BOOK PROPOSAL

A NATION OF INNOVATORS:

The Social, Cultural, and Economic Pioneers who Forged the American

Century

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Synopsis

Is American preeminence doomed? Hundreds of books and thousands of articles have argued that the United States' position as global leader is under threat by rising authoritarian nations—notably China—and the legacy of the Donald Trump presidency. TURNING POINTS challenges this consensus, demonstrating that throughout history, American liberal democracy has prevailed even under threat because of the unique strengths that first made the nation great: Its egalitarian society and innovative, risk-taking, national culture. TURNING POINTS makes this case by examining six crises that could have derailed America's rise, yet did not—because its citizens enjoyed the liberty to find solutions where the federal government had failed.

TURNING POINTS will begin with America's first crisis point: Its brutal early years that the Colonists survived by creating a society that valued risk-taking, individual initiative and innovation, laying the foundation for the American liberal democracy. It will discuss the build-up to the Civil War when abolitionists led a crusade to convince America's political leaders to end slavery—demonstrating to the world America's sincere belief in the democratic system. During Reconstruction, while the federal government was paralyzed by incompetence and scandal, a group of ruthless business tycoons turned America into a global power. In the late 19th century, progressives reformed American labor and inspired the spread of democracy around the world.

When the United States government withdrew into isolationism following World War I, private American bankers rebuilt the European financial system while American jazz musicians spread American culture, laying the foundation for American globalism after the Second World War.
TURNING POINTS then turns to the Cold War, when a group of rebellious young scientists enabled America to win the space race and, ultimately, prevail over the threatening Soviet Union.
In very recent history, TURNING POINTS explores environmentalists' stand against the Trump Administration threat to withdraw from the Paris climate accord, efforts that have impressed upon the world that America can still achieve many of its global environmental responsibilities. Finally, TURNING POINTS explores the rise of China, and the threat it poses to U.S. preeminence in light of this history and concludes that the United States—even burdened by the legacy of President Trump—can still inspire innovators and meet China's challenge both now and over the coming decades.

TURNING POINTS will appeal to a wide-ranging general audience, both national and international, including history buffs, business leaders and academics interested in the relationship between scientific and cultural innovation and global power, as well as America's future in the 21st century.

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Discussion

America *Second*?

Written in white lettering and emblazoned on a red and yellow background, *Time* magazine's front-page headline stated simply: "China Won."

Time chose these haunting words for the cover of its November 13, 2017 issue to announce that history has reached a new watershed moment: The American era was over, the Age of China had begun. The lead article, entitled: "How China's Economy is Poised to Win the Future," was unmistakable in its certainty. Instead of a global rivalry, China had *already* won its competition with the United States. Instead of American leadership, China had *already* replaced the United States at the apex of world power. Rather than merely challenging the "American model," the "China model" *already* drives the world economy.

The author was Ian Bremmer, President of the Eurasia Group, a political risk consultancy that advises international businesses and financial institutions on global political and economic trends. Bremmer's argument was as seductive as it was simple: China's highly centralized political and economic system has enabled its leaders to better mobilize the nation's resources to ensure its continued rise. By contrast, the U.S. system has ground to a halt, too politically gridlocked to undertake any new and decisive endeavors. Bremmer wrote: "As recently as five years ago, there was consensus that China would one day need fundamental political reform for the state to maintain its legitimacy and that China could not sustain its state capitalist system. Today China's political and economic system is better equipped and perhaps even more sustainable than the American model . . .."

The election of Donald Trump and the execution of his "America First" agenda signaling America's global retreat has taken these fears to entirely new heights. Now, there is a veritable avalanche

of articles and opinion pieces published in every global news outlet warning that the "American world order" is finished and a new international system was emerging, one centered on China not the United States. Trump's foreign policy blunders have only accelerated these trends.

Then there is Vladimir Putin. The 2016 Presidential Election scandal, Trump's pathetic fawning over President Putin at the 2018 Helsinki Summit, in stark contrast to his bullying of NATO allies at the Alliance summit just days earlier have turned the expressions of "concern" from 2017 into a feeling of outright dread in 2018. Many observers now believe that the actual goal of this president isn't merely to withdraw from the world but to destroy the international order built by the United States and its allies after World War II. For instance, Richard Haas, President of the Council on Foreign Relations, recently warned that "Trump . . . makes the US commitment to NATO conditional and makes clear his discomfort w(ith) Article 5 and collective security, the core of the alliance" causing America's European allies to question whether the United States will come to their defense should Vladimir Putin move against them, a particular fear of NATO's Baltic member who have witnessed Russian intervention in Ukraine. Jeremy Bash, former Chief of Staff for Leon Panetta at both the CIA and Department of Defense contended that "we're witnessing the de facto collapse of the NATO Alliance" and that the Trumps foreign policy represents "the most dramatic shift in American foreign policy since World War II." Lurking beneath the surface of this international maelstrom remains an increasingly-ambitious China, eagerly exploiting Trump's chaos to attack the American world order.

What most alarms many China watchers is the new, more aggressive, grand strategy developed by the government of Xi Jinping. As China began its reform programs it carefully followed the dictates of Deng Xiaoping who warned that the nation must "keep a low profile" to avoid conflict with the United States—what some scholars have nicknamed a "bide and hide" policy. However, once Xi consolidated power he launched a far more aggressive foreign policy centered on the idea of the "China Dream," the goal of restoring China to its supposed status as the world's greatest power. According to David Shambaugh, a professor of Chinese studies at George Washington University, Xi's ambition is to ensure that China replaces the United States as the dominant economic and technological power in the world by

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2050. A key part of Xi's economic strategy is the now infamous "One Belt One Road" initiative, an ambitious, ten-year $1.41 trillion infrastructure plan to rebuild the historic Silk Road that had once connected the nations of Asia with Europe, a plan that many argue is instead a debt trap ensnaring smaller countries in China's expanding financial web. Chinese ambitions have become so overtly aggressive that Michael Collins, the CIA Deputy Assistant Director for East Asia concluded that China has launched a full-scale "Cold War" against the United States in its bid for global hegemony.

Consequently, Trump's "America First" national security strategy and his incessant attacks on the very economic, political, and security institutions America helped create after World War II—are occurring just as China has accelerated its global challenge to the United States. While Trump is undermining confidence in America's leadership China is mobilizing its nation for a post-American world by promoting its own state-centric model as the most stable and effective model for economic and political development.

What is the "American World Order"?

Are we are really witnessing the end of the American Era? Is a new "Chinese Century" arising? In *Turning Points,* I demonstrate that the answer is no. I do so, however, by first addressing a series of simple questions. What constitutes a "world order?" What characterized America's rise to power and the world order it created? How do we conclude that it is declining? Is a new "Chinese order" truly emerging?

I argue that our current debate is plagued by significant misunderstandings regarding how exactly a "world order" arises and what actions are necessary for a nation to legitimately claim the role of global leader. Many scholars argue that the United States earned its legitimacy as a global leader primarily from a series of post-World War II multilateral agreements that defined how the international system would operate. Given the importance of the American economy the United States was at the center of this new system and pledged to defend it through a combination of both multilateral and bilateral alliances. As political scientist John Ikenberry writes, the American world order is a:

. . . hierarchical order with liberal characteristics, built around a set of American political, economic, and security bargains with countries in Europe and East Asia. The United States provided security, championed mutually agreed-upon rules and institutions, and led in the management of an open world economy. In return, other states affiliated with and supported the United States as it led the larger order. The United States dominated the order, but the political space created by American domination was organized around partnerships and agreed-upon rules and institutions that facilitated restraint, commitment, reciprocity, and legitimacy.

These agreements included the Bretton Woods international economic system based on free trade and convertible currencies, NATO, a collective security pact to protect America's European allies as well as bilateral defense pacts with nations in East Asia.

While Ikenberry is correct that these agreements became the basis for the both postwar order and defined America's place in it, they represent only the tail end of the story. What it ignores is the seven decades of growing American power and influence that paved the way for liberal internationalism, made possible by the stunningly rapid spread of American economic, political, and cultural ideals across the world—a process late 19th century Europeans called "the Americanization of the world" or what we today call, "The American Century."

It was the great American publisher Henry Luce who first coined the phrase "American Century" in an editorial he wrote for the February 1941 issue of *Life* magazine. Rather than a declaration of the beginning of a new era in world history as many historians argue, Luce considered the phrase a call to arms to protect what had already become and American world order. "Once we cease to distract ourselves with lifeless arguments about isolationism" Luce intoned "we shall be amazed to discover that there is already an immense American internationalism:"

American jazz, Hollywood movies, American slang, American machines and patented products, are in fact the only things that every community in the world, from Zanzibar to Hamburg, recognizes in common. Blindly, unintentionally, accidentally and really in spite of ourselves, we are already a world power in all the trivial ways - in very human ways. But there is a great deal more than that. America is already the intellectual, scientific and artistic capital of the world.

It is taken at face value that America was isolationist throughout much its history. But Luce's comments belie that argument as even before World War II had begun, American power and

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influence had spread through every corner of the world, indeed the very reason for American to enter World War II was to protect a world American had already created.

Americanization was result of the stunningly rapid spread of American political, economic, and cultural ideas, the development of the mass production/mass consumption society, the assembly line and the second industrial revolution, the unfolding of liberal democracy and universal suffrage, and an increasing cultural and economic focus on the general public rather than elite classes. Making this process unique was the singularly important role of American social and economic elites in promoting the American model of development and the backseat taken by the United States government at least until the Theodore Roosevelt's presidency when he enthusiastically displayed American economic and military power to impress the world of America's arrival.

Starting in the 1870s America's first internationalists moved aggressively to promote American political democracy and paved the way for the spread of American values throughout the world. Included were the great economic innovations engineered by the tycoons, Cornelius Vanderbilt, John D. Rockefeller, Andrew Carnegie, and especially Henry Ford, the man most responsible for the 20th century economy. Idealists spread throughout the world trying to convince global listeners of the virtues of American democracy, while American artists, in distinct opposition to their European counterparts, appealed to broad "low-brow" audiences in addition to elites. Thus, the Americanization of the world was a multitier phenomenon combining politics, economics, and culture, and spread with rapidity never seen before or since. So widespread was American influence—what the historian David Ellwood calls "the shock of America,"—that every corner of the world "from Zanzibar to Hamburg" felt its impact.

Of course, Americanization engendered many detractors. One of the most prominent was the French sociologist Andrei Siegfried who warned ominously that America is "creating an entirely original social structure which bears only superficial resemblance to the European," and that "to America, the advent of the new order is a cause for pride; but to Europe it brings heart-

burnings and regrets for a state and society that is about to disappear." The Great Depression, sparked by the American stock market crash and universally blamed on liberal democracy, portended the end of the American era. The successful recoveries of the Nazi German and Japanese economies, well before that of the United States even under President Franklin Roosevelt's New Deal, seemed to confirm the death of liberal democracy. It would take the incalculable costs borne by the United States during World War II and in rebuilding the world after the war, which enabled the United States to once again champion a liberal system. It was upon this tumultuous history that the belief in America as a global leader took form.

Scholars around the world point to China's role in averting a economic collapse during the 2008 financial crisis as the reason China can legitimately assume the leadership of the international community—Xi Jinping's "China Dream." This belief is a bedrock of Chinese school of thought known as the Tsinghua Approach which uses ancient Chinese history and current theories of international politics to argue that the time has come for China to assert its authority around the world. The Asia Infrastructure Investment Bank and the One Belt One Road initiatives launched in the last few years are the two principal methods by which China believes it can seize the baton of global leadership from challenge to the post World War II multilateral organizations created by the United States and its allies.

