

THE CHANGING WORLD

How do we know when the climate has changed? There are problems of scale, measurement, and understanding here that appear very abstract. The very concept of climate is an abstraction, a human rendering of data over time that cannot be observed in and of itself (Edwards 2010). No experiment is possible here because the scale is that of the planet itself. Scientists have devised a model called the carbon cycle to explain how the planet has sustained a favorable temperature for agriculture and settled human life over the past twelve thousand years, itself a tiny measure of geological time. The carbon dioxide exhaled by animal life was exactly balanced by plant photosynthesis, while the oceans released and absorbed balanced amounts of the gas. The quantities involved are minute. The carbon balance rested at 278 parts per million in the atmosphere—a tiny percentage of invisible gas. Human activity, such as the burning of fossil fuels, has raised that number to 400 parts per million—still tiny, still invisible, but now causing increasingly powerful effects in the climate worldwide.

Even if all emissions were to stop tomorrow, the climate will keep changing for centuries. And yet we still can't see it, literally and metaphorically.

We have to make climate change less abstract. Here's how it came home to me. In August 2010, I was in Guam, the US dependency in the central Pacific, beginning research on climate change. The indigenous Chamorro people on the island have recently sought to reclaim their long-ignored rights to their country. As part of that effort, they have revived traditional navigation, sailing canoes built by hand, using no modern materials, for thousands of miles, to show both that their society was not without technology and that not all technology requires environmental destruction. The navigators use their knowledge of the stars and the way land changes the direction of the ocean waves to set course.

During the conversation, a seventh-generation master navigator in this tradition, who goes only by the name Manny, explained his skill with an aura of authority. I asked if he has seen any difference as a result of climate change. He noted that he has always been able to predict the weather. His colleague explained that once a group of sailors was planning a voyage of about 1,500 miles. Manny simply said that they needed to be back by the end of the first week in July: on July 8 that year a typhoon struck. In this equatorial region, weather patterns observed over generations have been sufficiently stable to allow for such precision, he explained. "Now I can't tell what the weather will be," Manny told us. That's how we see that the climate, and the world, has changed.

What we can see now is the result of human changes to the world over the long human period since the Industrial Revolution began around 1750, which is a speck in the eye of geological time. Among the most notable ongoing transformations, in addition to climate change, are the sixth mass extinction of living things, and the ever-growing clearance of over one quarter of the world's forests. Imagine a world without coral reefs, with no summer ice in the Arctic, where big animals like lions, tigers, and polar bears can only be seen in zoos or carefully controlled outdoor protected areas like game parks. Welcome to 2040. The human relationship to the world is going to change fundamentally as a result of our having fundamentally changed the world. Simply put, everything will look different.

However, unless we have a highly trained eye, like Manny, these changes are not always easy to see. The most common effort to make them visible is the use of comparative formats. These can be very effective, for example the time-lapse photography used to document glacier retreats in the film *Chasing Ice* (2012). Placing twenty-five cameras in ice fields around the world for three years, photographer James Balog created a series of time-lapse sequences at each site. Even over this short period, the resulting "films" produced by playing the photographs continuously show a noticeable and shocking retreat of the ice. In similar fashion, James Brashears has revisited sites of famous photographs of glaciers and snow-covered mountains from the twentieth century and taken new pictures. Shown side by side, the photographs dramatically reveal the full extent to which the ice has disappeared.

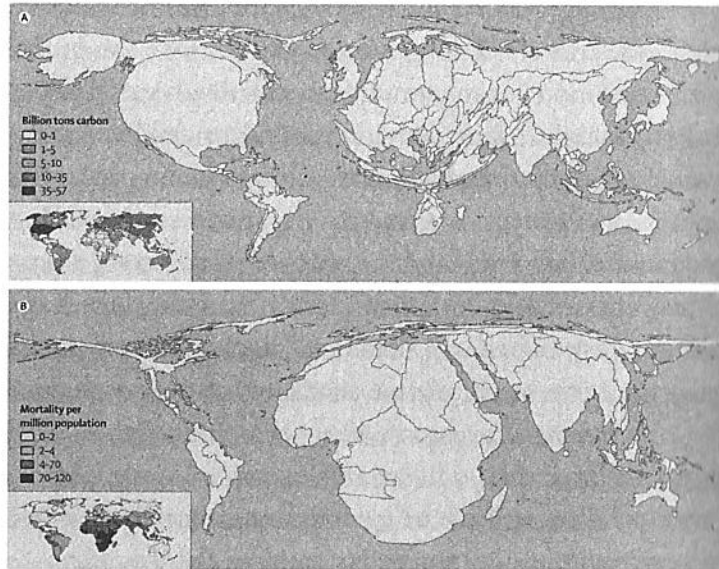


Figure 66. *The Lancet*, map, “Managing the Health Effects of Climate Change”

Comparison has been used to depict change on the global scale. The map of the world shown in Figure 66 was produced by the British medical journal *The Lancet* in 2009 to portray the relationship between global carbon emissions and mortality. The top half of the diagram represents countries according to the percentage of global carbon emissions for which they are responsible. More emissions means a larger size. The bottom half shows the likely consequences in terms of human mortality (deaths, in plain English) resulting from climate change for each country. In the top half, the EU and United States are very large, clearly the greatest emitters, while Africa is

almost invisible (the map would look a little different today because China has risen to the top of the emissions table). In the lower half, it is equally clear that Africa and India will suffer the greatest consequences.

The map tells us something important that we did not necessarily know before: there is an inverse relationship between the countries responsible for carbon emissions and those that suffer the consequences. Sub-Saharan Africa emits very little CO₂ but stands to lose many people as a result of climate change because of drought and other disruption to already precarious lives.

For the deniers, however, neither the diagram nor the photographs can show what is causing the warming. While 98 percent of scientists are in firm agreement that human activity is the clear cause, well-funded groups persist in calling this a debate. Many do so cynically, taking the funds that fossil fuel companies, the most profitable enterprises in the world, make available to them (Oreskes and Conway 2010). Nonetheless, another shift is concealed by all this bluster. Because climate change takes place on the planetary scale, scientists can only model its outcomes. Deniers claim to want experiments. The belief that science means observable and repeatable experiments, which began with Descartes in the seventeenth century (Chapter 2), is, to this extent, over. Global understanding is, by contrast, based on computational models supported by a knowledge infrastructure: in the case of climate, these would be weather observations, satellite data, radar readings, and so on, calibrated against past measurements. It is not something that

people can do by themselves, as could the heroic scientists of the past. Knowledge itself is now a model based on an Internet network.

SEE CHANGE

The change revealed by these models is so thoroughgoing that geologists have named the period since the Industrial Revolution as the Anthropocene: the New Human Era. This means that we have changed the planet's fundamental geology from the rocky depths of what is called the lithosphere to the highest reaches of the atmosphere. And that means a change in the way we measure deep time, the way the planet's immensely long history is understood. Humans have thrived in a tiny window of geological time known as the Holocene, meaning "entirely recent," which is a mere twelve thousand years old. The Holocene is the most recent part of the Quaternary, itself a young geological era that is approximately 2.5 million years old. To put this in context, the preceding Neogene era began approximately 23 million years ago. What used to take millions of years to change now takes decades. Transformations that would have been utterly invisible to humans now take place within the short span of one person's life. We have to learn to see the Anthropocene.

