

Invitation to a Renaissance

We all know the two hands which Michelangelo painted on the ceiling of the Sistine Chapel. The hand of God, with a reaching index finger, is about to touch the hand of Adam, still lifeless, with a drooping index finger. In the next moment, God will bestow the gift of life, not only unto Adam, but unto all of us.

These two hands, painted around the year 1512 at the height of the Renaissance in Italy, illustrated a great step forward in human thinking. Previous religious paintings depicted divine figures in a world removed from the rest of us: Christ on the cross, suffering his agony alone; the various saints, removed from our world in their sanctity; the Virgin Mary, peacefully apart from us with a child in her arms. But now, in Michelangelo's fresco, God shares the stage with a man, a newly created creature who will be the forefather of all the rest of us.

During the Renaissance of the early 1500s, man gained an importance which he never had before. He became the focus of great art: David, a mere shepherd, is the subject of Michelangelo's unprecedented sculpture. And man became the subject of scientific investigation: Leonardo da Vinci drew anatomical sketches of man's perfect body, as well as his inner organs.

The central question of the Renaissance—"Who is this human creature?"—moved north from Italy to the rest of Europe, awakening minds which had slept through the Dark Ages. This question touched every aspect of human life, spawning new religions, new architecture, new branches of science, new music, new literature, and a new sense of purpose. Yes, once God touched Adam's finger, granting him not only life but a multitude of unforeseen opportunities, the Renaissance carried people of many cultures toward lives that were far richer, and far more fascinating, than their ancestors had ever known.

In the old days, man had been a mere sinner, bowed before the judgment of God. Now he had become, if not a saint, then at least a figure of intriguing interest.

Today, five centuries later, if an artist were to depict the hand of man, and the hand of some divine spirit, what would they look like?

The hand of man would be the hand of a battered soldier, of a struggling refugee, bloodied and bandaged and reaching with trembling desperation toward whatever help might be offered.

And the hand of a divine spirit would be a woman's graceful and energetic hand, draped with garlands of flowers, bits of ferns and other greenery, offering not only life, but a sanctuary, and prosperity, and peace.

The hand of man has gripped far too many weapons, has grasped—or tried to grasp—far too many sacks of gold. Whereas the hand of nature, waiting patiently through the ages—despite the plundering, despite the black pollution, despite the unrelenting greed—offers her generous abundance, though an abundance that is green, and not gold.

The time has come for another awakening, for another fresh start, for another close study of this human creature. Yes, the time has come for the Renaissance of the 21st century.

That is the subject of this short book, written by a teacher who has spent his career in the classrooms of America, the Caribbean, Norway, and Russia, and who believes deeply in the young people he has met. Most recently, the teacher became a student again, in a class of nineteen students (young professionals) from seventeen countries, studying “Energy and Sustainability” at the University of Oslo. The oldest student in the class (I am 68) was enormously moved by the talent and determination of these young people from Asia, from Africa, from the Middle East, from North and South America, from Europe, who want to design and build a far better world.

They want to leave behind the shackles of the 20th century—the poverty, the plundering, the pollution, the wars—so that they can design and build *their own* 21st century, an unprecedented epoch when people will learn to live in harmony with each other, and with their planet Earth.

Let us ask the Big Questions that for too long have been neglected. Let us take a close look at our schools, so that we can move their classrooms—filled with bored and restless kids—from the 20th to the 21st century. Let us take a careful look at the Arctic Ocean, to see whether or not it will become our final military battleground.

Let us look with vision that reaches around our planet. Let us look with vision that reaches through the decades to the end—and beyond—of this hopeful century.

Long before the Renaissance of 1500, way back in the 1100s, when most people lived in rustic one-story dwellings and few edifices rose above the treetops, a growing number of people envisioned a new sort of building, unprecedented in size and beauty. It would have the shape of a cross, with walls of stone so tall that elegant buttresses

would support them from outside. The nave—the long portion of the cross—would be large enough to seat several hundred people, all facing the altar at one end. The transept—the two arms of the cross—would seat another hundred listeners. The walls would be so tall that pillars must support the vaulted ceiling. Perhaps . . . a dome might cap this enormous structure. Perhaps . . . twin towers would stand above even the roof and dome, with a dozen bells that might call out to worshipers living nearby and to pilgrims living far away. This new building would be the House of God. It would even have magnificent colored windows, so that the sun shining through might scatter bright colors across the pews and the people sitting in them.

