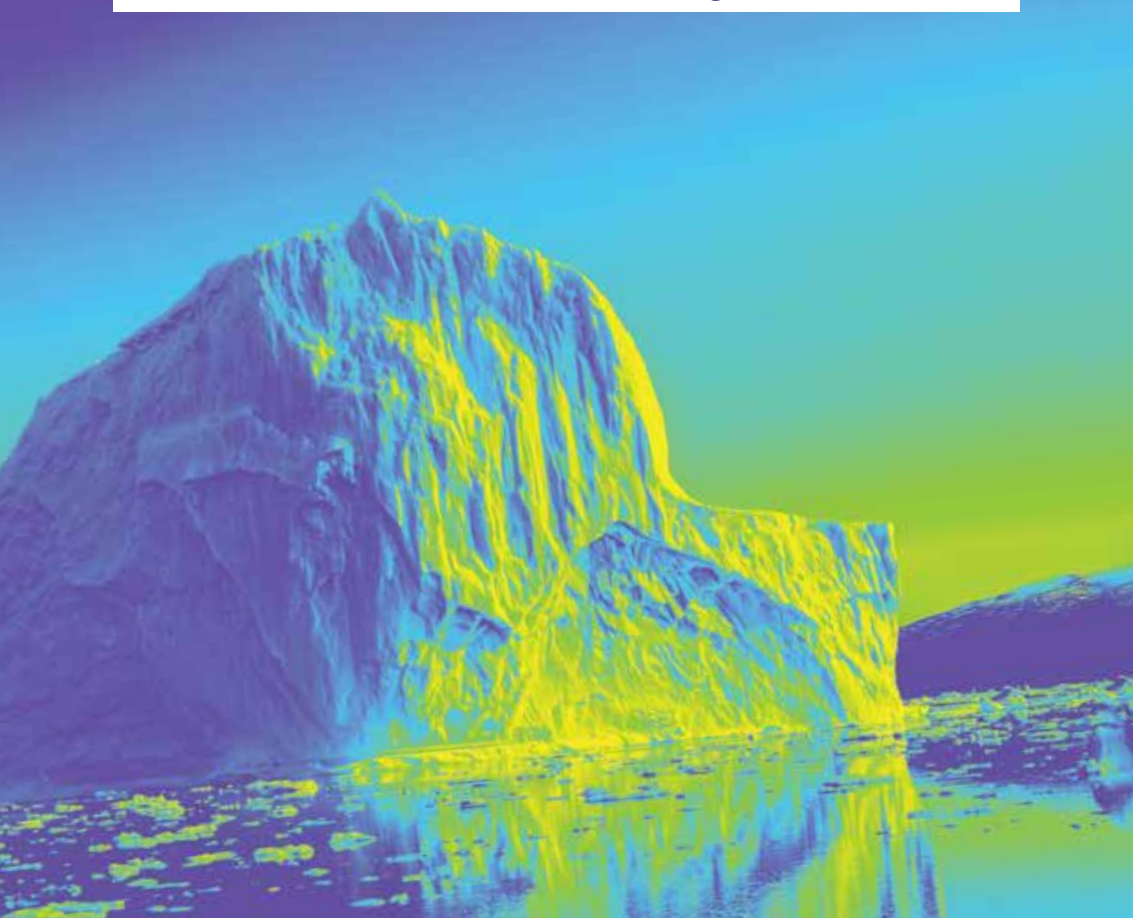


DESIGN FOR ADAPTATION

Cumulus Conference Proceedings Detroit 2022



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DESIGN FOR ADAPTATION

CUMULUS DETROIT

Cumulus Conference
Proceedings Series

Cumulus: The Global Association
of Art and Design Education and Research

Detroit 2022

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PROPOSAL FOR A WORLDBUILDING CURRICULUM

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Abstract

Design practice, adaptive or otherwise, requires research to inform its work. In addition to instruction in design tools, technologies, and methodological practices, a well-rounded design education course must propagate the intellectual knowledge and emotional dispositions, as well as the ethical and cultural awareness essential to creating visionary, equitable, and sustainable solutions for present and future global design opportunities. In response to the challenges of what has come to be termed the Anthropocene (i.e. the current geological age in which human activity is seen to have a dominant influence on climate and the environment), the Worldbuilding Curriculum proposes a pedagogy for a planetary imaginary that transcends physical, political, and ideological boundaries. The curriculum draws upon scholarship from a global, postcolonial perspective, situated within the humanities, sciences, and design theory. It investigates broad conceptual categories to develop a deeper understanding of critical domains affecting the planetary future, and hence their implications for the strategies and tactics designers might employ in response. The Worldbuilding Curriculum is intended to be applicable to undergraduate or graduate study or used as a basis for professional development and is broadly relevant to other disciplines.

Author Keywords

Curriculum; theory; planetary imaginary; sustainment; worldbuilding.