For as deep time has changed, one casualty has been one of the classic ways of seeing the world. A key precept of Western thought has been to distinguish between nature, which is simply present, and culture, which is made by

humans. In particular, the artist observes nature and makes it into culture—for example, a painted view of some land becomes a landscape. Now that distinction has collapsed. It has its own history that we need to trace before setting out to make the Anthropocene visible.

Since the scientific revolution of the seventeenth century, the West has prioritized what was explicitly known as the conquest of nature. For the English scientist Francis Bacon, the first to call for this conquest, nature was provided by God "for the relief of man's estate." Bacon meant that as humans are vulnerable, requiring food and shelter to survive, they can protect themselves by using the natural world as a resource. It was at just this time that Western artists began to paint landscapes, especially in the Netherlands, then a dominant economic power. Landscape was a visual representation of both the conquest of nature and the conquests of colonialism. The battle against nature was won, but is now being followed by its slow collapse under the consequences of its own efforts (Nixon 2011).

We have already not only long absorbed the costs of this conflict but learned to find them beautiful. Modern beauty was often the product of climate change. In early nineteenth-century Great Britain, for example, newly spectacular sunsets captivated the Romantic poets. They were caused by particles of the coal being used in the new factories of the period refracting red light in the air. The Romantics used the term *sublime* to refer to a kind of beauty that would be terrible to experience personally but was intensely moving to see depicted in art, such as a

shipwreck or storm of the kind we see in the painting of the Romantic artist J. M. W. Turner.

Today's hurricanes, droughts, floods, record snowfalls, and escalating temperatures create a different feeling—a constant unease as unusual weather becomes the new normal. That unease chimes with the uncanny feeling produced by the new global city, digital networks, and drones. In order to have lived in a month where the world was not warming month by month, you need to have been born in 1985 or earlier. If you were born after 1985, you have never known what the pre-climate-changed world was like. Your body knows nonetheless that the drought, the floods, and the rising seas are out of joint with past experience. It just feels wrong. So, we have to imagine that past, “unsee”—to use China Miéville’s term—how it has taught us to see the world, and begin to imagine a different way to be with what we used to call nature. That will be seeing the Anthropocene.

THE BIRDS

One of the most visible changes to the planet has been an enormous reduction in bird populations, so central to every mythological and cultural system humans have created. Humans have been devastating bird populations for a long time, reshaping how the world looks and sounds as they go. On the Pacific island of Tonga alone, twenty-six species of birds have been documented as becoming extinct since the arrival of humans some 2,800 years ago. Modern seafaring dramatically increased the pace of such extinction. Dutch

sailors arrived on the island of Mauritius in 1598, where they found edible, flightless birds they called the dodo. Sailors and other travelers ate the huge birds in considerable numbers, while the pigs and macaques introduced by the travelers feasted on their eggs. The last accepted sighting of the dodo was in 1662, one of the first casualties of the conquest of nature. ;

The transformation is astonishing seen in the longer time frames of extinction by means of natural selection. The background extinction rate (meaning the number of extinctions that would occur in the absence of human intervention) is very low. It would take four hundred years for a single species of bird to become extinct without human involvement. The dodo has been a fixture in



Figure 67. Green (after Wright), *An Experiment on a Bird in the Air Pump*

popular culture since the nineteenth century because it was the first modern sign that humans could change change itself.

The death of birds became a scientific curiosity across early modern Europe that stood in for the conquest of nature as a whole. The painter Joseph Wright of Derby depicted such a death in his *An Experiment on a Bird in the Air Pump* (1768). The air pump was invented in 1659 by the scientist Robert Boyle, who used it to demonstrate many of the otherwise invisible properties of air. His experiment, in which a bird was placed in the pump while the air was removed, demonstrated the necessity of air for life because the bird died. A century later, the experiment was as much entertainment as science, performed by self-described “natural philosophers” in lecture halls and private houses. (These are the kind of experiments that climate deniers today imagine being performed to test climate change.) Such is the scene dramatically depicted by Wright. The bird flutters in the vacuum pump, to the distress of the children, while adults conduct learned conversation on the spectacle. Science is represented as reason triumphing over sentiment, gendered as masculine and feminine respectively. The dramatic candlelight and the biblical appearance of the experimenter add to the tension of the scene. Most actual experiments used small native birds like larks and sparrows, but Wright painted a cockatoo. These tropical birds were newly known to English people thanks to the voyages of Captain Cook. The few specimens in the country were rare and expensive, so it would have been an

unlikely candidate for death by scientific amusement. By painting a tropical bird, Wright intended to highlight and visualize the symmetry between the conquest of nature and the conquest of new territory overseas that British philosophers had been making throughout the lifetime of the air pump (see Chapter 3).

Such experiments were not controversial because modern Westerners considered birds as inexhaustible resources. One of the most dramatic examples of this misconception is the passenger pigeon. These birds were so populous in North America that it challenged belief. The famous ornithologist and bird artist John James Audubon was so amazed by the “countless multitudes” of birds that he attempted to estimate them as they flew past him in Kentucky in 1813. He calculated that there were no fewer than 1,115,136,000 pigeons in the single “flock” that he saw. He was equally stunned by the visual beauty of it all:

I cannot describe to you the extreme beauty of their aerial evolutions, when a Hawk chanced to press upon the rear of a flock. At once, like a torrent, and with a noise like thunder, they rushed into a compact mass, pressing upon each other toward the center. In these almost solid masses, they darted forward in undulating and angular lines, descended and swept close over the earth with inconceivable velocity, mounted perpendicularly so as to resemble a vast column, and, when high, were seen wheeling and twisting within their continued lines, which then resembled the coils of a gigantic serpent.²

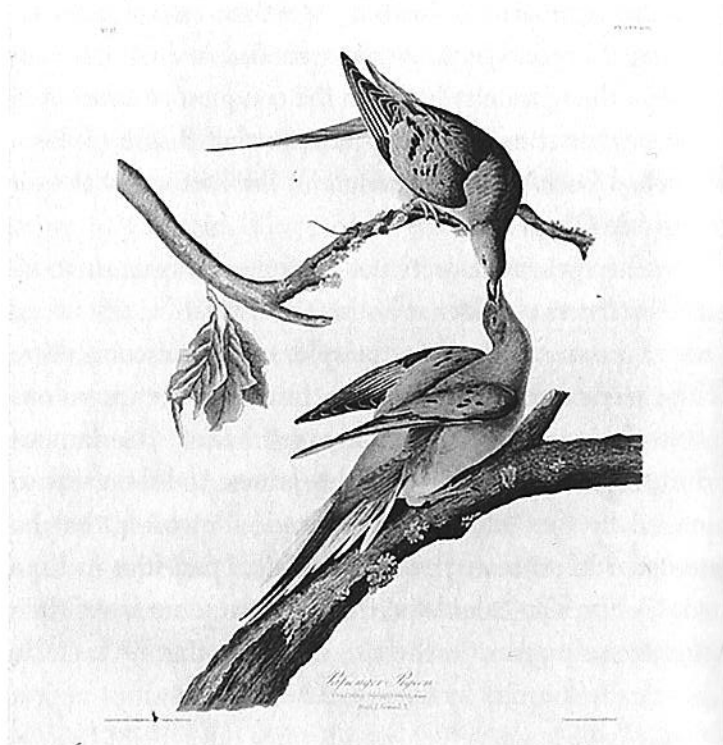


Figure 68. Audubon, *Passenger Pigeons*

As they flew by, however, humans waited with guns. Audubon described how at each location the birds passed, people would shoot as many as they possibly could, both to feed themselves and to fatten domestic pigs. The birds sold at market for a penny apiece. While Audubon feared that humans might extinguish the birds, he could not bring himself to believe that it could happen. A century after he encountered the pigeons in Kentucky, the last known passenger pigeon died in a zoo in Cincinnati, Ohio,

on September 1, 1914, just as humans set about slaughtering themselves in the First World War.