Who, in that early, rustic time could possibly have imagined . . . a cathedral?
And yet, they did.

Equally amazing, those who first designed this enormous edifice knew that they most likely would not live to see its completion. Men who cut the first stones and laid the foundation . . . gave to their sons the job of building the walls and windows and buttresses, and then they . . . gave to their sons the job of building the vaulted ceiling and the dome that—astonishingly—did not collapse. And then they . . . gave to their sons the job of building the towers, and perhaps even a spire that pilgrims could see from miles away across the countryside.

Yes, not only did they envision this unprecedented building, a building with an unprecedented purpose, but they were willing to begin a job that would take perhaps a century—several generations—to complete.

We must do the same today. We must envision new structures in the 21st century which go far beyond—in scale, in purpose—those of the 20th. And we must be willing to work on these vast offshore wind farms, these solar collectors in the desert, and a modern grid which provides power to all of us, equally and democratically . . . for generation after generation. The 21st century must be a century of vision, of great labor, of growing cooperation among peoples, and of gradual but irreversible triumph.

We have a choice today: more drilling for oil, more burning of coal, more delays in making the urgent decisions, and ultimately . . . global catastrophe that could last for centuries. Or, we can design and build an entirely new way to live together on this one and only planet which has been blessed with life.

A Renaissance is waiting.

Think what we could do, if we would only *do* it.

Chapter One

The Polar Ice Cap

First we shall look at the bad news: the melting of the polar ice cap. Then we shall look at the good news: people around the world are harnessing the sun and the wind and putting them to work.

And then we shall look at the great news: clean energy shall bestow upon us a multitude of benefits that go far beyond carbon-free electricity. Yes, we have launched on a technological revolution, harnessing the sun and the wind. But far beyond that, we have launched on a global Renaissance which will enable us to truly fulfill our human potential, so long curtailed by the shackles of poverty and war.

In March of 1776—four months before American colonials in Philadelphia declared their independence from Mother England—James Watt, a Scottish engineer, installed his newly designed steam engine at Bloomfield Colliery in Tipton, England, where it successfully pumped water out of a coal mine, enabling the workers to chip away at the coal in what would otherwise have been a flooded shaft. In April, Watt installed a second steam engine at an ironworks in Shropshire. During the course of the summer—while the British fleet, the most powerful navy in the world, sailed into New York Harbor, carrying thousands of redcoats, the most powerful army in the world . . . and while those redcoats rowed to shore in small boats and drove the rebellious Yankees off Long Island and then Manhattan Island, clearing the way for a British occupation of New York City for the next seven years—James Watt installed a third steam engine in London.

Thus began the industrial revolution, and an unprecedented burning of coal on planet Earth. Coal smoke has been rising up a growing number of chimneys since the day when Thomas Jefferson, appointed by his fellow congressmen to write the great document, penned the unprecedented words, “All men are created equal.”

The first commercial oil well, drilled by Edwin Drake in 1859, bored down sixty-nine and a half feet into the ground at Vanango County, Pennsylvania . . . and produced a gusher. It also launched the oil boom in America, triggering massive investments, fueling new industries, and changing forever the way America did business.

Now the black smoke from coal was joined by the black smoke from oil. Around the world.

The carbon dioxide in this smoke gathered in increasing amounts in the planet's atmosphere, forming a spherical blanket that became, over the decades, thicker and thicker. This blanket allowed energy in the form of sunlight to pass through it, with no noticeable change in the brightness of our mornings and noons and evenings. When this sunlight reached the surface of the Earth, much of it changed from energy in the form of light to energy in the form of heat, heat which kept the surface of the Earth nicely warm, able to support life both on land and in the seas.