Turning Points challenges pessimistic view of America future. I argue that these concerns are a result of a fundamental misunderstanding about the American Century, its origins, and its evolution across the late 19th, 20th, and 21st centuries. In particular, I argue that the dynamism and flexibility of American society, its egalitarian cultural model, its revolutionary economic system, and its entrepreneurial mindset have empowered the nation's rise and will continue to propel it into the future, despite the actions of Donald Trump.

Not only will America's social dynamism enable the U.S. to overcome President Trump's attack on the American world order, it will ultimately turn back China's challenge, as it did other challengers in the past. Today, as focused as we are on the here and now, we forget that America's fate has hung in the balance many times throughout its history. Since the founding of the republic, skeptics have consistently underestimated the United States, repeatedly declaring the American experiment a failure—yet the United States has always overcome these doubts and reaffirmed its unique position in the world. *Turning Points* will examine the history of the United States to identify the dynamic forces behind America's rise to power, how these forces enabled the nation to overcome past crises and explain why they will continue to propel America forward in the 21st century regardless of the challenges from China—or any other nation.

American Power and the Meaning of the American Century

I am a lifelong scholar of American foreign relations, and for nearly a decade I have worked as a researcher at the Arnold A. Saltzman Institute of War and Peace Studies at Columbia University. Not surprisingly, ever since Trump's election I have found myself on the receiving end of increasingly panicked queries regarding what his administration means for both America's future and the future of the world. *Does America want to remain a global leader? Will it be able to respond to the challenge posed by China? Or, is America doomed to suffer the same fate as the Roman and British Empires? Are we witnessing the end of the American Century?*

I contend that it will, but, to understand why we have to look carefully at 240 years of American history to rediscover where America's strength originated from—in other words, what "made America great" from the beginning. The first thing that leaps out from this history is many of the great advances that propelled America forward that laid the foundation for its ascent to the status of a world power were born from American society: its civic pioneers and brilliant business innovators whose actions remodeled American society and built a revolutionary economic system that would sweep—indeed, "Americanize" the world by the beginning of the 20th century. These leaders came from all layers of American society,

from the countless pioneers and innovators, business entrepreneurs, scientists, people of faith—

visionaries who have transformed the country and ensured its dramatic rise from a collection of isolated

British colonies to a global leader in less than a century.

During the late 19th century, these civic and business leaders had become so powerful that

Washington's political class, even the presidency, took a back seat to them just at the moment the nation

became a world power. How many people can name a single American president between Abraham

Lincoln and Theodore Roosevelt? But, how many have heard of John D. Rockefeller, Andrew Carnegie,

Thomas Edison, and Henry Ford? We see something similar today as technology entrepreneurs rank in

importance with the world most powerful leaders because their businesses have reshaped global society in

ways that few politicians could even dream of doing.

While other popular-history books focus on America's "Wise Men," the class of political leaders

who recreated the world after World War II, *Turning Points* will focus on the common individuals and

grassroots groups who acted on their own initiative, frequently having to labor to get the support of the

federal government and often having to act in in opposition to it—transforming the country with their

foresight and imagination. Certainly, America's elected officials matter; without the leadership of

Abraham Lincoln the United States would not have survived the Civil War. But the inspiration behind

many of America's most significant turning points originated well outside the elite halls of Washington

D.C. It is not a coincidence that America became recognized as a global power as Gilded-Age business

leaders like Nelson Rockefeller, Andrew Carnegie, Henry Ford, and J. P. Morgan turned America into an

economic and financial powerhouse. After World War I, when the United States government retreated

into isolationism the House of Morgan would take the lead in resolving Europe's crushing World War I

debt crisis. Simultaneously, American artists spread throughout Europe in the1920s bringing with them

American Jazz, film, and literature and providing a better understanding of who Americans were,

shattering myths that years of anti-American propaganda had engendered. Decades later it was the

brilliance of Robert Noyce whose vision led to the creation of the integrated circuit and the electronics

revolution, laying the foundation for Bill Gates, Steve Jobs and countless others who created the

computer age that by the end of the 20th century had changed global society forever. That society is again being "disrupted" by a new generation of business innovators, notably Jeff Bezos, Elon Musk, and Mark Zuckerberg—both for good and ill. America has constantly witnessed the rise of people capable of amazing things, whose accomplishments have expanded American power and influence even during times when the federal government had slipped into it many bouts of isolationism.

Rather than *leading* the nation, the historic role of America's political leaders has instead been to navigate the tumultuous whirlwinds generated by the innovativeness and creativity of American society with the hope of energizing American power at home and driving American influence abroad. Most foreign policy specialists naturally emphasize the role played by the nation's ruling circles in the rise of America's global power, a sensible decision for studying most countries around the world—but not for the United States.

Instead, America's global dominance was paved by the world's adoption of U.S. culture, the scientific advancements created by private research labs that have reshaped how the world works, and the role American business leaders have played in creating a revolutionary economic system that would undermine many of the world's despots and aristocrats and bring greater prosperity to many social and economic classes. American power can be felt everywhere and through many different mediums, not simply diplomatic. Indeed, this has been the case for so long, and the world has grown so accustomed to it, that people are often unaware of its pervasive influence. For instance, today it goes without saying that Western European traditions are based on the same liberal-economic principles as the United States, yet not that long ago European politicians decried America free market system as a threat to Europe's more traditional welfare-state model. Now, this debate is forgotten. Therefore, while China might be challenging aspects of U.S. power, *Turning Points* will demonstrate why it simply cannot challenge the depth of America's global influence and its standing in the world.

Turning Points will argue that America emerged as a global beacon and the epicenter of the world as a result of critical moments in American history when individual American visionaries seized the

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mantle of leadership, or specific social and religious groups acted when the federal government either wouldn't or couldn't. These turning points enabled the rise of the United States to become a world power and helped solidify America's most appealing national characteristics—democracy, liberty, individualism, and innovation—which have since spread to nearly all four corners of the globe. However, to do so the United States had to overcome significant threats to its existence.

Today, most Americans believe that the nation's pioneers spread out over a largely uninhabited continent and that the United States faced no significant foreign threats to its security until the world wars of the 20th Century. In reality, America was born surrounded by the British Empire—the world's superpower——which was determined to suppress its rise. The Royal Navy controlled the seas, and thus America's access to foreign trade; the British maintained a hold on Canada to the north and alliances with Native American tribes to the west threatening to box the U.S. into just the continent's Eastern half. As a subtle warning to the young nation to rein in its transcontinental aspirations, the British would maintain— in the words of its celebrated Prime Minister George Canning—an "amicable connection" with a recently independent Mexico, which at the time stretched from the Yucatan Peninsula, through the American Southwest, to what is today the California-Oregon border.

Endless crises, both domestic and international, punctuated America's growth even after its independence from England. To become a global power, the United States had to fight the Civil War, to this day the bloodiest conflict in its history, and grow its rural economy into a global economic powerhouse. It had to reach into that same well of strength to defeat the massive global challenges posed by Germany and the Soviet Union during and after two world wars. In this century, America will have to defend its position against a rising China and newly aggressive Russia, both seeking to exploit the vacuum of leadership created by Trump's election. The question on everyone's mind is will the United States in the aftermath of Donald Trump continue answer these challenges. *Turning Points* will show that even if Trump fails to act, as in the past, extraordinary Americans will still rise to the occasion.

American power originates from the collective innovativeness of the its people; and from a political system flexible enough—indeed, confident enough—that it encourages activism by its citizens and entrepreneurship by its business leaders. This the very nature of the "American Experiment" a cultural, social, and political model that has entranced the world for nearly 200 years, culminating in what many called the world's "Americanization." This was a term coined by late 19th century Europeans to describe the growing influence of the United States in every aspect of European life, an influence that Europeans, and indeed many other regions of the world, accepted voluntarily, not at the point of a gun.

This is a crucial distinction of my work. Critics of U.S. foreign policy consider the nation's military power and numerous foreign interventions the basis of America's global supremacy. Since the Vietnam War, there has been a significant debate among international affairs scholars over whether American preeminence has been a positive force around the world. Its present-day critics, most notably Boston College's Andrew Bacevich, Harvard University's Stephen Walt, and the University of Chicago's John Mearsheimer, argue that the American Century has been a period of military and economic domination—a distortion of America's traditional approach to foreign policy—that was forged in the ashes of World War II and the bitter Cold War competition with the Soviet Union. These scholars argue that the American Century ushered in endless, costly military interventions to stop the spread of Communism and to promote democracy. As such, it has been a terrible burden to both America and the world.

Yet, when one examines the massive, global impact of American culture, we see that the United Stated achieved political, cultural, and economic supremacy decades before the spread of American military power around the world. Indeed, it was America's economic and cultural domination of the world that prompted Luce to declare that an "American Century" already existed in 1941. I know of no example in history where a single nation had become so influential in so many ways without resorting to force, including Rome and the British Empire.

Neither the Chinese nor Russians have produced anything that can match the global sway demonstrated by the United States over the past two centuries. China has spent tens of billions of dollars

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since the 2008 Summer Olympics on a soft power campaign designed to promote its economic model and prepare the world for China's impending global leadership. Yet, global approval of China remains at a discouraging 31%, actually down several points from its 2008 high of 35%. Chinese leaders should be gnashing their teeth that despite these vast efforts world opinion ranks their favorability just a single point above Donald Trump; Putin's Russia ranks at the bottom. Consequently, pundits like Bremmer and Shambaugh who contend that China's economic success represents a decisive challenge to the American model do so because they do not fully recognize the real makeup of American power and place too much emphasis on China's controversial growth rates, its global investments, and the world's contempt for Donald Trump.

Is America Exceptional?

It is often said that America is a unique or "exceptional" nation, and in many respects, this is true. The importance of individual initiative, the creation of a civil society working independently of—even in opposition to—the federal government, would not have occurred elsewhere in the world on the scale it has in the United States. That the individual was empowered to dream of a better life, that citizen-sponsored organizations could emerge that would decisively influence the direction of the nation, that social elites weren't able to suffocate the newly successful (or *nouveau riche)* from rising in the ranks of society, and that immigrants to the U.S.—like Scotland's Andrew Carnegie, Germany's Henry Kissinger, or South Africa's Elon Musk—could rise to positions of immense power and influence are features unique to America. These distinctly American characteristics provided the United States with the social and political flexibility that led to the spread of revolutionary ideas, beliefs, and inventions that would remake America time and again, often propelling America to ever greater heights of power and global influence.

At first, America's foreign rivals looked askance at the young American nation—considering American individualism and civil society examples of American weakness, a demonstration that the United States was still an undeveloped nation. By the end of the 19th century, these criticisms were muted

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when America's rise was evident and "Americanization" became the watchword of a new era. The United States would quickly become the envy of the world, a place where tens of millions believed they could start anew. My family was among these people, leaving Serbia and Montenegro during the first half of the 20th century to find a better life in the United States. Ironically, my wife and I live in Serbia today; it is a testament to the success of "Americanization" that I am able to write this book in the country where my family began.

Ironically, the world's adoption of many of America's ideals hasn't narrowed the gap with the U.S. as much as one would have expected. The reason is that few of these nations truly wish to emulate that necessary flexibility of American society, instead preferring to maintain various levels of political control while waiting in the wings to duplicate the next great American leap forward. That pliability so important for America's radical breakthroughs has not been transplanted elsewhere. Instead, these countries favor evolutionary, not revolutionary, advances.

