

Hannes Androsch

♦

200 Years of Acceleration,
Upheaval and Radical Change
Prologue

♦

The inspiration for this book, which spans the period from the beginning of the Congress of Vienna in 1814 into the future, dates back to a conversation with the late Horst Grabert in Altaussee. Grabert, who passed away in 2011, was Willy Brandt's former Chancellery Chief of Staff and German Ambassador to Austria between 1974 and 1979. Our idea was to identify the long development of European history rather than merely selecting commemorative years.

This is why this book will not simply be one more volume that examines 1914. The events immediately preceding the assassination in Sarajevo and its consequences have had sufficient time in the spotlight, especially since this year marks the one hundredth anniversary, for example in Heinrich August Winkler's book *Geschichte des Westens* [History of the West], Margaret MacMillan's *The War That Ended Peace* and Manfred Rauchensteiner's *Der Erste Weltkrieg* [The First World War] not to mention Christopher Clark's *The Sleepwalkers*, Herfried Münkler's *The Great War* and Jörg Friedrich's *14/18 – Der Weg nach Versailles* [14/18 – The Road to Versailles]. The notion of “sliding into war” as expressed in the memoirs of former British Chancellor of the Exchequer, David Lloyd George, has meanwhile been refuted entirely.

Nonetheless, 1914 will play a part in the study of these 200 years, a history that is so rich in accelerations. The year marks the midpoint in the journey from the end of the Napoleonic Wars to the current crisis in Crimea and Ukraine as well as the crises in the Middle East and North Africa. The commemorations of 2014 mark the beginning of a series of further “anniversaries”: the October Revolution in Russia, one year after the end of the First World War and the First Republic that emerged from what remained of Austria.

In this context, as had been the case during the Ottoman Siege and Battle of Vienna in 1529 and 1683 respectively, Vienna is a hub of events and diplomacy and, both in the arts and sciences, at the same time is a reflection of the times: from the *Ancien Régime* to the *Belle Époque* and the *Fin de Siècle* – a new era of change, of upheaval and revolution is ushered in. As early as 1873, shortly after Paris had been fundamentally redesigned by Baron Haussmann, the capital of the Danube Monarchy is remodeled and modernized under liberal Mayor, Cajetan Felder, in line with the latest advances in architecture of the time. Felder played a key role when it came to pushing through the construction of the new City Hall on the Ringstraße boulevard, the first mountain spring water pipeline, the regulation of the Danube, the Central Cemetery and the hosting of the Vienna World Exhibition in 1873. Hence, for all this publication endeavoring to take a global historical view, it will still be essential to turn our gaze towards Austria.

A total of 14 junctures from various fields have been chosen to organize the content along the defined timeline. These events are not isolated milestones; they are the culminations of a longer development, or moments at which crucial events were set in motion – rarely are they defining moments whose significance was immediately obvious.

Often they are small, at times secondary, events in which something greater could be discerned. The list contains no battles, no accessions to the throne, no abdications. Many of these events only gain the significance we accord them today as part of a wider context and with historical hindsight: the incorporation of a company in the commercial register, a film screening in New York, or an academic lecture.

A Changing World Order

At the heart there is Europe. Early history begins with the Council of Constance, letterpress printing, the rediscovery of America, the circumnavigation of Africa. These events sow the seeds for the age of massive acceleration, change and upheaval. Enlightenment, humanism, sciences borne by rationality and empiricism, then the French Revolution and the Industrial Revolution -- the motors of change were started in the latter half of the 18th century in France and England. James Watt did not invent his steam engine from nothing but rather built on existing developments, for example, on those of his fellow British countryman, Thomas Newcomen, from 1712.

The relentless surge in the unleashing of intellectual, political and economic force comes in waves and only spreads to other corners of the globe some decades later. The USA had already broken away from the old continent and was charting its own path following the Declaration of Independence in 1776.

The beginning of the Modern era is accompanied by a significant shift in economic weight: although China is still producing one third of the world's economic output around 1820, the Middle Kingdom is in decline. By the mid 19th century, the other agrarian monarchies of Asia, the Mogul Empire of India and Tokugawa's Japan had fallen behind the West.

The European dynamic, whose colonialism and imperialism spread over the entire globe, initially unfolded under the umbrella of a restorative Pentarchy established by the Congress of Vienna (see essay beginning on p. 27): Austria, Prussia, Russia, Great Britain and the restored French Monarchy, which is readmitted to this "cartel of decision-making" (Heinz Duchhardt) after 1818. Following the revolutionary wars and Napoleonic hegemony, the ultimate goal of this quintet is, by means of the Holy Alliance, to prevent similar dominance by individual powers.

While, in the economy, productive forces are being unleashed at an unrelenting pace, social order initially remains conservatively restrictive. Yet in the climate of the police-state-like *Vormärz* period or Age of Metternich, *Wiener Klassik* (Viennese classicism), operetta, romanticism and Biedermeier flourish as artistic and practical alternatives. At the universities and in the salons, creativity is brewing. Liberal movements are shaped. The Greek War of Independence and the Belgian Revolution are only the first movements in what plays out throughout almost the whole of Europe in 1848.

PROLOGUE

In this year the old order begins to totter (see essay beginning on p. 55). From the February Revolution in France to Vienna's October Uprising -- throughout Europe the bourgeoisie is demanding a greater political say. Even the "Fourth Estate" is protesting; it is no coincidence that 1848 saw the publications of Karl Marx's and Friedrich Engels' *Communist Manifesto*. Unlike in 1789 and 1830, the Paris Uprising of 1848 has the character of a workers' revolution. Nationalism and Liberalism are joined by Socialism as driving forces of the century.