Ironically, Audubon's drawing of the birds has now become a memorial to this extinct species. It shows two birds billing, a courtship ritual in which one bird feeds the other. The female bird, above, nurtures the more brightly colored male bird, for as Audubon noted, "the tenderness and affection displayed by these birds toward their mates, are in the highest degree striking." For a century, it has not been possible to experience this relationship, once an integral feature of North American life, let alone see the spectacular maneuvers used to deter predators by the massive flocks of birds. Like all Audubon's drawings, it was itself made using corpses, rather than drawn from live birds. Audubon created a device using wires to pin the bird into the position he wished to draw it, as you can see from the forced position of the lower bird's wings to display the colorful tail.

His classic *Birds of America* (1827–38) is filled with accounts of shooting birds and otherwise obtaining dead birds from the flourishing bird markets that he visited, from New York to New Orleans. In his own time, this process was unremarkable, but today it seems to describe an everyday theater of cruelty that led to extinction. While people shoot birds less than they did, birds continue to decline as humans increase their settlements and the climate changes.

In 1962, the science writer Rachel Carson changed the way people understood the environment with her book *Silent Spring*, first published in the *New Yorker* magazine

(Carson 1962). Carson showed that the pesticide DDT was causing tremendous harm to people and animals, including birds. The title of her book came from her effort to imagine a spring without birdsong, caused by the damage DDT does to the shells of birds' eggs. The combination of this powerful image and her convincing evidence resulted first in restrictions on DDT use and then its ban altogether. We might wonder if Americans today, living in cities behind double glazing and plugged into their headphones, would be so moved by a threat to birdsong.

The 2007 Audubon Society report on the citizen count of the twenty most common birds in America found that since 1967 the average population of the common birds in steepest decline has fallen by 68 percent; some individual species nose-dived as much as 80 percent.³ A follow-up study in 2014 suggested that climate change threatens half of the bird species in America. John James Audubon's nineteenth-century volumes now document a cluster of extinct species and many more in sharp decline. We live on, and look at, a different, emptier, less song-filled planet than he did.

MODERN BEAUTY

Work that intended to capture the new or the everyday is now also a monument to environmental destruction or climate change. Just as natural history drawing captured soon-to-be-extinct animals by accident, so, too, did the painting of the new phenomena of modern industrial life highlight the

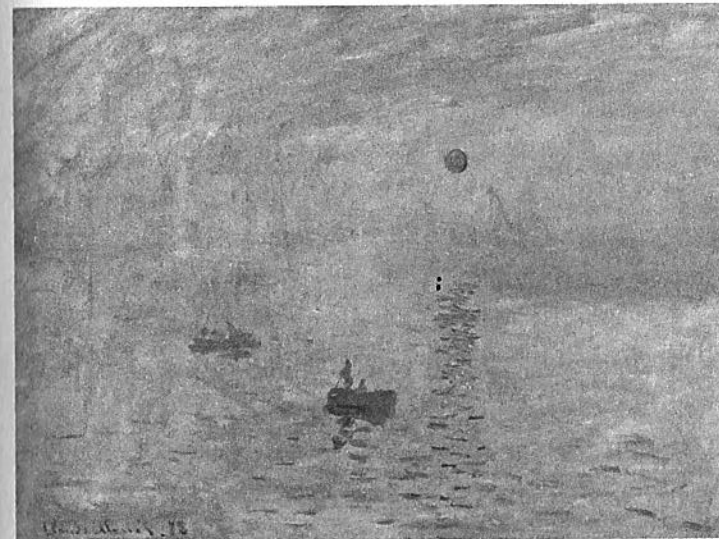


Figure 69. Monet, *Impression: Sun Rising*

process of climate change without the artists realizing what was really happening. This “double play” capacity can be seen across modern Western art. The city has become the habitat for the majority and we have naturalized it in art, photography, and film. We can learn to look again at these works to see how humans have changed the world, and then we could develop ways of seeing the planet that might be part of the solution. To do so, however, we have to “unsee” the ways in which we have come to see this change as beauty.

The effects have been dramatic since the beginning. There is no modern painting more widely reproduced and taught than Claude Monet's *Impression: Sun Rising* (1873). Without diminishing our appreciation of Monet's handling of color and light, I want to stress that this is

a painting that at once reveals and makes beautiful human environmental destruction. Coming late to the Industrial Revolution, France was just experiencing the smog produced by industrial coal use in the mid-nineteenth century. The port of Le Havre in Normandy, seen in Monet's picture, was well known for its smokiness. The effect was featured in a range of French visual culture such as popular photographs, postcards, and paintings from the middle of the nineteenth century on. Monet grew up in Le Havre, which was the main French port for transatlantic passenger shipping, predominantly steamship traffic. In his painting, traditional rowing boats can be seen isolated in the foreground. In the background, industrial machinery dominates the scene, such as the angular cranes to the right. Coal smoke pours forth from the chimneys of three steamers clearly depicted in the left middle ground of the painting. Overall, the painting generates the vivid set of sense impressions that gave first this work, and then an entire movement, its name. Coal smoke is yellow, the yellow that predominates at the top of the painting. In the early morning, the time depicted in the painting, the smoke encounters both blue morning light and the red of the rising sun, producing the array of refracted color that makes Monet's painting so stunning in the original.

There is a good deal of artfulness in Monet's apparently spontaneous effort to seize the moment. The mix of light and smoke combines to form what we might call a very modern form of beauty. The steamers can barely be distinguished in the smog, giving them the appearance

of factory chimneys. Somehow they fight their way out of the water, like a latter-day Leviathan, the legendary sea monster, adopted by philosopher Thomas Hobbes as the symbol of the state. The steamers are literally and metaphorically the source of power. The painting is made as if looking from an unusually high viewpoint. Perhaps Monet was looking out of a high window or from the rigging of a ship. Whether he physically put himself in such a place is beside the point. Monet gave visual form to the conquest of nature, transforming the once-fearsome ocean into a domesticated, human-dominated object. It's as if the function of the sea was now to be looked at.

Here the humans who have made the world in their own image look at their creation and see that it is good. While Monet's contemporaries at first experienced his work as shockingly modern and new, it soon became comfortably familiar, as it remains today. The painting made the transformation of the world by modern industrial processes not only visible but beautiful. Beauty has no practical purpose. So, although the actual smoke was the sign of industrial work, the painting emphasizes its handmade qualities. Monet wanted us to realize that his art was not simply a copy that a factory might make. It is for and about the leisure class, not the working classes. In reality, the smog was a dangerous by-product. The modern idea of beauty transformed the sensing of the color and smell of coal smoke into an indication of the continuing conquest of nature.