Introduction

In “The Social Life of Design,” Appadurai (2013) states, “Human history ... could be re-written as a history of design” (p. 254). For Appadurai, design is not only the purview of traditional artisans or modern industrial professionals; it is more broadly a mode of adaptation, the way in which humans have creatively sought to acclimate, as it were, to their environment, from the fashioning of the earliest prehistoric tools to the latest digital technology innovations. Moreover, design is not simply limited to the creation and production of functional objects; it is an essential part of social interaction and meaning-making, from the

simplest prehistoric societies to contemporary global civilization, including the systems and cultures within which they circulate. Design objects do not exist in isolation but are connected in a chain that extends from the things themselves to the physical, social, and cultural networks of which they are a part.

For example, the modern toaster sitting on the kitchen counter presumes the ability to connect to the electric power grid outside the home and exists in everyday life as part of a Western cultural practice known as “breakfast” (Molotch, 2005). Arguably more dramatic, the private automobile is connected to a system of “automobility” (Urry, 2004), the vast complex of technical, economic, social, and cultural networks of original equipment manufacturers (OEMs) and multi-tiered global supply chains; sales, distribution, and service centers; petroleum extraction, refining, and distribution; commercial and consumer finance; road construction and maintenance; urban and suburban development; and more. Automobility is on the cusp of major transformation with the proliferation of electric vehicles and autonomous driving, both of which require radically reconfigured infrastructures and supply chains as well as regulatory systems.

Certainly, the primary challenge for design in the present is responding to the environmental conditions of what has come to be termed the Anthropocene, the current geological age in which human activity is seen to have a dominant influence on climate and the environment (Crutzen, 2002; Crutzen & Stoermer, 2000). Climate change, or more accurately planetary warming, and other deleterious effects on the environment have been increasingly exacerbated since the mid-twentieth century as part of what is termed “The Great Acceleration” as industrial civilization has proliferated around the world (Steffen et al., 2015; McNeil & Engelke, 2016). Earth systems scientists have tracked the positive correlation between socio-economic trends tied specifically to economic activity, such as urban population, gross domestic product (GDP), primary energy use, fertilizer consumption, transportation, and telecommunications, since the early eighteenth century with earth-system metrics such as greenhouse gasses, surface temperature, ocean acidification, tropical forest loss, and terrestrial biosphere degradation, the most exponential impacts of which have occurred since 1950. Designers have contributed to those negative trends, albeit for the most part inadvertently, given their position within the industrial process.

In response to the challenges of the Anthropocene, the Worldbuilding Curriculum proposes a pedagogy that embraces a planetary imaginary (Chakrabarty, 2021), transcending existing physical, political, and ideological boundaries. The Worldbuilding Curriculum is an attempt to “[bring] theory to design so as to be able to think design in new ways in order to develop new design practices” (Fry, 2009, p. vii). Indeed, as Fry (2009) notes, “it is no longer possible to be a responsible designer and act ethically as such without being theoretically literate” (p. vii). The term worldbuilding was first used, according to the Oxford English Dictionary (OED), by Eddington in 1920 to describe the creation of hypothetical worlds with different physical laws as part of articulating the theory of relativity. It is now more commonly used to describe the construction of environments, from the micro to the macro, in fiction, film, game design, virtual reality, and other media. Recently the worldbuilding concept has been used to describe the ways in which architects and designers over the past century have fashioned world-scale projects to realize a planetary

future (Sarkis et al., 2020). It is this last sense from which the Worldbuilding Curriculum takes its cue.

The Worldbuilding Curriculum draws upon scholarship from a global, postcolonial perspective, situated within the humanities, sciences, and design theory. (See, for example: Chakrabarty, 2021; Escobar, 2017; Foster et al., 2010; Fry, 2009; Santos, 2016; Tassinari & Staszowski, 2020.) It investigates broad conceptual categories to develop deeper understandings of critical domains affecting the planetary future and hence the strategies and tactics designers might employ in response. The Worldbuilding Curriculum supplements technical and methodological instruction to facilitate a well-rounded design education course that propagates the intellectual knowledge and emotional dispositions as well as the cultural awareness and ethics essential to creating visionary, equitable, and sustainable solutions to present and future global design opportunities. It is adaptable for undergraduate or graduate study or as professional development. It is broadly applicable to the discipline at large, as well as to other disciplines, and is a work in progress.

Conceptual Categories

The Worldbuilding Curriculum has defined five broad categories of investigation to outline, question, and develop deeper understanding of the theoretical domains affecting the planetary future and thus design practice:

- **Culture:** the complex and diverse structures, relationships, and meanings that govern individual and group human interactions, whose emergence in prehistory signified an evolutionary milestone of the genus *Homo*.
- **Communication:** all forms of data and information flows, from genetic code to the binary digit, as well as the media through which they have been transmitted and archived, past and present.
- **Technics:** skills, methods, and processes that humans have used to adapt to the environment, from the rudimentary implements of the emergent genus *Homo* 2.3 million years ago to the latest digital mechanisms and networks of the present.
- **Exchange:** the broad range of interactions between various life forms, vectors, and objects, including sentient and non-sentient actants (Latour, 2007), as they have evolved on a planetary scale.
- **Ideas and ideals:** the origins and development of the *nöosphere* (Vernadsky, 1945), the third stage of planetary evolution, from inanimate matter – the geosphere – to the biological layer – the biosphere – to the emergence of sentient beings, especially humans, whose consciousness and environmental interventions (Haff, 2013) have transformed the geosphere and biosphere, and whose impact threatens a new mass species extinction.

