Manufactured Landscapes in Contemporary Chinese Science Fiction

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Abstract The term "manufactured landscapes" has negative, critical, and even ironic connotations. It refers to landscapes that have been deformed, destroyed, or devastated by human industrial endeavour, such as shipyards, dams, abandoned quarries and mines, and recycling junkyards of industrial waste. These man-made landscapes are closely related to energy consumption and environmental deterioration, and are symbols of troubled relations between humankind and nature. This article will explore the manufactured landscapes presented in Chinese science fiction, specifically three of Liu Cixin's SF novellas. Using the SF analytical framework, I argue that in Liu Cixin's three novellas, the aesthetic of estrangement is created by the extrapolative manufactured landscapes of huge bubbles, a long tunnel, and a coal mine on fire. These environmental extrapolations lead to cognition of an energy crisis, the depletion of natural resources, the degeneration of the environment, as well as possible solutions to these various environmental and energy problems. In addition, I contend that there is an intertexuality between Liu's imaginative manufactured landscapes in the novellas and the manufactured landscapes in the author's empirical world such as the Three Gorges Dam, the South-to-North Water Diversion project, the Shanghai Magnetic Railway, and numerous coal mines in China.
Key Words Manufactured landscape; energy; environment; science fiction; intertextuality

The image of a mammoth industrial structure dotting an urbanized landscape has been a motif in many Chinese SF narratives before the neologism of "manufactured landscapes" was coined.These "manufactured landscapes" presented in the large-scale photographs by Edward Burtynsky and captured in the documentary by Jennifer Baichwal provide us with a critical perspective to ponder industrial society and technology since the Industrial Revolution.[1] The term "manufactured landscapes" has negative, critical, and even ironic connotations. It refers to landscapes that have

been deformed, destroyed, or devastated by human industrial endeavour, such as shipyards, dams, abandoned quarries and mines, and recycling junk yards of industrial waste. These man-made landscapes are closely related to energy consumption and environmental deterioration, and are symbols of troubled relations between humankind and nature.

This article will explore the manufactured landscapes presented in Chinese science fiction, specifically three of Liu Cixin's (刘 慈 欣 , b.1963) SF novellas,*Underground Fire* (地火 , 2000), *Cannon of Earth* (地球大炮 , 2003) and *Soap Bubbles* (圆圆的肥皂泡 , 2004). Coal mines on fire, an entire city festooned with soap bubbles, and a giant tunnel through the center of the Earth to Antarctica are among the images in Liu Cixin's SF narratives that reveal a paradoxical relationship between the tapping of new energy sources and the devastating ecological consequences likely to follow. These narratives provide a critical reflection on what has been dubbed "the new materialism" — "a materialism based on transformations of energy." It is "neither a crude consumerist materialism nor a reductive atomic materialism. It takes seriously the material and physical world in which we live" (Crockett and Robbins xvi).

Manufactured landscapes and the new materialism are both significant concerns of environmentalism. When we examine how these environmental concerns are reflected in SF narratives, we are dealing with the relationship between environmentalism and science fiction. Specifically, we are looking at the interaction between environmental cognition and a sense of estrangement created by manufactured landscapes in SF narrative. Therefore, before doing my analysis of Liu Cixin's three novellas, I will briefly explain what I view as the connection between environmentalism and SF, as well as my framework for analyzing SF.

Over the past two decades, the interaction and connection between environmentalism and science fiction literature have been widely discussed, recognized and valued by environmentalists, literary critics, and political scientists. Some SF narratives make a literary contribution to discussions of environmental degradation and its origin.They address issues such as environmental movements, green political parties, deep ecology, the land ethic, landscape restoration, socio-biology, sustainable agriculture, eco-feminism, social ecology, and bioregionalism. When discussing the relation between the text and ecocritic in his book *The Future of Environmental Criticism*, Lawrence Buell claims that "no genre potentially matches up with a planetary level of thinking 'environment' better than science fiction does" (57). He further argues:"For half a century, science fiction has taken a keen, if not consistent interest in ecology, in planetary endangerment, in environmental ethics, in humankind's relation to the nonhuman world" (56). Patrick D. Murphy finds in SF

literature "several varieties of nature and environmental engagement" (41). Some SF narratives "provide factual information about nature and human-nature interactions as well as provide thematically environmentalist extrapolations of conflict and crisis based on such information"; they "provide analogous depictions of ecosystems and human interaction with such systems"; and they "demonstrate the disastrous consequences of exploitive relationships between humans and other humans, humans and other sentient beings, and humans and ecosystems in which they are an exotic" (41).