Because many of the failed revolutionaries and activists are persecuted, they strive to realize their ideals from afar. After 1848, Europe witnesses the first great wave of emigration overseas, especially to North America, Argentina and Australia. This is reinforced by the great waves of Irish emigration in the wake of the Great Famine following the failure of the potato crops between 1845 and 1852.

Many of the "Forty-Eighters" find their fortune in the USA and fight on the progressive Union side in the American Civil War between 1861 and 1865. By contrast, continental Europe -- which had seen a Springtime of the Peoples proclaimed in the year of revolution -- witnesses a long bloody winter of the people: a second wave of restoration. The five powers continue to see themselves as guardians of order in Europe. The fear of revolutionary movements holds them together. For the time being.

This European "concert" is shattered with the Crimean War, which begins in 1853 as the tenth Russian-Ottoman War, and with the Austro-Sardinian War from 1859 onwards in which Napoleon III supports the Kingdom of Sardinia-Piedmont against Austria. Solferino and Magenta, the two great battlefields of these wars, sound the death knell for the Pentarchy and indeed also for the Habsburg Monarchy. Italy's independence in 1861, the defeat of Austria by Prussia in Königgrätz five years later and the establishment of Bismarck's German Empire in 1871 see the baton come down for the final time on the European concert. A new architecture of alliances is created. Following the Congress of Berlin in 1878, a web of inner-continental guarantee treaties is woven that no longer corresponds to the concept of the Congress of Vienna. Even Russia ultimately has massive interests in war: it wants to integrate all Slavs and push forward over the Balkans to the Dardanelles and hence to the Mediterranean.

In this unsettled and contested region between the Black Sea and Mediterranean, in which the Tsarist Empire is fighting for more influence, the Danube Monarchy is fighting for the continued existence of its multinational empire and the Ottoman Empire (the "sick man of the Bosphorus") is fighting for survival, it is enough merely to lay the fuse. Following the two Moroccan crises of 1905 and 1911, the Bosnian Annexation Crisis of 1908 and the two Balkan wars of 1912/13 this fuse is lit in Sarajevo on 28 June 1914 -- with devastating consequences for the whole world (see essay beginning on p. 27). It may be a reverse paradox that the erstwhile Danube Monarchy -- condensed into "Kakania" by Austrian writer Robert Musil in his literary portrayal of the Austro-Hungarian Empire -- appears much better with historical hindsight than its reputation

would suggest. On the 100th anniversary of the outbreak of the First World War, the *Wall Street Journal* and the *New York Times*, among others, note as much.

If there is one single nation in the 19th century worthy of the name of world power then it is Great Britain, which drove both world trade on the seas and industrialization like no other nation: "Britannia rules the waves"

The British East India Company dominates Asia and provokes China by means of the First Opium War. The purchase of a major interest in the Suez Canal Company in 1875 secures the British government under prime minister Benjamin Disraeli the trade route to India. In the geopolitical "Great Game" over Central Asia the British prevent the Russian Tsarist Empire, via Afghanistan, from competing for the Indian subcontinent and hence gaining access to warm territorial seas.

Even after the Treaty of Versailles, the British Empire still spans 33 million square kilometers, more than the French, Spanish and Portuguese colonies together. But by the end of the First World War it is evident that the European century, and with it the Pax Britannica, is drawing to a close. Colonial imperialism is followed by a period of de-globalization. Ruling houses disappear, empires crumble: the Tsarist Empire, the Ottoman Empire, the Danube Monarchy and, some time later, even the British Empire and the other European colonial empires are no more. The European people's desire for liberty after the Napoleonic Wars ends in blind nationalism. Communism, Fascism and National Socialism paralyse the Old Continent.

On the other hand, the American century has long since begun. Whereas it was more or less equal to that of Great Britain in 1870, the USA's economic power in 1913 is already twice that of Great Britain's and by the end of the war, the debtor-creditor relationship has reversed. The American entry into the war against the Central Powers in 1917 is more than merely symbolic. It is the beginning of the "American Century". This is characterised by economic, political and military might, the spirit of an "American exceptionalism" as well as America's view of itself as an "indispensable nation".

The anti-colonial USA benefits from the most modern political constitution of the time. It is fortunate with two territorial expansions: the Louisiana Purchase from Napoleon in 1803 and that of Alaska in 1867 from Tsarist Russia, at the time in a precarious financial situation. America is successful in the Mexican-American War, which, when it ended in 1848, resulted in Mexico relinquishing more than half of its territory, including California, Arizona, Utah and Texas. In the 1898 Spanish-American War, Spain ultimately loses its last major colonies. One darker side of the push to "Go West" is, however, the genocide committed against the Indians of North America.

America's view of itself as a nation of immigrants enables it to integrate the millions that head for its shores and to give their talents free rein for the benefit of science and the economy. Following the example of the Pilgrim Fathers, who

set out for America on the Mayflower at the beginning of the 17th century, even before the Thirty Years War, from the beginning of the 19th century to the early 1930s, almost 60 million Europeans leave their homes and set sail for America, thus helping the USA to become the new epicentre of global power.

In 1814 the world's highest building is still in Europe. The cathedral tower in the Alsace city of Strasbourg is 142 meters high; for 230 years the tower retains this lofty honor until its height is surpassed in the 1870s by the cathedral at Rouen and then later by Cologne cathedral. Yet by the eve of the First World War, cathedrals have long since become mundane -- and the highest of them are now built in America. In 1914 the highest building in the world -- not including the Eiffel Tower in Paris -- is in New York: the 241-meter high Woolworth Building, which also represents the triumphant ascent of retail and commerce. It is superseded in 1930 by the Bank of Manhattan Company Building, then by the Chrysler Building and the Empire State Building and even later by the skyscrapers of Chicago and the Twin Towers of the World Trade Center in New York. The Manhattan skyline comes to symbolize engineering ingenuity, self-confidence, financial strength -- and finally the age of electricity, without which elevators and modern lighting would be but a pipedream.

