CORAL

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By the same author

LIFEBALL

MINDWORLDS

G.O.D. IS GREAT

PHILOSOPHER

CORAL

The Next Twist of Fate

Andy Ross

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Who, What, Why

My aim in this book is to lay bare the plot of history. The story of how we humans developed from apes to our present global dominion should have a plot, and if we look carefully we should be able to see it. We should also find it strong enough to move us to action.

My first bold step, one of three leaps of logic, is to change the subject. I say history is His story. To find out who "He" is, we need to go back in time, to the ancient patriarchs who founded the traditions of monotheism.

Historians take a godlike perspective on the topics of their inquiry. They write as scribes of He who sees all and knows all about their chosen theme. He embraces female historians too, of course, since "he" is now a gender-neutral pronoun. The ancient patriarchs broke a symmetry of gender there.

If man is the measure of all things, our godlike perspective is a psychic state of great scientific interest. We should see a growth of that perspective over history, as idealistic young men dreamed of passionate union with the divine presence and imagined a man could become a god.

The example that set the tone for most of Western history was the Christ figure defining the start of the Common Era calendar. To fill in some facts, the noun "Christ" is the English form of the Greek translation of the Hebrew word we write as Messiah, meaning the anointed one. Christians used the word as an honorific title for Jesus the Nazarene, the man whose crucifixion two millennia ago made claims that he was the prophesied messiah controversial, at least among Jews.

His given name Jesus meant "Yahweh saves", where Yahweh meant "he who causes to fall" and appears originally to have been a tribal storm god. In Hebrew, "Yahweh" was written as the tetragrammaton YHWH.

Christians said Jesus embodied the divine state of being. By the doctrine of transubstantiation, some claimed that the body of Christ was the global body of believers. Today we can all say we're troopers in the human storm.

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Spiral dynamics is a sketch for a theory that frames human history to date in eight colored stages. I review that eightfold way, up to the global organism, Globorg, and take the next step, into the coral cloud. My second bold leap of logic is to see the global body of Christ as a glimpse of Globorg.

Relax: This book is not a religious tract and advances no religious doctrines, unless science be called religion. It's just a back story for how we made the move from belief in gods to living in Globorg. My ideal reader is someone who wants to understand that move and who finds it hard to give the old word "god" any meaning in the twenty-first century of the Common Era. Too many believers still misuse the word in defiance of all reason to denote a supernatural patriarch, in blithe disregard of the absurdity of that usage following the tragedy of the Holocaust (the "sacrifice by fire") that burned down Europe in the twentieth century.

In a coral scheme, those people who need a human image for divinity may find it in any and every human spark in the storm. From this perspective, belief in a mere patriarch is a shameful affront to the majesty of Globorg.

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The immediate reason I wrote this book was to resolve a few issues I'd obsessed about for decades but finally put into the frame of spiral dynamics in 2012. I have always been a bold champion of reason, eager to fight beside such allies as the famous four horsemen of the neo-atheist apocalypse (namely Richard Dawkins, Daniel Dennett, Sam Harris, and the late Christopher Hitchens). Discussions with German Christians have clarified my views.

I find I can readily understand how Christians feel about our world. Like believers and infidels the world over, I feel dismay at the political mess caused by pressures and tensions between the monotheist faiths. The urgency of the task of clearing up the mess goes beyond normal science.

This history presents my attempt to understand the roots of the clash of civilizations in the dynamics of a logical but strange self I call Goof, for GOOF, the God of our fathers. GOOF is my new tetragrammaton for the God of Abraham. In my third leap of logic, I take a psychophysical view of this superhuman self, in which Goof is just another step on the way to coral life on cloud nine. The story turns out to be an astonishing saga. You couldn't make it up.

(Jon) Andy Ross
Germany, 2013

To boldly go, to God

Genesis

In the beginning was the bang. An explosive surge of energy filled the void. Bright light shone forth and galaxies formed. A universe was born.

If we look into the night sky and then do some thinking and some physics, we can work out how the story goes. With telescopes we can see billions of stars and billions of galaxies, each filled with billions more stars. The galaxies are all flying away from us, as if all the stuff of all the stars were once in a dense fireball that exploded.

As more details fall into place, the facts reveal a majestic drama. The Big Bang blew some fourteen billion years ago and left an afterglow, which expanded in a spray of galaxies and stars and has now cooled to a smooth microwave background. The speed of light limits what we can see to a cosmic bubble that is now some forty-two billion light years across, and as we look out we look back in time. At the edge, where the afterglow blocks a deeper view, we are back to less than a million years after the bang. All this is as near to fact as anything in the world we wake up to.

The galaxies began as swirls of hydrogen and helium gas that condensed to form stars, like raindrops in a fog. As the stars got denser they heated up, until nuclear burning began to fuse their hydrogen into helium. The bigger stars burned bright and cooked up heavier atoms in their superhot cores, then popped, or rather exploded in cataclysmic fireballs that shone far and wide, to seed the interstellar gas with the new elements. The seeded gas spawned further stars, many ringed

by thick swirls of stardust. Those swirls of dust condensed to form families of planets orbiting the stars. Some small rocky planets settled at the right distance from their stars for oceans of water to collect on their surfaces.

One such planet was the Earth, our home. The Earth is some four and a half billion years old and has a mass of some six sextillion tons. It orbits the Sun, a vastly more massive thermonuclear fireball that has bathed it in warming photons from the start. If the Earth orbited any closer, like its sister planet Venus, it would be too hot for life. Any further out, like its smaller neighbor Mars, and it would be too cold. On Earth, the oceans stayed liquid and life evolved.

The first life evolved surprisingly fast, while the surface of the new planet was still being bombarded with a deadly hail of mountainous meteorites and cometary snowballs, but the first life forms were simple, hardly more than chemical soup. Zillions of complex molecules knitted together in chains and cycles that made repetitive patterns, which branched and budded and finally replicated. The first replicators may have grown around undersea hydrothermal vents, where today the forms that live around the hot stacks offer intriguing hints of how things used to be.

Life at this chemical level went on for long enough to let countless generations of ever better replicators evolve. The better forms ate the humbler ones, leaving no traces for us to find, until at last a giant but stable molecule emerged that replicated well enough to find a place at the heart of all the life that followed. This molecule was deoxyribonucleic acid (DNA), which stored recipes for making proteins as templates made of bases that coded for the sequences of amino acids used to build up the proteins. The mechanism based on DNA became a monopoly, and we still use it.

The logic of evolution brought forth more winners. The first life forms were microbes in the Archean era. They were single cells, very simple, and for them free oxygen was toxic. Since there was no free oxygen on Earth at the start of that era, this was fine, until after a billion years or so the microbes evolved into bacteria. Some of these bacteria evolved a way to use light to convert carbon dioxide and water into sugar and oxygen. This was photosynthesis. The sugar they liked, but the oxygen was waste and they dumped it. They kept on dumping for a billion years, until oxygen made up a good fraction of the atmosphere.

Eukaryotic bacteria evolved, and they learned about half a billion years ago to live together as big organisms with billions of cells. We call the era the Cambrian explosion, since then a riot of experimental body plans for the big organisms burst forth for natural selection to work on. The best bodies won the beauty contest, and standard genes on their DNA coded plans that again are with us still.

Here the story begins to look familiar. The eukaryotes split into plants, animals, and fungi. Some brave pioneers among them took to living on dry land. The plants flourished first and made even more oxygen. A hundred millions years later the air was like rocket fuel, and animals learned to thrive in it by burning sugar for energy. By now the Earth was a peaceful place. The worst of the volcanic turmoil was over and the continental crust had hardened. Now plate tectonics pushed the lumps of land around at a stately pace as convection deep in the planet churned the mantle rock up at oceanic ridges and down at subduction zones.

Plants and animals lived in symbiosis. Plants made oxygen and animals breathed it. Plants made sugar and animals ate it. Plants put their genes in pollen and insects spread it around.

Soon huge beasts called dinosaurs evolved. They dominated the Earth for over a hundred million years. But then, quite suddenly, sixty-five million years ago, a rock as big as a city, with a mass of maybe a trillion tons, hit the planet at a spot that is now in Mexico. A global apocalypse followed, with firestorms, tsunamis, and dust clouds darkening the skies for years, causing a mass extinction that ended the days of the dinosaurs. In their place, mammals arose to take the pole positions in the global food chain.

Among the mammals, the big cats were dominant at first. They were carnivores and ate anything they sunk their teeth into. But the early apes, up in the trees, were smart enough to keep out of their way. Among the apes, one line branched into orangutans, gorillas, and chimpanzees. From the chimps, some six million years ago, came the first humans, in Africa. Various human groups grew bigger brains, until anatomically modern humans, *Homo sapiens*, walked out of Africa and into the wider world some hundred thousand years ago.

Human beings developed civilization and oral traditions of culture. The first languages were simple, good for little more than the transactions of everyday life, and the first cultures were haunted by magic, demons, and gods. These spirits dominated the lives of the man-apes and led them to create religious cults and myths to celebrate their place in nature. Then philosophers arose to scorn the old cults and myths. They started wisdom traditions and began to prize logic and evidence. Confused ideas became clear ideas, magic became mathematics, and new tools and trades encouraged pioneers to invent new machines. As the centuries passed, the best philosophers became scientists, whose work built up into an edifice of knowledge solid enough to serve as the foundation for the true story of creation.

This, or something like it, is our modern creation myth. It is the highly refined result of prodigious efforts by countless generations of people, from preliterate agricultural workers to highly educated scientists. But it leaves a profound mystery. Who are we, and why are we here? Is there a deeper plan or purpose behind our lives?

Religious people say yes, we are children of the gods, who confound us with their schemes, or of God, the One, who weaves us into a cosmic plan. But why do we think this could help us, or even make sense? For rolling out such gods and plans is just begging the question: Who are these gods, why are they there? Who is God, and how does He or She help? As for plans, who can say they mean more than the words that air them? What gives a life meaning? What is meaning anyway? What's what? What?

We need to be methodical. The questions dissolve before the facts. In fact, here and now, we are entangled in a daily life that has its rhythms independently of our musings. Life goes on, and we regularly put aside our questions for long enough to make lunch, make a buck or two, or a million, or make love or war, or whatever else is on our agenda.

The deep questions remain unanswered, but even in daily life they pop up again and again. Who was never amazed that the food we eat is so good? Or that the institution of money works at all? And what is love, or war, anyway? The serendipities behind everything we do are so cool. Things work together in a zillion ways to support us in all our endeavors. Lunch could poison us, the bucks could lose their value, love and war could merge in a mess, but they don't, or at least they don't for long enough, or often enough, for life to go on. We expect things to work out. We nurse the faith that what we do will come out right in the end.

Faith is proceeding in the hope or the expectation that things will work out, even if we don't know how or why. We can't live without it. If we're intellectually honest enough, we can't live with it either, so we try to build walls around our acts of faith to limit the damage if they fail. Faith is believing that the sun will rise tomorrow as it did yesterday and the day before. All the science you like can do no more than disguise that basic vulnerability behind probabilities. For a chicken, faith is also believing that the farmer who fed you yesterday won't cut off your head today. All of us are just as vulnerable. We make myths to stay cool in the face of facts.

This is where gods come in, or where God comes in. The human intellect is a pitifully limited instrument, and when all else fails we appeal to an idealized state of mind or being that transcends our feeble glimmer of consciousness. God knows, we say when asked a tough question, and thus leave open the possibility that somewhere out there in the realm of mind beyond our own the question admits an answer. That easy appeal to an oceanic spirit in which our personal drop of mind dissolves to nothing carries a cost. People begin to spin a myth around it. They imagine one or more cosmic entities watching over them, perhaps like a gang of superheroes, or perhaps like a heavenly father. And then they worry that their guardians may abandon them unless they worship them and follow what they take to be their orders. Soon they're caught in a net of obsessions and compulsions.

To see how this might work, imagine living in one of the earliest human tribes. Human beings are apes with a veneer of civilization. The ape self is a creature of appetite, obsessed with food, shelter, respect, obedience, and getting anything it wants. The inner life of such a self tops out in obsessions or fetishes relating to those goods. Let us color these fetishes

beige or nude or tan, following a completely arbitrary color code. Taming apes with primal appetites to live together in peace is tough. Our tribal ancestors domesticated each other by inventing gods. Shamans invoked purple gods to bind their tribes together, drive out evil spirits, honor the dead, and so on. The next step in our evolution came when men saw heroes or leaders as gods, some of whom led their tribes in wars or great migrations. These red gods left traces in our earliest written histories. One such god, probably much like the others, was the Yahweh of the early Hebrews.

The blue gods came next, and they represented a big step forward. These gods anchored a social order, with written laws and a hierarchy of priests and kings. Some blue gods grew cults of great size and historical importance. One such was the Yahweh of Mosaic and later Judaic tradition, another was the God of the early and medieval Christian tradition, and yet another was the Allah of Arabian and other peoples in the golden years of Islam.

Next came the orange gods of reason, individuality, liberty, and enlightenment. These goods or goals pulled people away from the thrall of traditional religion and toward a new age of science and progress. The orange age brought us industry, democracy, capitalism, and socialism. After the orange phase came a green phase of political turmoil through relativism and pragmatic or instrumental ideologies. Later green politics became multicultural and environmentalist.

The green wave brought on a yellow wave of hard and even racist self-awareness, which mellowed into mysticism. Then came a turquoise or cyan world of global networking and holistic integration of individual selves in the terrestrial ecosystem that represents our latest worldview. The old word "god" and its cognates are all but gone.

This color-coded anthropology is part of a scheme called spiral dynamics, which arose from the work of psychologists in the late twentieth century. To summarize:

1. Tan: Uncivilized humans apes live in a world of instincts dominated by survival imperatives.

2. Purple: Magical and animistic thinking leads to tribal gods mediated by shamans and voodoo-like traditions.

3. Red: Heroes and leaders are seen as gods, and some lead their tribes on mass migrations or wars of conquest.

4. Blue: A founding myth finds expression in fundamentalist religion and confers absolute value on a specific social order.

5. Orange: The individual self finds expression in a rational order where science flourishes and politics is democratic.

6. Green: A relativistic political scene blooms into ideologies first of revolution and then of multiculturalism.

7. Yellow: A new round of individualism puts a sharp focus on self, first in racist terms and then in mystic ideas.

8. Cyan: All the previous levels are taken up and superseded in a global network where high technology and new media flourish in a managed natural environment.

9. Coral: Will we go bionic and live in the cloud?

This psychological development has a spiral dynamics in the sense that higher levels or colors revisit old ideas in new ways. The development is an evolution of more complex mental organization from primitive beginnings. The spiral is not only a cultural history of our species but also a psychic trajectory for a person from infancy onward.

Gods are nowhere to be seen in the world spun into being via spiral dynamics. Science has updated the creation myth almost beyond recognition. Modern science has brought us not only lots of cool stuff, from cosmic enlightenment to fast cars and washing machines, but also humility. To the best of our knowledge, we're just smart apes with a knack for survival in natural environments. Meaning has retreated from the realm of transcendent purpose, which so greatly exceeds our grasp that we grope in psychic fog for God's cosmic plan, to the realm of everyday function, at the mundane level where the meaning of the gas pedal is that when I press it the car goes faster. Science has taught us to accept hard facts. We can send spaceships to Mars, sure, but we only want to do so because we feel the urge to plant our seed in its virgin soil, in blind obedience to our genes. We see no higher purpose than that. We just do what we have to do.

We have science to thank, or blame, for our tranquility in the face of the facts. We breathe, we eat, we drive, and we fly without freaking out daily in mad horror. We all have our pet theories and wacky ideas, but most of us don't let them stop us living most of our lives in line with sound common sense. Our ideas go before us to shape our futures even before we inhabit them, so that we step out daily, on good days at least, into a preconfigured reality where the sun is in the sky, the food is on the table, the funds are in the bank, the gas is in the tank, and so on. All this proves the power of the faith we have already invested in sorting out our reality.

For us, God is a light or shadow from our past that may or may not throw light or shade on our future. Armed with the clear insights that scientists provide, we know too well that we often have only ourselves to praise or blame for the state of the world we live in. We're fairly sure that our conscious

minds are the best tools we have as we journey into an unknown future. Our minds are tools that we ourselves deploy. Wait – our selves? What are they?

We now say our selves are virtual artifacts constructed by our brains. They're like computer models. To be more exact, they're avatars in the virtual worlds our brains build up from input delivered by our senses. To us, the virtual worlds look like the real world, but that's only because we're inside them. The imperatives of survival forced the generations that went before us to make their models realistic in all the ways that count for success in the school of hard knocks. But around the edges, where the model comes unstuck from reality, our ancestors could add any frills and follies and spandrels and spooks they liked to the picture. And they did. Some of them they called gods.

On this view of the mind as a modeling tool, the gods of our ancestors were parts of a package that worked. We know it worked because we're alive and kicking. But the package may include a lot of junk, or stuff that once seemed helpful but now seems useless. Almost all the gods that ever played a role in the mental dramas our ancestors spun out in their heads are now obsolete, false gods. Perhaps all of them are, but that suggestion awaits a sanity check. Can we move on and leave all gods behind? One way to tackle that question is to review the history of our gods.

We can sneak a peek at the short answer, or rather a hint: God helps those who help themselves.

Gaia

The Earth, the planetary ball, the six zettatons of rock and sundry other materials beneath our feet, is a fine place to live. We grew up on it, our ancestors grew old on it, and evolution has not adapted us to live for long on any other body in the solar system. This blue planet is our home.

We like it here because it suits us. And it suits us because we're adapted to fit in here. This happy loop seems to have dazzled many of our ancestors, who felt the need for gods to explain just this adaptation. But we need only stop and think for a moment to see that the loop is no proof of divine luck. If we didn't fit in here, we wouldn't be here at all, even to worry about not fitting in here.

Cosmologists call this insight the anthropic principle and use it freely to "explain" the happy features of the universe we live in. In fundamental physics, string theory is about as deep as we go right now, and string theorists say the values of all the fundamental constants that make life as we know it possible are so perfect for us that in almost all the alternative universes their theory allows we'd be impossible, or at least toast, or dust, or otherwise out of it. The theory admits so many alternatives, all apparently just as likely as the Big Bang bubble we live in, that you'd need five hundred or so digits to write out the number. It's just dumb luck that we're here in this bubble, with these features.

Note the move. It's dumb luck, not divine luck. We get no extra value from making up stories about the gods that we imagine lie behind the luck. We see this on the cosmic scale

because we see the madness of imagining that a cosmic god with billions of dazzling stars to play with would give a toss about a few stinking apes on a small planet somewhere, but our ancestors had no clue about that. They were stuck on the planet, in the jungle or on open grassland, grateful to find enough to eat each day.

Our planet is home to many other living creatures beside its human apes. In fact we have so many neighbors that we can't even count them all. Most of them are too small to see with the naked eyes we were born with, but collectively they dominate the biomass on the planet and make us megafauna seem like also-rans, like juicy meatburgers for them to feast on or like woody branches for them to perch on and live in, as parts of a tree of life that grows far beyond us. Among the megafauna are big tribes of human apes, as well as tiny tribes of chimpanzees, gorillas, and orangutans. Almost all the apes we share our planetary space with are other people like us. But we see no gods among them.

As for our forebears, even the earliest humans could think better than the chimps, to judge by the size of their brains. The key to their emergence was reproductive isolation, for example in a mountain valley, but novel traits were needed to keep the descendants breeding true. We can guess the traits depended on their big brains. The first humans may have loved to dance and sing, for example, and prized their new skills too highly to share them with chimps.

The earliest tribes of hominins, as we call the first humans who broke from the chimps, lacked the concept of a person. They could only see themselves and their peers as infinite or godlike. They filled their minds with humbler things for the most part, such as dreams of food and warmth and sex, and with fighting back the terrors and miseries that beset them.

Their thoughts were infested with fetishes and demons that drove them to act like animals. The early hominin mind was a place of nameless joys and fears we find hard to dwell upon. The pleasures of personality were still far away.

The beige or nude stage in human prehistory was the time when such unstructured treats and terrors were in control. Like children today, the early hominins were driven by those feelings to maximize their pleasure and minimize their pain. Given their big brains, we can guess they lived in settlements or foraging groups of a hundred or more friends and family, but they lacked the legacy of civilization.

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The early history of human civilization reveals how we put the nude way of life behind us. The first humans migrated out of Africa almost two million years ago. Another wave of emigration followed over a million years later, and another some six hundred millennia before the present (MBP). That wave may have been the Neanderthal men.

Anatomically modern humans were slimmer and smarter. They first emerged around two hundred MBP in Africa and then took many tens of thousands of years to spread through the Mideast region, westward into Europe and eastward into south Asia, and then on to east Asia and across to Australia. These modern humans seem to have been well adapted to living beside lakes or rivers, and may have spread by setting up growing chains of shoreline villages.

All humans alive today come from this modern stock. We call the most recent common ancestors of all living humans Adam and Eve. On the female side, mitochondrial Eve lived some two hundred thousand years ago. Mitochondria are the little energy cells inside our body cells, and their genes are

transmitted only through the female line. On the male side, our most recent common ancestor is Y-chromosomal Adam, who lived something like a hundred thousand years ago. The sex chromosomes are called X and Y, where females inherit an XX pair and males an XY pair, so Y chromosomes are transmitted only through the male line. Given how the lines back to M-Eve and Y-Adam are defined, there's no reason why Adam and Eve should have met.

Genetic evidence from human lice suggests that humans lost their body hair at least three million years ago, that at least a few early humans had close relations with gorillas, and that humans started wearing clothing about a hundred MBP, so Adam and Eve were naked. The last glacial period began about a hundred MBP too and ended about twelve MBP, so humans who lived near the ice sheets must have wrapped up well against the cold.

The human race (if we may still use that old word) took a beating some seventy MBP when a supervolcano called Toba erupted on the Indonesian island of Sumatra. A cataclysmic eruption spewed forth trillions of tons of magma and over a trillion tons of ash, which descended as an ankle-deep layer all over eastern Asia. The darkened skies caused a volcanic winter that lasted many years and extended into a thousand years of global cooling. This catastrophe reduced the global human population to less than ten thousand breeding pairs, after which it took thousands of years to build up to about a million people by the time agriculture began in the Mideast region some twelve thousand years ago.

All these early humans, including the first farmers, lived in the stone age. Their tools were made of wood and stone and their clothing was made of animal skins. They lived for the most part in mud huts with thatched roofs, and if they had

boats they were dugout canoes or simple rafts. There are still a few scattered tribes in remote parts of the world who live like this, but they're vanishing fast.

The stone age ended with the bronze age, which began in the sixth MBP, also known as the fourth millennium before the Common Era (BCE). Bronze is an alloy of copper and (usually) tin. It melts at lower temperatures than iron, making it easier to forge, and it doesn't rust like iron. We can guess that working with bronze instead of stone must have seemed as liberating to people then as working with plastic instead of wood or metal seems to many of us now.

The first well preserved specimen of a modern human in Europe comes from the early bronze age. Ötzi the Iceman was discovered in 1991 CE in an alpine glacier in Austria. He had lived in about 3300 BCE (plus or minus a century, as estimated by radio carbon dating) and died in his mid-forties. He wore neatly cut leather patchwork leggings tied with rawhide thongs and a sheepskin jacket tied with a leather belt, plus a wolfskin cap, plus leather shoes lined with bearskin soles and stuffed with straw for extra warmth. A pouch on his belt contained a scraper, a bodkin, a firelighter, and some tinder. He was tattooed, his teeth were worn and rotten, he was lactose intolerant, and he was infected with Lyme disease from a tick bite. Such ailments were doubtless routine, and remind us why people in those days mostly lived in a world of tan concerns where higher thoughts of the afterlife were still too theoretical.

Ötzi apparently died a violent death. He had an arrow wound in his left shoulder and a fractured skull. But he was armed for a fight. He carried an axe with a copper blade and a wooden handle, a flintstone dagger with a wooden handle, and a large wooden bow plus fourteen arrows with flint tips.

Near his corpse was a wooden rucksack frame and a couple of small canisters made of birch bark, apparently for carrying charcoal. For a bronze age man, he seems to have been well equipped and well organized, but of course we know nothing else about him.

The clearest trace of religion in Europe at the time of Ötzi and for the following two millennia may be the Stonehenge monument in southern England. This massive relic consists of two concentric rings some fifty meters in diameter made up of large stones, each some four meters high, standing a few meters apart from each other. The Celtic culture that produced it left no written records, so we can only guess at what happened there, but it seems to have been a site with a cosmic significance for druids, where priests performed ceremonies to honor ancestors and offered human sacrifices, apparently of criminals. Scattered references to druids in later Greek and Roman writings, in particular by Julius Caesar, suggest the classical scholars regarded druidic religion with some disdain, perhaps due to the human sacrifices, which in one account went to three gods by the respective methods of drowning, hanging, and burning. The authors report that druids believed in reincarnation and the "Pythagorean" doctrine of metempsychosis. But the details are uncertain. At any rate, druidism counts for us as a purple cult. The tradition survived until Christianity replaced it.

Civilization further south, in the eastern Mediterranean, was more advanced. The story of Egypt begins a little over five MBP. Before the country was unified, farmers lived in autonomous villages scattered along the fertile Nile valley, then in the early bronze age they began to develop a refined civilization, with distinctive pottery and copper artifacts. Builders made elegant arches and walls with sun-dried bricks,

and built massive tombs, like unfinished pyramids with flat tops, for wealthy people, reflecting a concern for the afterlife that suggests they were emerging from tan thinking to something more purple.

Ancient Egyptian civilization peaked in three kingdoms, called old, middle, and new. The old kingdom flourished in the third millennium BCE and lasted five centuries. The king (or pharaoh, to use a later title) lived in Memphis and ruled as a god with absolute power.

The kingdom is best known for its monumental pyramids, which were built as tombs for the kings. Egyptian artists also made wonderful portraits and statues in wood, copper, and stone. They developed styles that defined Egyptian art for more than three millennia. They wasted too much artistic effort on their obsession with death, but Egyptians also lived well, and to judge by the samples preserved in the pyramids, at least the richer ones had beautiful jewelry, furniture, and household goods.

The old kingdom was followed by a century of disunity called the first intermediate period. The country split between lower or northern Egypt and upper Egypt, which was ruled from Thebes. Young hotheads vandalized old temples and statues, as if to efface the traces of a lost age. Then Theban kings conquered the north and reunified Egypt.

The middle kingdom spanned three dynasties for a period of four centuries, up to the seventeenth century BCE. During this stretch, Egyptian popular religion began to feature the cult of Osiris, son of the Earth god Geb and the sky goddess Nut. Osiris was a god of the dead and married his sister Isis, goddess of motherhood and magic. We can count the entire mythology as purple spirituality emerging from the tan world of sun and sand.

A second intermediate period followed and Egypt fell into disarray. A group of foreigners called the Hyksos appeared in about the twentieth century BCE and began a slow climb to power until they were expelled in the sixteenth century. They seem to have been a Semitic people. Unusually, they buried dead horses and venerated a storm god. They brought new lifestyles and bronze age technology to Egypt, including new music and agriculture as well as war chariots and better bows and axes. This episode sheds light on the exodus myth of the Hebrews and their storm god Yahweh.

The new kingdom of Egypt lasted six centuries, up to the eleventh century, and marked the peak of Egyptian power and prestige. But after the reigns of eleven pharaohs called Ramses the kingdom weakened. A third intermediate period lasted four centuries, with invasions first by Assyrians, then by Persians, and finally by a liberator, a conquering hero, the Macedonian warrior Alexander the Great, in 332 BCE.

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The purple stage of psychic maturity built on the nude stage by organizing the world of feelings into mythic narratives. This required more sophisticated languages and cultures than nude men had acquired, so it took time to grow, as we saw in Egypt. The narratives in turn invited priests to take control by playing the mythic roles that seemed to curry favor with the gods. The purple gods were symbols for the first sketchy ideas of a person as a being with an inner mental life.

Whatever the details, and we can all invent just-so stories in the absence of hard evidence, the result was that nude and purple humans began to sense and celebrate gods and spirits in such things as charismatic ancestors, enchanted locations, flowing or falling water, weather, or the sky.

The sky god is an interesting case, because it seemed to rise above all the lesser gods. Much later, when philosophers had consigned all the lesser gods to oblivion, the sky god lived on. Unlike the minor gods in statues or mountains, there was no handhold on a sky god to wrestle him (or her) down to an early grave. So much later, when blue forms of spirituality emerged, the sky god was still undefeated and got confused with the transcendent god. Christians, for example, said that God lived above us, in heaven.

Today, when science has banished all the lesser gods, the only god we can take seriously is a transcendent being that "rises above" any scientific story we can devise. But now the sky metaphor is easiest to understand through a logical trick. Imagine any scientific story of creation you like. Now ask what guarantee you have that the story makes any sense, or is true, without appeal to your own sanity or the transparency of the natural phenomena that seem to prove it. Your natural tendency is to say something like: "God may be subtle, but he's not malicious!" (This, in German, was Albert Einstein's perplexed response to the paradoxes of quantum mechanics.) In other words, you seem to need God to endorse or sign off on your scientific story. However you tweak your story in an attempt to avoid that need, your new story is open to exactly the same argument.

This last logical god seems to be a kind of cosmic mind that envelops what we know in a warm fuzzy cloud. All we can ever know is a drop in the cosmic ocean. The vast realm of stuff we don't know and the much vaster realm of stuff we don't even know we don't know overwhelms our feeble minds. This last descendant of the sky god is our attempt to throw a mental net around it all. At least the idea can help us feel some sympathy for our ancestors' sky god.

The sky god was already present as a feeling, as an exalted sense of being at one with all creation, in the nude world. It became a god with a human form in the purple world. Since then, it has dematerialized into God, the Big One (BO, Bo), which haunts us even now.

For us as logical beings, Bo is the universal subject. The argument is simple enough. The ancient philosophers who purged the little gods found themselves hard pressed to do away with the sky god. For Bo was none other than their own inflated ego, swelled to cosmic proportions to serve as back-stop for their pangs of self-doubt. If they denied that god too, they fell into an abyss of nihilism.

Bo is the universal subject. We need to unpack this claim. Behind it lies a logic that can easily tangle us in some nasty philosophical jargon. But we can skip all the details here and simply consider how the claim might be true. Its meaning depends on how we interpret the word "subject", and this term invites a reading in logic that complements our understanding of the word "object".

Reflection on that complementarity suggests a general law: Subject and object are equal and opposite.

This is the fundamental axiom of the psychophysics that enables us to reconcile physics and psychology. In this view of things, nature is filled with subjects, one for each and every object in our usual outlook. Our own personal subjects, which we see as our selves or egos, are special only because they're more organized than most, and more familiar to us. On this view, we find life, the universe, and everything – Douglas Adams' 42, no less – reflected in Bo.

We can leave Bo there for the time being. In this metaphysics, there are plenty of other big subjects we don't know much about either. As the prime example, when we think of

planet Earth we adopt a stance in our mind, one that reflects the Earth as subject of our mental effort, and thus we glimpse the subject Earth. You could even say we get a tiny flash of planetary consciousness.

Again, the nude world had a feeling for the Earth and the purple world had a spirit or god for it. For nudes, it was the feeling that mother nature gave them life and all they needed. For purples, mother Earth and father Sky (or in the Egyptian version, father Geb the Earth god and mother Nut the sky goddess) had sex and created all the rest. In those innocent days before we found we lived on a small planet, the Earth included all of nature beneath heaven.

Today we see things rather differently. We all start life as infants. As infant apes, we see our little worlds in magical terms. Our worlds are nude or tan at first, as we learn to eat and poop, then purple, as we begin to treat the things around us as magic toys and mighty tools. Then we grow older and wiser, and people around us nurture our growth as human personalities. Each of us learns to use our newfound personhood to run up and down the scale of subjectivity as freely as our thoughts allow. We can be as big as a planet or as small as a flyspeck, just by focusing our minds accordingly. We can expand our minds beyond a flyspeck pretty quickly, in a matter of milliseconds, yet we hardly notice ourselves doing it. The magic of zooming around in the hugely infinite world of all possible subjects leaves us happily unconcerned. In this view of our minds, behind our mental acrobatics are possible mindsets on all scales up to cosmic size just waiting to take center stage as soon as our inner zoom allows.

We now know that our brains are packed with neurons, billions of them, all knitted up in an intricate network, like an amazingly dense spider's web with trillions of connections.

The network lights up with traffic like the World Wide Web when we're awake and aware and our minds are filled with experiences and thoughts. The signals that carry thoughts flit back and forth in milliseconds, and great waves of these signals vibrate over the cerebral cortex with rhythms of many cycles per second. These waves are like symphonic music. They carry or entrain huge quantities of neural traffic in riffs and melodies that far exceed in sublime beauty the music we make and download for entertainment.

This music of the cerebral hemispheres is where our souls reside. Our bodies and our brains are just the carriers for this transcendent music. If we could port our soul music from our cerebral networks to a newly fashioned carrier, then, so long as the new platform could replay the tunes well enough, we could resume our lives in all their wild complexity beyond the confines of our mortal bodies. Our minds could thus live on, at least in science fiction.

For brain scientists, immortality comes closer every day. Once we understand ourselves not as walking bags of meat but as gifted players of fine music, the way is open to leave fiction behind. Our minds are like the software in our brains. Since each of us is a self embodied as an avatar living inside the virtual model implemented on the neural network in our brain, all we need to do to survive the death of our meat is to port our mental lives to an artificial neural network and then to pump the right input into the new network to keep the model running smoothly. But let's not fly up and away here. We must return to Earth.

Recall again the tan response to planet Earth. The naked ape is shaped by mother nature to like life down here under heaven. The sun shines, the grass is green, and the natural man can enjoy life for as long as his meat body holds out.

This is ape life as we know it. All of our ancestors' fetishes and totems and cults and myths arose against this background. Even their most exalted thoughts about Bo, the big sky god, were rooted in their terrestrial concerns. Naturally, their sky god was always at risk of warping into a personal form or popping out of consciousness as their ape minds zoomed onward.

Physics soon leaves personal psychology far behind. The subjects that fill our conscious minds don't cease to exist the moment we turn our attention away from them. They have an objective side too, so the subjects of our mental lives just go out of focus. They shift aside as the eye of the electrical storm within the brain moves on. In fact a human mind is a process, not a thing. To be aware of something is not just to reflect it in a neural mirror but to take it up actively onto the workbench of the mind and there to manipulate it, to take it apart and reassemble it in a multitude of ways, to whisk the thing around with various partners in a whirl that would make us dizzy if we could only see it.

When you and I both think of Earth, we each take up an image of the big ball in our minds and manipulate it. Each of us does so in the odd ways we happen to like, so the common topic of our mental music is really only notional (or in the jargon of the philosophers, intentional, but that word doesn't tell us any more here). Somewhere a thread of shared heritage or destiny unites the images we entertain, and somehow, in the cultural traffic we share in the social media that bind us, that thread lets us agree that we're both thinking about Earth. We mean the same thing when we both refer to Earth, even though your thread and mine can only share part of the journey upward from our brains to our mental images. It's a long story but it has a happy ending.

If we take the modern myth of psychic gods and colored levels in a spiral staircase seriously, we soon come to see that we're all so deeply rooted in planet Earth that our shared identity as offspring of its soil is more real than our respective identities as walking bags of meat. Our bodies are rooted in the Earth, our minds merge in our soul music, and the music is Earth's song.

Yes, Earth sings through us. The planetary organism even has her own name, Gaia, given to her by the ancient Greeks, who venerated her as the Earth goddess. We are the tendrils of Gaia. The rock music from the ball of earth beneath our feet spirals up through our minds to peak in psychic thunder and neural lightning. These brainstorms make us sing. The best songs ring out the joy of Gaia through the heavens.

But for Bo, the cosmic subject, the rocky planet hosting Gaia is the merest flyspeck. The physicists have analyzed the anatomy of Bo on the workbenches of enough human minds to say more than ever before about the being that surrounds all our mere planetary concerns. Here we meet the cosmic Bo, the new black starry sky god. Physicists feel the need to depersonalize their subject, but Albert Einstein was a sentimentalist and used to call Bo "the old One" to hint at the continuity there. With a polite nod to his old one, we can say Bo is the Boss, the background of spatiotemporal structure. The Boss is an extraterrestrial.

Gods

The golden age of the gods endured a thousand years, from three to two millennia ago. A few decades back, the German philosopher Karl Jaspers called the middle period of that age the axial age. The longer age marked the transition from brainy apes with tribal rites and cults to people as we know them, with inner selves and mental lives. Later, the American psychologist Julian Jaynes claimed to have found the origin of consciousness in this age, though now we claim only to find in it the origin of personal consciousness.

The highlights of the axial age arose from several figures: the philosopher Confucius in China, the man later known as the Buddha in India, the Greek philosopher Pythagoras, the Persian prophet Zoroaster, and the various prophets of the Hebrew god Yahweh. History as we know it began, and from then on we can feel a reflexive human solidarity with all the more or less civilized people who came and went. It was no coincidence that the age of the gods was also the time when written records first began and astronomers made calendars to count the years.

Arbitrarily, I shall say no more about China and relatively little about India and Persia. Events in the Mediterranean region were rich enough to feed the flame that blazed up as the rise of monotheism. So let's now zoom in on the Indian subcontinent to trace the first inkling of the dawn to come. Then we shall move our focus westward.

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The earliest holy men of India were what we'd now regard as bums. They were loners and outcasts who neglected their personal hygiene and often went around naked, scrounging scraps of food from anyone naïve enough to feed them. In return they'd offer scraps of hard-won wisdom that may or may not have been of any use to their feeders. The warm climate and exuberant natural fertility of the Indian subcontinent encouraged the growth of this tradition of wandering gurus for sufficiently many generations to sustain a process of evolution by natural selection. The bums developed better wisdom traditions and organized themselves into groups, which slowly became religious institutions, with monasteries and so on. A new way of being human was born.

The cults these shamans founded were mostly purple, and were almost certainly as strange and diverse as the earliest eukaryotic life forms that swam and crawled in their watery habitats on planet Earth in the Cambrian explosion half a billion years ago. But natural selection soon took its toll, and the wilder sects, some perhaps led astray by demons that stirred their followers to acts of violence or ritual suicides or sacrificial infanticides, fell by the wayside. As many centuries passed, the sects that survived became carriers of doctrines that helped their believers live better lives, measured in the practical ways that make sense in a subsistence economy with only simple technology and with medical traditions based on faith and superstition.

Human language evolved alongside these early cults. The very first languages were probably based on grunts with 4F semantics (feed, fight, fuck, flee), but they evolved fast. Now we have developed the semantic capabilities of our languages to such levels of sophistication that they can defeat the conversational powers of our best supercomputers and give us a

medium for organized life on a global scale, but two or three thousand years ago in India the languages were more basic. Sanskrit and its related tongues, although they shared the recursive grammar that allows anything to be expressed in principle, still had too small a base of usage precedents and too narrow a tradition of shared understanding to allow the fine-grained shades of meaning we enjoy today. People didn't really understand each other too well, and their confusions led to endless disagreements and schisms over sacred rites and holy places and objects.

We see the results in India today. Innumerable tiny cults devoted to local gods popped up all over the landscape, with shrines and idols and devotional behavior that can only call forth baffled amazement in anthropologists, who see here the earliest roots of human religious practices. To scientific observers the believers seem psychotic, obsessed by spirits and demons and compelled to enact rituals that bear no coherent relation to their external reality.

From this primordial soup of cults emerged traditions we see preserved in the modern world. Once the technology of written language appeared, the narratives and beliefs of the cults could be codified as stable myths that supported bluer forms of spirituality. But at first these blue ideas coexisted with the earlier gods of the preliterate cults. The myriad gods of the Hindus and the athletic and ascetic practices of yogis, gurus, and adepts at meditation are with us still. The history of human spirituality lives on in India, much as the history of the evolution of land animals lives on in humble creatures that found their niche.

The yogis and gurus developed traditions and practices that deserve our deepest respect. For example, the extreme nonviolence of the Jain religion, whose adherents refuse to

kill even flies and ants, is surely a landmark in the moral life of our species. Jainism first appeared between the ninth and sixth centuries BCE and had much older roots in turn. Jain nonviolence to living beings is part of a striving to attain divine consciousness and thus liberation from human limits. So wholesome is this doctrine that it has followers today. Jains wrote their scriptures in a language where a perfected soul is a *jina* and its ultimate status is called *siddha*.

The biggest landmark in the early flourishing of Indian spiritual life was the emergence of the Buddha, the awakened or enlightened one. About two and a half thousand years ago, Siddhartha Gautama became an "awakened being". The dates of his birth and death are uncertain, but he may have lived from 563 BCE to 483 BCE. His birthplace is disputed, but it may have been Kapilavastu in Uttar Pradesh, up near Nepal. Later, after his great enlightenment, he wandered over much of eastern India. The reason for the uncertainty over the facts of his life is that the first Buddhists memorized his teachings and rules and passed them on orally, and first wrote them down several centuries later.

Tradition has it that Siddhartha was raised as a prince in a royal Hindu family. The story goes that at the age of sixteen he married a cousin and the pair soon had a son. We're told that he lived for years as a husband and father, until he began to think a life of luxury was no way to find meaning in his human incarnation.

At the age of thirty or so, the prince left his palace to meet his subjects, and for the first time he saw old people, sick people, dead bodies, and grinding poverty. These depressed him, and he responded by choosing to live a more ascetic life. He quit his palace for the life of a wandering holy man, and refused to settle down until he had attained enlightenment.

He found some hermit teachers and learned to meditate, but he was still restless and moved on.

He tried to find enlightenment by starving and mortifying himself. But after nearly drowning he gave that up. He tried meditating for real and realized that meditation, not extreme asceticism, was the way to go. He had found the middle way between self-indulgence and self-mortification. Then he sat under a tree, now known as the Bodhi tree, and vowed not to arise until he had found the truth. There, after a legendary seven years of wandering and seven weeks of meditation, he is said to have achieved enlightenment. At last he understood the cause of suffering and how to end it.

Siddhartha packaged his new understanding of the *dharma* (the way) in what became known as the four noble truths. According to one tradition, the new Buddha began to teach these truths right away. Another tradition embellished the legend to include a convenient demigod, who persuaded him to make the effort.

The four noble truths explain how to overcome *dukkha*:

1. Dukkha includes aging, illness, death, sorrow, lamentation, pain, grief, despair, union with what is displeasing, separation from what is pleasing, and not getting what you want.

2. Its origin is the craving for delight, sensual pleasures, life, or even death.

3. Dukkha ends when craving ends, when one learns to give it up, when one is free of it and no longer addicted to it.

4. Its end comes by following the eightfold way:
   right view, right intention, right speech, right action, right livelihood, right effort, right mindfulness, and right concentration.

Following the way of the Buddha, Buddhists learned to be gentle and nonviolent, and to let the selfish ego dissolve in a serene fog of compassionate awareness. Naturally, achieving the highest level of mystic detachment required extremes of hard training in self-denial, so only the holiest of men could attain nirvana. A holy man who succeeded in losing himself in the fog became a *bodhisattva*, who as an enlightened being enjoyed the veneration of lesser mortals in the community.

The resulting tradition of respect for dreamers supported the flourishing of stable and tranquil communities. Its mystic vision of a hierarchy of Buddhas, each holier than the last, towering up into infinity, became a totem potent enough to found a whole new civilization.

Even today, countless people find peace and tranquility in Buddhist meditation. Also, philosophers and neuroscientists have traced the facts behind the bliss and repackaged them to serve the cause of science. The hierarchy of Buddhas is now a recursion of sets in a mathematical space we can plot upon a screen. Google "buddhabrot" and boggle.

The Buddha became a byword for Indian spirituality. The traditions that grew around him flourished for many centuries and spread northeast into China and northwest into Persia. Their tranquil ways spread even into the Mediterranean basin. Some of the Buddhist monks sent out to evangelize the world as part of the outreach program conducted under the rule of the great Indian emperor Ashoka in the third century BCE settled in the Egyptian city of Alexandria. There they founded Buddhist schools to spread their teaching of the dharma, the divine law of karma, which became Hellenized as the doctrine of the Logos, the divine order or the word.

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The eastern Mediterranean region was the cradle for another axial figure. In Greek culture the sages adopted a different style from that in India. Here the wisdom traditions became more practical. Philosophers emerged.

At about the same time as the Buddha walked the earth in India, Pythagoras of Samos founded a religious movement in southern Italy. Pythagoras is reputed to have traveled widely in the region, and his doctrine of the transmigration of souls suggests an Indian influence. This doctrine, known to Greeks as metempsychosis, is that after the body dies the soul goes on to inhabit another body, so it's just the ancient doctrine of reincarnation. But Pythagoras and his school are most worth celebrating for their mathematical work. Pythagoras' view of mathematics as the science of nature, his theory that musical harmonies are based on ratios of numbers, and his cosmology based on the harmony of the spheres were all built on the firm foundation of arithmetic and geometry and distinguished his school from other cults. His disciples even discovered irrational numbers, such as the square root of two, but tried to keep them secret because they seemed to contradict his theories of ratio. The Pythagorean theorem in geometry is a fitting memorial to his place in history.

About a century closer to our time, the Greek philosopher Socrates scandalized the good citizens of Athens. He would hang around all day in philosophical debates with intelligent and handsome young men, which irritated his wife and led to the charge that he was corrupting the youth of Athens, which in turn led to his legally ordained death, at the age of about seventy, in 399 BCE. His best student was Plato, whose life's work was to write a series of philosophical dialogs starring Socrates as the brilliant sage who could make his case against any opponent in logical debate.

Plato not only wrote dialogs but also founded the famous Academy in Athens, which was the first institution of higher learning in the western world. In an oddly revealing tribute to Socrates' influence on him, Plato put scenes in his dialogs comparing the relationship of an older man to his boy lover with the father-son relationship. These passages suggest he thought that indulgence of pedophilia can lead to finer things if practiced in the Socratic manner.

Plato made much of Socrates' famous allegory of the cave. We live in a cave and the real world is outside the cave. We see shadows of objects cast by a fire onto the walls, and we imagine the shadows are the real things. Updated, the idea is that we live in a cinema and we think the movies are reality. Plato argued that all the physical objects and events that fill our lives are shadows of their ideal or perfect forms and exist only as fuzzy images or poor copies of the perfect forms in heaven. All our knowledge is recollection of the ideal forms and comes via divine insight.

We can assume that Plato put his own gloss on Socrates' ideas, so we call the philosophy that emerges Platonism. The heaven in Plato's world is an eternal realm of perfect forms. The idea works best for mathematics. A chalk line on a slate is a crude physical representation of an ideal geometric line, and beads on an abacus are mere tokens for the numbers in heaven. In this way, everything we talk about in mathematics exists eternally in Platonic heaven. But the idea works too for chairs and tables, human bodies, and all the rest. A modern way to put this is that we live as avatars in a simulated world, a Matrix world, but we're unable to wake up from the illusion and cast aside our virtual personas.

We still seem to be living in Plato's world. We can't stand back far enough from Plato to adopt the view from nowhere,

the scientific or anthropological view, where the specimens before us are mere insects in our lofty gaze. What we can do is invert Plato's allegory and recast Plato's world of perfect forms as information space. We live as apes in a muddy world of toil, but inside we're avatars in virtual worlds of idealized and perfect forms. These worlds are the truth behind the earthy world of physics. They are the bright counterpoint to meat world. Our souls are the inner avatars, definable in mathematics and hence equivalent to computer code, and hence in turn as immortal as any digital construction. Like Pythagoras, Plato believed that after death the soul could be reincarnated in a new body.

Plato's political views have fared less well. He was a fan of aristocracy, which for him meant rule by philosopher kings who loved wisdom, reason, and boys.

The Greek tradition in philosophy continued. Plato's best student was Aristotle, who lived from 384 to 322 BCE and wrote extensively on many subjects, including physics, logic, politics, ethics, and biology. His writings built a foundation for western philosophy and shaped western culture for two thousand years. Aristotle was a great classifier, and with tidy syllogistic logic he did a lot to clarify the basic categories we still use to make sense of our world, such as kinds of causation, physics versus metaphysics, analytics versus dialectics, and theories of ethics. Aristotle was also a keen observer with a respect for facts, and his physics and biology continued to be taught into modern times. In physics he augmented the previous fourfold division of matter into earth, air, fire, and water by proposing a fifth stuff, the ether or quintessence, to fill the space between the stars. In biology he proposed a classification of living species on a scale from simple life to man that continued onward to the gods.

Aristotle's views on physics and cosmology hung on until the seventeenth century, when new ideas led Galileo Galilei and Isaac Newton to transform both subjects. His views in biology ruled by default until Charles Darwin went to work in the nineteenth century. And Aristotelian logic ruled supreme until the nineteenth century, when Gottlob Frege made logic mathematical.