All the above comments on the relation between environment and SF narratives reveal an interaction between environmental cognition and the estranged world that SF creates. This leads to my framework for analyzing SF. In his book *Metamorphoses of Science Fiction*, Darko Suvin argues for an understanding of SF as the "literature of cognitive estrangement" (4). He defines SF as "a literary genre whose necessary and sufficient conditions are the presence and interaction of estrangement and cognition, and whose main formal device is an imaginative framework alternative to the author's empirical environment" (8). In this definition, "Concepts of science [are] for cognition, and fiction for estrangement" (13). The framework of "cognitive estrangement" distinguishes the SF genre from both realist literature and meta-empirical genres such as the fairy tale, mythology, and fantasy narration. Estrangement distinguishes SF from literature of a realist, naturalist or empirical bent. Estrangement also signifies a break with the empirical world, but is at the same time beyond the confines of reality with the help of "novum" (a strange newness) (4). Cognition distinguishes SF from myths, fairy tales, folk tales, and fantasy. "Significant modern SF, with deeper and more lasting sources of enjoyment, also presupposes more complex and wider cognitions: it discusses primarily the political, psychological, and anthropological use and effect of knowledge, of philosophy of science, and the becoming of failure of new realities as a result of it" (15).

Using the above SF analytical framework, I argue that in Liu Cixin's three novellas, the aesthetic of estrangement is created by the extrapolative manufactured-landscapes of huge bubbles, a long tunnel, and a coal mine on fire. These environmental extrapolations lead to cognition of an energy crisis, the depletion of natural resources, the degeneration of the environment, as well as possible solutions to these various environmental and energy problems. In addition, I contend that there is an intertexuality between Liu's imaginative manufactured landscapes in the novellas and the manufactured landscapes in the author's empirical world such as the Three Gorges Dam, the South-to-North Water Diversion project, the Shanghai Magnetic Railway, and numerous coal mines in China. I borrow the term "intertextuality," coined by poststructuralist Julia Kristeva in 1966 to refer to the interaction between

the manufactured landscapes in reality and the ones described in Liu's novellas.[2] Intextertuality is a narrative technique to convey the meaning of one text by referring to another text. In my discussion of Liu Cixin's novellas, I expand the concept of "another text" to something more than just literary text. It is something in reality that readers can refer to so that they will have a better understanding of the thematic concerns of the narratives. Specifically, in Liu Cixin's novellas, "another text" refers to manufactured landscapes in contemporary China. Liu Cixin borrows and transforms such manufactured landscapes as the Three Gorges Dam, the dams built for the South-to-North Water Diversion project, underground tunnels, and abandoned coal mines. In this way, the resulting intertextuality alerts readers to China's gigantic engineering projects, raise their environmental consciousness, and explores alternative solutions to energy problems.

Liu Cixin's day job has been that of senior computer engineer in Shanxi province's Niangziguan (娘 子 关) Electric Power Plant. He published his first SF short story "Whale Ballad" (鲸歌) in 1999. That same year, he won first place in the Milky Way Award competition — China's most prestigious science fiction award — with the story "Travel with Her Eyes" (带上她的眼睛 , 1999). Since then, he has definitely been China's most prolific and popular SF writer with his numerous sci-fi short stories, novellas, and full length novels, among which *Drifting Earth* (流浪地球 , 2000), *Ball Lightning* (球状闪电 , 2004), and the trilogy *Three Bodies* (三 体 , 2006-08) have been particularly well received. Aside from these narratives dealing with outer-space travel and the eschatology of the universe, Liu also wrote some novellas dealing with the energy crisis in contemporary time, such as *Cannon of Earth*, *SoapBubbles*, and *Underground Fire*. The visions of disaster portrayed in these three novellas are consistent with the eschatological point of view reflected in Liu's other narratives on the ultimate fate of Earth and universe. *Cannon of Earth*, *Soap Bubbles*, and *Underground Fire* are all about the depletion of energy and natural resources (water, coal, and refined fuel) in the near future, and the environmental problems brought about by industrial development. Liu Cixin not only reveals the problems, but also tries to provide an alternative to solve a given energy issue or environmental problem. However, these solutions entail gigantic engineering projects, and thus cause further environmental problems.