Even after the great waves of immigration have ebbed, the "land of unlimited opportunity" continues to have an almost magnetic attraction for the displaced and the persecuted. The scientists that fled Nazi Germany in the 1930s, such as Albert Einstein or Edward Teller, played, together with J. Robert Oppenheimer, himself the son of an immigrant, a crucial role in the development of the atomic and hydrogen bombs, the weapons that were to prove decisive in enabling America to call the shots in the aftermath of the Second World War. Finally, after 1945, Wernher von Braun provided the USA with crucial missile technology know-how.

On the other side, Soviet Russia and its satellite states form themselves into the second great bloc, thus challenging the USA. The decline of the Tsarist Empire begins with its defeat to Japan in 1905, the civil war following the October Revolution, Stalin's purges and the *Holodomor* famine that he engineered, costing some 3.5 million lives in Ukraine in the 1930s (Borderland and "Bloodlands"). The visible crises and manifest backwardness often make us forget that, over the course of the two centuries, this huge country has demonstrated incredible powers of regeneration. As early as 1812 the Tsarist Empire defeats 400,000 members of the *Grande Armée* on its own soil, even though Moscow burns as a consequence, and leaves only 20,000 or so to return to Paris. Under Alexander II, it is hugely expansionist in the Caucasus and constitutes the dominant continental European power in the First World War. At the end of the Second World War, Russia is one of the victorious powers, even if it suffers by far the greatest losses. Stalin makes clever use of this "Great Patriotic War" for propaganda purposes.

These two post-1945 competing systems last until 1989. One could even claim that it is only in this year that the First World War truly ended. For in the decades preceding, Europe is divided by the Iron Curtain and, from 1961, by the

Berlin Wall. Under the re-armament mantra of an "equilibrium of terror", this rivalry has led to wars and dangerous tension in many other regions of the world, from the Korean War in the 1950s to the Vietnam War and the Cuban missile crisis and even to Afghanistan in the 1980s -- a country that was always, and still remains, a "graveyard of empires". In this context, we must also mention the numerous armed conflicts on the African continent and in the Middle East, which have confronted the world with floods of refugees unprecedented in living memory.

In tandem with the development of world trade and the first golden age of globalization, we witnessed the emergence of a new global monetary system. Whilst the gold standard reigned supreme in the 19th century, after the Second World War the US dollar and, increasingly in Europe, the deutschmark established themselves as new reserve currencies.

The Nixon shock on 15 August 1971 marks the end of the Bretton Woods system of fixed exchange rates of a dollar gold standard and the beginning of the petrodollar system. From now on what is crucial is that the currency is not backed by gold but by oil, with the dollar as a trading currency -- and hence the USA gains the "exorbitant privilege" of being able to print its own money. The Soviet Union, dependent on its oil, raw materials and gold reserves, gets into economic difficulties, exacerbated by excessive arms spending.

In the end, the Soviet Union ends up coming off a clear second to the USA. Both the Iron Curtain and the Berlin Wall fall, the Soviet Empire crumbles and the Soviet Union implodes. Even earlier the Soviet intervention in Afghanistan comes to an end and the events on Tiananmen Square overshadow what many consider to be an "annus mirabilis". There is a short-term emergence of American unipolarity but, as has since become evident, there is no "end of history". Since then, considerable shifts in influence and power, as well as the uncertainties and imponderables these bring with them, have occurred. Bellicosity using drones and data obviously cannot change this. Yet despite the breaking away of the Eastern European states, which started to join the European Union and the western defense alliance NATO from 2004, Russia -- which boasts 17 million square kilometers, a wealth of energy and natural resources and has a Putinite model of state capitalism -- remains a crucial player, also as a nuclear power, that continues to lay claim to its role as a world power. This has been made very clear by the crises in Crimea and Ukraine as well as those in Georgia, Syria and Iraq. Vladimir Putin uses them to retrieve lost "sacred Russian soil" and regain status as a world power "Wherever there are Russians that is Russia" is the new doctrine of the Russian President, who has described the break-up of the Soviet Union as the "greatest geopolitical catastrophe of the 20th century".

The implosion of the Soviet Union and the fall of the Iron Curtain bring to an end the "short 20th century" that Eric Hobsbawm, the British historian with Viennese roots, contrasts with the "long 19th century". A new phase of globalization

begins, speeded up by new transport and communication technologies. This re-globalisation is marked by the fact that capital, too, has become mobile on a global scale and in real time. But just as previous financial booms ended in crisis – the stock market crash of 1873 and the world economic crisis in 1929 – the period of economic upsurge after 1989 was brought to an abrupt halt on 15 September 2008 by the "Lehmann moment". As Queen Elizabeth II put it, absolutely correctly, a financial sector that has become increasingly detached from the real economy makes the global economy increasingly vulnerable to crisis. Economics, from Adam Smith to Keynes, Hayek or Friedman and not even the mechanistic Chicago School, has no satisfactory answers or convincing solutions: economics remains the "dismal science".

Both economically and geopolitically, the most important counterpart to the USA since the end of the Cold War has turned out to be an empire that has put decline, decades of bloody civil wars, famine and political experiments behind it: China.

What Japan accomplished one century previously in the form of the Meiji Restoration – a systematically planned economic and political opening up in the Western tradition – is also undertaken in the former Middle Kingdom, too, after the death of Mao Zedong. The reforms initiated by Deng Xiaoping after 1978 usher in the most prodigious and swiftest process of economic catch-up in world history. China has since doubled its economic strength every ten years (see essay beginning on p. 41). Shortly after the breakup of the Soviet Union in 1989, we see an economic upsurge in India under Manmohan Singh from 1991 as well as, previously, in other parts of Asia such as Singapore or South Korea. These countries emerge from the isolation caused by self-sufficiency and return, with some 1.5 million workers, to the world economy – and thus increasingly to the world's political stage.