We see this philosophy at work whenever foreign governments announce that they intend to create "the next Silicon Valley." Silicon Valley was not "created" by the U.S. government. It emerged from a new entrepreneurial culture invented by a group of young scientists led by Robert Noyce—and now known forever as the "Traitorous Eight"—after they had founded Fairchild Semiconductor and invented the first operational integrated circuit. Indeed, the very term, "Silicon Valley" refers to a place where inventors come to create "startups," the majority of which fail. This flexibility has allowed for a spontaneity unique to the American experience, one, for instance, that would allow those eight, restless twentysomething-year-old scientists to abandon a scientific giant, found their own startup, invent the integrated circuit, create Silicon Valley, and give birth to the age of electronics—while operating only on a shoestring budget in a building without toilets.

Their success revolutionized the nation at a time when, like today's contest with China, many doubted whether the American system could survive the challenge posed by an authoritarian state. With that single invention, whose discovery scientists around the world had aspired for, these scientists

changed the world and ensured America's ultimate victory in the Cold War; my book dedicates a chapter to their story.

Some nations have studied Silicon Valley and are trying to emulate it. But there is a fundamental distinction between Silicon Valley and its supposed competitors: America has an historic willingness to not only forgive failure, but to consider failure a positive. Venture capitalists have even come up with a stylish name: "failing forward" a life experience necessary to build a successful business. This has created an entrepreneurial freedom and risk-taking mentality that allows for the creation of radical new technologies that risk-averse investors might not have supported otherwise.

However, elsewhere in the world accepting failure, such as a startup going bankrupt, remains very difficult. Europeans recognize this problem and the European Union has created a "second-chances" program to allow failed entrepreneurs another opportunity to raise financing for new projects. Just the use of the term "second chances" is all one needs to know to understand European attitudes towards startup failure—in essence, communicating that while you did blow your first opportunity we are prepared to give you one last shot. In China if you have sufficient political connections you will not have to worry as much about failure—unless your business performs so poorly that it embarrasses your benefactor. Indeed, until recently Chinese banks have issued loans totaling hundreds of billions of dollars to support businesses that would have failed anywhere else in the West. But that has led to an alternative problem, non-productive "zombie" companies that exist only because of government support. Given the financial risks these debts have created, China is trying to weed out these zombies.

Or, even more perniciously, consider the new social scoring system that China is rolling out for its citizens with the help of two government supported companies, Alibaba and Sesame Capital. These companies have devised an algorithm which calculates an individual's social score by weighing their credit history, their history of fulfilling contracts, shopping history along with their social behavior based on how one performs at work, whether one criticizes the government on social media, who one's friends are, do these friends complain about the government on social media. According to business consultant Rachel Botsman, those who score poorly may be treated like second-class citizens, facing many

limitations on their activities, including such varied punishments as "slower internet speeds, restricted access to restaurants, and removal of the right to travel."

This new world, reminiscent of the dystopian futures portrayed in the British TV series *Black Mirror,* will have a dramatic impact on entrepreneurship as only those with the highest scores will earn the right to receive financing. Yet, innovation requires challenging what has come before, recognizing weaknesses and identifying improvements. Radical innovation requires the willingness to disrupt whole sectors of society, traits most often found among Malcolm Gladwell's "outliers." How can significant innovation occur if entrepreneurs must first worry about how their actions will affect their social scores? In reality, there would be no place in today's China for the likes of the Traitorous Eight—or for that matter many of the great entrepreneurs throughout American history.

My background

In 2010, at the height of the global financial crisis, British historian Niall Ferguson published an essay in the prestigious journal *Foreign Affairs* in which he challenged the way historians have treated the concept of imperial decline. Rather than being the slow, centuries-long process long described by historians, Ferguson concluded that mighty empires collapse suddenly, even in a matter of a few years. Despite their size and apparent stability, complex civilizations are in reality flimsy, precarious, heaps of numerous ill-fitting components. Consequently, even a small trigger can plunge a seemingly robust society into chaos practically overnight. Ferguson's theory would explain why, despite having ruled the Mediterranean for five centuries, ancient Rome crumbled in a single generation in the face of the barbarian onslaught. Might the financial crisis, Ferguson asked ominously, be the dramatic catalyst leading to the collapse of American global power and influence? Today, we might rephrase that question: *will it instead be Donald Trump's rejection of the liberal world order that enables China ultimate triumph?*

As a U.S. citizen, this question alarms me; but as a historian, it fascinates me. Ever since I was a child I have been riveted by history's great turning points, the same type of triggers Ferguson described.

Any list of the most momentous turning points in human history will certainly include the fall of Rome, my first historical love interest. It will also include the stunning rise of Islam in the seventh century, when a small group of Bedouins inspired by Mohammed stormed out of the Arabian desert and in a matter of decades conquered just about everything from Spain to Central Asia. It will include the sweeping, seemingly spontaneous social and economic changes of the fifteenth century Renaissance, the nineteenth century Industrial Revolution, and the current era of Electronics. At the University of Southern California, where I earned my Ph.D. at the School of International Relations and during my postdoctoral fellowships at Harvard and Stanford, I studied America's Cold War strategy from the end of World War II to Vietnam—a very narrow window in time, but one that was also a major turning point: it most reflected the seismic changes nuclear weapons wrought on global affairs. This research became my first book, *Undermining the Kremlin: America's Strategy to Subvert the Soviet Bloc, 1947-1956*.

In *Turing Points*, I am determined to help general-audience readers understand the decisive moments in American history where extraordinary Americans arose to drive the nation's rise to global power. It will also identify threats most likely to challenge the nation's future so that we may stem or reverse any potential decline.

As with the specter of Vietnam, President Trump's legacy has the potential to haunt the United States for decades to come. *Turning Points* will argue that America will recover; history teaches us that time and again, the United States has had to rebound from a wide variety of crises. This allows me to say with confidence that the resilience and innovativeness of the American people and the flexibility of American society will enable the nation to overcome this trauma just as it did the fall of South Vietnam in 1975 when Americans watched in humiliation as military helicopters evacuated desperate South Vietnamese from the American Embassy's rooftop in a doomed Saigon. We must not forget that the Soviet Union did crumble, and America did emerge victorious in the Cold War, a mere sixteen years later, an especially important point to keep in mind when reading the endless proclamations of China's coming global hegemony.

We can expect little in the way of positive leadership from the Trump Administration. What will pull us through—what will maintain the American engine and continue the nation's advancement—will be its private sector and civil society, especially in the fields of culture, industry, technology, and science. *Turning Points* will argue that these forces, representing the sum of the American experience and the success of its economic and political system, can continue to influence the world if, as has so often happened in the past, a new generation of civic leaders emerges to push America forward. These forces created a nation that many across the world have long hoped to emulate, forces that remain powerful enough to propel America forward if we, too, choose to take the initiative and act.

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Turning Points will examine specific episodes in American history in which civic, business, technological, and cultural leaders emerged from American society to take decisive actions in response to national crises that propelled the country forward when central authority was either ineffective or obstructionist.

Introduction: The American Character

The Trump presidency has generated a feeling of gloom and doom regarding America's standing in the world, with many arguing that the American Century has ended and that a new, post-American era is upon us. To the contrary, American power is determined by more than who just sits in the White House: it's a combination of the strength, vibrancy, and innovative spirit of American society in its entirety. That intrinsic strength, if mobilized, will fill the vacuum left by having a person like Donald Trump in the White House, as it has throughout American history.

Chapter One: The Tycoons

Late 19th century America was a nation being rebuilt from scratch. The government had emerged from the Civil War weak and reviled. Political battles over the specifics of Reconstruction, and a

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proliferation of crass get-rich-quick scandals involving politicians and their entourages, left public confidence in federal power at historic lows, where it would remain for the rest of the century. The American presidency had weakened to become almost a symbolic office after the 1868 impeachment of President Andrew Johnson by a group of Congressmen—the self-styled Radical Republicans—frustrated by what they viewed as Johnson's soft policies toward the defeated South. Rampant corruption had undermined citizens' faith. It is in this climate that a handful of brilliant, ruthless industrialists would step in to transform the country's business practices, creating a revolution that would change the world's economy forever.

There is much to condemn about the business practices of the railroad, steel, financial, oil, and automobile tycoons of the Gilded Age. Still, the "Robber Barons"—Cornelius Vanderbilt, Andrew Carnegie, John D. Rockefeller, J.P. Morgan, Henry Ford, and others—built mighty industries, connected the country's vast distances with infrastructure, and left the nation economically prosperous. Like the aristocratic patrons of the Italian Renaissance, they created a profound intellectual legacy through their support of scientists, engineers and inventors who would, decades later, play a new critical role in America's rise to global power. Rockefeller, Carnegie, and Ford would use their wealth to endow foundations that would play critical roles in supporting academics, and work with civic leaders to build democracy both in the U.S. and abroad.

Chapter Two: ~~The Inventors,~~

Chapter Two: The Progressives

Interestingly, the volatile mix of wealth inequality and political corruption, juxtaposed against the impoverishment and suffering of millions of exploited American workers, would spark a counter-revolution, also spearheaded by citizen leaders. The Progressive Movement of the late 19th and early 20th century arose to reform America's brutal labor practices. Led by social reformers such as Jane Addams and Upton Sinclair as well as journalists including Jacob Riis and Ida Tarbell, the Progressives denounced corporate greed and urged Americans to think clearly about the meaning of democracy. When Theodore

> **Commented [GM2]:** Tesla, Edison, and others who developed American science—think about getting rid of this chapter and referencing them as part of the importance of the industrialists.

> **Commented [GM3]:** Focus on how this led to Wilsonianism that defined US Foreign Policy for the remainder of the century

Roosevelt assumed the presidency in 1901, Progressives inspired his "trust busting" crusade to break down the giant corporations dominating the American economy. These progressive ideals also became the basis for Woodrow Wilson's ambition to actively promote democracy around the world—policies that have remained in force even until today.

Europeans witnessed these great transformations with astonishment. In a few decades, a nation devastated by civil war had emerged as a leading economic power, with products sold worldwide and business practices emulated across the globe. A once primitive continent had become a rising behemoth.

CHAPTER Three: The Financiers

During the years following World War I, America's most important and influential ambassadors to Europe were not from the State Department, rather, they came from the surprising combination of worlds: Jazz and private finance.

On November 11, 1918, the guns of war fell silent along the Western front—the allies and the Germans had signed an armistice agreement and World War I was finally over. From the carnage of this terrible conflict, the worst war on record, the American people believed that a new world would emerge, one where the great power rivalries would cease as national differences would be resolved by the new League of Nations, ensuring that war would become a distant, horrible memory. When President Woodrow Wilson embarked for Europe to negotiate the Treaty of Versailles that was to lay the foundation of this new world, tens of thousands of hopeful Americans bade him farewell and millions more would welcome him on the European side of the Atlantic, praying for salvation. Yet, these great hopes were crushed by the bitterness of America's French and British allies who insisted on imposing a brutal peace upon a defeated Germany, ignoring Wilson's protests that a vengeful treaty would lead only to more war.

Americans were aghast, and despite Wilson's heroic "whistle-stop tour," in which he traveled the country by train speaking to the endless crowds gathered at each train stop, the President failed to convince the Senate to approve the Treaty of Versailles or even approve United States membership in his

> **Commented [GM4]:** How these bankers filled the gap left by the US govt after World War I to rebuild the world financial system and the expansion of American industrial methods in Europe.

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League of Nations. Through his great exertions, Wilson would suffer a major stroke and lay incapacitated for the remainder of his term in office.