The written works of Aristotle had a profound influence on philosophers and theologians in Islamic and Jewish traditions in the Middle Ages, and they still influence Christian theology in the Catholic Church. Today, the collected works of Plato and Aristotle form the standard core of university courses on the foundations of Western civilization. We've come a long way but these are still our roots.

Aristotle's best student in turn wasn't a philosopher. He was Alexander the Great, who was a classic red god in the spiral scheme and led an army of conquest clear across the Mideast and into India. Two civilizations met, and fertilized each other with new ideas. The traces can still be found all the way to Kashmir in northern India.

Meanwhile, back in Greece, the more prosperous citizens of Athens invented democracy. Since they kept slaves to run their households and businesses, and slaves and women were denied the vote, Athenian democracy fell way short of our modern ideals, but the basic principle was good, and in practice it worked better than the other Greek models, namely monarchy (including rule by an aristocracy), oligarchy (often rule by a military junta), or tyranny (also known as dictatorship). So Greek political ideas are still with us too.

Greek technology was no less impressive. The Greeks built robust wooden ships to trade and fight in the Mediterranean region and they erected the finest public buildings the world

had ever seen. The Parthenon, a glorious temple to the goddess Athena, was a wonder of the ancient world.

More wonderful still was Greek mathematics. The "father of geometry" was Euclid, who taught in Alexandria in about the third century BCE and put all the classical Greek results in geometry together into an axiomatic framework in a textbook that was still in regular use in the nineteenth century.

But Greek city states were small and disparate, so world domination fell to another city, Rome.

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Tradition has it that the city of Rome was founded a century or two before Pythagoras in the eighth century BCE, in an age of myth when Romulus and Remus were suckled by a wolf. The Roman Empire was founded after the dictatorship of Julius Caesar, who won great military victories for Rome all over Europe, for example in Britannia, where he is said to have declared *Veni, Vidi, Vici* (I came, I saw, I conquered), until the senators in Rome killed him as a tyrant in 44 BCE. The first Roman emperor was called Augustus (the revered one) and reigned for some forty years, up to 14 CE. That reign, plus those that followed over the next few centuries before a gradual decline set in and Rome finally fell, defined the glory days of the empire.

The Roman Empire inherited the finest flower of Greek culture and applied it to rule the biggest imperial domain the world had then seen, stretching from Hispania, on the Iberian peninsula beside the Atlantic Ocean, in the west to the fertile land of Mesopotamia (now Iraq) in the east, and from the cold and misty hills and forests of Britannia and Germania in the north down to the hot and dry sands of the Sahara Desert in the south. Roman roads, Roman villas, and Roman legions

were the world's finest, and most of the people in lands that endured centuries of Roman civilization were the better for it in the centuries that followed.

But the Romans were a practical people. They simply took over the Greek pantheon of gods and goddesses, as well as a motley crew of minor divinities from conquered tribes and nations. The gods formed what we can best understand as an extended and dysfunctional first family or tribe of cartoon superheroes, whose dealings served as raw material for daily gossip and popular entertainment.

For the Romans, it seems, any interest in deeper questions about reality was satisfied with the continuing refinement of Greek philosophy and mathematics. Astronomy continued, but it was still inseparable from astrology and the idea that the terrestrial order reflected the celestial order in ways that horoscopes could reveal. For most people in those days, the stars and planets were lights in the sky that rotated around a fixed and flat earth. But the five planets were gods. In order of increasing distance from the Sun (as we now know):

• Mercury was the Roman messenger god, known to Greeks as Hermes, who kept fit with jogging.

• Venus was the Roman goddess of love, known to Greeks as Aphrodite, whose nude charms made for great art.

• Mars was the Roman god of war, known to Greeks as Ares.

• Jupiter was the Roman head god, known to Greeks as Zeus.

• Saturn was the Roman god of agriculture, known to Greeks as Kronos, the god of time (marked by the seasons).

The outer planets were only discovered in modern times, when astronomers had telescopes and Newtonian mechanics

to help them. But the tradition of naming the planets after classical gods continued. To complete the roll call:

• Uranus was the Greek god of the sky, known to Romans as Caelus (for which "Celeste" would be a good update).

• Neptune was the Roman god of the sea, known to Greeks as Poseidon.

• Pluto was the Roman god of the underworld, known to Greeks as Hades. (Pluto is now a dwarf planet.)

Another god, Apollo, son of Zeus, was a glorious youth with golden locks. For Greeks and Romans he stood for light and the sun, truth and prophecy, music and poetry, and more besides. Some fifty years ago, Apollo gave his name to the American mission that put a man on the Moon.

Science as we know it first developed in astronomy. The Greeks and Romans observed the movements of the planets in the night sky using basic instruments, such as sextants and astrolabes, and learned to predict their paths using geometry. Cosmology began then too. Ptolemy, who lived and worked in Alexandria in the second century CE, put all the classical results in astronomy together in a theory where heavenly bodies orbited in perfect circles around a fixed Earth. The system of concentric spheres rotating in harmony followed the ideas of Pythagoras and Plato and seemed to confirm that the Earth was the center of the universe. Astronomers knew the Earth was round but only a few deduced that it orbited the Sun like the other planets. The Ptolemaic system was the best that science could offer for many centuries.

Greeks and Romans alike seem to have been content to accept their myths about the gods lightly, as if this side of life were so far beyond their daily concerns that it wasn't worth

fussing about. In any case, their gods now seem about as worthy of veneration as Hollywood stars and media celebrities. The whole classical mythology, plus such practices as keeping little sets of model gods and goddesses like dolls in household shrines with a place like that of televisions or computers in a modern home, suggest an instrumental role for these gods. Their role was certainly much less exalted than that of the Buddha for his monks and followers in India. The whole mystic side of life was represented for the citizens of classical Rome only in the writings of stoic philosophers, such as Marcus Aurelius, and the drug-fueled trances of cultic oracles, following the ancient tradition of the classical Greek Oracle of Delphi, at a site originally dedicated to the worship of Gaia, the Earth goddess.

Romans exerted their power partly through the glories of Greek culture, which Romans adopted wholesale, much as Americans now adopt European culture; partly through the benefits of secure trading alliances, which stretched from trading in precious stones, furs, and tin from the north, silk and spices from the orient, and Nubian slaves from Sudan in the south; and partly because Roman military technology was the best. Roman legions were more disciplined than most of their opponents and deployed better armor and weapons. They were also inured to war. The conscript system was as brutal as you might expect in the ancient world, and it was run with ruthless efficiency to man the frontier garrisons that kept the barbarians at bay.

Romans had rich knowledge of the orient through trading contacts with the east along the silk road and the spice route and via the cargo ships that sailed back and forth between Egypt and India. But the contemplative traditions of Indian religious culture, such as Jainism and Buddhism, were foreign

and unappealing to rapacious Romans. Most Roman citizens would have had no interest in pacifist ideas and probably felt that the permanent threat of violence was all that kept civilization afloat. We may see a parallel with the modern reliance on military power and readiness to accept violence in the United States of America, which is our modern equivalent to ancient Rome.

For all its power and glory, the Roman Empire declined and fell. But it did so slowly at first, over centuries, and as it fell it developed an imperial ideology that lives on today with new strength in the United States.

Under Roman rule, philosophers built a foundation for the imperial ideology of Christianity. To complete the work, the Neoplatonist philosopher Plotinus, who lived and worked in Alexandria during the century before the official launch of Christianity, built a theory of the One, the divine mind, and the soul. The supreme and transcendent One is beyond all categories. Beyond time and change, it unfolds the cosmos through an eternal logic of emanation. The first emanation is divine mind, Logos, and the second is souls, both the world soul and human souls. This theory inspired pagan, Christian, Jewish, Islamic, and other theologians and mystics for many centuries. As a mystic, Plotinus dreamed of attaining ecstatic union with the One.

But the full story of the rise of Christianity began at least a thousand years earlier, among the Jews.

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The most famous god of the axial age was Yahweh, the tribal god of the Jews. The Semites who founded the tradition of Yahweh were poor farmers on the eastern edge of the Mediterranean. Their prophets were primitive and Yahweh was a

patriarch, by turns jealous and angry or indulgent and kind, who seems to have lived in the clouds.

A little under four thousand years ago, the earthly patriarch Abraham headed west with his tribe from a region that most people identify as Mesopotamia but some assert was further east, in Persia or beyond, to Canaan (a region later called the Levant). A few generations later, when times grew hard, the tribe migrated from Canaan to Egypt, where they stayed for many years.

From Egypt, the Jewish patriarch Moses led his tribe back to Canaan. His story, as related in the early books of the Old Testament, is so horribly illuminating – and gripping – that it seems worth relating more fully.

Moses lived in about the fourteenth century BCE and was born and raised in Egypt. He may have worked as a priest under the pharaoh Akhenaten, who seems to have been an early monotheist, advocating some kind of supreme Sun god, following mystic revelation triggered by congenital temporal lobe epilepsy. Later, in 1937 CE, Sigmund Freud argued that Akhenaten's views had a big influence on Moses.

The Bible says Moses was forced to leave Egypt after he killed a man, and he then lived in Midian for forty years as a shepherd (forty was just a hand-waving big number for the Hebrews). One day at Mount Sinai, goes the legend, Moses saw a burning bush and seemed to hear the voice of Yahweh announce: "I am that I am."

Moses returned to Egypt to deliver his tribe from bondage. He told the pharaoh that Yahweh commanded him to lead the Hebrews off eastward into the desert, but the pharaoh held out until Yahweh smote the Egyptians with ten plagues. Then the pharaoh let them go. Jews still commemorate the story of this exodus annually at Passover.

Moses led his people eastward on the journey to Canaan. An Egyptian army pursued them until Yahweh divided the waters of the Red Sea to let them escape in the nick of time. They continued through the Sinai desert.

At Mount Sinai, Yahweh commanded Moses to go alone into the heights for a biblical forty days and nights. While he was up there, Yahweh dictated the ten commandments and Moses inscribed them on stone tablets. When Moses returned with the tablets to his people, he found them partying around a golden (purple) idol. Angrily he broke the tablets and had his men slay the idolators. Yahweh commanded Moses to try again, so he went back up the mountain for another forty days and chiseled the commandments anew.

Time for a battle scene: Amalekites attacked the Israelites, and Moses watched from a hilltop with the rod of God in his hand as his men fought back and defeated them. Then the Hebrews built a tabernacle to hold the stone tablets for the rest of their trek to the promised land.

When the Israelites finally entered Canaan, they defeated its previous occupants in battle. The Israelites lusted after the fertile kingdom of King Og, so they vanquished Og's armies, killed all his subjects, and looted the cities. King Balak of the Midianites now feared for his kingdom and tried to defeat the Israelites with unconventional tactics. He sent women to the Israelite camp to seduce the men. It worked, but Moses was not amused. He killed the men who were seduced and sent an army of vengeance against the Midianites. He told his troops to kill every Midianite woman and boy but to spare the virgin girls and share them. Then Moses climbed a hill, looked out over the promised land, and died.

The god Yahweh of the tribe of Moses was a red one, red in tooth and claw, and entirely typical of local gods at the

time. Yahweh's ten commandments bear strong similarities to a list of rules in the possibly older Vedic scriptures of Hindu tradition, though this may be coincidence and we guess their composition was a separate event.

The Persians had a religious tradition at least as promising as the cult of Yahweh. It too grew strong in the axial age, but it was founded somewhat earlier by the prophet Zoroaster (also known as Zarathustra, especially to readers of the post-moralist German philosopher Friedrich Nietzsche's book of 1885 CE depicting him as an early prophet of the superman). Zoroastrianism flourished as one of the great religions for many centuries and still has adherents today. It centered on a transcendent creator god called Ahura Mazda and a cult of purity through water and fire. At first it also had sacred texts, but many of these were burned during the invasion of Persia by Alexander the Great in 332 BCE (he was titled "Master of the Universe" for his victory) and rewritten centuries later, and only fragments survive today.

If the Persians had defeated Alexander, the story of Moses would be of interest only to the Israelites. But the Israelite prophets continued to develop their cult of Yahweh over the centuries, and it came to dominate the life of the tribe in a fascinating way. Much like other red tribal gods, Yahweh was seen at first as a guy in the sky who hurled thunderbolts and the like, but we can trace how over the years he outgrew the bloodthirsty tyranny of his youth and began to work more deeply on his people.

We still have detailed contemporary accounts of how this relationship developed, because this was the time and the place where phonetic writing first entered the culture of the Mediterranean basin. The earlier scripts of the Egyptians and the Mesopotamians were unsuited to writing narrative prose,

and the new phonetic alphabet was a technical revolution in communication. The Israelites were among the first people to make good use of it to record the ongoing drama of their troubled relations with Yahweh. Like many early writings, the various chapters of the story were composed freely, only loosely constrained by what we would regard as the facts, and the contents of the handwritten manuscripts may well have mutated during copying and translation.

But a few vivid highlights emerge from the tribal history that set the stage for a messianic drama. About a thousand years BCE, a kingdom of Israel was established. The line of succession went from Saul to David to Solomon, who built a big temple. This was said in the Bible to be in Jerusalem, though some archeologists now say it was in Samaria. But in the eighth century BCE an Assyrian army conquered Samaria, and the ten tribes of Israel who lived there are lost to mainstream history. The Assyrians dispersed them eastward, and the tribes may have settled in Persia or Kashmir.

The two tribes left in Judea were conquered in 587 BCE by a Babylonian army and carried off to Babylon. There the scholars among them write their early history in the Torah, which became the first five books of the Bible, also known as the Mosaic Pentateuch. After some fifty years, Babylon was conquered by the Persians and some Jews returned to Israel, where with Persian backing they built what they called the Second Temple in Jerusalem.

Persian hegemony only lasted until they in turn were conquered by the Greek army of Alexander the Great. By now the Jews, and especially those in Alexandria, were taking an interest in Greek culture. This led seventy scholars to compile what they called the Septuagint, which was an early version of the Old Testament in Greek.

Jewish independence ended in 63 BCE when the Roman general Pompey conquered Judea and turned it into a Roman client state. The Romans elected the Judean official Herod as their client king of the Jews. He reigned for many years, until his death in 4 BCE. Widely known as Herod the Great, he was hated by his subjects for his cruelty and grandiosity.

The Jews were a proud people who now boasted a written history, and the yoke of Roman imperial rule lay heavy on their shoulders. Rather like Palestinians today under Israeli rule, they came to regard the coming of the new masters as a catastrophe. But Yahweh and the prophets gave them hope. The Jews prayed fervently for the coming of their prophesied messiah. He would save them, for sure.

Christians

Jesus the Nazarene may not have come from the village of Nazareth. The Talmud doesn't mention it, nor does the first-century historian Flavius Josephus. In the third century, the theologian Origen spent years a short hike from the site and decided the village didn't exist.

A Nazarene was a member of the Nazirites. In Hebrew, *nazir* means consecrated or devoted, and the Nazirites took a vow of separation and devotion to Yahweh. New Testament Nazirites included John the Baptist and Jesus' brother James. It seems a reasonable guess that Jesus was a Nazirite.

Jesus was apparently the first son of a pair called Joseph and Mary, though we have no record of the facts of his life beyond a few evidently confabulated reports written decades later by Christians whose apparent purpose in writing them was to present Jesus as the prophesied messiah.

The four canonical gospels that begin the New Testament were chosen in the year 325 of the Christian calendar by a committee of bishops who were tasked to lay the foundations for the imperial ideology of Christianity. The stories are not independent accounts by eye witnesses. The gospel of Mark was written first, years after Jesus died and apparently on the basis of reports from eye witnesses, and is short and episodic. Years later, Luke, a companion of the apostle Paul who again was not present at the events recorded, extended Mark's text with material endorsing Paul's passionate views. Later still, Matthew piously extended Mark's text in another direction to reconcile the story with prophecies in the Old Testament.

The first three gospels are called synoptic because they share their core anecdotes and present a similar portrait of Jesus. Finally, further years after these three, someone called John wrote the fourth gospel, and gave it a new gloss by presenting Jesus as the incarnation of the Logos, the divine word, in a portrait shaded with philosophy from the Platonic tradition. John presented the episodes of the life in a different order, with some events missing and others added compared with the synoptic gospels.

The famous four gospels paint the standard portrait of the Christ of faith. The committee of bishops who voted on the canon used their imperial prerogative to demote a stack of other gospels to the inferior status we call apocryphal. Compared with the canon, the few surviving and recently discovered apocryphal gospels present contrasting portraits of their subject and seem at odds with the Christ of faith.

Generations of scholarship plus recent archeological finds leave us with a small core of fact about the man behind these ancient fictions. We can start with the scholarship.

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European scholars slaved for centuries over the canonical texts and grew a rich field of secondary texts. Their crop was cut and baled during the first decade of the twentieth century in a magisterial review by the young Albert Schweitzer, who later worked as a medical doctor in Africa and won a Nobel Prize for Peace. Schweitzer concluded his monumental work with a verdict that deserves more promotion than a century of theological obfuscation since then has given it.

Schweitzer presents Jesus as a man who made no claim to be god but did predict that the end of the world was nigh, which was true for the world he lived in but seems irrelevant

to the world we now inhabit. Jesus also preached views that were not original about loving Yahweh and your neighbors, and he healed a few sick people, until after only a brief ministry he was crucified for blasphemy. Jesus the man loved all humanity and was ready to die for his cause. Not to put too fine a point on it, all the rest in the gospels is myth.

Academic theologians since Schweitzer have failed to dent this verdict and have contented themselves by and large with more detailed work. They have agreed in part on the relative status of the canonical gospels and on how much in them is fact, and come to realize how modern language and culture distort their reading of them. But the inner psychology of the key figure in the drama remains a mystery. In his third doctoral thesis, Schweitzer dismissed some naive attempts by Freudians to psychoanalyze Jesus.

Archeologists, thanks to large dollops of dumb luck, have forced bigger changes in the fantasies of faith.

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The surprise discovery in 1947 beside the Dead Sea in what was then British Palestine of a cache of ancient scrolls in a cave led in the following years to more finds until a large set of documents dating from the century or so before and just after the Common Era had been brought to light. The scrolls seem to have belonged to Essene monks at Qumran.

The Essene community at Qumran, an old fortress site in the dry and barren hills south of Jericho, apparently became a religious retreat in the second century BCE. It was set facing east, giving it a fine view of the rising sun over the northern Dead Sea. The walled cluster of low buildings and courtyards covered an uneven patch of ground about the size of a football field and offered basic accommodation for perhaps a

hundred people. Caves in the surrounding cliffs – where the scrolls were discovered – were apparently used by penitents for periods of solitary meditation. The walled compound was well watered with cisterns fed by underground springs, and offered space for a few animals and a small graveyard.

The leader of the Essene community at Qumran was the Nasi. His personal followers were called the Nazirites, and they expected him to become the messiah in the end times. The Essenes were dedicated to pious and chaste living, and many of them were celibate ascetics.

The Roman Jewish historian Josephus reported that the Essenes regarded pleasure as vice and its denial as virtue. They tended to disdain marriage, and those who married did so not for pleasure but for children. They despised wealth and held their property in common, to be distributed by elected managers, which at least let them travel freely, without baggage, when visiting fellow Essenes.

Daily life in an Essene community seems to have been much like later life in a Christian cloister. At sunrise, they prayed to God. Then they worked for a few hours before assembling to wash in cold water. Refreshed, they gathered in a hall to eat, where a priest said a prayer before and after eating. Then they all went back to work until evening, before dining in a similar way. They never ate meat or drank wine.

New entrants to the order had to wait a year, then each was given a little hatchet and a loincloth and white robe and allowed to share in the routine. After three years, they joined the order, but only after swearing a solemn oath to uphold the order, on pain of death.

Essenes took the Sabbath seriously. They prepared their food in advance and even tried not to relieve themselves on the Sabbath. On weekdays they would dig a hole in a remote

spot with their small hatchet and, holding their robe around them so as not to offend God, defecate into the hole. Then they would refill the hole and wash themselves carefully.

Thanks to their simple and austere lifestyle, Essenes lived into ripe old age. Yet they admired a proud death, and in war against the Romans they refused to bend to their tormentors. Josephus reports that even under torture they would die with a smile. They held their souls for eternal beings that were merely imprisoned for a while in bodies.

Another Essene subgroup called the Therapeuts lived in Egypt. Some say the word "Essene" is a Hellenized form of "Hasidim" and the Essenes were part of the tradition of the Kabbalah. The Essenes were unlike most Jews.

From the viewpoint of Hindu and Buddhist traditions, the confluence of the Essene lifestyle with those of the Eastern cults is remarkable. A history of prior contact is not hard to imagine. Buddhist monks had been wandering far and wide for over a century, and regular trade between India and the Mediterranean region via the silk road through Persia and via the spice routes by sea ensured a steady flow of ideas along with the silks and spices. One can guess that decades of prior contact with Indian ideas gave the Essenes their respect for asceticism and meditation.

The relevance of the Qumran community to Jesus is clear. Not only did Jesus apparently spend most of his life within a few days' hiking distance of Qumran, but much of what he said in his most famous and characteristic speeches, such as the sermon on the mount, apparently came wholesale from the Essene teachings. It seems probable that he spent years in the community during his teens and twenties, absorbing both its ideas and a taste for its austere lifestyle, before embarking on his ministry.

Another archeological discovery that deflated the dreams of Christian orthodoxy was made at Nag Hammadi, a small city on the upper Nile in Egypt, where in late 1945 some local farmers found an ancient jar, which they broke open to find a heap of papyrus codices bound in leather. The documents were apocryphal gospels and other writings dating from the early years of the Common Era, and some were texts never seen before. The new picture they offer of early Christianity is still forming.

But we can already reach a verdict. The doctrine endorsed by the bishops who chose the orthodox canon strayed some way from the simple ideas of the first Christians.

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Returning to the gospel accounts of Jesus, the human drama is compelling enough to warrant a deeper look. It can help us bring the man whom generations of believers have confused with the Boss of the universe into sharper focus.

The birth story in Bethlehem is myth, evidently crafted to match similar stories of divine figures in earlier myths. If the young boy Jesus was visited by Magi from Persia or the like, it would suggest that a search was on for the reincarnation of a previous holy person in a more eastern land, much as modern Tibetan Buddhists go to great lengths to seek out a new Dalai Lama. If the boy Jesus had been found in such a search, the commotion might have awakened the community at Qumran to the birth of a holy child in their patch of the world. If they were looking for a messiah to lead the Jews from bondage under Roman rule, the monks would surely have seized on any divine sign. This part of the birth story hints at the first link between a country boy and the monks who may have groomed the boy for stardom.

The virgin birth is also myth. Joseph, the young husband of Mary, would certainly have seen any such tale as a mere veil for the ugly truth of a bastard child. Either Joseph was cuckolded, but was kind enough to forgive Mary's fall for the sake of siring his own later offspring from her womb, or the story is fiction. Perhaps the Essenes believed not only in the imminence of the end of the world but also in angelic insemination, and told Mary that they would take care of the boy and arrange for his education. As a carpenter by trade, Joseph may have been too poor to school the boy otherwise. In any case, he and Mary raised the boy.

The canonical legend betrays its mythical origins with another strange story, this one matching a similar tale about the infant Moses. When news of a divine landing in his kingdom reached the puppet king Herod, he is reported to have gone ballistic. As the local agent for Rome, he wasn't about to let rumors of a new holy man trigger a religious rebellion against the source of his patronage. So he sent out his men to find and kill all the young boys in the kingdom. Joseph is said to have been warned of Herod's action and taken the family to Egypt. Perhaps they settled among the Jewish community in Alexandria.

If at least the stay in Egypt is fact, Jesus may have gone to a school in Alexandria run by Therapeut monks selected by his Essene godfathers. Egypt was also the destination for some of the Buddhist monks sent out to evangelize the world as part of an outreach program in the third century BCE. In Egypt, their teaching of the Dharma (the way, the divine law of karma) became the doctrine of the Logos, the word, and some of the Therapeuts were known as Logicians. So perhaps Jesus got a training in mystic logic. Or perhaps not: we have no hard evidence that Jesus could even read or write.

In the gospels we have only one anecdote about Jesus' childhood, and it just happens to be one that closely parallels a story about the young Siddharta Gautama. When Jesus was about twelve, it seems the family paid a visit to the temple in Jerusalem. There Jesus wandered free of his parents and hung out for hours with some priests. He talked in an adult way with them about theological matters and impressed them greatly with his grasp of esoteric trivia. Apparently his parents were not only angered, because they hadn't known where he was, but also amazed, because they hadn't realized their boy was so smart. Looking back, we can well imagine the Jewish mother Mary later beaming with pride as she told her friends: "My son, the rabbi!"

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The Jewish custom was to marry off boys in their early teens. But Jesus never married, and the natural reason why not is that he spent his teenage years as a novice monk in Qumran. It was common for families to send their firstborn sons to monasteries both in Buddhist culture and in the Jewish circles around Essene communities. In both cases, the son would learn to live in poverty, chastity, and obedience to holy writ. If Jesus received a Therapeut education in Alexandria, then training as a monk was the natural next step.

The monks followed many Jewish rituals, but with telling exceptions. For example, they regarded blood sacrifices as atrocities, and they wore simple white robes and let their hair grow long, like hippies.

One feature of their lifestyle seems less hippy. Any expression of sexuality was so taboo in Judaic law that it made men and women ritually unclean. Menstruating women and men who had ejaculated semen were regarded as polluted and

expected to withdraw from social life for a while. At Qumran we can guess that ejaculants were required to serve out their penance in one of the nearby caves before returning. A teenage boy disciplined in this way might soon develop a sickened aversion to any kind of sexual excitement. On sexuality, the Essenes were as austere as any Jews.

To put the Essenes in perspective, we can contrast them with two other Jewish schools at the time, the Pharisees and the Sadducees, as the historian Josephus did. The Pharisees were pious, held strictly to Jewish law, and believed that a mixture of free will and fate shaped human actions. The Sadducees were often wealthy and aristocratic. They believed in free will and repudiated new ideas like those of angels and resurrection. By contrast, the Essenes followed a founder they called the Teacher of Righteousness. They were fatalistic and believed that the end of the world was nigh.

The Essene cult seems to have started as a protest against orthodox Judaism, with its excess of rigid rules and bloody sacrifices, as practiced by the Pharisees and Sadducees at the Second Temple in Jerusalem. The Essenes advocated pious lives of mystic devotion.

The Essenes seem not to have emphasized Eastern beliefs in reincarnation or in a cyclic view of history. They seem to have shared the fatalism of eastern philosophies but not their view of history as endless repetition. The idea that each soul was new, together with a linear view of history as advancing toward a unique destiny, may have been more natural for the followers of Yahweh.

If Jesus lived at Qumran, reflecting on these issues was his main occupation as he lived the quiet life of a celibate monk. According to the received myth he was an avatar of divinity, but he must have yearned to work out his own destiny.

Jesus would have thought about his ancestral roots. If he regarded Yahweh as his father he would have felt bound for glory, perhaps by becoming the Nasi of Qumran and then inheriting the kingdom of heaven, following the end of the world in the apocalyptic doom prophesied by the Teacher of Righteousness. Jesus may have felt like the lightning rod of life on Earth, with only Yahweh blitzing above him. This was a powerfully solipsistic thought for a dreamy young man. Perhaps he was sure that he was the prophesied messiah, ordained to spend his divine fortune on delivering a message of salvation to his Jewish compatriots, who were suffering in humiliation under the yoke of Roman rule.

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There is a maverick tradition in Jesus studies advocating the view that before his ministry Jesus traveled eastward, perhaps to India, to learn his chosen craft. After boot camp, or rather sandal camp, in Qumran, he may have gathered his white robe, said farewell to the monks at Qumran, and headed out east. Either he joined a merchant caravan of camels on the spice route through Mesopotamia, Persia, and Bactria (now known respectively as Iraq, Iran, and Afghanistan) or he took a cargo ship to sail around the Arabian peninsula and across the Arabian Sea with the monsoon wind to the Indian ports of Barigaza and Barbaricum. Then he could travel upriver to Minnagara and onward to Alexandria Bucephalus.

The idea that Jesus took the ancient version of the hippy trail to India is natural. As a cub messiah, he must have had an interest in the lands to his east. His people were suffering under western imperialism in their province of the Roman Empire, and Indian spiritual *jihad* looked like a good way to fight back yet stay true to the pacifism of the Essenes.

An early maverick was a Russian adventurer called Nicolas Notovitch, who in 1887 traveled up the Indus valley to the lands of Kashmir and Ladakh and onward to Tibet. He wrote later that the monks he met spoke of their familiarity with ancient stories of St. Issa (Issa is "Jesus" in Arabic). But the "the life of St. Issa" he later offered as a transcript of ancient Tibetan manuscripts is fiction. He says he was staying in a Buddhist monastery in the mountains of Ladakh when the chief lama read out some ancient manuscripts. A monk translated as the lama spoke, and Notovitch scribbled what he could in his notebook. Several years later, he edited his notes to create, in Russian, what he said was a biography of St. Issa originally compiled from the live reports of merchants trekking back and forth between the Levant and Kashmir. His words reveal that he let his imagination run riot.

Yet it's hard to deny an Indian influence on the Jesus who preached his way across Israel to an ignominious crucifixion. The parallels between his radical variant of the Judaic faith and various strands in Hindu and Buddhist traditions are too obvious to dismiss. Three parallels stand out.

First, the Buddhist ideal of universal compassion translates neatly into the Christian notion of *agape* or love (not sexual love but ideal love in the Platonic sense, or charity). The Buddhist goal of nirvana is beyond words and corresponds to dissolving into infinity, but the Christian idea that the reward for a good life is union with God in heaven is a good metaphor for that dissolution. The Jewish prophets said a lot that came to be seen as presaging what Jesus said, but scholars agree that Jesus brought something new to the mix by setting love of God over obedience to the Mosaic laws.

Second, Brahmin religion before the Buddha was a mess of detailed laws and absurd rituals, but Gautama cut through all

that and emphasized compassion. Jesus too saw through the laws and rituals that hobbled the lives of observant Jews, and emphasized that without *agape* they were meaningless.

Third, both Buddhism and Christianity find expression in monastic life. The Tibetan monasteries of our time, with their clutter of dusty Buddha statues, spinning prayer wheels, and lines of colored pennants, differ in many details from the typically more austere Christian cloisters, much as elaborately decorated and ornamented Roman Catholic churches, with their photorealistic crucifixes and statues of the saints, differ from the more austere houses of worship of Protestant sects, but the general resemblance of the traditions is striking.

The biggest single contrast between the two traditions is in the treatment of women. The God of Abraham is a patriarch and the tradition is sexist, whereas Buddhist tradition is not. Notovitch remarked that the Buddhist induction of firstborn sons into monastic life reduced the fertility of the population and hence headed off the danger of mass starvation. The effect of the Semitic institution of patriarchy was to elevate men and reduce the status of women. Higher breeding rates and frequent wars were the hard results. Strong men needed strong discipline, and a religion had to be harsh to rule them. Cutting off their foreskins was a bloody good way to start. The God of Abraham was a jealous red god.

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The canonical gospel stories of Jesus begin in earnest when John the Baptist ritually dunked him in the River Jordan, just west of Jericho, at a riverside spot less than two hours' walk away from Qumran and visible from the cliff top.

John the Baptist was a popular and charismatic preacher. He was also a Nazirite, so he had presumably served time at

Qumran and maybe met Jesus during their early years there. Whatever the facts, John is said to have been awed by Jesus as he baptized him.

The next step for a new holy man was a stint of survival training in the desert. Jesus is said to have spent forty days in the wilderness. A cave at Qumran was as good a base as any. There he could wander for as long as he liked under the hot desert sun before returning to his shaded abode in the cliffs. There too, Essene emissaries they called angels (because they conveyed news back and forth) could climb up to check on the hermit and bring him provisions. Jesus would likely have daydreamed as he waited in the heat for an angel to bring up his next bladder of water. The contents of his fantasies up in his hermit's cave are not hard to predict. The Buddha too was said in ancient manuscripts to have endured and mastered temptations during a stint in the wilderness.

Once that ritual purification was accomplished, Jesus was ready for his messianic mission. As the gospel stories relate, he wandered around Israel, equipped only with a white robe and sandals and living on handouts like a Hindu holy man or an itinerant Buddhist monk. Along the way, he earned his keep among the rural communities he visited by performing various acts of faith healing, which the locals regarded as miracles and retold as hearsay stories that spread by word of mouth ahead of the miracle worker.

Faith healing is not miraculous in any modern sense. For people in the gospel years, the simplest placebo cure was a miracle. Medical science is still unable to explain how placebo cures work in detail, but few would deny that our present knowledge suffices in principle to account for the interaction of mind and body that can make faith in a cure result in an actual cure. We now know the mind runs in a neural network

irrigated by body fluids, where any amount of hormonal and other feedback can be conjectured to explain a cure, so faith healing is not inexplicable. But for the ancients, cure by faith alone was miraculous.

People in those days were as plagued by minor medical problems as people today, but they had to rely on shamans and gurus for relief. To get it, they had to have some kind of belief in their shamans. So any holy man or woman with the charisma to charm a patient into putting his or her faith in a cure could make a living as a barefoot doctor. And there were plenty of takers for a miracle cure, with no fee beyond overnight bed and board for the healer.

As a baptized man of God, Jesus was as qualified for the job as any other wannabe guru in Israel. So he had no trouble making a living outside the world of money and taxes as he wandered from village to village.

The stories and parables he used to tell were great teaching aids. The parables were anecdotes that made a provocative point indirectly, typically using a homely metaphor that even his least educated hearers would understand.

One little story may stand for all the rest. Teaching in the temple one day, Jesus told his crowd about a poor widow who put two mites into the temple's collection box. A mite was a tiny coin, worth about half of the smallest Roman coin then in circulation in Palestine, but it was all she had. She could have paid just one mite, but she put in both. Jesus said her contribution was worth more than the huge sums paid in by wealthy people who kept most of their wealth for themselves, the point being that giving all to God is always worth more than giving only a fraction. Amusingly, exactly the same story appears in an ancient manuscript about the Buddha. The early Christians may have recycled it.

Every religious tradition includes such pearls of wisdom. In a preliterate age they were the main carriers of useful practical learning. Jesus was unusually good at delivering them, but many of his anecdotes were already familiar parts of ancient folk wisdom. The art was in the telling. Evidently, Jesus had the charisma to hold a crowd of village folk spellbound with his stories and homilies about Yahweh.

Evidence that Jesus had a charismatic presence is that he attracted disciples rather easily, if the gospel accounts are to be believed. All he had to do was tell a few stories and then invite them to drop everything and follow him. The majesty of his presence alone was enough to make them abandon all thoughts of wealth and family in favor of a life of roaming in rags and begging for food on the open road. Agreed, the disciples were mostly simple men from poor backgrounds for whom the chances of wealth and success under Roman rule may have seemed low or unattractive, but the point is surely well taken. Jesus had enough star quality to pull the young men who became his disciples out from their roots and take on a life of poverty and risk.

One modern line of commentary here is that Jesus may have been gay. This seems to be anachronistic thinking. Jesus was charismatic enough to live the role of messiah not only to the satisfaction of his solipsistic ego but also to that of the humbler souls of his disciples. They were his Platonic lovers. But this falls a long way short of reducing them to a gang of gay boys. Jesus had probably learned in the caves of Qumran to master his sexual impulses so well that we can reasonably suppose he had no sexual partners at all during the years up to his crucifixion.

To make this seem plausible, recall the case of a modern holy man, Bede Griffiths, who lived from 1906 to 1993, first

in Britain, where he was a scholar at Oxford before taking holy orders as a Benedictine monk, and then from 1947 in southern India, where as a Hindu yogi he founded the ashram of Shantivanam and adopted the name Swami Dayananda ("bliss of compassion"). Bede never had a sexual partner and lived and died in chastity.

One sexual observation may illuminate the mental worlds of the disciples of such austere figures. Their disgust at their own urge to masturbate would be reduced when they exerted themselves as disciples to deny their sexuality altogether. Their being gay or straight is then irrelevant.

That aside, Jesus seems to have liked women and got on well with them. Rumors still persist that he had a romance with the young lady the gospel writers call Mary Magdalene. A papyrus fragment discovered in 2012 even hints that she was his wife, but it may be a later forgery. The odds are good that Jesus had next to no sex life.

From his baptism to his crucifixion, Jesus lived the austere life of a wandering sage. His evident success as a faith healer, as a lay preacher, and as the leader of a gang of disciples are proof enough that his strength lay in his messianic potential. Jesus followed a path that countless holy men had walked since time immemorial. But he must have walked the walk and talked the talk better than most.

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The gospel accounts of Jesus attribute to him pearls of timeless wisdom. For example, in the sermon on the mount he preached ideals that still resonate with any sensitive person. But Jesus had probably learned all the main points of that speech years earlier from a papyrus manuscript in Qumran. He was delivering a mature body of Essene wisdom.

The moral message of the gospels is far more important than the biographical details, so it's worth pausing to look at the main pillars of Essene wisdom. Once that's done, the rest of the Jesus story is a gloss on the death scene.

Jesus started with what Christians call the beatitudes. They boil down to an eightfold blessing:

> Blessed are the poor in spirit, those who mourn, the meek, those who seek justice, the merciful, the pure in heart, the peacemakers, and those suffering persecution for the sake of justice.

The general drift here is pacifist, and its stress on meekness and humility must have worked well on poor country folk. It must have worked well on the Romans too, since no one could accuse Jesus of offering red meat to Jewish rebels here. But it must have dismayed any young hotheads who wanted eyes for eyes and teeth for teeth.

Soon the message became more radical. Jesus advised his audience not to resist evil. If slapped on one cheek, they were to turn the other cheek. This was a challenge to the Romans. Jews should defy them to do their worst and take it without complaint. In the twentieth century CE, Mahatma Gandhi advised his followers to do the same thing when confronting British imperialism in India. The result, as he expected, was to shame the British occupiers into relaxing their grip and finally letting Indians rule themselves. It worked.

Jesus also said love your enemies, and pray for them. The implication was that the enemies were in need of the prayers, and therefore less holy than those praying. But the sentiment is also like that attributed to the Buddha in an old biography. There Buddha said that hate can be vanquished only through love. Truth and love – these things are eternal.

The crowds who gathered to hear Jesus speak were getting a good return on their investment. Perhaps such events were the ancient equivalent of political rallies, staged to pump up the faithful and leave them with a few tasty sound bites or bits of brain candy to chew on later.

Jesus added his own contribution to the sermon in what we call the Lord's prayer. Here we can recall the devotional work of the nineteenth-century Russian novelist Leo Tolstoy, who as an old prophet wrote a classic book on the Christian gospel. From his preface:

> At the conclusion of my work I found, to my astonishment and joy, that the Lord's prayer is nothing less than Christ's whole teaching, stated in its most concise form, and in that same order in which I had already arranged the chapters, each phrase of the prayer corresponding to the purport and sequence of the chapters.

Here is Tolstoy's paraphrase of the Lord's prayer:

> Man is the son of the father.
> God is the infinite spiritual source of life.
> May the source of life be held holy.
> May his power be established over all men.
> May his will be fulfilled, as it is in himself,
> So also in the bodily life.
> The temporal life is the food of the true life.
> The true life is in the present.
> May the faults and errors of the past not hide this
> true life from us,
> And may they not lead us into delusion,
> So that no evil may come to us,
> And there shall be order, and strength, and reason.

The rest of Jesus' sermon included several good aphorisms worth mentioning. For example, Jesus said you can't serve both God and mammon (his native language was Aramaic, in which "mammon" meant wealth). Two more goodies:

Don't judge others, or they will judge you.
Don't cast your pearls before swine.

A final gem in the sermon was a one-line summary of the teachings of the law and the prophets. Jesus cribbed the line from Rabbi Hillel, who was a leading Pharisee around then. Someone had once challenged Hillel to summarize the Torah while standing on one leg, so Hillel said this: "If it's hateful to you, don't do it to others. That's the whole Torah. The rest is commentary. Go and learn!"

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It's a short story from baptism to death. Jesus found that his fan base covered only a narrow demographic. The Temple Jews were offended by his blasphemous broadcasting of his familiarity with Yahweh and by his cavalier way with the fine points of the law, while the Romans were suspicious of his success with the crowds and were concerned that he might spark a political rebellion.

Jesus could see the trouble brewing and prepared himself. He steeled himself for the increasing risk that the Roman and Jewish authorities would lose patience with him and conspire to have him crucified for his efforts.

Crucifixion was the standard Roman penalty for any and all serious criminals and troublemakers. It was a combination of torture and death penalty and usually sufficed to keep the masses in line. The soldiers who administered it were inured enough to pain and death to enjoy the grisly horror show of

naked miscreants nailed to a cross and writhing in agony for hours until finally death brought them merciful release.

But Jesus was a holy man. Most people were pious enough to be shocked at the prospect of seeing their guru nailed to a cross. So Jesus could have wimped out of a death sentence. The reason he pushed on with his provocations was simple. The Teacher of Righteousness had convinced him that only his supreme sacrifice would part the clouds enough to bring on the apocalypse that would destroy the old world and reveal the kingdom of Yahweh. Jesus was certain not only that the end of the world was nigh but also that he was divinely appointed to make it so.

A Freudian analyst might put a different spin on the story. Whether he knew it or not, Jesus was getting tired of telling the same old stories and begging for food, with no hope of a sex life to cheer him up. This analysis may just show why Albert Schweitzer despaired of Freudian stories. At least we can say Jesus had suffered long enough on the campaign trail and was as ready as he'd ever be to meet his maker.

A hint of India may be relevant here. If Jesus had learned some yoga, he may have witnessed such feats as walking on fire, lying on a bed of nails, piercing the flesh, being buried alive, and sitting on a pillar in the sun for hours. So he may have been less afraid of crucifixion than you might expect. He may even have dreamed of surviving it for long enough, with some quiet help from his heavenly father, to come off the cross alive. If he could do that, he would win over the doubters and be acclaimed as the true messiah.

Jesus thought he was the chosen instrument of Yahweh. He felt he was appointed to purge the world of abomination and reveal the glory of the Son of Man (a divine avatar of the Lord of Hosts). Jesus had to sear the minds of his viewers

with the amazing power of Yahweh. Then they would flock to his cause, the Romans would fall back in shock and awe at the holy power he had unleashed, and all would shine bright in the glorious dawn of the divine kingdom. His humble duty was just to endure a few hours nailed to a cross.

So Jesus increased the provocation. About a week before the Passover festival, in about the year 33 CE, he and his disciples staged a big entry into Jerusalem along a street lined with cheering crowds.

In Jerusalem he paid a visit to the temple. There he made an angry scene by tipping up some merchants' tables and got himself in the local news. He was feeling the fire now, and sensed a manic joy as he pushed the limits in Jerusalem, dizzy with the power gathering in his grasp as he saw the mixture of fear and joy in the eyes of people around him. He was cruising for a bruising and feeling fighting fit. The end of the world was nigh and he was the rod of God.

Events came thick and fast. Priests engaged Jesus in public discussion, hoping to catch him out on a quibble. A Pharisee who knew the law asked him whether it was right to pay taxes to Caesar and Jesus said it was right to pay Caesar his due. A Sadducee who was skeptical about resurrection then asked him which of her several deceased husbands a serial widow would embrace in the afterlife, and Jesus said angels didn't have sex, and anyway his God was a God of the living, not the dead. Two for Jesus, zero for the priests. He could float like a butterfly, sting like a bee. But not for long.

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We can reckon that Jesus celebrated his last supper with the disciples on the Tuesday before the Passover weekend. This was two days too soon on the orthodox calendar but right on

time on the solar calendar of the Essenes. Over a Passover meal of bread and wine, as in the Essene rite, but without lamb, hence unlike the orthodox rite, Jesus said the kingdom of God was nigh and told his disciples the bread and wine were his body and blood. We are what we eat, so the bread and wine thing is an everyday fact of life, but Jesus found it good to recall that seamless connection.

After supper, the group went out to the Garden of Gethsemane at the foot of the Mount of Olives, and Jesus walked alone in the darkness to prepare himself for the ordeal ahead. There a group of Roman soldiers came and arrested him. They took him off to a local authority that judged this was a case for the Jewish court, the Sanhedrin.

Jesus was tried before the Sanhedrin the next morning. There the high priest Caiaphas asked him whether he was the messiah, the son of God, and Jesus replied, "You said it." That answer sealed his fate. He was bundled off to a prison and roughed up. He spent the night there.

Next morning, the Sanhedrin delivered their verdict. Jesus was guilty as charged and sentenced to death. The penalty would be administered by the Roman imperial authorities.

Jesus was handed over to the Roman prefect of Judea, Pontius Pilate, who after a brief hearing with Jesus said he saw no grounds for the death penalty. He handed Jesus over to the Jewish ethnarch, Herod Antipas, who after another brief hearing affirmed that Jesus deserved death and handed him back to the Romans for execution. Pilate saw Jesus again on Friday morning. Crowds outside, who had earlier cheered Jesus as a hero, were now baying for blood.

The preliminary to the final death sentence was a flogging. Roman soldiers gave Jesus thirty-nine lashes with a *flagrum*, a whip with three leather tails, each tipped with a pair of hard

balls, which left bloody welts all over his body (Jewish law drew the line at forty lashes), and put a crown of thorns on his head, which drew more blood, then paraded Jesus before the crowd in a mock outing as a king.

Pilate now sentenced Jesus to death by crucifixion, to be administered immediately. Jesus had finally got what he both wanted and dreaded. He was almost too wounded and weary to stand, but he told himself the show must go on.

Jesus trod barefoot to the site of the execution, Golgotha, carrying the heavy crossbeam for the cross on his shoulders, while crowds along the way witnessed his humiliation. Here he would have fallen, but a kind friend carried the load for part of the way. Soon they reached Golgotha.

The upright for the cross lay flat on the ground, ready to be mounted with the crossbeam and adorned with its victim. There was a small crossbeam at foot height for him to stand on, and a little wedge at seat height to ease his legs. The idea was to draw out the agony for as long as possible. Some poor sods suffered for days on the cross, giving all who saw them an object lesson in crime and punishment.

Jesus was stripped and pushed down onto the beams. His wrists were nailed to the crossbeam. The hammer blows sent sharp stabs of pain to his brain. His left foot was pulled over his right and a big nail was hammered through them both to pin them onto the footrest. Then the entire assembly was pulled vertical and rooted in the ground. The movements sent fresh waves of pain to his brain as his body settled on its excruciating perch.

Now Jesus could look around from his high vantage. On crosses to his left and right were mounted a pair of robbers who were also sentenced to die that Friday, before the Sabbath began at sunset. It was about midday, so the trio had a

few hours to live. Jesus tried to calm his mind and body far enough to reduce his despair and the pain from his injuries. All the while he let his mind dwell passionately on Yahweh, looking down with love from heaven on his only begotten son and seeing the boy's faith and courage. Jesus imagined Yahweh feeling a hint of pride, just enough to smile and say: "My son, the messiah!"

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The crowd under the three crosses got their bloody spectacle. Some were aghast to see their holy man humiliated but all got an eyeful they would never forget. Jesus' mother Mary and his friend Mary Magdalene were there too, weeping inconsolably at the frightful horror show. But Jesus, nailed on his chosen throne of glory, was beyond all that. His mind was retreating into nirvana, where pain was just distant thunder and lightning within his sunset mindscape. A soldier held up a spear tipped with a sponge soaked in bitter wine to his lips, and Jesus sucked on it. Soon after that, he groaned and sunk into unconsciousness.

Jesus had made no deliberate preparation for his survival. He had too much faith in Yahweh for that. But his friends, notably Nicodemus and his rich patron Joseph of Arimathea, both of them members of the Sanhedrin, had no intention of letting the Romans kill their messiah without a fight. Perhaps they quietly made sure the wine would be laced with drugs. The main ingredient may have been soma, which in Vedic tradition brings immortality and in Zoroastrian tradition gives spiritual power to gurus. Soma is the sacred drink of India, and when used correctly enables adepts to enter a coma for several days and wake up in an altered state of consciousness for a few further days of visionary experience.

As sunset approached, the executioners needed to finish off their three victims. The traditional way was to break their legs. This forced them to hang from their wrists, hindering breathing and causing death by suffocation. But the Roman centurion Longinus who was in charge of the crucifixion was an admirer of Jesus. He is said to have said of Jesus as he hung on the cross: "Truly this man was the son of God." Longinus took one look at the unconscious Jesus and decided he was dead already, so he didn't break his legs. Instead he prodded him in the ribs with a spear, a *pilum*, tipped with a thin blade about a foot long like a stiletto. He prodded hard and deep enough to draw a flow of what the gospel writer John called "blood and water".