Declaring the 21st century as the Asian – or even the Chinese – century as a consequence would, however, be premature. The USA continues to shape the world politically, as a military power and, particularly, with its cultural influence, thanks, for example, to Marlboro, McDonald's, Coca-Cola and Disney. Bollywood is no more than an Indian version of Hollywood. Silicon Valley is still near San Francisco. The new "Softpowers" of the digital world, from Google to Facebook, from Apple to Intel, are practically all from the USA and exert a magnetic effect on the world's most talented. The NSA (National Security Agency), one of 17 US secret services, strives for global domination of the world's information. The shale gas revolution offers the USA new competitive opportunities, the possibility of reindustrialization and of reducing its greenhouse gas emissions. The prospect of an average Chinese ever becoming as wealthy as an American or European is light years away. Thus, Mark Twain's comment on the premature newspaper reports of his demise holds equally good for the significance of the USA in the modern world: "Reports of my death have been greatly exaggerated."

The mechanisms of policy making and conflict management have meanwhile become much more multifarious and literally global in scope. After the Congress of Vienna, five states shaped and characterized the post-Napoleonic era. After the First World War, 32 states formed the League of Nations in 1920. Nowadays the UN, which built on the experiences of the League of Nations, counts 192 countries as its members. 192 countries took part in the Expo 2010 in Shanghai; the 2012 Olympic Games in London boasted 204 competing nations.

It remains unclear who will be able to take on a lasting leading role in the new, multifaceted concert of global powers alongside the USA and China, whose interdependence unites them as both opposite poles and rivals ("Chimerica"). Moreover it remains to be seen whether Europe will succeed in being a player in its own right or will merely be a plaything in a game played by the powerful.

Declaring the 21st century as the Asian – or even the Chinese – century as a consequence would, however, be premature. The USA continues to shape the world politically, as a military power and, particularly, with its cultural influence, thanks, for example, to Marlboro, McDonald's, Coca-Cola and Disney. Bollywood is no more than an Indian version of Hollywood. Silicon Valley is still near San Francisco. The new "Softpowers" of the digital world, from Google to Facebook, from Apple to Intel, are practically all from the USA and exert a magnetic effect on the world's most talented. The NSA (National Security Agency), one of 17 US secret services, strives for global domination of the world's information. The shale gas revolution offers the USA new competitive opportunities, the possibility of reindustrialization and of reducing its greenhouse gas emissions. The prospect of an average Chinese ever becoming as wealthy as an American or European is light years away. Thus, Mark Twain's comment on the premature newspaper reports of his demise holds equally good for the significance of the USA in the modern world: "Reports of my death have been greatly exaggerated."

The mechanisms of policy making and conflict management have meanwhile become much more multifarious and literally global in scope. After the Congress of Vienna, five states shaped and characterized the post-Napoleonic era. After the First World War, 32 states formed the League of Nations in 1920. Nowadays the UN, which built on the experiences of the League of Nations, counts 192 countries as its members. 192 countries took part in the Expo 2010 in Shanghai; the 2012 Olympic Games in London boasted 204 competing nations.

It remains unclear who will be able to take on a lasting leading role in the new, multifaceted concert of global powers alongside the USA and China, whose interdependence unites them as both opposite poles and rivals ("Chimerica"). Moreover it remains to be seen whether Europe will succeed in being a player in its own right or will merely be a plaything in a game played by the powerful.

Although the rise of the West in the modern era appears so far to have gone hand in hand with secularization, the decline in importance of religion, the

Islamic world is currently rising particularly strongly. A region of major trouble spots has emerged: from Mindanao in the Philippines and Indonesia to India and Pakistan; from the Persian Gulf and the Arab Peninsula to North and Central Africa and as far as the west coast of the African continent, home to some one billion people and with significant reserves of natural resources, in particular, oil.

There is no indication yet that, following the "Arab Spring", the Arab region could become a power factor in the foreseeable future. In a parallel to the events following the European Springtime of the Peoples of 1848, the region of the "Arabellion" region is now descending towards restoration and counter-revolution. This is proving to be less of a "clash of civilizations" and more a clash within one civilization. An Arab autumn looms, if not an Arab winter. Threshold countries such as Brazil, Indonesia, India or Turkey have not yet been on the world stage for long enough to be able to make a contribution to bringing about stability. This is also true of South Africa and Nigeria although Africa, given its population development, certainly has good chances of moving up the economic rankings.

And what of Europe, which was the emerging power at the beginning of the 19th century? In economic terms it has regained its position as a giant, politically it is a dwarf and in military terms it has remained a worm, as German politician Egon Bahr put it. After the Second World War it rose like a phoenix from the ashes and can look back on a seventy-year period of peace and liberty as well as increased prosperity and welfare. And yet, although Europe is united in a Union (see essay beginning on p. 195), it is fragmented and does not have a common voice in terms of foreign and security policy. Europe is currently the only part of the world whose population is forecast to shrink. In 2050, four percent of human-kind will live on the proverbial "old" continent. In the year 1000, Europe boasted some ten per cent of the global population, around 1800 it was 13 per cent and in 1900 it was 19 per cent. Nowadays it is only seven percent.

These seven percent produce about a quarter of global economic output and, with a social expenditure share of 25 per cent, consume half of global social benefits. In Austria, social benefits make up 30 per cent of economic output, in North America less than 20 per cent and in most other parts of the world well below ten per cent.

Demography, democracy, freedom and opportunity

The population explosion makes plain the breakneck acceleration with which the eight generations we are discussing here have experienced astounding changes, upheavals and revolutions – far greater changes than their ancestors ever experienced in the preceding three millennia.