Outcomes

Adopting Guattari's (2008) ecosophical principles, the Worldbuilding Curriculum is intended to foster the following outcomes:

- **A mental ecology** that repairs the psychological damage that centuries of anthropocentric and colonized subjectivities have had on individual

consciousness and enables the potential to envision a sustainable, equitable future across the planet.

- **A social ecology** that dismantles systems of oppression and exploitation, past and present, that have divided the planet and its inhabitants and depleted its resources and instead preserves ancient and contemporary wisdom and cultures and provides structures for an intersubjective, multipolar future.
- **An environmental ecology** that heals the metabolic rift with nature at the root of the current ecological crisis (Angus, 2016; Foster et al., 2010), which has been exacerbated by human intervention into the ecosystems of the planet and threatens to render it uninhabitable, and instead promotes regenerative practices for a future that is sustainable and equitably distributed.

Worldbuilding Curricular Organization

In its current iteration, the Worldbuilding Curriculum comprises three units. The content and organization of these units are general guidelines and may be expanded or contracted in keeping with specific learning outcomes.

- **Unit I:** The Earth's material history, the emergence of life and hominids, and the subsequent development of culture as part of the evolutionary process.
- **Unit II:** The development of human culture across space and time, surveying the development of world cultures from antiquity to the modern period.
- **Unit III:** The above-noted conceptual categories that constitute the foundation for imagining, following Foucault (1970), a new episteme (i.e. the underlying assumptions that guide the potential horizons of thought) of a planetary future.

Unit I

Unit I reviews the planet's origins out of solar debris from around the sun in the Hadean eon 4.6 billion years ago up to the current Phanerozoic eon, which began some 540 million years ago and during which hominids first emerged. It introduces the conceptual frame of "-spheres" through which to view Earth's development and structure. It then traces humankind's early existence from the prehistoric to the Iron Age.

Planetary Cosmology and the "Spheres"

Unit I starts with the planet's physical cosmology. It uses the International Commission on Stratigraphy's geological time scale to depict the large spans of time of the planet's development. The timeline reviews major developments of the four planetary eons: Hadean, with the earth's formation 4.5 to 4 billion years ago; Archean, with the first formations of life 4 to 2.5 billion years ago; Proterozoic, with early life 2.5 billion to 541 million years ago; and Phanerozoic, with more complex life forms 541 million years ago to the present.

As part of surveying the planet's evolution, the curriculum studies the five great mass extinctions (MacCloud, 2013): the Ordovician-Silurian, the first major and second-most catastrophic extinction event some 450 million years ago; the Late Devonian, 360 to 372 mil-

lion years ago; the Permian-Triassic, 250 million years ago and the most severe extinction event; the Triassic-Jurassic of approximately 200 million years ago, after which the dinosaurs emerged as the dominant terrestrial vertebrates; and the Cretaceous-Paleogene 66 million years ago in which the non-avian dinosaurs went extinct. These extinction events are studied in anticipation of considering the Holocene-Anthropocene, the sixth great extinction that some believe is currently underway and is the result of human activity as a “global superpredator” (Darimont et al., 2015; Kolbert, 2015). The implication of design as directly responsible for and potentially remediating this reputed current extinction is a topic to be taken up in dialog with studio practice in terms of material exploration, value-chain adaptations, waste-stream management, user interface, and environmental logistics, to name but a few areas of opportunity.

Dating back to Aristotelian physics, which defines the four elements of earth, air, fire, and water as constituting the earth’s “terrestrial spheres,” the concept of “spheres” continues to be used to describe planetary subsystems in both the sciences and the humanities. Unit I takes up the concept in establishing a framework for subsequent study. The most fundamental sphere originates with the planet’s material formation in the Hadean eon and is termed the geosphere. This includes rocks and minerals from deep in the planet’s molten core to the soil, sand, and rocks on its surface. It also includes the nonliving parts of plants and animals that may have become fossilized over time, as well as water (which is sometimes seen as a separate sphere, the hydrosphere), and the atmosphere.

Coined by Suess in 1875, the second sphere is the biosphere. Later taken up by Vernadsky (1945) as the second stage of Earth’s development, the biosphere is the global ecosystem of all living things, flora, fauna, and microbes. The biosphere has its origins in the Archean eon at least 3.5 billion years ago in abiogenesis, the natural process in which life arose out of non-living matter such as simple organic compounds. The biosphere is the thin layer of life that resides on top, just above, and just below the surface of the geosphere in the Earth’s crust. It has evolved over time, as has been scientifically studied, and, along with the geosphere, is now being affected by human intervention to the point that a new geological age, the Anthropocene, has been introduced as an object for scientific consideration (Crutzen, 2002; Crutzen & Stoermer, 2000).