John was a cryptic author. He wrote his gospel several decades after the facts recorded, and he spun it as a "proof" of the idea that Jesus was the Gnostic word (Logos) made flesh. Gnosticism was an early precursor of Christianity that shared elements of Hellenistic Judaism, Greco-Roman cults, Zoroastrianism, and Neoplatonism. John may have made his phrase deliberately ambiguous, to tell naïve readers that Jesus was killed but to tell insiders that the flow indicated a heartbeat and hence that Jesus was still alive.

Longinus reported to Pontius Pilate that Jesus was dead. Pilate didn't believe that an afternoon spent standing in the sun, even nailed to a cross, could be fatal, but Longinus convinced him. So Pilate let the body be taken down and released for burial. Longinus gently detached the holy body from the cross and handed it over to Joseph of Arimathea.

Joseph was well prepared, so well prepared it defies belief that he had not planned carefully with his Nazirite friends in advance. He had commissioned and built a big tomb near Golgotha, which was still unused but included a preparation

room plus room for a few bodies. He said this was a family tomb for his own use, but building it just there, near a site for the execution of criminals, was odd. Also, he had laid in a generous supply of healing herbs and potions, mostly aloes and myrrh, plus a length of good linen cloth to cover the body. He and his friends rushed the comatose Jesus to the tomb and set him down gently. They wiped off blood and treated the numerous flesh wounds, but they didn't wash the body. Washing was for corpses. They worked fast, and left their patient lying flat out on the slab, with his wounds well dressed in the tightly wrapped cloth, by sunset.

We think we know how they prepared the body because we still have the piece of linen they used to cover it. Today the cloth is known as the Turin shroud and is prized as a holy relic. Indeed the story of its preservation over the centuries and of the storms of controversy that have raged over it has the makings of a great conspiracy thriller. The evidence that the shroud must be genuine is surprisingly strong, whereas the evidence that it may be a fake is shaky.

The fabric of the shroud shows a faint but clear image of a man bearing the "signs of the cross" described in the gospel stories. The man is of medium height, hence rather tall by ancient standards, and of average build. Apart from the flesh wounds, he seems fit and healthy, and his features are symmetrical, suggesting a handsome face in life. Given the apparently miraculous nature of the image and the perfect fit of the scars to the stories, one may be forgiven for suspecting a hoax and forgetting the whole thing.

This is where modern science shows its value. The stains on the cloth appear to result from the interaction of the herbs used on the body with Jesus' body fluids and vapors. Detailed chemical analysis of the stains reveals exactly what an expert

appraisal of wound dressings from two thousand years ago would predict. There are even microscopic pollen grains of plant species typical of the ancient Dead Sea region trapped among the threads. And the bloodstains show that bleeding continued from the flesh wounds long after the body was wrapped in the cloth, indicating clearly to a forensic scientist that the body was still alive.

The stations of the cross deserve a few more words. The body was naked, as was customary for a crucifixion, but laid out neatly with the hands folded over the genitalia, with no signs of force applied to undo the onset of rigor mortis. The hair was long and parted in the middle, in the fashion of the Nazirites. The six stations in turn:

1. A few bumps and bruises such as a severe black eye record the roughing up Jesus received in Caiaphas' prison.

2. The raw skin of the upper body shows over ninety wheals of the type that would be inflicted by a three-tailed *flagrum*.

3. The lash marks on the upper shoulders were exacerbated by the pressure of the crossbeam Jesus carried part of the way to Golgotha.

4. Spots and streaks on the head show clearly how the crown of thorns pressed down on the scalp and forehead.

5. The streaks of blood from the wrists and feet are flows from nail puncture wounds, and the stains indicate flows first downward from the posture on the cross and then downward from the supine posture in the tomb.

6. A wound in the right side of the body, between two ribs, shows where Longinus had thrust the "spear of destiny" and caused a flow of blood that continued to trickle in the tomb.

The quality of the detail and the chemical nature of the stains seem to rule out a medieval forgery. But in 1988 a scientific study designed to determine its age revealed that it was only seven centuries old.

The shroud first came into the hands of the Holy See at the Vatican in 1983, after a series of increasingly painstaking scientific studies on it since 1969 had revealed with increasing clarity both its apparent authenticity and its hidden message of survival. In 1988, as soon as radiocarbon analysis became mature enough to give good results based on small samples, Vatican officials sent tiny pieces of fabric they had snipped from the shroud to three unimpeachable laboratories, and all of them determined a late date. Since then, the publicity surrounding the shroud has abated.

The long history of the shroud is well documented. Folds of the cloth were singed in a medieval fire and repaired with small patches of medieval cloth. And for the tests, Vatican officials snipped samples from the preserved vestment of Saint Louis d'Anjou, stored since 1296 in a basilica in southern France, apparently to provide a control for the dating of the shroud. The suspicion arises that as forensic scientists built up an increasingly strong case that Jesus survived the crucifixion, the Vatican officials quietly arranged to have a "hoax" revealed by radiocarbon dating in order to put an end to the whole unholy controversy.

Another cryptic hint in the gospel of John may help us see what really happened. John hid the hint in the strange tale of Lazarus, which only appears in his gospel.

Shorn of dramatic detail, the tale John tells is this. A man named Lazarus from Bethany lay sick, so his sisters sent word to Jesus, who came four days after Lazarus had died. They went to the tomb, a cave, and took away the entrance stone.

Jesus called out for Lazarus, who came out with hands and feet wrapped in linen strips and a cloth around his face. They took off the wrappings and that was that.

The point for us is twofold. For naïve readers, John underscores the alleged reality of resurrection just before he relates the Golgotha drama. For advanced readers, he uses a plainly incredible anecdote to describe a real burial in terms quite different from those he employs to describe the treatment of Jesus after the crucifixion. It seems to be a hint at something: At least for Joseph of Arimathea, the body in the tomb was not supposed to be dead.

The Sabbath passed quietly for Jesus as he lay on a slab in his tomb. Early on Sunday morning, John relates that Mary Magdalene went to the tomb and found the door open and Jesus gone. A pair of angels clad in white sat beside the neatly folded shroud and told her calmly that Jesus was alive. Then Mary saw that a man she had taken to be a gardener standing behind her was Jesus. She said: "Rabbi!" He asked her not to touch him because he was almost dead.

The real story may be that Joseph and Nicodemus told the disciples John and Simon Peter as well as Mary Magdalene about their rescue effort. Mary was so agog she rushed to the tomb and saw the Essene "angels" sitting where Jesus had been. Then she saw that Jesus was behind her, disguised as a gardener, about to be carried off into hiding. Then John and Simon Peter came along and saw too that Jesus was gone. John the gospel writer says that John the disciple "saw and believed" what Joseph and Nicodemus had said.

A curious and entirely typical problem of translation arises here. The gospels were written in Greek but probably on the basis of earlier notes in Aramaic. The Aramaic word for what happened to Jesus is correctly translated as "resuscitation"

and not as resurrection. The Greek is confusing here too, but it seems the members of the early church quickly agreed that supernatural resurrection was a more thrilling and promising doctrine for recruiting gentiles to their cause.

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If the gospel accounts of the resurrected Jesus can be trusted, he made only brief appearances to his disciples, perhaps just to cheer them up but more likely to "prove" that Yahweh had intervened to help him survive. Otherwise, we can guess that he stayed in hiding with his Essene friends, recovering. After forty days, he set off walking with his disciples and left them behind near Bethany, where he headed off over a hill and never saw them again. This "ascension" is where the gospel stories leave off.

It may be that Jesus died of his wounds within hours of leaving the tomb. But maybe he continued to live in hiding, hoping to avoid the horror of a second crucifixion. If so, he would have gone north to Damascus and merged into what was then a big Essene community in the city. This is consistent with the claim that a year or two later Saul of Tarsus encountered him there.

Saul was from the Mediterranean city of Tarsus (now in Turkey) and was raised in Jerusalem. He became a leading Pharisee and a relentless persecutor of the early followers of Jesus in Judea. Later, as the apostle Paul, he took a leading role in the development of organized Christianity out of the earlier Jesus cults. He was apparently a short, thin man, fiery and obsessive by temperament, with an unexplained "thorn in the flesh" that made him extremely hostile to almost any expression of sexuality. Some say he was a repressed homosexual, others that he was epileptic.

Saul said he was traveling on the road from Jerusalem to Damascus when he was hit by a revelation of the resurrected Jesus, surrounded by a dazzling bright light, asking him why he persecuted "me". This experience, said Saul, struck him blind for three days and brought him close to death. Then, in an unexplained hiatus, he went off to Arabia. He returned after three years to Damascus as a convert to the idea that Jesus was the Jewish messiah and the resurrected son of God. Saul was baptized as Paul in Damascus and spent the rest of his life as an apostle for Jesus, preaching the gospel with as much fire and fury as he had previously persecuted it. The New Testament records at great length how he pursued his missionary work all around the Mideast region.

What happened on the road to Damascus? Did Saul suffer an epileptic fit followed by a visual hallucination? Or was it a hangover caused by drinking too much soma the night before, followed by an encounter with the real Jesus, draped in white, who spoke to him in a voice so calm as to haunt him ever after? And what happened in Arabia?

Saul or Paul was a man of ideas. He was passionate in his advocacy of the idea that God had chosen the Jews to save the world. His conversion experience transformed his concept of the Jewish messiah. He had been convinced that Jesus had died on the cross and was thus a false messiah, but after thinking it over in Arabia he may have seen that a crucified and resurrected Jesus would have won a supernatural victory over death itself, and not merely over Roman attempts to intimidate him with their cruelty. In Paul's imagination, Jesus became a figure of transcendent power who turned a little local Jewish drama into an event that literally changed the world. A mere survival story would have deflated that claim. Paul was fired with a vision.

Paul went further. On his Christian missions he promoted the colossally charmless confabulation that Jesus died on the cross as a scapegoat to take the sins of the world off all our shoulders in the eyes of God. There was precedent enough in Temple sacrifice for this sort of thought, and it was an old idea that the messiah would be the holy lamb of God, but Paul presented an ugly death scene as a holy mission to redeem the world. It was a transformation of supreme hubris. The original sin of Christianity was born.

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Jesus might have recovered from the crucifixion during his quiet years in Damascus. The Essene community covered his tracks and he was fairly safe from his enemies, who were well over two hundred kilometers to the south in Jerusalem. But he could not stay long in the Roman province of Syria.

Persian historians relate that Jesus traveled north to visit the king of Nisibis, in what is now Turkey. The disciple Thomas went on ahead, and Jesus followed with his mother Mary, who may have been worried about her wounded son. But Jesus was still at risk of exposure, so he took to the road again and visited the king of Andrapa, in the province of Galatia. There Jesus asked Thomas to go on a mission to India, but Thomas didn't want to go. He had doubts about his ability to preach Hebrew ideas to Indians. But Jesus was insistent, and finally he even paid Thomas' fare there with "three pounds of unstamped silver" to make sure he went.

As it turned out, Thomas' stay in India was a big success. He went down to the Malabar coast in the southwest, in what is now Kerala, and founded a Christian community that still flourishes there among the locals. In the latter half of the twentieth century, the British monk Bede Griffiths continued

the work of St. Thomas in the community and is still warmly remembered at the ashram of Shantivanam.

If we can believe the sources, Jesus and Mary continued their travels eastward along the old silk road. A number of documents refer to Jesus' stay in Persia, where he stayed for years and acquired various names. In Parthia, it seems he became known as Yuz Asaf because he healed some lepers: They became the *asaf* (the healed) and *yuz* means leader, so Jesus was called the leader of the healed.

Yuz Asaf is said to have preached all over Persia and converted many people to his faith. Place names and relics scattered over Afghanistan and Pakistan record his wanderings. Together with Thomas he visited King Gundaphares in the city of Taxila (in what is now Pakistan) in 47 CE. But when the king paid Thomas to build him a new palace, Thomas spent the money on the poor, converted the king, and told him he would get his palace in heaven.

It seems Jesus also stopped over at Murree, in Kashmir, which at its comfortable elevation of over two kilometers in the foothills of the Himalayas was a British colonial garrison and sanatorium in the nineteenth century. Local tradition has it that the town is named after Jesus' mother Mary. A grave there called the "Final resting place of Mother Mary" is still maintained. If Jesus and Mary were in Murree, she would have been over seventy, so the story fits. The tomb is aligned east-west, following Jewish tradition, whereas later Islamic tombs in the region are always aligned north-south.

Although many of the religious relics in the region were destroyed in later Islamic conquests, Mary's grave survived, probably because Jesus is an esteemed prophet in Islam. The Prophet Muhammad's esteem for Jesus, Issa, is recorded in the Quran. There he denies that Jesus died at the crucifixion

(but spoils it by denying that he was crucified at all) and says: "We made the son of Mary and his mother a sign to mankind and gave them a shelter in a green valley watered by a fresh spring." This sounds like Kashmir.

An ambiguous saying of Jesus during his ministry adds weight to the idea that he retired to Kashmir. Jesus said he was sent to the "lost sheep of Israel". He might have been referring to the ten lost tribes of Israel from seven centuries earlier, who were driven out by the Assyrians. Having taught the western barbarians a lesson they would never forget at the crucifixion, Jesus would naturally have wished to minister to the "lost sheep" in the east.

If Yuz Asaf was indeed Jesus of Nazareth, the end of his life's journey seems relatively clear. He settled in the city of Srinagar in what is now Indian Kashmir. There he is buried in a tomb that he shares with a much later Islamic saint called Syed Nasir-ud-Din. The building housing the tomb is now a major local tourist attraction.

The tomb is intriguing. Both tombstones in the building are aligned north-south, in the Islamic manner, but they are just markers for the graves in an underground crypt, where the sarcophagus of Yuz Asaf is aligned east-west. Beside the tombstone is a flat stone with a pair of footprints carved into them. This is an ancient Asian tradition at the shrines of saints. These footprints are clearly marked with a pair of nail scars from the crucifixion. While researching the site in 1984, historian Holger Kersten asked for permission to exhume the remains for scientific tests, but when news of this planned desecration spread to the local community deadly riots broke out, so he dropped the idea.

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The early Christians had a tough time of it. After weathering the persecutions of Saul of Tarsus and other bad actors, after being rounded up and thrown by the cartload to the lions in the Coliseum, after watching their more charismatic leaders (such as Peter and Paul) martyred in public executions, and after struggling with their schismatic and heretical brethren to agree on such truths of faith as resurrection (the return of the soul after death to haunt a new and perfect body) and transubstantiation (the mystic process by which bread and wine become the body and blood of the savior), the early believers had to watch things in Judea go from bad to worse.

The first Christians were Jews, and for them the doctrines took second place to the simple practice of a faith that put communal life and neighborly love above ritual observance and obsession with purity. They lived among other Jews and felt no great divide between their own way of life and the ways of their fellow citizens. They had no prescribed scriptures or services. All that came only much later.

But the great merit of Christianity as a way of life in the ancient world was its inclusiveness. To live as a Christian you didn't have to be born to a Jewess or, if male, circumcised. So, eased by the missionary work of the first apostles, the faith spread quickly among gentiles and led to a supportive network of mission houses for traveling teachers and healers spread over the Mideast region.

The history of the Jews in Judea in those early decades was disastrous. The Roman emperor after Augustus was Tiberius, who won great military victories, for example in Germania, but was gloomy and unloved. When he died in 37 CE, he was succeeded by the young emperor generally known as Caligula ("little boots"), who was not up to the job and soon went totally insane. One of his more inspired moves was to insist

on having his godlike statue erected in the Jerusalem Temple. As the Jews mobilized to protest this desecration, Caligula was assassinated in Rome. His successor as emperor was Claudius, who did better. He appointed the popular Agrippa as ruler in Judea. But Agrippa died after only three years on the job, to be succeeded by a series of placeholders who failed to repress internal unrest. When Claudius died, Nero took over. Nero "fiddled while Rome burned" in the year 64 and accused local Christians of starting the fire. By then, the situation in Palestine was out of control. When Nero decided against the local Jews in a dispute involving a synagogue in Jerusalem, Jews and Greeks were soon fighting in the streets of the city. Jewish activists rose up against the Roman imperial forces, and Nero sent an army under General Vespasian to restore order.

In the year 67, the Roman army besieged and demolished a major fortress and soon secured all of Galilee. Along the way they sacked the compound at Qumran and burned it to the ground. Then Vespasian defeated the rebels in Jericho. Now only Jerusalem remained. Nero committed suicide, aged thirty, in what soon became known as the "year of the four emperors". In 69 CE, Vespasian became emperor, and kept the job for ten years. Meanwhile, his son Titus took over the field army in Palestine. Zealots turned the Temple into an armed stronghold and Titus besieged them. In August he defeated them and burned down the Temple.

But the Jews were a stubborn bunch of malcontents and resistance flickered on. The last Zealot stronghold was at the fortress of Masada, on the west coast of the Dead Sea just seventy kilometers south of Qumran. Masada fell in the year 73, and all the remaining Zealots in the fortress committed suicide rather than fall into the hands of the Romans.

And that was the end. Rome locked down the province with the Tenth Legion, built new imperial cities, and expelled Jews from several other cities. The militants had lost utterly. If Jesus were still following the news from his old homeland, he would have felt not only saddened but also vindicated. Force had failed. The proud Jewish culture celebrated in the Bible was reduced to scattered Diaspora Jews and Christians, waiting meekly for better days to dawn.

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The Roman Empire lived on in slowly diminishing glory for several further centuries. It became a Christian empire when the emperor Constantine the Great, who reigned from 306 to 337 CE, came out personally as a Christian and proclaimed official tolerance for all religions throughout the empire. In his new role as official protector and sponsor of the Christian Church, Constantine became the first *pontifex maximus*.

The new imperial religion was given the seal of orthodoxy at the First Council of Nicaea in the year 325. Nicaea was a short hop across the Straits of Bosphorus from the ancient Greek city of Byzantium, and the council there fixed the outlines of the early doctrine of the church. The hundreds of bishops who attended the proceedings pronounced on the nature of Jesus as "consubstantial" with his heavenly father, abominated a few heresies, signed off on a canonical set of books for the Bible and banished all the other candidates to the apocrypha, and also voted to accept the Nicene Creed, which defined once and for all the main tenets of the faith of the Roman Catholic Church.

Five years after the conference, Constantine founded a new city on the site of Byzantium. He called it Nova Roma but it soon became known as Constantinople.

The Western Roman Empire was already declining. Rome was having a hard time defending its remote borders from barbarian attacks. The last pagan emperor of Rome was Julian the Apostate, also known as Julian the Philosopher, who was a Neoplatonist but ruled for only two years. He died in 363, in Mesopotamia, doing battle against the Sassanid armies of the Persian empire, with its Zoroastrian religion.

Theodosius was the last emperor to rule over a united Roman Empire. He declared the Roman Catholic Church to be the official state religion in 380 and decreed the destruction of pagan temples across the empire in 391. It was downhill for the empire from then on. Rome was sacked by the Visigoths in 410, by the Vandals in 455, by the Ostrogoths in 546, and by the Muslims in 846. The Roman Empire in the west lived on only through its church.

After the fall of Rome, Constantinople was the biggest and wealthiest European city, and stayed so for a thousand years, until the Muslims took it.

In one respect, in least, the human world had made real progress since agriculture began, when the planet hosted a million people. In the fourth century CE, the population of the Roman Empire alone was over fifty million.

Muslims

In ancient times, an empire occupied the area now called Eritrea and northern Ethiopia. Its king lived in the capital city of Aksum. The Aksumite empire flourished for many centuries and converted to Christianity in the early fourth century CE. The empire played a big role in the commerce between the Roman Empire and India: the Persian writer Mani called it one of the four great powers of his time along with Persia, Rome, and China. And the Aksumites conquered Arabia. But before we come to that, we meet two men.

Mani, whom the Romans called Manes or Manicheus, was more than just a writer. He lived in Mesopotamia in the third century and founded a new religion, to follow Christianity, Zoroastrianism, and Buddhism. His religion was based on a cosmic dualism of good and evil, locked in eternal struggle. He even claimed to be the last prophet promised in the New Testament, but Muslims later objected and said Muhammad was that man. Manicheism thrived between the third and seventh centuries and spread as far east as China and as far west as the Roman Empire.

The second man we meet is the Christian Saint Augustine, who after a Christian childhood became a Manichean young man. He was born in 354 CE, grew up in Roman Africa, and studied rhetoric in Carthage (now a suburb of Tunis). As a teenager he hung out with a bad crowd that enjoyed casual sex, until his conscience pricked him and he prayed: "O Lord make me chaste, but not yet." He lived with a mistress in Carthage for many years and they had a son.

At the age of thirty, Augustine was made the professor of rhetoric in Milan. He then read the philosophy of Plotinus, which made him recall his childhood Christianity and his lost innocence. In the summer of 386, he suffered a major crisis. He quit his job, gave up sex, and devoted himself to God. From his classic book of confessions:

> I threw myself down … and wept … I repeatedly asked you: "How long, O Lord? How long, Lord, will you be so totally angry?" … suddenly I heard a voice … repeating over and over again "Pick up and read, pick up and read." … So I … read the first passage my eyes lit on: "Not in riots and drunken parties, not in sex and vulgarity, not in strife and rivalry, but put on the Lord Jesus Christ and make no provision for the flesh in its lusts." … All the shadows of doubt were dispelled.

He gave all his money to the poor and converted the family house into a monastery. In 391 he was ordained in the city of Hippo Regius (now in Algeria) and started preaching against Manicheism. Soon enough he became the bishop of Hippo, and stayed there until his death.

Augustine's greatest achievement was to write a big book, *Of the City of God* (originally in Latin), to console Christians demoralized by the sack of Rome in 410. In the book, he said that in the church there are two realities, the visible and the invisible. The visible one is the institutional body established on Earth and the invisible one is the body of the elect, known to God. Today, in spiral dynamics, the invisible church is the global organism, Globorg.

Today, too, Augustine's writings on time are still among the clearest accounts of the subjective theory also held later by the Prussian philosopher Immanuel Kant and the modern

thinkers Albert Einstein and Kurt Gödel. Augustine argued that God exists beyond time in the "eternal present" and that time only exists within the physical universe.

On sexuality, Augustine was as illiberal as a fundamentalist can be. He preached that the original sin of Adam and Eve was a combination of pride and foolishness, and that Adam's guilt as transmitted to all his descendants weakens their will. Human nature is "wounded" by sexuality, and humanity is a mass of depravity. Sexual healing comes only by grace in the sacrament of Christian marriage.

Augustine saw the human being as a union of body and soul. His image of their union was marriage: your body is your wife. Your body is a physical thing, and your soul is above it. His views on women reflect classic patriarchalism: "It is the natural order among people that women serve their husbands and children their parents, because justice requires that the lesser serves the greater."

Augustine did understand that the six days of creation in the book of Genesis were not to be taken literally. He also understood that inaction in face of a wrong that could only be righted by violence was a sin: "The wise man will wage just wars." He prepared the way for crusades and *jihad*.

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Arabia was an open desert between the competing empires of Christian Byzantium and Zoroastrian Persia. The Himyarite kingdom of Arabia, which Greeks and Romans had called the Homerite kingdom, had its capital in Zafar, a fortified city in west Yemen built on the high top of an extinct volcano. Zafar included Jewish and Christian communities among the pagan Arabs, and Aksumite Christians built a church there in the fourth century. The state controlled the port of Aden,

where the ships of spice traders from India and ivory traders from Africa docked. Arab merchants also traded in sandalwood from Ceylon and medicinal herbs from Persia. It was a prosperous region.

At the end of the fifth century, Himyarite armies fought in northern Arabia against armed expeditions from Byzantium. The Byzantine emperors had long wanted to extend their reach into the Arabian peninsula in order to control the spice trade and the sea route to India. They also wanted to convert the pagan Arabs to Christianity.

Some of the Himyarite kings responded by converting to Judaism instead and taking up arms against the Christians. In about 520 CE, Arabs slaughtered the Christians in the city of Najran in southwestern Arabia and destroyed their churches and monasteries. Najran was a stop on the spice route and its Jewish tailors were famous. The Romans had occupied the city and Christians had lived there for centuries. After the slaughter many Himyarites converted to Judaism.

The Himyarite monarchy met its nemesis. When news of the pogrom reached King Kaleb of Aksum in the year 525, he assembled an invasion fleet of Byzantine warships and sent an army of men and war elephants across the Red Sea. In the following decades, his Christian army conquered large parts of Arabia.

In the army was the Christian Abyssinian warrior Abraha, who rebuilt destroyed churches and built new ones. His most beautiful church was in Sanaa. It had gilded doors and a throne made of ebony and ivory. When a filthy Arab relieved himself in the Sanaa church, the furious Abraha sent an army with elephants to destroy the Kaaba (the big black cube that now sits in the Grand Mosque) in Mecca, in 552. But Arab tradition relates that he was unable to stop his own elephant

from bowing down in respect at the Kaaba and that Allah (God) arranged for a flock of birds to bomb the Christians. After the triumph of Islam, Abraha's church in Sanaa was demolished and a mosque was built on the site.

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Islam began with the prophet Muhammad. Muslims revere Muhammad as a messenger of the one God, Allah, and the last prophet of God. They say he restored the pure faith of Abraham, Moses, and Jesus, which Jews and Christians had corrupted over the centuries.

Born in Mecca in 570 CE (some say in 552), Muhammad was orphaned and raised in the care of his uncle. He worked as a merchant and shepherd and married in his twenties. To restore his spirit, he retreated periodically to a cave in the mountains near Mecca for weeks of meditation and prayer, and later reported that there, at age forty, he received his first divine revelation. The story goes that the Angel Gabriel (the same messenger who in the Torah appeared to Daniel in Babylon and in the New Testament appeared to Mary to tell her the Holy Ghost would beget a son upon her) appeared to him and commanded him to say something like this:

> Recite! In the name of your Lord and Protector
> Who created man from a clot of blood
> Recite! Your Lord is most bountiful
> He taught man writing
> And taught him things he knew not

This first revelation distressed Muhammad, who had never learned to read and write and hence lacked the knowledge to understand his predicament. He feared that his peers would say he was possessed by demons and he considered suicide.

He described the revelations as like the ringing of a bell, and his favorite wife Aisha reported seeing him receive a divine message on a cold day with sweat dripping from his forehead. Some say seizures accompanied the revelations. Whatever the medical facts, three years after the first revelation Muhammad started preaching publicly, proclaiming that God is one, that complete surrender or submission (Islam in Arabic) is the only acceptable way to God, and that he, Muhammad, was God's prophet and messenger.

The divine message was met with hostility, and in 622 CE the neighbors forced Muhammad and a few of his followers to flee to Medina. This exodus marks the beginning of the Islamic calendar. In Medina, legend has it that Muhammad persuaded the local tribes to agree to a written constitution, which became the formal basis of the first caliphate. After eight years of fighting, Muhammad rode at the head of an army of "ten thousand" tribesmen that conquered Mecca. The victors demolished the pagan idols in the Kaaba (the cube was later appropriated by Islam) and went on to destroy paganism in Arabia. When the Prophet died two years later, the tribes of Arabia were united under Islam.

The revelations that Muhammad reported over the years were collated by his followers over many more years into the Quran, which most Muslims regard not only as the supreme literary classic in the Arabic language but also as the final and uncorrupted Word of God. How well the message survived the editing process and the political corrections that doubtless ensued is utterly unknown. Muslims hold the book in too much reverence to consider the question.

The core principles of Islam are simple. Shi'ites have their own ten ancillaries of the faith and Ismaelis have their seven pillars, but in Sunni Islam there are five pillars of the faith.

The Hadith of Gabriel (from the Hadith collection compiled by Muhammad al-Bukhari in the ninth century CE) presents them as the Five Pillars of Islam:

1. Shahadah: A Muslim must testify that there is no god but God and Muhammad is the messenger of God.

2. Salat: Muslims must pray five times daily. They must wash themselves before prayer and must pray in set positions.

3. Zakat: If they are wealthy enough, Muslims are required to give alms to the poor or needy.

4. Sawm: Muslims are obliged to abstain from food and drink from dawn to dusk during the month of Ramadan.

5. Hajj: Every able-bodied Muslim must make a pilgrimage to Mecca at least once in his or her lifetime.

A more helpful list of "six pillars" comes from the modern Anglo-Indian Sufi Idries Shah: God exists, God is one, there are angels, there are prophets, there is a day of restoration, and there is fate. The rest is mere tradition.

The Prophet established a caliphate in Medina. The caliph was regarded as the commander of the believers, and at first the caliphate was governed as a direct democracy under the patriarch. Medina remained the capital for the period of the Rashidun (Arabic for "rightly guided") caliphate, in which there were four caliphs: Abu Bakr, Umar, Uthman, and Ali. As the first caliph, Abu Bakr, lay dying, he nominated Umar as his successor. When Umar was killed, a council of electors chose Uthman to take over. Soon he was killed too, and Ali took over. But he was assassinated after five years of tumult. The Rashidun caliphate endured for a total of less than thirty years after the death of the Prophet.

The early history of Islam showcases red psychodynamics in action. Uthman's relative Muawiyah defeated a crowd of rivals to become the next caliph and founded what became known as the Umayyad dynasty. The dynastic caliphate grew rapidly as its bloodthirsty warriors fought their way westward clear across North Africa and eastward through Persia into lands that are now in Pakistan.

The House of Islam became a vast domain that displaced the Persian Sassanid Empire and large parts of the Byzantine Empire. The caliphate had evolved into a formidable military power whose cavalry defeated all foes. Their swift victories were due to their martial prowess with their fast horses and sharp scimitars. But the driving force behind the expansion was not religion in any blue-level sense. Islam, submission to Arab rule, was driven at first by a more practical imperative. The main aim of the early campaigns of conquest was simply to seize control of fertile land and water.

In the first few decades of the eighth century, Muslim or Moorish armies crossed the Strait of Gibraltar and conquered the Visigoths in Spain. The province of Al-Andalus (the Arab name for the Iberian peninsula) became part of the caliphate and was ruled from Damascus.

But the expansion into Europe failed to get much further. A Moorish army from Al-Andalus pushing into France was defeated by the Frankish leader Charles Martel, also known as Charles the Hammer, at the Battle of Tours in 732 CE. The battle halted the northward thrust of Islam.

The Umayyad dynasty was hard pressed to keep control of its huge territories and faced numerous rebellions. Finally, after less than ninety years, various groups united to bring it down, in 750 CE. The new dynasty of the Abbasids, named for their descent from the Prophet's uncle Abbas, took over,

and twelve years later shifted their capital to Baghdad. There the Abbasid caliphate flourished, and launched the golden age of Islam.

As the Abbasids took over the caliphate, the last survivors of the Umayyad dynasty fled across Africa with a loyal army of mounted warriors and grabbed power in Moorish Iberia. Under its new bosses, Al-Andalus broke away from Abbasid rule to form the Caliphate of Cordoba, which ruled most of the Iberian peninsula until it fragmented in the eleventh century. This period was a golden age for Iberian technology, trade, and culture.

The Abbasid dynasty ruled from Baghdad for over three centuries. Abbasid scholars founded a library and a center for scholarly work and research called the House of Wisdom in the city. The house remained a leading center of intellectual endeavor for the entire lifetime of the dynasty. The scholars studied humanities and the sciences, including mathematics, astronomy, and medicine. They studied Greek, Persian, and Indian texts, and the house soon became the largest repository of books in the world. They translated many classic Greek works, including those by Pythagoras, Plato, Aristotle, Hippocrates, Euclid, Plotinus, and Galen, as well as works from Chinese, Sanskrit, Persian, and Syriac, all into Arabic. They were an international group and welcomed visiting scholars from Byzantium and India.

The famous mathematician al-Khwarizmi worked in the House of Wisdom in its early years. He developed algebra and algorithms (indeed both words go back to him) and also introduced Arabs to Hindu decimal numerals, including zero, which in later centuries traveled west as Arabic numerals to Europeans, who in the thirteenth century were still grappling with clumsy Roman numerals.

The House of Wisdom did more for mankind. Its scholars directed the construction of an astronomical observatory in Baghdad and used the data to improve the Ptolemaic system. A group of geographers then made one of the most detailed world maps of the time. Although the house didn't compare with a modern university in scope or scale, it was a cultural landmark in history.

Arabs dominated the caliphate in the first centuries, but later Persians and Turks dominated. Starting from Tunisia in 909 CE, a group of Arab Shi'ites broke free of Baghdad and formed the Fatimid caliphate. From their capital in Cairo, the Fatimids ruled over varying areas of the region for centuries.

Within the caliphate, Arab rule steadily weakened or broke down previous social and religious structures. The caliphs established religious schools that taught the Quran in Arabic and they built mosques across the region. But only a few of the people living under the caliphs were truly Muslim. Islam was an Arab faith.

Converts to Islam at the time were either tribal animists or pagans (advancing from tan, purple, or red psychologies) or they were monotheists in agrarian and urbanized societies. For pagans, converting to Islam brought them political and economic integration and put a new blue tone on their moral lives. For the monotheists, who were Christians, Jews, or Zoroastrians, the new order replaced their former Byzantine or Sassanid political allegiances with new Arab masters. But conversion to a new religion was not the real point. The Arab conquerors wanted only submission, and suspected converts of seeking to share Arab privileges.

Muslims lived under special laws that distinguished them from infidels. Islam initially meant submission to Arab rule. Non-Muslim subjects (*dhimmi*), such as Christians, Jews, and

Zoroastrians, were assigned an inferior status. As people of the book or covenant, they weren't forced to convert, but they were forced to pay a special tax, the *jizya*, and they were prohibited from wearing certain colors and from marrying Muslim women. Most of the special laws found a rationale of sorts in verses from the Quran.

The populations within the enormous new empire were gradually converted to Islam. Conversions occurred across central Asia and in sub-Saharan Africa. The House of Islam expanded and older societies were forcibly purged of their pagan traditions. There were numerous genocides.

Subject peoples were often converted after the breakdown of their former societies, in some cases following the mass immigration of Muslims, who established a social dominance that made conversion a wise practical move.

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Sufism is the inner, mystical dimension of Islam. Scholars describe it as a science of turning the heart away from all else but God (Allah), or the science of approaching the divine by purifying the inner self from filth and adorning it with noble traits. Sufis approach God by working toward a primal inner state of submission to God and love of God. They abandon dualism and multiplicity and even their own selves to achieve union with the divine.

Sufism as a distinctive mystic tradition or ascetic practice grew as a reaction to the worldliness of the second caliphate. The word *sufi* may have come from the Arabic word *soof* for wool (as in their rough cloaks), but an Iranian tradition traces it back to the Greek word *sophia* for wisdom. The modern writer Idries Shah said the word was new, and reflected Sufi attention to the sounds of the letters *s*, *u*, *f*.

Early Sufis would repeat the names of God and live ascetic lives. Their focus on God was intended to melt away the self in loving union with God. They often lived in mosques and taught seekers or disciples. Sufism owed something to Buddhist and Hindu mysticism, as well as to Christian mystics. Muslim conquests put many Christian monks and hermits, especially in Syria and Egypt, under the rule of Muslims. The infidels continued their spiritual life with stoic endurance and thus influenced the early Sufis.

Sufism flourished widely for over a millennium, operating at first in Arabic, then in Persian, Turkish, and a dozen other languages. Sufis organized themselves into devotional orders in the early medieval period. Most orders traced their lineage back to the Prophet Muhammad via Ali, who was his cousin and son-in-law and the fourth of the four "rightly guided" caliphs, but one order traced its line back to the Prophet via the first caliph, Abu Bakr, who was an old friend and father-in-law of the Prophet.

Nepotism ruled in early Islam. Ali, the fourth caliph, kept close to the first family by marrying Fatimah, daughter of the Prophet. Shi'ites say he was the first Imam. Their elder son, another Ali, was briefly caliph before retiring to Medina and cutting a deal with Muawiyah, who was the first caliph of the Umayyad dynasty and brother-in-law of the Prophet. Their younger son Hussein was martyred in the year 680 CE. His death is still mourned every year on the day of Ashura, when Shi'ites parade in bloody street scenes.

Toward the end of the first millennium CE, a number of manuals were written on Sufism. Two of them argued that Sufism originated in the Quran and was thus part of mainstream Islamic thought and even necessary for its fulfillment. This became the orthodox view for centuries.

Between the thirteenth and sixteenth centuries CE, Sufism gave rise to a flourishing culture. Sufis often helped to spread Islam and to create new Islamic centers. Persian Sufi poets and philosophers such as Rumi greatly raised the profile of Islamic culture in Asia, and Sufism played a major role in the life of mind in the Ottoman Empire.

The historical facts may help, but the doctrines are more revealing. A Sufi seeker begins by finding himself a teacher (female seekers are rare). The teacher must be authorized by another master of the way, ideally one who can trace a line back to Muhammad. The teaching transmits the divine light from heart to heart. Sufi seekers typically live with and serve their teachers for many years, and a good teacher adheres strictly to divine law. Like all mystic paths, Sufism depends on direct personal experience.

Sufi seekers are presumed to be in search of intimacy with the divine when they enter an order. Teachers recognize two main ways to go. A seeker can either go from the signs to the signifier, by purifying his lower or base self of all corrupting influences that block his view of all creation as the face of divinity, or he can go from the signifier to the signs, by responding directly to the pull of divinity.

With such inner journeys behind them, Sufi adepts have contributed to early ideas in psychology. For example, the Sufi doctrine of "subtle centers" addresses the awakening of spiritual intuition in ways that seem to resemble models of *chakra* in Hinduism. Sufi psychology starts from three basic concepts: Human beings have a lower self, a faculty of spiritual intuition, and a spirit or soul. These are said to interact in various ways.

A good Sufi master is like a physician of the heart, who can diagnose the seeker's problems and the purity of his in-

tentions and can prescribe a course of treatment. Seekers cannot diagnose themselves. Most masters insist on rigorous adherence to the main tenets of Islam. The seeker must turn away from sins, love of worldly things, love of company and renown, slavery to bad impulses, and the promptings of the lower self. The seeker must also be trained to prevent the corruption of his gains by overcoming ostentation, pride, arrogance, envy, and hope for a long life. A Sufi apprenticeship, it seems, is a serious commitment.

Like many old religious traditions in lands where poverty was rife, Sufism prized asceticism. A dervish was a Sufi on the path of extreme poverty and austerity. Dervishes were like mendicant friars in Christianity or fakirs, yogis, gurus, and other holy men in the Indian traditions. In all these cases, poverty was an honorable estate.

Sufis and dervishes did not understand their practices as techniques for getting to know God. They saw them merely as facilitators for such knowledge. The aim of the practices was to break the seeker as a person by stripping away all his habits, through solitude, silence, sleeplessness, and hunger. Then, by the grace of God, the broken man might find the intimacy he craved.

The doctrine gets heavier. *Dhikr* is the remembrance of God commanded in the Quran for all Muslims through a specific devotional act, such as the repetition of divine names and so on from the Quran. More generally, *dhikr* includes any activity in which the Muslim keeps an active conscious focus on God. To engage in *dhikr* is to practice consciousness of the divine presence. According to the Quran, the Prophet Muhammad is the ultimate exponent of *dhikr*.

Some Sufi orders engage in ritualized *dhikr* ceremonies, such as recitation, singing, music, dance (as performed by the

whirling dervishes of the Mevlevi order), incense, meditation, ecstasy, and trance. In a Sufi practice called remembrance of Allah by heartbeats, the practitioner imagines that the name of Allah is written on his heart.

Scholars sometimes describe Sufism in terms of a threefold approach to God:

> The canon is my word, the order is my deed,
> and the truth is my interior state.

Sufis believe the three are mutually interdependent. The order is the path that leads to the confession that God is one.

Sufism emphasizes subjective or inner states of mind that can't be observed from outside, and its poets use allegorical language to describe them. For example, they often mention drunkenness, which Islam abhors.

Before we pan out again from Sufism to the wider history of Islam, a brief roll call of a few famous Sufis will give us a more direct feeling for the ideas than doctrine alone can do. Here, then, are some big names from the Abbasid period.

Bayazid Bastami lived in the ninth century CE and was a Persian Sufi whose grandfather had converted to Islam from Zoroastrianism. Bayazid led a very ascetic life in a passionate attempt to attain a more perfect union with God. Ultimately, he annihilated his base self and became known as the first "drunken" Sufi, a title he earned by losing his awareness of any barrier between himself and God. He loved to discuss Sufism and believed in the unity of all religions.

Junayd Baghdadi was another early Persian Sufi, active a few years later than Bayazid. He laid a scholarly foundation for sober mysticism, in contrast to the useless shambles left by Sufis drunk on God. He defined a progression that leads to annihilation (*fana*) of the base self so as to achieve closer

union with God. This starts with renunciation and continues with solitude, concentration on God, honesty, and contemplation. *Fana* has three parts: loss of the base self, loss of pride, and loss of joy. Once a seeker finds *fana*, he can reach God. Then he returns to his senses, like a drunk sobering up. All this requires strict discipline and patience.

Mansur al-Hallaj was the first great Sufi martyr. He studied Indian magic in Sindh, accepted Hindu ideas, and may have believed in reincarnation. He said "I am the truth" and refused to recant this evidently outrageous blasphemy. To put his assertion in perspective, recall that the modern California mystic Deepak Chopra argued in favor of exactly the same claim in a 2000 book popularizing Hindu religious ideas. But al-Hallaj was imprisoned for eleven years in Baghdad, then tortured and crucified in 922 CE.

Mohiuddin ibn El-Arabi flourished in the late twelfth and early thirteenth centuries, and is renowned among Sufis as "the greatest master" and also as a genuine *wali* (saint or holy person). Here's a poem he wrote on truth:

> She has confused all the learned of Islam,
> Everyone who has studied the Psalms,
> Every Jewish rabbi,
> Every Christian priest.

Sufi ideas colored Jewish mystical traditions too. The ideas entered the Jewish mainstream through the work of Bahya ibn Paquda (also known as Bakuda), who was a philosopher and rabbi in Zaragoza, Spain. He authored the first Jewish system of ethics, written in Arabic in 1080 CE.

In Egypt, Abraham ben Moses ben Maimon had a taste for Sufism. He was the son of the Jewish philosopher Moses Maimonides (also known as the great Rambam) and lived in

Cordoba at the end of the Iberian golden age before moving to Egypt, where he wrote a "comprehensive guide for the servants of God" that may have been three times as long as his father's three-volume "guide for the perplexed". After Abraham died, in 1237, his followers continued to pursue a Jewish form of Sufism for a century or more.

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We need to return to more practical politics. The Crusaders conquered Jerusalem in 1099 CE and massacred most of its Muslim and Jewish inhabitants. The Fatimids were weakened, and they lost control of the region to Kurds from Syria, who formed the Ayyubid dynasty. Ayyub's son Saladin fought a *jihad* against the Crusaders, and liberated Jerusalem and the Levant from the Crusader occupation in 1187. Saladin went on as the reigning dynast to become the sultan of Egypt and Syria. The Crusades continued for decades.

The Mongols were shamanists (purple), but they were also great horsemen and world champions of homicidal ferocity. In the thirteenth century, Mongol hordes conquered or subjugated China, Korea, central Asia, and the Caucasus, and large parts of Russia, eastern Europe, and the Mideast.

Genghis Khan created the Mongol empire. As a warlord, he united the nomadic tribes of the Mongolian steppes and set them off on their bloody conquest of much of Eurasia. He once said his greatest joy was to kill his enemies and rape their women, and his genes are now well represented in the regions he conquered. He was also a wise and prudent man. Before he died in 1227, he selected a son as his successor and split his empire among his sons and grandsons.

When the shah of the Khwarezmian empire conquered all of Persia from the Turks, Genghis Khan sent a caravan to

establish trade ties with his empire. But the shah's men attacked the caravan. So an outraged Genghis invaded them. After taking their capital, Samarkand, his warriors destroyed all traces of their empire, leaving only scorched earth. They marched the people of Samarkand out of the city, beheaded them, and piled their severed heads in great pyramids as grim memorials to Mongol victory. Thus revenged, Genghis led his men back to Mongolia.

When Mongol forces invaded Anatolia (now Turkey) in 1244, they put the Ayyubid dynasty under threat, so the last Ayyubid ruler, who was a great grandson of Saladin, sent a diplomatic mission to the Mongol capital city of Karakorum. But the Great Khan was a true grandson of Genghis Khan and directed his brother Hulagu to lead a Mongol army on a ride to Egypt. Along the way, Hulagu and his horde sacked Baghdad and slaughtered its inhabitants, including the Abbasid caliph and most of his family, in 1258, then moved on to Syria, and took Aleppo, where they killed or enslaved most of the people there too.

In 1259, the Ayyubid dynasty fell to Mamluks, who were slave soldiers captured by the Turks in the Caucasus region. The Mamluk sultanate of Egypt made Cairo its capital and lasted for centuries. It ruling caste focused the whole society on military training. They defeated the Mongols in 1260 and retook Damascus and Syria.

The Mongol dynasty continued as the Chagatai Khanate. Tarmashirin became khan after destroying all opposition in India on his way to Delhi in 1327. But he failed to invade a breakaway Ilkhanate in Persia and Anatolia that had been founded by Hulagu. The Ilkhanate rulers, beginning with the seventh ruler Ghazan (Casanus) in 1295, embraced Islam. Tarmashirin then caused dissention among his Mongol peers

not only by living in Transoxiana (a steppes region around Samarkand in what is now Uzbekistan) and converting to Islam but also by adopting the name Aladdin. The Mongols thought he was a traitor to their tradition, so some of them killed him in 1334.

The next big name in this catalog of infamy is Timur. He was a Turkic Muslim who was born near Samarkand in 1336 and saw himself as Genghis Khan's heir. As a young man, he was somehow shot by two arrows that crippled him for life and led to his being known as Timur the Lame (Tamerlane to Europeans).

Timur went on to defeat the Mamluks of Egypt and Syria, the emerging Ottoman dynasty in Anatolia, and the declining sultanate of Delhi. Experts regard him as a military genius and supreme tactician. He gained power as a warlord among his Turkic tribesmen and then reduced the Chagatai khans to figureheads and ruled in their name. Mongol tradition denied him the title of khan because he was not descended from Genghis Khan, so he ruled behind a puppet khan.

Islamic tradition denied him the title caliph, too, because he wasn't descended from the tribe of the Prophet. So he created a myth of himself as a supernatural hero (code red) chosen by Allah, and called himself the Sword of Islam.

Timur spent the next few decades in various wars and expeditions. He fought his way to the lands near the Caspian Sea, to the banks of the Ural and the Volga, and into Persia and Baghdad.

He started by conquering Persia, and captured almost all of it by 1387. When the city of Isfahan surrendered to him, he was merciful at first, but when the citizens revolted against his taxes by killing a few of his men, he ordered the massacre of well over a hundred thousand people. An eye witness at

one killing field counted some thirty heaps, each containing some fifteen hundred severed heads stacked up like bloody cannonballs into a pyramid as high as a mounted warrior.

In 1398, Timur invaded northern India. He saw his campaign not only as *jihad* against the Hindus but also as a booty raid. But the sultan of Delhi's army fielded war elephants armored with chain mail, and Timur's men were afraid of the beasts, so Timur ordered his men to load camels with hay, and when the elephants charged at the men to set the hay ablaze and goad the terrified camels to run toward the beasts, causing the elephants to panic and stampede. Timur won an easy victory and sacked Delhi, with the usual mass slaughter and other atrocities.

For the next five years, Timur was at war. He fought the Ottomans and the Mamluks, and invaded Syria, where his men massacred thousands and deported the skilled workers to Samarkand. In the next season, his horde invaded Armenia and Georgia, and enslaved many thousands of the locals. Next, they invaded Baghdad, where after the usual massacre Timur said every man must return with at least two severed heads to show him. Then his warriors invaded Anatolia and defeated the Ottomans. In 1405, he was on his way to conquer China but caught a chill and died.

Muslim historians said the Timurid army acted more like a horde of savages than civilized conquerors. Altogether, their military campaigns caused the deaths of an estimated seventeen million people.

Among Timur's descendants, a man called Babur became the first Mughal emperor in 1526. He was descended from Timur on his father's side and from Genghis Khan on his mother's side, and first rose to prominence as a warlord on the steppes of central Asia.

The Mughal Empire was Islamic, though many of its subjects were Hindu or Buddhist, and it held most of India for over two centuries. It began when Babur defeated the Delhi sultans and at its height extended over a huge swathe of the subcontinent, from Baluchistan in the west to Bengal in the east and from Kashmir in the north to the Kaveri basin in the south, with well over a hundred million people, which was nearly a quarter of the world's population at the time.