Coal Gasification

In *Underground Fire*, the protagonist Liu Xin is an engineer who specializes in the technology of coal gasification in the coal mining industry. His father has died of silicosis as a result of a lifetime of work in the coal mine. Liu Xin has tried to find ways to improve mining technology so as to eliminate the need for coal miners

to work below ground. He has performed laboratory experiments in gasifying the underground coal and transporting the gasified coal through underground pipes. In this way, workers do not need to work in the underground shafts anymore. However, due to a technical negligence in the experiment, the underground coal of the entire coalmine caught fire one day. The situation soon went out of control. It took eighteen years to finally put out the mine fire. All vegetation in the vicinity was either burned or withered as a result. Thousands of people became destitute and homeless. Liu Xin committed suicide. However, one hundred years later, coal gasification finally becomes a mature technology and replaces the conventional approach to coal production.

This story touches upon three main issues in contemporary China's coal industry: rampant pollution, harsh and dangerous working conditions, and the need for technical improvements. First of all, the story reveals the most devastated scene of a mining accident. In the narrative, after the accident, Liu Xin revisits the coalmine. It is as if he is strolling through Hell. The sky is clouded by heavy black smoke, and the Sun is merely a dull red disk. Particles of coal dust generate static electricity in the sky. They are like lightning flashing in the sky from time to time. The burning coal mine is eerily illuminated by flashes of lightning. Monstrous columns of thick black smoke billows from every mine pit and rise up in the sky like boa constrictors climbing upward. Underground fires glow at the base of these columns of smoke. Highways are burning hot; asphalt pavement is melting. The noxious air reeks of sulphur. The highways are full of people and cars. People are wearing respiratory masks. Their clothes are covered by grey dust that is falling from the sky.[3] This eschatological scene of the mining accident reads much like a newspaper report of a mining accident in contemporary China. According to statistics, the death rate from coal mining accidents in China has dropped significantly during the past two decades. But the overall mortality rate from coal mining in China is still very high when compared with that in advanced countries. For example, 2630 people died in Chinese coal mine accidents in 2009, and 2433 died from this in 2010. The death rate per megaton of coal mine in the Chinese industry is 0.803%.[4] Coal mining accidents are directly related to two other problems: bad working conditions and low pay. In the novella, when the protagonist enters the office building of the coal mine, he sees a big crowd of miners on strike due to not having been paid for months in a row. Many of them are disabled due to mining accidents and have been living on a pension ever since. The bad working conditions, low pay, and wages being in arrears have been stubbornly persistent problems in the Chinese coal industry. Liu Cixin's depiction of the miners' strike is very realistic. For instance, a recent news report of over a thousand Chinese coal miners on strike during 23 February 2014 is set in the Yangzhuang Coal Mine in Shandong province. They

had not been paid for six months of work.[5]

This narrative also presents an extrapolative picture of the future coal industry. The last chapter of the novella is set 120 years in the future, by which time gasified coal has already been successfully produced. The traditional coal mining industry with workers toiling in underground tunnels can now only be seen in museums. In just such a museum, a teacher tells her students that gasification technology has delivered the world from the throes of its energy crisis. In the late 21st century, the decline after "peak oil" had already occurred, and was about to set off another world war in the Middle East. Fortunately, the timely invention of gasification technology provided the world with abundant and relatively non-polluting new energy resources, and thereby saved everyone from another world war.