The American people had become so angry and felt so betrayed by their European allies that they demanded the country return to its pre-war isolationism and to never again meddle in European politics. For the next two decades, American foreign policy would maintain a strict neutrality.

The American government's decision to withdraw internationally did not mean, however, that America itself would ignore Europe. To the contrary, the 1920s were witness to a stunning expansion of American influence throughout the continent, particularly in the cultural sphere. Jazz musicians quickly became America's most potent ambassadors, spreading American culture everywhere, but especially playing a dynamic role in shaping the attitudes of the newly democratic Weimar Germany.

Chapter Four: The Artists

> **Commented [GM5]:** How American Jazz, literature, Film captured European audiences, (see also about Japan in this era) and how that promoted American influence abroad—reference that this began at the turn of the century and accelerated after WWI.

Making for odd partners, Wall Street's leading bankers, led by the House of Morgan, soon joined America's Jazz musicians in helping to heal the wounds of war in Europe. With the abdication of the American government, private banking groups from the United States took the lead to restructure the European financial system and to support European recovery.

Only a few years after World War I, these private banking efforts began to stabilize the European economy. Ironically, they were to be undermined by events from the United States: the 1929 Stock Market Crash that would trigger a world-wide Great Depression, the collapse of the world economic system, the rise of Adolf Hitler, and ultimately, World War II.

> **Commented [GM6]:** Look at how the journalist community worked with Nelson Rochefeller on Latin America late 1930s and WWII—Fight against Nazi influence in South America, key to US security, public diplomacy

Chapter Five: The Journalists

Chapter Six: The Marshall Planners

> **Commented [GM7]:** Look at the businesses which entered the European space after the Marshall Plan—helping rebuild a shattered Europe and reform occupied Germany.

Chapter Seven: The Computer Scientists (1957 – 1991)

Eight rebel scientists created the technological revolution that would re-energize American innovation, win the Cold War, and remake the world.

On October 4, 1957, the Soviet Union stunned the world by placing Sputnik, the first man-made satellite, into orbit around Earth. The achievement was unprecedented—and ominous. Just twelve years earlier, with the detonation of the atomic bomb, the United States had stood unopposed as the scientific leader of the world. Now it had been bested by its most powerful adversary. Armed with nuclear warheads Soviet rockets now could kill millions of Americans in minutes. The reaction of the American people, and across the world, was many times that of 9/11.

Along with fear, Americans were awash in self-doubt. Had the United States lost its ability to innovate? If so, why? Was a Communist society better able than a democracy to mobilize its nation's resources to fight a Cold War? Some scholars blamed America's technological paralysis on a way of doing business that had become moribund and hierarchical. America's rapidly expanding corporations had evolved to demand teamwork and a lifetime of loyalty to one company—which seemed to have corralled the country's pioneering nature, robbing individuals of their entrepreneurial spirit. These were concerns that haunted President Dwight D. Eisenhower as he faced a new future for the United States.

Ironically, the answer Eisenhower sought could already be found in an as yet unheard-of Mountain View, California, start-up. Fairchild Semiconductor had been created just three days before the Sputnik launch, formed by a group of scientists, only one over 30 years of age, who had dared to defy a brilliant Nobel Prize-winning scientist. By leaving his firm and forming their own startup, the "traitorous eight," as they would come to be known, would re-energize American innovation, win the Cold War, and ensure American primacy for decades to come.

Their singular invention was the integrated circuit, a simple-looking device that allowed the connection of more than one transistor on a piece of silicone. The integrated circuit would make the electronics age possible, allow the United States to build its own, better, more accurate rockets, and enable America to land a man on the moon.

No less an achievement of these young men would be to restore much of the pioneering, entrepreneurial spirit that appeared to have been lost decades before. Their actions would encourage other innovators to change jobs or strike out on their own. Fairchild employees would go on to create over a hundred tech companies—the "Fairchildren"—in addition to 2000 other companies that have ties directly back to Fairchild—in what soon became known as Silicon Valley the center of world innovation and an incubator for entrepreneurship. These companies have combined worth measuring in the trillions of dollars.

Soviet leaders would admit later that the invention of the personal computer was a crucial reason behind the United States' victory the Cold War. Without the intervention of the Traitorous Eight, the computer might not have been invented; democracy might not have triumphed over dictatorship. Their story offers us invaluable lessons for our current contest with China.

Chapter Eight: The Tech Giants (2017 -)

> **Commented [GM8]:** How the rise of Apple, Microsoft, Compaq, etc. helped America survive the Japanese Challenge

Chapter Nine: The Chinese Challenge

The twenty-first century opened with such promise, as hopes for the spread of liberal democracy had never been higher. The terrorist attack on 9/11, followed by a decade and a half of war in the Middle East caused a global outcry that dampened these expectations, while instead increasing doubts about the world's acceptance of American leadership. Now, just over fifteen years later, many declare that we are witnessing the end of the America Century. China is now in ascendance, benefiting from America's missteps and the election of Donald Trump, and seems destined to replace the U.S. at the apex of the international system.

There is a saying in business that past performance doesn't guarantee future returns. Conversely, the incomparable Mark Twain purportedly observed: "The past doesn't repeat, but it often rhymes." While the history of America's great turning points doesn't provide us with one-hundred percent certainty

regarding America's future, its constant rhyming over the course of two hundred years allows us to draw a number of rather significant conclusions—the preeminent one being, don't count the U.S. out.

The future of the world in the 21st century will be determined by the nation that can create the most advanced technologies, produce the most original and ambitious thinkers and entrepreneurs, and solve the century's most important social and political problems. Today, artificial intelligence is considered the key to the future and everything suggests that China is seeking to dominate that market. The question is, which type of society is best able to meet the challenges needed to create—and exploit—those future technologies, as well as those that no one can even imagine today. The spontaneity and risk-taking at the heart of the American character makes the United States the most likely place where these future technologies will emerge.

Historically, authoritarian nations have been less able than the United States to produce such revolutionary advances, however, in the past few years, they have demonstrated a unique ability to exploit those advances in ways that have helped to undermine the American system. The most obvious case is social media. Ten years ago, social media seemed to herald a new age of democratic development sparking the Arab Spring that rapidly spread throughout North Africa and the Middle East, only to collapse after a few years. Over the past several years we have seen how social media can be manipulated by America's challengers, for instance allowing Russian intelligence services an unprecedented access to American political discourse, brilliantly exploiting its flaws to the benefit of Russian national security. China's social scoring system is yet another method by which an authoritarian power can manipulate social media, this time with the goal of repressing opposition at home. We must address how future technological advances will impact the future of democracy around the world.

Artificial intelligence raises these threats to a level that today we can only guess at. Thanks to its promise, a new economic system is emerging, the fourth industrial revolution that futurists call Industry 4.0 that could potentially prove the death knell to the American Century. Just as the steam engine led to the first industrial revolution and Britain's dominance of the world economy, and the assembly line

followed later by robotics led to the American dominated second and the third industrial revolutions, this fourth iteration will be just as revolutionary and will certainly crown the next global economic leader.

With artificial intelligence, industry 4.0 will make all lines of production "smart," meaning they can communicate in real time with other components throughout the production process and resolve problems that might emerge without significant human oversight. Because the fourth industrial revolution will pay off with vastly improved production speed and performance, China is investing massive amounts of resources—its very own Marshall Plan, to once again quote Ian Bremmer—into developing an AI capable of dominating this new industrial age. Others warn as well that the United States might not lead this revolution. As Brown University Professor Edward Steinfeld argues, it is China that aims to be at the forefront of Industry 4.0; a position from which it will strive to replace the United States at the pinnacle of the world economy.

The conclusion of *Turning Points* will examine future threats to American dominance and determine how American society can respond. This is the question we will need to be address if we are to secure the continuation of the American Century.

Conclusion: The Future

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SAMPLE CHAPTER

(CHAPTER FIVE)

THE TRAITOROUS EIGHT

Introduction: Why America Won the Cold War

"Stop the baloney, Leslie," chided Soviet Field Marshal Nikolai Ogarkov. "You know your country has military superiority over my country, and that your superiority is growing." This surprisingly candid admission from the man the West considered the Soviet Union's foremost national security expert was not exactly the response *New York Times* reporter Leslie H. Gelb had expected.

It was early in 1983, and the Soviets were in the midst of an alarming buildup of the fearsome SS-20 ballistic missile, capable of carrying three nuclear warheads apiece and striking targets across Europe in only a few minutes. A feeling of dread swept the continent as Soviet deployments escalated, until over 600 of these highly accurate weapons were positioned right on Western Europe's doorstep. In his office at the Soviet Ministry of Defense in Moscow, Ogarkov discussed these concerns with Gelb, who had articulated what most people in the West feared: That the United States was losing the Cold War, America's four-decade struggle against Soviet communism. This global conflict had already included two brutal wars against Soviet allies in Korea and Vietnam costing over a half-million American casualties. It was a conflict considered so critical to the nation's future that the United States was prepared to do the unthinkable: Fight a nuclear war to defend the American Century.

Gelb had assumed that Ogarkov would agree. During the 1970s, Soviet propaganda repeatedly boasted that America global power and prestige had waned dramatically. Vietnam had been a bitter defeat; so, too, was the humiliating hostage crisis in Iran—only resolved after well over a year of desperate negotiations. The SS-20 deployments frightened America's NATO allies even further, portending a decisive shift in the European balance of power towards the USSR. Meanwhile, Ronald Reagan had triumphed in the 1980 presidential election by warning that the USSR was winning the Cold War and might soon be able to defeat the U.S. in a "hot" nuclear war. The United States, and indeed the entire Western world, seemed in grave danger.

Yet, here was the USSR's premier strategist insisting in a private, off-the-record conversation with Gelb that, instead, it was the Soviet Union that was in crisis—and his reasoning was surprisingly

straightforward: While American society was readily embracing the electronics revolution—especially the personal computer—Soviet society languished.

"Modern military capability is based on economic innovation, technology, and economic strength; and military technology is based on computers," Ogarkov told Gelb. "You are far, far ahead of us with computers. I will take you around this ministry," he continued, "and you will see that even many offices here don't have computers. You have little kids in America, three years old, who know how to deal with computers. It takes years here to train Soviet recruits in the military to use them, because they've never used them before. We're afraid of computers. If we start deploying computers, it's going to mean loss of political control for the Soviet leadership: it'll mean information can be spread without the okay of the central government, so we're afraid of that; it puts us at a major strategic disadvantage with the United States. And unless we change that situation, we're going to fall irretrievably behind America."

Exaggerations aside (at least for 1983), Ogarkov was admitting that the electronics revolution would determine the U.S.-Soviet competition—and that his side was losing. After years of efforts to become a global military power comparable to the United States, the Soviet Union was now discovering that thanks to the rise of computers, America was on the verge of deploying a whole new generation of "smart weapons" that would decisively upset that balance of power—weapons that just a few years later would shatter Saddam Hussein's vaunted, Soviet-trained, Soviet-equipped military in a matter of weeks. The fate of the USSR was at stake; Ogarkov doubted whether the Communist Party could rise to the challenge.

The Soviet Communist Party had long been suspicious of new inventions, like the computer, that could enable the unrestricted spread of information. Indeed, Soviet law dictated that even typewriters and copy machines had to be registered with the state. Eventually, the Party embraced the mainframe behemoths of the 1960s and the more advanced mini-computers of the 1970s, recognizing that these types of computers wouldn't undermine their authority since they could be operated by teams of chosen specialists. Nevertheless, limitations caused by the Communist system—namely the lack of free-market

competition that would empower innovation—would prevent the Soviets from keeping pace with American models.