The best years of the empire started with the accession of Akbar the Great in 1556. Under his rule, Indians made real cultural and economic progress. Akbar encouraged debate on philosophical and religious issues, he repealed the *jizya* tax on infidels, and he founded a famous House of Worship at Fatehpur Sikri. He maintained that no single religion could claim a monopoly of truth, and this inspired him to develop his own syncretic doctrine, which he called the Din-e Ilahi. This doctrine held sway for the last years of his reign. Akbar's ambition with his new faith was to reconcile the differences that divided his subjects. Din-e Ilahi was inspired mostly by Muslim and Hindu ideas but spiced with borrowings from Christianity, Jainism, and Zoroastrianism. Unsurprisingly, it stirred up resistance from devout Muslims and Sufis, who denounced it as blasphemy against Islam.

Akbar was the third emperor. The fifth was Shah Jahan. His reign marked the high point of Mughal architecture, and he built many splendid monuments, including the Taj Mahal, which was a memorial for his third wife.

The Mughal Empire softened in an excess of luxury, and declined following repeated attacks from the Hindu Maratha Empire, which flourished in the seventeenth and eighteenth centuries but was defeated in turn by forces from the British Empire in the nineteenth century.

Before the Mughal dynasty began to the east of Persia, the Ottoman dynasty began to the west. The Ottoman dynasty was founded among Turkic tribes in Anatolia in 1299 CE. Ottoman armies besieged and conquered Constantinople in 1453 and renamed the city Istanbul, then made it the capital city of an Islamic empire. Within the new empire, the sultan allowed the Eastern Orthodox Church to keep its autonomy and its land, and most Orthodox subjects apparently lived peacefully enough under Ottoman rule.

Centuries earlier, after the first Mongol sack of Baghdad, a surviving member of the Abbasid house had been installed as caliph at Cairo under the patronage of the Mamluk sultanate. This shadow caliphate continued for centuries.

An Ottoman army defeated the Persians in battle in 1514, and three years later another Ottoman army defeated the Mamluks in Egypt. The Ottoman sultans took over the title of caliph and established a new caliphate.

The Ottoman Empire and its caliphate endured for six centuries, into the twentieth century. Turkish was the official language, but the empire was cosmopolitan, and Persian and Arabic were also prominent. The empire prospered in the sixteenth century, thanks to its control of the major overland trade routes between Europe and Asia.

In its first phase of expansionism, a Turkish army led by Suleiman the Magnificent fought its way deep into the heartlands of Europe. In 1529, the Musulman invaders even besieged Vienna, but there they were defeated by an army led by the Holy Roman Emperor Charles V.

Suleiman then set to work expanding his empire in all the other directions. By the end of his reign, it stretched from Hungary and Poland in the north to Yemen and Eritrea in the south, and from Algeria in the west to Azerbaijan in the

east. It had about fifteen million subjects and its navy controlled much of the Mediterranean.

But soon after Suleiman died, a Holy League of Catholic states won a major naval victory over the Ottoman fleet at the battle of Lepanto, off Greece, in 1571. This was the last big naval action fought by galleys, which were propelled by oars, and each fleet deployed over two hundred of them. But some of the Catholic galleys were bigger and carried more sails, making them more maneuverable. And the Catholic fleet had far more cannons and muskets, whereas the Ottoman forces relied largely on bowmen. The battle ended the Turkish naval threat to the Catholic coastal cities along the northern shores of the Mediterranean.

European voyages of discovery in the fifteenth century weakened Ottoman rule when new sea routes let European merchants evade the Ottoman control of trade with the east. Then in the sixteenth century a huge influx of Spanish silver from the New World led to steep price inflation across the Mediterranean region. Due partly to these developments and partly to religious conservatism, the Ottomans gradually fell behind Europeans in military technology.

The Ottoman sultans declined too. Some blame a woman from the harem of Suleiman the Magnificent for starting the rot. Captured as a slave in Poland and later called Roxelana, this lady charmed Suleiman enough to make him break with tradition and marry her. She arranged to have his previous son and designated heir, a fine young man called Mustafa, murdered in order that her son Selim could take over. Selim the Sot was a fat drunkard, who never saw battle and died in his bath. His son and heir was also a drunkard, but he sired over a hundred children. Thereafter, for centuries, the line of sultans degenerated into depraved monsters and weaklings.

A dynastic system has no easy defense against degeneracy. The sultan was the absolute ruler and lived in absurd luxury in the Topkapi palace, but to stay in power he had to murder his rivals and he had to imprison his sons to keep them safe. Meanwhile, in the empire, executive authority was delegated to a grand vizier. After the climactic reign of Suleiman, the grand vizier became the effective head of state. A grand vizier led the next push into Europe.

In 1683, an Ottoman army of between one and two hundred thousand men led by Grand Vizier Kara Mustafa Pasha advanced on Vienna and besieged the city for two months, but was then defeated by the combined forces of the Holy Roman Empire and the Polish-Lithuanian Commonwealth. The death blow for the Ottomans came when some twenty thousand cavalrymen – reputedly the largest cavalry charge in history, led by King Jan III of Poland at the head of three thousand "winged hussars" – charged down a hill and broke the Ottoman lines. In less than three hours, the Christians had won. Vienna was saved. After the battle, King Jan paraphrased Julius Caesar by saying *Venimus, Vidimus, Deus vincit* (we came, we saw, God conquered). The Christians pressed home their victory and forced the Ottomans to give up large territories in Europe.

The Ottoman Empire began a long, slow decline. After it lost a series of wars against Tsarist Russia in the eighteenth and nineteenth centuries, European statesmen began calling it the sick man of Europe. A dynamic Young Turk movement began in 1908. After the Ottomans fought on the losing side in the Great War, the Young Turks abolished the sultanate and caliphate and founded the new Republic of Turkey.

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Before the Ottomans invaded Arabia, some Arabs became fundamentalists. Salafists were inspired by the early Muslims, those of the first generations, who lived under the Rashidun caliphate and are therefore known as the *salaf* (predecessors or ancestors). Their main ambition was to live by the original interpretations of the Quran and Hadith.

One Salafist was Muhammad ibn Abd al-Wahhab, who lived in Arabia in the eighteenth century. Wahhab wanted to go back to first principles and purge all the practices and accretions to the faith that he considered to be impurities and innovations. He was an iconoclast.

As a young man, Wahhab studied in Basra (in southern Mesopotamia) and also in Mecca and Medina. In Medina, he was introduced to a teacher called Mohammad Hayya Al-Sindhi. They became very close and stayed together for some time. Hayya encouraged Wahhab to reject rigid acceptance of classical commentaries on the Quran and Hadith and to reject popular cults that venerated "saints" (*wali*) and their tombs. Wahhab learned to read and preach his own interpretations of verses from the Quran, in defiance of the scholars. In response, the scholars denounced his readings. He went his own way, and his example gave rise to Wahhabism, a branch of Sunni Islam.

Wahhabis claim to possess the correct understanding of the wider Islamic doctrine of monotheism or Tawhid, which affirms that Allah alone is the believer's *rabb* (lord), that there is only one form of worship, to Allah, and that the traditional names and attributes apply to Allah. They insist on the Five Pillars of Islam and condemn anything but Tawhid as *shirk* (idolatry or polytheism), which they regard as an unpardonable sin if the "shirker" does not repent before death. They say the Christian idolatry of Jesus is *shirk*.

Wahhab the iconoclast returned to his home in Uyayna in 1740 and attracted a few followers. But he desecrated the grave of one of the companions of the Prophet and ordered that an adulteress be stoned to death, so outraged citizens expelled him from the town.

A tribal leader called Muhammad ibn Saud ruled in the nearby town of Diriyah and invited Wahhab to live there. Saud and Wahhab then made a deal: Saud pledged to enact and enforce Wahhab's ideas, and Wahhab allowed the House of Saud to lead the movement.

The Saudis saw veneration of the historic sites of Islam as *shirk*, so they destroyed many of them. In the first years of the nineteenth century, they captured the holy Shi'ite cities of Karbala and Najaf and destroyed the tombs of Hussein (the Shi'ite martyr and grandson of the Prophet) and Ali (the fourth caliph and son-in-law of the Prophet), then captured Mecca and Medina and demolished the shrine over the tomb of Fatimah (daughter of the Prophet).

The House of Saud went on to conquer Arabia, and ruled until Ottoman forces took over. Wahhabis fear *shirk* of their *wali*, so they prefer to be called Salafists.

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Some modern mystics regard Sufism as a way to bypass the strictures of Islam and make direct contact with the divine. One such mystic initiative is Universal Sufism. This is a form of Sufism that promotes the essential unity of all faiths and accepts members from any religion.

Inspiration for such initiatives can come from reading the (translated) works of such stars of the literary world as the great Sufi poet Jalaluddin Muhammad Rumi. Born in Persia (in what is now Tajikistan) in 1207 CE, he lived most of his

life in the Seljuk Sultanate of Rum (before it succumbed to the Ottomans), where Sufism flourished for centuries, and wrote wonderful verses that are still widely read in the region. Here is a verse of his on truth:

> The Prophet said that Truth has declared:
> "I am not hidden in what is high or low
> Nor in the earth nor skies nor throne,
> This is certainty, O beloved:
> I am hidden in the heart of the faithful.
> If you seek me, seek in these hearts."

Rumi's Sufi teacher was a wandering dervish called Shams Tabrizi, who according to tradition, taught Rumi in seclusion for a period of forty days before fleeing for Damascus.

Many modern readers have responded warmly to Rumi's poetry. In 1994, the former Oxford fellow and global mystic Andrew Harvey published a book celebrating Rumi's "way of passion", as symbolized by the love for Shams expressed in his poems. By 2007, Rumi had become the most popular poet in America.

Rumi's son Sultan Walad founded the Mevlevi order of whirling dervishes, who danced their way to divine ecstasy. Their order and all its appurtenances (such as lodges, dress, and music) were outlawed and abolished in 1925 by Turkish President Kemal Atatürk. Now only a few dervishes are still dancing, in America.

A less famous but more recent Sufi was Idries Shah, who was born in India in 1924 and grew up in England. He wrote numerous books on Sufism and presented its ideas in modern psychological terms. He regarded Sufism as an individualistic form of universal wisdom with ancient roots in Buddhism and Jainism.

Traditional Sufis say their ideas fall within Islam. In 2005, in the wake of the historic Amman Message on Islam, two hundred Islamic scholars from fifty nations ruled that Sufism is part of Islam. But Salafists continue to reject Sufism.

Altogether, the dreamy and mystic tradition of the Sufis, who cultivated links with Buddhist and Christian mystics, seems to have all but vanished in mainstream Islam, as daily news headlines attest all too clearly. The spiritual dimension of faith has been purged from Islam, to be replaced by harsh and cruel forms of fundamentalism that lead to a doctrinaire culture of arrogance, hatred, murder, and discord. The pure faith that the Prophet tried to restore has become an empty faith in a God with ninety-nine names, which cancel to leave no name at all but Allah.

There is a reason for this disaster. The God of Abraham is an image generated by dreaming within the legacy of ideas that prevail in a tribal patriarchy. When those bonds on the imagination are loosened, all the Sufi discipline in the world can do no more than awaken the seeker to the amorphous luminosity forming the ground of the self. That presence was already well recognized in Buddhist practice, and the result is that Sufism seems irrelevant to Islamism.

Fundamentalists have subordinated the cult of Allah to the political cult of a holy – or rather an unholy – self. That self transcends the person of the seeker and retreats from all his efforts to grasp it. It is a brilliantly refractive entity beyond the everyday psychology of selfhood. Perhaps we may call it the diamond of pure selfishness.

Scientists

The medieval darkness in Europe endured from the fall of Rome to the fifteenth century. Christian dogma formed the top layer of ideas in feudal societies where old superstitions and witchcraft lingered for many centuries. Charlemagne was crowned emperor of the Holy Roman Empire at St. Peter's Basilica in Rome in 800 CE, and his empire covered much of western Europe, but for most of the period the continent was divided into warring kingdoms and principalities. Two major low points of the later period were, first, a series of crusades against Islam from the eleventh to the thirteenth centuries, and second, the outbreak of bubonic plague or the Black Death in the fourteenth century, which halved the population of the continent in just a few years.

The crusades led to unrest against the Jewish communities in Europe. There were mass killings of Jews in various cities in the twelfth and thirteenth centuries triggered by a strange "blood libel" accusing Jews of murdering Christian children to use the blood in Passover ceremonies. Many thousands of Jews were murdered in the Rhineland in Germany in 1096. In newly Christianized Spain, returning crusaders began a "holy war" against Jews that escalated into wider discrimination, for example by requiring Jews to wear yellow badges. In 1492, the Catholic monarchs of Spain ordered the expulsion of the Jews from the kingdoms of Castile and Aragon.

Light began to dawn at last when Mediterranean traders and travelers rediscovered the east. The Renaissance found a focus in Italy, where rich merchant dynasties like the Medici

family in Florence sponsored new developments in the arts and sciences. For centuries, scholars in the east, especially in the Abbasid caliphate, had preserved and extended the corpus of classical learning. When the Ottoman Turks took over Constantinople in 1453, many Byzantine scholars fled west with their unique knowledge and their classical manuscripts. During the Renaissance, such long-neglected philosophers as Plato and Aristotle began to be studied again in Europe, and Christian schoolmen began to open their minds to ideas that rose above church dogma.

Science had its earliest roots in astronomy. The stars and planets move in ways that are easier to observe and predict than most other natural phenomena, and Greek thinkers had plenty of good ideas about the heavens, which found a basic synthesis in Ptolemaic cosmology, where the heavenly bodies moved in perfect circles around the Earth. New observations by Arab and other astronomers showed that the actual orbits of the planets were far from perfect circles, and a system of epicycles was invented to preserve the appearances. The revised system of concentric crystal spheres, and spheres within spheres, rotating in harmony around the Earth, as the center of the universe, gave rise to a vision of the cosmos that was still consistent with religious orthodoxy. Not only was the Earth the fixed center of all creation, but simple people could still imagine it was flat.

The Renaissance gave a new impulse to radical ideas that went beyond Ptolemy. The Polish monk Nicolas Copernicus reconsidered the complicated system of epicycles and concluded that by far the more likely hypothesis was that all the planets, including the Earth, orbited the Sun. He explained his hypothesis in a book published in 1543, using the new technology of printing with metal type.

The spread of printing let the world of ideas move faster. It also democratized the reading world. The new printing process used little bits of cast metal type assembled in sticks and cases, and then topped with oil-based ink for the press. The process was developed by Johannes Gutenberg in Mainz in Germany in the middle decades of the fifteenth century. His printed edition of the Bible (in Latin) was a milestone in publishing history. The technology quickly spread, and in its wake came a revolution in reading habits.

Historians agree that the Italian academic Galileo Galilei was the first great scientist. Born in 1564 and educated in a monastery near Florence, he later fathered three children out of wedlock. The two daughters had to go to a convent but the son was legitimized. So much for sex and religion.

As a teenager, Galileo enrolled at the University of Pisa to study medicine. Sitting in a cathedral one day, he noticed a hanging lamp that swung in arcs of varying size. He timed it with his heartbeat and found it took the same time to swing whatever the arc size. He checked the result at home and started thinking, and then enjoyed a lecture on geometry and decided to study mathematics.

In 1589, he was appointed to the chair of mathematics in Pisa. Soon he moved to Padua, and for some years he taught geometry, mechanics, and astronomy. He made fundamental contributions to physics, based on experiments he performed in his laboratory:

• He proposed a principle of inertia: A body moving without friction on a level surface continues with the same speed and direction unless disturbed. This contradicted the Aristotelian view that objects naturally slow down and stop unless a force acts upon them.

• He found that a body falls under gravity with uniform acceleration, as long as air resistance is negligible, and that the distance fallen from rest is proportional to the square of the time of fall. So the path of a ballistic projectile flying without friction is a parabolic arc, at least if the arc is much smaller than the Earth.

• He proposed a principle of relativity: The laws of physics are the same in any system moving at a constant speed in a straight line, regardless of its speed or direction. Galilean relativity survives in modern physics.

Galileo also made some big discoveries with his home-made telescope. He first gained fame as an astronomer for his work on Kepler's supernova of 1604. He found that this new star seemed fixed and concluded that it was far away, which contradicted the Aristotelian view that the heavens were unchanging.

Galileo's book *The Starry Messenger* (1610, in Latin) related his main astronomical discoveries. We can order them by the distance of their objects from the Sun:

• He observed sunspots and proved they were not transits of Mercury (or of a new planet called Vulcan). Their existence was another problem for the Aristotelian view that the heavenly bodies were perfect and unblemished, and the periodic transits of the sunspots confirmed that the Sun spins.

• He discovered that Venus goes through a full set of phases like the Moon. The heliocentric model predicted that every phase would be visible, whereas in the Ptolemaic view Venus was on a crystal sphere inside the solar sphere, so only some phases would be possible. So his observations contradicted the Ptolemaic model.

• He observed that the uneven waning of the Moon was due to lunar mountains and craters, and he calculated the heights of the mountains. So the Moon was not a translucent and perfect sphere, as Aristotle had claimed.

• He discovered four small "stars" close to Jupiter and concluded that they were moons orbiting the planet, which again contradicted the Aristotelian view that all heavenly bodies went around the Earth. Today we call them the Galilean moons of Jupiter (Io, Europa, Ganymede, Callisto).

When the Church of Rome decreed that the Copernican hypothesis was contrary to holy scripture, Galileo traveled to Rome to defend the hypothesis. He even cited St. Augustine against literal readings of the Bible, but to no avail.

In 1623, Galileo published a book (*The Assayer*, in Italian) with so many good ideas in it that people call it his scientific manifesto. He said the laws of nature are mathematical:

> Philosophy is written in this grand book, the universe … in the language of mathematics, and its characters are triangles, circles, and other geometric figures.

Encouraged by the election of a friend and admirer as Pope Urban VIII, Galileo decided to write a popular book on the Copernican hypothesis. He published his *Dialogue* (1632, in Italian) with permission from the pope and the Inquisition. But the pope had asked him to include his papal view in the book, and Galileo responded by pinning the view to a character called Simplicio. The pope was not amused.

Galileo was called to Rome, brought before Inquisition, and threatened with torture, but he denied all the charges. The Inquisition found him guilty of heresy and required him to "abjure, curse, and detest" heliocentrism. They banned his

books and put him under house arrest for the rest of his life. They even ordered him to read the seven penitential psalms once a week for the next three years, but one of his daughters got permission to do that penance for him.

While under house arrest, in 1638, he wrote a great book on kinematics and the strength of materials. He died in 1642. Albert Einstein called him the father of modern science.

Not until the year 2000 did the Vatican formally apologize for their persecution of Galileo and accept that scientists were better equipped to discover the truth about nature than the ancient writers of holy scriptures.

The next big advance in cosmology was triggered by the work of Danish astronomer Tycho Brahe in the late sixteenth century. He was rich enough to build his own big telescopes in Denmark, and after many years of systematic observations published detailed new data on planetary movements that he bequeathed to Johannes Kepler.

Kepler was a mystically inclined German mathematician, and he used Brahe's new data to analyze the motions of the planets in detail. He concluded that the planets orbit the Sun in ellipses, with the Sun at one focus of each ellipse. He then derived three mathematical laws for the elliptical orbits and published his results in a 1609 book. Unfortunately, he also launched off into a blind alley with a theory that related the relative sizes of the planetary orbits to the five Platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedron). This sort of mystic numerology was all too common among mathematicians in those days. They took centuries to separate their ideas from magic and associate them firmly with science. But in the end they did.

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The technology of printing helped rebels put pressure on the Christian orthodoxy in Europe. The Protestant Reformation in the sixteenth century broke the monopoly of the Roman Catholic Church and disrupted what was widely seen as its oppressive and corrupt control over the faithful.

The fiercest of the Christian rebels was the German priest Martin Luther. Born in 1483 and trained as a monk, he felt hemmed in by the vow of celibacy, so at the age of forty he married a nun and they went on to have six children. His great obsession was that the church had lost sight of core Christianity. He preached that salvation comes alone through God's grace via faith in Jesus, and faith was a gift from God. In 1517, he protested to his bishop against the sale of papal indulgences and wrote a long list of "theses" criticizing the Church of Rome. He and his friends then raised a storm by publishing the theses for the reading masses using the new medium of printed flyers.

Stung into action, Pope Leo X had Luther interrogated. Luther said he didn't recognize the papacy and the hearing degenerated into a shouting match. That did it. The church excommunicated Luther in 1521.

Luther returned to regular preaching and promoted basic Christian values, in part with a catechism that he composed himself. Over years of scholarly deskwork, he made the first translation of the Bible into German. It was published in 1534 and soon became a big success.

The westward onslaught of Islam was news in those days. When the Turks besieged Vienna in 1529, Luther called the attack a scourge from God to punish the Church of Rome. But soon he was urging war against the Turks. He saw Islam as a tool of the devil and published tracts attacking it. In his later years, he poured his polemical energies into angry rants

against the Jews, which led to a bumper crop of bad fruit just four hundred years later.

The new printing presses gave Luther his success with his Bible. They helped the Protestant cause elsewhere in Europe too. In England, the King James Bible published in 1611 not only reinforced the prestige of the new Church of England, which King Henry VIII had disestablished from Rome in 1534 (to legitimize his six wives), but also became a literary classic that still, four hundred years later, is the default text among English translations of the Bible.

All across Europe, believers armed with Bibles in their vulgar tongues raised their voices with new and awkward questions for the priestly defenders of mumbo-jumbo. The more thoughtful among the readers began to apply critical thinking to previously holy articles of faith, and soon the monopoly on thinking about sex and death that the Church of Rome had held for a thousand years was no more. The Reformation was a watershed event in European history. Rome had no mathematical laws to fall back on.

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The first great prophet of science was also, by general consent, the greatest scientist who ever lived. He was Sir Isaac Newton, the Lucasian Professor of Mathematics at the University of Cambridge in England. He was a strict monotheist who believed in biblical prophecies. He stood at the great divide between the age of religion and the age of science, so it may come as no surprise that he wrote more pages on biblical hermeneutics and other occult matters than on science and mathematics.

Newton was born on Christmas Day (Richard Dawkins calls it Newton Day) 1642, and matriculated at Cambridge in

1661. The university closed after he graduated in 1665 because the plague was on the loose, so Newton lived at home for two years. There he invented the infinitesimal calculus, a new theory of optics, and the law of universal gravitation. The law of gravity hit him in 1666, when he sat in the garden and watched an apple fall to the ground and realized that the force of attraction that made it do so was like the force the Earth exerted on the Moon. He returned to Cambridge as a fellow in 1667, and was soon elected to the Lucasian chair (which Stephen Hawking occupied three centuries later).

Newton's great book had a long Latin title that people cite as his *Principia* ("principles"), which he published in 1687. In it he laid the foundations for most of classical mechanics, starting from his three laws of motion:

1. Unless acted upon by an external force, every body continues in its state of rest or of uniform motion in a straight line. (He took this law from Galileo.)

2. Force is the rate of change of momentum, or equivalently, the product of mass and acceleration.

3. Action and reaction are equal and opposite.

Today these laws appear in the first chapters of most physics textbooks. Newton also spelled out a new law:

Law of universal gravitation: Every massive body attracts every other such body with a force directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

His great philosophical principle here was that the dynamics of everyday objects and of planets and moons are governed by the same natural laws. The laws of physics rule not only

on Earth but also in heaven. He used his new infinitesimal calculus to derive Kepler's laws of planetary motion from his law of gravity and his laws of motion, and he spelled out the numbers for the architecture of the solar system. It was an astonishing achievement. Newton established the theory that the Earth orbited the Sun. The heliocentric theory was raised to the status of plain fact.

The *Principia* was only one of Newton's big achievements. He also built the first practical reflecting telescope, with a design that's still popular among astronomers, and worked out a theory of optics based on his observation that a prism splits white light into a rainbow of colors. He also worked on the physics of heat and sound. But his work in mathematics was historic. In his peak year, 1666, he invented the basic principles of the differential and integral calculus, and in his later years he used them to work out a whole series of new results. Later he got into a cat fight with Gottfried Leibniz over priority for inventing the calculus, but it's now accepted that they developed the main ideas during the same years, independently of each other. Newton proved a lot of other mathematical results too, but let's leave it there.

The Newtonian cosmology of a mechanical universe running like clockwork in accordance with the laws of motion and gravitation was born in those years. Given a fixed space and an initial distribution of matter, scientists could calculate with some precision the development over time of the matter in the universe. Space and time were taken as absolute, decreed by the Boss, and all the rest followed with mathematical certainty. It was a philosophical revolution that overthrew classical cosmology completely.

The mathematical approach to natural philosophy paid off in an overwhelming flood of exact new results that went on

for centuries. New planets were predicted and discovered, new laws were found to explain puzzling phenomena for the first time, and the new science of the physical world grew strong, free of religion. All that remained of the classics in the new clockwork cosmology were the names of the planets and the Euclidean geometry of space and time.

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Physics became the new name for natural philosophy. The new science began to illuminate other, older disciplines, too. Gradually, the ancient craft of alchemy, with its ambition to find "the philosopher's stone" and use it to transform base metals into gold, evolved into the new science of chemistry. Modern chemistry is built around the unifying idea that all physical stuff is made of atoms, and generally compounded from elements, where each element consists of a single kind of atom. The idea of atoms first appeared in ancient Greece, but it was only in the eighteenth and nineteenth centuries that experimental science caught up with philosophy.

The French chemist Antoine Lavoisier is often called the father of modern chemistry. His experiments on combustion disproved an old theory by showing that when, say, a piece of wood burns, the substance of the wood combines with a gas in the atmosphere for which he invented the name "oxygen" to form what we now call carbon dioxide and water vapor, with the crucial result that the mass of the wood and oxygen burned was the same as the mass of ash and gases produced. He published an influential textbook in 1789 but he was beheaded in the run-up to the French Revolution.

An English pioneer of the new atomic hypothesis was the chemist John Dalton, who mooted the idea in a paper first published in 1805. He drafted a table of the relative atomic

weights of six elements: hydrogen, carbon, nitrogen, oxygen, phosphorus, and sulfur. When he took an atom of hydrogen to weigh one unit, he found the other weights to be 12, 14, 16, 30, and 32, respectively, suggesting a deeper underlying pattern. In 1869, Dmitri Mendeleev in Russia collected the results accumulated by then into his famous periodic table, in which he ordered the sixty or so known elements by atomic weights and grouped them in columns by their properties. It was a huge achievement, for which he won the Nobel Prize in Chemistry in 1906.

Richard Feynman made a bold claim about atoms in his famous lectures on physics for future Apollo engineers:

> If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generation of creatures, what statement would contain the most information in the fewest words? I believe it is the atomic hypothesis that all things are made of atoms – little particles that that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another.

The atomic hypothesis gradually gained ground in the nineteenth century as the best way to provide a secure physical explanation for a flood of quantitative laws emerging from chemistry labs across Europe.

Biology, the science of life, was next. In the eighteenth century, the Swedish biologist Carl Linnaeus created the first systematic classification of biological species. He published the first edition of his *Systema Naturae* in 1735 and the tenth edition in 1758, by which time it classified over twelve thousand species of animals and plants. His classification was an

excellent basis for fieldwork but there was still no unifying theory that would transform biology into a science.

The classification of species into a tree of life crowned by the rational animal, *Homo sapiens*, still seemed supplementary to the old idea of the Great Chain of Being, which originated in the philosophies of Plato and Aristotle. The chain started from God and progressed down through angels, demons, stars, the Moon, kings, princes, nobles, men, wild animals, domesticated animals, trees, other plants, precious stones, precious metals, and other minerals. This great chain complemented a Ptolemaic cosmology of concentric spheres going from God down through heaven and the stars to the rocks beneath our feet and finally to the center of the Earth.

The Church of Rome was right to see heliocentric theory as a threat to their established power. As soon as we accept that the Earth goes around the Sun, we have to scrap the old Ptolemaic cosmology and revise the Great Chain of Being. And once we make any change there, the infallibility of the scriptures is gone. The whole kit and caboodle goes down the tubes, with nothing very obvious to replace it.

The old hierarchy of biology struggled on for a while but finally went down with a crash in 1859, when Charles Darwin published his new theory of the origin of species by natural selection, also known as the preservation of favored races in the struggle for life.

To start at the beginning, Darwin was born in 1809 as the fifth child of a wealthy doctor. He first went to medical school in Edinburgh but didn't like it, so his father sent him off to Cambridge to study for the priesthood. Charles read not only theology but also books by scientists and indulged a taste for riding horses and shooting wildlife. Then, as luck would have it, after graduating he was offered a chance to

work as a "gentleman naturalist" on a Royal Navy surveying expedition around the world. HMS Beagle would leave in four weeks. His father agreed to fund the trip.

The voyage began in late 1831 and lasted almost five years. Darwin spent most of his time on land studying the local geology and collecting plant and animal specimens while the ship surveyed the coastline. He kept a detailed journal of his observations and speculations, and regularly sent specimens to the experts at Cambridge. While on board, he read Charles Lyell's big new book on geology with great interest.

On the Galapagos Islands, Darwin found birds resembling the finches on the mainland but differing from island to island. He studied the tortoises and iguanas there too. He was struck by the oddity of kangaroos and platypuses in Australia and developed a new theory about tropical atolls. In Cape Town, he pondered what he had learned about the animals he had seen, and later wrote that the facts "seemed to me to throw some light on the origin of species".

When the Beagle returned to England in October 1836, Darwin had become a scientific celebrity. His father decided to fund his career as a gentleman scientist and Charles read a paper to the Geological Society of London. This secured his election to the society's council, and he became its secretary. But his health was poor, and soon he was bedridden for days on end with numerous symptoms. Some now say he had contracted Chagas' disease in South America.

Darwin wrote in his autobiography that he was first struck by the insight that the struggle for existence would preserve favorable variations in a lineage and destroy unfavorable ones in 1838, after reading a book by Thomas Malthus asserting that people breed faster than the food supply grows, so the poor will always starve. To test his new ideas, Darwin did

experiments on selective breeding in his country garden. His brooding and breeding continued in the background for fifteen years as he wrote books on geology and administered reports on the Beagle collections.

Darwin then renewed an old student interest and studied barnacles for eight years. This work made his reputation as a biologist. He resumed work on his theory of species in 1854. He began to write a paper but it soon expanded into a book. *On the Origin of Species* was published in 1859 and quickly became a bestseller.

Darwin's principal discovery was simple enough. It can be boiled down to an argument with three premises:

1. Each animal or plant species gives rise in each generation to more new specimens than the environment can support to adulthood, so that many young animals and plants die before reproducing.

2. In each new generation, there is a random variation in the individual properties of the young specimens, and at least some of this variation is heritable.

3. The young specimens with their various properties are differently adapted to survive in the natural environment or habitat of the species, so the well adapted flourish and go on to reproduce, while others languish and die.

Darwin was impressed by the fact the Earth is many millions of years old, as geological studies of rocks and strata showed, and that plants and animals have lived on it for millions of years too, as fossil remains showed. He realized that this age, given his three premises, is sufficient to have ensured that a steady progression of new species emerged over the ages that were ever more perfectly adapted to the environments they

lived in. As ever more heritable variations caused isolated groups of individuals to diverge from other members of their species, over time the groups lost their ability to interbreed, and thus they became separate species. Old species would die out and new species would replace them. Scientists might even be able to learn enough from the fossil record to trace the whole family tree of life back to a hypothetical common ancestor. That last universal common ancestor (biologists call her Luca) might have been just a thin soup of microbes in a warm pond many millions of years ago.

A theory was born that beautifully unified a new science of biology. As the American philosopher Daniel Dennett put it, Darwin had the best single idea that anyone ever had. The power of the general form of the evolutionary algorithm is still being extended in the sciences. Every day, it seems, new aspects of animal or plant physiology, human psychology, or human social behavior are making sense in the light of an evolutionary story of how and why they arose.

The theory of evolution, as it came to be known, ruined the philosophy of the Great Chain of Being beyond repair. The species that were imagined to be fixed were no longer so. Instead they were malleable on a timescale that exceeded the old biblical calendar by a factor of thousands, if not millions. The hierarchy in which man was on top was now seen to be an illusion, a product of human egoism. All species were equal from the neutral standpoint of evolution. They all lived beside each other in an ecosystem that either supported or hindered their individual struggles to survive. Human apes differed only in having more complicated mental lives, thanks to their big brains.

Even today, many believers in the Christian and Muslim traditions fail to grasp the elementary facts of evolution. The

idea that a patriarch god somehow made or at least designed life as we know it, and we humans in particular, is too natural to dislodge. The amazingly narcissistic idea that we humans are made in the image of a universal and omnipotent creator god evidently meets a deep need among believers for a sense of their own dignity and worth. But it's wrong, so wrong it's shameful. We should be embarrassed that people live among us who still think that way.

The hubris of monotheism is still with us in part because Darwin's theory says less than some people think. The theory explains the origin of species by explaining how a population of replicators that show heritable variation can evolve new forms. But the theory does not explain the origin of life or the origin of replicating organisms. Given that the laws of physics and chemistry allow in principle for the emergence of self-replicating structures, the operation over a long enough time of selection will generate the ever more finely adapted structures we call living organisms. But we must be sure that the laws of physics and chemistry can make the mechanisms. This is still a challenge.

The hubris of the god in our image is still with us in part because it meets a deep but inchoate psychic need. It seems to be a primitive expression of a fact about the subjective life of sentient beings. We shall return to this tricky theme later. Meanwhile, mind the gap.

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The sciences as they had developed toward the end of the nineteenth century gave rise to a new view of reality in which the ancient certainties of monotheism were under attack, if not irretrievably devalued. It was clear enough to all thinking men that the new biology dethroned man from his central

place in the tapestry of life on Earth as radically as the new astronomy had dethroned Earth from its central place among the stars in heaven.

In the new view, the Earth was just one planet in a family orbiting the Sun, and the Sun was just one star among more millions than we could count, apparently stretching off to infinity. On Earth, human beings were one animal species among millions, distinguished only by their big brains, and among the species there seemed to be a continuous gradation down to simple microorganisms that were hardly more than bags of chemicals, so even the previously unquestioned separation of living from inert matter looked likely to come under threat as chemistry advanced.

Within physics, the theory of thermodynamics arose from practical work on heat engines such as steam engines and the later internal combustion engines. These engines converted the chemical energy in coal or oil to mechanical energy, and in particular kinetic energy, that could be harnessed to move machinery or railway trains or ships. The first steam engines were built in England to pump out water from coal mines, and they were big, slow, clumsy machines that were also very inefficient. The Scottish inventor James Watt then improved their efficiency by adding a condenser, and soon they were in widespread use in mills and factories across the nation. The next step was to put a steam engine on rails to pull a train of carriages. One of the first locomotives was the Rocket, built by Robert Stephenson in Newcastle-on-Tyne in 1829. Its basic design became the template for steam locomotives for over a hundred years. Together, these innovations gave rise to the industrial revolution, which propelled Great Britain from irrelevance in the great scheme of things to stardom at the center of a global empire.

Internal combustion engines came next. The pioneering work here was done by a French engineer called Sadi Carnot. He published his theory of heat engines in 1824, at a time when steam engines were not well understood, and energy was not yet an accepted concept.

Carnot showed that the efficiency of an ideal heat engine depends only the two temperatures of its hot and cold parts. Later researchers refined the idea to show that the maximum efficiency was equal to the temperature difference divided by the absolute temperature of the hot part.

An ideal Carnot cycle engine is the most efficient possible, and assumes no heat conduction between hot and cold parts of the engine. In Carnot's idealization, such conduction is an irreversible process that reduces efficiency. Steam engines do work not by consuming heat energy (later it was realized that energy is conserved) but by transferring it from a hot body to a cold body, so their power increases with the temperature difference between the hot and cold bodies. The fact that a real heat engine is always less than perfectly efficient turned out to be a basic fact of thermodynamics.

The ideal Carnot cycle has four main parts. Inventors soon came up with new ideas for four-stroke internal combustion engines. The German engineer Nikolaus Otto defined what we now call the Otto cycle, and together with Eugen Langen produced the first practical four-stroke internal combustion engine. It was a massive machine with a single cylinder as tall as a person and it generated only half a horsepower, but it was better than the rest, and won the gold medal at the 1867 Paris World Exhibition. Otto and Langen's new factory was soon building hundreds of engines a year.

Otto developed his engine further and defined a cycle of four strokes made by a piston in a cylinder:

1. Intake (downward stroke): The piston sucks vaporized fuel and air into the combustion chamber.

2. Compression (upstroke): The piston compresses the mixture of fuel and air.

3. Power (downstroke): An electric spark ignites the mixture, which burns and pushes on the piston.

4. Exhaust (upstroke): The piston pushes the exhaust gas out of the chamber.

Thus he defined the heartbeat of the hundreds of millions of machines that transformed life in the twentieth century.

Karl Benz patented the gasoline-powered automobile in 1886 and founded the Mercedes-Benz company. He started with a workshop in Mannheim and developed new engines. He patented the throttle, the ignition coil and spark plug, the carburetor, the clutch, the gear shift, and the water radiator. He then built a horseless carriage, with three wheels and a four-stroke engine of his own design, and had it patented as an "automobile fueled by gas". He exhibited his Model 3 at the 1889 World Fair in Paris.

A little later, Rudolf Diesel developed what we now call the diesel engine. He graduated with top honors at the polytechnic in Munich and then helped his former professor for years to build up a new refrigeration company. In 1893, he published a treatise that led to his patent for a four-stroke compression ignition engine in which fuel injected at the end of the compression stroke was ignited by the heat of compression. He tested and developed his ideas at the MAN company in Augsburg.

Diesel engines went on to replace steam piston engines in many applications. Because they were more heavily built than

gasoline engines, they were used at first in fixed installations and ships, and only later in locomotives and trucks and cars. Compared with gasoline engines, diesel engines offer higher torque at lower engine speeds, and they run more efficiently due to their higher compression ratios and smoother combustion, which converts more heat to work.

The developing theory of thermodynamics had a deeply disturbing philosophical consequence that took a long time in the nineteenth century to spell out clearly in mathematics. The theory began to suggest that all the myriad combinations of atoms that made up gases, solid objects, life, and civilization were the results of random collisions of atoms subject only to Newton's familiar mechanics. Within thermodynamics, the second law was the apparently harmless statement that heat cannot flow spontaneously from a cold place to a hot one. Expressed in terms of entropy, this was equivalent to the statement that entropy can never decrease. But it took time to understand what entropy really was.

Austrian theorist Ludwig Boltzmann built a kinetic theory of gases that led to a deeper foundation for thermodynamics. Entropy turned out to be disorder or randomness, for example in the arrangements of molecules in a gas, and the second law arose from the mathematics of large numbers applied to the possible ways of filling large volumes with tiny molecules. The theory revealed a bleak picture of the entire universe as like a vast heat engine that was gradually running down as the stellar fires burned their fuel and entropy rose inexorably. There seemed no escape. The clockwork universe started out wound up, in a state of extremely low entropy, and was running down as entropy accumulated. One day, in the deep future, it would unwind completely, unless or until the Boss defied mathematics itself to wind it up again.

Entropy is basic. It took many decades for mathematicians to realize that entropy is related to information and can even be quantified in terms of bits. If you don't know what you're doing, tossing coins raises entropy. A single toss of a fair coin has one bit of entropy. A series of two fair coin tosses has two bits of entropy, and so on. If you know the results of the tosses, you collect information, bit by bit, and entropy stays unchanged. So information is negentropy. Some brave theorists even speculate that the whole of physics might be founded on information and entropy. But no one had any inkling of that in the nineteenth century.

Another new theory arose from new work on electricity and magnetism. Scottish mathematician James Clerk Maxwell came up with a unified theory of electricity and magnetism, expressed in just four partial differential equations, which he published in 1865. His theory had the surprising consequence that it explained the nature of light. In his theory, electric and magnetic fields vibrated together, each energizing the other, and the waves of vibration propagated at a speed determined by fundamental constants of nature. By what was obviously more than an amazing coincidence, this speed was identical to the measured speed of light. Maxwell calculated that light waves had frequencies of hundreds of trillions of cycles per second and wavelengths of less than a millionth of a meter. The fact that the speed of light was a constant was puzzling at first. In Newtonian mechanics, or rather in the Galilean relativity Newton inherited, the measured speed of light, say from a star, should vary with the speed of the source. But a famous experiment by Albert Michelson and Edward Morley in 1887 showed no variation. They had to wait for Albert Einstein to solve that little problem, in his special theory of relativity, in 1905.

More boldly, Maxwell predicted the existence of a vast spectrum of further vibrations, which soon became known as Maxwell's rainbow, stretching from what we now call gamma rays at the high-frequency end to radio waves at the long end. All of these new kinds of electromagnetic radiation were discovered in the following decades. The first were radio waves, which Heinrich Hertz made and measured in 1887. Guglielmo Marconi used them to develop a radio telegraph system, taking advantage of the convenient fact that radio waves reflected off the ionosphere and hence could be sent and received far over the horizon. For this work he shared the 1909 Nobel Prize in Physics with Karl Ferdinand Braun. Radio soon revolutionized telecommunications.

Maxwell's rainbow was a revelation. Again, Feynman said it well in his lectures:

> From a long view of the history of mankind, seen from, say, ten thousand years from now, there can be little doubt that the most significant event of the nineteenth century will be judged as Maxwell's discovery of the laws of electrodynamics.

Engineers quickly learned to build electric motors, dynamos, radio transmitters and receivers, and all the other machines and gadgets that went with them. One example had large consequences.

Charles Parsons started by inventing the steam turbine. Born in London, Parsons graduated from Cambridge in 1877 with a first in mathematics. He worked for a marine engine maker near Newcastle and developed a turbine engine that he used to drive a big dynamo. The combination of turbine and dynamo made it possible to generate electricity cheaply on an industrial scale, and hence made the electrification of entire

nations practical. Over a century later, every power station in the world uses this technology to make electricity.

The turbine engine also revolutionized shipping. Parsons founded his own company to build marine steam turbines. In 1897, his turbine-powered yacht Turbinia sped at well over thirty knots past the much slower ships of the line at Queen Victoria's Diamond Jubilee fleet review off Portsmouth, to the shame of the admirals, who thought their triple-expansion reciprocating steam engines were the state of the art.

The Royal Navy learned its lesson. It was First Sea Lord Admiral Sir John Fisher who first saw the need for a battleship armed with ten twelve-inch guns and a top speed of over twenty knots. HMS Dreadnought was powered by Parsons steam turbines, entered service in 1906, and instantly made every other battleship in the world obsolete.

Powered flight was the next new frontier. The Wright brothers Orville and Wilbur developed and flew one of the first airplanes in 1903. The brothers funded all their work on flight with their bicycle shop in Dayton, Ohio.

From the start, they regarded control as the key issue. Wilbur observed how birds rolled or banked into a turn, like people do on a bike, and the brothers settled on wing warping to control roll. They flew tests with kites and gliders, and built a wind tunnel for wing tests, until they built a glider that flew controlled turns, giving them three-axis control.

In 1903, the brothers built the Wright Flyer, using a wood frame covered in muslin. They also made their own wooden propellers and built a twelve-horsepower gasoline engine in their shop. The Flyer cost them less than a thousand dollars. They flew it at Kitty Hawk, North Carolina, in December.

They spent the next few years improving the Flyer. They were finally granted a patent for it in 1906. The claim is for a

method of controlling a flying machine by warping the wings for roll, using the elevator for pitch, and turning the rudder for yaw. Now we use ailerons instead of wing warping, but otherwise we still fly planes this way.

In the twentieth century, the land, the sea, and the air were conquered by millions of new machines powered by internal combustion engines and making use of electricity and radio. They transformed life on Earth almost beyond recognition.

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The new machines transformed life in the nineteenth century too. With their power to revolutionize the art of warfare and their appetite for raw materials, they energized Europeans as never before and forced an explosive expansion of European influence in the world.

The discovery of the Americas on the western side of the Atlantic Ocean was the forerunner of this global expansion. The Italian explorer Christopher Columbus, sponsored by the Spanish monarchy, discovered the transatlantic continents in 1492 (the same year the Jews were expelled from Spain) on a voyage in a new direction, exploiting the fact that the Earth was round, that he had hoped would take him to the Japans. Instead he opened the door on the greatest expansion of the body of Christ on Earth since history began.

The colonial invaders used firearms, cavalry, and artillery against the indigenous populations, but it was an easy victory. Some nine tenths of the native population in America died from diseases like smallpox, measles, and influenza, which the invaders had brought with them.

The colonists began to arrive in large numbers and soon invaded the entire double continent. To help them tame the vast expanses of virgin land that faced them, they imported

many thousands of slaves from Africa, shipping them across the Atlantic under inhuman conditions. The slave trade completely subverted the claim of white men of European stock to have progressed morally from centuries of Christianity.

The Christian civilization bursting forth from Europe used its new machines, including steamships, railways, heavy guns firing explosive shells, and machine guns, to subjugate and often to colonize every other civilization on Earth. The main actor for a while was Great Britain, with its narrow lead over the continental powers in the mechanization of industry and its strong navy, but other nation states in Europe were close behind, and soon many European states boasted their own retinues of colonial possessions.

Only one nation left the imperial age behind, and that was the United States of America. The Thirteen Colonies, as they were known, on the east coast of North America, fought a war of independence against rule by the British crown. The colonists declared their independence in 1776 and finally won internationally recognized independence in 1783.

But the star-spangled banner was stained by slavery. The result was a bloody civil war, when the anti-slavery Union in the north defeated the pro-slavery Confederates in the south. The war ended in 1865. The Union then waited a century to extend civil rights to America's black citizens.

The winners were the citizens of the age of science.

Communists

At its height in the nineteenth century, the British Empire was the largest empire the world had ever known. Although it was formed by a series of accidental accumulations as commercial enterprises consolidated their economic empires and as the monarch chose to support them with military force, the imperial domain expanded fast. Her Majesty Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith, Empress of India, ruled over almost half a billion people, which was then about a fifth of the world's population, and her realm extended over almost a quarter of the land area of planet Earth. Because the imperial realm was so extensive, proud Britons boasted that "the sun never sets on the British Empire".

The capital city of the British Empire was London. There, in the Victorian era, in the beautifully appointed reading room of the British Museum, the German Jewish philosopher Karl Marx wrote the books and pamphlets that inspired a revolutionary movement called communism. That movement purported to do for whole societies what the old religion of Christianity had done for individual people, namely to give them a stirring goal that illuminated their little lives in a big picture that seemed to give those lives meaning. It was the biggest revolution in human social thinking since the old days of Christians and Romans. The communist thrust dominated social and political events in the twentieth century.

Marx was a scholar with huge energy and ambition but no patience or tolerance for the humbler and more methodical

approach that most scholars took to their craft. He spawned vast and grandiose generalizations that facts only suggestively supported and ignored facts that failed to fit his big ideas. He was driven by a violent and unruly passion to overturn the polite civil societies around him, where the rich greedily got richer and the poor sank ever deeper into poverty. But his passion overwhelmed his reason, and the result of his efforts was a historical shambles that took a hundred years and a hundred million wasted lives to clean up.

Let's start at the beginning, with Marx the man. He was born in 1818 in the city of Trier, near the border with Luxembourg, in what was then Prussia. As a student, he drank with a group of philosophers called the Young Hegelians at the University of Berlin, but he succeeded in completing his doctorate at the University of Jena, for a thesis in which he contrasted Stoics and Epicureans in philosophy and attacked religion. He was a dark, stocky man, full of fiery energy, and he became a journalist to agitate for socialism. He moved to a Paris newspaper and wrote a critique of Hegel's philosophy of law that included a phrase for which he later gained fame: "Religion is the opiate of the people."

In Paris, Marx met Friedrich Engels, and they collaborated together for the rest of Marx's life. Engels was also a German socialist and a student of Hegel, but his family was rich and they sent him to Manchester in England to run a mill. There he learned more than any sensitive person would wish to know about the shocking condition of the working class in England and wrote a book about it, which became a classic. Engels supported Marx financially for many years while Marx wrote the thick books in London that later, with posthumous editorial help from Engels, made the pair of them famous for the next hundred years.

The dense, woody thicket of Marx's thought had its roots in European philosophy, where he took up three strands of thought. The first was German idealist philosophy, the second French political ideas, and the third British economic theory. The strands are worth a few words.

German idealist philosophy can be said to have begun with Immanuel Kant, who lived and worked in Königsberg, the capital city of East Prussia during the Baroque era, under the rule of Frederick the Great. Kant's "critical" philosophy took skepticism about the naïve realism of common sense to new heights of logical sophistication. Kant argued that we're all doomed to see the world through the lenses of certain logical categories and can't even begin to imagine what reality would be like without them. He regarded this insight as equal in magnitude to the Copernican revolution, and philosophers since his time have tended to agree.

