Team 3 Presents:

Dawn of Modern Technology

Based upon chapter 3 of Lewis Mumford's "Technics and Society" and chapters 1 and 2 of David Nye's "Consuming Power."

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Mumford describes three technological phases distinguishable by five characteristics: geographical origination, resources and raw materials, energy usage and generation, modes of production and worker type. He begins with the Eotechnic Phase in chapter 3, while the paleotechnic and neotechnic follow in chapters 4 and 5 respectively. Words like "eotechnic" seem daunting until they are defined in more familiar terms. Although "eotechnic" is not explicitly found in dictionaries, the prefix "eo-" means oldest or earliest, and, thereby, eotechnic implicitly means the dawn of modern technics. From 1000-1750 AD the Eotechnic Phase set in motion the technological change leading to modern industrialization. Eotechnic characteristics of both energy source and raw material are wood. Paleotechnic implies an ancient age of technics by the prefix "paleo-" and is specifically found in the dictionary to mean of, relating to or constituting a period of industrial development marked by the predominance of hand tools and craft industries or by complex industries. The characteristic energy source and resources are coal and iron. Accordingly, neotechnic refers to the new or current technological age of industrial development. Energy in the form of electricity and dominant use of metal alloys characterize this age.

The Eotechnic Phase did not spontaneously originate, but rather developed as a result of generations' worth of preparation. Mumford begins his discussion of eotechnics by describing society's reliance upon earlier cultures and generations to pass on their knowledge. Society advances by building upon the achievements emplaced by earlier peoples. Scientists seek to further understand the universe by contributing insight to problems of old: theories slice through layers of mystery one by one to uncover the truth. Realizing his dependence upon a pre-existing mathematical foundation, Sir Isaac

Newton described in a letter to Robert Hooke in 1675, "If I have seen further … it is by standing upon the shoulders of giants." The Eotechnic Phase developed from the needs and resources of the times, and, likewise, the Paleo- and Neotechnic Phases built upon inventions of the Eotechnic Phase. Mumford describes the Eotechnic phase is an "important period of preparation, when all the key inventions were either invented or foreshadowed," (109). This change affected not only technology, but society and culture.

During the early shift to a monetary economy, money was abstract; earning money was not the sole aim of workers. Mumford describes workers without social mobility as, perhaps, happier than those in modern society who strive, struggle and sacrifice for 'success' or to attain a 'better' life: "When their living became easy, people did not go in for abstract acquisition: they worked less. And when Nature abetted them, they often remained in the idyllic state of the Polynesians of the Homeric Greeks, giving to art, ritual, and sex the best of their energies," (102). Similarly, Mumford explains, "The goal of the eotechnic civilization as a whole until it reached the decadence of the eighteenth century was not more power alone but a greater intensification of life: color, perfume, images, music, sexual ecstasy, as well as daring exploits in arms and thought and exploration," (149). Toward the end of the Eotechnic Phase work for work's sake began to materialize. As Thoreau puts it, "The laboring man has not leisure for a true integrity day by day… He has no time to be anything but a machine" (Nye, 68).

"The belief in the good life as the *goods* life came to fruition before the paleotechnic complex had taken shape," (105) but "if the gospel of work took form during this period, it did not dominate," (150). Initially the developing technology improved the culture and lives of the majority by providing them with leisure time, or at least lightening their

physical labor demands. Eventually, though, eotechnics advanced via a toll paid by society.

Social decline resulted from mechanization of man via humanization of the machine. People lost their trade to the machine, and came to feel, "isolation and helplessness," (147), as exemplified by, "at the end of the sixteenth century, when the ordinary worker, though still losing ground, losing freedom and self-control and substance, was unruly and resourceful—still capable of fighting or colonizing rather than ready to submit to the yoke of either becoming a machine or competing at sweated labor with the products of the machine," (147). Psychological decay also developed from technology in this era. Technology rendered precise the art of glass-making, which permitted people to see their physical appearance accurately, as had only been done via a still pond or a polished metal surface. Accurate mirrors, perhaps, launched the epidemic of superficiality, although cannot be blamed for creating narcissism. Mumford attributes, "indeed, when one is completely whole and at one with the world one does not need the mirror: it is in the [eotechnic] period of psychic disintegration that the individual personality turns to the lonely image to see what in fact is there and what he can hold on to…" (129). Psychic disintegration of the sixteenth century has surely increased exponentially to produce the currently vain, image-oriented, marketing-receptive modern western culture. Thus, people's lifestyles also changed during the transition into a technical world.