Between the birth of Christ and 1800, the world population expanded from 270 million to one billion. Since then it has increased to over seven billion. This

population growth is most apparent in the New World. In 1800, the USA registered a population of five million inhabitants; today it has a population of 315 million. And yet the situation prophesied by the British economist and cleric Thomas Malthus in 1798, in which food production would not be able to keep up with population expansion, leading inevitably to famine and destructive wars, has never arisen. In fact, the probability of being killed in war or as a result of the consequences of war is lower today than ever before. The Anglo-American historian Ian Morris recently offered proof of this: despite two World Wars, famine resulting from state negligence and genocides such as those in Armenia, the European Holocaust or in Rwanda, Morris calculates that only 2% of those killed in the 20th century were war victims. In the Stone Age, by contrast, every tenth person was likely to die violently. The evolutionary psychologist Steven Pinker comes to similar conclusions in his recent book, *Why Violence Has Declined*.

The real revolution, however, is that we have succeeded not only in feeding a rapidly expanding population but in continuously improving their nutrition and requiring ever fewer people in order to achieve this. The fact that fairness of distribution has largely been ignored during this development cannot be overlooked, even though billions of people have been relieved from abject poverty. At least two billion people continue to starve while a third of the global population suffers from obesity and all the serious consequences for their health which that causes, to a large extent as a result of excessive consumption of sugar.

As a result of a second agricultural revolution, following on from the industrial revolution and typified by extensive mechanization and the use of artificial fertilizer, yield per acre and overall agricultural productivity increases to an unprecedented extent. A grain of wheat planted in 1800 yielded just over four grains; today that yield is over 25 grains. Moreover, increasing urbanization has led to an expansion of the area given over to agriculture. The percentage of the overall population employed in agriculture was around 50% in the middle of the 19th century while today it is under 3% averaged over the whole of Europe and even less in the USA, Germany and Austria. The proportion of the working population employed in agricultural production and commerce grew rapidly in the heyday of the Pax Britannica, but is now declining.

Aside from the improvement in nutrition, spectacular advances in modern medicine have led to an increase in life expectancy from 40 in 1800 to 85 today.

The medical discovery of the importance of hygiene by Ignaz Semmelweis (see essay beginning on p. 81) saves millions of lives. A woman's risk of death in childbirth sinks to an all-time low from that point on, as does the level of child mortality. Rudolf Virchow's work on cellular pathology, published in 1856, as well as Robert Koch's discovery of the tuberculosis pathogen in 1882, would both be worthy of inclusion in this volume. The identification of the different blood groups by Karl Landsteiner in 1900 made it possible to transfuse blood without

risk. The psychiatrist Julius Wagner-Juaregg receives the Nobel Prize for medicine in 1927 for his development of a treatment for malaria-induced paralytic dementia. Alexander Fleming's serendipitous discovery of the effect of penicillin in 1928 is similarly groundbreaking: antibiotics have shown themselves to be the most effective weapon against disease-inducing bacteria, although it has to be said that they are now increasingly becoming alarmingly resistant to treatment. In medical diagnostics and pharmaceutical research, further groundbreaking developments take place, while programs of immunization are able to win the battle over diseases such as tuberculosis, polio and tetanus, all of which were once endemic. Surgical development is spectacular, ranging from the first successful gastrectomy by Theodor Billroth in 1881 to the first successful heart transplant by Christiaan Barnard in 1967.

Modern chemistry has made significant changes to human life: through the development of efficient fertilizer for agriculture; through a multitude of new insights and processes in the pharmaceutical and biochemical fields, not least the development by the young chemist Felix Hoffmann of what is today probably the most common medicine worldwide – aspirin; and through the development of new materials such as PVC (polyvinylchloride), as well as the invention of the production of pure, crystalline silicon, the essential component both of the modern computer and communication industry and of solar cells. New chemical processes influence both demography and individual opportunity equally and to an ever greater extent. It is, furthermore, a chemist who makes a significant contribution to the emancipation of women: Carl Djerassi, an Austrian working for the pharmaceutical company Syntex and who has to escape to the USA with his family from the Nazis in 1938, develops the first contraceptive pill at the beginning of the 1950s.

Gender equality had been a clarion call of the French Revolution, but it took until the end of the 19th century before women were allowed to study at university.

In Austria, the first woman to be awarded a PhD, Bertha von Suttner, receives it in 1897. She is also a courageous pacifist who campaigns against war under the slogan, 'An end to armament'. From the beginning of the 20th century, the suffragettes gradually struggle for and attain the right to vote (see essay beginning on p. 187), which is only one of many milestones on the road to more equality and greater emancipation. In many countries, however, even these small victories have yet to be achieved.

With the introduction of the contraceptive pill, chemical and pharmaceutical endeavor extends into private lives, with far-reaching consequences for public life. Ever more women take control of family planning, thus allowing them to control the course of their own lives. Economic independence grows as a result of an increase in educational opportunities and in levels of employment. Changes to divorce law and in societal attitudes towards divorcees – as well as, incidentally, attitudes towards homosexuality – as was amply demonstrated by the

recent victory of Austrian singer Conchita Wurst in the Eurovision Song Contest – favor the development of that independence. And thus the birth rate in the Western world begins to drop from the 1960s onwards.

Equal rights for all is also the guiding principle of the new workers' movement and its theorists. Friedrich Engels, son of an industrialist, had completed an apprenticeship in Manchester, the city in which industrialization progressed at its most rapid and ruthless (Manchester capitalism). Engels' 1845 essay entitled *The Situation of the Working Class* in England is a wake-up call. All over Europe, trade unions come into being and are viewed as a threat by the ruling classes. In Germany, the then Chancellor Bismark reacts to the situation by introducing accident and health insurance, followed by Austria 16 years later. Between 1860 and 1910 the working week is reduced from 85 to 55 hours. In 1908, a 10-hour working day is introduced as a legal norm. In particular, the two World Wars lead to the extension of the welfare state – from warfare to welfare.