The extrapolation of coal gasification is not merely a fantasy. Even though coal gasification technology is still at the beginning stage of development, it has already been in commercial use on a small scale. The governments of both the US and China view coal gasification as a core technology of green energy in the future. After peak oil, coal gasification would be part of the many-sided solution to our energy crisis. Prior to the Industrial Revolution, humans derived energy from burning wood and other biomass, as well as harnessing water power, wind power, and draught livestock. As pointed out by Crockett and Robbins in his book *Religion, Politics and the Earth*, "The discovery of coal met with a ready-made advancement of greater exploitation of energy conversion capability and technological innovation that birthed the Industrial Revolution" (90). In the Industrial Revolution, the modern steam engine, combined with the exploitation of coal, propelled an already powerful Europe, and resulted in Great Britain's relatively dominant position in the world during the 19th century. The mining and burning of coal by steam engines fuelled the British Empire from the late 18thcentury to the early 20th century. Around that time, the discovery and tapping of petroleum and natural gas led to their replacement of coal as the primary source of energy in more and more countries of the world. During the transition from coal to oil, the United States gradually replaced Great Britain as the relatively dominant great powerin the world. But what may happen after the depletion of petroleum? After all, untapped reserves of oil and coal are limited. Therefore, people have to improve the efficiency with which oil and coal are utilized. Gasification-based energy systems would be one of the solutions. Coal gasification has the advantage of higher energy efficiency, and also emits fewer greenhouse gases than the burning of coal. Statistics published by the US Department of Energy demonstrate the higher efficiency of gasified coal. "Less fuel is used to generate the rated power, resulting in better economics (which can mean lower costs to rate payers) and the formation of fewer greenhouse gases (a 60%-efficient gasification power plant can cut the formation

of carbon dioxide by 40% compared to a typical coal combustion plant)."[6] Coal gasification is especially important for the Chinese government. Coal gasification will not only help reduce air pollution from the combustion of coal, but will also greatly improve the production-related safety record and miners' working conditions by transforming underground mining to a surface-level operation. This is also the protagonist Liu Xin's major concern in the novella. He strives to transform the dirty and dangerous coal industry into a clean and safe industry.

Energy Depletion

In *Cannon of Earth*, because of environmental problems and energy depletion, people become increasingly interested in the natural resources of Antarctica. The UN has designated Antarctica as a Global Development Region. The major countries in the world have established economic zones and explored the natural resources there. China has even launched a gigantic engineering project to connect China with Antarctica — and built a tunnel from Beijing to Antarctica through the center of the Earth. It seems that the tunnel has a perfect energy saving design: it uses gravity to ship people and goods to Antarctica. It will supposedly be cheaper and faster to travel from Beijing to Antarctica in this tunnel than by train from Beijing to nearby Tianjin. However, the project turns out to be a big financial and engineering disaster. A lot of workers die from accidents when building this tunnel. Many other people go bankrupt from having bought stock in the tunnel construction companies. In addition, because of the high investment required by this project, the resulting shipping costs are not lower than the conventional way of shipping. More importantly, the Antarctic dream is soon dashed because of the excessive exploitation of natural resources and industrial pollution. Antarctica was turned into a polluted and resource-deficient continent, no different from other continents on the Earth. So the UN issues a new Antarctic treaty. All countries withdraw from Antarctica in the hope that the continent's ecology will recover as excessive exploitation is phased out. The only large-scale man-made thing remaining there is the huge abandoned tunnel through the center of the Earth. Half a century later, with the further environmental degradation of Earth, people have to close all industrial facilities on the Earth, and move all the industries they wish to preserve to outer space. The abandoned tunnel in Antarctica is finally turned into a useful space gun for the launching of spaceships.

Liu's *Cannon of Earth* reminds the reader of Jules Verne's novel *From the Earth to the Moon* (1865), in which people build an enormous sky-facing Columbiad space gun and launch three people in a projectile with the goal of landing them on the moon.[7] In Liu's story, the tunnel was originally designed as a transportation corridor for shipping goods from China to Antarctica. Though the project fails because of