The third stage of the planet’s development as defined by Vernadsky (1945), following Teilhard de Chardin, is the noosphere, the biospheric transformation that occurred with the emergence of human cognition. For Vernadsky, the noosphere emerged at the point where humankind began to use transmutative technologies to create new materials from naturally existing elements. (For example, extracting metal from ore and subsequently creating alloys.) For anthropologists such as Geertz (1973b), the development of culture is a major step in the noetic evolution of the human mind. Foucault’s (1970) concept of the episteme can be seen as a noetic construction in the broadest sense. Recent media theory has adapted the concept of the noosphere under the guise of notions such as collective intelligence (Levy, 1999) and hive mind (Kelly, 1995), in which human consciousness is taken to be interconnected via the global network of digital communication technologies. The dramatic impact of human intervention into the geosphere and biosphere, recently termed “the technosphere” (Haff, 2014), has interrupted many of the planet’s natural cycles, often to deleterious effect. As with consideration of the Holocene-Anthropocene extinction, the implication of design in developing, perpetuating, and remediating the deleterious

effects of the technosphere on the planetary future is an imperative consideration to carry over into studio practice. In this respect, the Worldbuilding Curriculum seeks to develop the consciousness of designers as they intervene in the planetary ecosphere in visionary, equitable, and sustainable ways.

The Emergence of Humankind

The second part of Unit I traces the archeological record of humankind's emergence in Africa and migration across the planet in what can be understood as the first example of globalization. It then reviews humankind's early history. It is particularly informed by what is known as the "world-systems" approach (Chase-Dunn & Lerro, 2014).

According to the scientific record, the earliest specimen of the genus *Homo* dates back some 2.8 million years with the modern human, *Homo sapiens*, emerging in Africa approximately 300,000 years ago in the Middle Paleolithic period. Humans are then believed to have migrated from Africa to Europe, Asia, and finally the Americas over the subsequent millennia (Harari, 2015; Litt et al., 2021). The first humans in Europe and Western Asia were Neanderthals with *Homo erectus* populating the more eastern regions of Asia. Humans arrived in the Americas approximately 15,000 years ago.

Though there is evidence of the use of stone tools by hominids as far back as 3.3 million years, the Upper Paleolithic period (50,000-12,000 B.C.E.) is generally recognized as when the behaviors, technological innovations (i.e. design), and cultures that constitute modern humankind began to emerge. During this period, humans lived as hunter-gatherers and developed pottery and textiles (Chase-Dunn & Lerro, 2014; Garcea, 2013). The development of agriculture, which marks the beginning of the Neolithic period, first occurred 12,000 years ago in Southwest Asia, the "Cradle of Civilization," and spread throughout the rest of Asia, Africa, and Europe over the next several thousand years (Chase-Dunn & Lerro, 2014; Colledge et al., 2013). It also independently occurred later in Mesoamerica (Scanes, 2018). Access to consistent and predictable sources of food led to the development of fixed communities with built structures, animal husbandry, and more refined tools fabricated from metal (Chase-Dunn & Lerro, 2014). This period also saw development of the first forms of writing (Woods, 2010).

Metallurgy dates from approximately 5000 B.C.E. with evidence of copper smelting in Eastern Europe. Adding tin to copper gave strength to the compound and marked the transition into the Bronze Age, which lasted from approximately 3200-1200 B.C.E. (Chase-Dunn & Lerro, 2014). Alloys were used in the manufacture of tools, utensils, weapons, and decorative objects. This period also witnessed the development of urban cities, early civilizations and empires, and trade networks. The Bronze Age introduced aspects of modern culture in terms of social stratification, governmental and economic administration, organized religion, mathematics, etc., leaving evidence that constitutes the early recorded histories of humankind.

The Iron Age is the final stage of humankind's prehistory. It conventionally begins by world region according to when iron and steel advanced to the point where they replace bronze implements for common use, which archeologists typically date to c. 1200 B.C.E. (Milisauskas, 2002). This is also about the time that alphabets and written languages begin to appear, and as a result, written history (Chase-Dunn & Lerro, 2013; Lam, 2010).

Unit II

Unit II traces the development of human culture and its articulations across space and time. It begins by surveying the development of world cultures in antiquity. It subsequently investigates historical developments by world regions to construct what Foucault (1977) terms “a history of the present,” a genealogy of diverse human cultures leading to the emergence of a global imaginary (Steger, 2008), a perspective that is critical for design practice in the twenty-first century. It again draws upon the world-systems approach to understand human development from the early regional empires – with limited, if any, contact between them – to the interconnected global system of today (Chase-Dunn & Lerro, 2014). By taking a world-systems approach, Unit II seeks to inculcate a decentered perspective among designers with respect to arenas in which they will operate.

The ancient world

What constitutes ancient history is typically defined as extending from the invention of writing to the early centuries of the Common Era, although the exact end dates continue to be debated (Morris & Scheidel, 2016). The period from 800-200 B.C.E. is often referred to as the Axial Age and covers developments in ancient Greece, present-day Iran, China, and the Indian subcontinent when trade and communication across the regions proliferated, including the rise of the Silk Road (Eisenstadt, 1986). This period also witnessed broad changes in religious and philosophical thought. Unit II surveys the ancient empires and civilizations before studying the histories of the world’s regions up to modern times.