Children also have rights, but this realization does not become well-established until the 19th century. In Great Britain, factory employment for children under nine is outlawed in 1833, while mine work for children is restricted from 1842. In 1896, penalties are introduced in Germany for parents who abuse or neglect their children. However, from these milestones it is still a long way to the UN Children's Rights Convention of 1990, since ratified by 190 of the 193 member states.

At the beginning of the period chosen for this publication, entire sections of the population are denied access to basic rights by virtue of their background. From the beginning of the 19th century, that situation is successively ameliorated. As a result of British pressure, the Congress of Vienna passes a fundamental ban on the African slave trade. In 1861, under Tsar Alexander II, Russia becomes the last large European power to put an end to indentured labor. In the same year, the American Civil War begins, leading to the inclusion of the abolition of slavery in the American Constitution four years later. However, it takes another 100 years before a major breakthrough in the struggle for the civil rights of black Americans is achieved by Martin Luther King, a breakthrough which has yet to take place in many countries.

The end of colonialism from 1945 onwards is coupled with the liberation of entire peoples from patronizing treatment at the hand of colonial powers. Mahatma Gandhi is for India what Nelson Mandela will later represent for South Africa, although, incidentally, Gandhi himself is heavily influenced by his experience of apartheid during his time in South Africa.

The former colonies, having frequently suffered authoritarian regimes and brutal dictatorships during colonial times, paradoxically often find what they are looking for in the political systems of the colonial powers in their search for the best form of government. After the Second World War, democracy triumphs. In 1941, following on from disastrous first attempts at democracy in Germany,

Spain and Italy, all of which end in fascism, only eleven nations are democracies. Today, according to *The Economist*, 40% of the world's population lives in political systems that allow free and fair elections. In combination with the modern social and welfare state, which demands of its people, instead of the tithes of the Middle Ages, up to half of their income in taxes and social contributions, the development of a previously unimaginable standard of living is possible.

Even though western democracies are prone to both 'gridlock' and new populist movements resulting from it, leading in many cases to crises of confidence, this form of government remains the ideal in many parts of the world. Nations that have taken other roads, cutting themselves off from the rest of the world and oppressing their people, are generally regarded as failed states, from North Korea to Zimbabwe to Somalia. Having said that, many nations follow moral concepts which differ from those of the democracies in question.

As with democracy, city life also leads to liberation. Increased agricultural productivity and new forms of employment in urban centers lead to ever higher levels of population in urban conglomerations. It is not until the second half of the 20th century that urbanization increases to such an extent, beginning in Europe. In 1800, less than 20% of the populations of the UK and Germany lived in cities, while today 80% do so. Since 2007, over half of the world's population has resided in urban conglomerations and that level will soon reach 70%.

In developing nations, this trend has reached dramatic proportions. Among the ten largest cities in the world in 1910, six of them were in Europe. Today, Tokyo is the largest metropolis on the planet. The top 10 include Jakarta, Mexico City, Mumbai, São Paulo, Shanghai and Chongqing. Only following on from those cities do we find Istanbul and Moscow, megacities on the fringes of Europe. It is expected that by 2030 a billion Chinese people, 70% of that country's population, will live in cities.

Mobility, communication, innovation

According to the economist John Maynard Keynes, the standard of living of people in centers of civilization remained unchanged from the beginning of documented history to the earliest years of the 19th century. Even in 1900, the car has been invented but it remains the privilege of a tiny minority. There are no passenger planes, no telephones, and only the most rudimentary use of electricity. And then suddenly things speed up and it is not only dramatic inventions which change the daily lives of a rapidly increasing number of people: the invention of toothpaste in 1850, as well as the accompanying toothbrush with nylon fibers, the development of the document folder and the paperclip by Louis Leitz in the 1870s and of course the patenting of aspirin in 1899 all contribute to this sudden increase in the pace of change. Today, over 95% of households in the western industrialized nations contain a telephone connection, a fridge, a TV, a washing machine, a vacuum cleaner and other technical comforts. All these developments

have contributed to the fact that the average citizen, as once remarked by Eric Hobsbawm, today lives better than a monarch of 200 years ago.

It is only under these circumstances that a culture can develop which is not restricted to the privileged few: from jazz to film music, musicals, pop and rap, and from 'talkies' to home cinema and video games. The much proclaimed 'work-life balance' for as many of us as possible is a prerequisite for the success of the leisure industry, especially tourism and the sport industries with their ever more commercialized packaging.

Modern forms of transport such as trains, cars and airplanes make it possible for ever more people to cover ever greater distances. Around 1850, approximately 800 million kilometers were travelled in Germany every year, mostly by rail. By 1870 it was 3.5 billion and it rose to 25 billion by 1900. Today that figure has risen to over 1.2 trillion kilometers. On average, every German covers 15,000 kilometers per annum, 12,000 of those by car. Globally, there are well over a billion cars on today's roads. In 2010, over 5 billion air passengers were recorded. Mobility is becoming increasingly synonymous with freedom.

As the world shrinks, so also does time. Traffic has increased both in density and speed. In 1869 alone, two milestones in the history of infrastructure development are achieved: the inauguration of the First Transcontinental Railroad in the USA enables passengers and freight to travel from the east to the west coast of the USA and back again in seven days, instead of four months as had previously been the case; the opening of the Suez Canal cuts the time required to sail from Hamburg to Bombay by 24 days. Modern chemistry also contributes to the reduction in travel time: Alfred Nobel succeeds in developing liquid nitroglycerine, discovered in 1847, into a solid explosive which is first used in the construction of the St. Gotthard Tunnel in Switzerland between 1972 and 1882.