It was the personal computer, a computer that the average citizen could own and operate, that terrified the Soviet leadership. If the PC became commonplace among the citizenry, the authority of the Soviet Communist Party, the all-knowing political vanguard charged with leading the country to communism, could be challenged. The party was already trying to crack down on the regime's many dissidents who were secretly publishing widely-read critiques of Soviet communism, a subversive genre called *samizdat* or "self-publish." Armed with a personal computer and a printer, their numbers would expand dramatically, each rapidly producing opposition pamphlets the rest of the nation would eagerly read.

Ogarkov understood the Party's fears. Nevertheless, he recognized times were changing—rapidly. "We are so far behind," he lamented, "because our political leadership is afraid of computers. The political leadership in my country sees the free use of computers as fatal to their control of information and their power. So, we are far behind you today, and will be more so tomorrow. The Cold War is over," Ogarkov conceded, "and you have won."

Ogarkov wasn't feeding Gelb *dezinformatziya*—the Russian word for disinformation, or what we today call "fake news." Instead, he was privately airing the same warnings he had long given his own government: All the gains the Soviet Union had made since World War II—rising from ashes to become a global superpower and a viable challenger to American liberal democracy—were about to be swept away by America's ever-widening lead in electronics. The culmination of his work was a classified study entitled *History Teaches Vigilance,* a lengthy history of the importance of innovation in Soviet military history released in 1985, in which Ogarkov argued that the Soviet Union must quickly catch up with the United States if it were to remain a great power in the age of electronics. This could only happen if the Communist leadership liberalized Soviet society, allowed for the free expression of ideas, and removed the myriad restrictions that prevented people from owning a PC—in essence, *Americanized.*

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In issuing this warning, Ogarkov had quite deliberately placed himself in the middle of a power struggle within the Soviet Communist Party elite, a battle between the new guard—those like himself, who wanted to reform Soviet society and enable the type of innovation necessary to keep up with the West—and a decrepit old guard more interested in protecting its status and privilege.

In September 1984, Ogarkov would fall victim to this power struggle, ousted from his position after the old guard had elected an enfeebled Konstantin Chernenko Soviet Premier. Just six months later Chernenko would die, allowing the new guard led by Mikhail Gorbachev to seize power and launch the massive structural reforms Ogarkov had deemed so necessary.

But by then it was too late for the Soviet Union. Gorbachev had wanted to Americanize a regimented Soviet society so that it, too, could spark those revolutionary innovations that had made America's rise possible. Instead, his efforts to dismantle the repressive Soviet system precipitated the collapse of the entire nation. On December 25, 1991, not seven years after taking power, Gorbachev resigned from office, the last leader of the Soviet Union. Just as Ogarkov had predicted, the Cold War was over—and America had won.

To this day, scholars heatedly argue over who most deserves credit for America's Cold War victory and its subsequent return to global dominance. Some of these "triumphalists"—as they are called, argue that it was President Harry Truman and his 40-year policy of containment, while others insist it was Ronald Reagan's aggressive foreign policy and proposed "Star Wars" missile-defense program. What is important here is that both sides agree that America's victory was the result of wise presidential leadership and successful national security policies; in this scenario, intellectual breakthroughs like the electronics revolution were events that played out only in the background.

Obviously, presidential leadership is important. But as it turns out, Ogarkov was right as well, as the Soviet collapse can be traced to Gorbachev's desperate, last-ditch effort to match the achievements of the United States in what the Soviets then called the "scientific and technological revolution." Ogarkov

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never believed that the Communist Party would try to launch the necessary reforms, but when the new guard tried, he had a front-row seat to his nation's stunning collapse.

The computer, therefore, was more than just an electronic device; it symbolized the unique strength of the American system, a system established to empower individuals, enable the type of intellectual freedom and risk-taking necessary for spectacular advancements, and encourage the sparks of creativity necessary for truly revolutionary innovation. The Soviet reformers recognized their dilemma: How do you reform a system where the Party's communist dogma went unquestioned—indeed could never be questioned, lest their political control unravel? Where in such a society could an individual have the freedom to follow his or her passions that might one day lead to spectacular breakthroughs? Would such a society so easily forgive an individual whose whims had failed? Gorbachev's answer was to end the communist party's dominance of Soviet society, to allow other parties, groups, and associations the right to exist. That move happened several decades too late.

Innovation, American Style

It would be a mistake, however, to assume inevitability; that is, that the intrinsic superiority of the American system foreordained the nation's triumph in the Cold War and its dominance of the 20th century. This was an often-stated belief of American leaders from the 1940s and 1950s who, when faced with growing Soviet power, reassured themselves that, ultimately, the American system must prevail. The reality is it took the life's work of real men and women, people who truly embodied America's "intrinsic superiority," for liberal democracy to emerge victorious.

This is the great irony of American liberalism: The revolutionary changes it often generates are themselves not predictable. This may seem strange when it comes to the computer, since today's models are considered the inevitable result of years of scientific development, beginning with the primitive machines that helped break Nazi codes during World War II to today's super-advanced computers. In reality, they aren't. They bear as much similarity to each other as does an Abacus to a scientific calculator.

What made possible the electronics age—and ultimately America's victory in the Cold War—was a revolutionary invention: the integrated circuit, created in the late 1950s by a small group of scientists who were literally the only technicians capable of inventing it, in the only place in the world where it could have been invented. Adding more drama to the story, their invention came at time when much of the world believed that America had actually *lost* its scientific spark and that the Soviet Union had instead become the scientific leader of the world. Why? Because in 1957 the Soviet Union had scored the greatest technological achievement since the first atomic bomb test: It had designed the first rocket in history to launch a satellite into orbit.

American science had fallen behind, and the nation was looking for answers. Though huge amounts of government money quickly poured into rebuilding America's scientific research programs— similar to China's current efforts to develop artificial intelligence—the answer appeared elsewhere, thousands of miles away from Washington, D.C., in the small city of Mountain View, California. There, a spark was lit that changed the world, a change only the most eccentric visionaries could have ever anticipated.

It took a group of eight young American scientists—rebels with a cause—who set out to defy the prevailing corporate culture of the 1950s and commit an act of mutiny so shocking that it could never have happened anywhere else in the world, not even today. These eight would then go on to create the integrated circuit—what we today call the microchip. It was arguably the most important electronics advance of the 20th century and the device that made today's computers possible. They would inspire other young scientists to follow their lead and found their own technology companies in San Francisco's South Bay, which a decade later would be renamed Silicon Valley. Their mutiny turned America into the world's great center for innovation.

What was their act of infamy? To spurn their boss, William Shockley, one of the greatest scientists of the time, a Nobel Prize winner, a national hero, and create their own firm, Fairchild Semiconductor. For doing so they would forever be known as the Traitorous Eight—although, to this day no one knows for certain who gave them that moniker.

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Today, such events are commonplace in America. How many legendary twenty-year old college dropouts have gone on to create multibillion-dollar companies in the just the past few decades? The names include Microsoft's Bill Gates, Apple's Steve Jobs, Facebook's Mark Zuckerberg, Steven Dell of Dell Computers, Oracle's Larry Ellison, and Uber's Travis Kalanick.

How many thousands of associates leave tech firms to form their own startups? The numbers are enormous. But this is not the case elsewhere in the world.

Indeed, when one looks at America's greatest tech rivals—China, South Korea, Japan— when one considers the authoritarian nature of their societies, in which hierarchy and order matter above anything else, it is impossible to imagine that eight young men barely out of university could ever have challenged a national hero the likes of whom Shockley had become by the mid-1950s and continued with their careers—let alone triumphed. Indeed, for the past few years China has launched a massive crackdown on individual dissent by using technology to reassert the Communist Party's dominance of Chinese society and to crush any potential "traitorous eights" in ways once reserved for "science-gone-mad" fictional novels. It is impossible to imagine a similar group like the Traitorous Eight succeeding in China. A person of Shockley's status would certainly have been a feted member of China's political elite, actions perceived as undermining him would be seen as an attack on the State itself. The Traitorous Eight would be quickly banished from mainstream Chinese society.

This is not to say that the actions taken by the Traitorous Eight were without risk. Just like the first American pioneers, the brave abolitionists, or the post-Civil War tycoons, the Traitorous Eight would have to face their skeptics—which is why the earned their moniker to begin with. But the spark they launched both socially and scientifically would overcome all doubters and launch a revolution that reaffirmed the superiority of American innovation, paved the way for its historic victory in the Cold War, and ensured its global supremacy for decades to come. Had the Eight not possessed that unique combination of genius, tenacity, intellectual courage, and a lot of *chutzpah,* that victory likely would never have occurred. This is their story and in microcosm, the story of the United States.

Setting the World on Fire

When William Bradford Shockley won the 1956 Nobel Prize in Physics, he seemed destined to remake the world. He was already the holder of many of the most important patents of the 1950s, to the point that Bell Labs scientist Raymond Warner later claimed Shockley was personally responsible for "half the worthwhile ideas in solid-state electronics" during the field's first dozen years. *Time* would name the brash 47-year-old Shockley one of the most important scientists of the 20th century. Responding to all these accolades, Shockley would boast to his wife, Emmy, that he was destined to "set the world on fire"—an ambition that had already driven him from his prestigious position at Bell Labs to launch his namesake laboratory in a region of Northern California known primarily for its odd combination of Stanford University and fruit orchards.

Shockley's brilliance was obvious, and he had risen to head Bell Labs' Solid-State Physics division, the premier scientific lab in the country, only a decade after completing his doctorate at MIT. At the Bell Labs facility in Murray Hill, New Jersey, Shockley had supervised his future co-Laureates, John Bardeen and Walter Brattain, in creating the first transistor. Until the transistor, televisions, radios and early computers were powered by vacuum tubes, bulky and fragile glass bulbs that used a heated filament to amplify electrical signals. Shockley's smaller, sturdier and less costly breakthrough used silicon, then a newly discovered semiconductor material, to amplify electric signals without heat or glass.

The word "semiconductor" has two definitions. A semiconductor *material* is a substance that conducts electrical current, but only to a degree. Electricity can flow through a semiconductor more freely than it can through materials such as plastic, which have almost no conductivity, but less so than through materials such as copper, which have almost full conductivity. Most semiconductors are crystals—commonly silicon, an abundant element found in sand and quartz—that have been treated to allow electricity to flow through them in a controlled manner: quickly, but not too quickly. A semiconductor *device*—such as Shockley's transistor—is a component made of semiconductor material. These components are what make electronic gadgets work.

The transistor was the component of the future, but Shockley had increasingly felt that his superiors at Bell Labs were not affording him the respect he deserved and the opportunity to achieve his true ambitions. Compounding his frustrations, he quickly realized that his invention had potentially lucrative commercial applications that Bell Labs, whose focus was basic research, wasn't interested in. For example, in 1949 Shockley had designed a prototype transistor radio, yet it was the technology giant Texas Instruments and the Tokyo Telecommunications Engineering Corporation—renamed Sony in 1958—that successfully mass-marketed millions of these gadgets by the mid-1950s.

Lured by the possibility of both scientific achievement and commercial success, Shockley made the drastic decision in 1953 to take a leave of absence from Bell Labs. After receiving significant financial backing from a California inventor and investor named Arnold Beckman, owner of Beckman Instruments, Shockley returned to his childhood home in the Bay Area, where his mother still lived, to perfect the transistor and develop new products based on the emerging semiconductor technology.