both technical and economic reasons, it is eventually refashioned as a space gun for launching spaceships into orbit five decades later. It plays the same role as the Columbiad Gun, but on a much larger scale. The major difference between the two cannons lies in the aims of their designers. The Columbiad projectile aims to land astronauts on the Moon and explore its surface. However, the projectile becomes a Moon satellite, and the fate of the three astronauts on board remains unknown. In contrast, the Cannon of Earth has a more practical mission, and achieves its goal by sending space ships into orbit around the Earth. It is possible that Liu was inspired by Verne's novel. In contrast with Verne's novel of pure fantasy, Liu's novella broaches energy issues and environmental concerns. The changing mission of the canon reveals various alternative paths to the overall destination of solving the world's energy problems. The reason for building the tunnel through the center of the Earth is to exploit the energy and natural resources of Antarctica. The tunnel itself is also energy saving because it does not use any fuel. It uses only gravity to move the train forward. However, the project fails, natural resources in Antarctica become depleted, and finally people cast their eyes up toward outer space. The long tunnel in the novella reminds readers of China's air-raid shelters and tunnels dug in late 1960s to early 1970s when Mao Zedong and his Communist Party mobilized the Chinese populace to engage in civil defence projects such as tunnel construction.[8]

The novella's long tunnel also reminds readers of the Shanghai Maglev train and tunnels. The Shanghai Maglev is the first commercially operated high-speed magnetic levitation railway line in the world and the third Maglev line to be operated. The train line connects Shanghai's Pudong International Airport with the outskirts of central Pudong, where passengers can transfer to the Shanghai Metro — with connections to destinations all over Shanghai. The Shanghai Maglev train shares some similarities with the Cannon of Earth in terms of its huge cost and low utilizationrate. The Maglev project required almost three years to build, from March 2001 to the end of 2003. The commercial service of the train line started in January 2004. The total investment for it was RMB1.2 billion. It was the cooperative project between German companies and local Chinese companies. The local Chinese companies built the track. In order to maintain the stability of the track, several thousand concrete piles were driven 70 meters deep into the ground to lay the foundation. Steel reinforced concrete supporting columns were driven into the ground with an interval of every 25 meters because of unstable soil conditions in the Pudong area.[9] It is uncertain how these steel and concrete structures in the ground will affect the geological structure and soil conditions in the Pudong area. However, one thing people can see is that the utilization rate of the Shanghai Maglev Train is not as high as the project leaders originally expected. In spite of its high speed, most passengers still choose to ride the

conventional metro instead of Maglev train because of the expensive price of a ticket for the latter. Similar to the Cannon of Earth, shipping or transportation costs are very high in order to break even on a big investment. As what Liu says in the story: the biggest disaster is the project itself. It is an unprecedented engineering project in terms of technology, but it is also a big financial burden. It is hard to explain why this money-burning proposal could have been signed off onin the first place. It is probably because of the fantasy of the discovery of the new continent and the frantic worship of technology. From the perspective of economics, the time of completion of the project is also the time of its death. The advantages of a brief shipping time and low energy consumption were offset by high shipping expenses.[10] The Cannon of Earth is an extreme version of Shanghai Maglev train Line. Through his novella, Liu offers socio-political commentary on China's construction of face-giving huge engineering projects such as Shanghai Maglev train line: a very high level of government and thus taxpayer funding, plus a change to the geological characteristics along the route of the project, along with a very low utilization rate due to sticker shock among the general public.

Another extrapolative disaster the novella describes is the consequence of over-exploitation of Antarctica. It also warns people that the natural resources in Antarctica are limited. In the narrative, the Cannon of Earth is just part of a bigger project — the Antarctic Courtyard project. Similar to many other countries, China regards Antarctica as its backyard where it can exploit natural resources and develop industry in almost any way it deems appropriate. However, this Antarctica dream soon shatters. Excessive industrialization and exploitation of natural resources ruins the world's last pristine continent. The global environment thus further degenerates, and pollution as well as stepped-up ozone depletion result in the extinction of vast amounts of vegetation. Clean air itself becomes a precious and rare commodity. Now the only way to save the Earth is to shut down all of the planet's heavy industry, including the energy sector. The Cannon of Earth is transformed into a space gun to launch space ships into orbit. It launches one space ship every two or three minutes. These space ships help move all of the planet's heavy industry from Earth to outerspace. These space ships are as numerous as meteor showers in the night sky. This dramatic change of the use of the tunnel from a failed engineering project to a highly efficient space gun reveals Liu's optimistic view of technology. He also provides an ultimate solution to energy needs and environmental problems on Earth. That is, he points to the necessity of expanding our realm of everyday activity to outer space. This solution appears to resonate with the new materialism.

