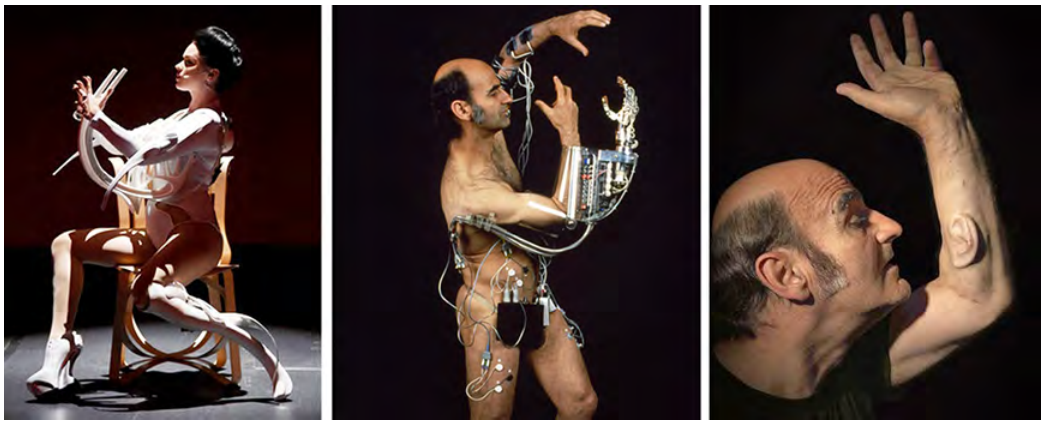
Through their process of creation and visual outputs, artists have the unique ability to show what new tools are capable of before others can envision it, opening our minds to future visions of how new technology can be used to benefit and enhance humanity.

As artists use and explore these tools of the 4th industrial revolution in creating artwork about humanity, nature, technology and current events, they study, tell stories about and merge humanity and technology. In the process of learning and leveraging new technology to create their work, they make cross-disciplinary advancements and innovations across many disciplines including scientific, engineering, social, environmental and healthcare fields.

The artist still has a role of legacy maker, and now has new opportunities to create legacy and the quest for immortality through creating artwork - using biological and genetic materials, merging infotech with biotech and creating work regarding transhumanism and posthumanism. For example, contemporary artists are exploring bionics and bioprinting new forms. These artworks not only advance the technology and perception of concepts, they also test the ethics of these themes and propose workflows, research and developments to the scientific and medical community.

"Regenerative Reliquary" Amy Karle 2016
3D printed scaffolds for stem cell growth into bone. Image credit: Charlie Nordstrom

3D fabrication technologies have the potential to open our minds to a new way of thinking and making, and they have the potential to reshape us. Artists are using tools of the 4th industrial revolution to create artwork that becomes a tool in itself to augment beyond the abilities of the human and empower ourselves to transcend the human condition.



Left: "Sonifica" Viktoria Modesta, Anouk Wipprecht and Monad Studio, 2016: interactive prosthetic set for musical performance. Image Credit: FIU Architecture. Middle: "Amplified Body" Stelarc, 1994: a performance/concert with industrial robot, medical devices and virtual reality support. Right: "Ear on Arm" Stelarc, 2008 surgical implant of a ear on forearm that would transmit the sounds it hears over the internet. Image credits: Stelarc.

Art of the 4th Industrial Revolution performs functions of traditional art: documenting, storytelling, religion, ceremony, propaganda, social commentary, legacy, creative expression, function and beauty; as well as to help understand and positively impact human evolution in ways not previously witnessed.

Conclusion

The step that we are at now in our evolutionary journey is humanity and technology merging. Through the inquiry, visions, workflows, use of tools of the 4th industrial revolution, and ultimate creation of artwork, artists make advancements in the creation of their work that serve to benefit humanity and impact human evolution in ways not previously witnessed. As we progress into the 4th industrial revolution, and as we become more automated, a role of the artist and designer is to creatively explore and show how we can use these tools and machines. As with piano companies hiring composers to give demonstrations of what their instruments could do, artists have the unique ability to show through visual output what new tools are capable of before others can envision it, opening our minds to future visions of how new technology can be used and making advancements towards those goals in the process of creating their work.

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