Two years later, Monet fully realized this worldview in his small but dense painting *Unloading Coal*. A fleet of

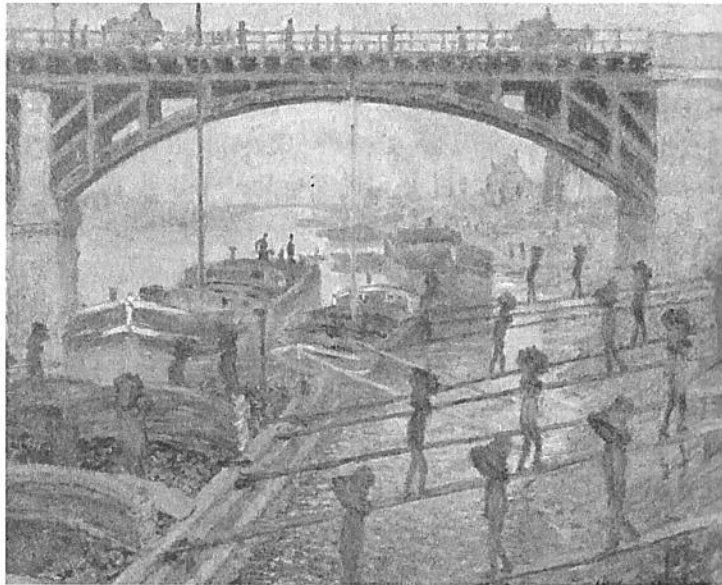


Figure 70. Monet, *Unloading Coal*

coal barges from the mines in the north of France enter the picture space from the bottom left to the center, almost as if invading it. Coal, itself the product of a very demanding form of manual labor, is carried off the barges for use in this industrial suburb of Paris. The workers cannot be distinguished individually, precisely because as individuals they do not matter. What counts is just the unloading of the coal. Like mining, it's back-breaking work. From here, the coal is transported by means we cannot see to factories like the one in the background, once again pouring out smoke. Those factories produced goods like the iron for the modern bridge and the commodities being transported across it by carts. A gaslight, the visible sign of modern

human dominance over nature, can just be made out on the left of the bridge. The bridge appears to be a visibly “higher” level of existence, one dominated by manufactured goods, and artificially lit. The figures are no more distinct or individualized up there. Some are at rest, or watching the underlings carry coal, so you would rather be one of them. The key spaces of modern industrial society—production and consumption—are linked into one visualized system here.

Just as with *Impression* a few years earlier, *Unloading Coal* is constructed from an unusual midair viewpoint, perhaps the view from a train window as it crossed over the river heading to Paris. As we saw in Chapter 4, the moving image as seen from the train is often taken to be the precursor of cinema. Monet here made the moving modern world into a still. This freeze-frame accounts for the strong sense of movement in the painting, given coherence by its overall warm tone, that subdued yellow hue, which is the product of coal smoke. The degradation of the air is again seen as natural, right, and by extension beautiful. The changed world is now so built into our senses that it determines our very perceptions, and so it has become beautiful and aesthetic.

If beauty is what is known as the aesthetic, art here produces a sensory anesthetic to the actual physical conditions.⁴ Whereas watching coal being unloaded on a smoggy day might not be an elevating experience, looking at Monet's painting of such a scene is exactly that. Just as nineteenth-century art had pictured storms and mountains

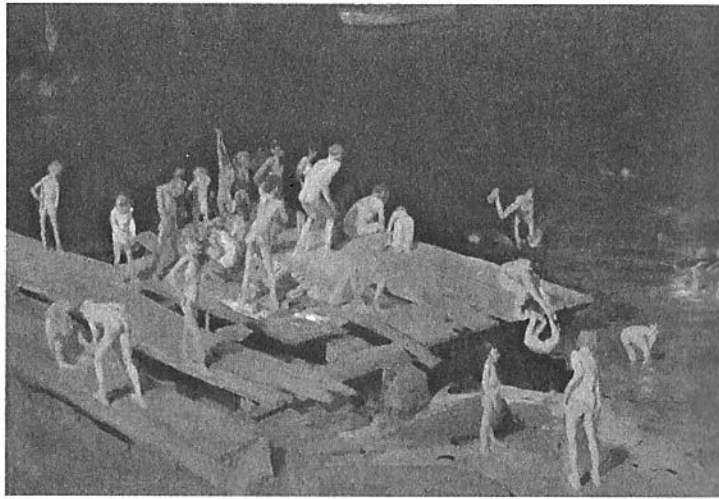


Figure 71. Bellows, *Forty-Two Kids*

as beautiful rather than threatening, Monet changed our perception of the modern city. Indeed, the invention of medical anesthesia in the nineteenth century was one of the most dramatic reductions in human suffering ever known, so the dulling of the senses was not always perceived as a bad thing. A remarkable example of how this sensory anesthesia actually worked in practice comes from New York. If we look at George Wesley Bellows's classic painting *Forty-Two Kids* (1907), we see a group of naked children getting ready to swim in the East River on a hot day.

The assumption is that they are poor, from the Lower East Side of the city, where immigrants were then congregated in large numbers and dreadful conditions. The water is black. It was not a metaphor. At that time, all the bodily waste of the 6 million people living around New York

Harbor was piped straight into the water. You could also find many dead animals in the river, not to mention industrial waste. In the nineteenth century, oyster beds were so flourishing in New York that they were one of the key food sources for the city. By the early twentieth century, they had all died.

Officials charged with dealing with the disposal of sewage could not understand why there was no public outcry or even perception of the waste. In 1912, five years after Bellows made his painting, a British scientist commented after a tour of the harbor: "I am surprised that a city claiming to be one of the first in the world should allow such a disgraceful condition of affairs to exist." City sewage officials noted in amazement:

The people of New York seem strangely indifferent to the polluted condition of the harbor. They have recently built some of the finest and most expensive hospitals and apartment houses on the shores of the most polluted large part of the inner harbor, namely, the Upper East River, where that fetid stream is joined by the black and malodorous Harlem.⁵

The point was that, while the "great unwashed" working classes might have been expected to be willing to live with dirt and smells, so, too, were New York's elites. Even today, any rainstorm that generates over half an inch of water flushes raw sewage into New York's rivers. Swimmers and surfers know to stay out of the water at local beaches

the next day. The desire to live in the modern city was so great that it anesthetized the senses, or at least allowed people to disregard what they saw and smelled in the water. The image of the city replaced its material reality and became a new reality.

Such selective perception was by no means unique to New York. For over a century, London was afflicted with dense smogs produced by burning coal. Known as peasoupers, and often referred to incorrectly as fog, this persistent smog became a feature of London life. Tourists expected the fog, and Londoners missed it when away. It became a character in nineteenth-century fiction, such as the famous opening to Charles Dickens's *Bleak House* (1852–1853):

Fog everywhere. Fog up the river, where it flows among green aits and meadows; fog down the river, where it rolls defiled among the tiers of shipping and the waterside pollutions of a great (and dirty) city. Fog on the Essex marshes, fog on the Kentish heights. Fog creeping into the cabooses of collier-brigs; fog lying out on the yards and hovering in the rigging of great ships; fog drooping on the gunwales of barges and small boats. Fog in the eyes and throats of ancient Greenwich pensioners, wheezing by the firesides of their wards; fog in the stem and bowl of the afternoon pipe of the wrathful skipper, down in his close cabin; fog cruelly pinching the toes and fingers of his shivering little 'prentice boy on deck.