Before the Industrial Revolution—before the thickening blanket of pollution—part of this heat rose into the atmosphere and dissipated into space, thus maintaining a perfect equilibrium on the surface of planet Earth, neither too cold nor too hot. Life could flourish in this steady environment. But the thickening blanket of carbon dioxide kept an increasing amount of heat from passing through . . . and thus the world became increasingly warmer.

Glaciers which had existed for eons atop the world's highest mountains began to melt. These glaciers, melting at their lower edges, had fed the great rivers of the world, enabling early human civilizations to tap the water into growing systems of irrigation.

Now as the vast sheets of ice shrank at an increasing rate, the rivers below them, and the farms growing irrigated crops, were threatened.

But something else was also melting. Hidden from our eyes until satellites began to peer down during the 1970s, the curved sheet of ice that floated on the Arctic Ocean and thus capped planet Earth was also melting, because the ocean beneath it was slowly warming. The warming ocean melted the underside of the ice cap, and also melted it along its outer edges. The ice cap became thinner, smaller, and more fragile, breaking off in pieces whenever storm waves battered its outer periphery. Cracks in the ice reached up from the bottom, allowing the warming water to penetrate directly into the ice, melting it even more rapidly.

During the summer of 2012, the polar ice cap shrank to its smallest size on record. Even in winter, when the top of the world leans away from the sun and is thus cloaked in darkness, the polar ice cap is now distinctly smaller than it was just a few decades ago.

As the polar ice cap melts, it reveals a growing amount of open dark water. For three million years, the ice cap has reflected most of the sun's light back into space.

Now, the Arctic Ocean absorbs an increasing amount of that sunlight, which warms the water. The warming water melts the underside of the ice cap at an increasing rate; the ice cap shrinks at an increasing rate; the Arctic Ocean thus absorbs more and more sunlight at an increasing rate . . . and the entire process accelerates.

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Let us now pause for a moment to consider an underappreciated fact: the most important event in your life today, no matter where you live in the world, is the melting of the polar ice cap. For three million years, this rounded sheet of ice has been a major component of planet Earth, fundamental to the regulation of heat, but now it is disappearing at an increasing rate.

How long before the ice cap disappears during the summer, so that the Arctic Ocean is no longer protected from the light of the sun?

We don't know.

How warm will the Arctic Ocean become, as summer after summer it absorbs unprecedented amounts of sunlight?

We don't know.

The warming ocean will warm the many currents which pass through it, including the northern reaches of the Gulf Stream. How much warmer will the currents become, and what will happen as they carry this extra heat on their journeys around the planet?

We don't know.

The warming ocean will warm the winds that blow across it, winds that eventually blow across northern Russia, Alaska, northern Canada, and northern Europe. These warming winds will gradually thaw the permafrost that lies beneath the tundra, releasing methane gas that has been trapped beneath the ice for eons. How much methane is hidden beneath the tundra?

We don't know.

Methane is a greenhouse gas which can form a blanket at least twenty-five times thicker than the carbon dioxide blanket, holding in much more heat, and thus warming the entire Earth even further. How much warmer will the Earth become, with increasing amounts of methane in the atmosphere?

We don't know.

How much more about the Arctic, in all its complexity, do we not know?

We don't know.

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Now let us take a look at the Gulf Stream as it approaches the Arctic Ocean. This river of warm water originally gathered its heat as it flowed across the Atlantic just north of the equator beneath the blazing sun. It circled through the Gulf of Mexico, hooked around the tip of Florida and then flowed north along the sunny beaches. At some point along the Atlantic coast, the Gulf Stream angled to the northeast and crossed the North Atlantic, eventually bringing its warmth to the shores of Europe.

The Gulf Stream now divides, so that one portion flows south along the coast of France, while another portion flows north along the coast of Norway. Because of the Gulf Stream, the fjords of Norway are open all winter, enabling the Vikings a thousand years ago to sail in winter as well as summer in their long wooden ships.