Buttressed by his ever-growing reputation, Shockley sent out a call to the top university physics and engineering departments across the country seeking gifted students to join Shockley Semiconductor Laboratory. The applications flooded in, and with his keen eye for talent, Shockley selected a group of young scientists around which he would build his company. They included Robert Noyce, Gordon Moore, Eugene Kleiner, Jay Last, Victor Grinich, Sheldon Roberts, Jean Hoerni, and Julius Blank—the future Traitorous Eight.

While Shockley's hiring choices were brilliant, his management style was dismally incompetent. Like many academics, he was unable to prioritize among the many ideas he hoped to pursue, often shifting from one interest to another before research had been completed. He refused to foster a scientific community within his firm, instead preferring to isolate employees from each other; his researchers had little idea what their coworkers were working on. Instead, each scientist reported his research directly to Shockley. Even then, Shockley demonstrated little loyalty or confidence in his employees' work.

Shockley, for his part, knew he was hard on his scientists but believed himself to be a taskmaster who led according to the corporate management style of the time, driving his young protégés to achieve the success he had attained. His employees saw it differently.

"He was very abusive," Jay Last, a member of the Traitorous Eight who would go on to become a pioneering entrepreneur, would later recall. "I went from being his fair-haired boy to the causes of all of his problems." Shockley humiliated his researchers in front of their colleagues, had his former peers at Bell Labs secretly critique their work, and would dismissively ask his employees, "You sure you have a Ph.D.?" He accused his deputy director, Dean Knapic, of being a pathological liar, forcing Arnold Beckman to bring in a psychological testing company to investigate—with the company finding no evidence that Knapic was untruthful. Shockley frequently forced employees to take polygraph tests over mundane issues—once, to find out who had lodged a tack on a door handle, injuring a secretary. No one had; however, a whole afternoon was lost trying to find the "culprit."

The final straw was Shockley's stunning decision that the lab would not commercially develop the transistor. Instead, he declared, that the lab would develop and produce his newest concept, an electronic component he called a four-layer diode that he believed would be superior to the transistor, as it would connect several transistors on one device. It was superior. In fact, Shockley's idea was ahead of its time, so much so that the technology had yet to be invented to ensure that the component would be sturdy enough for industrial use and sufficiently economical to manufacture.

Noyce and Moore wrote their boss a lengthy memo arguing that the lab, which had yet to make a profit, should continue its work on the transistor, the one product ready for the consumer market. The transistor was "less cutting-edge, but more practical," Noyce and Moore argued, according to Noyce's biographer Leslie Berlin; the duo believed the company should "perfect transistors before moving on to the trickier diodes." (The four-layer diode was eventually produced but had been overshadowed by the invention of the integrated circuit.)

Shockley not only dismissed their concerns, he was outraged that they dared challenge his authority—he was the leader; he was the one to give the orders. In this adverse work environment, with

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little prospect of the company seeing a profit anytime soon, and with their futures on the line, Noyce, Moore and the rest of the Eight began to consider their options.

The Great Revolt

The Traitorous Eight were in a quandary. They were bitterly disappointed in their situation, recognizing they'd never achieve the illuminating careers they had hoped would come with working for the celebrated Shockley. But what were they to do? Could they betray a leading figure like Shockley and be taken seriously in the burgeoning new field of which he remained king? Could the entire group find work together in another firm? And what investor would be willing to provide these troublemaking, twenty-something "outliers" with the huge financial investment they would need to get a science lab off the ground? After several months of agonizing self-assessment, the Eight decided to try and convince Beckman, the Lab's patron, to shake-up the Lab's operations, appoint a chief executive from the home office of Beckman Instruments, and promote Noyce to the position of head of research at Shockley Semiconductor. Shockley would remain, but as a consultant.

Beckman recognized the problems with Shockley's management style, acknowledging the part it played in the lab's failure to make a profit. Shockley had already angered Beckman by threatening to quit—claiming, ironically, that his researchers were prepared to leave with him, which the group assured Beckman was not the case. After a series of meetings, Beckman seemed poised to agree to the researchers' demands, until colleagues warned him that such a move would destroy Shockley's hard-won reputation in the scientific community. In a decision he would soon regret, Beckman changed his mind and told Shockley's young employees that Shockley was the boss and to fall in line. He harshly criticized them for undermining Shockley's authority by coming to him in the first place. "We discovered," Moore would playfully observe years later, "that a group of young PhDs couldn't push aside a new Nobel Prize winner very easily."

The Moment the World Changed

Wednesday, September 18, 1957, was beautiful and sunny, with a touch of crispness hinting at the arrival of fall—a typical San Francisco Bay Area autumn day, but not a day one would have expected a world-changing revolution to occur. Indeed, for Shockley, it began like any other: an early wake-up, a quick breakfast, then a ten-minute drive from his home on Corte Via Road in Los Altos, California, to his laboratory in Mountain View. There, Shockley anticipated that he and his team of scientists would continue their groundbreaking work in solid-state electronics.

Yet, Shockley had grown irritated that members of his team would go over his head and complain to Beckman. He decided to investigate and moments after parking his Jaguar at the company lot, announced to his lab that he would question each member of his research team, one by one, to flush out the plotters.

It didn't take long for him to discover who they were. The second person he called into his office was Gordon Moore, who readily admitted that he and seven other of Shockley's prized acolytes were resigning from Shockley Semiconductor. Years later, Moore would reflect that when Shockley left the office later that day, "he looked like a beaten puppy."

The mass defections were definitely a punch to Shockley's gut. These were his handpicked employees; young men, all but one under the age of 30, brimming with promise and poised for success. Moore and his fellow defectors were all brilliant scientists. Shockley had required them to pass a battery of intelligence tests before he had hired them; tests including many brain-teaser-type questions decades later would become a standard interview technique by Google and other Silicon Valley firms. Shockley's scientists were all distinguished graduates from the world's top universities: The Massachusetts Institute of Technology; Caltech; the University of California, Berkeley; Stanford University; New York University, and the University of Cambridge. Shockley had chosen each for his unique skill: chemistry in Moore's case; the knowledge of semiconductors in Noyce's. Shockley believed he and this team would be at the vanguard of the business in semiconductor devices, one of the most important new technologies in the world, and that they would turn the Bay Area into the epicenter of an electronics industry he himself

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would define. However, the day they walked out on him, Shockley would write in his journal simply, "18 September, Group Resigns."

Before their departure was officially announced, Beckman called the group into his conference room to make one last plea for them to stay, and—according to painstaking notes taken by Last—to censure them for even thinking of leaving. Reading from a script prepared by his attorney, Beckman explained that while he recognized the right of an individual worker to quit his job, their group exodus was "disloyal," "an act of conspiracy." Beckman pointed out that their departure would cost him "a million bucks down the drain" and asked that they reconsider, warning that the business community would consider this "a shameful act."

The group realized that everything Beckman had said was true: they would be considered disloyal, indeed traitors, yet they remained unmoved by his attempt at intimidating them. There simply was no way they could continue to work with Shockley, regardless of the risk to their careers. As so often happens, the desperation of a few Americans would trigger a seismic wave that forever changed the United States.

The renown Shockley believed would be his fell instead to the Traitorous Eight. The company they launched just two weeks after their mass resignation quickly became the revolutionary business Shockley himself had envisioned. With Beckman's decision to sell the lab in 1960, Shockley and his ill-fated lab descended into anonymity. Fairchild would produce the integrated circuit, making possible every electronic gadget of the past half-century, from kids' toys to the satellites that traverse our skies, and launch the computer revolution.

It is clear today that the establishment of Fairchild Semiconductor was a turning point in modern history. It's scientific triumphs and new business approaches renewed America's status as a global innovator at a time when—like today—many considered the nation's future with deep misgivings. Even though the actors in this drama didn't yet know it, their discoveries would set history in motion so that, decades later, the United States would prevail in the Cold War—like the Minutemen who sparked the American Revolution at the battles of Lexington and Concord. The Eight's decision to buck social

convention was uniquely American, demonstrating how the American system engenders spontaneity—in America, change can come from anywhere. Finally, the impact of the decision would accelerate the spread of American ideals across the globe.

A "Second-Rate Power"

As the tempest at Shockley Laboratory was playing out in relative obscurity in Northern California, the United States was engaged in its own, far more critical struggle for dominance. The end of World War II had left the Soviet Union ravaged and the United States the most powerful, most advanced, and wealthiest nation on Earth. Just a dozen years later, however, the Soviets had made rapid leaps forward in military technology, and U.S. leaders increasingly feared that the Cold War was shifting in favor of the enemy.

In 1949, a mere four years after America had ended the war by dropping two devastating atomic bombs on Japan, the Soviets shocked the world by developing a nuclear weapon of their own—with every intention, Americans believed, of eventually using it on the U.S. In 1955, three years after the United States produced the "Super," or hydrogen, bomb, Soviet scientists matched that accomplishment, again to the dismay of the world community, exploding a 66-megaton *Tsar Bomba* five thousand times more powerful than the Hiroshima bomb. The Soviets now presented a legitimate nuclear threat, albeit one against which, theoretically, the U.S. could still defend itself. Since any nuclear attack on the U.S. would arrive via bombs dropped by Soviet bombers based on the Kamchatka and Kola peninsulas—many flight hours from any American target—the United States might have time to scramble fighters to shoot down these bombers. By 1957, the U.S. had put into place sophisticated air defenses and the Distant Early Warning radar system, which would allow Washington to detect an incoming Soviet attack and mobilize its military forces with the hope of intercepting it.

Then, on Friday, October 4, 1957, just three days after the Traitorous Eight had founded their company, the Soviet Union stunned the world by launching the world's first manmade satellite into orbit. Named Sputnik, the spherical, beeping, beach-ball-sized object could circumnavigate the entire planet in a

little over an hour and a half. Soon after the launch, Arthur C. Clarke, the legendary English science fiction writer, warned that the day "Sputnik orbited around the Earth the United States became a second-rate power."

The launch of Sputnik was an unprecedented scientific triumph, and a major propaganda victory for the Soviet Union. For America, it was something else altogether: The Cold War version of 9/11, the moment when the U.S. realized just how vulnerable it was to defeat in a nuclear war. Indeed, just the possibility of that defeat severely undermined America's ability to prosecute the Cold War. If the Soviet leadership fully appreciated Sputnik's importance to the escalating nuclear arms race, so, too, did everyone in the United States—from the highest echelons of government to the everyday citizen on the street.

The reason behind the anxiety was simple: The Soviets' ability to place this little metallic sphere, harmless in and of itself, into orbit represented an advance in rocket technology so dramatic that it shook the Western world's faith in the U.S. and nearly destroyed America's self-confidence. The Soviets had shockingly surpassed the United States in the critical field of rocket science and very soon would deploy nuclear-armed intercontinental ballistic missiles with which it could strike the United States in just thirty minutes, missiles that could not be shot down by American anti-aircraft forces. Armed with the massive nuclear warheads of the 1950s, a Soviet missile attack would utterly devastate the continental United States, wiping out entire cities and their suburbs, killing tens of millions of Americans. Few believed the United States could survive such a strike. In the months that followed, panicked Americans would watch on the nightly news as America's most advanced rockets exploded on the launch pad. Every government building was built with reinforced bomb shelters and millions across the country furnished their own homes with fallout shelters in anticipation of doomsday.