It is as if the fog (really the coal smog) is now the background to all natural and human activity. The smog is so naturalized that it can itself even be polluted by the dirt of the city. Yet it makes the shops turn on their lights two hours early and dims out the gaslights of the streets. It is everywhere, and “at the very heart of the fog,” says Dickens, is the High Court of Chancery. This court dealt with cases concerning property. The fog symbolizes the dominant place of the rule of law in modern life. It reaches every corner of our lives, every object that surrounds us. In the eyes of imperial culture, law separated the “civilized” from the “savage,” the result of the conquest of nature. Fog was the visible by-product and symbol of that conquest. *Bleak House* was not so sure, for the interminable case of *Jarndyce v. Jarndyce* at its center destroyed the lives of all it touched.

Exactly a century after the publication of *Bleak House*, the Great Fog (as it was then known) of December 1952 brought twilight at noon to London. Photographs show dim outlines of landmarks perceived through the haze. A later study estimated that it killed some twelve thousand people by exacerbating lung disease and other breathing difficulties, more than four times the casualties of 9/11. But if you look in newspapers, diaries, and other sources for those days, it's hardly mentioned. *The Times* (London) newspaper noted that fog held up traffic and mentioned breathing difficulties only for cattle at the Earl's Court market. After a century, fog just came with London, in the way that smog (by then properly named at least) was later associated with Los Angeles. In retrospect, the Great Fog

is often associated with the passing of the Clean Air Act of 1956 that finally led to the end of the peaseoupers, if not of the smog. In fact, the act followed a private member's bill, showing that there was no great urgency from the official point of view.

OLYMPIC COAL AND STEEL

In his classic description of urban poverty in the Great Depression of the 1930s, *The Road to Wigan Pier*, George Orwell described how

Our civilization . . . is founded on coal, more completely than one realizes until one stops to think about it. The machines that keep us alive, and the machines that make machines, are all directly or indirectly dependent upon coal.⁶

In many ways, it would be fair to say that it still is, particularly if steel is added to the mix. Records show an acceleration of environmental destruction, especially carbon emissions, since the beginning of globalization in the 1980s. Despite its high levels of carbon emissions, 30 percent of UK energy is still derived from coal, while 39 percent of US electricity came from coal in 2013. China, which is now the leading user of energy worldwide, derived 69 percent of it from coal in 2011. Coal has again become the single largest source of global carbon emissions, overtaking those from vehicles. When the world is changing,

it makes little sense to measure results nation by nation. We have to think in terms of cause and effect planetwide, meaning we have to relearn how to see the world as a whole. We cannot see from the partial viewpoint of our own nation or region, but need to bring together different points of view so as to see the Anthropocene. Perhaps we are still anesthetized by our pleasure in modern urban living, unseeing what its costs are at home and elsewhere.

Looking at the dynamics within Monet's *Unloading Coal* allowed us to see the formation of the Anthropocene in Europe. Today we need a global version of this way of seeing. Rather than a single frame, we should think of connecting a series of such frames into a "film" that would allow us to see the structures, networks, histories, and effects of the Anthropocene. This film would not be the view from the train so much as the view from the ground. It is the view first of all of the landless. In Brazil, 1 percent of the population owns 45 percent of the land. Worldwide, 20 percent of the hungry are landless food producers, while there were 2.2 billion people earning \$2 a day or less in 2011, according to the World Bank.⁷ It is also the view from a sustainable farm, from the bottom of a skyscraper or from the informal housing around global cities.

Sustainable and fairly owned land is the opposite of the global city using coal for energy and steel for building construction. Coal and steel production links mining nations, such as Australia, Brazil, India, and South Africa to China and the developed-world economies in a network of mining, production, and final use of energy and construction

in global cities. This is the network we need to understand in order to think visually and see the changing world.

When the Olympic Games were held in Beijing in 2008, there was tremendous concern in Western media and sports circles about the effects of air pollution. Some athletes arrived wearing face masks. It has recently been estimated that 750,000 people a year die from pollution-caused illness in China. In the winter of 2012–2013, 600 million Chinese people lived under a cloud of smog that covered about 500,000 square miles; it was visible from space, disappearing only occasionally.⁸

By contrast, when the first day of the 2012 London Olympics coincided with an air-quality alert, no one mentioned it. The story about London's air quality was supposed to be a good one. Since 1990, UK emissions have been reduced by about 21 percent, mostly due to declining coal use.⁹ But the picture is complicated by carbon emissions due to imported goods and services. The UK emissions from imports increased 23 percent from 1997 to 2004, but have since fallen due to the financial crisis.¹⁰ London will not meet European Union air-quality standards before 2030, it has since been announced. Chinese smog is very visible in Western media, whereas first world failings are ignored.

How can we start to see past the haze? Let's pursue this Olympic parallel through the coal and steel networks. Both the Beijing and London Olympics engaged top artists to create steel monuments as a central part of their projects.

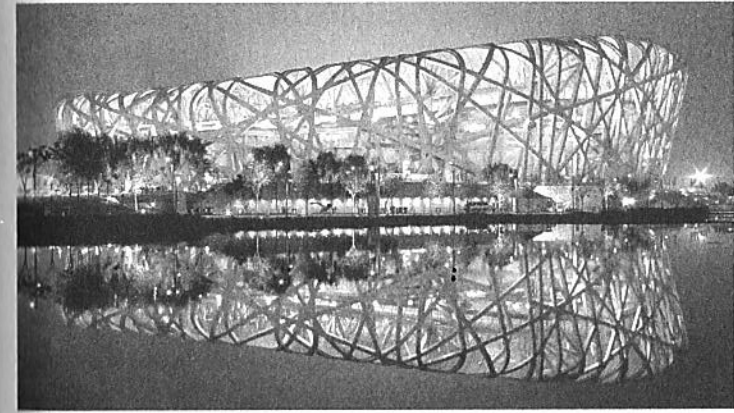


Figure 72. Beijing National Stadium

In Beijing, Ai Wei Wei helped design the dramatic Bird's Nest Stadium (officially known as the National Stadium), while Anish Kapoor created a giant public sculpture known as *Orbit* for the 2012 Games. Both the stadium and the sculpture were made from steel. The global steel industry has been booming in parallel with the rise of China. According to 2012 figures, China produces over 700 million tons of steel a year, half of all global production, compared to just 88 million tons in the United States.¹¹ Steel production is a spectacular source of carbon emissions. According to the Organisation for Economic Co-operation and Development:

Steel production accounts for 5% (8% including power, mining and ferro-alloys) of global CO₂ emissions. The steel industry is the largest industrial CO₂ emitter (30%).¹²

The smog around the stadiums was, then, directly connected to the steel with which they, and the monuments around them, are made.

The Bird's Nest Stadium alone used 110,000 tons of steel. The remarkable elliptical shape of the stadium was at first designed to support a retractable roof. When this was canceled because of cost, the result was a beautifully original form. The apparently porous building was designed by Swiss firm Herzog & de Meuron working with Chinese architect Li Xinggang. It was inspired by Chinese ceramics and cost \$300 million. As Li said, "In China, a bird's nest is very expensive, something you eat on special occasions."