Water Shortages

The novella *Soap Bubbles* is about how people use technology to solve the problem of water shortages in northwest China. Yuanyuan, a materials engineer, hails from a northwestern city called Silk Road in China. Nowadays, however, Silk Road City is disappearing because of desertification. Inspired by soap bubbles, Yuanyuan invents a kind of special foaming agent to produce giant bubbles in sky. Yuanyuan and her colleagues use these bubbles to capture moist air from the faraway South China Sea and Bay of Bengal. These bubbles fly away and carry back moist air to northwest China. When the bubbles break, their vapor condenses into rain. So the city of Silk Road is saved from water shortage and desertification.

Liu's story reminds some readers of the science popularization narratives written in 1970s China such as "Round Smoke Ring" (圆圆的烟圈), which explores possible solutions to the problem of exhaust emissions in a chemical factory. In *Soap Bubbles*, Liu provides a better way to solve the water shortage problem than simply launching huge engineering projects. Though Liu does not mention the Three Gorges Dam Project or the South-to-North Water Diversion Project, readers can easily make a quick connection to these projects when reading Liu's narrative. Water shortages and desertification have been a long lasting problem in northwest China. The Chinese government has been engaged in the South-to-North Water Diversion Project since 2002. The project is a multi-decade infrastructural effort to better utilize water resources in China. The engineering scale and challenge of this project exceed even the massive Three Gorges hydro-power project. Similar to the Three Gorges project, this is also a controversial project and involves such problems as large-scale human migration, radical changes to various local eco systems, and negative impacts on local history and culture. In *Soap Bubbles*, Liu offers an alternative solution to the problem of water shortages in northwest China. Instead of building gigantic dams and hydro-power stations, people use high tech methods of capturing moist air, which brings rainfall to regions in desperate need of more water. The solution does not involve huge engineering projects, large-scale human migration, pollution, or gigantic costs for the government and taxpayers.

In the narrative, Liu provides a detailed description of the bubble project. The project takes ten years. During these ten years, gigantic sky grids have been built. Every grid has thousands of big rings. These rings are formed by thin tubes with small holes in them. The diameters of these rings range from several hundred meters to one thousand meters. They can produce huge bubbles when filled with a foaming agent. The sky grids are both land-based and sky-based. The land-based grids are spread along the shores of the South China Sea and the Bay of Bengal. Bubbles containing

moist air form a new "Great Wall" over a thousand meters high in the sky. Blown by strong winds, these bubbles flow like a long river, drifting deep into the hinterland, passing over the Himalayas, and finally arriving in northwest China. The city of Silk Road is under a dream-like sky. The bubbles cast huge shadows on the ground. The most spectacular scenes are at dawn and dusk when the morning or evening sunlight makes the bubbles shine a golden color. When the bubbles break, drizzle and rain soon fall from the sky.[11] The image of transparent and flowing bubbles is in sharp contrast with the concrete grey dams over Yangtze River and many other rivers in China. The bubble river flowing in the sky from the South China Sea and the Bay of Bengal to northwest China also parallels the Yangzi River's flow in actuality.

However, there are some potential consequences that Liu Cixin does not mention in his story. How will the bubble project affect the environment of the South China Sea when its moist air is captured and shipped to other regions? Will this project have an impact on the local vegetation and fauna in northwest China after its pattern of humidity changes? Will the bubbles bring light pollution to the Silk Road city? These questions remain unanswered in the story. However, it may cause the reader to ponder how whenever we benefit from technology, we are likely to encounter some negative consequences as well.

Conclusion

As with many other SF narratives, *The Cannon of Earth*, *Soap Bubbles* and *Underground Fire* are wedded to a hope of finding in the unknown the ideal energy solution or the possibility of alternative energy sources. Analysing the novellas in the "cognitive estrangement" framework, we can observe that the depletion of energy and natural resources amounts to the aesthetic paradigm of these three SF narratives. These estrangements are created by the gigantic engineering projects and spectacular scenes, which were made possible by innovative technologies. One could point to three cognitions in particular.