The earliest empires include the Sumerian Empire in Mesopotamia, the Egyptian Empire along the Nile, and the Qin dynasty and Han Empire in China. In India, the Vedic Period (1759-600 B.C.E.) laid the foundation for Hinduism. The Mediterranean Sea enabled the exchange of goods, technologies, and ideas initially to foster the development of the Minoan and Mycenaean civilizations in Europe, eventually culminating in the dominance of the Roman Empire over the region. Over the millennia, trade by land and sea began to expand between Europe and Asia, along with the establishment of centers of power and culture (Chase-Dunn & Lerro, 2014). In the Americas, empires began to arise as early as 2500 B.C.E. (Fagan & Beck, 1996). These include the Zapotec Empire (700 B.C.E.-1521 C.E.), Mayan civilization (2000 B.C.E.-the Spanish Conquest), and later, the Aztecs (1300-1520 C.E.). Other significant Mesoamerican cultures include the Olmecs (1500-400 B.C.E.) and the Toltecs (950-1150 C.E.).

In Africa, the Aksumite Empire (100-940 C.E.) controlled trade in the southern part of the Red Sea in what is now Ethiopia and the Bab el-Mandeb Strait (Phillipson, 2013). The Kushite Empire was an advanced civilization with its own language and script, and the Kushites developed innovations in technology, medicine, and mathematics (Wellsby, 2013).

“Post-Classical” History

“Post-classical” is a term used by the discipline of world history (the field of historical studies that looks at history from a global perspective) to describe the period from approximately 500-1500 C.E., roughly coinciding with the European Middle Ages (Stearns, 2017). Recognizing its Eurocentric bias (Goody, 2006; Santos, 2016; Wolfe, 2010), the concept is useful in organizing the content that follows. World history identifies certain trends that appear to have occurred broadly across the globe. Stearns (2017) notes the

expansion and growth of civilizations, particularly the Islamic Empires in Western Asia and Northeastern Africa, the Byzantine Empire in Eastern Europe and Western Asia, the Songhai and Mali Empires in West Africa, and Wari and Inca Empires in South America. China also continued its dynastic development.

Universal religions also developed, with Buddhism spreading from India to China; Christianity, divided into Roman Catholic in Western Europe and Eastern Orthodox in Eastern Europe and parts of Asia, continued to supplant so-called pagan religions; and Islam spread across North and West Africa, the Iberian Peninsula, and into Central Asia, India, and as far east as Indonesia. Trade expanded across Eurasia with the Silk Road under the stabilizing effects of the Mongol Empire, as well as water routes for the trade in spices (Chase-Dunn & Lerro, 2014). China extended its influence in the East and the Americas established its own trade, restricted to the continent. The Oceanic islands also established trade with one another. After studying the larger trends of the post-classical period, Unit II introduces a series of regional studies up to the beginning of the modern period, which is generally defined as 1500 C.E. to the present (Stearns, 2001).

Modern History in Global Context

The early modern period (c. 1500-1800) is characterized by the acceleration of technological innovation and science, and, importantly, the emergence of the modern European nation-state, along with the economic developments of capitalism and the first phases of colonial expansion, in particular into the Americas, by European powers (Chase-Dunn & Lerro, 2014; Stearns, 2001). The period also saw the dominance of the Ottoman Empire in Southwestern Asia, the Ming dynasty in China, and the Mughal Empire in India.

In the late modern period (c. 1800-present), Western European nation-states and worldviews came to dominate most of the rest of the world (Chase-Dunn & Lerro, 2014). The late modern is the period of European imperial expansion into Africa, Asia, and Oceania to supplant earlier regional empires, the dramatic acceleration and spread of industrialization, and the increasing integration of the global economy. The nation-state model came to dominate the global order, with challenges to the European imperium beginning after the Second World War with postcolonial independence movements, particularly in Asia and Africa. Most recently, what has been termed a “transnational” or “global” capitalist system has arisen with super-state entities such as the World Bank, the International Monetary Fund, and international corporations exerting economic, political, and cultural influence, especially in lesser-developed parts of the world (Chase-Dunn & Lerro, 2014; Robinson, 2004; Sklair, 2001).

Unit III

Whereas Units I and II are organized along axes of time, Unit III is organized conceptually.

Culture

“Culture,” as Williams (1983) notes, “is one of the two or three most complicated words in the English language” (p. 87). Its Latin root, *colere* (to till, dwell, worship), forms such words as *cultura*: cultivation; *culter*: knife or plowshare; *cultor*: planter, also worshiper of the gods, hence the English word “cult” (Kroeber & Kluckhohn, 1952, p. 145). Its early usage in English was to tend something, essentially crops or animals. The metaphorical usage to mean human development, as in “to be cultivated,” does not come until later in

the eighteenth century (Williams, 1983, p. 88). There are now several distinct uses: the physical descriptor, i.e. “germ cultures”; the process of human development, i.e. to be a “cultured” person; to describe a particular way of life of a people, period, and/or place, i.e. “early American culture”; and intellectual and artistic works and practices, i.e. “high” culture (Williams, 1983, p. 90). Culture is both a material thing and a symbolic practice. Designers, along with visual artists, musicians, writers, craftspersons, etc., are cultural producers in both senses of the term.