The stadium adopted the concept of nature as a resource for human need and turned it into a monument to Chinese progress. Lit up by fireworks for the opening and closing ceremonies, the stadium was indeed a stunning sight. Even more remarkable was the invisible transformation produced by Chinese officials during the Games. By dint of compulsory reduction of industrial activity and keeping cars off the roads, China produced clean-air days for the Games. Not only that, scientists later calculated that the reduction in emissions was 0.25 percent of the entire global target to keep under a 2°C rise in average temperature. The surprising lesson is that, were the other global cities to follow this lead, it would actually be possible even at this late stage to contain global warming.

Four years later in London, the Games were marked by a specific steel monument, Anish Kapoor's *Orbit*. In this instance, the steel came from ArcelorMittal (after which the sculpture is now named), a global steel corporation

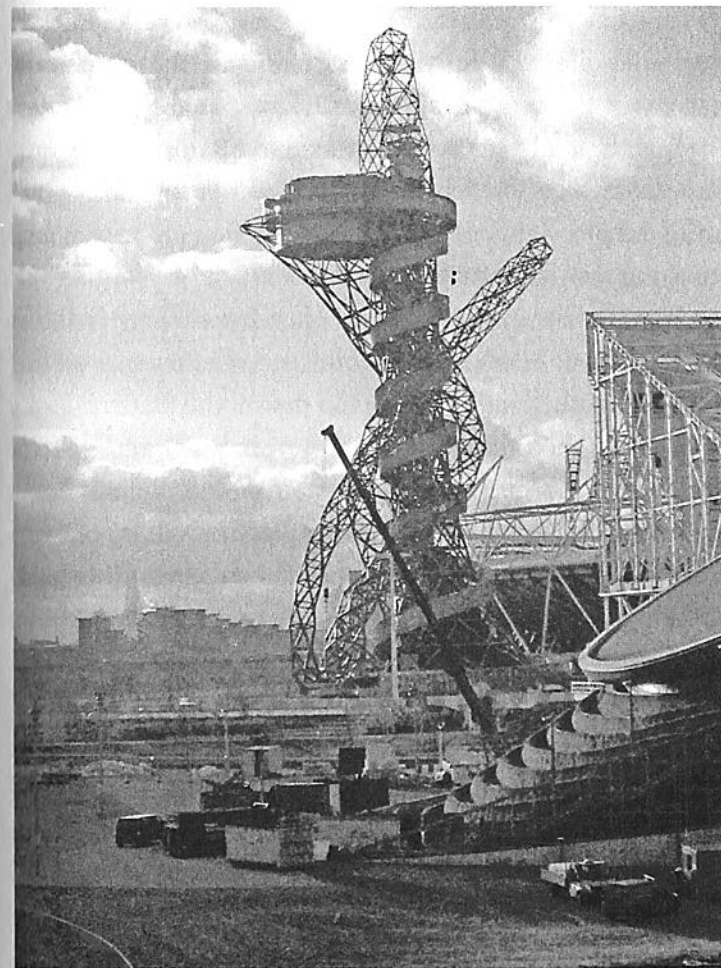


Figure 73. Kapoor, *Orbit*

run by Lakshmi Mittal, Great Britain's wealthiest man. His company had revenues of over \$94 billion in 2011 and outlets in sixty countries. Throughout the Olympic year 2012, there was passionate industrial action over job losses at an ArcelorMittal plant in northeastern France, which became

an issue in that country's presidential election. These issues were invisible in London, where most of the discussion was about *Orbit* as an artwork. It was very different from Kapoor's best-known works that tend to be smooth, curved, sometimes highly reflective forms. *Orbit* is a visually confusing tangle. Kapoor spoke of "making something that was continually in movement."¹³

From what seems to be the intended viewing point, a long extension heads from the bottom left into space on the right, distracting and breaking the flow of the piece. It looks better from the other side. Even so, what is this? Kapoor's goal of giving visual form to "instability" has perhaps been realized too well. There's a viewing platform on top of what looks like one of those terrifying circular exits to European parking lots. The piece is, simply, the spectacle. It works as long as you look at the Olympic Stadium next door, smaller than I expected. Or look toward the increasingly dramatic skyline of the City of London, including Renzo Piano's dramatic 1,000-foot-high 87-story skyscraper The Shard, completed just in time for the Olympics, capped with a 500-ton steel spire. Another way of looking at the City would be to see it as home to many of the scandals associated with the 2008 financial crisis, such as the manipulation of the LIBOR interest rate. Look the other way from *Orbit*, though, and the view is of Stratford, an as-yet-ungentrified part of the East End, dominated by unlovely high-rises and a tangle of roads, overhead power lines, and railway tracks.

In interviews, Kapoor claimed an affinity with Vladimir Tatlin's legendary *Monument to the Third International*

and the Eiffel Tower. Gustave Eiffel's steel pyramid was built for the International Exhibition of 1889 in Paris. These were the mass spectacle tourist events of their time, displaying products from around the imperial world. In fact, many of the pavilions even included residents of the countries they represented as human displays. The International Exhibition was an unabashed celebration of the conquest of nature and the rise of Western "civilization" in its place.

By contrast, although it was never built, Tatlin's spiraling Constructivist tower was intended as a homage to the 1917 Russian Revolution. His design (1919–20) aspired to outreach the Eiffel Tower and thus symbolize the dominance of Communism. For Lenin, Communism was famously "electricity plus Soviets," embodying just as much determination to conquer nature. If we imagine Kapoor's sculpture as the successor to both empire and Communism, it might be seen as the "monument to globalization." It makes sense in this context, four years into the financial crisis that began in 2008, that it has the strong feeling of instability. From this perspective, you can imagine that what *Orbit* actually looks like is a folded-in combination of the characters for pounds, dollars, and euros: £ / \$ / €. In that way, it really was the most appropriate monument that there could have been.

VISUAL THINKING FOR THE ANTHROPOCENE ERA

If there are to be new ways of imagining ourselves in the world, there will need to be a new visual way of thinking for the Anthropocene era, perhaps even a monument for the

Anthropocene (one is actually being planned by Argentinian artist Tomás Saraceno in Toulouse, France). A good place to start would be the documents produced for over twenty years by Canadian photographer Edward Burtynsky of what he calls the “manufactured landscape” created by mining. Such landscapes can be seen all over the world and are entirely artificial, the building blocks of the Anthropocene. In his 1985 photograph of the Westar Open Pit Coal Mine, Burtynsky captured the sheer scale of the mine at Sparwood. Trucks and other equipment in the middle ground are dwarfed by the concentric circles formed by coal removal that laid bare the hillside, forming a new apocalyptic human-generated vista. We might call this *anthropocene landscape*. Located close to the Banff National Park in British Columbia, Sparwood is a small community otherwise famed only for displaying what it claims to be the world’s largest truck. Good roads connect the mine to the highway system so that the coal can be distributed quickly. The coal from the open mine is now used in the manufacture of steel. In 2014, thirty years after the picture was taken, the mine was expected to be active for another twenty-nine years. These interconnections and networks are part of what made the Bird’s Nest Stadium and the *Orbit* possible but remain unseen, the material side to globalization that most prefer to ignore, just as the anthropocene landscape is experienced only by those who have to work there.