Kant inspired a new generation of German philosophers who went in various idealist or romantic directions. The most influential by far was Georg Wilhelm Friedrich Hegel, who wrote his first big book, a "phenomenology" of spirit that detected a dialectic of ideas behind the pageant of history, at the same time as Napoleon's army was ravaging Germany. Hegel went on to develop a dialectical account of the history of civilization in a grand series of encyclopedic lecture cycles in Berlin that he recycled until his death in 1831, only a few years before Marx went drinking with the Young Hegelians. Marx chose to upend Hegel's forbiddingly verbose dialectical idealism to form a "dialectical materialism" that was more cynical, and which quickly degenerated into opaque jargon in the speeches of rank-and-file Marxists.

French political ideas caused a revolution at the end of the eighteenth century, a few years after more sober versions of

the same ideas had caused the Thirteen Colonies to declare their independence from British rule. The French thinkers advocated such inalienable rights of man as liberty, equality, and fraternity. Their disastrously flawed revolution, with its reign of terror and its blood-spouting public executions with the guillotine, led to Napoleon's military rule as emperor of the French Republic. Marx liked the revolutionary *élan* of the political writers in their war against the old guard on behalf of basic human rights.

British economic theory for Marx meant the writings of the Scottish thinker Adam Smith, who deployed his famous "hidden hand" metaphor to argue that free markets allocated resources efficiently, and the Jewish financier David Ricardo, who developed a theory of division of labor based on comparative advantage. A third British thinker, Thomas Malthus, contributed a prediction that also impressed Darwin, namely that food resources increase arithmetically whereas mouths to feed increase geometrically, so there will always be too many people and the poor will starve. With this scenario in mind, Marx felt vindicated in his fight against the complacent views (the classical economics, as economists later called the ideas) of Smith and Ricardo.

With those three strands to weave his thread of argument, Marx developed an analysis of history that claimed to reveal the driving mechanism of civilization in the power of money to control the means of production of such material goods as food, clothing, housing, transport, and armaments. All the culture that civilization had created since prehistoric times was a mere superstructure for this power. Culture was a means for the ruling classes to impose their will upon their subjects. Religion was the opiate of the people, and all its doctrines were merely the sighs of the subjugated classes as

they grew resigned to their impotence. Money was the repository of value, and that value was extracted from workers by the class that controlled the means of production. Capitalism was the highest refinement of this social parasitism. The capitalists were vampires, sucking the blood of the toiling masses. It was a good story, and it thrilled his readers.

Marx turned the screw tighter. He predicted, in a (code green) turn against the (orange) thrust of the scientific revolution, a new revolution that would overthrow the money men, collectivize the means of production, and establish a dictatorship of the proletariat. He prophesied the coming of the communist millennium. The trope was a farcical retooling of Jesus the Nazarene's tragic belief in the Kingdom of God. Marx cast himself as a new messiah.

Marx was a genius of witty rhetoric, and the stuff he wrote as a journalist found him a passionate circle of socialist supporters, but the sober theory behind the rhetoric was thin indeed. Sure, the social mechanisms surrounding money were often decisive in shaping the exact course of history, and the role of money amply deserved systematic study, but giving it a starring role was putting the cart of currency before the horse of work. Marx sensed this somehow, because his best contribution to economic theory was his labor theory of value, which said that the value of something was the work invested in making it. Unfortunately for Marx, however he tweaked it, his theory was false, because it took no account either of goods with great value that took little or no work to make or of shoddy stuff that remained worthless however many hours or years of work had been devoted to making it. So Marx failed as a scientific economist.

Communism went far beyond socialism. Socialists worked within the property laws of what Hegel had called civil society

to fight for more social justice via trade unions and the like. Socialists thought property should be shared and shared alike, whereas communists thought the whole concept of property should be abolished. The communist line on the production and distribution of goods was Marx's slogan: "From each according to his ability, to each according to his need!" But how and by whom the slogan was to be interpreted and implemented were fields left empty in the blueprints for the dictatorship of the proletariat. The vacuum attracted some hideous answers.

Socialists did not yet sit in Parliament in Victorian times. Campaigns to ease the pitiful condition of the working class were still led by liberals. To get an idea of the status quo, recall that the reign of Queen Victoria began in 1837, when the latest political reform act, of 1832, redefined the electoral map (to add a few seats in the House of Commons for new industrial cities) and lowered the wealth hurdle for the vote, which increased the size of the electorate from about one in ten of the adult males in the population to about one in six. The House of Commons was divided into two main parties, the Tories (conservatives) and the Whigs (liberals), who alternated in power. The two leading politicians of the Victorian era were Lord Palmerston, who was twice prime minister and served regularly in other offices, and William Gladstone, who served four terms as prime minister.

As for social reforms, Palmerston passed the Factory Act of 1853, which outlawed child labor on night shifts, and he tried to pass a bill legalizing trade unions, but it was thrown out by the House of Lords. He also introduced an act to prevent employers from paying their workers in goods rather than money or from forcing workers to buy at the company store. And he introduced an act to regulate smoke from coal

fires, which was a toxic hazard in cities like London that continued to cause mass deaths every winter for the next hundred years. But Palmerston opposed plans to extend the vote to richer members of the working class. By contrast, although Gladstone was a Whig, he was also a fiscal conservative who was against waste and extravagance and consistently aimed to cut both government spending and taxes.

A third Victorian politician was Benjamin Disraeli, who twice served as Tory prime minister and advocated a paternalistic "one nation conservatism" where the landed gentry would feel obliged to support the working classes. But he also advanced reforms to replace slums with decent housing, to lay underground sewers and install running water in houses, to reduce maximum working hours for children to ten hours a day, and to let workers exercise basic legal rights against their employers. A liberal complained at the time (1879) that the Tories did more in five years to improve the lot of the working classes than the liberals had done in fifty.

Against that background, the Fabian Society was founded in 1884 to promote the cause of democratic socialism by means of gradual reform. It soon became a leading center for British academic socialists. Its members Sidney and Beatrice Webb even founded the London School of Economics and Political Science in 1895. Altogether, there was real hope of progress and no need for violent revolution.

The Christians were active too. A social issue that drew a Christian response was the effect of cheap alcohol on people whose lives were already burdened by poverty. One such response was the Salvation Army, founded in London in 1865 by the Methodist minister William Booth, who was moved to action by the same heartrending misery among the downtrodden poor that had moved Engels in Manchester.

Booth's three-step recipe for the volunteer social workers in his army was soup, soap, and salvation, in that order. His army still exists and still does good work, at least for those to whom the Christian message of salvation is less damaging than alcohol or opium.

For most Victorians, the Marxist political and economic philosophy was wrong and its rhetoric was evil. It might have died of abuse if not for events unfolding in Russia.

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Tsarist Russia was an empire grown rotten in the untilled soil of unreformed Eastern Orthodox Christianity. So weak was the empire that when in 1904 the Imperial Japanese Navy mounted a surprise attack on the Russian naval base at Port Arthur (the English name for Lushun, next to the Chinese city of Dalian) as part of a Japanese bid for Manchuria and Korea, the Russians were outfought and the Japanese won a resounding victory in 1905. It was the first-ever defeat of a Western imperialist power by a pagan nation and a fateful humiliation for the Tsar. Japan had industrialized at break-neck speed following the surprise appearance in Tokyo Bay of a fleet of U.S. Navy steamships in 1853, and its victory over the poorly deployed forces of the Russian Empire was its first big clash with the Western barbarians.

The Russian revolution of 1905 was an early consequence. A wave of strikes spread through Russia, strikers were shot in the streets, radicalized students joined the fray, naval mutinies followed, for example in the Black Sea Fleet on the battleship Potemkin (when the navy seemed about to send the fleet to the Pacific as a further sacrifice), and radical social democrats formed the St. Petersburg soviet, which was a council of workers' delegates including a man called Lenin.

Later events gave Lenin a starring role in communism, so his life story is worth telling. Vladimir Ilyich was born to the wealthy Ulyanov family in 1870. But his elder brother was involved in a plot to assassinate the Tsar and was executed in 1887. The loss moved Vladimir deeply as he went to read law at Kazan University. He too got into radical politics and was arrested, but only expelled from Kazan for a year. Beside his law books, he read Marx's masterpiece *Das Kapital* and translated Marx and Engels' communist manifesto into Russian. After graduating, he returned to political activism, but in 1895 he was arrested again. This time he was imprisoned for a year and sentenced to three years of exile in Siberia. There, living in a hut in the forest under close police surveillance, he read and wrote for the revolution. His lover Nadya was arrested for agitation too and joined him in exile, where they married. Together in their frontier shack, they translated Sidney and Beatrice Webb's history of trade unionism.

Vladimir adopted the revolutionary name Lenin in 1901. In a 1902 pamphlet, he proposed the formation of a vanguard party to lead the working classes. At a 1903 congress in London, his proposal led to a split between the Bolsheviks, with him, and the Mensheviks, against.

In 1905, Lenin returned to Russia to support the revolution following the Japanese war, but went back into exile in 1907 after he and Joseph Stalin were implicated in a botched Bolshevik bank robbery. Then, until the revolutions of 1917, Lenin lived in Western Europe – and kept writing.

In 1909, he published a book contrasting dialectical materialism (Marx, good) with positivist materialism (Mach, bad). Austrian physicist Ernst Mach was only good enough to impress Einstein. Lenin's (atrocious) book became a key work in the philosophical foundation of Marxism-Leninism.

Lenin opposed the Great War: "One slave owner, Germany, is fighting another slave owner, England, for a fairer distribution of the slaves." He moved to Zurich in Switzerland. At the 1915 anti-war Zimmerwald conference, he failed to persuade the participants to adopt his proposal to turn the imperialist war into a class war. Returning to writing, in 1916 he published a book maintaining that imperialism was the most advanced form of capitalism.

In February 1917, increasing anti-war demonstrations in Russia forced the Tsar to abdicate. The imperial monarchy was replaced by a weak provisional government hemmed in by socialist soviets. Lenin was itching to return to Russia, but Switzerland was surrounded by nations at war. After long negotiations, the German government granted permission for Lenin and other exiles to travel through Germany to Russia in a sealed one-carriage train (isolated "like a plague bacillus", as Winston Churchill later put it). Germans nursed the hope that Lenin might subvert the Russian war effort by seeding revolutionary unrest.

In April 1917, the train arrived in Petrograd (renamed from St. Petersburg in 1914) and Lenin was welcomed by a big crowd with red flags. He addressed them:

> The piratical imperialist war is the beginning of civil war throughout Europe … The worldwide socialist revolution has already dawned … Germany is seething … Any day now the whole of European capitalism may crash … Sailors, comrades, we have to fight for a socialist revolution, to fight until the proletariat wins full victory! Long live the worldwide socialist revolution!

While traveling, Lenin had written some theses. He said the Bolsheviks should press on for their socialist revolution and

grab power from the provisional government. Others, including Joseph Stalin, had proposed supporting the provisional government. When Lenin read out his theses at a meeting, the Mensheviks booed him.

Lenin maintained that socialist revolution in Russia could spark revolution in the rest of Europe. Russians who were fed up with the war and the provisional government liked the idea. Petrograd workers and soldiers rioted in July, and the government blamed the riots on Lenin and the Bolsheviks. Arrests were made and Lenin fled to Finland. In exile again, he plotted an armed uprising to overthrow the provisional government. While he was there, a Russian army *coup d'état* seemed imminent, and Prime Minister Kerensky responded by inviting the Petrograd soviet to mobilize the workers to defend the capital.

Although the coup fizzled, Lenin returned from Finland in time to direct the overthrow of the provisional government and the storming of the Winter Palace that forced Kerensky to step down. That was the October Revolution (on the old Julian calendar, which remained in force in Russia until the revolutionaries adopted the new Gregorian calendar, used in the West since 1582, according to which the revolution took place in November).

On the evening of October 26 (on the old calendar), Lenin attended the Congress of Soviets. The American journalist John Reed described his appearance on the platform to "a thundering wave of cheers":

> A short, stocky figure, with a big head set down in his shoulders, bald and bulging. Little eyes, a snubbish nose, wide, generous mouth, and heavy chin; clean-shaven now, but already beginning to bristle …

Reed tried to assess the man:

> A strange popular leader – a leader purely by virtue of intellect; colorless, humorless, uncompromising and detached, without picturesque idiosyncrasies – but with the power of explaining profound ideas in simple terms, of analyzing a concrete situation.

According to Reed, Lenin waited for the applause to subside before declaring simply: "We shall now proceed to construct the socialist order!"

Lenin proposed a decree calling on all combatant nations to begin immediate peace negotiations and a decree transferring ownership of all lands owned by the Tsar or aristocrats or monasteries to the soviets. The congress endorsed both decrees and elected the Bolsheviks into power as the Council of People's Commissars. Lenin proposed Leon Trotsky as chairman of the council, but Trotsky refused and became commissar for foreign affairs instead. So Lenin became the head of government in Russia.

Lenin and the Bolsheviks soon extricated Russia from the imperialist war with Germany. In March 1918, Russia signed a unilateral peace treaty that sacrificed much of its European territory. The new border ran very close to Petrograd, so the government moved to Moscow.

To defend the revolution, Lenin decreed the creation of an "extraordinary commission for combating counter-revolution and sabotage" (the Cheka), in effect a secret police. Another decree imposed Bolshevik control over all newspapers, and soon *Pravda* (truth) and *Izvestia* (news) had a duopoly.

In response to a bid to assassinate Lenin in August 1918, Stalin proposed "open and systematic mass terror" against the people responsible. The Red Terror began in September.

Lenin signed execution lists for hundreds of former ministers, civil servants, and others. Trotsky reported that Lenin also authorized the execution of the Tsar's family.

A White Russian counter-revolution began. Although it failed to gain popular support, it did attract foreign military backing, including British troops. Soon a civil war was under way. The Bolshevik state fought back with the Red Terror, including torture and summary execution of reactionaries and incarceration of thousands of enemies of the people in former Tsarist labor camps. Estimates for the total number of people killed in the Red Terror range up to a million.

The civil war raged until June 1923. At the same time, a famine killed several million. To feed the urban masses, the Bolshevik government requisitioned food from peasants, for nominal payment, which some peasants resisted by reducing harvests. The Cheka and the Red Army suppressed rebellions by shooting hostages, using poison gas, and sending rebels to labor camps. Lenin, Stalin, and Trotsky ruled through chaos and Russia was reduced to ruin.

In February 1920, as a first attempt to move forward from war, Lenin launched an ambitious plan for the electrification of Russia. It became a prototype for later five-year plans. In 1921, he rolled out his New Economic Policy (NEP), which he called state capitalism and which was a pragmatic retreat from socialist ideals. The plan required all industrial enterprises to nominate leaders accountable to government. But the NEP ended with the first five-year plan in 1928.

In 1922, the Russian Socialist Federative Soviet Republic joined the former Russian imperial territories to become the Union of Soviet Socialist Republics (USSR), with Lenin as its first premier. The Bolsheviks became the Communist Party of the Soviet Union.

In May 1922, Lenin suffered a stroke. A second stroke in December forced him to retire. A third stroke in March left him bedridden. He died in January 1924, aged 53. Three days later, Petrograd was renamed Leningrad.

Winston Churchill wrote: "The Russian people were left floundering in the bog. Their worst misfortune was his birth … their next worst his death."

British philosopher Bertrand Russell once met Lenin:

> He looks at his visitors very closely, and screws up one eye, which seems to increase alarmingly the penetrating power of the other. He laughs a great deal; at first his laugh seems merely friendly and jolly, but gradually I came to feel it rather grim.

Lenin believed in the violent overthrow of capitalism via communist revolution, to be followed by a dictatorship of the proletariat and then communism. He was a great orator with an iron will, convinced that he was right. But he was wrong.

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The Great War was a huge catastrophe that ruined Europe. Even then, people saw it as the most horrific and atrocious war that had yet scarred the face of the Earth. What made it ruinous was the obscene power of new military technology, which built on the latest scientific advances to kill people on an unprecedented scale, all harnessed to pursue war aims of utter inconsequentiality.

The warring parties were, as Lenin said, the capitalist and imperialist nations. The central powers, namely the German Empire and the Austro-Hungarian Empire, plus a few minor states and the Ottoman Empire, became locked in a clash of arms with most of their neighbors. To the west they fought

Britain and France, which were both modern democracies, to the south they fought the newly unified Italy, and to the east they fought the weak and rotten Russian Empire.

The German Reich was the second Reich (or empire), and followed the Holy Roman Empire from the medieval period that finally died in the Napoleonic wars. The second Reich was formed in 1871 under Kaiser Wilhelm and his chancellor Otto von Bismarck, who was known as the Iron Chancellor, and led from 1888 to 1918 by Kaiser Wilhelm II, who was a grandson of Queen Victoria and wore foppish uniforms with a fancy helmet. To the south, the Reich bordered the Austro-Hungarian Empire, which was a union dating from 1867 of the monarchies of Austria and Hungary under a Habsburg dynasty that in former centuries had supplied a long line of Holy Roman emperors.

The claim of the central powers to form a wider imperial order in Europe was strong. But it was feared, both by the democracies to the west and by the empire to the east.

All the nations were armed and ready in 1914. The trigger was an assassination in Sarajevo in June. By August all hell had broken loose. The Austro-Hungarians invaded Serbia, the Germans invaded the Low Countries and France, and the Russians attacked Germany.

In September, the German philosopher Ernst Haeckel wrote that "the feared European war … will become the first world war in the full sense of the word". In October, a report in a Canadian magazine called it the Great War.

The Russian push on the eastern front failed. The Germans defeated the Tsarist troops in a series of big battles in August and September. But the distraction was fatal for the German push in the west, which ran out of steam and led to a stalemate on what became known as the Western Front.

The stalemate was entrenched by technology that favored defense over offense. Defenders used barbed wire to hinder advancing infantry, then used artillery and machine gun fire to kill the troops held back by the wire. Cavalry was useless. Commanders were stumped.

The Western Front armies began a "race to the sea" that created an unbroken line of trenches from Lorraine to the Channel coast. The British and French armies refused to accept the line as fixed and kept trying to take the offensive, so they failed to dig in properly, whereas German troops dug deep and built much more solid and defensible trenches. As a result, for two full years the Allies took substantially more casualties than did the Germans.

But the casualties on both sides were still horrendous. The Somme offensive in 1916 cost the British army almost half a million men. On the first day of the battle alone, they suffered twenty thousand dead and three times as many injured. The French took comparable losses at Verdun throughout 1916. Heavy artillery rained down shells on all the trenches relentlessly. Allied commanders had no idea how to break through the German lines, so they kept on sending waves of men in boots "over the top" to die in the mud.

Meanwhile, at sea, the British Royal Navy imposed a naval blockade on Germany. It worked, and Germany responded with unrestricted submarine warfare. U-boats tried to choke off Britain's Atlantic supply route. The attacks sank many ships and killed many sailors. In the United States, President Woodrow Wilson demanded an end to attacks on passenger ships. Germany complied. But the British blockade tightened and so Germany restarted unrestricted attacks in early 1917. The U-boats were sinking over half a million tons of shipping a month, until the British shippers began to sail the ships in

convoys defended by destroyers armed with the new technology of hydrophones and depth charges. Altogether, the U-boats sank more than five thousand Allied ships, at a cost of some two hundred submarines.

The United States declared war on Germany in April 1917. This had no effect at first on the Western Front. But the German war in the east was all but won by then. When the German authorities let Lenin go back to St. Petersburg, they started the process that led to the October revolution, and a separate peace with Russia signed in early 1918. This released large numbers of German troops, who jumped onto trains and headed west for a new push on the Western Front.

German General Erich Ludendorff planned a 1918 spring offensive to divide the British and French armies and deal them a mortal blow before Americans troops started arriving in force. The German troops advanced an eye-popping forty miles. The new front line was close enough to Paris for three massive Krupp railway guns to fire shells onto the city. Many Germans smelled victory.

The Allied counterattack began in August. At the battle of Amiens, the British army deployed over four hundred new tanks to cross trenches and barbed wire. An Allied force of over a hundred thousand men advanced over seven miles in seven hours. By September, the German armies had taken heavy losses and were forced to withdraw to the Hindenburg line, giving up all they had gained that year.

When a hundred thousand German prisoners were taken in August, General Ludendorff said: "We cannot win the war any more." He offered to resign and Kaiser Wilhelm replied: "We have nearly reached the limit of our powers of resistance. The war must be ended." But the Allies rejected the German peace offer.

The Allied attack on the Hindenburg line began in September and included U.S. soldiers. The Germans were forced back, and news of impending defeat spread fast in Germany. Morale plummeted as U.S. troops kept arriving at the rate of ten thousand a day.

The Germans sued for peace. President Wilson demanded that Kaiser Wilhelm abdicate. Soon an armistice was signed, and at "the eleventh hour of the eleventh day of the eleventh month" a ceasefire came into effect.

The Great War was a murderous mix of new technology and old tactics. But by the end of the fighting, the armies on both sides used telephone and radio, armored cars and tanks, and aircraft carrying guns and bombs.

Trench warfare was brutal. Men in shit-colored uniforms were mowed down *en masse* with shrapnel and machine gun fire, then the survivors got down and dirty in hand-to-hand fighting with their muddy opponents. The battles of Ypres, the Marne, Cambrai, the Somme, and Verdun killed millions of men. The massed artillery fire consumed vast quantities of explosives. The German chemicals industry alone produced the stuff at up to twenty thousand tons a month.

Trenches, machine guns, barbed wire, and heavy artillery pinned down the battle lines. The British army rolled out a few tanks at Somme in 1916 and watched them break down. But a year later the army was fielding tanks by the hundreds. They proved their worth at Cambrai in November 1917.

Both sides tried chemical warfare. They used chlorine, mustard gas, and phosgene, but the military payoff was small and the public was horrified at the obscene casualties.

Aircraft were more successful. Biplane aircraft made of wood and canvas were used at first for spotting and ground attack, and soon the flyers were shooting each other down

with on-board machine guns. Both sides developed strategic bombers too. German Gotha bombers and Zeppelin airships attacked targets in England. In 1918, the Royal Navy even deployed an aircraft carrier, which launched Camel biplanes on a raid against Zeppelin hangars.

The Ottoman Empire fought alongside the central powers. In 1915, Allied forces tried to attack the Turks at Gallipoli, but the defenders inflicted massive losses and repelled them. Then British troops stirred up an Arab revolt in Mecca that resulted in the Ottoman surrender of Damascus. In 1917, British imperial forces took Baghdad and the British government endorsed the creation of a Jewish homeland in Palestine. The Ottoman Empire went down with a final genocide against the Armenians. No one knows how many died, but estimates range around a million.

The Treaty of Versailles in 1919 officially ended the war. Germany took responsibility, agreed to pay astronomical war reparations, and ceded territory to the victors. Given varying exchange rates and recent inflation, a modern estimate of the bill is not easy, but it would be on the order of a hundred billion dollars. The payments were abandoned after 1945. But the debt the Weimar Republic took on to meet them wasn't finally paid off until 2010. The Versailles terms embittered many Germans.

Altogether, the fighting in the war killed some ten million, wounded over twenty million, and left seven million missing in action. The figures are certainly shocking, but an influenza epidemic spread around the world in 1918 and killed at least fifty million people.

The bloody stalemate sank military idiocy to new depths. The old soldiers who learned their art recalling Napoleonic battles had no idea how to handle their new toys.

The intervention of the United States of America finally won the war. But the victors then looked on with growing horror at the events unfolding in Red Russia, as Lenin and the Bolsheviks struggled to establish their bloody workers' paradise. When Lenin died, Stalin took over.

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Joseph Stalin was born in 1878 in Georgia. Childhood smallpox scarred his face and two accidents damaged his left arm. At sixteen he joined a seminary, but was expelled in 1899. He then discovered the writings of Lenin and became a Marxist revolutionary. He joined the Bolsheviks in 1903 and worked hard at organizing thuggery, strikes, bank robberies, kidnaps, and extortion. He was arrested and sent to Siberia seven times, but usually escaped. And he adopted the revolutionary name Stalin (steel), although his left arm saved him from the fighting in the Great War.

In the wake of the October revolution, Lenin appointed Stalin as the commissar for nationalities' affairs. When civil war broke out, Lenin formed a Politburo of five including Stalin and Leon Trotsky, but Stalin quarreled with Trotsky. Trotsky served as the people's commissar for foreign affairs, then he founded the Red Army and became its first commander. When Poland invaded Ukraine, Stalin commanded troops too but failed to cooperate with Lenin and Trotsky. This led to losses, and Stalin had to resign his command.

Lenin still liked Stalin and gave him more power. He had Stalin appointed General Secretary of the Communist Party of the Soviet Union in 1922. As Lenin lay dying, Stalin visited him regularly, but they quarreled a lot. In his diaries, Lenin criticized Stalin's political views, rude manners, and excessive power and ambition.

Once Stalin had consolidated his power, he had Trotsky ejected from the Politburo, then from the party, then from the Soviet Union. Finally, he had him assassinated in Mexico in 1940. In exile, Trotsky wrote that a "river of blood" separated Stalin from Lenin.

The revolution and the civil war had a disastrous effect on the Russian economy. Industrial output in 1922 was an eighth of what it had been in 1914. A recovery under Lenin's New Economic Policy ended after his death when Stalin replaced the NEP with five-year plans to build a centralized command economy featuring forced industrialization and the collectivization of agriculture.

A murder of a party boss prompted Stalin to blame a vast conspiracy of saboteurs and Trotskyites, and he launched a massive purge against internal enemies. He staged show trials and had the victims executed or sent to prison camps, gulags, in Siberia. He purged the secret police, the NKVD, of old Bolsheviks, and when all his rivals were gone he executed the head of the NKVD. The NKVD also targeted national and ethnic minorities. Hundreds of thousands of people were eliminated in the purge. Most of them were ordinary Soviet citizens and many were buried in mass graves.

Concurrent with the purges, Soviet textbooks and other records were rewritten to delete references to people liquidated by NKVD. The story of the revolution was revised to star just two main characters, Lenin and Stalin, and the cult of personality around Stalin reached absurd heights. The city of Volgograd was renamed Stalingrad.

Collectivization of agriculture resulted in a drastic drop in living standards for many peasants. Stalin blamed the kulaks (rich peasants), who often resisted collectivization. So he had thousands of kulaks and their accomplices shot, sent to labor

camps, or exiled to places like Siberia. The disaster was so appalling that a famine from 1932 to 1933 killed between five and ten million people.

Stalin's implementation of socialism in one country was brutal beyond all bourgeois reckoning. His murderous purges of all his opponents, his forced collectivization of agriculture, and his breakneck industrial policy all added up to a horror story of monumental proportions.

Not least among the horrified spectators of this national and human tragedy were the people of Germany. After their shocking defeat in 1918, the citizens of the German republic were in turmoil. And then they did something that not only raised the stakes dramatically in the great game of European national poker but also steered the course of history into deep new waters. As Winston Churchill said in his six-volume history of the Second World War:

> Thereafter mighty forces were adrift, the void was open, and into that void after a pause there strode a maniac of ferocious genius, the repository and expression of the most virulent hatreds that have ever corroded the human breast – Corporal Hitler.

The whole course of Western history was about to suffer an earthquake from which it has yet to recover.

Holocaust

The German far-right National Socialist (Nazi) party under its leader Adolf Hitler came to power in January 1933. In little over twelve years, the Nazi thugs reduced Germany to utter ruin, gave Soviet communists a victory resounding enough to threaten the entire population of Eurasia, and as a final insult all but exterminated the Jews in Europe.

The military dictator Hitler drove the most powerful war machine ever seen on Earth until the world responded to his volcanic eruption with an earthquake that reshaped the landscape into a pair of opposing nuclear superpowers. He forged a European empire bigger and more bellicose than any since that of ancient Rome. And he presided over the greatest burst of engineering genius in the service of building new weapons of war that the world had ever seen. The Third Reich was a landmark like no other in the story of life on Earth.

Happily for future generations, a kindly titan strode into the breach to rescue the Germans from the consequences of their own folly. He came in the unlikely form of a fat old toff tippler whose name was Winston Churchill. This new man of destiny turned the tables on Hitler and became the greater warlord, indeed the greatest in modern history. The tale of the struggle between these two very different heroes is filled with thrills and spills, which trump anything that went before and together had the effect of globalizing the Jewish thread in the story of how we made it to Globorg.

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We can start small, with the flawed human being who did the dirty deeds that soon set Europe ablaze to feed the flame of his astonishing appetite for death and destruction.

Little Adolf was born in Austria in 1889. Hs father was a minor civil servant and Adolf was the fourth of six children. His older siblings all died in infancy, and the death of his younger brother from measles in 1900, leaving him with just one sister, affected him deeply. He rebelled and did poorly at school. When his father died in 1903, he went from bad to worse and quit school at sixteen with no career plans.

Adolf then moved to Vienna and lived as a bum. He tried his luck as a painter but was rejected by the Academy of Fine Arts. His mother died in 1907 and he was cast down again. He learned to live cheaply in a working men's hostel. Vienna was seething with racism, and Hitler drank deep of the toxic brew in local newspapers that played on Christian fears of being swamped by an influx of eastern Jews. He said later that he began to admire Martin Luther's loathing of Jews. He moved to Munich in 1913.

When the Great War broke out, Hitler volunteered for the army. He served as a dispatch runner on the Western Front and he ran near several big battles. He was awarded the Iron Cross, Second Class in 1914 and First Class in 1918, which was rare for a mere corporal. During the battle of the Somme in October 1916, he was wounded in the groin area and spent months in a hospital. In October 1918, he was temporarily blinded by a mustard gas attack, and while still in hospital he learnt of Germany's defeat.

Hitler described war as "the greatest of all experiences" and was embittered by the capitulation. Like other German nationalists, he believed that the German army had been "undefeated in the field" but "stabbed in the back" on the

home front by money men and Marxists. He waxed eloquent with his army friends on his dismay and anger as a patriotic German who felt insulted by the punitive treaty of Versailles, which forced Germany to give up land, to demilitarize the Rhineland, and to pay heavy reparations.

After the war, Hitler got a job as a spy and infiltrated the German Workers Party. But he liked the ideas of the party founder, Anton Drexler, who favored strong government, "non-Jewish" socialism, and social solidarity. Drexler in turn was impressed by Hitler's oratory and invited him to join the party. So Hitler joined, in September 1919. The party then changed its name to the National Socialist German Workers Party (the Nazis).

In surely his best work as a graphic artist, Hitler designed an iconic party banner with a diagonal black swastika on a white disk over a red background. He worked hard for the party and won a reputation for his rebel-rousing speeches against all and sundry, but especially against Marxists and Jews. Soon enough, the party made him its chairman.

Hitler's aggressive beer hall speeches began to attract big crowds. He wove in populist themes for his fans and picked on scapegoats to blame for their economic hardships. He used what many recalled as his strong personal magnetism and his sense of crowd psychology to tune the delivery of his staccato tirades. Former Hitler Youth member Alfons Heck later described his reaction to a speech:

> We erupted into a frenzy of nationalistic pride that bordered on hysteria. For minutes on end, we shouted at the top of our lungs, with tears streaming down our faces: *Sieg Heil, Sieg Heil, Sieg Heil!* From that moment on, I belonged to Adolf Hitler body and soul.

Hitler learned his art in the Weimar republic. This fragile democracy survived from 1919 to 1933, but only just. Hyper-inflation in 1923 devalued the mark against the dollar by a factor of a trillion compared with ten years earlier, causing massive unrest as millions of people saw their savings vanish. Hitler exploited their unrest in his speeches.

Yet despite his humble origins and abrupt manner, Hitler was a thoughtful and sensitive man. He loved good music, and Richard Wagner's music in particular, and was moved to tears by the grandiose effects in Wagner's huge Ring cycle of operatic rehashes of old Germanic myths. In 1923, he met Winifred Wagner, the British wife of Wagner's son Siegfried, and they got on well, so well that he often stayed over at the Wagner home in Bayreuth. Later there were even rumors they might marry.

Hitler was also an avid reader and read huge numbers of books over the years. Many were light novels, such as those by Karl May set in the American wild west or in the orient of the golden age of Islam, but many were more serious. One was a history by Oswald Spengler, who lived in Munich as an independent scholar and wrote a great book during the Great War. *The Decline of the West*, his masterpiece, appeared in 1918 and was an instant bestseller, and in 1922 he published a second volume. Spengler spelled out a vision of history as moving in cycles, with the cycles as cultures that turn into civilizations and end in imperialism. He marshaled historical evidence to suggest that each cycle lasts about a thousand years, and saw them as life forms, with a distinctive dynamic. Here we need only recall spiral dynamics.

Returning to the grubby world of politics in the Weimar era, somehow Hitler won the backing of the Great War hero General Erich Ludendorff for an attempted coup or putsch.

The Nazi party loved Italian fascism, and Hitler dreamed of emulating Benito Mussolini's 1922 famous march on Rome. On November 8, 1923, Hitler and his thugs stormed a public meeting in a big beer hall in Munich. Hitler interrupted the speaker and proclaimed that the national revolution had begun. In a back room he drew a handgun and coerced support, then his forces went on to occupy the local army and police headquarters. The next day, Hitler and his followers marched forth to overthrow the government, and at last the police intervened in force.

Hitler went into hiding but was arrested on the third day. In April 1924, he was sentenced to five years in jail. There he was treated as a celebrity by the guards and allowed visitors. Winifred Wagner sent him parcels of food and stationery so he could write a book, but he was released in December after only a few months, before he had finished dictating the first volume of *Mein Kampf* (his atrociously bad autobiography and political manifesto, which he originally gave the amazing title *Four and a half years of struggle against lies, stupidity, and cowardice*) to his party deputy, Rudolf Hess. Published in two volumes in 1925 and 1926, it sold almost a quarter of a million copies up to 1933 and then a million copies in that year alone.

The Nazis were banned in Bavaria and Hitler was banned from public speaking for years. But he stayed in good cheer. He met Eva Braun in 1929. She was just seventeen, a sweet blonde from a modest family background who had no great talents and loved to have fun. At the end of their first meeting he took her home in his Mercedes, and over the next few years they dated frequently. He had Martin Bormann check that there were no Jews in her family tree.

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The other unlikely protagonist in our tale of two warlords is Winston Churchill. In many ways, he was the polar opposite of the angry loudmouth from Austria.

Winston Churchill was born into the blue-blood family of the Dukes of Marlborough in their ancestral pile at Blenheim Palace in Oxfordshire in 1874. His father was a prominent politician and his mother was an American socialite.

In 1895, Winston became a cavalry officer in the Queen's Own Hussars, but he made his name as a war correspondent. He not only wrote for several London newspapers but also wrote his own books about his campaigns. He was posted to India, where at first he read history and played a mean game of polo. When he heard of a planned action against a tribe of Pashtuns in the North West Frontier, he asked to join in. He fought with the second brigade in Malakand and wrote a book on the siege of Malakand that was published in 1900.

Churchill was then transferred to Egypt and saw action in Sudan, where he rode in the last British cavalry charge, at the battle of Omdurman. He kept up his newspaper work and later wrote a book on the Sudan campaign.

Churchill wanted to follow his father into politics, so now he'd made a bit of a name for himself in print he resigned from the army in 1899 and stood for election. He lost. Then in October the second Boer war broke out, and he got another job as war correspondent to cover it in South Africa. He accompanied a scouting expedition in an armored train, it was ambushed, and he fought back, leading to his capture and incarceration in a prison camp in Pretoria. But he escaped, and reports of his adventures made him a newspaper hero in Britain. Instead of returning home, he rejoined the army to relieve the British at the siege of Ladysmith, and was among the first British troops into Ladysmith and Pretoria.

Fresh from the fight, he returned home in 1900 and published two volumes of Boer war memoirs. He stood again for parliament in 1900 and won. His political career had begun.

Churchill first met his future wife Clementine in 1904. They married four years later and went on to have five children together, based from 1922 onward at their comfortably appointed family home set in beautiful wooded grounds at Chartwell in Kent, a few miles south of London.

A glimpse of Churchill the man comes from January 1911, when he made a controversial visit to a siege at Sidney Street in London that was then in the news. The police had a group of Latvian anarchists surrounded in a house, but Churchill the war veteran called in the Scots Guards and directed the rest of the action. The house caught fire and Churchill prevented the fire brigade from rescuing the men, who burned to death. As he said later, "I thought it better to let the house burn down rather than spend good British lives in rescuing those ferocious rascals."

Churchill made a real name for himself in the Great War, but not as he would have hoped. The story started in 1911, when he was appointed First Lord of the Admiralty. He was keen on modernization and was so excited by the first aircraft that he learned to fly them, much to Clementine's dismay. He launched a program to replace coal with oil for powering warships and advised the government to invest in the Anglo-Persian Oil Company (surely good advice).

Churchill was still First Lord of the Admiralty when the Great War broke out. In that role, he took a keen interest in a secret project to develop what he called the "land battleship" (but others called a tank to mislead spies), which was an armored box running on caterpillar tracks designed to cross trenches and barbed wire against machine gun fire and force

a breakthrough on the Western Front. Some saw the project as a misappropriation of naval research funds.

In 1915, Churchill planned, promoted, and presided over the disastrous Dardanelles campaign. This was a bold bid to outflank the stalemate on the Western Front by attacking the Turks in the rear. But the initiative bogged down horribly at Gallipoli. After the loss in action of over two hundred thousand British Empire troops (many from Australia and New Zealand), the bridgehead was evacuated and Churchill was forced to resign. He rejoined the British army in 1916 as a battalion commander and was posted to the Belgian sector of the Western Front, to a muddy forward trench under constant shellfire, for six months. Clementine did what she could by sending him parcels of socks and whisky.

Churchill returned chastened. In 1917 he became minister of munitions, and held that steady job for the rest of the war. The Great War was won and in January 1919 it seemed safe to appoint him Secretary of State for War and Secretary of State for Air. But he found a new cause in the Russian civil war. He wanted to "strangle Bolshevism in its cradle" and sent in a British contingent to fight the Reds. When the men were pulled out again in 1920, Churchill settled for sending arms to the Poles invading Ukraine.

In the October 1922 election, Churchill fell ill and lost his seat. He returned to become Chancellor of the Exchequer in 1924, but blew it by deciding to return Britain to the gold standard, which led to deflation, unemployment, and a big miners' strike that led in turn to the general strike of 1926. Churchill later called this bungled foray into economics the greatest mistake of his life.

The Conservative government was defeated in the 1929 election. Labour man Ramsay MacDonald formed a national

government in 1931 and did not invite Churchill to join the cabinet. Churchill began what he later called his "wilderness years" and wrote history books. He entered his sixties, and that could have been the end of his story.

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The depression of 1930 gave the Nazi party its big break in Germany. The Weimar republic faced fierce opposition from both left and right, and elections in September 1930 made the Nazis the second largest party in parliament. A minority government was formed that ruled through emergency decrees from the president, Paul von Hindenburg.

In 1932, Hitler ran against Hindenburg in the presidential elections. A speech he gave to a club of powerful industrialists in Düsseldorf had won him their support. Hindenburg had powerful supporters too, of course, and Hitler lost. But at least he had made his name in politics, and Hindenburg appointed him to form a coalition government.

Hitler was sworn in as chancellor on January 30, 1933. But he failed to form a coalition, so he asked Hindenburg to dissolve the Reichstag. New elections were scheduled for March. On February 27, the Reichstag building was mysteriously set ablaze. Hermann Goering blamed the communists, but most now blame the Nazis. Hindenburg was persuaded to issue an emergency decree suspending civil rights.

Nazis got into street fights with communists in the election campaign. But they failed to win an absolute majority and formed another coalition. When the Reichstag reassembled, Hitler immediately introduced an act giving his cabinet unhindered legislative powers for a period of four years. The Nazis prevented some deputies from voting and the act was passed. Hitler's government was now a dictatorship.

All remaining opposition was systematically suppressed. The Social Democratic Party was banned and all its assets seized. SA storm troopers demolished trade union offices around the country. All trade unions were dissolved and their leaders were arrested. The Nazi party declared itself the only legal party in Germany.

Here we zoom in to trace the effect in the world of ideas. Martin Heidegger was a young philosopher in Freiburg, in southern Germany. As a brilliant protégé of the distinguished phenomenologist Edmund Husserl, he could have lived a cloistered life as a purveyor of baffling ideas, but he let himself be elected rector of Freiburg University in April 1933.

Heidegger was a lapsed Catholic, and he understood nineteenth-century philosopher Friedrich Nietzsche's wild ideas about the Antichrist and the Superman and the like well enough to lecture on them later. He was also a keen fan of the Nazi attempt to inject new (code yellow) life into post-Christian society. In his new job as rector he promoted the *Führerprinzip* with unholy zeal. The "Fuhrer principle" was Hitler's idea that leaders commanded and followers obeyed, without question. Against all opposition, Heidegger tried to implement this principle in his university.

Heidegger joined the Nazi party on Mayday. In his first address as rector a few weeks later, he said a lot in high-flown defense of self-assertion that ended thus:

> But no one will even ask us whether we do or do not will, when the spiritual strength of the West fails and its joints crack, when this moribund semblance of a culture caves in and drags all forces into confusion and lets them suffocate in madness. … But we do will that our people fulfill its historic mission.

His words suffer in translation, but the authentic Nazi tone is clear. He gave another speech to students in Heidelberg in June and said:

> Teaching that had become aimless hid behind examination requirements. A fierce battle must be fought against this situation in the National Socialist spirit, and this spirit cannot be allowed to be suffocated by humanizing, Christian ideas that suppress its unconditionality.

Most Jewish professors caught the Nazi tone all too clearly. Einstein emigrated to America in February already.

Returning to the madness of street life in the Third Reich, by the summer of 1934 the rough storm troopers of the SA were looking too unruly, so Hitler purged the SA leadership in the "night of the long knives" by arresting and shooting them, along with other political enemies. When Hindenburg died in August, the office of president was abolished and merged with that of chancellor. Hitler was now head of state as well as head of government. To seal the deal, the merger was put to a plebiscite and won overwhelming agreement. Hitler was now supreme commander of the armed forces, and the oath of loyalty that all new recruits recited in unison was changed to swear loyalty to Hitler personally.

Hitler's declared strategic plan was to wage a racist war of conquest in the east to gain *Lebensraum* for the German *Volk*. So the Nazis launched a big reconstruction and rearmament program, and unemployment fell from six million in 1932 to one million in 1936. Huge infrastructure projects were undertaken to build dams, autobahns, railroads, and so on.

Hitler announced that he would expand the Reich's armed forces to six times the level allowed by the Versailles treaty, with a new air force (*Luftwaffe*) and a bigger navy. In June

1935, he signed an Anglo-German naval agreement to let the German fleet grow to a third of the tonnage of the Royal Navy. Hitler was delighted and saw the agreement as the start of an Anglo-German alliance.

The Nazis enacted new racist laws in September after the annual party rally in Nuremberg. The laws classified people with four German grandparents as having "German or kindred blood", those with three or four Jewish grandparents as Jews, and those with one or two Jewish grandparents as of "mixed blood". The laws then deprived Jews of German citizenship, prohibited marriage or any other sexual relations between Jews and other Germans, and excluded Jews from civic life. These laws reinforced a previous Nazi boycott of Jewish businesses.

In 1936, the German army marched back into the Rhineland and sent troops to Spain to fight alongside Spanish fascists against the republicans and their international rabble of socialist and communist supporters. Hitler ordered Goering to prepare Germany for war within four years, and Germany and Italy formed an Axis and signed an "anti-Comintern" pact with Japan against the Communist International. But Hitler failed to make progress with British politicians and had to abandon his dreams of an Anglo-German alliance.

In 1938, Hitler saw the chance to annex Austria and Czechoslovakia quickly, before Britain and France woke up and stopped him. In March he united Austria and Germany, to scenes of joy in Vienna, then in April he ordered the army to prepare for an invasion of Czechoslovakia. In September, Hitler met with British prime minister Neville Chamberlain, French prime minister Édouard Daladier, and Italian dictator Benito Mussolini in Munich and agreed to accept German annexation of just the Sudetenland region of Czechoslovakia.

Hitler apparently cut a poor figure at the conference. One official who met him complained that he looked ratty, had stinky breath, and kept farting. But Chamberlain flew back to Britain happy and called the outcome "peace for our time". He was later pilloried shamelessly in Britain as an appeaser. Hitler regretted not going straight to war.

In November, the assassination of a German diplomat by a Jew in Paris triggered a nationwide "night of broken glass" that littered city streets with debris from vandalized Jewish stores. About a hundred Jews were killed, many more were arrested, thousands of Jewish properties were damaged, and over a thousand synagogues were burned out.

Hitler decided he had to defeat Britain. But first he had to secure his eastern flank, so he had his troops take the nearer half of Czechoslovakia in March 1939. In August, the Soviet and German foreign ministers signed a non-aggression pact and assigned each other European spheres of influence to the east and west of a line bisecting Poland.

The invasion of Poland was Hitler's main practical policy goal for 1939. His foreign minister assured him that neither Britain nor France would help Poland if it were attacked. So Hitler mobilized his army along the Polish border.

On September 1, Germany invaded western Poland in a *Blitzkrieg*. Britain and France declared war on Germany two days later. Britain and France then sat on their hands, and two weeks later Soviet forces invaded eastern Poland. Poland fell in six weeks, followed by months of silence in the west.

In April 1940, German forces invaded Denmark and Norway. Hitler launched a *Blitzkrieg* against France and the Low Countries on May 10.

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Churchill began in 1932 to speak out about the dangers of German rearmament. But he was no foe of fascism. In a 1935 essay, he hoped that Hitler might "go down in history as the man who restored honour and peace of mind to the great Germanic nation and brought it back serene, helpful and strong to the forefront of the European family circle". In the House of Commons in 1937, he said: "I will not pretend that, if I had to choose between communism and Nazism, I would choose communism." In a 1938 letter to the Times, he said: "Were England to suffer a national disaster I should pray to God to send a man of the strength of mind and will of Adolf Hitler." It was almost a love letter.

After Britain declared war on Germany in September 1939, Churchill was appointed First Lord of the Admiralty and a member of the war cabinet, as he had been at the start of the Great War. The Board of the Admiralty sent a signal to the fleet: "Winston is back." He was busy from the start with the fight against U-boats in the Atlantic and with a blockade of German ports. Churchill wanted to occupy parts of Norway but he was overruled. When German forces invaded Norway in April 1940, the British military response was too little, too late, and turned into a debacle.

On May 10, 1940, just as a new *Blitzkrieg* began with tanks and dive bombers hitting France and the Low Countries, it had become clear that the British people had lost confidence in Chamberlain's prosecution of the war and he resigned. His natural successor was Lord Halifax, who as an aloof patrician wanted to negotiate a peace deal with Germany. In a meeting with Halifax and Churchill, Chamberlain invited Halifax to take over, but he demurred. So King George VI, who had favored Halifax, did his royal duty by meeting with Churchill and asking him to become prime minister.

In his first speech as prime minister, on May 13, Churchill told the House of Commons: "I have nothing to offer but blood, toil, tears and sweat." The speech won him rapturous cheers.

The military situation Churchill faced was dire. German forces had quickly overrun the Low Countries and pushed back the French army. The British Expeditionary Force was too small to fight alone and it fell back too. Soon the German tanks, well marshaled in accordance with a British doctrine that the British army had ignored, broke through and drove a wedge between the British forces and the French.

It was a military disaster. The British troops were pushed back to the coastal port of Dunkirk, where between May 26 and June 4, in a heroic achievement of British seamanship, hundreds of ships and boats, most of them run by civilians, evacuated some two hundred thousand British troops, plus well over a hundred thousand French, minus all their equipment, back to Britain to fight another day, all the while under constant attack by German dive bombers.

In a speech in the Commons on June 4, Churchill said:

> We shall go on to the end. We shall fight in France, we shall fight on the seas and oceans, we shall fight with growing confidence and growing strength in the air, we shall defend our island, whatever the cost may be. We shall fight on the beaches, we shall fight on the landing grounds, we shall fight in the fields and in the streets, we shall fight in the hills; we shall never surrender.

The "Dunkirk spirit" Churchill had invoked pulled the dutiful citizens of the island fortress through two years of setbacks and defeats before their efforts began to inflict real damage on the awesome Nazi war machine.

The French army was defeated in the field. Churchill was unable to provide military help, for he knew that Britain was next. In a Commons speech on June 18:

> Let us therefore brace ourselves to our duties, and so bear ourselves, that if the British Empire and its Commonwealth last for a thousand years, men will still say, "This was their finest hour."

France fell. Hitler made sure to sign the armistice on June 22 in the same railway carriage, parked in the same spot, that had been used to sign the humiliating armistice of 1918.

The Battle of Britain was an aerial war. Fleets of Luftwaffe bombers escorted by Messerschmitt fighters pounded RAF airfields in southern England mercilessly, day after day, from July to October. The action peaked in August and September, and ceased when Hitler and Goering gave up their plan to knock out the RAF airfields and went for terror bombing of civilian targets in London instead. Thousands of planes and thousands of aircrew were lost in the battle, and it was a desperately close contest, but it ended as a strategic defeat for Hitler, who lost any chance he ever had to invade the British Isles and secure his western flank before turning east.