Unit III surveys the field of cultural production as it is broadly understood, taken to mean “the social processes involved in the generation and circulation of cultural forms, practices, values, and shared understandings” (Chandler & Munday, 2011). It is the object of study of several disciplines, including anthropology, sociology, psychology, history, philosophy, and economics. Aspects of culture include but are not limited to the arts, religion, and all manner of tools, as well as social structures and political organizations, mores, rituals, culinary practices, and all modes of interaction among and between individuals and groups. Several aspects of culture, specifically communication, exchange, technologies, and ideologies, are also investigated as separate yet interlocking concepts below.

As Geertz (1973b) notes, culture emerged as a mode of adaptation in human evolution, enabled by the higher-order brain functions of *Homo sapiens* when compared to earlier hominids. Unit III explores different theories of culture with an eye toward deconstructing and decolonizing Western hegemonic constructions (Kimmerer, 2013; Smith, 2012). It is especially concerned with investigating and retrieving indigenous cultural practices that have been subject to what Santos (2014) terms “epistemicide,” the eradication of local knowledge under colonization and exploitation by the Global North (see also Escobar, 2017; Goody, 2006; Wolfe, 2010).

Communication

The Oxford Dictionary of Media and Communication defines communication as “most broadly, a process of interaction through messages or signals among or within humans, animals, machines, or plants” (Chandler & Munday, 2011). It is enabled via systems of agents, codes, channels, and relationships, which can be face-to-face or mediated, interpersonal or mass, synchronous or asynchronous, intentional or unintentional, as expressed in one of the earliest and most influential models, Laswell’s 1948 “Who? Says what? In which channel? To whom? To what effect?” (in Chandler & Munday, 2011.) A communication is also the product of the communication process, an object studied by semiotics and other forms of linguistic analysis. Unit III examines communications through the lens of mediation, the process whereby communications are encoded, transmitted, and received, and the epistemological and structural relationships they enable (Chandler & Munday, 2011; Innis, 1950; Williams, 1983, p. 204-207), which has had a profound impact on the past development of design as a practice and for its future potential.

For example, the appearance of broadcast television after the Second World War can be seen as both a technological innovation and a cultural form (Williams, 1975). Although television technology was available much earlier, it was only with the proliferation of the suburbs after the war that the medium emerged as a major communication apparatus and social institution. By virtue of its ability to transmit sound and images across space to a mass of individual households physically separated from the interactions of the

urban environment, television provided a form of social cohesion for what Williams (1975) terms the condition of "mobile privatization" (p. 19). Through its programming distribution and flow, television organized the daily routine from morning commuting information and weather reports to midday newsbreak to evening entertainment, culminating in the nightly sign off, all the while promoting the ostensible benefits of a mass industrial consumer utopia. In the 1950s and 1960s, television was a relatively stable system, drawing an increasingly suburban and decentralized population into a homogenized national imaginary (Williams, 1975, p. 77-120). The advent of cable television and programmable VCRs in the 1970s offered the opportunity for time shifting with even greater flexibility and individualization is now available with on-demand digital streaming services.

A communications perspective that seeks to strike a balance between technology and culture, as well as historical and structural methods is Debray's (1996) mediology, the "study of the ways and means of symbolic efficacy" (p. 7). The primary theoretical framework is the mediasphere, the entire milieu of the transmission of meanings and people in particular places and times. The structure of the mediasphere has undergone three principal transformations over the millennia: the logosphere in which writing dominates the transmission of ideas; the graphosphere in which printed texts impose rationality on the symbolic environment; and the videosphere in which audiovisual systems rule (Debray, 1996, p. 171). There is also acknowledgment of a "premediasphere" prior to the invention of writing, termed the mnemosphere, in which the spoken word and the "arts of memory" prevail (Debray, 1996, p. 27). With all analog forms of media – visual, verbal, textual, audio, and combinations thereof – now being remediating (Bolter & Grusin, 2000) by the binary digit for worldwide transmission through a variety of networked and wireless devices, there is cause to consider the possibility of a newer mediasphere, the datasphere in which all thought and expression dissolve into a ubiquitous information flow without subjectivity in the philosophical or political sense.

Technics

The OED defines "technics" as being "of or relating to the arts or sciences; (later) of or relating to technology. Also: of or relating to a particular art or science or its techniques; technical. Skillfully made or constructed." Although the OED notes that these usages are now rare, having been supplanted more commonly by "technology" and "technique," Unit III retains the term to stress the notion that humans have used their experiences and creativity to devise implements and methods to adapt to their environment, from the emergence of the genus *Homo* up to the present. Technics comprise the rudest stone tools of primordial times as much as the latest digital mechanisms and networks. Unit III surveys the evolution of technics as material and as culture in recognition of Appadurai's (2013) notion, articulated at the beginning of this paper, that design is part of humankind's history nearly from its very beginnings.