Freight travel also burgeons – not least as a result of the 'container revolution' which began in the 1960s. Long-distance emigration is first made possible by the invention of steamships, and it is not infrequently the children of immigrants who initiate decisive innovation: Thomas Alva Edison, for example, son of a free-thinking political activist who had had to flee from Canada, invents an electric stock-market ticker and goes on to both invent and perfect the electric light bulb. Henry Ford's father fled the Irish potato famine in County Cork in 1847 and arrived in the USA; his son revolutionizes both car and factory production from 1908 onwards with his Model-T Ford. The steel magnate Andrew Carnegie and the banker J. P. Morgan leave their mark both on their era and on the industries they lead.

In Germany it is men like Werner von Siemens, the AEG founder Emil Rathenau, the steel magnates Alfred Krupp and Fritz Thyssen, as well as the pioneer of electronics, Robert Bosch, who are the prototypes of a new class of technology-oriented capitalists. In the USA, the age of machines makes especially those people rich who are able to produce energy and, in particular, fuel: John D. Rockefeller, a descendant of immigrants from the German town of Rockenfeld, near

Neuwied, goes down in history as an oil tycoon. His Standard Oil Company (see essay beginning on p. 67), which gives rise, after its breakup, to today's oil giants Chevron and Exxon, stands for a new player in the economic landscape: the large corporation. He also stands for a new source of energy: the oil industry, following the first successful drilling operation on 27th August in Titusville, Pennsylvania, fuels the affluence of nations to this day. The industrial age is from its very beginnings, however, also an age of coal, which still forms 30% of the global energy creation today. Alongside oil and gas, the world's industry has thus become dependent largely on fossil fuels for its energy. The age of synthetic materials also has its source in the use of oil and gas.

It is probably no coincidence that the tallest building in the world in 2014, the 828 m high Burj al Arab, is located in the desert nation of Dubai where the immense profits of the oil industry are invested in an infrastructure which has no parallel.

While smoking chimneys and puffing locomotives and ships were symbolic of the industrial age, conveyor belts, clean rooms, robots and laser devices mark the industrial plants of today.

The development of modern communication systems is closely bound to mobility: travelers no longer have to forgo the exchange of information with others – the essay beginning on p. 183 of this publication underlines the importance of the conception of the World Wide Web by Tim Berners-Lee in 1989. That essay could equally have chosen as its central juncture the year 1866 in which the first transatlantic cable went into operation, enabling telegraphy between the USA and Great Britain.

Telegraphy makes the carrier pigeon obsolete and telephony is the next logical step. A handful of prototypes are developed but only Alexander Bell succeeds in 1876 in the USA in developing a telephone that is ready for market. The 'Gutenberg galaxy', as the media analyst Marshall McLuhan calls the age in which the book is the central medium, is succeeded by an age of electric and electronic communication that is less and less tied to telephone boxes, landlines and desktop computers. From 1990 onwards, mobile telephony begins its world conquest. There are now 7 billion mobile-phone connections globally. The personal computer, first introduced by IBM in 1981, has also learned to walk. Data and voice communication nowadays frequently take place using one and the same device, either a smartphone or a tablet PC. Even radio, film and television (see essay beginning on p. 139), very noticeably the dominant media of the 20th century, have become mobile.

The modern communication and navigation systems are only made possible by the thousands of satellites orbiting the globe today. In 1957 the Russians put the first artificial projectile, Sputnik, into orbit. The USA reacts to this 'Sputnik moment' with high levels of investment in research, of which around half flows into military research. The zenith of this period is 21 July 1969, the

day on which Neil Armstrong is the first man to walk on the moon. This space race does not stop with the end of the Cold War. In 2014, there are already ten space powers and private space travel is not far away.

Besides the conquest of the macrocosm, the penetration of the microcosm is the second great exploratory thrust of the post-colonial period. Research into the world of the minute, a world not even visible with a microscope, has undoubtedly reached new heights with the description of the structure of atoms. A decisive contribution to this effort is made by Ludwig Boltzmann with the proof that many natural phenomena can be understood in terms of the movement of atoms and molecules as a result of alterations in their temperature. Atomic physics is regarded as one of the three most significant achievements in physics at the transition from the 19th to the 20th century. This is joined by the theory of relativity and by quantum theory, which is closely tied to atomic physics and whose basic equation, which has also found its use in materials science, originates from Erwin Schrödinger (the Schrödinger wave equation)¹.

In 1905 the chain of events is exceptionally dense: in this year Albert Einstein delivers the breakthrough in atomic theory by explaining the theory of relativity, which goes back to an idea by Ernst Mach, and suggests that light consists of subatomic particles, called photons – an important contribution to the acceptance of quantum theory. The development of semiconductors and, as a result, the development of modern computers, would not be conceivable without quantum physics, just as GPS navigation systems would not be conceivable without the theory of relativity. A further important contribution to this development is the discovery of cosmic radiation in 1912 by Viktor Franz Hess. His discovery shows, among other things, that there are cosmic phenomena which are less stable than generally assumed.

The insights of modern physics from Boltzmann's Law of Distribution of 1872 to the discovery of radioactivity at the end of the 19th century by both Antoine Henri Becquerel and Marie and Pierre Curie, from the Plank Postulate to the atomic model of Niels Bohr in 1913 and the quantum-theoretical explanation of the structure of an atom by Wolfgang Pauli (the Pauli Principle), as well as the Heisenberg Uncertainty Principle and the demonstration of nuclear fission by Otto Hahn along with the analysis of the process by Lisa Meitner just prior to the Second World War all change, quite literally, the world. At the World Expo in Brussels in 1958, the Atomium seems to herald a new age of energy.