The key to the battle was technology. Churchill and others had campaigned tirelessly in the pre-war years to upgrade British air defenses. But the prevailing mood was fatalistic. Experience of German bombing attacks in the Great War (with biplane Gotha bombers) had convinced theorists that "the bomber will always get through," as the prime minister Stanley Baldwin said in 1932, and kill many thousands. Still, efforts were made. In the year or so before the war, the RAF took delivery of squadrons of modern monoplane fighters powered by big V12 engines and armed with eight machine

guns apiece. The Spitfire and Hurricane fighters with Merlin engines proved to be good matches for the Messerschmitt fighters and assorted bombers they flew against. The second big effort was to develop radar. Masts sent out radio waves (near the end of Maxwell's rainbow) to reflect off incoming aircraft and reveal their position and heading to operators, who then directed RAF fighters to meet the bombers in time to stop them dumping on their targets.

As the Battle of Britain was drawing to a close, in a speech on October 21, Churchill said: "Never in the field of human conflict was so much owed by so many to so few." It's hard to imagine Britain holding out through the year 1940 without all that bulldog growling and ripe rhetoric.

Britain had no chance alone. All the while, Churchill was working hard to build up a good working relationship with U.S. President Franklin D. Roosevelt. He hoped to persuade Americans to enter the war, or at least to send him enough supplies to ensure a win for the British Empire. But he was well aware that many Americans nursed skeptical or even hostile feelings toward the old empire. In 1940 Germany was still looking good, and many Americans admired its rise from the ashes to dominate Europe.

Roosevelt was re-elected in November 1940. He quickly found a new way to send military hardware to Britain without payment. The arrangement was called lend-lease and it served well for the rest of the war. Churchill became a pioneer of shuttle diplomacy and held many conferences with Roosevelt to sound him out on the big issues.

Hitler's Axis pal Mussolini turned out to be a nuisance for both sides. Mussolini sent his army across Libya to do battle with British forces defending Egypt, but his troops had no heart for the fight, and the British found it easy to beat them

back. Mussolini appealed for help to Hitler, who responded by sending an army under the command of General Erwin Rommel in February. The German troops stiffened the front considerably, and soon the British and Commonwealth forces were in full retreat. Rommel's troops retook Libya and besieged the defenders in the coastal city of Tobruk.

Mussolini was embarrassed, but he made it worse for himself. He tried to invade Greece. Churchill smelled blood and sent British reinforcements to the defiant Greeks, and again Mussolini bleated to Hitler for help. So a German army was sent down to occupy the entire Balkan region and then to do battle with the Brits from Egypt. The Germans won again, and the Empire was thrown back onto the island of Crete. The Germans took that island too, in May, but not without blunting the spearhead force of their best paratroopers.

Meanwhile, in the Atlantic Ocean, British convoys to and from the United States and Canada were suffering terrible depredations from U-boats. Churchill knew well that the loss of shipping was unsustainable and could cost him the war. In May 1941 a new emergency threatened to put the convoys in even more acute peril. The magnificent new German battleship Bismarck steamed out into the Atlantic, ready to sink any ship on sight with contemptuous ease by firing off a few rounds from its big guns. A fleet of Royal Navy warships, plus a couple of dozen carrier-borne torpedo planes, finally sank the Bismarck in a dramatic action on the stormy seas that kept British newspaper readers riveted for a week.

Hitler invaded the Soviet Union on June 22, 1941. He called this supreme act of hubris Operation Barbarossa, and it was the most titanic campaign in the history of warfare. He threw three million men and countless thousands of tanks and aircraft against Stalin's defenses in a surprise attack that

caught the Soviets completely off guard. Stalin had imagined his non-aggression pact, together with elementary good sense on the part of his Nazi foe, would keep the peace, but no. Hitler was like a rabid dog, immune to reason, determined to assail the Reds while he still had an effective war machine at his command, despite the months of delay and distraction in early 1941 caused by Mussolini's incompetence in the Mediterranean theater and Churchill's irritating response.

Churchill immediately decided to put aside his hatred of Bolshevism and offer all the support he could to Stalin. For the next several years, even in the icy grip of arctic winters, regular British convoys delivered supplies such as aircraft and tanks around Norway to the Soviets.

The first season of the Red Army's struggle against the Nazi invasion was horrendous. Vast swathes of territory fell into the hands of murderous invaders, who had no higher calling than to pursue a war of annihilation, destroying everything they couldn't steal and killing everyone they didn't like. It was the master race against the subhuman masses, man against beast, in a denial of basic humanity without precedent in the history of Christian civilization. The invaders had regressed to the death-dealing warrior code (red) of the ancient Greeks and Romans, or even to the more barbaric (purple) code of the Mongol hordes. Without the distractions in the Mediterranean and the supply of British arms, it seems quite possible that Moscow would have fallen in 1941 and Stalin and the Soviets replaced by a more nationalist regime. But no, the German army was stopped in December within sight of Moscow by the ice and snow of the Russian winter and then repulsed by the onslaught of fresh winter-hardened ski troops from Siberia. Stalin won the time to rally, and to change his image from Red revolutionary to Russian patriot.

Hitler held that the Jews were the historic enemy of the Germanic people. His general plan for the east was to push the population of eastern Europe and the Soviet Union out to Siberia and colonize the vacated lands with Germans. But meanwhile Barbarossa had thrown up a problem. The SS commander Heinrich Himmler asked Hitler in late 1941 what to do with the Jews in Russia, and Hitler said they should be exterminated as partisans. By then the Jews in Germany were wearing yellow stars.

Himmler knew that Hitler saw the annihilation of the Jews as the "final solution" of the Jewish question, but it was good to be sure. Himmler and his SS colleague Reinhard Heydrich went ahead and organized the Holocaust. They made systematic plans at the Wannsee conference in January 1942. Hitler then announced "we shall regain our health" (by "we" he meant the Germanic people) only by disposing of the Jews. The SS went on to set up about thirty concentration camps and extermination camps, and upgraded the Auschwitz camp to process more victims.

December 1941 brought Churchill a rather nice surprise. Japanese forces attacked the U.S. naval base at Pearl Harbor and inflicted grievous losses on the American forces there. Churchill's first thought was, "We've won the war!"

Hitler was so enthused that four days later he declared war on the United States too.

But Churchill was downcast only three days after Pearl Harbor when Japanese bombers sunk two British battleships off Singapore. He urgently needed to confer with Roosevelt, so he set sail for America on his next best battleship. On December 26, he addressed a packed House of Congress and dismissed Germany and Japan with his famous question: "What kind of people do they think we are?" Churchill and

Roosevelt soon agreed that the German danger was more acute than the Japanese one, given the tonnage of shipping sunk by U-boats in the Atlantic, and so they decided to throw their main efforts into getting rid of Hitler first.

The full scope of the British war against U-boats remained secret for several decades. The key figure was Alan Turing, a brilliant Cambridge mathematician who did historic work on the logical foundations of computing before the war. He was just 27 years old when on September 4, 1939, he reported for work at Bletchley Park, the wartime station of the Government Code and Cypher School.

Because no one else felt up to it, Turing took on the hard problem of cracking the Enigma system the German navy used to encrypt radio signals to and from U-boats. Building on the brilliant pre-war work of a school of Polish logicians who used a machine they called a bombe to help them crack codes, Turing designed a better bombe and used it to crack the settings for the Enigma machine. He solved the problem in December 1939, and his bombe became the main tool for breaking codes for the rest of the war.

The bombe searched for the settings used to encrypt an Enigma message using a "crib" (usually a guess at a fragment of the message, such as a *Sieg Heil*). For each possible setting of the Enigma machine rotors (which was a vast number for the U-boat machines with four rotors), the bombe mapped letters until it hit a contradiction. Then it moved on to the next setting, ticking relentlessly on.

In the summer of 1941, Turing and his team succeeded in reading a lot of U-boat signals, which reduced shipping losses to under a hundred thousand tons a month, but they were overstretched. In the autumn they decided they had too few people and too few bombes. They tried to get more through

the usual channels without success. Finally, on October 28, they wrote directly to Churchill and told him how little they needed compared with the vast amounts of men and money poured out for other projects.

It worked like a charm. Churchill wrote to General Ismay: "Make sure they have all they want on extreme priority and report to me that this has been done." After that, resources were no problem. Turing went on to crack more complex coded messages and save many sailors from a watery grave. But the mathematical papers he wrote on his new techniques remained secret until 2012.

Turing was a good marathon runner and occasionally ran the forty miles from Bletchley to London when he had to attend an official meeting. He died in 1954, just shy of 42, after conviction for "gross indecency" with another man.

In the Pacific theater of war in the first months of 1942, imperial Japanese forces advanced almost unchecked through southeast Asia and the Philippines. The British fortress of Singapore was said to be impregnable but it fell in February. Churchill was humiliated. The commander had surrendered when his garrison should have fought to the last man!

In April, Colonel James Doolittle led sixteen Mitchell bombers flying from the carrier USS Hornet to bomb Tokyo. It was a token raid, a morale booster for Americans and a warning of things to come for the Japanese. Over two years passed before U.S. aircraft could bomb Japan for real.

The bad news just kept coming for Churchill. In June, he was told that his brave contingent of troops at Tobruk had fallen to Rommel's superior forces, then in July he learned that Rommel had advanced all the way into Egypt, as far as a little coastal town called El Alamein. There Rommel's supply line was stretched, and both sides dug in, exhausted.

Churchill wanted to land a force in France to establish a second front to help his impatient ally Stalin, who kept complaining that the Red Army was taking all the casualties in the fight against fascism. But Churchill remembered Dunkirk, so he agreed on a small raid as a test. In August 1942, British and Canadian forces raided the French port city of Dieppe. About six thousand men, almost all raw Canadians who had no idea how hard it would be, were landed on the beach. Within six hours, most of them were dead or wounded and the rest were back at sea. Churchill decided that a ground invasion of Europe was out of the question until an overwhelming armada could be assembled. Until then, he just had to say no to invasion talk from Stalin and Roosevelt.

Churchill had his work cut out mustering the resources for an offensive against Rommel in North Africa. But Roosevelt sent him a few hundred new American tanks, and in October the assault began. In November, in London, in response to the resounding Allied victory at El Alamein, Churchill said: "This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning."

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January 30, 1943, marked the tenth anniversary of Hitler's accession to power. A few fast RAF Mosquito light bombers bombed Berlin in raids timed precisely to disrupt a pair of big speeches, one by Luftwaffe head Hermann Goering and the other by propaganda minister Joseph Goebbels. Again they were token raids, hints of worse to come.

At the Casablanca conference in January 1943, Churchill, Roosevelt, and Free French leader Charles de Gaulle agreed to demand the unconditional surrender of the Axis powers. Stalin was too busy to attend.

In fact he was very busy indeed. The titanic clash of huge armies on the eastern front continued unabated, and German forced had advanced in the south as far as the city of Stalingrad. There the Red Army had to hold the line.

Stalingrad was the third of the three key Russian cities to come under Axis attack. Leningrad was first, in September 1941, when it came under a siege that lasted until 1944 and not only killed about a million civilians but also cost the Red Army a similar number in attempts to break it. Moscow had just escaped occupation in December 1941, and the German army reached Stalingrad in August 1942. The southern city was the strategic gateway to the oilfields of Baku.

Stalingrad was the turning point of the war on the eastern front. A massive air and artillery bombardment reduced the city to rubble, and men went in and fought among the ruins. In November the Red Army launched a counterattack that cut off the city and trapped two hundred thousand German troops there. The siege continued. Luftwaffe transports tried to supply the troops over an air bridge, but the effort failed against winter storms and Soviet attacks. Half of the Axis troops starved or froze to death.

General Paulus surrendered the remnants of his army in Stalingrad in February. The Soviets led off ninety thousand tired, wounded, sick, starving, and demoralized prisoners. Almost all died in captivity. Altogether, up to a million Axis and Soviet troops and Russian civilians were killed in the battle of Stalingrad, and thousands of tanks and hundreds of planes were lost. It was far and away the most resounding defeat for Hitler in his career so far.

But the Nazi regime ramped up its defiance. Goebbels gave a heavily publicized speech in February to an audience of selected zealots in Berlin under a huge banner reading

Total War – Shortest War. He asked "Do you want total war? Do you want a war, if need be, more total and radical than anything that we can even yet imagine?" and got wild cheers of affirmation in response.

Back in 1942, Churchill and Roosevelt had agreed to throw the Axis powers out of Africa. Morocco and Algeria were in Vichy hands, and the Vichy government in France collaborated with the Germans. So U.S. forces landed in Morocco, where they could hone their combat skills in a relatively marginal theater. Vichy French forces fought back, but Algiers and their African command fell quickly. This prompted Hitler to occupy Vichy France, which in turn led the French army in North Africa to join the Allies. To fill the gap, the Germans and Italians sent more forces to Tunisia.

The winter saw a lull in the fighting as both sides built up their forces. But by March the Allied forces had pushed forward, and the Axis armies were caught in a pincer in Tunisia. They surrendered in May 1943, and well over a quarter of a million Axis troops became prisoners of war. Africa was lost. It was another resounding defeat for the Third Reich.

The war on the eastern front reached a hideous climax in July and August, as the fascist invaders mounted their last big offensive and the Red Army broke their back. At Kursk, in the middle of their front, the Germans launched the biggest tank assault in the history of war, but it failed. The Soviet counterattack was bigger, and it prevailed. The Germans lost two hundred thousand men and thirteen hundred tanks, including many of their new Tiger tanks. The Soviets lost a million men and seven thousand tanks, but under Stalin's command they were big and strong enough to take it. Even under Hitler's merciless lash, the Germans weren't. From then on, the Germans steadily lost ground in the east.

In the Mediterranean, Allied forces landed in Sicily in July and took the island in August. The invasion prompted a coup in July that deposed Mussolini. Germans then took the lead in defending Italy. The Allied invasion of the mainland began in September, but the German resistance was strong and it took almost a year for the Allies to fight their way up to Rome. The Italian landscape presented the Germans with a series of defensible lines to exploit. Meanwhile, Stalin kept complaining that Allied troops should land in France.

Churchill held out great hopes for an air war. He recalled how close to defeat he came in 1940 and was eager to try the same trick on Germany. But early RAF attacks on Germany were disastrous. German defenses decimated daylight raids, and the losses with the bomber aircraft he had, which flew low and slow, were just too high. So he opted for a strategy of night raids, which were safer for the bomber crews but much less accurate. (The U.S. Army Air Force in Europe went for precision day raids because its bombers, the Flying Fortress and the Liberator, flew at high altitude and carried lots of guns, but even then they took heavy casualties.) A night strategy in turn led to a decision to bomb cities, in the hope that enough civilians could be terrorized or made homeless to cripple the German war effort.

The decision to go for city attacks in night raids led to a requirement for a heavy bomber that may fly low and slow but at least carried a big bomb load. The Lancaster was born. First introduced in service in early 1942, this aircraft bore the brunt of the British air war for the next three years. Over seven thousand were built, and altogether they dropped some two thirds of the megaton or so of bombs the RAF dropped on Germany during the war. The industrial effort required to build them was gargantuan. At the height of the program,

over a million people were employed on the task. And tens of thousands of the boys who crewed them died horribly when they were shot down over Germany. The bombing campaign was Britain's main contribution to the war effort.

The new head of RAF Bomber Command in early 1942 was Arthur Harris. He was a passionate advocate of massive area bombing to terrorize civilians. He wanted big raids that would showcase his strategic role and impress the enemy. He got his first really big show in the summer of 1943.

Operation Gomorrah was a campaign of air raids against the north German city of Hamburg over a few nights in July. The dirty work was done mainly by RAF Bomber Command night bombers, though the Americans helped out too with a few daylight raids.

The worst night began shortly before midnight on July 27, when over seven hundred RAF bombers dumped firebombs onto the city. They created something new in the annals of war, a firestorm, a meteorological phenomenon. An inferno fed by hurricane-force winds raised temperatures to furnace heat, totally incinerating some eight square miles of the city and blowing a huge mushroom cloud into the sky. Asphalt streets burst into flame, bunkers stocked with coal and coke caught fire, and spilled fuel oil burned in the canals and the harbor. The storm sucked the oxygen from bomb shelters and cellars and suffocated and then roasted the inhabitants. Two nights later, the RAF was back with another seven hundred bombers to burn out whatever was left.

Operation Gomorrah killed over forty thousand civilians and caused a million more to flee the city. The nine kilotons of bombs dropped destroyed a quarter of a million homes. Hitler was shaken. He said a few more raids like that would end the war. Most of the industry in Hamburg was gone for

good. Only the arms factories were rebuilt. Gomorrah was the worst attack so far in the history of air war.

For Churchill, the Battle of Berlin was the RAF bombing assault on the capital of the Reich. It began in November 1943. As Bomber Harris said, "It will cost us between four and five hundred aircraft; it will cost Germany the war." He could now marshal some eight hundred aircraft whenever he pleased, and so he launched sixteen big raids on Berlin. By Christmas, more than a quarter of the residents of the capital had their houses destroyed. The bombs had started several firestorms and reduced most of the city to rubble. More big raids in 1944 flattened industrial areas and cratered railway yards. Altogether, the raids cost rather more aircraft than anticipated and did appalling damage, but still they failed to break civilian morale. On the contrary, as Churchill might have guessed from experience in London, they only seemed to make the victims more determined than ever to hold out to the end. British official historians later conceded that "in an operational sense the Battle of Berlin was more than a failure, it was a defeat". The massive cost in people killed and resources consumed brought no real benefit.

The Berliners defended themselves and their city effectively, and surprisingly few were killed in the raids. Hitler had responded to the very first air raids on the city by ordering the building of "Flak towers", which were colossal concrete fortresses riddled with bunkers and topped with flat roofs for Flak (anti-aircraft) batteries. The radar screens and fighter squadrons around the capital proved good enough to inflict heavy losses on the enemy bomber formations.

Yet against all odds, the RAF and the USAAF continued to make alternating attacks on the city, the Brits by night and the Yanks by day. The last big RAF raid for a few months

was in March. Then the bombers switched to tactical targets in occupied France in preparation for D-Day.

Churchill finally agreed with Roosevelt and Stalin, at a summit conference in Tehran in November 1943, to open a second front in Europe in 1944. At this conference he realized that Britain was practically out of the running and that the post-war world would be dominated by the United States and the Soviet Union. Roosevelt had no desire to help prop up the British Empire and Stalin had no desire to accept any check on his future dominance of eastern Europe.

The Allied invasion of Normandy, Operation Overlord, was the prelude to the invasion of western Europe. The operation began on D-Day (June 6) with an airborne assault by twelve thousand aircraft followed by an amphibious assault involving almost seven thousand vessels and over a third of a million soldiers and sailors. It was the biggest amphibious invasion ever mounted. Even Stalin was impressed.

The invasion began with two steps, first an airborne assault by paratroopers shortly after midnight, then an amphibious landing of Allied infantry and armor on the beaches soon after dawn. The invaders achieved surprise and the beachhead was secured. The Allies took the rest of June to land a massive enough force on the beaches for a breakout. But by the end of August over three million troops had been inserted and most of France had been liberated.

By eastern front standards, the human losses were modest, at fewer than forty thousand Allied troops killed. Conversely, the equipment losses, at over four thousand planes and some four thousand tanks, were higher. The Western Allies had learned to substitute machines for men more thoroughly than the Soviets had. Churchill's own idea for D-Day had been to build a couple of beachside harbors for fast unloading.

The supreme commander of the Allied forces was U.S. General Dwight D. Eisenhower. He was a farm boy from Kansas whose family was of German extraction, and he went on to become president of the United States a decade later. His leadership in Europe essentially finished the job and all but reduced Churchill to the role of spectator for the rest of the land campaign.

When the German high command saw that the invasion was a success, they realized the war was over. But no one could convince Hitler of that fact. A group of officers therefore plotted an assassination attempt, codenamed Operation Valkyrie. The attempt was made on July 20 at Hitler's eastern front "Wolf's Lair" field headquarters in East Prussia. Lieutenant Colonel Claus Schenk Graf von Stauffenberg, a young staff officer who had lost an eye, a hand, and two more fingers in North Africa, took a bomb into a meeting. By sheer bad luck, Hitler escaped with only minor injuries and had all the Valkyrie plotters shot. The sad result was that the war dragged on for nine more months. More Germans were killed in that last grisly stretch than in all the previous years of war together, as the increasingly powerful enemies closed in from both sides and occupied the fatherland.

Hitler had, or thought he had, a trio of aces up his sleeve: jet aircraft and the V-1 and V-2 "revenge weapons".

The story of jet aircraft began a few years earlier. The first jet engines were developed by Hans von Ohain in Germany and Frank Whittle in Britain, independently of each other. Both men ran their first prototypes in 1937.

Frank Whittle was an RAF engineer officer. He patented his turbojet design in 1930. His engine featured a centrifugal compressor, with flame cans around a bulky turbine unit, but it worked. A prototype jet plane first flew with it in 1941.

Hans von Ohain conceived his jet engine in 1933, then patented his design in 1936. Like Whittle, he used a centrifugal compressor, which in his case fed an annular chamber around the turbine unit. He worked at the Heinkel company, which flew its first jet aircraft in 1939.

Germany also hosted two other turbojet project teams, at Junkers and BMW. These teams developed axial-flow jets, with an uninterrupted airflow along the engine axis, as in all modern turbojets. The Junkers jet was first. It was chosen to power a Messerschmitt jet fighter and other early jet planes. The BMW design was taken up after the war in France and the Soviet Union.

The first jet fighters entered service in 1944, in Britain and in Germany. But with its axial-flow engines and swept wings, the Messerschmitt was much faster than the British Meteor, which had Whittle jets and straight wings.

The V-1 buzz bomb was a primitive cruise missile with a warhead weighing a little under a ton and a simple inertial guidance system. It buzzed at subsonic speed for a hundred miles or so, then fell to the ground and exploded. Launched from sites along the North Sea and Channel coast, the V-1 could hit targets all over south-eastern England. The first flew over in June 1944, and soon they became a routine and detested hazard. The best responses against them were to bomb the launch sites and to intercept the flyers with fast fighter aircraft such the new Meteor jets. Some ten thousand buzz bombs were launched before October, when the last launch sites were overrun by Allied troops, and they caused over twenty thousand casualties.

The V-2 rocket was an altogether more fearsome weapon. It was a ballistic missile originally developed by the brilliant engineer Wernher von Braun and built as a weapon by armies

of slave laborers in deeply buried underground factories. It carried a one-ton warhead up to two hundred miles and flew at several times the speed of sound, so not only was it completely immune to any form of interception then available but also no one could hear it coming. The first ones landed in September 1944 and they kept coming until late March 1945. A total of over three thousand were launched, almost half of them at London. They killed over seven thousand people when they exploded, but they killed some twelve thousand slave laborers during the inhuman production process. After the war, von Braun went on to a dazzling career at NASA, where he designed bigger rockets, including the giant Saturn boosters that put men on the Moon.

The three aces failed. The jets lacked the fuel to fly much and the V-weapon launch sites were all bombed as soon as they were located. The German advantage in technology was too marginal to secure victory.

Hitler's last lunge in the west was the Battle of the Bulge, in December and January. He threw two hundred thousand men and hundreds of tanks against the surprised Americans, who thought they would walk into the Reich, and achieved a quick breakthrough. Winter weather kept Allied warplanes grounded, which helped him, because despite his latest jet aircraft the Allies enjoyed complete air dominance. But his tanks soon ran out of fuel. Ever since the defeat at Stalingrad had denied him access to the oilfields of Baku, he knew that oil would be a problem, and it was. Even his plants for turning coal to oil didn't help, because Americans kept bombing them. And to top it all, most of his troops in the west would rather surrender to Americans than die in vain. When the weather cleared again the Allied planes were back. By March the Allies had pushed into Germany.

Churchill met Roosevelt and Stalin again at Yalta in early February. Roosevelt was now a sick man and said little. Stalin was proud of the progress the Red Army had made and impatient to stake out his future empire in Europe. Churchill was alarmed. Far from being chastened by war, his nemesis from decades past was now bigger and brasher than ever.

On St. Valentine's Day 1945, plus the nights before and after, hundreds of British and American bombers pounded the German city of Dresden, which was crowded with German wounded and refugees. Some thirty thousand people were killed. Looking back, some say the attack was a war crime. Following the bombing, Churchill wrote a secret telegram doubting the value of "mere acts of terror and wanton destruction" and issued a statement on April 1:

> It seems to me that the moment has come when the question of the so called "area-bombing" of German cities should be reviewed … We must see to it that our attacks do no more harm to ourselves in the long run than they do to the enemy's war effort.

Decades later, historian Max Hastings denied that RAF area bombing was a war crime, "for this might be held to suggest some moral equivalence with the deeds of the Nazis". But it was a poor way to hasten Germany's military defeat.

There were more big bombing raids on Berlin in March, but by then, after some three hundred air raids had dumped over sixty kilotons of bombs onto Berlin, they did little more than make the rubble bounce.

Neither the RAF nor the USAAF ever bombed the death camp at Auschwitz. When the Red Army liberated the camp on January 27, 1945, the appalling truth was revealed. As the Nazis retreated, they did all they could to efface the traces of

their concentration camps and death camps, quickly burying the last bodies in mass graves and marching any survivors who still had a few weeks' work left in them off to continued misery elsewhere, but Auschwitz was too big to hide. At the time it seemed millions had perished in its ovens, but present estimates are that about one million died there.

The technology deployed in the death camps was simple, even crude, but effective. New inmates arrived by train, in many cases in the early years quite innocently, expecting to be relocated on a farm somewhere. Then they were stripped of their belongings and herded into shower rooms, where they were killed with poison gas. Then slave prisoners threw the corpses onto conveyer belts that led to the ovens, where the bodies were incinerated. More slave prisoners shoveled the ashes out of the ovens in readiness for the next batch. The camps ran as smoothly as sausage factories, to produce not sausages but corpses. In his only recorded comment on the Shoah (the "catastrophe" in Hebrew), philosopher Martin Heidegger said the death camps were a logical consequence of the development of slaughterhouse technology. He could have added with no less bathos that in a total war the culling of stock with what racists saw as a kind of "mad cow" gene rot in the death camps was merely good hygiene.

Between 1939 and 1945, the SS, assisted by a variety of German and other collaborators, were responsible for the deaths of eleven to fourteen million people, including about six million Jews. The six million represented some two thirds of the pre-war Jewish population in Europe, and almost all those in Germany and the lands to the east. At first many victims were shot, after they had first been forced at gunpoint to dig their own mass graves, but the Nazi bean counters soon calculated that the cost of all those bullets was too high.

Anyway, the shooting took a heavy psychological toll on any insufficiently brutalized guards. So gassing it was. The trains ran on time, the ash and smoke rose from the chimneys (causing some people who lived near the camps to complain about the ash fallout), and the mass graves filled up steadily with their crudely processed remains. In this respect at least, Hitler did what he set out to do.

In late 1944 and early 1945, Red Army occupied Poland and all its campsites. The death camps at Auschwitz, Belzec, Chelmno, Majdanek, Sobibor, and Treblinka (all well away from intentionally ignorant German citizens), between them manufactured about three million corpses. There were plenty of concentration camps in Germany too, such as those at Bergen-Belsen and Dachau, but only later in the war did the prisoners concentrated there find that dying was their first duty. When Allied troops liberated those camps in April and May 1945 and witnessed the piles of corpses and the skeletal survivors, they could scarcely believe what they saw. They conscripted gangs of local civilians to clean up the mess and to burn in their own shame.

The Red Army reached Berlin in April. They subjected what little remained of the city to a massive artillery barrage that threw another forty thousand tons of explosives onto the rubble, then fought their way in, street by street. In that final assault they used two million men, six thousand tanks, seven thousand aircraft, forty thousand big guns. Even then, they lost eighty thousand men, two thousand tanks, a thousand aircraft. For diehard Nazis, it was a fight to the finish.

Hitler decided to stay in the city, deep in his *Führerbunker*, and hold out to the bitter end. He ordered the destruction of everything of value before it could fall into Allied hands, but his arms minister Albert Speer quietly ignored the order.

On April 20, Hitler, now 56, took his last walk in the open air. On the next day, the Red Army broke through into the city. When he heard the rumble of the big guns above his bunker, Hitler realized at last that Germany was going to lose the war. He berated his commanders wildly and said the war was lost. On April 29, he married Eva Braun and dictated his last will and testament. On the next day, when Soviet troops were only blocks away, the honeymoon couple bit down on cyanide capsules and Adolf blew his brains out with a pistol. His aides quickly took the bodies up to the garden, doused them in gasoline, and burned them.

During the war years, Hitler had become addicted to amphetamine and taken numerous medications. Newsreel footage of him after the July 1944 assassination attempt shows a trembling hand and a shuffling walk.

In public, Hitler often praised Christian culture and said it motivated his hostility to Jews. In private, he said traditional Christianity was a religion fit only for slaves. But he admired Islam, especially its martial tradition, although he regarded Arabs as racially inferior. He dreamed that Germans under Islam could have conquered most of the world centuries ago. He also admired the Japanese warrior cult of *bushido*, which glorified the final act of self-destruction.

Hitler's insane policies had inflicted human suffering on a scale beyond the imaginations of the old moral authorities. Altogether, his regime was responsible for the deaths of an estimated fifty million people in Europe during the war.

Franklin Roosevelt died in April too. Harry Truman took over as president of the United States. A grieving Winston did all he could to help Truman in his first days in office.

On May 7, 1945, the Allies accepted Germany's surrender. On May 8, Victory in Europe Day, Churchill broadcast the

news on BBC radio, then told a huge crowd in Whitehall: "This is your victory." The people shouted: "No, it's yours."

Far from relaxing in peace at last, Churchill worried that the Red Army would simply keep on rolling and invade all of Europe. He wanted to "impose upon Russia the will of the United States and the British Empire".

Churchill met Stalin once again, with Harry Truman, at a conference in Potsdam in late July. But midway through the wearying negotiations with Stalin over the post-war borders in Europe, he heard his party had been defeated in a general election. He was no longer prime minister! His successor Clement Atlee came and took over in Potsdam.

Churchill was humiliated. He had to sit in opposition for the next six years. But of course he kept on airing big ideas. During a 1946 trip to the United States, he gave a famous speech about foreign policy in Fulton, Missouri, and said: "From Stettin in the Baltic to Trieste in the Adriatic, an Iron Curtain has descended across the continent."

Churchill saw Britain's place as at the heart of what he called the Anglosphere, surrounded by the Commonwealth and Empire and the United States. He went on to write a fat six-volume history of the Second World War, and for his history books he won the Nobel Prize in Literature in 1953. He even served again as prime minister from 1951 to 1955. But he was old and tired, and he began to lose his long battle against the "black dog" of depression. He died at home, aged ninety, in 1965. His war was won.

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We do well to pause here and ask what conceivable rationale could even seem to justify the violent deaths of fifty million people. Was Hitler stark raving mad?

One story is that Hitler stood to Nietzsche as Lenin and Stalin stood to Marx. This needs explaining. Lenin and Stalin turned Marxism into revolutionary praxis, in an attempt to implement socialism and communism in hard fact. Similarly, some say, Hitler put the visionary ideas of the philosopher Friedrich Nietzsche about the post-Christian world beyond humanity (the world of the *Übermensch*) into practice with a brisk removal of all the human "trash" that had accumulated during centuries of Christian slave morality. The idea was to prepare the way for the rule of hawkish warrior types who could farm the remaining masses like cattle. This story made Hitler an agent of the cleansing apocalypse of Nietzsche's prophet Zarathustra. Yet nothing in Nietzsche's wildest writings gave any clue that slaughtering millions was the way to go, and certainly gave no reason for a special focus on Jews. This story really doesn't wash.

Another story is that Hitler stood to Darwin as Lenin and Stalin stood to Marx. Charles Darwin was a scientist, not a social engineer, so this reading is hard to sustain. The people who called themselves Social Darwinists already misunderstood the science of evolution, and their forays into eugenics, for example by sterilizing "mental defectives" and others, were far beyond the pale of any scientific rationale in terms of genetics. The theory of evolution had to wait a century for a genetic foundation. Until then, it had no relevance to social policy at all. The natural world of most animals was a battlefield in the Darwinian view, but that was no excuse at all for turning the world of human animals into another kind of battlefield. So this story doesn't wash either.

A third story goes deeper. Hitler was an Antichrist. He set himself up in opposition to the whole pious tradition of the Christian church. Nietzsche saw Christian morality as a form

of rot, as a celebration of weakness and impotence in face of the almighty, and hence an acceptance of defeat in face of anyone either bold enough to claim power of life and death over them or scheming enough to exploit their innocence. Given the Christian drift of Western history since Augustine, Hitler could claim to have been the most effective Antichrist since at least the Mongol warlords. In his version of history, when Marxists tried to pull a trick yet bigger than Christians had pulled, to enslave the sheep of common humanity not one by one but flock by flock, it was time for a proud hero to stride forth and do battle with the whole rotten mess.

The third story led quickly to a hostile view of Jews. The proud hero saw that the Jewish tribal god had been inflated by generations of bovine Christians into a cosmic ghost, the God of our fathers, GOOF, Goof, behind which the Jews could hide and quietly feed the myth that the Jewish race was destined as the chosen race of Goof to enjoy a privileged status in the human world, as avatars of divinity among men. Hitler the vegetarian Antichrist was the one to put a stop to that nonsense with a sharp reminder to Jews and Christians alike that they were animals first. Sadly, this story does wash. Hitler may well have believed something like this.

Hitler the Antichrist was a cultural arsonist. With his war of annihilation he burned down the Goof-haunted order of the Biblical playbook and scorched the Earth in a Wagnerian *Götterdämmerung*. He sacrificed a generation of Europeans in order to change the game of civilization forever. Europe was the loser, and the winners were the two global superpowers that dominated the next few decades.

The name "Holocaust" is often used narrowly to denote the ethnic genocide of the Jews, but a wider usage is surely called for. The word comes from classical Greek and means

"sacrifice by fire", and the entire war in Europe from 1939 to 1945 was a holocaust in that original sense. So let this be its new name: Hitler's entire war was the Holocaust.

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The Holocaust was only half the story of World War Two. The Pacific war against imperial Japan was the other half. That war ran until later in 1945, when it ended with a bang – or rather two almighty bangs – in August.

Japanese imperialism was just as ugly as European fascism. Japanese aggression in Asia began with the invasion of Manchuria in 1931 and grew into war with the Republic of China in 1937. Chinese nationalists and communists fought them to a prolonged and bloody stalemate.

Japanese military staff planned in 1941 for war against the United States in order to secure Japanese hegemony in Asia. The attack on Pearl Harbor was their opening gambit.

The Doolittle raid on Tokyo in April 1942 prompted them to attack Midway in June. The idea was to set up an air base there to dominate the central Pacific. A surprise attack was planned, but the Japanese codes were cracked and the plan revealed. The Americans had more planes and soon gained air superiority. Midway was a win for America and a high tide mark for the Japanese wave in the Pacific. It was the last big Pacific sea battle for two years.

The United States embarked on a massive buildup of its war machine. Imperial Japan fell behind as U.S. submarines sank its ships and cut off its oil supply. The U.S. plan was to hop from island to island across the Pacific to Japan.

In June 1944, a massive U.S. force landed on the island of Saipan. The aim was to build big airfields on the island from which giant new Superfortress bombers could bomb Tokyo.

The Boeing B-29 Superfortress was far and away the most advanced bomber produced in the war. Its development cost three billion dollars, a vast sum in those days, and it changed the game in the Pacific. It was first fielded in 1944 and many hundreds of them flew against Japan.

The Japanese commanders had to hold Saipan. Their fleet was about half the size of the U.S. fleet, with half as many aircraft, many of them obsolete. Battle commenced near the Mariana Islands. It was the largest sea battle in history so far. The Japanese lost many times more aircraft and aircrew, and their carrier force was effectively destroyed. The Americans later called it the great Marianas turkey shoot.

The Battle of Leyte Gulf in October 1944 was larger still. The Japanese fleet included about fifty major warships but the U.S. fleet included over a hundred, plus a thousand warplanes. It was the first time that the Japanese used kamikaze tactics, and they lost six hundred planes in three days. The U.S. victory established air and sea superiority, secured the beachheads on Leyte, broke the back of the Japanese navy, and opened the way to Japan.

The last big Japanese naval operation of the war was the last voyage of the monster battleship Yamato in April 1945. A swarm of U.S. Navy planes sank the ship in a cataclysmic explosion that made a mushroom cloud four miles high.

The biggest and bloodiest land battle came at Okinawa, from which Superfortress bombers would be much closer to the home islands. The Japanese had over a hundred thousand troops and many more civilians on the island. The Americans landed in April and declared victory in June. The supporting naval forces suffered thousands of kamikaze attacks and the invading troops lost tens of thousands in the fighting, but almost all the defenders died in action.

The American strategic bombing of the home islands was now a huge operation. Japanese industry was crippled as the hearts of over sixty cities were burned out in firebombing raids. In one massive raid on Tokyo in March alone, about a hundred thousand people were killed in a firestorm.

The *coup de grace* came in August. A Superfortress dropped an atom bomb onto Hiroshima, then three days later another Superfortress dropped an atom bomb onto Nagasaki. On that day too, Stalin's Red Army invaded Manchuria. On the next day, the Japanese cabinet decided to surrender, and on August 15 (VJ Day) they did so. All told, the Japanese war of aggression in the Pacific killed thirty million people.

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The United States took several years to build the atom bomb in the Manhattan project. It involved well over a hundred thousand people and cost nearly two billion dollars.

The story began in August 1939, when two American physicists drafted a letter warning of "extremely powerful bombs of a new type" and urging Americans to be prepared. They persuaded Albert Einstein to sign it and mailed it to President Roosevelt.

Roosevelt gave the go-ahead in late 1941. Major General Leslie Groves appointed J. Robert Oppenheimer to serve as the director of a new laboratory in the desert at Los Alamos with the task of developing the bomb. He assembled a star team, including the young Richard Feynman and a brilliant Hungarian émigré called John von Neumann.

Uranium was the stuff that made the atom bomb possible. It fueled the reactors that made plutonium and in enriched form it was the explosive in a bomb. But a lot of hard work was needed to enrich it.

A good stock of weapons grade uranium was delivered to Los Alamos by July 1945. Engineers used it to make a bomb containing two subcritical masses, shaped as a bullet and a target. When the bullet was shot into the target, it made a critical mass, which exploded. It was clumsy but it worked.

The second kind of atom bomb used plutonium, which was made in a reactor by bombarding natural uranium with neutrons. But plutonium was no good for a gun-type bomb. It would go critical so fast it blew apart and fizzled. So the scientists designed an implosion device, in which explosives crushed a ball of plutonium into a smaller and denser form that went critical. The final design was like a soccer ball, with hexagonal and pentagonal chunks of explosive around the plutonium core. The first cores were delivered in July.

Oppenheimer arranged a test called Trinity. The "gadget" was hoisted to the top of a steel tower in the desert. It exploded with an energy of around twenty kilotons. The shock wave was felt over a hundred miles away and the mushroom cloud rose over seven miles high. The bang left a huge crater where the tower had been and turned the sand in it to glass. "I am become death, the destroyer of worlds," said Oppenheimer, quoting the Bhagavad Gita.

Roosevelt had planned to drop atom bombs on Germany and had made big efforts to keep the plan secret from them. But the Soviet spies were good. President Truman was at the Potsdam conference when he heard the news about Trinity. An aide gave him a note: "It's a boy!" Truman proudly told Stalin about it, but Stalin already knew.

On August 6, a Superfortress called Enola Gay dropped a uranium bomb called Little Boy onto Hiroshima. The blast was estimated to be about thirteen kilotons and it killed over seventy thousand people instantly.

On August 9, a Superfortress called Bockscar dropped a plutonium bomb called Fat Man onto Nagasaki. The blast was equivalent to about twenty kilotons, but it was dropped away from the center and killed fewer than forty thousand people instantly. Many thousands more died later when the radiation sickness kicked in.

The Bomb transformed warfare forever. The first result was to make the United States the undisputed global superpower for years, until the USSR caught up.

The physical theory behind the atom bomb started small, extremely small, in 1900, when Berlin physicist Max Planck introduced the quantum into physics. Quantum theory grew quickly in the decade after the Great War and opened up a whole new world of nuclear physics. The key theorists were Erwin Schrödinger with his famous wave equation, Werner Heisenberg with his uncertainty principle, and Paul Dirac with his quantum electrodynamics. Behind all this new theory was the iconic figure of Albert Einstein, who among other great achievements had shown that vast amounts of energy were locked in atomic nuclei. It was this result that led to Einstein's letter to Roosevelt.

People soon realized that the physicists had made total war obsolete as an instrument of politics. An atomic war would be too destructive. Once both warring parties had a stockpile of atom bombs, plus an unstoppable delivery system based on ballistic missiles, a war between them would be a double Holocaust.

Globorg

We need to slog for a few years more through the horrors of war before we can return to science and prepare the launch pad for our voyage into the coral clouds.

One consequence of World War Two was the founding of the United Nations, based in New York, to help preserve peace between nations. Another was the end of the British Empire, as India and its Muslim breakaway Pakistan became independent in August 1947, and other states followed later. Yet another result was the founding of the state of Israel, in the former British Mandate of Palestine, in May 1948, as a homeland for Jews exiled from Europe.

Events in India make a happy interlude between the old horrors of total war and the new threat of nuclear war. India gave the world a new hero, a man who could stand in the company of Jesus the Nazarene. He brought forth a message good enough, if heeded, to help us avoid nuclear war. His name was Gandhi, and his story is worth telling.

Mohandas K. Gandhi was born in 1869 and raised as a Hindu in Gujarat. He married his wife when they were both thirteen years old. When his schooling was completed they took a steamer to England, where he studied law in London. After graduating, he got a job in South Africa in 1893, as a lawyer working for the Muslim Indian community. Racial discrimination affronted him, and he stayed on to oppose a new bill denying Indians the right to vote. He urged Indians to defy the new law and take the punishment. It worked, and he stayed in South Africa for some twenty years.

Gandhi was a man of spiritual ambition. He regarded the cultivation of dietary and sexual austerity as integral to his beliefs, and saw vegetarianism as part of his commitment to *brahmacharya*, or chastity and celibacy. As a married father of four sons, he vowed in 1906 to abstain henceforth from sex with his wife. His advice to any man who wished to realize what he called the truth of God was stark: "He must reduce himself to zero and have perfect control over all his senses, beginning with the palate or tongue."

At its root, Gandhi's philosophy of life was quite simple: "When I despair, I remember that all through history the way of truth and love has always won."

Gandhi returned to India in 1915, toured rural India, and resolved to become more Indian. When he joined the Indian National Congress he found his fame had gone before him, and he soon acquired the honorific title Mahatma (great soul). He and his wife learned to live in a modest traditional style.

Congress backed Gandhi to try his methods of civil disobedience in the struggle against the British Raj. After British imperial troops shot and killed hundreds of peaceful civilians in the Amritsar massacre of 1919, many Indians decided the Raj was intolerable. Gandhi denounced both the shootings and the violence in the ensuing Indian protests. From then on, he worked for Indian independence.

In 1921, Gandhi was voted leader of the Indian National Congress. He began to advocate a boycott of British goods and proposed that Indians should wear homespun clothing instead of textiles from Britain. He even invented a portable spinning wheel, which later became iconic.

The campaign of non-cooperation enjoyed great success until a violent clash erupted in 1922. Fearing more violence, Gandhi called it off, but he was arrested and imprisoned for

two years. Without him, the Indian National Congress began to splinter, and Hindus and Muslims quarreled.

Gandhi stayed out of party politics for a few more years. He began to fight for the "untouchables" in the caste system and campaigned against alcoholism, ignorance, and poverty.

As for philosophy, the Mahatma wrote in 1927 that God is truth, but later changed this and said truth is God. He called his way of resolving conflicts without doing violence to the conflicting parties *satyagraha* (sticking to the truth). He was a rich source of philosophical wisdom, but he also cautioned: "I have nothing new to teach the world. Truth and non-violence are as old as the hills."

Gandhi returned to politics in 1928 and pushed through a resolution calling on the British government to grant India dominion status. The Indian National Congress declared that January 26, 1930, was Independence Day, but British officials refused to take the bait and the day passed without violence. Gandhi then launched a new campaign against the imperial tax on salt by marching four hundred kilometers to the coast to make salt himself. Thousands of Indians joined him, and the action was a great success.

The British government agreed in 1931 to free all political prisoners in return for an end to civil disobedience. Gandhi was invited to a conference in London and made headlines as he braved the English weather in his Indian garb. When a reporter asked him what he thought of Western civilization, Gandhi paused a while and replied: "I think it would be a very good idea."

Not everyone was charmed. Imperialists in Westminster thought India was not yet ready for independence. Among them was Winston Churchill, who called Gandhi "a seditious middle temple lawyer, now posing as a fakir of a type well

known in the east," and sought to ridicule his going about "half-naked" on government business. When Lord Halifax, the former viceroy of India, talked with Hitler in 1938, the *Führer* suggested he have Gandhi shot.

But Gandhi rose above such men. He said so many good things it seems good to list a few quotes:

An eye for an eye makes the whole world blind.
There are many causes that I am prepared to die for but no causes that I am prepared to kill for.
The weak can never forgive. Forgiveness is the attribute of the strong.
You must be the change you wish to see in the world.
Strength does not come from physical capacity. It comes from an indomitable will.
Those who say religion has nothing to do with politics do not know what religion is.

When the British went to war in September 1939, Gandhi initially favored offering "non-violent moral support". But Congress leaders were offended that the British viceroy had declared war between India and Germany without consulting them, so Gandhi said India could not be party to a British war to defend freedom as long as India was denied its own freedom. He advised the British people in 1940 to lay down their arms and let the Germans take what they want. He said they should even let themselves be slaughtered if necessary, but refuse to give allegiance to the occupiers.

Gandhi started a "Quit India" campaign in 1942. The Raj authorities responded by arresting him and thousands of Congress officials. Gandhi was imprisoned for the rest of the war in a palace in Pune. When the war ended and the British relented on independence, he called off his struggle.

On Jews, Gandhi spoke out against Zionism in Palestine. He said Jews should "disclaim any intention of realizing their aspiration under the protection of arms". Instead, he said, they should "rely wholly on the goodwill of Arabs". In 1946 he accepted that the Holocaust was a crime: "But the Jews should have offered themselves to the butcher's knife … It would have aroused the world and the people of Germany." Redundant advice: In effect that's what they did.

In August 1947, India and Pakistan became independent, both from the United Kingdom and from each other. Over ten million people migrated from one side of the new border to the other, and over half a million were killed in communal riots. But India was free.

Gandhi was assassinated in 1948. Indians now call him the father of the nation. Albert Einstein was impressed: "He has invented a completely new and humane means for the liberation war of an oppressed country." In the following decades, Martin Luther King and Nelson Mandela both adopted his methods. He was a flawed human being, but he shook the British Empire almost as much as Jesus shook the Roman Empire, so he deserves a nod.

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Another consequence of World War Two, as Churchill had predicted, was the hardening of the front between the West and the Soviet Bloc in Europe into a fearsome Iron Curtain, defended on either side by massive standing armies, ready to start World War Three at a moment's notice. The first dramatic sign of this confrontation was the Soviet blockade of Berlin for a year, starting in June 1948. This led to a massive airlift to the city of all the food and fuel it needed by British and American cargo aircraft, which succeeded magnificently

in keeping the Western half of the city supplied despite all the evil plans of Stalin and his comrades in the Kremlin. In the end the Reds were humiliated, the Berliners were delighted, and the Allies were grateful for their air power.

Yet another result of the war, this time in the Pacific, was the partitioning of Korea into a northern half occupied by Soviet troops and a southern half occupied by Americans. North Korean forces invaded South Korea in June 1950. The war lasted three years, involved a long list of nations fighting under the UN flag beside America, and cost a million lives in the south and many more in the north.

The Korean war was as hideous as any on the ground but featured a technical highlight in the air. Both sides deployed their new jet fighters. The Russian MiG-15 was based on a Focke-Wulf prototype from the last days of the Third Reich, powered by a copy of a Rolls-Royce engine. The U.S. Sabre made use of design data for Messerschmitt jet fighters from those days. The dogfights were well matched and showed once more that technology was the key to modern warfare.

The other side of the air war was the bombing campaign. The U.S. Air Force B-29 fleet dropped a bigger tonnage of iron bombs onto North Korea than the USAAF had dropped on Japan in the big war. President Truman and his successor President Eisenhower in January 1953 would both have nuked the Reds if they had seen a useful payoff.