The development of technics, in the form of tools, machines, knowledge systems, and methodologies, is central to human evolution, enabling the species to perform tasks that the body alone cannot. The most rudimentary technics apply knowledge and materials to adapt to the environment in things such as the sticks and unmodified stones believed to be used by the earliest hominids some two to three million years ago (Delson et al., 2000). The earliest manufactured stone tools, made from chipping flakes off stone to form an edge for chopping, sawing, and cutting, are evidence of a cultural evolution based on the

application of knowledge to artifacts, a measure of human adaptation to the environment. Learning to control fire is another major evolutionary technic for purposes of warmth, light, cooking, and keeping dangerous animals and pests away. Control over fire contributed to socialization in the groups that would cluster around it for heat and safety. Control of fire was crucial for two later technics: firing clay for pottery and manipulating raw ores in the development of metallurgy.

One category Unit III uses to understand technics is White's notion that human development has advanced by virtue of its ability to control certain forms of energy (cited in Knight & Smith, n.d.). The major phases using this frame are the leveraging of the body's own physical power, the energy from domesticated animals, the energy of plants (i.e. agriculture), the use of natural resources (i.e. solar, water, wind, carbon, and fossil fuels), and nuclear power. Energy is used in combination to create a major development in human technics, electricity, which is derived from harnessing the natural resources of water, wind, solar, carbon, and mostly fossil fuels (primarily coal, oil, and natural gas) in its generation.

Another category is based on Lenski's view of humankind's intellectual development, using knowledge and creativity to shape the environment (cited in Knight & Smith, n.d.). Lenski's perspective sees the level of communication as key: initially genetic information passed through heredity, then the point where humans learn and pass on information based on experience to the use of language and written systems of communication. Humans develop societies based on these forms of communication, from the hunter-gatherer to the agricultural to the industrial, with certain societies adapted to specialized functions such as maritime.

Energy is critical to a just and sustainable future. The global dependence on fossil fuels is driving the planet's ecology to the crisis point as reported by the Intergovernmental Panel on Climate Change (Working Group III, 2022). The per-capita energy use of the Global North far exceeds that of the Global South, although the developing economies of China and India have become major contributors to the rise in greenhouse gasses (Fuhr, 2021). Moreover, the legacy of colonialism continues the inequitable distribution of life opportunities and future potential in lesser-developed parts of the world (Davis, 2017; Roberts et al., 2003; Rodney, 1981). At the same time, the political, economic, and cultural hegemony of the West has virtually obliterated Indigenous knowledge and practices that were based in sustainable relationships with local environments (Escobar, 2018; Santos, 2016). Facilitating equitable sustainment and safeguarding local cultures and environments for the long term are the major challenges, and indeed imperatives, facing design practice now and in the future (Appadurai, 2013; Fry, 2009; Escobar, 2018).

Exchange

Life is inconceivable without exchange (Slater & Tonkiss, 2001, p. 7). At its most basic, exchange is "the action, or an act, of reciprocal giving and receiving; of things in general, of goods and merchandise" (OED). Exchange comprises a range of interactions: of things in the common sense, for example, the exchange of one item for another in barter; or actions, i.e. in the exchange of gunfire in combat; or the exchange of thoughts and ideas, as in a conversation or debate. Exchange can likewise take place in an economic market, again as commonly understood, when the exchange is some form of monetary value given in receipt of a thing or service. As anthropologists note, gifting is also a form

of exchange with the reciprocity being in the nature of the relationship between giver and receiver, for example of kinship, honor, or power, and what that relationship connotes within the sociocultural milieu in which it takes place (Malinowski, 2014; Mauss, 1954; Slater & Tonkiss, 2001). As Latour (2007) notes, exchange may not only take place among sentient beings but can be any form of reciprocal action, between machines, for example, or chemically, as in the transfer of a nucleus from one molecular environment to another.

Different societies emphasize different modes of exchange. Modern Western thinking about exchange generally assumes the dominance of one particular type – market exchange – and all that implies socially, economically, and politically. Slater and Tonkiss (2001) distinguish between marketplaces – physical spaces of exchange which are found in a wide variety of societies historically and globally, only some of which are strictly dedicated to commodity transactions – and modern markets, which are products of the West. Modern markets are conceptual spaces of exchange where producers and consumers are said to meet to negotiate supply and demand based on price. Notions regarding modern markets emerged in the late eighteenth century in Western Europe with Smith's (1776/1976) treatise *The Wealth of Nations*, first published in 1776, which sets out the case for market exchange specifically in the context of the mercantile system of early colonialism.

Unit III surveys the development of the market society from its origins in eighteenth century Europe to its current state as the global paradigm for exchange. The unit reviews mercantilism and its relation to the Western colonial project, including the transatlantic slave trade, which was instrumental to the growth of modern capitalism (Beckert, 2015; Chase-Dunn & Lerro, 2014; Horne, 2018; Williams, 2021). It reviews the classical, neo-classical, and neoliberal theories of economics, as well as heterodox perspectives on the left and right. Emphasis will be placed on more recent global perspectives from both the North and South. Unit III also considers the gift as a model of the animating inspiration of creativity, which is realized in the form of cultural productions that circulate and establish relationships among their recipient communities (Hyde, 2019).