A branch of the Gulf Stream hooks over the top of Norway and flows to the east into Russian waters, which do freeze in the winter and require icebreakers to keep the shipping lanes open.

The bulk of the Gulf Stream—now called the North Atlantic drift—does something which we might not expect: it *sinks*, then continues its journey at great depths, eventually wandering south to other regions of the planet.

Why does the Gulf Stream sink? Winds blowing across it cause evaporation, which both cools the water and, because the salt is left behind, makes it saltier. Cooler water, and saltier water, becomes denser water. By the time the Gulf Stream reaches the top of the world, it is so cold, so salty, so dense, that it sinks . . . and continues its planetary journey hidden in the dark depths, moving south across the Atlantic basin.

But what happens as the oceans around the world become warmer? Might the currents passing through them become warmer as well? And what happens when the melting polar ice cap dilutes a salty current with fresh water? Now the Gulf Stream becomes warmer, less salty, and thus less dense. It will have less tendency to sink. Will it sink only part way, then wander off in a new direction? Will it wander about near the surface, perhaps blocking its own path? Might it do one thing one year, and something entirely different the next?

We don't know.

Yes, the most important event in your life today is the melting of the polar ice cap. It is melting because we have burned coal, and then oil, for far too long. Changes on a planetary scale have already begun. We have no understanding—because we have no previous experience in all of human history—of how these unnatural, unprecedented changes will affect the future of life on Earth.

But shall we not have a bit of good news? Shall this book be all gloom and doom?

One hundred years ago, in 1915, the young men of Europe were slaughtering each other in the trenches of World War One. That war brought substantial progress in the field of weaponry: airplanes, which the Wright brothers had developed only a decade ago, now shot each other down along the front. Machine guns rattled at charging troops, cutting them down by the thousands. Chemical gases produced a slower and more hideous death.

Otherwise, the war resulted in little progress. John Maynard Keynes, who attended the peace conference in Versailles, predicted that the treaty which punished Germany would move Europe toward still another war. Only twenty-one years later, Keynes was proven right when Germany invaded Poland.

One century later, though we still have not given up our weapons and our wars, young people around the world, women and men both, are increasingly committed to building a world that is clean, prosperous, and peaceful. Environmental studies programs have blossomed in high schools and colleges; the students themselves recycle every unwanted scrap of paper, they insist on locally produced foods in the cafeteria, and they even monitor the school's energy efficiency. This is a huge step from letting the janitor take out the trash.

People have begun marching in the streets, demanding an end to oil, an end to pipelines, an end to the dangers of fracking. These marches are not the raucous demonstrations of long-haired hippies during the 1960s, but are most often peaceful though determined gatherings of families and neighbors, with grandparents and kids included. People have discovered that they have a voice, an educated voice, a voice which demands to be heard.

“Developing countries” no longer lag behind, waiting for aid programs that too often ended up in the pockets of dictators. Countries around the world are harnessing the sun, harnessing the wind, using their own ingenuity to design programs especially

suited to their geographies and cultures. A small solar farm can provide a village in the mountains of Nepal with electricity for every home, so that each room has lights and children can do their homework at night; with electricity for the school, so that the kids can have laptops; and with electricity for the medical clinic, so that medicine can be stored in a refrigerator and emergencies can be handled at night. One small solar farm can bring that village and its children right into the 21st century.

Yes, China burns vast amounts of coal, but China is also building wind turbines and solar farms as fast as it can, so that one day soon her prosperous people can breathe clean air.

Brazil fuels its cars with sugarcane. Morocco catches the sun's rays with thousands of mirrors, which reflect the light onto a tower filled with salt; the sun thus heats the salt until it is molten; the molten salt turns water into steam, which keeps the turbines spinning through the night.

Little Scotland, home of James Watt, is determined to be the first country in the world able to power itself with 100% clean energy. In Ireland, a battleground for five centuries, engineers in Belfast are now working with engineers in Dublin to build the next fleet of offshore wind turbines.

Yes, we have launched a global Renaissance, rather than another World War. Look around at the progress, get yourself educated, and be enormously glad that you are a witness to this extraordinary time.