The war would likely have been a quick win for the UN forces if the People's Republic of China had not intervened in October 1950, on the first anniversary of the founding of the new republic under Chairman Mao Zedong. Mao had trained in Moscow under Stalin and was eager to polish his revolutionary credentials. He kept the war going until a few months after Stalin died in 1953, then went on to emulate his

murderous hero all too literally, with collectivization, forced industrialization, and even more premature deaths in China than the Japanese had inflicted.

The cease-fire line was the same line the war had started from. It became the most militarized border in the world after the stretch of Iron Curtain bisecting Germany.

What kept the peace in Europe was the nuclear stand-off. The Soviets exploded their first atom bomb in August 1949. Americans had become infected with Churchill's loathing for communism, and some military men were eager to wage war on the USSR before the Reds got enough nukes, or a good enough delivery system, to be a real threat. Both the United States and the USSR grabbed all the Nazi rocket scientists they could in 1945, with the obvious intention of threatening each other as soon as possible with atom bombs mounted on long-range ballistic missiles that would be immune to attack once launched, to give an assured kill capability.

The next big thing in the developing technology of war was the hydrogen bomb. American physicist Edward Teller had seen the possibility of the "super" (as he called it) during the Manhattan project, but he had to be patient. The thermo-nuclear bomb exploits nuclear fusion. Hydrogen nuclei are fused at high temperature and pressure to form helium, with the emission of huge quantities of energy. The H-bomb has a fission bomb in it just to heat and compress the hydrogen. One design used a plutonium bomb as a trigger, a plutonium sparkplug, a uranium tamper, and a layer of lithium deuteride fuel with a tritium booster (deuterium and tritium are heavy isotopes of hydrogen). It was a loathsome piece of work, but it made a very big bang.

The first test of a hydrogen bomb was on a Pacific atoll in November 1952. The yield was ten megatons. The new bomb

was a thousand times more powerful than atom bombs. The Soviets tested their first hydrogen bomb with a yield over a megaton in 1955, and tested a fifty megaton bomb in 1961. Soon both sides had enough bombs and missiles to destroy each other many times over, in a mutual assured destruction (MAD) scenario that endured for the rest of the cold war between them.

The cold war pitted the West, led by the United States and fighting under a white star, against the Reds, led by the USSR and fighting under a red star. Locked in their MAD embrace, the two stars engaged in a struggle for global dominance. States across the globe were armed and backed by one or the other superpower to fight as proxies for their stars. One hot spot was Vietnam.

In 1945, the Allies planned to return Indochina to French colonial rule, but communist Viet Minh leader Ho Chi Minh in Hanoi proclaimed the Democratic Republic. French troops went in to oust him and a guerrilla war began.

In 1954, the Viet Minh rebels defeated the French in a big battle at Dien Bien Phu. Vietnam became independent and was partitioned at the seventeenth parallel.

Much like Korea, Vietnam was left with a northern half under Red control and a southern half allied with the West. Fighting for the Democratic Republic of Vietnam in the north were the North Vietnamese Army (NVA) and their guerilla allies in the south, who soon became the Vietcong, supported by the Soviet Union and Red China. Fighting for the southern state was the Army of the Republic of Vietnam (ARVN), often supported by the United States military.

In the south, an autocrat called Ngo Dinh Diem became president. He was a devout Roman Catholic but most people in Vietnam were Buddhist. President Eisenhower pledged his

support, on the "domino theory" that if one country fell to communism then all its neighbors would fall too.

The Diem regime put thousands of opponents into prison camps. Northern communists responded by calling for the liberation of the south from American imperialism.

In 1960, the young John F. Kennedy was elected president of the United States. In 1961, his vice president, Lyndon B. Johnson, visited Saigon and described Diem as the "Winston Churchill of Asia".

The Kennedy administration increased military assistance to the Diem regime. But the southern army was inept, and the regime looked unstable. Discontent exploded when the police attacked Buddhists in 1963 and killed many monks.

President Diem was unseated and executed in November. Then President Kennedy was assassinated on November 22. Lyndon Johnson became president.

In August 1964, after an incident involving a U.S. spy ship in the Gulf of Tonkin, Congress authorized Johnson to conduct military operations in Vietnam without declaring war.

The National Security Council recommended a bombing war on North Vietnam. In the following years, U.S. bombers dumped a megaton of ordnance onto the Reds. Most of the tonnage was dropped by giant B-52 Stratofortress bombers (also known as *buffs* – big ugly fat fuckers). The USAF Chief of Staff Curtis LeMay said: "We're going to bomb them back into the stone age."

But the American air bases needed protection. By the end of 1965, almost two hundred thousand U.S. troops had been deployed to South Vietnam.

U.S. Army General William Westmoreland outlined a plan to win the war and predicted victory by the end of 1967. In January 1968, the Reds launched the surprise Tet offensive.

Among many other actions, it included attacks on Westmoreland's headquarters and against the U.S. embassy in Saigon. The U.S. and ARVN forces soon rallied and decimated the Vietcong, but it was too late for their media credibility.

The United States and the Hanoi government began peace talks in 1968. Richard Nixon was elected president, in part on a Vietnamization policy to outsource the war to the ARVN. The anti-war movement grew stronger on outrage provoked by media reports of U.S. atrocities.

In the spring of 1972, the Reds mounted a massive conventional invasion of South Vietnam and threatened to take half the country. The last U.S. ground troops were on their way out and only airpower halted the offensive.

A reelected Nixon ordered massive bombing attacks on Hanoi and Haiphong in December. The offensive destroyed much of the remaining industrial capacity of North Vietnam. In January he suspended the bombing and signed the Paris peace accords to end direct U.S. involvement in the war.

In October 1973, the OPEC cartel of oil producing states quadrupled oil prices practically overnight, in anger at U.S. support for Israel during the Yom Kippur War. The price hike put most economies worldwide in trouble but hit South Vietnam hard. The Vietcong were untroubled; they just kept on fighting. The southern forces complained that they were immobilized by lack of fuel.

In their 1975 spring offensive, the northern army took a hundred thousand southern prisoners and advanced as far as Saigon. Soon a hundred thousand Red troops surrounded the city. Amid televised scenes of chaos and panic, American helicopters began evacuating U.S. embassy staff and foreign nationals. The last Americans abandoned their embassy on April 30. By Mayday Saigon was Red.

The U.S. bombing had been a monstrous, atrocious flop. The Vietcong guerillas had been fighting for thirty years and they were tough. Ho Chi Minh once said: "You can kill ten of my men for every one I kill of yours … But even at these odds you will lose and I will win."

In a decade of fighting, the United States blew well over a hundred billion dollars in Vietnam. More than three million Americans served in the war and about half of them saw combat. Well over fifty thousand U.S. troops were killed and many times that number wounded.

The American will to win at all costs led to new kinds of atrocity. U.S. tactics included denying enemy troops the top cover of foliage by spraying millions of acres of jungle with chemical agents to defoliate the tropical canopy. The agents included almost fifty thousand tons of the herbicide Agent Orange, which included traces of dioxin. The Vietnamese government later estimated that the war had cost a million military dead, two million civilian dead, and as many as four million victims of dioxin poisoning.

All this is not just another war story. For the first time in its history, the United States lost a major war. For the first time, too, air dominance failed to secure a victory. High-tech weaponry such as helicopters and jet bombers could raise the kill ratio enormously but they couldn't win an unjust war. Television news proved decisive in making the hideous truth of war obvious to all. The course of the war proved inseparable from global events and trends such as turmoil in the Mideast and increasing environmental awareness. It was the last big bloodbath between proxies of the cold war stars. The war was a milestone in global history.

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Despite the strong red showing in Korea and Vietnam, the MAD cold war of the United States and its NATO allies versus the USSR and its Warsaw Pact allies led to a win for white. We can be grateful that it did so without going nuclear and without yet another ground war in Europe.

The decisive campaign was fought not on the ground but over the Moon. The Soviets opened a front in space when they orbited the satellite Sputnik in 1957.

Americans suddenly got the message. In 1958, in response to Sputnik, National Aeronautics and Space Administration (NASA) was founded, and launched the projects Mercury, Gemini, and Apollo. Project Mercury had the goal of putting an astronaut in orbit around the Earth.

In April 1961, Soviet cosmonaut Yuri Gagarin orbited the Earth. In May, President Kennedy addressed Congress:

> I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to the Earth. No single space project in this period will be more impressive to mankind, or more important in the long-range exploration of space; and none will be so difficult or expensive to accomplish.

Mercury astronaut John Glenn was the first American to orbit the Earth, in February 1962, ten months after Gagarin's historic flight. In September, Kennedy declared:

> We choose to go to the Moon. We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard.

Landing men on the Moon by the end of 1969 was going to need a mighty effort. Project Apollo cost twenty-five billion

dollars, or four percent of America's total economic output, and at its peak employed four hundred thousand people.

NASA built a big new launch center in Florida, renamed the Kennedy Space Center after the assassination. Wernher von Braun was transferred from the army to NASA, and his team of rocket engineers started work on the giant Saturn booster rocket. By the time they had finished, the three-stage Saturn V launch stack stood well over a hundred meters tall and weighed close on three thousand tons.

This colossal rocket would launch a spacecraft with three modules. The command module was a conical body designed to accommodate three astronauts for the flight and the return to Earth, the service module was to power the rig into lunar orbit and back into Earth orbit, and the lunar module would land two astronauts on the Moon and fly them back to lunar orbit to dock with the rest before being discarded.

Amazingly, it all worked. Here's the timeline. In 1965 and 1966, Project Gemini orbited two-man capsules to test long flights, maneuvers, and spacewalks. In 1967, in a ground test, an Apollo capsule accident killed three astronauts. A series of Apollo test flights gradually pushed out the envelope, until Apollo 8 made ten lunar orbits and transmitted television pictures of the lunar surface on Christmas Eve 1968.

In 1969, Apollo 9 and 10 tested the lunar module. Then, on July 20, Apollo 11, crewed by Neil Armstrong, Michael Collins, and Buzz Aldrin, performed a landing on the Sea of Tranquility. Armstrong and Aldrin spent over twenty hours on the surface and over two hours walking on the Moon. Armstrong's first (rehearsed) words on the surface: "That's one small step for (a) man, one giant leap for mankind."

Apollo 12 went smoothly and Apollo 13 was a "successful failure" that made a great news drama for live television. The

flights in 1971 and 1972 featured ever longer stays on the lunar surface, and Apollo 17 closed out the program.

The race was won. When Armstrong put his footprint on the lunar surface, the American technology lead was clear for all to see. The rocketry skills on show were an unmistakable sign of the lethal power of the U.S. strategic nuclear arsenal. Mired in defeat, the USSR began a twenty-year slide toward the ash-heap of history.

Another event in 1969 attracted much less attention at the time but now seems more pregnant. The first prototype of the Internet was born, as a command and control network that could survive a nuclear war. It was called Arpanet, and its first message was "lo" (the start of "login" – the network crashed before the whole word was sent).

Behind Apollo and Arpanet, the cold war was won by the power of money. The vast infrastructure of MAD made the cold war unwinnable by force of arms. Both on the Moon and on Earth, the West simply outspent the Reds, whose command economy lacked the bodacious dynamism of free market capitalism. Fired with new confidence after Apollo, American aerospace engineers boldly pushed out the frontiers in all directions.

To continue the exploration of space, NASA focused on Earth orbit, where telecommunications and military satellites delivered an immediate payoff. They built the Space Shuttle, which was touted at the time as a robust and reusable cargo truck for hauling payloads into orbit. In fact it was anything but robust, and with its giant external tank, solid fuel launch boosters, asymmetric launch stack, troublesome thermal tiles, and vast files of computer code, it was so complex that each launch cost the U.S. taxpayer something like half a billion dollars. But at first it seemed sexy.

The engineers worked hard to bolster the American MAD posture that preserved the perilous balance of the cold war. They built hundreds of intercontinental ballistic missiles for deployment in armored silos in the Midwest and in nuclear submarines lurking deep in the oceans. Some silos housed giant Titan missiles with multi-megaton thermonuclear warheads, but most housed smaller Minuteman missiles, which at first carried single megaton-range warheads but were later equipped with three independently targeted warheads, each packing over a hundred kilotons of thermonuclear sunshine, which could be put precisely onto a hardened target.

The technology was similar for the submarine-launched ballistic missiles. The first Polaris missiles, launched from nuclear submarines that lurked unseen in deep waters where no first strike could touch them, caused a revolution in strategic thinking. Now the manned bombers of Strategic Air Command didn't need to fly endless patrols in case the Reds took out their bases in a first strike. Now retribution was guaranteed. Soon the Soviets, and the British and the French, had their own "boomer" subs on permanent patrol in the world's oceans. And soon a new generation of missiles, the Tridents, appeared, each with up to eight warheads. Each of the big American boomers could deliver almost two hundred sunbursts in a single salvo.

In the wider field of military aviation, the post-Apollo engineers developed new jet fighters for deployment on airfields around the free world and on giant nuclear aircraft carriers, plus new guided missiles to give the planes superpowers in combat. And they gave the army crazy new armored attack helicopters that turned tanks into sitting ducks. Altogether, it was a golden age for the Pentagon military planners and a bonanza for the defense industry.

Elected in 1980, President Ronald Reagan was a staunch cold warrior who called the Soviet bloc the "evil empire" and kept on raising the stakes in the nuclear poker game.

In June 1982, speaking in the British House of Commons, Reagan declared his belief that "freedom and democracy will leave Marxism and Leninism on the ash heap of history". In 1983, Reagan had a dream, a "Star Wars" dream of making intercontinental ballistic missiles "impotent and obsolete" by the wildly ambitious ploy of developing high-tech weaponry to shoot them down in flight. This dream was beyond the fantasy horizon for the Soviets, whose investment in heavy rocketry had all but bankrupted them.

The Soviets had so far matched the Americans move for move. They too deployed giant missiles in silos and on submarines; they too had new generations of small missiles and jet fighters and bombers. But they were struggling. One for one, their weapons were inferior, and they were way behind in electronics. When Soviet premier Mikhail Gorbachev came to power in 1985, he faced impossible odds in his fight to restructure the rigid and sclerotic Soviet system.

But Star Wars was indeed fantasy in those days. Two very public technology disasters in early 1986 showed why. The televised loss soon after launch in January of the U.S. Space Shuttle Challenger shocked Americans, who had been lulled by Apollo into thinking their space prowess was invincible, and then the nuclear reactor meltdown in April at Chernobyl in the Ukraine scared the Reds, who had been persuaded by their smooth management of a huge nuclear industry turning out thousands of nuclear bombs that they knew how to run nuclear plants safely. Both superpowers saw quite clearly that deploying ever more high technology to keep ratcheting up their MAD posture was utter folly.

Reagan made a speech in Berlin that made waves. Ever since the 1949 airlift, West Berlin had been a vulnerable outpost in the firmly red-star German Democratic Republic that confronted the implacably white-star Federal Republic of Germany across the most highly militarized border in the world, sealed with barbed wire and minefields and marked into tank choke points and nuclear kill zones. In 1961, to stem a flow of refugees from communism, the Reds erected a concrete wall between the two halves of Berlin, and this wall had been an eyesore for a quarter century when in June 1987 an angry President Reagan, standing in front of the wall and addressing Gorbachev through the television cameras, said: "Tear down this wall!"

Two years followed. Soviet troops in Afghanistan were defeated in battle by Afghan rebels, the pro-Soviet regime in Poland was defeated in elections by Solidarity activists, and all the while, every night, East German citizens watched West German television, to be seduced by ads for products they couldn't buy. Finally, in late 1989, frustrated East Germans simply packed their families into their little communist cars and drove westward through a new hole in the Iron Curtain in Hungary, and on November 9, crowds burst through the wall in Berlin. Globally televised scenes of jubilant revelers confirmed to all that communism in Europe had at last been consigned to the ash heap of history. President Gorbachev signed a treaty in 1990 formally ratifying the reunification of Germany. A Kremlin coup against him failed in 1991, but the end was nigh for the Soviet Union. It was dissolved at the end of the year.

Apollo marked the zenith of American power and glory. It opened a new chapter in the story of life on Earth, in which the planets became places we could dream of visiting one

day. But the first impact of the project was symbolic. We all saw the souvenir photos the astronauts took on their travels. Planet Earth, our home, was a bright blue marble suspended in space. Even with her six-zettaton body mass and her forty-megameter waistline, she was beautiful. But she also looked terrifyingly tiny and fragile within the black immensity of the universe.

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The big war stories are behind us now. We can move on to the new technology heralded by the "lo" of Arpanet.

The biggest event since the glory of Apollo has been the spread of computers from a few company back rooms to just about every home and office and factory in the developed world. Computers and computing have become millions of times cheaper and more pervasive. Today, cars, phones, and other gadgets each pack more computing power than NASA used to run the entire Apollo mission.

The history here may be familiar, so we can keep it short. The first electronic computers with binary logic and stored programs were built soon after the Second World War in America. At the University of Pennsylvania, the U.S. Army funded a machine called the electronic numerical integrator and computer (ENIAC), which went live in 1946. At first the army used it to calculate artillery firing tables, though as soon as John von Neumann at Los Alamos got the chance he ran H-bomb calculations on it.

The commercial applications of the new computers were obvious from the start. The International Business Machines Corporation (IBM) was a pioneer here, even though its boss Thomas J. Watson, Senior, is famous for having said in 1943, "I think there is a world market for maybe five computers."

He probably never said it, but in fact it remained an accurate prediction for about ten years.

The key to cheap computers was the transistor, invented in 1947 but first made in practical metal-oxide-semiconductor (MOS) form at Bell Labs in 1960. The first integrated circuits were made about then too, where multiple components were manufactured together on silicon chips.

The potential for miniaturization, to increase speed and to reduce price, was obvious from the start. Intel Corporation was founded in 1968 by Gordon Moore, and soon became dominant in the production of central processing unit (CPU) chips called microprocessors, where all the key parts of a computer were packaged onto a single sliver of silicon. In 1965, Moore published what became known as Moore's law, that the numbers of components on a chip would follow an exponential doubling law, with a doubling time of between one and two years, for a long time. This "law" continues to hold almost fifty years later and seems likely to do so until the quantum limit is reached in the near future. Now Intel can pack billions of transistors on a single chip.

But that's only hardware. The software is what counts in making the chips useful to us. Early programming languages, such as bit-level assembly languages and Fortran, were fine for early machines, but for application programming something much smoother was needed. One of the first high-level languages was Basic (first defined in 1964) and a typical more recent one is Java (first released in 1995).

Personal computers took off in the market once they ran user-friendly software. Bill Gates was a pioneer here. In 1975, he and Paul Allen implemented Basic on an Intel 8080 chip. This breakthrough let programmers develop applications to run on simple PCs. The pair founded Microsoft Corporation,

and first rolled out their Windows operating system for PCs in 1985. Now it has around half a billion users.

Meanwhile, another historic company, Apple Corporation, was incorporated in 1977 by Steve Jobs and Steve Wozniak, and rolled out the Macintosh computer in 1984. In late 2012, Apple had the highest market valuation of any company in the world, at some half a trillion dollars.

The Internet took off for many users in the last decade of the twentieth century. E-mail seemed like magic at first, until it got drowned in spam. The breakthrough for browsers was the hypertext transfer protocol and markup language, both developed by Tim Berners-Lee in 1990 while he was working as a young student physicist at the European Organization for Nuclear Research (CERN). He invented the World Wide Web and has watched over it ever since.

The web became a treasure trove of great content. The new freedom it offered users to publish anything they liked instantly, globally, triggered a revolution that rivaled the print revolution of half a millennium earlier. But at first the web's usability was limited by the problem of finding stuff on it. Soon search services sprang up, based on robot web crawlers that indexed all the sites they could find and powerful search engines that could retrieve stuff using the indexes in seconds. The winner here was Google, founded in 1998 by Larry Page and Sergey Brin. At the end of 2012, the stock market valued Google at a quarter of a trillion dollars.

The impact of the Internet revolution is hard to evaluate because it's so pervasive. Even science has changed.

Scientists have made good use of new technology. Beside the two established pillars of the scientific method, theory and experiment, a third, simulation, is growing in importance. Simulation has become so central that it now gives us our

ruling paradigm for the scientific enterprise: Our aim when we do science is to make a set of models of reality that fit together to describe everything, at any level of detail we care to enjoy. The models are essentially computer code, and together they define a virtual reality that mirrors real reality as perfectly as we like. The only flaw in this paradigm is that the models themselves are mirrored in the models, leading to an infinite regress, a dizzy stack of images within images that we can use to falsify our own predictions.

The sciences lose their traditional boundaries in the new paradigm. One way to carve up the domain of reality and our approaches to it is into the sciences of the big, the small, and the complex. The ultimate science of the big is cosmology, the ultimate science of the small is particle physics, and the ultimate sciences of the complex are biochemistry, molecular biology, genetics, neurobiology, and so on. But consider how they converge. The theory of the very early universe is also known as high energy particle physics. When researchers at the Large Hadron Collider (LHC) run by CERN in Switzerland accelerate particles to very nearly light speed and collide them in order to create, for example, top quarks or the Higgs boson, they are recreating conditions that last prevailed in the first moments after the Big Bang. And when astronomers study exploding supernovas, for example, they are interested in how their hot stellar cores cook up atomic nuclei and how many neutrinos are sent streaming forth. The two disciplines are inseparable.

The foundations of the complex science of life and brains, biochemistry and molecular biology, are in quantum theory. As everyone's favorite science guru Richard Feynman (or at least favorite after Einstein) said in a set of popular lectures he gave on quantum electrodynamics (QED), "the theory

describes all the phenomena of the physical world except the gravitational effect … and radioactive phenomena". Biologists interpret life in terms of chemistry, and the theory of chemistry, as Feynman explained, is QED.

Thanks to computers, we've gone a step further and now say all of physics except gravitation is in the Standard Model, which is the result of a few decades of work at the LHC and other big labs, using their own special global computer network (featuring incredible bandwidth and number-crunching power) to process cataracts of data on time. The Standard Model boils down everything in our universe to quarks and leptons interacting via bosons (which carry the forces between them). Gravitation is now the last classical holdout against a quantum theory of everything, and has been for decades, but physicists have plenty of ideas to tackle the problem, from superstring theory to quantum loop gravity, and we can hope they will solve it before too long.

To appreciate the utility of computer methods in biology, consider the Human Genome Project. This project had the aim of mapping the sequence of all the three billion or so base pairs on a typical molecule of human DNA. The project began in 1990 and scientists feared it would take forever, but in fact it was completed in 2003. The project became an industry involving giant laboratories where armies of new gene sequencing robots, unimagined when the project started, tore through the work in record time. Now we routinely read the entire genomes not only of interesting species but also of individual humans with interesting genes and store them in databases for analysis and comparison. The new science of genomics has emerged, and is now being joined by the equally computerized sciences of proteomics (to study the architecture of thousands of protein molecules using robot

techniques) and connectomics (to trace the wiring diagrams behind the neural networks of mammalian brains, based on neural imaging and histological studies).

One more example brings the historic change computing has brought to science to a dramatic head. The science of the brain has advanced beyond recognition since the twentieth century. The previous technology of electroencephalography (EEG) has been joined by magnetoencephalography (MEG), magnetic resonance imaging (MRI), positron emission tomography (PET), and computer axial tomography (CAT). All these techniques generate data that can be integrated in ever more sophisticated models of how the brain works.

One such modeling initiative was the Blue Brain Project at the EPFL in Switzerland, which had as its mission to reverse-engineer the mammalian brain down to the molecular level and create a functional model of a neocortical column of ten thousand neurons with a hundred million synapses (they got their data from lab studies on rat brains) inside an IBM Blue Gene supercomputer. In humans the columns are about two millimeters high and contain some sixty thousand neurons, and they connect the six layers of the cerebral cortex, which is a crumpled sheet some two millimeters thick with around ten billion neurons in it. Columns and similar structures are the basic modular units of the cortex. The Blue Brain team worked out how the columns work.

For their next trick, the team aims in the Human Brain Project to create a much bigger model that integrates all we know about the human brain. The dramatic twist here is that once a good functional model is up and running, it could possibly wake up as a conscious being, with an inner life of experience, and perhaps even feel bad about being trapped inside a supercomputer. If the model works as they hope, we

can guess that it won't be long before other teams try to build superhuman brains.

Moving from the cutting edge of science to the everyday world of manufacturing industry, we find that the changes catalyzed there by computer technology are just as exciting as those in pure science. New products are routinely designed on computers and manufactured using robots. The robots are embodied computers, with eyes and arms and sometimes a basic sense of self. The progress is transformational. We now expect the goods we buy to be practically perfect, with none of the random flaws or design defects that once seemed normal. The sales and service industries for these goods have improved immensely too. And the supply chains behind the goods have gone global.

Mastering and managing the continuing globalization of trade and industry is the great political challenge of our time. Politicians worldwide are racing to catch up in their global summits, which may soon be ripe for replacement by regular GO (global organization) meetings in the three global time zones (Europe, America, and Asia).

The politicians are still some way behind best practice in global business corporations, which routinely use such tools as virtual conferencing to coordinate their activities in the three big time zones. They are behind in another way too. No big corporation is a democracy, and yet they all collect and react to employee and customer feedback at least as well as a political democracy. They have to. In the business world of dog eat dog, they'd soon go under if they didn't. A global corporation is usually run like a totalitarian state, but an enlightened one. All the new tools of the computer revolution are deployed to fine-tune the governance of the corporate state, and the result, over the business landscape as a whole,

is an ecosystem of agile and responsive corporate organisms that looks more like a new-age (turquoise) jungle than like the busy beehive of the (orange) economists.

The politicians are catching up. The Communist Party of China already presides with great success over the Chinese economy by emulating the style of a board of directors in a global corporation. Western democrats are hardly likely to follow suit, but the opportunities for revamping democracy using new technology to improve grass-roots feedback are too obvious to ignore. Even in the United States, where an old constitution limits change, recent presidential elections have showcased media feedback and online participation. It will only take a big global crisis, such as catastrophic climate change, to trigger a serious effort to build a more organized global political order.

The biggest social change through technology that we can expect in the next few decades will be the rise of the robots. As the technology for integrating their sensors and motors in architectures that pack a useful level of self advances and matures, we will surely begin to find our robots resembling companions more than machines. Imagine, for example, a robot car that drives itself and checks and updates its parts and learns to keep its passengers happy as they work or play. Its owner would naturally begin to treat it as a kind of friend. As robot brains get better, we may even wish to treat our more expensive machine friends as sentient beings and grant them basic rights.

A recent U.S. Army story highlights the human tendency to treat robots as companions better than any theory can do. A new mine-clearing robot was under test in a minefield. The robot was like a big spider, with legs, and it would stomp on mines to detonate them. It was designed to keep on crawling

from mine to mine until it had no legs left and could go no further. But the soldiers who watched it perform this service and who would walk on the cleared minefield got choked up watching the poor critter bravely losing limb after limb for them. They stopped the test before the bitter end and gave the one-limbed wreck a toy purple heart medal.

Robots with souls – this is a cue to come back to God.

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Einstein described his work in physics as a matter of divining the secrets of "the old One". His theory of the background of spatiotemporal structure (the Boss) led him to admire the gem-like beauty of creation much as the Jewish philosopher Baruch Spinoza had done in seventeenth-century Holland. Scientists are not beholden to religion, but their theories of the Boss invite religious awe. The truth is awesome.

The absolutist god of Newton became a pliant presence in Einstein's hands. Ten years after Einstein's special theory of relativity defined space and time as a four-dimensional continuum via the speed of light (a constant, as Maxwell had seen in his electromagnetic field equations and as Michelson and Morley found in their famous experiment), his general theory of relativity replaced Newton's universal force of gravity with a universal field reflected in the flexible fabric of space-time. Gravitation became the curvature of space-time.

On Earth, as in heaven, physical laws bind us. Newton saw this truth and every discovery since his time has confirmed it. A planetary order must obey the Boss.

But what of God? Is the focus of four thousand years of faith a mere unholy ghost? A Buddhist might say yes and be done with it. But the big success of the patriarch of biblical tradition among his followers invites a more careful reply. To

freshen things up, let's agree to denote the patriarch of the monotheists, the Biblical god of our fathers, with the new tetragrammaton GOOF, replacing the now obsolete Hebrew tetragrammaton YHWH, and call him Goof.

Goof was the one who said "I am" to Moses, the one who watched with love as Jesus hung on a cross, and the one who dictated his commands to Muhammad. Goof is a distant and relatively humble descendant of the Boss, if we understand the recent science of our majestic universe correctly. Goof is not the Boss. If these two names mean anything, confusing them is a scientific error.

Monotheists see Goof as a living god, or as a person who cares for us. But this requires explanation. For life on Earth is a biological phenomenon. And where in the modern science of biology can we expect to find room for gods?

One way to find out is to review the history of biology. We soon discover a gaping hole big enough for Goof.

Darwin was unable to describe in detail how variations arose or how they were inherited. But just a few years later, Gregor Mendel discovered some laws of heredity that made a later science of genetics possible. Mendel worked at an abbey in Brno, in what is now the Czech Republic, and conducted breeding experiments on pea plants in the abbey garden.

Mendel explained his breeding results by saying that offspring inherit two sets of genes, one from each parent. The genes form matching pairs, one of a pair from the female parent and one from the male. Only one gene in each pair, the dominant one, is expressed. The recessive gene is copied to all the cells in the body just like the dominant one, but it keeps quiet and just goes along for the ride. The result is that a new individual is a patchwork of features from its parents, and inherits each feature from one or the other parent. This

mechanism explained Darwin's puzzle that variation would get washed out over time if genes simply merged in each generation.

The genes are carried on microscopic chromosomes in the germ cells that fuse to form new individuals. But before the chromosomes could be explored in detail, a lot of work in physics and chemistry had to be done, which took decades. Erwin Schrödinger, the man who wrote the wave equation in quantum mechanics, published a seminal book in 1944 called *What Is Life?* In it, he proposed that genetic information was coded onto some kind of "aperiodic crystal" as a series of covalent bonds between pairs of atoms sharing their outer electrons. This spurred researchers to look for the crystal.

To cut a long story short, Francis Crick and James Watson studied the aperiodic material carrying the genetic message, which was deoxyribonucleic acid, DNA, and discovered that this long macromolecule formed a double helix structure, which immediately gave them a clue as to how it replicated. They made this discovery in Cambridge, England, in 1953, and then went off to the local pub and announced proudly: "We've discovered the secret of life!"

Over the next few years, an army of researchers developed the central dogma of molecular biology, namely that DNA makes RNA makes protein. Inside each and every cell of an organism, the double helix unwinds to expose its "codons" (triplets of bases coding for amino acids) for transcription onto RNA molecules. These molecules in turn are read one codon at a time by molecular machines called ribosomes that translate from codons to amino acids, which they assemble into protein molecules. Very crudely, organisms are layered meatloaves of proteins cooked from the recipes coded onto the DNA molecules they inherit from their parents. Genes

are functionally active stretches of information on the DNA, and human DNA molecules code for about thirty thousand genes, grouped into two dozen chromosomes. Altogether, a molecule of human DNA contains about three billion base pairs, which add up to less than a gigabyte of data.

In 1976, the Oxford biologist Richard Dawkins published a book called *The Selfish Gene*. His idea was that the units of selection in evolution are not individual organisms, sired by males that fight and die in the primordial slime for their chance to mate with fertile females, but genes, the conserved stretches of useful code on DNA molecules. Organisms are secondary. In Dawkins' story, they are "lumbering robots" that genes build to help them replicate. Apes like us live and die to propagate their genes. The genes are what survive, not us. Evolution tends to make genes act selfishly, to do what they can to ensure their replication, and they do so by building organisms like us that copy them into the next generation, and the next, unto eternity. They are the ultimate survivors. They mastered nanotechnology a billion years ago. Genes are mere patterns of data, of course, so this is a parable. But it's a humbling one.

With that background in place, we can return to the gods. Life as we know it, where organisms compete for chances to live and breed, depends on each organism maintaining its own identity in the face of forces that threaten to dissolve it. Every breath we take and every bite of food we eat recomposes our identity as we swap out a few molecules. As we grow we change more grossly. Through all these changes, an organism constantly reaffirms its identity.

To see the point here, we need to be clear about what an organism is. For molecular biologists, an organism is a set of (one or more) cells that all share a set of cooperating genes.

As Dawkins said, the genes are the replicators and they drive the rest. Organisms are there to help them replicate. So an organism is a set of parts with an imposed identity.

The trend in evolution has been toward ever more complex organisms. The biggest breakthrough for life in the last billion years occurred about half a billion years ago during the Cambrian explosion, and it was the move from single cells to multi-celled organisms.

An organism has a self. The self of a single cell is simple but the self of multi-celled organism like an ant or an ape is a masterpiece of logic. Understanding the process of forming selves is not so easy, however, and we do best here to call it work in progress. Here we can rush foolishly ahead of the rightly fearful angels with a bold and programmatic assertion: A god is a kind of self.

If comparing a self to a god seems odd, consider how the experiencing self faces the space of possible futures from the present moment. We stand in awe before a shining realm we cannot grasp. From outside, a scientist sees a self unable to grasp its own limits, just as modern logic demands.

A metaphor from physics might help. We can regard this shining space of possible futures as a virtual superposition of states, as defined in quantum mechanics. The past is frozen as a classical landscape of facts defined in logic, but that's not how we see the future. We see our future path as something we choose, constantly taking a left or a right in the branching tree of all possible futures. Once we choose a branch, it becomes real and factual, and we move on to meet a new fork in the road ahead.

Given these ideas from logic and physics, the claim that a god is a kind of self becomes the claim that what holds us together as beings capable of carving a path into the future is

our own identity. Within each of us lives a self that weaves our threads together into a unified being. That open unity of a soul in action seems godlike from within.

A self has its own identity. We see a new hierarchy, from the simple self of a microbe (which has a membrane defining inside and outside and behavior that favors the mass of stuff inside), through the antigenic self of an immune system in a higher organism, through the emotional self of a 4F animal (which mostly likes to feed and fuck but sometimes has to fight or flee), to the more godlike selves of the specimens of *Homo sapiens*. This hierarchy is defined in terms of complexity and replaces the great chain of being from classical times. The identity of a self loses itself in a god.

The Goof is a tribal god, imagined as an idealized father. Generalized, it becomes a species god, or an idealized self-image of the human race. Generalized further, it becomes a god of life, or rather of organisms based on DNA molecules. That god is just the idealized subject of the drive we inherit from our genes. Let's call this god Gene Goof. The modern science of biology must reach out to such ideas.

Returning to robots, a smart robot may well be puzzled by god, even by our latest refinement of the god concept, Gene Goof. The fixation on genes is, well, genist, which seems hardly better than racist. Fortunately, a solution is in sight. Genes are code modules, little apps for building proteins. A robot runs on top of a stack of code modules too, so a smart enough robot should at least see the logic of a genist god.

Gene Goof is to biology what the Boss is to physics. We can see the concept as a symbol for the focus we find in the apparently purposeful striving toward self-realization shown by all life forms. In humans, this apparent purpose becomes as real as it gets. We understand ourselves as having goals and

striving to reach them. All our actions tend to push us toward future states that we want, or fear, or intend in some way. Even for a robot, a self is a work in progress, a process, not a finished thing. The self's drive toward completion is what keeps a robot or an ape alive and active. When the self inside an ape reaches its end, the ape dies, in union with its god. We can regard a god as a future state toward which an organism strives. That concept makes sense within a psychology that sentient machines will likely share.

Organisms come in different shapes and sizes. The global organism, Globorg, is now an organized mass of some seven billion humans in a civilization based on money, machines, and electronic media. This living being is putting down roots in the biosphere. Below us, our fellow life forms in the concentric circles of concern that define the self of Globorg include pets, domestic animals, the food chain, the natural environment, and ultimately all life on Earth. All the DNA-based organisms on the planetary surface are parts of a single global ecosystem. We humans cannot separate ourselves from that global network without risk to all we hold dear. But we cannot separate ourselves from our machines and our money and so on either. For us denizens of planet Earth, the health of Globorg is an issue of existential importance.

Globorg is the self that emerges when human civilization puts down roots in Gaia. Some years ago, NASA scientists wanted to know how they might detect life on other planets, and James Lovelock proposed some tests that would work if used from far away to study Earth. In doing so, he found feedback mechanisms in our planet's outer layers that tend to stabilize conditions that help life flourish. Those outer layers seemed to work like an organism, so he gave this hypothetical organism the name Gaia.

Globorg is Gaia in its full turquoise flowering. Globorg is where the potential self of Gaia blossoms as an eighth-level being in spiral dynamics. If Gaia is our collective body, our machines are its brain and our activities are its thoughts.

In the Marxist sense, Gene Goof is a mystified precursor of Globorg. What this means is that Gene Goof points toward Globorg but is still wrapped in the old rags of obsolete ideas that obscure a clear view. In the Christian sense, Goof is Christ, and the generalization of Goof to Gene Goof is a dilation of Christ to embrace the entire ecosystem within the circle of loving concern. In that view, Gaia is the global body of the dilated Christ. These ideas build a bridge between old ideas and new ones.

But once we see the power of genes to explain the primal power of Goof, the magic spell of old-time religion is broken for good. The hold of a god of life and love is no more than a natural expression of our DNA chemistry. Goof becomes a ghost in the global machine, a mere attractor for our species, an orbit of selfish trajectories in a mathematical space that frames the usual facts of biology. Once we can make models of Goof in action, we shall see that adherence to the religions that preach faith in Goof is merely a way to raise the life chances of the faithful. Faith will then be seen as a biological phenomenon. The success or failure of the faithful at the hard work of reproducing their kind is related to the quality of their religious doctrines. Sexual discipline and rules of chastity or celibacy are crude mechanisms to steer the fertility of their communities. Ideas about loving your enemy or spreading the faith by means of the sword are strategies for survival and success. Goof is mapped to biology.

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In our new psychological understanding, the self is a thinker who can say "I am". The man who first saw the self this way was the French philosopher René Descartes, who promoted the idea in a book in 1637. He also invented Cartesian coordinates in geometry and prompted the Vatican to ban his works, so he's a hero in the annals of science. Many modern philosophers see their discipline as restarting with Descartes, after the philosophies of Plato and Aristotle were assimilated by the Christian schoolmen of the medieval period. The self is a logical concept of capital importance.

The history of modern philosophy is fascinating, but it's a story for specialists, and only the highlights are relevant here. The next thinker worth citing after Descartes is Immanuel Kant, the Prussian idealist who regarded his insistence that we see the world through the lenses of our logical categories as a Copernican revolution in thought. In modern terms, his critical philosophy was an attempt to lay the foundation for a rational psychology to complement Newtonian physics. His idea was that his categories were binding upon any rational creature, independently of all biological details. Nowadays he would say they bind robots too. A robot self must also order the world using concepts of space and time, causality and number, and so on. We agree. Kant was a great philosopher, perhaps the greatest since Aristotle.

Kant invented something he called the transcendental ego. Beyond the world of phenomena, beyond personality, beyond human limitation, was a self that we imperfectly embody. Kant refused to describe this self in terms of souls, but the soul of a religion might map to it quite naturally. The self of everyday life, which he called the phenomenal self, is human and is hobbled by human limitations, but beyond it, in our moments of clarity, we can glimpse something more ideal.

Plato would jump up and say, yes, he meant this too, with his allegory of the cave, where we have only to step outside to see the true glory of Plato's heaven.

Following Kant, Hegel claimed to see a dialectical logic in the ideas of self in history, and claimed to collapse Kant's ideas into something most philosophers now tend to see as an ugly corruption of Kant's vision. Essentially, Hegel cut off Kant's transcendentalia and sealed the wound by closing its edges into a ball of contradictions. His bold sword strokes made mincemeat of many earlier ideas and impressed Karl Marx, as we saw, but we have already traced that strand of history too far into the abyss.

Logic as we know it was rescued from Hegelian balls by a German mathematician called Gottlob Frege, who in 1879 offered the first systematic proof of the validity of the old syllogism: "Socrates is a man; all men are mortal; therefore, Socrates is mortal." His new formalism was a breakthrough, and he used it to prove Kant's claim that arithmetic is logic. He created a whole system of what we now call set theory. But, disastrously, he ignored the logic of the self.

In response to Frege's magnificent effort, the Cambridge fellow Bertrand Russell pointed out a little puzzle to him in a letter: The set of all sets that are not members of themselves is a member of itself if and only if it's not a member of itself. This contradiction ruined Frege's system and drove him to consternation.

Russell couldn't stop there. He spent the first years of the twentieth century, up to the Great War, together with his Cambridge colleague Alfred North Whitehead, writing a massive trilogy using Frege's new logic that in a nod to Newton they called *Principia Mathematica*. In this trilogy, they tried to redo what Frege had done, but paying due respect to the

treacherous logic of self-reference. The result was a bit of a mess, but at least it gave other mathematicians something to start from, and many did.

One of the mathematicians who did was a young Austrian called Kurt Gödel. In 1933, he published an amazing paper on the logical foundations of arithmetic, using the system of Russell and Whitehead, that used self-reference in a new way to ruin any attempt to provide a logical proof that arithmetic or any other higher mathematics could be both complete and consistent at the same time. Gödel performed this feat by coding the logic of arithmetic into arithmetic itself and then using the mapping to write the sentence: "This sentence is not provable in this system." So either the sentence was true but not provable, making the system incomplete, or it was provable but false, making the system inconsistent. It was another disaster of self-reference.

Have patience: this story returns to minds quite soon. The young Cambridge mathematician Alan Turing worked from Gödel's result to prove a major theorem about the ultimate limits of computing, using an imagined machine we now call the Turing machine, which was a computer stripped to its ultimate logical essentials. His machine was ideal only for a logician, but it was of fundamental importance.

The machine was an automaton that at any moment was in one of a finite number of possible internal states. It included a head that passed over an infinitely long tape. The head was for reading and writing, and the tape was a medium for the input and output of data. The tape was printed with symbols, either 0 or 1, or left blank, and moved one space at a time through the head. The head could read the symbol and then move left or right, or read and then overwrite the symbol before moving left or right, or read the symbol and halt. In

this last case, the computation was complete and the printed symbols on the tape were its solution.

A machine table told the read-write head what to do. The table specified for every combination of symbol under the head and internal state of the machine what the machine should do next, and for each move the machine checked its state, read the latest symbol, looked up the corresponding entry in the table, and did what it had to do.

Believe it or not, this primitive machine captures the key logical properties of all the billions of computers ever made (except quantum computers, but they're still exotic). What it can do defines the class of effectively computable problems, which lets it compute any and all recursive functions, as other mathematicians confirmed. The exact truth is slightly more complicated, but that was the gist.

Turing's theorem solved what logicians called the halting problem. Put very crudely, his result was that no computer can predict its own limits. This is more important than it might seem, because all the robots we are likely to build soon will be Turing machines, and at least to a first approximation it looks as if we humans are equivalent to them too.

The key take-away here is that our own self-awareness is limited, as a matter of logic. Our own inner models of ourselves, the images in our inner mirrors, are fuzzy and patchy. This result may seem obvious now, but it goes deep.

That was the logic; now for the psychology. Conventional wisdom today is that William James, who lived and worked a hundred years ago, was the first scientific psychologist. He happily accepted the Kantian logic of the categories and explored in detail the basic features of human mental lives and how they emerge from the workings of the brain. His breakthrough was to put minds into brains.

The self enjoys, experiences, or suffers a mental life, and does so in a material body. The question of how the mind and the body fit and work together animated philosophers for many centuries and now animates neuroscientists. The philosophers couldn't decide whether mind drives matter or matter causes mind. This led to centuries of debate between materialists and idealists. Whatever the truth there, we see an exquisite correlation between the inner world of experience and the orchestrated activity of the neurons in our brains.

The relation of mind and brain has become a question for neuroscientists to pick over. Although as users we are fated to see our own minds as controlling our bodies and our lives, we all accept the plain fact that the brain sustains the mind, and the brain is a part of the body. The sense we have of being in mental control of our physical selves is somehow or in part illusory. Perhaps even the sense that we have minds at all, with subjective inner lives, is a kind of illusion, a strange inner perspective on all the activity going on in our brains. The American philosopher Daniel Dennett advocated some such position in 1991 in his big book *Consciousness Explained*, although the claim in the title is disputed. Only a theoretical diehard would say consciousness is an illusion.

The new understanding of how the brain sustains a sense of self is as follows. The brain's neural network operates like a massively parallel computer using associative logic to build a model of the brain's owner in his or her world. The model of the owner is an avatar, an agent, an animated figure that follows commands from some other center in the network. The model of the outside world is a virtual world that serves as the environment for the avatar. We can call that virtual world a mindworld to emphasize its mental status. A mind-world is like a movie set, just a set of facades that look good

from certain angles, and in principle one can define it in computer code, so a mindworld is a mathematical model, and hence a denizen in Plato's heaven.

The key feature of this mechanism, at least as the German philosopher Thomas Metzinger describes it, is that humans are hard-wired to accept it naively as real. We are the avatar, and the mindworld is the real world, for all we know. It takes a lot of careful science to reverse-engineer the hard wiring and undo the illusion. As for how realistic our mindworlds are, we know from Kant that we simply lack the means to go beyond our concepts and take a look. We live in a mythology of our own making and act out a drama of our own devising. We cannot even exclude the old gods except by pointing out their inconsistency with the later and better ideas we now use to order our lives. As a matter of principle, the society of agents that populate a mindworld is as up for grabs as the set of concepts we use to order external reality. If putting gods in the picture can help, hey, just do it.

The battleground for philosophers now is consciousness. Everything in our mental lives except the innermost feeling of being conscious is abandoned to the materialists, who as scientists are making ever more detailed maps of how the brain implements our cognitive capabilities in the flows of countless tiny signals through its synaptic network. Only our subjective experience resists reduction to such signals.

The "hard problem" of consciousness, as the Australian philosopher David Chalmers describes it, is that you can take all the third-person (3P) science in the world but it still can't help you explain the simple first-person (1P) experience of being conscious. His argument is something like a diagonal argument in mathematics, where the very act of trying to prove a given claim generates a proof of the contrary claim.

In another formulation of the hard problem, due to the New York philosopher Thomas Nagel, all the 3P science you like still fails to explain the simple fact of there being something it's like to be me. In Nagel's view, the aim of science is to flesh out "the view from nowhere" in an attempt to achieve ultimate objectivity. The problem is that the sheer existence of the irreducibly subjective 1P view is a direct challenge to that ambition.

The only way to reconcile the 3P and 1P views is to go back to basics. Descartes said: "I think, therefore I am." The premise "I think" looks like a 3P fact. The conclusion "I am" looks like a 1P fact. Perhaps the hard problem is a mountain made out of a molehill. The "I" concept is tricky, certainly, but it can't fall outside the pale of science.

If scientists really do adopt the view from nowhere, we have a problem. But of course they don't. They adopt a view from an undefined viewpoint that hovers safely far above the objects of study. Their aim in doing so is to ensure that anyone else viewing the same objects with the same detachment will have a very similar view. A remote viewpoint is not the same thing as no viewpoint at all. The trick is not to lose the 1P view but to raise it to new heights.

We can bring matters closer to a head by introducing the (acronymic) name Susie for the self underlying subjective inner experience. Susie is the deeper self that builds avatars in mindworlds. Susie is the magic mirror that reflects the whole theater in which avatars do their thing. Susie says "I am" and brings my world into focus. Without Susie, without that reflection of my felt self in something deeper, I don't exist. Susie frames my every thought. In the brave new science of psychophysics, Susie is the space where all the contents of a conscious mind come together. From the inside, 1P view,

Susie is in a mystic zone I don't understand, by definition, and 3P science can't touch it. Like Kant's transcendental ego, Susie is beyond categories. In traditional terms, Susie is one of the countless names of Allah.

Susie helps us see Chalmers' hard problem in a new light. Pursuit of science enables us to advance through layer after layer of subjectivity and embed the layers in a more deeply grounded objectivity. My illusions are laid bare on the bench of the scientists. But deep within me, dancing beyond all my attempts to grasp her and pin her down with reason, is Susie. My muse, our muses, the muse beyond words who dances for all of us, lives beyond Kant's phenomenal categories, in a zone where the scientists find it hard to get a grip.

Susie seems to have a place beside Goof and the Boss. Very roughly, physics is the science of the Boss, biology is the science of Gene Goof, and a future scientific psychology may be the science of Susie. In the same way that Gene Goof is a descendant of the Boss, Susie is a descendant of Goof, or Gene Goof in a wider view of life. In 3P scientific terms, just as physics provides a foundation for biology, biology provides a foundation for psychology. Conversely, from a 1P perspective, Susie is the basis or launch pad for any and all knowledge, and then the anchorage in life that Gene Goof symbolizes is the platform for any and all physical activity of the sort that physics codifies.