The commonest and most utilized fuel during the eotechnic was the renewable and initially wood. Wood was vital; it was the premier energy source of the day as well as the building material for houses and most machines. Mumford describes, "As raw

material, as tool, as machine-tool, as machine, a utensil and utility, as fuel, and as final product wood was the dominant industrial resource of the eotechnic phase," (120). Initially, forest resources seemed inexhaustible, especially in early America. While Lewis Mumford discusses industrialization on a worldwide scale, David Nye's Consuming Power reviews events happening in the New World – specifically, the northern colonies of what was to become the United States of America. The Southern states did not develop alternative energy because their needs were satisfied by slavery: a system utilizing African slaves' muscle power. The South, therefore, lagged behind its northern counterpart in industrialization. As a whole, European settlers were not as careful with the natural resources upon arrival to the new world as the indigenous people. More forests were cleared in the first 200 years of European immigration to North America than were lost in Europe in the previous millennium. Why were American forests obliterated at an alarming rate? Settlers viewed North American forests as a seemingly endless supply of timber and agricultural land. Therefore, they used as much as needed to produce as much as possible. This generally differed from the ideology of Native Americans.

Nye presents a Native American culture that is somewhat different than most history books present. He describes their technologies of canal building and pyramid construction and mentions that many tribes lived in cities. Despite the high population concentration in these early urban centers, the citizens maintained a reciprocal relationship with the land. They farmed and respected the land and, in turn, the Spirits provided enough resources to sustain life. After a few years (usually eight to ten), tribes moved on to a new area to let their previous location reforest and regain nutrients.

Although the Native Americans utilized the Earth's resources, they did not interfere with what they did not need.

As opposed to Native American cultures, settlers required increasing amounts of resources to fulfill production demands. What could not be imported had to be made in the colonies by knowledgeable smiths. In addition to wood as a fuel source, other sources of renewable energy were harnessed during the eotechnic. Capturing wind energy via windmills and water energy via waterwheels provided locusts of growth for towns along rivers and other otherwise rural, agricultural areas. Once the capital investment for the construction of a mill was attained, the cost of operation of a mill was minimal and its fruits were labor-saving blessings for farmers, carpenters, etc. The mill evolved into the center of most towns, as it was the primary energy source. Often, the mill was also the place where goods could be purchased and people could come together to socialize. The miller became a necessary fixture in the community, as he supplied not only energy, but often controlled much of the land in the area. As the miller rose to a local figurehead in most small towns, he gained political power while producing mechanical power. Thus, mechanical power and social power became linked. Managing sources of power became desirable.

Although the new economy favored the miller, not everyone did. Farmers' fields were flooded due to damming for rivers to power at the mill. Millers often disregarded their complaints because they obstructed his goals. As time progressed, the effects of the mill on society were felt in most homes. Since energy was being produced on a larger scale than ever before in the New World, people stopped handcrafting most items and relied on trade to attain mass-produced goods from throughout the region. What did

people do with time liberated from handcrafting? Nye suggests that, "in multiplying the power of production, men and women also multiplied their desires" (68).

Growing cities and production increased the demand to expedite current transportation of both people and goods. Seeing as waterways were the most effective means of moving goods, people engineered canals to connect vital waterways. For such a daunting task, a tremendous amount of energy was necessary. The need for energy was satiated by using horses. Horses provided the power with which canals were dug, thus decreasing the energy input needed from human labor. James Watt coined the term 'horsepower' as the weight of coal a horse could raise 22,000 pounds one foot in one minute (U.S. Department of Energy). People relied heavily on the newly built system of canals and their locks; as their reliance on canals increased, so did their dependence on energy. Nye states, "Those who navigated the waters outside the mills were regulated by locks" (49). As Henry David Thoreau said of the new industrialization: "Those who labored inside were subject to the repetitive hum and rumble of the machines, and they felt a steady pressure to conform to the larger rhythm" (Nye, 49). There were some who witnessed this change in society, as Thoreau did, and still kept their energies to themselves, but a growing number of Americans relied on the new technology.