Habermas (1991) has studied the historical development of exchange from marketplaces into markets, tying together notions of social, economic, and political exchange in his theory of the public sphere in which news from distant marketplaces served early on as a valuable resource for profitably exchanging commodities, as well as a valuable commodity in its own right. The exchange of information, mediated via printed newsletters, pamphlets, gazettes, and the like, additionally gained value as political discourse in the emergence of democracy in what has been termed the marketplace of ideas.

Ideas and Ideals

Ideas are “simply any product of mental apprehension or activity, existing in the mind as an object of knowledge or thought; an item of knowledge or belief; a thought, a theory; a way of thinking” (OED). The capacity of the mind to conceive ideas is part of human evolution (Geertz, 1973b; Vernadsky, 1945). That humankind developed the consciousness to manipulate the planet's resources to its own ends marks the emergence of the *nöosphere* (Vernadsky, 1945). That the *nöosphere* has developed into a globally interconnected apparatus of information exchange is acknowledged under recent media theory (Levy, 1999; Kelly, 1995).

Ideals can be understood in two senses: “Existing as an idea or archetype; relating to or consisting of ideas in the Platonic or theological sense” and “Conceived or regarded as perfect or supremely excellent in its kind; answering to one’s highest conception” (OED). As understood in the first sense, Plato’s philosophical notion of ideal form holds that things in the material world, a chair, a circle, a tree, etc., only exist in their perfect state as philosophical concepts. The second sense derives from the first and is the sense that Unit III addresses, as applied socioculturally.

In the eighteenth century, Destutt de Tracy termed the scientific study of ideas “ideology” to distinguish it from ancient metaphysics (Williams, 1983, p. 154). The term was originally used to study epistemology and linguistics and the OED continues that connotation in its first definition: “The study of ideas; that branch of philosophy or psychology which deals with the origin and nature of ideas.” A functional definition is further maintained later in the entry as “a systematic scheme of ideas, usually relating to politics, economics, or society and forming the basis of action or policy; a set of beliefs governing conduct” (OED).

Not long after Destutt de Tracy’s coinage, Napoleon Bonaparte used the terminology to attack proponents of democracy who “mised the people by elevating them to a sovereignty they were incapable of exercising” (cited in Williams, 1983, p. 154). This negative connotation persists today, particularly in political discourse. The negative sense was given greater weight by Marx and Engels in *The German Ideology*, written between 1845 and 1847, in which they described ideology as false consciousness: “In all ideology men and their circumstances appear upside down as in a *camera obscura*” (cited in Williams, 1983, p. 155, emphasis original).

Later writers sought to retrieve the more neutral conception of ideology (as reflected in the OED functional definition) as a set of beliefs governing conduct. Mannheim (1955) argues for a broadening of the concept to recognize that a whole group’s thought was formed by its social position and the context in which it was created. For Geertz (1973b), ideology is a cultural system, a set of symbolic structures for making sense of the world – positively, which he terms “interest,” or negatively, which he terms “strain” (p. 201). The symbols can either be “cognitive,” i.e. explanatory, or “expressive,” i.e. emotive (Geertz, 1973b, p. 281).

A more contemporary understanding, which best represents the Worldbuilding perspective, is the imaginary. Although the term has been used as early as the mid-twentieth century (see Sartre, 2010), its use in Unit III derives from Taylor (2003), who devised the term “modern social imaginaries” to describe the way a given people imagine their collective social life. Taylor in turn took his inspiration from Anderson (1994), who developed the term “imagined communities” to trace the historical causes of nationalism. Anderson is relevant for design due to the connection he establishes between the invention of the printing press as a technology of cultural dissemination and the emergence of the political consciousness that underpins national identity. Also taking inspiration from Anderson is Steger (2008), who coined the term “global imaginary” to refer to the global consciousness that has emerged in recent decades with the rapid rise of communications technologies. The Worldbuilding Curriculum proposes that the term “planetary” be substituted for “global,” reflecting Chakrabarty’s (2021) assertion of the need to decenter the human in the face of the crises of the Anthropocene.

Conclusion

This proposal is an outline of a theoretical foundation that develops a planetary imaginary, one that recognizes the deep history of the earth and broad patterns of change, of which human agents are only a small part. It seeks to offer a theoretical perspective that prompts designers to develop new ways of thinking, and thus designing, in that light. Following Chakrabarty (2021), it contrasts the planetary with the global, understanding that the latter is the constructed object of human history whereas the former is the province of evolutionary processes beyond human control and under which humans must adapt (which is to say, design in accordance with) rather than seek to dominate.

There is much work needed to realize the curriculum as a truly planetary imaginary. First is the fact that the literature surveyed herein is entirely in English, originally or in translation, the language of Western empire and those who have the cultural and social capital to engage in the conversation. How space might be opened for others to enter the conversation needs further research, especially with an eye toward heretofore marginalized voices (Escobar, 2017; Santos, 2016). A particular emphasis needs to be placed on Indigenous voices in that regard.

Another facet is the need to expand the conversation across disciplines. An attempt has been made in this proposal to incorporate scientific knowledge along with that of the humanities and the social sciences. It is vital that the conversation continue as the stakes are high. To quote the Dane: "To be or not to be? That is question." Never has that been truer for humankind than at this moment.

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