Since the dawn of the Cold War Americans had feared the Soviet Union's growing influence, often depicted in U.S. government propaganda as the tentacles of an octopus engulfing the world. With the Sputnik launch these tentacles felt like the clasp of a vice. A stunned Congress held emergency

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hearings investigating how the Soviets could have won this decisive, first hurdle of the space race, while a mortified President Dwight D. Eisenhower organized special meetings of his National Security Council summoning leading experts to assess America's potential responses.

At an NSC meeting held just ten days after the Sputnik launch, one scientist warned, "the Soviets have picked up tremendous momentum, and unless we take vigorous action they could pass us swiftly just as in a period of twenty to thirty years we caught up with Europe and left Western Europe far behind." Others contended that the Soviet advances were a result of the much greater emphasis its leadership placed on scientific education as compared to the United States.

Unless the U.S. could master rocketry and create its own ICBMs, America's allies would lose faith in the nation's ability—indeed, willingness—to maintain its alliance commitments and counter Soviet aggression throughout the world. Americans debated which unpleasant outcome was preferable: "better dead than red" or "better red than dead?"

In response, Congress passed the National Defense Education Act of 1958, increasing funding at all levels of the educational system, appropriating tens of billions of dollars to support scientific research, and the creation of NASA; Eisenhower added the first science advisor to a presidential cabinet. But the massive infusion of government money and the creation of new agencies were merely beginnings. America needed a technological quantum leap to reassert its dominance as the most effective political, economic and cultural model for the world to emulate. If that leap had never materialized, America would have lost the Cold War.

The Fairchild Spark

The Traitorous Eight's new venture, Fairchild Semiconductor, was funded as a division of Fairchild Camera and Instrument, an East Coast supplier of electronic equipment to the U.S. military. Its owner, Sherman Fairchild, an inventor in his own right, was impressed by Noyce and his colleagues and decided to take a risk on them. In retrospect, its establishment mere days before Sputnik could not have been better timed. The United States needed its own Sputnik-level innovation, and soon. To do so

required building advanced navigation systems that would enable a rocket to enter orbit around the Earth and, eventually, travel to the moon—or to land a nuclear warhead on a target in the Soviet Union with pinpoint accuracy. Consequently, the market for high-tech equipment immediately skyrocketed, and the country's technology industry was called to deliver.

In January 1958, the United States government contracted with International Business Machines—-already an established technological powerhouse—to create navigation systems for its missile and planned B-70 bomber programs; IBM, in turn, needed specially designed transistors and invited the fledgling Fairchild Semiconductor to bid on the work. That month, Noyce traveled to IBM's offices in Owego, New York, to negotiate the deal. Like a general who blocks his army's only escape route before a battle, leaving his men with the sole option of fighting to the death, Noyce committed his Fairchild team to assemble, in a mere six months, 100 units of a wholly new type of transistor (called "double diffused") made with a complicated, recently invented technology that had yet to be fully grasped. Fairchild got the account and his stunned team managed to pull off Noyce's risky gambit. Such were the primitive conditions of Fairchild's early years that the group ended up cushioning their small, highly sensitive components in box of Brillo pads in order to securely ship them to IBM headquarters.

Despite Fairchild's initial success, complications emerged; many of their early transistors were faulty, ceasing to work with a tap of a pencil. After much panic-driven research, physicist Jean Hoerni, one of the original eight, came up with the idea of adding an oxide layer to insulate the transistor components and which would allow the etching of patterns directly onto the silicon wafer. This new, improved transistor coating was so reliable it became a technological game-changer; Fairchild would reduce its production fail rate by more than *a thousand times.* The reason our electronics devices today work with the degree of reliability they do is because of the planar process, something that likely would never have happened without Hoerni's expertise and Noyce's vision. It was also the key breakthrough that would lead Fairchild to the development of the first commercially viable integrated circuit, an invention that ultimately allowed the fledgling company to thoroughly outshine its much older, larger competitors. However, much to their surprise, it looked like they had been beaten to the punch.

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At an industry trade show in March 1959, Fairchild archrival Texas Instruments announced it had patented an entire circuit built on a single wafer of semiconductor material. Called the solid-state circuit, it was designed by Jack Kilby, who would later win the 2000 Nobel Prize in physics for the invention. Noyce was furious; he had already been working on a similar design based on Hoerni's planar process coating methods. Texas Instruments, however, had no technology comparable to the planar process. Therefore, Kilby's circuit relied on fragile, exposed wires connecting the transistors—meaning the solid-state circuit would easily fail and, thus, had no real commercial application. Noyce saw an opportunity to regain the advantage. Thanks to the planar process his team had the technology to make an integrated circuit with no exposed wires.

Even if you're a Luddite whose never seen the insides of an electronic device, you only need to look at side-by-side photographs of the two inventions to see just how much more advanced Fairchild's version was. The Texas Instruments circuit is the technological equivalent of a horse-and-buggy with a motor and steering wheel: It looks as if someone glued several transistors to a wafer and added some wires. The Fairchild circuit is a single piece of silicon with embedded transistors and etched-in wires—a sleek sports car blazing into the future. Infinitely more viable commercially, the Fairchild integrated circuit became the industry standard. By the early 1960s even Texas Instruments would license the Fairchild design, abandoning Kilby's more primitive circuit.

So, what exactly makes the integrated circuit (and its successor, the microprocessor) so revolutionary? The key reason is miniaturization. The circuit makes it possible for machines to securely connect an ever-increasing number of transistors on a single chip, whereas before transistors had to be large enough so that they could be wired together by an actual technician. The more transistors—or in 1957, vacuum tubes—a device needed, the more exposed wiring it would take to connect each transistor or tube, the more likelihood breaks would occur, and the slower and less reliable the device would become. Due to these difficulties, scientists feared that future electronic devices faced very restrictive

physical limitations, meaning they wouldn't be able to perform as was hoped. Scientists named this crisis the "tyranny of numbers"–a crisis the integrated circuit would solve.

Consider this thought experiment: Today we are able to make incredibly powerful computers that can fit in the palm of your hand, like the latest iPhone X. Its processor contains four *billion* transistors on a chip that measures no more than an inch long. It has the storage capacity of 256 *billion* bytes of information, what we call a gigabyte; not to mention video capability, Wi-Fi capability, and a thousand other features. To understand the importance of the integrated circuit just imagine what an iPhone would have looked like in 1957, when Fairchild began operation and when vacuum tubes were still standard in computers.[*]

According to various engineering estimates, to assemble billions of vacuum tubes the size of a light bulb into a single device with the computing power of an iPhone X, you'd need at least ten square miles of space, about the size of Manhattan south of Central Park. Matching the data-storage capability of the iPhone X would be even more daunting. The prototype of a computer hard drive, developed in 1956, was called the RAMAC, short for "Random Access Method of Accounting and Control." It weighed almost as much as a midsized car, was the size of two large refrigerators positioned side-by-side—yet it held a mere five megabytes of data. You'd need 51,200 RAMACs to match the storage capacity of the smartphone in your pocket right now. Try to visualize 100,000 refrigerators lined up side-by-side. Don't worry, neither can I.

Altogether, an iPhone X made in the mid 1950s would have been the size of a small city, requiring enough electricity to power four billion light bulbs and 51,200 RAMACs—likely requiring its own power plant. More problematic, during the 1950s the United States only produced upwards of 400 million vacuum tubes per year, meaning more factories would be needed to keep up with this vastly

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[*] The first transistor-based computer, the IBM 7090, entered service in November 1959. Operating on 50,000 discreet transistors it required so much wiring that it was only slightly smaller and barely more powerful than the tube-based models. Increasing transistor count would prove so difficult that it would soon be eclipsed by models using the integrated circuit that emerged in 1961.

increased demand. With the cheapest tube costing $15 (and ranging as high as several thousand dollars)—to buy four billion vacuum tubes at the lowest price would have cost $60 billion—in 1957 dollars. That was $15 billion more than the U.S. defense budget that year. To rent just one RAMAC would set you back $3,200 per month (IBM only rented them, but they likely would have cost millions to purchase); to rent 51,200 per year would cost you almost $2 billion a year.

Consequently, the costs for the just the bulbs and RAMACs (let alone a myriad of other things that would be needed: wiring, technicians, replacement tubes, etc.) would be unbelievably high, my estimate is that the total, adjusted for GDP, would equal roughly $2 trillion today. That's more than three times what the United States currently spends on its national defense, just to achieve the computing power equivalent to a single iPhone X. To try to build one would have required harnessing the entire United States economy on the scale of a wartime mobilization, akin to building of the pyramids of Egypt. Yet, very soon, tens of millions of these devices will be in operation, in addition to the several billion or more smart and tablet devices already currently in use.

That's what the integrated circuit meant to the world. That's the revolution the guys from Fairchild launched.

Fairchild's Triumph

Fairchild's success came quickly. While Arnold Beckman was selling off the unprofitable Shockley Semiconductor Lab, by 1960 Fairchild had become one of the biggest electronics firms in the San Francisco Bay Area, with 1,400 employees and annual sales of $21 million ($175 million in 2017 dollars) and second only to Texas Instruments in the production of silicon components. In March of 1961 they began mass production of the first commercial integrated circuit named "Micrologic" which powered navigation systems for the Minuteman ICBM and Apollo space missions.

Not surprisingly, Fairchild's employees became hot commodities; many would be enticed by a rapidly growing pool of investors to start their own tech companies. According to the business journal Endeavor Insight, the genealogy of today's Silicon Valley companies includes over 100 ventures directly

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founded by Fairchild Semiconductor alumni, collectively known as the Fairchildren. By 2014 Silicon Valley boasted ninety-two publicly traded firms, valued at $2.1 trillion and employing over 800,000 workers who could be traced directly back to Fairchild. Fairchild employees were also instrumental in the establishment Kleiner, Perkins, Caulfield, and Byers and Sequoia Capital, two of Silicon Valley's most important venture capital firms, which have helped found countless other tech giants, including Apple, Google, Facebook, Amazon, Genentech, Yahoo, WhatsApp and many more. Altogether, Endeavor Insights estimates that nearly 2,000 publicly and privately held tech firms are connected to Fairchild Semiconductor. None of this would have happened had the Traitorous Eight not acted that morning of September 18, 1957.

Fairchild would not be Noyce and Moore's only success. In 1968, after most of the original Eight had left Fairchild, Noyce and Moore approached Arthur Rock, a San Francisco venture capitalist who had first championed the Traitorous Eight's search for an investor, seeking funding for a new startup. Rock responded, "it's about time," and raised $2.5 million (nearly $18 million today) to start a new firm, with the rest of the Traitorous Eight eagerly investing in it as well. Noyce and Moore called their new company Intelligent Electronics—Intel—and brought on as manager another legendary Fairchild alumnus, Andy Grove, who would be named *Time* magazine's 1997 *Man of the Year* for Intel's role in the development of the computer. In 1971, this spinoff would introduce the microprocessor, a component that combined 2,300 transistors with memory chips on a single bit of silicon the size of a fingernail. Intel would call its breakthrough a "computer on a chip"—and it was. The microprocessor pushed the computer industry to even greater heights; more and more transistors could be squeezed onto a chip to increase the computing power and make smaller computers possible—the era of the personal computer had arrived.

The American Phoenix and the Soviet Collapse

Mikhail Gorbachev became General Secretary of the Soviet Union on March 11, 1985; like Marshall Ogarkov, he long recognized that unless the Soviet Union reformed it would never be able to spark the level of innovation needed to match the accelerating American advantage in electronics—and if they couldn't, there was very little hope that the USSR would maintain its superpower status.