Society's dependence on harnessing power from nature increased, and the General population of the United States grew and expanded westward. Adventurous people moved into former frontier carried with them the knowledge of the mill and horsepower. They eventually settled and formed new towns and mills, thereby gaining personal independence but also establishing energy dependence. As one can recall, myriad people during Colonial times must have possessed the skills to weave, make hay

and candles, raise animals, and roof their houses. Currently, few are taught the skills to perform all of the above tasks.

As time passed, society progressed and citizens gained knowledge in specialized fields. People began to specialize, which resulted in a diverse culture valuing different skills and attributes. Apprentices learned their trades, often working and living with the skilled tradesman and his family. Craftsmen taught skills and life lessons equally. Skills and science were often mixed with generations of tradition. According to one carpenter, "When the bubble is lined up between the two marks etched in the glass tube of a level, you have aligned yourself with the forces that hold the universe together" (Nye, 37). Without fully understanding natural phenomenon, they developed more advanced tools. Harnessing natural power sources enabled a technological revolution as exemplified in technological and intellectual achievements.

The craft of glass-making drastically altered the technology of the eotechnic phase, revolutionized the mentality of the population and laid the foundation for our current scientific era. Lenses were made for microscopes, spectacles and telescopes, revealing new truths about the microcosm, the immediate and the macrocosm. Mumford argues that the use of spectacles increased the duration in which people could read and facilitated people in more accurately perceiving their immediate world, thereby stimulating the intellect and ingenuity and exposing weaknesses in hygiene, respectively (Mumford 128). People became more interested in their physical world because "glass not merely opened people's eyes but their minds: seeing was believing," (Mumford 127). Glass windows lengthened the workday in poor weather conditions. Instead of closing wooden shutters, people were protected from precipitation and wind by glass, which

allowed transmittance of light. Workers were less dependent upon nature, and therefore began to isolate themselves from nature (Mumford 130). As a bridge between science and technology, glass sparked (or at least supported) experimental science: glass vials and flasks made modern chemistry possible, thermometers improved medicine, telescopes improved astronomy, microscopes enhanced biology and medicine etc. Many other inventions of the time were important.

Of the many inventions of the eotechnic phase, the printing press is arguably the most valuable, second only to the scientific method. In the 1440's, Gutenberg perfected the old printing press instrumentation and thereby enabled written word to replace face-to-face interaction. Mumford describes written communication as a labor saving device that, "released people from the domination of the immediate and the local," (Mumford 136). Technologically, the printing press utilized completely interchangeable parts, relied upon standardized type and demanded mass-produced paper. These attributes are fundamental in modern technics, and their creation ignited the fuse to a technological explosion. Socially and intellectually, communication expanded geographically through written word and facilitated the spread and sharing of ideas. Redeeming the psychological decay induced by mirrors, and in addition to the other, positive, influences of glass, advent of the printing press marks the beginning of a new intellectual age.

The intellectual achievements of the eotechnic phase include a desire for evidence and the scientific method for achieving such evidence. Mumford attributes, "the printed word furthered that process of analysis and isolation which became the leading achievement of eotechnic thought," (Mumford 136). Nonetheless, "the most important invention of all had no direct industrial connection whatever: namely, the invention of

the experimental method in science, (Mumford 132). Scientific inquiry established exact measurement, mathematics, fine manipulation, accurate timing, a foundation in experimental science, the scientific method and the university. The scientific method has affected our culture so much that we theorize about historical origins of the machine with scientific thought.

The Eotechnic Phase was a 750 year period that set the stage for modern technology. Inventors changed the mentality and reality of the eotechnic world, and foreshadowed the changes that were to come in later phases. Dependency upon natural sources of energy as opposed to human muscle power, mechanization and standardization, growth of cities and scientific though are all pearls of this era. Besides some of its benefits, present cultures have also reaped some weaknesses; namely, social and psychological decay.

References

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United States Department of Energy. http://www.energy.gov/