The first cognition is to raise reader's consciousness with respect to the energy crisis: conventional sources of energy such as petroleum, coal, and hydro-power, are limited in our continents, including Antarctica. We will soon exceed the capacity of the natural resources of the earth to sustain several billion people at the levels of consumption many of us have already reached. What will we do when we use up these conventional energy sources and other natural resources? As Crockett and Robbins have pointed out, "In its most basic sense, life is energy conversion. In a way, being or legality itself is also energy. At the beginning of the twentieth century, Albert Einstein demonstrated the convertibility of mass and energy in the famous formula, $E=mc^2$. Energy is fundamental to everything we are and everything we do" (87). Liu Cixin's

novellas examine the crucial role of energy in the rise of technological civilization and consider how that civilization is threatened due to the limited supply of cheap energy sources. *Underground Fire* and *Cannon of Earth* consider a future beyond oil and beyond heat, and thus is integral to our stated goal of thinking what comes next: collapse, if not utter exhaustion.

The second cognition is to exploit available energy resources in concert with developing human technological innovations. Developing technologies has been what we human beings have done collectively over the last few millennia. In these three narratives, such innovative technologies are intended to solve the energy and natural resource crisis, but they either fail or create even worse environmental problems. However, the author gives readers hope. In *Cannon of Earth* and *Underground Fire*, the Antarctic Courtyard and coal gasification projects both fail at the beginning. However, one century or so later with further development of science and technology, both coal gasification and gravity-powered transport are used to benefit people. These endings of his novellas reveal the author's optimistic views about science and technology.

The third cognition is how the development of science and technology will affect our environment. The extrapolative descriptions of the manufactured landscapes, such as the burning coalmine, gigantic tunnel and huge bubbles, are the marks of trauma that human beings have left on the Earth. They have become part of the natural world. These extrapolative manufactured landscapes echo and transform such manufactured landscapes in the author's realist world as dams in the South-to-North Water Division project, the Shanghai Maglev train, and abandonedcoalmines in China. In addition, some depictions in Liu's three novellas are not only extrapolations in time but ostensibly factual, newspaper-style reports about what has happened in contemporary China. The intertextuality within the novellas and outside of them provides a basis for in-depth environmental and political cognition.

Note

1. Jennifer Baichwal, *Manufactured Landscapes* (New York: Zeitgeist Films, 2007). Baichwal was inspired by the photographic works of Edward Burtynsky and made this documentary film. For more of Burtynsky's works, see Edward Burtynsky, *China: the photographs of Edward Burtynsky* (Göttingen: Steidl, 2005).

2. Julia Kristeva, *Desire in Language: A Semiotic Approach to Literature and Art* (New York: Columbia University Press, 1980) 69. Kristeva's coinage of "intertextuality" represents an attempt to integrate her study of how signs derive their meaning within the structure of a text with her examination of the multiple meaningsin each text (especially novels).

3. Fro full text of the novella, see Liu Cixin. *Underground Fire*. This story can be accessed on internet.

4. For detail, see Caomu guzi, "Statistics of death rate in mining accidents since 1949 in China." Also see Baidu wenku, "The Fourth Set of Statistics of Annual Dearth Rate in Mining Accidents."

5. For detail, see Zhongguo jinwang, "Shangdong Yangzhuang Coal Miners on Strike because of Wages in Arrears."

6. For detail, see "How Coal Gasification Plants Work," Office of Fossil-fuel Energy.

7. Jules Verne, *From the Earth to the Moon*. Scholastic Book Services, 1965. This novel can be accessed on internet.

8. For detail, see Wang Zhenhu, "Air-Raid Project during the Period When the Sino-Soviet Relationship Deteriorated."

9. For detail, see "Shanghai Maglev Train."

10. For full text of this novella, see Liu Cixin. *Cannon of Earth.* The work can be accessed on internet.

11. For full text of the story, see Liu Cixin, *Soap Bubbles*. It can be accessed on internet.

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