Gorbachev's "new way of thinking" called *Glasnost* (openness) and *Perestroika* (restructuring) hoped to encourage changes in the Soviet Union similar to the social transformation Noyce and his colleagues had initiated in the United States twenty-eight years before. The goal was to encourage thinking outside of the communist party, to allow for criticism of government actions, and to reform Soviet society to make it much less hierarchical, allow for individual risk-taking, and become more responsive to the needs of the average Soviet citizen. Ever since the 1917 Bolshevik Revolution the Communist Party dictated what needed to be done to strengthen and improve the nation; those with alternative visions were labeled dissidents and sentenced to prison, including the great Andrei Sakharov, father of the Soviet hydrogen bomb who spent years under house arrest until released by Gorbachev in 1986. With even their greatest scientists silenced, how could new ideas emerge that would move the Soviet Union forward in the rapidly changing world of the 1980s?

Encouraging the use of computers throughout the Soviet Union, especially the personal computer, was paramount for the success of Gorbachev's reforms. The challenge was immense. According to engineering scholar Michael Curtis, by 1987 only 200,000 personal computers operated in the USSR compared with 25 million in the U.S., giving the United States a vast advantage in productivity.

The irony is palpable. The USSR had long valued the importance of science and, as the Chinese are doing today, invested enormous resources in building many of the most advanced scientific institutes in the world—boasting eight Nobel Laureates in physics and chemistry. Indeed, many of the Communist Party's most senior members were themselves trained engineers. Soviet émigrés to the West frequently expressed great pride in the alleged superiority of Soviet education in the fields we today call STEM:

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science, technology, engineering, and math. Eventually, the Soviets would even become enthusiastic about incorporating mainframe computers throughout the economy—as there was generally but one mainframe computer per establishment, this only strengthened centralized controls in those businesses.

However, the accelerating pace of American electronics innovation, as the Micrologic gave way to ever more advanced integrated circuits, meant that even these computers quickly became obsolete. This became an especially pronounced problem in the 1960s when the Soviet space program, despite its initial successes, failed to keep up with the American program because Soviet onboard computers lacked the power necessary to handle the progressively more complex calculations needed to reach the moon. By the mid 1960s, the Soviet moon program was cancelled.

The differences between the American and Soviet society deepened as computers spread throughout American life yet failed to do so in the Soviet Union. Productivity and efficiency levels increased dramatically in the United States and elsewhere in the West, yet only stagnated in the USSR. Soviet society simply couldn't embrace the personal computer for fear that it would empower the individual—the very reason the personal computer was created—and threaten the very fabric of an authoritarian system. Therefore, incorporating personal computers throughout the USSR would require a complete reform of the Soviet political edifice, a transformation that would allow the average Soviet citizen the ability to own a personal computer and provide the incentive for software developers to write the software necessary to run these computers.

Before 1985, all that was illegal. Indeed, so repressive was the Soviet leadership toward the personal computer that it would take fundamental legal and political reforms before the USSR could even enter the electronics playing field. For example, until 1986 it was illegal under Soviet law to simply create software for a personal computer. This was precisely the same time that Gates was re-writing the software industry in the U.S., creating the tech behemoth Microsoft.

Gorbachev officially launched his reform program in March, 1986, at the 27th Party Congress, the official Communist Party meeting held every five years; though he had already signaled his position the previous June declaring that "microelectronics, computer technology, instrument making, and the entire

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information-science industry are the catalysts of progress." That March he created a new government agency: The State Committee for Computer Technology and Informatics, to promote their use. Just the name itself lets you know how doomed an effort this was.

In many respects, Soviet society was not ready for these reforms. At first, the Soviets thought they could simply copy American innovations, but without the necessary support infrastructure—i.e., people who could fix them—these computers quickly became of little value. Older Soviet officials had little use for the new technology, while younger, more computer-savvy officials were too afraid Gorbachev might be overthrown in a coup and succeeded by an anti-reform regime that would imprison his supporters. Consequently, despite the supportive rhetoric from Gorbachev's pronouncements, adoption of computers continued slowly.

This conundrum was best summarized by George Schultz, U.S. Secretary of State under Ronald Reagan. "Totalitarian societies face a dilemma," Schultz argued. "Either they try to stifle these technologies and thereby fall further behind...or else they permit these technologies and see their totalitarian control inevitably eroded." Such was the case with the Soviet Union as dissident movements in Moscow and nationalist movements within the republics exploited these embryonic technological changes and launched their challenge to the Communist Party in Moscow. Only a few years later this battle would play out in the streets of Moscow during the failed August 1991 coup against Gorbachev; four months later the Soviet Union ceased to exist.

While chaos gripped the Soviet Union, in the United States, well, let's just say things turned out differently. While the leadership in Moscow sought to create a modern Soviet society capable of benefiting from the electronics revolution, American society had already adapted to the computer. By the end of the 1980s the computer was everywhere, in millions of homes, schools, businesses across the United States—and the U.S. government didn't need to create any ridiculous-sounding government bureaucracies to ensure their spread.

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Instead, it was because of the wonderful marketing of leading American businesses, especially Apple, Dell, Hewlett-Packard, and Compaq, that transformed the complex IBM computers of the 1960s and 1970s into the readily accessible personal computers of the 1980s and beyond. Indeed, these companies were so successful that by 2004 IBM ceased making the PC, selling off its division to Lenovo of China. Meanwhile, Gates and Jobs were locked in a battle over who could produce the best system software to make the personal computer as easy to use as possible. In the 1980s and 1990s Apple was no match for Microsoft, even though it produced the best system software. By the mid 1990s Apple, which had fired Jobs in 1985, was nearly bankrupt, and by the late 1990s would beg for Jobs' return. On the other hand, Microsoft's operating system, Windows, quickly became the standard platform for the world's PCs, turning Microsoft into the world's leading technology corporation.

Soon, the American PC industry dominated the world; even Japan's vaunted technology sector, which had made significant inroads in America's global dominance in the 1980s, buckled as it, too, tried to catch up with the U.S. PC production. Japan had placed its bets on the mini-computer, the smaller version of the old mainframes that dominated the early computer market and had to rapidly shift course as the PC market exploded. For varied reasons, by the early 1990s Japan's tremendous economic growth had slowed to a crawl and concerns eased that Japan would ever catch up with the United States.

As it turned out, the PC was just the beginning. Soon smart phones—basically, hand-held computers with a phone attached—became the world's next "it" thing. Apple, with Jobs now firmly back in control, began the revolution with the introduction of the iPod in October, 2001, which personalized music tastes and demonstrated a market for hand-held devices—and ignited Apple's rise from obscurity to global dominance in the technology sector. The world would change with the launch of the iPhone and, later, the iPad. By 2017, Apple had more than 700 million active iPhone and over 350 million iPad users; with the increasing power, they often offer a credible alternative to the PC resulting in a drop in PC sales.

While Apple now faces many competitors—including South Korea's Samsung, China's Huawei, even Microsoft has created a tablet—the radical innovation that led to the creation of the iPhone and iPad

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was Apple's alone. Today, Apple is on the brink of becoming the world's first trillion-dollar corporation, not bad for a company begun out of a garage in the mid 1970s by a couple of arrogant, twenty-year-old college dropouts who seldom wore shoes.

Like Fairchild before it, Apple has become a metaphor for America, a company that revels in world-changing, radical innovation. Today companies like Tesla (created by Elon Musk a South African émigré) are following in Apple's footsteps, enabled by America's liberal system where such individual successes aren't seen as a challenge to the political order. This is what differentiated the United States from the Soviet Union; this is what continues to differentiate the United States from China and its other competitors around the world. As Noyce once stated: "innovation is not fostered by committee decisions. Pluralism is not an American tradition, individualism is."

Robert Noyce and the American Century

It was a scorching hot, Sunday morning in Austin, Texas when Robert Noyce decided to take a swim in his backyard pool; the date was June 3, 1990, he was hoping for a few moments of relaxation to ease the strain from his exhausting work schedule. Two years earlier, Noyce had left Intel to become director of SEMATECH, a consortium of semiconductor businesses working in collaboration with the U.S. government to improve production of U.S. semiconductors—the work was grueling. While Noyce exercised, thousands of miles away Gorbachev's political and economic reforms were spinning out of control, leaving America's archrival, the Soviet Union, in the throes of political and economic chaos.

After finishing his laps, Noyce emerged from the pool and laid down to rest. In his sleep, he suffered a massive heart attack, dying that same day. He was a mere 62 years old. Yet, Noyce had lived long enough to see the American Century rebound from those panic-stricken days of Sputnik, a direct result of his decision, taken at the age of twenty-nine, to lead a revolt against William Shockley, launch Fairchild Semiconductor, and make history. Thousands around the world attended services for Noyce, each of whom understood just how important a contribution he had made to the country, and the world. Ten years later, his closest associate, Gordon Moore would travel to Stockholm, Sweden to watch Jack

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Kilby accept the Nobel Prize for Kilby's role in the invention of the integrated circuit—Moore wanting to represent Noyce, who would have also shared the award had he been alive.

Though Noyce never had the singular fame of a Bill Gates or Steve Jobs, everyone in the industry recognized the paramount role he had played in the electronics revolution. Without Noyce, Kilby's flawed design might have been the only circuit available, a design his own company, Texas Instruments, quickly concluded had no commercial value. While scientists across the world were trying to create comparable circuits and resolve the tyranny of numbers, none had Noyce's vision. Even today historians of technology marvel at Bell Labs' failure to first invent the integrated circuit even though they had developed "nearly all the underlying technology that went into it" a debacle that historian Michael Riordan argues created a cascade effect that eventually played a role in the breakup of AT&T. For these triumphs Noyce was given the title "Mayor of Silicon Valley." He should also be remembered as one of the driving forces behind the American Century.

The integrated circuit and its successor, the microprocessor, remade the world. When Noyce and his seven cohorts designed Fairchild's first integrated circuit he imagined it holding no more than one-hundred components; by the time he died the number had reached a million; in 2017, IBM announced a chip that would hold 30 *billion* transistors. Thanks to their technological revolution, we live in the wondrous, yet frightening, age of electronics. Thanks to their social revolution we know that new generations will arise challenging today's convention just as they had done decades earlier; these revolutions will continue to distance the United States from the rest of the world—including China—and empower America throughout the 21st century.

Author's Biography

Gregory Mitrovich is a Research Scholar at the Saltzman Institute of War and Peace Studies at Columbia University where he is currently studying the reasons for America's rise to power and its future in the 21st century. He received a Ph.D. in International Relations from USC and was awarded two post-doctoral fellowships at Harvard University, including two years at the Harvard Kennedy School, and an

additional two years as a fellow at the Center for International Security and Cooperation and the Hoover Institution at Stanford University.

Mitrovich was one of eight winners (out of 300 university applicants) to receive the prestigious Minerva Research Initiative grant, offered by the Department of Defense. This $1.3 million grant funded his project, *Culture in Power Transitions: Sino-American Conflict in the 21st Century,* a multi-year study comparing and contrasting how the United States and China use their respective cultural models to promote each nation's global influence. *Turning Points* is one of the books resulting from this research. He is currently organizing a study of American grand strategy in the 21st century and how the United States will respond to the challenge from a rising China.

Mitrovich is the author of *Undermining the Kremlin: America's Strategy to Subvert the Soviet Bloc, 1947-1956* which won the Stuart L. Bernath Book Prize for outstanding book in international history awarded by the Society for Historians of American Foreign Relations. He loves all types of history is an avid science reader. He loves all sports, especially the NFL, though he still suffers from the demise of his once beloved San Diego Chargers.