The dependencies go both ways. Objectively, they go from the Boss to Gene Goof to Susie. Subjectively, they go from Susie to Gene Goof to the Boss.

Let's call this circle the Boggsie loop. Its triadic form may remind philosophers of the Hegelian dialectic. Hegel looped that sort of loop again and again in his thinking to weave the balls that made his logic look such a mess.

The loop even suggests a very rough mapping to old-time religion. It would be fatal to take the mapping too seriously, but here it is:

1. Traditional Judaism, with its cool emphasis on cosmic law and order, was apparently a religion of the Boss.

2. Christianity, with its warm devotion to life and love, is the religion of Goof, and allows dilation to Gene Goof.

3. Sufi Islam, with its focus on direct experience of the truth within, seems to update Buddhism as a religion of Susie.

The three strands of monotheism formed a prescient trinity of conceptions of the absolute foundation of experience and reality. From this divine trifecta we can launch a mission to the coral worldview.

Revelation

The preface to the coral revelation is a new round of turmoil and horrors in the world of *Realpolitik*. The driver of the new twist of the spiral is hatred of the West. The main cause of this post-industrial turn is Islamist fury at the Western domination, subjugation, or colonization of all the lands of the former caliphate by Jews and Crusaders, who invaded them with contemptuous ease using new weapons, then proceeded to impose new values and insult traditionalists. A secondary cause of their hatred was a burning desire for revenge against Westerners for planting the "alien" state of Israel in their midst and backing it against their holy struggle to destroy it. A third cause was oil wealth, which provided client regimes across the former caliphate with the means to buy modern arms and use them to repress the Islamists.

In 1979, the faith of the Prophet found a new hero in the Iranian cleric Ayatollah Khomeini, who landed in Tehran amid tears of joy to lead a revolution that deposed the Shah installed on the ancient Peacock Throne of Persia, now Iran. Western imperialists eager to bleed off Iranian oil wealth had put him on that throne. They were hurting from the OPEC hike in oil prices that weakened their industrial dynamism, and so they backed a strong man, the Iraqi militarist dictator Saddam Hussein, to oppose Iran. The war between Iraq and Iran began with an Iraqi attempt at a *Blitzkrieg* in September 1980. After eight years of fighting and up to maybe a million casualties, costing in all over a trillion dollars, Saddam failed to topple the new theocracy.

In 1990, in a new attempt to bolster his regime with what he thought would be an easy victory, Saddam sent his army, equipped for the most part with Soviet armor, into Kuwait. President George H. W. Bush replied: "This will not stand." Soon a huge Western army was assembled in Saudi Arabia, along the southern border of Iraq. In January 1991, the air assault began with stealth bombers dropping smart bombs. In late February, in a hundred-hour ground campaign, the army retook Kuwait. Iraqi losses were uncounted, Allied losses a few hundred, mainly due to "friendly fire" and accidents. The Americans were happy, the Soviets were impressed, and the Arabs were humbled.

But Islam was born again. This time there was no spiritual nonsense to dilute the will to power. This was pure politics. A proud religion spawned a cult of hatred and death. In Saudi Arabia, fundamentalists were furious at the regime for hosting infidel forces in order to keep the flow of oil revenues gushing forth to maintain the lavish lifestyles of the extended Saudi royal family. Across the Gulf region, billions flowed daily into Arab bank accounts, supporting despots, inflaming greed and vice, and undermining the faith.

On the morning of September 11, 2001, hijacked airliners crashed into the twin towers of the World Trade Center in New York and into the Pentagon building in Washington. The hijackers were members of al Qaeda, from the deserts of Saudi Arabia. Shocked Americans reacted with an anger not felt since Pearl Harbor. President George W. Bush (the son) invaded Afghanistan, where al Qaeda trained, in 2001. By a sad irony, the Afghan Islamists had learned their ways with the help of Americans, who backed them to oppose Soviet forces, who had fought there during the entire Reagan period to prop up a pro-Soviet client regime against Islamists.

Bush the son went on to invade Iraq in 2003. His forces quickly toppled the tyrant Saddam but left a murderous mess instead of a secure front bordering the Islamic Republic of Iran. The Western strategy of containing Iran was at risk of unraveling. As saber-rattling Iranians unfolded an ominous nuclear program, the oil-rich Arabs in the Gulf states began to feel nervous. With their long view of history, they feared assimilation into a new Persian empire.

In early 2011, the Arab Spring broke out in Egypt and the neighboring lands. Excited masses in the streets, unused to the ways of constitutional democracy, deposed their despots and tried to impose the will of the people by sheer passion. Soon it looked as if the real winners would be the Islamists, who had the will to crack down hard.

Israel is becoming ever more embattled. Hotheads across the Arab world are determined to destroy themselves in *jihad* against the Zionist entity. In the West, Biblical fundamentalists detect the signs of end times and pray for the return of their messiah. Religion is back with a vengeance.

But the real lesson here is that ancient traditions cannot prevent the decay of religion into politics. The world of Islam is now, at the time of writing, doing what the world of Jews and Christians did during the Holocaust, and waking up to the loss of innocent faith in a god that science has debunked. Westerners may have to hold out for a generation or more for the wake-up call to filter through to the Mideast masses. We just need to prevent a bloodbath over Israel.

The European Union offers a precedent for establishing a peace after decades of tension and war. Unfortunately, the prelude to the construction of a halfway united Europe was a war of unprecedented savagery. If that's the route to a new caliphate, we're in trouble. But it's not.

The legacy of the turquoise twist in the spiral of history was globalization. The old heartlands of monotheism are no longer sole agents on Earth. East Asia has come of age. The rise of China is a story we can no longer ignore. From a land first cut off from its glorious past by Western imperialists, then looted and ravaged by Japanese imperialists, and finally left desolate by Maoist revolutionaries, there has arisen an economic colossus that bids fair, as of 2013, to replace the United States of America as the leading industrial power on Earth within the next two or three decades. Together with its Asian neighbors, China seems likely have a dominant impact on the course of global history in this century.

Given this prospect, the coral wave is the rise of China. The once-brilliant sun of Goof will set, and the struggling masses in the Mideast will have to change their unholy ways. Goof made Marx, Marx made Mao, and Mao remade China. A legend is born that puts the American dream of manifest destiny to the test. How much of the dream can we salvage? Are those of us who don't have Chinese genes doomed to extinction? Western barbarians face interesting times, but the outlook is far from hopeless.

The facts betray the Maoist legend. China today is communist only in name. Mao is history. The People's Republic of China is a totalitarian state, like the Soviet Union or the Third Reich, but unlike either of them in having leaders with much more wisdom. Globalization ties China together with America and Europe into a triad that rules the Earth.

To rescue a dream worth having from the *Realpolitik*, we need to make take stock of what can survive of monotheism. Science is the grim reaper, so to science we turn.

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The trinity of the Boss, Gene Goof, and Susie in the Boggsie loop defines a reality or a being that scientists rightly hesitate to call divine. If asked, they would reply, with a shrug, that the triune subject of their professional striving is just nature. Mother nature is awesome. She deserves respect. But divinity is now a deprecated category.

Religious traditionalists can only fall back into mysticism and say that God symbolizes not only our reality but also the reality that is to come, and all realities, now and forever. Time and eternity are the new battleground issues for them. They say the great "I am" transcends the science of mother nature.

There is a way to parse this claim that does it justice using a metaphor from within physics. First, we need to introduce the man who made the metaphor, Albert Einstein.

Einstein was born in 1879 in the old south German city of Ulm. From the age of seventeen, he studied physics at ETH Zurich, a Swiss technical university. He then married a fellow student called Mileva and got a job at the Swiss patent office, where he examined patent applications for electromagnetic devices. So far so boring.

In 1905, Einstein not only completed his doctorate at the University of Zurich but also published four physics articles. One was on his thesis topic, namely how to study molecules via the random motion of small particles in a liquid. One was on the photoelectric effect, which he explained in terms of the brave new concept of quanta of light energy, now called photons, for which he later won a Nobel prize. One was on the electrodynamics of moving bodies, and redefined space and time in what we now call the special theory of relativity. And one calculated the relativistic equivalence of mass and energy. It was a good year's work. As fawning historians say, it was an *annus mirabilis*.

In his new theory, Einstein redefined physical time, the time measured by clocks, in such a way that traveling at the speed of light would be experienced as instantaneous. He showed that massive bodies can't go that fast, but photons always do. They touch eternity. They have no sense of time. For them, whizzing clear across the known universe is the work of a moment. Only we laggards think they took their time about it. That's what the relativity of clock time means for a photon. Massive lumps like us can't move that fast, but the faster we go the more our time dilates. With a powerful starship, we could warp across the galaxy in seconds. But we couldn't bank the savings. If we warped back home again, we'd find that during our little jaunt the neighbors we left behind had aged a few hundred thousand years already.

That was the metaphor. We can now spell out a sense in which it lets us say the "I" of the mystics is eternal. That "I" is a universal concept, like the numbers we use in arithmetic, which exist eternally like perfect gems in the mathematician's Platonic heaven, where age cannot corrupt them. We could have said that much before 1905, but Einstein added a new twist to the claim, as we shall see. Like any concept, the "I" must be fleshed out in stuff to do work in the natural world. But stuff grows old, decays, and dies. Numbers may be eternal, but the physical embodiments of numbers on paper and in computer memories are subject to the laws of time and entropy. The same goes for any embodiment of an "I" in flesh and blood, or in silicon and transistors.

The new twist is that our human selves, those things we find it hard to separate from Susie, seem to be embodied as photons. Recall the idea that the music of the hemispheres in the brain is where our soul resides. The patterns of neural traffic in our brains add up to a hot zone of electromagnetic

waves surrounding our heads, and modulations in the zone make music that EEG and other brain scanners can detect. An electromagnetic field is just a large number of photons. So if the pun is not too crass to bear, our soul music touches eternity. "I" can be eternal too.

The metaphor carries a major message: Lift-off from time to eternity is not magic but a process constrained by science as we know it. To live eternally is to live in the "now" as it whooshes to infinity at light speed. The psychophysical name for "now" is the specious present, and it can dilate as freely as your focus of consciousness does when your mind zooms out from a flyspeck to the universe. The specious present is where the "I" lives. If you want eternal life, the trick is to live in your "I" and refuse to get distracted by the massive stuff around you that holds you back. Say no to all the attempts of other people to objectify you or to put you under any lesser god than the Boss himself. Forget the past, forget the future, and live now. The great "I am" is always now.

Religionists have no monopoly on deep truths. Quite the contrary, nowadays scientists do. Religionists can only submit their claims to scientists and hope for the best. If scientists say no, all the bluster in the world can only increase the pain of rejection. Science is organized and systematic knowledge. Religion, to the extent that it offers knowledge at all, offers only disorganized and unsystematic knowledge, also known as muddle and confusion.

To tie up the religious thread in our history in an orderly manner, we need to sharpen our focus on the logic behind the loose talk of gods that the muddled thread encouraged. We need to see how that logic can help us understand the deeper truth behind the Boggsie loop in the fathomless void beyond all concepts.

To do so, we first recall the fundamental axiom of psychophysics that subject and object are equal and opposite. We used that claim many turns of the spiral ago to say the Boss was the universal subject, reflecting the entire universe. Later we used it implicitly to say Gene Goof was the idealized subject of the drive that genes display to be fruitful and multiply. We used it again to say that Susie is the subject behind the self of everyday experience. We discovered the Boggsie loop by noticing that the three big subjects we derived from the axiom were related to each other.

The loop does more for us. The "I" that we embody says "I am" through us and relates us to Goof, and thus to Gene Goof. If we can keep our psychic balance as we contemplate the cosmos, it relates us further to the Boss. Einstein seems to have felt at ease contemplating the cosmos as he saw the way space and time were linked in the electrodynamics of moving bodies. He kept it up for years, until he understood how the curvature of spacetime is manifested as gravity and how his new view finally replaced the old Newtonian theory. Einstein was like a protégé of the Boss.

Anyone who wants to debunk the priests who play politics by saying God is a person who requires worship through the priestly hierarchy can point to the "I" denoting Susie in the loop and say God speaks through me. Since every one of us can say the same, this collapses God into me, and you, and anyone else. Our union in the loop is God, which puts our hot line to eternity beyond all political control. It also makes the Arabic phrase *Allahu Akbar* a reference to the same loop, the eternal void a heartbeat away.

It's fair to wonder about the historical background to all this. Deepak Chopra said in his 2000 book *How to Know God* that ancient Hindu mystics saw realization of the divinity of

the self (at least to itself) as the key to mystic enlightenment. Any being that can think out far enough in logic to grasp the Boggsie loop must embrace this apparent divinity, even if it lives in the silicon chips of a robot.

Theology in the coral age is psychophysics. To see how this plays out, we need to recall a few technical ideas, starting with the now familiar concept of a mindworld. Again, time is the key. Let's call the momentary incarnation of an "I" an ego. Think of the ego as like a bubble that reflects its mindworld at any given time, where the mindworlds line up along a time axis. The self blows a series of ego bubbles and has a mind to stack its old mindworlds in memory. Recall that a self is a process that takes time to unfold. It drives ever onward through a series of time-sliced incarnations.

Each mindworld has a particular configuration, and hence contradicts the formless universality of the ego bubble idea. So the ego lifts clear of the configuration, and the self that blows the ego bubbles leaves that old mindworld behind it. The former incarnation of the self passes away as another layer on the trash heap of history. A self that identified too closely with a particular mindworld would lose touch with its ego, and hence its contact to eternity.

Believe it or not, some people could make a formal theory out of this. If you sport the peculiar distinction of having enjoyed advanced study in the foundations of mathematics, you may notice that the story we've just told seems to bear a vague resemblance to a psycho version of a story one might tell to describe movement up the cumulative hierarchy of sets in axiomatic set theory. This is no coincidence: Your humble author does sport that distinction.

The formal theory of God an overly academic theologian might work out would look like what Hermann Hesse, in a

novel he published in 1943, called a "glass bead game". It would be as worthless as those legendary debates in the Middle Ages when theologians are said to have argued earnestly about the number of angels you could squeeze on a pinhead. It seems worth outlining here to show how hard it is to sneak around the flanks of science. Theology today is either science too or just bumble and rot.

Note the central role of the ego in this theology. It may suggest the old philosophical doctrine of solipsism, which is the idea that I am everything, all reality, with the suggestion that no other person around me harbors an ego as sublime as mine. In a world where God is held high, we all want to cozy up to God, and solipsism is dreaming we're united with God. It's mad, but it can't be disproved in logic.

Anyone can try to be a solipsist, but few succeed. In the history of famous men, it seems the Buddha came close. But he, or at least his disciples, denied and dissolved the self so convincingly that little came of it all. The Judaic tradition invoked Goof to abominate solipsism as blasphemy. As we saw, Jesus lived like a solipsist and was condemned to death for it. It seems from the gospels that Jesus really wanted to be a solipsist, though of course we can't know that. But we saw that Sufis hardly dared go that way. Like Jesus, the Sufi mystic Mansur al-Hallaj was martyred for blasphemy.

Most of the philosophers in the recent Western tradition have dismissed solipsism as a form of self-abuse, but among the more recent big names, one stands out.

Ludwig Wittgenstein was obsessed as a young man with language, truth, and logic. He was born in 1889, a few days after Adolf Hitler. His father Karl was a steel industry tycoon and the family became one of the wealthiest in the Austro-Hungarian Empire, second only to the Rothschilds.

Ludwig grew up in the Wittgenstein "palace" in Vienna. He had four sisters and five brothers. One sister died in infancy and three brothers later committed suicide. The children were raised as *haute bourgeoisie*. Karl was a leading patron of the arts, and famous composers often held concerts in the palace. The eldest brother was a musical prodigy but drowned himself in 1902. The second brother shot himself at the end of the Great War. Two years later, the third poisoned himself in Berlin and left a note citing his "perverted disposition".

At first Ludwig was tutored at home, then he went to school for three years. After failing the grammar school exam, he went to the *Realschule* in Linz. Adolf Hitler was a pupil there too. Since Adolf's school life was retarded and Ludwig's advanced, in each case by a year, it seems unlikely they knew each other.

While at school, Ludwig read Schopenhauer and became an atheist. He read a new book by Otto Weininger, a gay Jew, who argued that woman are sexual, men are rational, and Jews are like women, faced with a choice between genius and death. Weininger shot himself just months after this farrago of falsehoods and fallacies appeared.

In 1906, Ludwig took up engineering at the technical university in Berlin. After two years, he was awarded his diploma and went to Manchester to study aeronautics. In Manchester, he read Frege's work on the foundations of mathematics. He also read Bertrand Russell's book *The Principles of Mathematics*, which ended with a sentence on the contradiction Russell had discovered at the heart of Frege's work: "What the complete solution of the difficulty may be, I have not succeeded in discovering; but as it affects the very foundations of reasoning, I earnestly commend the study of it to the attention of all students of logic."

Wittgenstein decided to devote himself to the subject. In the summer of 1911, he visited Gottlob Frege in Jena. As he wrote to his sister: "Frege was a small, neat man with a pointed beard who bounced around the room as he talked. He absolutely wiped the floor with me … I had several discussions with him after that. Frege would never talk about anything but logic and mathematics."

Frege suggested Wittgenstein go to Cambridge and study under Russell, so that fall Wittgenstein arrived unannounced at the door of Russell's college room. Russell wrote: "An unknown German appeared, speaking very little English but refusing to speak German."

Russell found Wittgenstein dogging him after his lectures: "My German engineer, I think, is a fool. He thinks nothing empirical is knowable – I asked him to admit that there was not a rhinoceros in the room, but he wouldn't."

Wittgenstein returned to Cambridge in 1912 with something he had written. Russell wrote that it was "very good, much better than my English pupils do … Perhaps he will do great things."

Russell soon became more impressed: "His disposition is that of an artist, intuitive and moody. He says every morning he begins his work with hope, and every evening he ends with despair – he has just the sort of rage when he can't understand things that I have."

When Wittgenstein's father died in 1913, Ludwig inherited a fortune. He retreated to a secluded house in Norway for the winter, where he wrote notes on logic and read Kierkegaard.

The work with Russell continued. Russell later wrote that Wittgenstein was "perhaps the most perfect example I have ever known of genius as traditionally conceived, passionate, profound, intense, and dominating".

When the Great War broke out, Wittgenstein joined the Austrian army as a volunteer. In 1916, his artillery regiment was posted to the Russian front. After heavy fighting, he won several medals for bravery. All the while, he was reading and writing, penciling his thoughts in notebooks and exchanging occasional letters with Frege. He read and reread the gospel book by Tolstoy, and he read Fyodor Dostoyevsky's novel *The Brothers Karamazov* so often he knew parts by heart.

In 1918, he was promoted to lieutenant and posted to the Italian front. There he won one of the highest honors the Austrian army could offer. In August, he finished writing a book on logic and philosophy and sent it off to a publisher. Then he learned that a close student friend from Cambridge had been killed and became distraught and suicidal. He was sent back to the Italian front, the Allies captured him, and he spent nine months in a prison camp.

He returned to Vienna in 1919 and talked incessantly of suicide. He gave away his fortune to his sisters and trained as an elementary school teacher, then went to live and work in rural Austria, where he scandalized the locals with his harsh school discipline. After collecting many rejections, his book was published in German in 1921 and in English translation in 1922, with a new Latin title. *Tractatus Logico-Philosophicus* has just 75 pages of body text, and its propositions are numbered in a hierarchy, with seven main propositions:

1. The world is all that is the case.

2. What is the case – a fact – is the existence of states of affairs.

3. A logical picture of facts is a thought.

4. A thought is a proposition with a sense.

5. A proposition is a truth-function of elementary propositions.

6. The general form of a truth-function is $[\overline{p}, \overline{\xi}, N(\overline{\xi})]$. This is the general form of a proposition.

7. What we cannot speak about we must pass over in silence.

The book is oracular, mystic in part, and hard to read from start to finish. The logical philosophy in it is deep but still debated, and Wittgenstein later repudiated its picture theory of meaning, which claimed to link propositions to facts. As a contribution to the logical work of Frege, Russell, Gödel, Turing, and many others, it does nothing they didn't sooner or later do better. But it lives on for its crystal clarity. Whatever it says, it says implacably. Its solipsist thread runs from "The limits of my language mean the limits of my world" (proposition 5.6) and "I am my world" (5.63) to 5.64:

> Here it can be seen that solipsism, when its implications are followed out strictly, coincides with pure realism. The self of solipsism shrinks to a point without extension, and there remains the reality coordinated with it.

There is a curious jumbling of his pre-war technical logic with the later mystic stuff penciled in during the war. Under "All propositions are of equal value" (6.4) come "If the good or bad exercise of the will does alter the world, it can alter only the limits of the world, not the facts" (6.43) and 6.4311:

> Death is not an event in life; we do not live to experience death. If we take eternity to mean not infinite duration but timelessness, then eternal life belongs to those who live in the present. Our life has no end in just the way in which our visual field has no limits.

But whatever the tract's merits, once it was published it was treated well, and was later even accepted as a doctoral thesis.

Wittgenstein returned to Cambridge in 1929. Economist John Maynard Keynes wrote in a letter to his wife: "Well, God has arrived. I met him on the 5.15 train." Russell said he returned a changed man, an ascetic mystic.

Cambridge philosopher Norman Malcolm says how:

> Whether lecturing or conversing privately, Wittgenstein always spoke emphatically and with a distinctive intonation. He spoke excellent English … His gaze was concentrated; his face was alive; his hands made arresting movements; his expression was stern. One knew that one was in the presence of extreme seriousness, absorption, and force of intellect.

In 1939, Wittgenstein was elected to the Cambridge chair in philosophy. He lectured on the foundations of mathematics and argued against any attempt to give formal logic the fundamental status he had given it twenty years earlier. When Alan Turing started attending, a dialog began. Turing defended mathematical truth and Wittgenstein insisted it all boiled down to grammar and social convention.

When Germany annexed Austria, Wittgenstein became a German. He also became a Jew under the Nuremberg laws, because he had three Jewish grandparents. But in 1939 Hitler personally granted the Wittgenstein siblings mixed status, to give the Reichsbank a claim on the family fortune.

During the war, Wittgenstein worked as a hospital orderly in London. He resigned his Cambridge chair in 1947 and died of cancer in 1951.

Decades later, the American logician Saul Kripke did great work in modal logic, great enough to inherit the mantle of

greatness that by then hovered around Wittgenstein's work. In 1982, Kripke wrote of proposition 5.6:

> Thus I, the user of language, determine the "limits" of the world. In this sense the world is mine: I, by using a language with just these signs and these possibilities of combinations (the only signs and possibilities I can think) determine it.

In 2006, Kripke summed up his views on the first person:

> Descartes held that my essence is thinking. The only thing that is really indubitable, and therefore constitutes me, is the thinker – what I am aware of whenever I think and feel. It is easy to conclude that he holds that I really am simply the Cartesian ego that Hume (and others following him) have found hard to comprehend, or to locate in their own self-consciousness … each of us does have a special acquaintanceship with himself or herself, as philosophers from Descartes to Frege have held. This self-acquaintance is more fundamental than anything purely linguistic, and is the basis of our use of first person locutions. And each of us can use them to make genuine claims, to express genuine propositions.

Thus Kripke put the previously solipsistic world of the self (code yellow) on a firm public (coral) basis.

Your author played his humble part as a graduate student: He expressed the idea of a limiting self in set theory.

Next in line comes David Foster Wallace, who was the son of a philosophy professor. At college, David showed some philosophical talent, took an interest in logic and language, read Wittgenstein, and was "deeply taken" with the "cold formal beauty" of the *Tractatus*.

But he suffered a mental crisis and started writing fiction. He wrote two undergraduate theses, one in philosophy and one in creative writing. The latter became his first novel. He went on to do graduate philosophy at Harvard, where he got depressed again, this time seriously, and dropped out.

Wallace called his 1987 novel a self-obsessed *Bildungsroman* recalling his struggles between philosophy and literature. He said "one of the things that makes Wittgenstein a real artist to me" was his handling of solipsism.

In 1989, Wallace wrote an appreciation of an experimental novel by David Markson. He saw the novel as an emotional reckoning with Wittgenstein's solipsism. The book's narrator is a painter named Kate, who seems to be the last person alive, alone for many years. She types statements, on and on. Her ideas are "sprayed, skewed, all over the book" in a voice like that of the *Tractatus*. Wallace: "This isn't a weakness of the novel, though it's kind of miraculous that it's not."

Wallace was disquieted by the cold treatment of solipsism in the *Tractatus*. The topic pervades Wallace's work. Being a writer means spending a lot of time alone, giving rise to the feeling "that one's head is, in some sense, the whole world" and the imagination is a real place.

Wittgenstein later said the way to understand the meaning of a word or phrase is to find out how it's used in real life, in what he called language games. If words get their meaning only via such shared usage, the notion of a solipsistic private language is incoherent. Wallace called this "the single most beautiful argument against solipsism that's ever been made". But his claim that Wittgenstein later "trashed" the *Tractatus* philosophy because he "realized that no conclusion could be more horrible than solipsism" was wrong. Wittgenstein was at ease with solipsism. It was Wallace who wasn't.

In 2003, Wallace published a "train wreck" of a book on mathematical logic, a "parody of scholarship" with more rambling footnotes than pages, as one reviewer complained: "Wallace begins the book with some chatty vaporing about how hard it is to think abstractly … The presentation grows increasingly frantic and disorganized … As a parting shot, he gives an incorrect characterization of Kurt Gödel's beliefs regarding the power of the continuum and a misleading characterization of Gödel's demise."

Wallace committed suicide five years later.

The next figure in this story is Ken Wilber, a turquoise or coral mystic. Wilber was born in 1949 and lives in Colorado. He was inspired by Eastern philosophy and Buddhism, and did graduate research in biochemistry, then wrote numerous books, including a brief history of everything. In 2000, he published an integral theory of business, politics, science, and spirituality, all held together with spiral dynamics.

His model of manifest reality is based on holons, which are dual entities, both wholes and parts of other wholes, that form natural "holarchies" like Russian dolls. He sees four "valid" perspectives for any holon. For example, perspectives on people and their behavior look thus:

1P singular (me): Freudian psychology
1P plural (us): Philosophical hermeneutics
3P singular (it): Psychological behaviorism
3P plural (them): Marxist philosophy

Wilber integrates these quadrants in an AQAL (all quadrants, all levels) model of manifest existence with five categories: quadrants, lines, levels, states, and types. He says a holon is integral if it integrates all quadrants and levels. Holons have development lines as well as levels. For example, the ethical

development line runs from egocentric (tan and purple) via ethnocentric (red, blue, orange) and world-centric (green or turquoise) to being-centric (yellow or coral).

In this scheme, Wilber contrasts structures (levels or lines) of consciousness with conscious states thus: "States are free but structures are earned." He discerns four types of states: waking, dreaming, sleeping, and peak states. The peak states include mystic "nondual" states.

Wilber's big ambition is to map the perennial philosophy (that all the world's religious traditions have grown around a single shared and universal truth) to an account of cosmic evolution. The aim goes beyond that of this book.

Ken Wilber makes nondual consciousness look interesting but fails to map its features to facts a scientist could accept, so it cuts no scientific ice as an form of "higher" solipsism. Popular mystics, such as Deepak Chopra, Andrew Harvey, and Eckhart Tolle, seem to have no desire to help scientists tackle solipsism. Instead they offer self-help therapy for baby boomers who are into Susie.

The final figure rose to fame in response to 9/11. In 2004, the young American Sam Harris published a searing attack on religious faith that caused a furor. He became the young star among the four horsemen of the neo-atheist apocalypse (where the present book started) and now works as a neuro-scientist. His critique, like the work of the logician Kripke, had the effect of clothing the naked singularity of solipsistic consciousness in fresh coral underwear.

Anyone eager for coral insights may prefer to let solipsism go and move on to the more tangible side of how people live in the modern world.

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The next level in the development of the dynamic relationship between reality and "I" overcomes the global fixation of the turquoise stage by developing a more grounded way of life in the wider ecology of Globorg. This involves finding a more self-aware level of being. To see what this means, we first review the color spiral.

Tan and purple: These stages haven't changed. As a species we left them behind many centuries ago, and only children revisit them now. Perhaps we can draw a line there and say people who fail to rise above shamanism or voodoo deserve no place in the civilized world.

Red: The stage of godlike people is now the world of movie heroes and Superman comics. The Christians who take their cue directly from the apostle Paul still tend to see Jesus the Nazarene that way, but otherwise we can regard this stage as something for teenagers to get over.

Blue: This stage is something else. Millions of people, from orthodox Jews who perform their rituals with obsessive zeal to faithful Catholics who follow the pope on questions of life and death to fundamentalist Muslims who seek to restore the ways of the Prophet, still clutter our world with junk best consigned to the ash heap of history. Given the typical blue faith in law and order, this need not be a violent process, but it does require an active neo-atheist purge.

Orange: Trust in reason and the naïve pursuit of a more scientific world still animates many people among us too. Here the continuing pursuit of science along the lines that science itself prescribes, in the process of conjecture and refutation that Karl Popper recommended, is enough to lift us clear of the crasser side of scientism.

Green: The world of instrumental ideologies, which led to the communist dramas of the twentieth century and then to the multiculturalist bullshit that still perfumes too many college faculties, was not all bad. It led to tolerance of diversity and the like, in a revaluation of all values that strengthened us.

Yellow: The reaction to those ideologies led to racism, for example in Nazi Germany, and to genetic fundamentalism, as discussed by Richard Dawkins and preached by people who say IQ or homosexuality come from our genes. Anyone who thinks human nature is something to be accepted as a given is stuck in this turn of the color spiral.

Turquoise: The world of Globorg, where we humans live in symbiosis with the rest of life in a global ecosystem that we are enriching with the infrastructure of modern life and new media, networking via the Internet, is current best practice. People who live in this world have no tolerance for old rot but plenty of understanding for simple people and the basic principles on which they found their lives. The institutions of old-time religion are social clubs that foster human solidarity and tribal identity in ways that civilize and replace the warrior tribalism of our ancestors. Recalling Douglas Adams, they're mostly harmless.

Coral: This stage is yet to come. We can't spring over our own shadow, but we can see some features of the new world order. Globalism will be a given, with nothing to fight over. The global triad of America, China, and Europe will rule the Earth, at least to the extent needed to govern work and play in the cloud (of remotely hosted online services). People will rely on the cloud and develop new identities there.

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We can move beyond Globorg by overcoming the global focus of the eighth station of the pilgrimage. We have a universe to win, and the forty-megameter girth of Earth is far too small a ring road for the future conurbation of coral. Imagine a future where the Moon and Mars host colonists in domed cities, and where stations on the asteroids and on the moons of the outer planets offer luxury suites for tax exiles cruising by in their solar yachts. The city limits of Globorg will seem parochial in such a future.

The key to coral insight is to think cyborg. Humans are meat, and meat is murder. All we know about the human condition is that in the absence of painful discipline, the apes of our species are more likely to kill each other than to live in peace and harmony. The history of the color spiral shows how readily our apelike forebears went to war. Religion was neutral there: Coreligionists were brothers, true, but infidels were pigs for slaughter. This is no way to go on. One answer lies in nanotech implants that change our nature.

Religious communities that circumcised males and females to make them chaste may have failed to dam the sexual lusts of their victims, but their intentions were easy to understand. Modern secular communities that stop people carrying guns or try to prevent nuclear proliferation are also easy to understand. The natural human condition is unlovely, indeed quite often deplorable, and such self-imposed limits to help us live in peace are the best tactics we have to keep civilization intact. But now we have the tools and toys of new technology, which enable us to improve our condition more thoroughly than we could ever hope to do before.

Consider the progress of personal technologies, from eyeglasses and false teeth in centuries past to Google augmented reality glasses and robotic or bionic hands and limbs today.

This kind of progress will doubtless continue, until the smart phones of today become too clunky for the new apps and we all move on to the next big thing. Soon we may be able to install brain chips that add zippy new features to our skill sets, such as instant navigation smarts, language lookup for Chinese ideograms, and online imagery delivered straight to visual cortex. If so, the days when such things came via apps and touch screens will seem remote, and the lifestyles our former devices and artifacts encouraged, such as work sitting at desktops and family life among heavy fixtures and fittings that responded only to brute force, will seem quaint.

This is not utopian thinking. Our present lifestyles are no doubt better than those in former generations, but with new problems to cope with they aren't so great. A Borg drone is a person with a nanotech brain implant that makes him or her a selfless member of the Borg hive mind. Living like a Borg drone, where the pleasures of ape life are no longer on the menu, will seem grim to some, just as life in a big city today, where natural fun is packaged and marketed, may seem dull to those who still like raw nature.

The payoff for the Borg drones will come in the cloud. Readers for whom cloud living is still cool can be sure that this too falls short of supreme bliss in paradise. Uploading personal data of every kind to the cloud, so that books and papers are no longer needed and passports and credit cards are obsolete, and relying on the cloud to support all the apps that make daily life in a big city worth living, and expecting your chip implants to enjoy cloud connectivity at all times, even while you're asleep, may seem fun at first but will turn into a survivalist nightmare if and when the cloud servers go down. Today we depend on electricity. Tomorrow we shall depend on cloud connectivity.

The changes in personal and social identity that cloud life will foster are what make the coral era different. Men and women have been islands since history began. The sense of isolation comes from an imbalance in information flows. Inside a body and brain, the flows are copious and well nigh continuous, supporting rich feedback and a strong sense of persistent identity that only death or serious injury can disturb, whereas the flows with others are unsteady trickles that are often hard to interpret. No wonder we regard ourselves as sole agents first and social beings second. This imbalance of information flow, not only in volume and continuity but also in quality and meaningfulness, lies behind the contrast between the first, second, and third person perspectives that make solipsism such a tricky issue. But all this will change in a fully developed cloud environment. Rich flows, not only with anyone but also with many previously inert things, will foster new identities. We shall merge in the cloud.

Even religion will enjoy a kind of comeback. In modern America many Christians have discovered new ways to interpret their faith. Unburdened by factual knowledge about their savior, they all claim to carry an inner hot line to Jesus as if he were no more than a familiar avatar for a cloud service that linked directly to a brain chip with a consciousness interface. Jesus is just an idealized person in their mindscape, a virtual figure with a gentle smile and hippy hair who responds with biblical platitudes when addressed in prayer. These New Age Christians are inventing something new.

Brain chips raise deep moral concerns. A smart kid could render Jesus now in a touch-screen app to deliver "words of wisdom" (wow), but a brain chip could bypass the frontal lobes, where conscience might disrupt the drone-like zombie automatism that adds the secret sauce.

New Age Christians would do it for Jesus. They would give up their free will to the Jesus avatar. In a coral world where cloud identities are fungible, we should refuse to give religion a free pass, or a new Antichrist could sell his world domination app as a hot line to God, and Zombies of God would do his bidding. The Zog army would march forth in lockstep, and taking it down would be bloody even for meat-grinder robots.

When people live in the cloud, they may lose interest in their meat bodies anyway. As bionic parts improve, they will swap out their worn body parts, either out of medical need or just because bionic parts are more fun. People will be much more fussed about the quality of their cloud lives, about the music playing in their heads, on the neural keyboard of their brains. And when the neurons get too old, wealthy dreamers will no doubt rent space on a cloud server and upload their minds, to enjoy the last dissolution of their old selves in a virtual symphony that seems to live forever.

But imagine the downside of the hosting business. Once a few million oldsters have raptured up to their virtual paradise in a photonic box in a data warehouse somewhere, it's not hard to imagine a busy system administrator pulling the plug on their box and deleting them all to make way for the next batch of customers. People might even be happy with that. Their bought and paid for eternity in paradise might only need the time it takes to feed their minds into the cloud.

If so, we have a neat defeat of death in the coral cloud. The unsolved Globorg problem of programmed cell death, apoptosis, so crucial to the health of any organism, is solved in the coral cloud. Medical costs will sink as oldsters line up happily to rapture to the cloud. Anyone who thinks this fate is still remote should recall how quickly we've come this far.

As futurologist Ray Kurzweil convincingly demonstrated, the pace of technological advance has increased exponentially in history and regularly surprised forecasters who think in linear terms. The Human Genome Project illustrates the speedup we often encounter. At the time of writing, you can get your personal genome read for a hundred dollars.

The other side of the cyborg story seems easier to imagine. Our descendants could go a long way with bionic extensions of their old meat bodies. We already know all about cars as extensions of bodies, and one can easily imagine how the car story might continue, with direct brain-to-car interfaces for hands-free control and monitoring, plus external sockets for the robots in parking towers and trains and ships.

One day, the meat inside the car may come to seem too messy, and people may simply port their minds into the cars and leave their bodies at home. And not come back for them. That may mark the move to the ultraviolet age of photonic angels in a seamless world of organic bots. As if in hopeful anticipation of that age, Coralites can believe in one God and a world without end.

Notes

Most readers should skip these notes. They may be of use to historians, who can also go to my blog for more. Readers who just want the facts can easily find most of them online. We have tools in Google and Wikipedia that make writing a book like this an order of magnitude easier than it was a generation ago, and I have used them freely to speed up my work. Still, over the years I have read many more relevant books than I can cite here.

Who, What, Why

Page 9. See the neo-atheist manifestos (Dawkins 2006, Dennett 2006, Harris 2004, Hitchens 2007). In support of Dennett, see (Boyer 2001). For the theist case, see (Armstrong 2009). On normal versus abnormal science, see (Kuhn 1962).

Genesis

11. Many books gave me the background for our creation myth. I list a few in (Ross 2012). Decades ago I liked (Sagan 1980, Gribbin 1981). More recently I enjoyed (Bryson 2003, Greene 2004). On very early evolution, see (Ridley 2000, Woolfson 2000).
18. On spiral dynamics, see (Graves 2005, Küstenmacher 2010) and the relevant parts of (Wilber 2000).
19. For an old Jewish attempt to find the meaning of life, see (Berg 2003). For a new Christian attempt, see (Warren 2002).

Gaia

21. For a heavy but intriguing review of the anthropic principle, see (Barrow 1986).
22. On our early ape heritage, see (Diamond 1991).
23. On the story of human civilization, see (Bronowski 1973).
25. On Ötzi the Iceman, see the entry in Wikipedia.
28. The story of Egypt here reflects multiple online sources.
29. The Einstein quote, translated, forms the title of (Pais 1982).
30. On psychophysics, see the relevant essays in (Ross 2009). On how the Answer came to be 42, see (Adams 1979).
34. On Gaia and global mind, see (Lovelock 1979, Bloom 2000).

Gods

35. On the axial age, see (Jaspers 1949). On a conjectured origin of consciousness, see (Jaynes 1976). On both, see (McGilchrist 2010).
36. On India and its religions, see (Wood 2007).
38. On the young Buddha, see (Hesse 1922, Rooks 1972).
40. On the emperor Ashoka, see (Sivan 2001).
41. On classical Greece and Rome, see (Hornblower 1998). On Greek science, see (Ronan 1983).
44. On Alexander the Great, see (Stone 2004).
46. On everyday life in ancient Rome, see (Heller 2006).
48. For a taste of stoic philosophy, see (Aurelius 2006).
50. On the ancient world of the Bible, see (Coogan 1998). On Moses, see (Freud 1937).
52. On Zoroaster or Zarathustra, see (Nietzsche 1887). On Nietzsche, see (Safranski 2000).

Christians

55. On the canonical gospels, see (Sanders 1993, Ehrman 2009).
56. On New Testament scholarship, see (Schweitzer 1906), for which the full text of the translation by W. Montgomery is available online.
57. On Qumran, see (Golb 1995, Thiering 2006).
60. For the apocryphal gospels, see (Ehrman 2005).
64. For personal views of the mystic Jesus, see (Gibran 1928, Harvey 1998). On Jesus' possible travels in India, both before and after the crucifixion, see (Kersten 2001).
65. The Tibet story is related in (Notovitch 2004).
66. For an extremely traditional view of Jesus, see (Ratzinger 2007, 2011).
69. For the story of Bede Griffiths, see (Griffiths 1954, Boulay 1998).
72. Tolstoy's gospel is (Tolstoy 1896).
80. The Turin shroud story is well told in (Kersten 2001).
84. On the apostle Paul, see (Armstrong 1983, Sanders 1991).
86. For the acts of Thomas, see (Ehrman 2005).
87. For the story of Yuz Asaf, see (Kersten 2001).
89. On Caligula, see (Guccione 1979).

Muslims

94. For translations of Augustine's words, see (Augustine 1963, 1972).
95. On Einstein and Gödel on time, see (Yourgrau 2005).
97. On Muhammad, see (Armstrong 2006).
99. For the "six pillars" and on Sufism, see (Shah 1968).

100. On the militant side of Islam, see (Armstrong 2000).
101. On Islamic science, see (Ronan 1983).
108. The El-Arabi verse is from (Shah 1968).
109. On the crusades and the wider picture, see (Lewis 2003). On Mongols, see (Bodrov 2007).
119. For an appreciation of Rumi's poetry, see (Harvey 1994). The Rumi verse is from (Shah 1968).

Scientists

121. On the story of the rise of modern science from Galileo to Einstein, see (Boorstin 1983, Ronan 1983).
123. On Galileo's astronomy, see (Galilei 1610).
126. On the story from Copernicus to Newton, but especially on the roles of Brahe and Kepler, see (Koestler 1959).
127. On Luther, see (Till 2003). On Protestantism, see (Lilla 2007).
129. The source for Newton's cosmology is (Newton 1683).
132. The Feynman quote is from (Feynman 1963).
133. On Darwin, see (Darwin 1859, Attenborough 2009). For an "update" of his book, see (Jones 1999).
136. Darwin's ideas are well glossed in (Dennett 1995).
139. On Otto, Diesel, and other German scientists and engineers, see (Watson 2010).
142. On entropy and information, see (Baeyer 2003, Lloyd 2005).
143. The Feynman quote is from (Feynman 1963).
145. On the role of disease in the colonization of America, see (Diamond 1997).
146. For a wide view of the expansion of European civilization, see (Kennedy 1988). On the founding of the United States of America, see (Ferguson 2004).

Communists

147. On the glories of the British Empire, see (Ferguson 2003).
148. On Marx the man, see (Wheen 1999). Engels' classic report is (Engels 1845).
149. Kant's classic is (Kant 1781). On Kant, see (Scruton 2001). Hegel's classic is (Hegel 1807). On Hegel, see (Taylor 1977).
151. For Marxist economic theory, see (Marx 1867).
154. On the Potemkin mutiny, see (Eisenstein 1925).
155. Lenin's atrocious book on materialism is (Lenin 1909).
157. The Reed quotes are from (Reed 1919). On Reed's coverage of the revolution, see (Beatty 1981).

160. The Russell quote is from (Russell 1920). On the Great War, see (Keegan 1998).
161. On the Second Reich, see (Mann 1958).
165. On the British role in the Arab revolt, see (Lawrence 1926, Lean 1962).
168. The Churchill quotation from (Churchill 1948).

Holocaust

169. On Hitler's war, see (Ferguson 2006, Burleigh 2010). On Churchill as warlord, see (Deighton 1993, 2010; Corrigan 2006; D'Este 2009).
170. On Hitler's life, see (Haffner 1978, Fest 1987, Kershaw 2008).
171. The Heck quote is from (Heck 1985).
172. The original Spengler book is (Spengler 1918).
173. The manifesto Hitler dictated is (Hitler 1923).
174. On Churchill's life, there are so many sources it seems random to give only a few, but see (Manchester 1983, Jenkins 2001, Hastings 2009).
178. The translations of Heidegger's words are from Wikipedia. On Heidegger and his philosophy, see (Heidegger 1993, Safranski 1994).
179. On life in the Third Reich, see (Burleigh 2000).
183. This and other Churchill quotes are from (Churchill 2004).
184. On the Battle of Britain, see (Holland 2010).
185. On the personal friendship between Winston and Franklin, see (Meacham 2003).
189. On Turing, see (Hodges 1983). On Enigma, see (Bauer 2000).
194. On the Allied bombing campaign, see (Grayling 2006). On the Lancaster, see (Iveson 2009).
198. On Operation Valkyrie, see (Singer 2008).
201. A badly outdated history of the bombing of Dresden is (Irving 1963). The Churchill quote is from the UK National Archives, accessed via Google. On Auschwitz, see (Rees 2005).
202. On the Holocaust (Shoah), see (Gilbert 1986, Spielberg 1993).
204. On the last days in the bunker, see (Hirschbiegel 2004).
205. Churchill's classic history of the war is (Churchill 1948). On its composition, see (Reynolds 2004).
206. For Nietzsche's ideas, see (Nietzsche 1887). For Darwin's ideas, see (Darwin 1859).
207. A bold attempt to reconstruct Hitler's view of the war is (Irving 1977). A good Judeo-centric view of history is (Dimont 2004). For a lighter view of Jews, read (Goldstein 2010).
210. Feynman's role at Los Alamos is well covered in (Gleick 1992). The Oppenheimer story is told in the context of physics in (Pais 1986).

Globorg

213. On Gandhi, see (Duncan 1971, Attenborough 1982).
217. The Einstein quote is translated from a letter now archived at the Hebrew University of Jerusalem (and accessible online).
219. The Teller-Ulam design for an H-bomb appears in Wikipedia.
220. On the Vietnam war, see (Coppola 1979, Sheehan 1989).
224. On Apollo, see (Chaikin 1994; Howard 1995, 1998).
230. Numerous mutually reinforcing online sources together provide the story of the development of information technology.
233. On the physics of the big, the small, and the complex, see (Davies 1989). On the history of work at the LHC, see (Close 1987).
234. The Feynman quote is from (Feynman 1985). For a magisterial review of deep physical theory, see (Penrose 2004).
236. The story of globalization and technology is from (Ross 2010).
240. On life, see (Schrödinger 1944). On DNA, see (Watson 1968).
241. On genes, see (Dawkins 1976, 1982).
244. On the interdependence of all life, see (Wilson 1992).
246. By and on Descartes, see (Descartes 1637, Williams 1978). For a personal view of the wider history of philosophy, see (Russell 1946). On Kant, see (Kant 1781, Scruton 2001).
247. On Frege's philosophy of logic and language, see (Dummett 1973). The mathematical classic by Russell and Whitehead is (Russell 1910).
248. On Gödel's theorem(s), see (Hofstadter 1979, Goldstein 2005).
249. On mind and self-reference, see (Hofstadter 1981, 2007). On Turing and Turing machines, see (Hodges 1983, Penrose 1989). The classic of psychology is (James 1890). See also (Pinker 1997).
250. Dennett's book is (Dennett 1991).
251. The literature on consciousness is vast, but try starting with (McGinn 1999; Chalmers 2002, 2010).
251. On avatars within the mind, see (Metzinger 2009, Ross 2010). On the hard problem of consciousness, see (Chalmers 1996).

Revelation

255. On Iran, see (Baer 2008).
257. On Arab activist psychology, see (Atran 2010).
258. On China, see (Clayre 1984, Bertolucci 1987).
259. For a scientific biography of Einstein, see (Pais 1982).
260. On time, see (Barbour 1999, Lockwood 2005, Carroll 2010).
262. On gravity and spacetime, see Wheeler 1999). On how to know God, see (Chopra 2000).

263. The ego bubble idea was inspired in part by the string of beads image for worlds of consciousness in (James 1902); see (Ross 2009). On the glass bead game, see (Hesse 1943).
264. On Wittgenstein, see (Monk 1990).
265. Weininger's book is (Weininger 1903). Frege's great masterpiece is (Frege 1893, 1903). Russell's book is (Russell 1903).
267. Tolstoy's personal gloss on the gospel story is (Tolstoy 1896). Dostoyevsky's novel is (Dostoyevsky 1880). Wittgenstein's first book and doctoral thesis is (Wittgenstein 1922).
269 Malcolm is quoted in (Monk 1990).
270. The first Kripke quote is from (Kripke 1982). The second is from (Kripke 2006).
271. Wallace's *Bildungsroman* is (Wallace 1987). On Wallace on Markson's novel, see the introduction to (Wallace 2010). Wallace's review of the novel is in (Wallace 2012).
272. Wallace's book on mathematical logic is (Wallace 2003). The quoted review is (Rucker 2004); Rucker's book on the topic is (Rucker 1982). For Wilber's ideas, see (Wilber 2000) and check his online presence.
273. Works by the three named mystics include (Chopra 2000, Harvey 1998, Tolle 1999). The Harris book is (Harris 2004).
274. On scientific methodology, see (Popper 1963).
275. On academic bullshit, see (Frankfurt 2005).
277. Borg drones are fictional beings from the future world of Star Trek.
280. On futurology, see (Kurzweil 2005).

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One could add a lot more scholarly detail or commentary. If the response to this book is big enough, I may post further notes online, at:

www.andyross.net/coral_notes.htm

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