Another vital part of this thinking is to show how colonial histories continue to shape energy production. The artist Sammy Baloji (b. 1978) makes us see how the

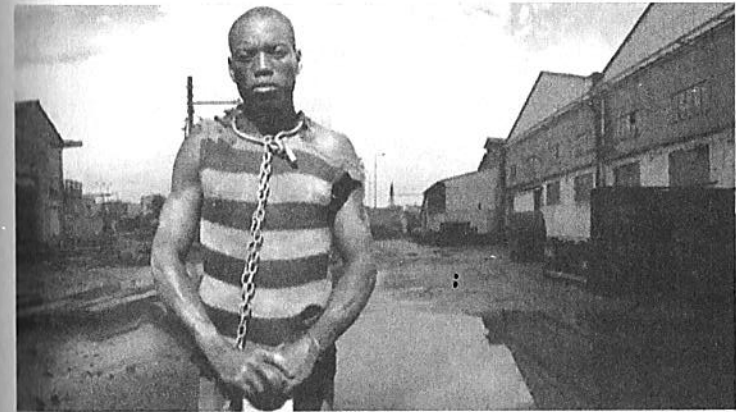


Figure 74. Baloji, *Mémoire*

colonial history of the Democratic Republic of Congo’s second-largest city, Lubumbashi, in Katanga Province, is directly connected to the global city and its digital networks. Born in Lubumbashi, Baloji trained in the DRC and in France. His extensive and widely exhibited *Mémoire* (2006) project consists of montages in which Africans and Europeans photographed in the colonial era appear in front of present-day mine works. Once again, the sense of haunting and the uncanny reappears in our global present.

Made in very large-scale format, Baloji’s montage of black-and-white and color film is visually arresting. His work attests to the long history of exploitation in the region. Beginning in the 1920s, Belgian colonists began to mine the immense copper deposits in Katanga, often using forced labor, especially during the Second World War, when demand for copper was high. After independence, the Gécamines state-owned mining company

became equally famed for its output and its corruption in the 1980s. Following subsequent decades of war, the mines photographed by Baloji are now postindustrial ruins. Broken-down buildings and enormous deposits of trailings (what remains after the ore has been extracted) create an apocalyptic landscape. Baloji describes how

my current works have a direct connection with the colonial past, which gave birth to the cities of Katanga [P]rovince. These cities were built upon mines. The latter belong to Katanga's history. The essence of my question lies in the daily life of Congolese people.¹⁴

In 2006, Congo was at the bottom of the United Nations Human Development Index and close to the bottom of its transparency index, indicating high levels of corruption. As many as half a million people, including many children, now work as subsistence miners in the region, meaning that they dig ore-bearing rock out of the ground and sell it individually. The demand for copper comes largely from China, which takes up to 40 percent of the global supply in order to make consumer goods, such as computers, refrigerators, cars, and plumbing equipment. In the United States, the Dodd-Frank Act (2010)¹⁵ now forbids the use of so-called conflict minerals, meaning minerals produced under duress or in war conditions. Despite efforts by companies like Intel, the global flows of the mineral market make it very hard to know whether the computer I am using to write this chapter has Congo copper in it or not.

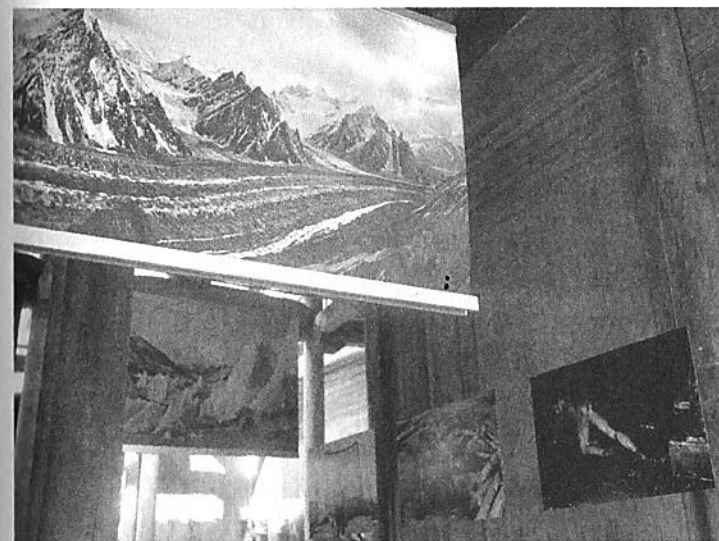


Figure 75. Installation view of *Coal + Ice*, Yixian, China

What techniques should we use to make such global flows apparent? *Coal + Ice*, a 2011 international collaborative documentary exhibition drawing on the work of more than thirty photographers, set out to make visible the connections between increased coal use and melting ice fields.¹⁶ In the words of its curators, Jeroen de Vries and the photographer Susan Meiselas, *Coal + Ice* “visually narrates the hidden chain of actions triggered by mankind’s use of coal. This photographic arc moves from deep within the coal mines to the glaciers of the greater Himalaya where greenhouse gases are warming the high altitude climate” (*Coal + Ice* 2010). The installation asked spectators to see the connections between modernity and climate change without pushing easy answers or dictating conclusions.

James Brashears's photographs of retreating glaciers hang here above powerful documentary photographs of the labor of Chinese miners. The story is not simple. Mining communities are close knit, generating not just financial benefits but pride and solidarity. At the same time, the work is difficult and dangerous, with planetary consequences. Ending mining would have benefits for the climate but would damage these human communities. It is up to the viewer how to frame the comparison. It takes time, and installations like this allow us to do the visual thinking necessary to imagine these histories and to begin to devise alternatives.

We should develop our skills in this kind of visual thinking to understand human interaction with key natural systems, such as rivers, which are now undergoing dramatic change. Consider the vital Mississippi River. Long the means of transporting America's wealth from the days of the Cotton Kingdom in the South to today's grain shipments going downriver, passing oil tankers heading north, the Mississippi is a key national artery. It waters—and now increasingly floods—many states. In 1944, Harold Fisk of the Army Corps of Engineers, which is responsible for federal waterways, made a remarkable map of the Mississippi River floodplain.

Fisk's large-scale and monumental map shows a swirling set of meanders and bows formed over the long expanse of geological time. It makes deep time visible. The “modern” course of the river is depicted in white at the center of the tangled weave of its former trajectories. The result looks more like a William Blake painting than a geological

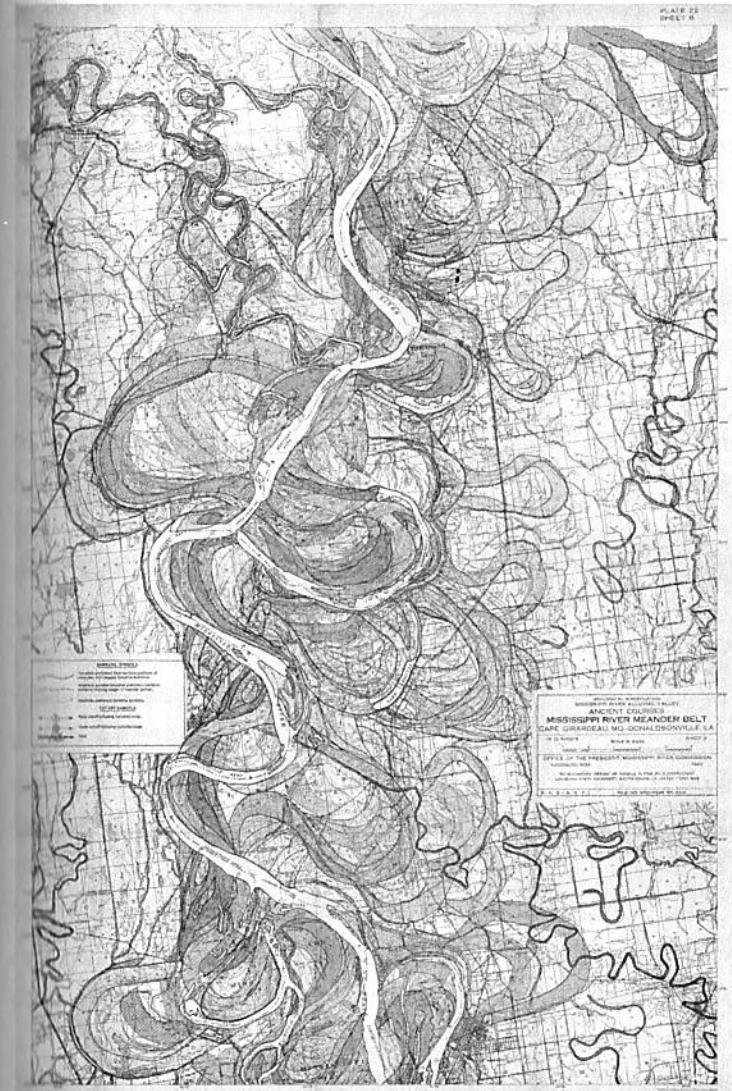


Figure 76. Fisk, map of the Mississippi River and floodplain

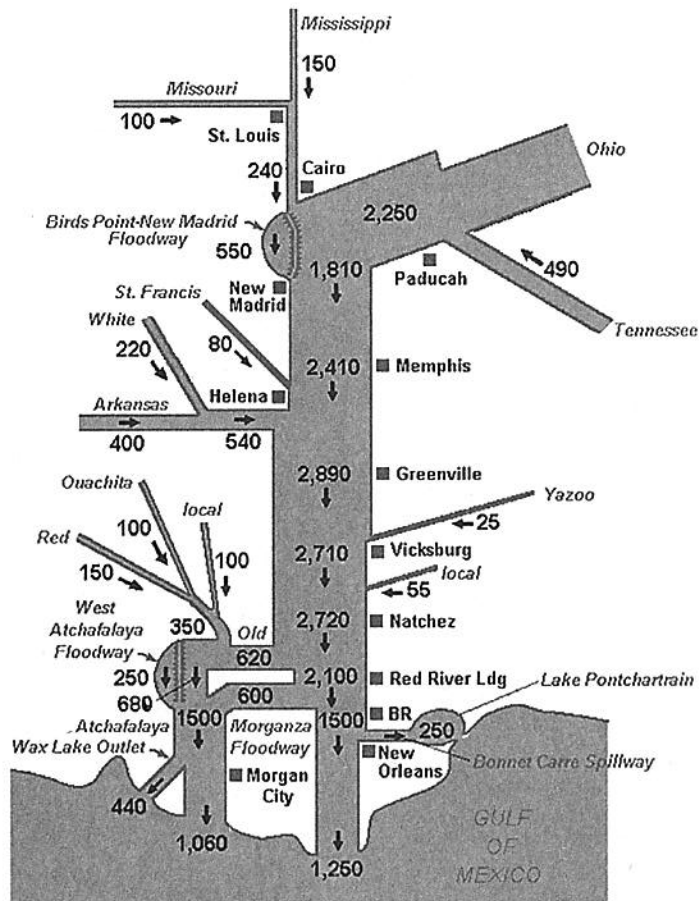


Figure 77. US Army Corps of Engineers, diagrammatic map of the Mississippi River

diagram. The two hundred years in which European Americans have been trying to modify the course of the river are too brief to visualize on such a scale. The map gives us a sense of the river as a living thing, with a history and memory, rather than an inanimate flow of water.

It creates a sense of comparison and history in one frame and shows that any attempt to confine the river to a single course is likely to be futile.

By contrast, twenty-first-century maps of the river by the Corps show it as a straight line, constrained between impassable levees that are only as strong as their weakest point. The city of New Orleans discovered this to its cost when the levees broke after Hurricane Katrina in 2005. You might not at first even recognize this as a map of a river.

The Corps' map visualizes the conquest of nature. It turns the whorls and swirls of the river that Fisk had mapped into a set of straight lines and data points. That river does not exist. By the same token, nor can the Corps successfully contain it within those boundaries.

The Army Corps of Engineers is a group of soldiers involved in maintaining and extending the conquest of nature. The Corps refers to river water as the enemy and adopts what has been called a fortress model for the preservation of cities. It has helped eliminate wetlands and bayous that provided some natural protection against flooding. Since Katrina, most calls for the restoration of New Orleans have followed that fortress, or "hard," model. After Hurricane Sandy hit New York City (2012), the preferred term there has been *resilience*, meaning seawalls and other barriers. The alternative is soft development. Soft development emphasizes the restoration of wetlands, swamps, shellfish beds, and other means of absorbing or diverting floodwaters. It allows rivers to flow more naturally. Compare Fisk's map of the Mississippi to that made by the Corps and we can see how the army tries to replace

curves with straight lines. In what remains a very militarized society, the “hard” options are more culturally and politically palatable, even though the “soft” options are more likely to be effective.

The underlying question is really how we see the changing world around us. From the Greek philosopher Aristotle we inherited the idea of unity of time and place, meaning that what is depicted should be seen from a particular place over no longer than a single day. The visual system of perspective, known to the ancients and revived to dramatic effect in the European Renaissance, added the injunction that what is seen should be taken in by a single spectator from a single, identifiable place. To see the changing world, we will have to set aside all of these time-honored strategies. We need to compare across time and space and learn to see from other people’s perspectives as well as our own.

As the examples in this chapter from Guam to the Mississippi River show, we also have to change our understanding of time. Deep time is changing in front of our eyes. If we don’t take into account the worldwide situation, we will constantly be caught by surprise. Developed nations largely ignored reports of sea-level rise in the Pacific because they assumed it would not affect them and were taken by surprise when the 2011 tsunami overwhelmed seawalls in Japan and released substantial quantities of radiation from the Fukushima nuclear plant into the atmosphere, the Pacific Ocean and beyond. “No man is an island,” wrote John Donne in seventeenth-century London. We are now all connected and change itself is changing.

CHAPTER 7

CHANGING THE WORLD

On January 1, 1994, as the world was getting over its New Year’s Eve festivities, the Zapatista rebel army came out of the jungle in Chiapas, Mexico, and declared, “¡Ya basta!” (Enough!). The action was timed to coincide with the commencement of the North American Free Trade Agreement (NAFTA), which removed trade barriers between Mexico, the United States, and Canada. The EZLN (Zapatista Army of National Liberation/Ejército Zapatista de Liberación Nacional) was formed to create alternatives to globalization for the local Maya and other groups, concentrating on civil rather than armed resistance. The Zapatistas made skillful use of media to spread their concept of a politics “from below, for below,” issuing a series of “Declarations from the Lacandon Jungle” online. They saw changing media and politics as two parts of the same process. The Zapatistas have a talent for media-friendly events. Their spokesperson, Subcomandante Marcos, became something of a media personality, always appearing wearing a ski mask and smoking a pipe.