Peaceful use of atomic energy – for which Victor Weisskopf, a notable atomic physicist and a witness to the first atomic bomb test on 16th July 1945, devoted his life – leaves its mark, at least until the Chernobyl disaster in 1986, on global energy policies.

All these insights and developments also accelerate changes in philosophical thought. Above all, it is the members of the Viennese Circle such as Moritz Schlick,

Rudolf Carnap, Otto Neurath and Hans Reichenbach who concern themselves intensively with the consequences of new scientific insights for philosophy, including the effects of Albert Einstein's relativity theory and of quantum physics. The Viennese-born Sir Karl Popper places the old question of the limitations of human insight against the background of scientific discovery anew in his work *The Logic of Scientific Discovery* and in so doing triggers a fundamental scientific and political discussion. The thesis of the American philosopher Thomas S. Kuhn that there is no continuous progress in science but rather revolutions, so-called 'paradigm shifts', causes a sensation. The same can be said of the 'anarchistic theory of scientific insight' propounded by the Austrian-born Paul Feyerabend, which states that there is no need for binding rules for scientific endeavor because all conceivable scientific strategies may lead to insights, i.e. anything goes. Increasingly, even scientists themselves are discussing the philosophical consequences of their research, such as, for example, the cosmologist Steve Weinberg in his now famous book *The First Three Minutes*, but also the Austrian quantum physicist Anton Zeilinger.

John Dewey and Ludwig Wittgenstein remain leading examples of the many philosophical paradigm shifts, but also Martin Heidegger and Theodor Adorno, the latter as a member of the so-called Frankfurt School. Decades after the heyday of Albert Camus and Jean-Paul Sartre, Michel Foucault and Jacques Derrida take French philosophy to new heights.

As a measure of all human activity, human reason forms the centre of all scientific deliberation during the Age of Enlightenment. Following on from the Copernican insight that the earth is not the centre of the universe, the human race is knocked off its pedestal in a further two instances by science. In his book *On the Origin of Species*, Charles Darwin proves that humans evolved from animals – a theory which, even in the West, is bitterly opposed by many to this day. As a result of his research into the human soul, Sigmund Freud purports to discover that we are not even in control of our own actions in daily life. In 1917, Freud invented the phrase "wounds inflicted on humanity's pride" for these three violations of our narcissistic self-image.

New disciplines such as sociology and psychology come into being while the economic philosophy of the 20th century experiences two remarkable theorists in the form of John Maynard Keynes and Milton Friedman. Further major contributions to this discipline are made by Austrian economists such as Eugen Böhm-Bawerk, Carl Menger, Joseph Schumpeter (see essay beginning on p. 169), Fritz Machlup and Friedrich Hayek.

Equipped with the latest technological means, science devotes itself to the human race right down to the tiniest detail: James Watson discovers the structure of DNA in 1953 and the late 20th century is marked by the decoding of the human genome, made possible by knowledge of the atomic structure of the genetic building block, DNA.

PROLOGUE

Scientific uproar and political revolutions are accompanied by sea changes in the arts, from literature to music to visual arts (see essay beginning on p. 125). Rapid successions of artistic styles mirror changes in the times to which the arts both react seismographically and indeed anticipate: from Romanticism to Impressionism and Expressionism and on to Fauvism, Futurism and Cubism, the latter founded in part by Pablo Picasso.

The great composers deliver the soundtrack of their epochs: at the beginning of the 19th century Ludwig van Beethoven, a great admirer of Napoleon, stands apart. In 1813, Giuseppe Verdi is born and will later be a witness to the 1848 revolution in Paris and will become as much a symbol of the Italian Unification Movement as his contemporary Richard Wagner is to many nationalistic Germans. The music of Arnold Schönberg, on the other hand, reflects the inner conflicts of *fin de siècle* Vienna. Jazz and rock 'n' roll, whose dissemination and popularization are linked to the new audio media from shellac to vinyl and CD and on to MP3 like no other musical styles, leave their impression on entire decades of the 20th century. Karlheinz Stockhausen creates many milestones in electronic music.

In urban planning, the signature styles of the great architects become visible. The cathedrals of the secular world are closely tied to names such as Martin Gropius, Alfred Loos, Otto Wagner, Frank Lloyd Wright, Ludwig Mies van der Rohe, Le Corbusier, Antoni Gaudí, Oscar Niemeyer, the Bauhaus architects and Austrian architects such as Richard Neutra and Hans Hollein, the latter dying in 2014. Thanks to their sensitivity to change, sculptors such as Auguste Rodin, Alberto Giacometti, Alfred Hrdlicka and Fritz Wotruba reflect the developments of their times in their work.

Against the background of these multifarious changes, one would be entirely justified in describing the span of time covered in this book as a new geological period, or at the very least as a scientific, intellectual, technological, artistic and indeed sociological watershed, as an epochal turning point. It is a period that can be made recognizable by the mention of a few well-known names of the time along with their exceptional achievements: Einstein, Picasso, Schönberg, Weber, Rilke, Kafka or Joyce. The Dutch chemist Paul Crutzen suggested that the time from 1800 onwards should be named the Anthropocene Period since the human race in its knowledge and actions has never had a more powerful effect on its surroundings than in the last two centuries. After thousands of years in which the fight against an all-powerful natural world formed the centre of our consciousness, we inhabitants of this planet have, with the industrial revolution, set a chain of events in motion the consequences of which are unknown and barely predictable. Changes to the landscape, greenhouse gases and extinctions transform the face of the planet and redefine the conditions of life. While the middle of the 19th century saw the end of a small ice age which had begun in the 14th century and reached its zenith in the 17th century, human responsibility for at least part of the predicted global warming has since taken on a central role in scientific debate.

The world is not about to run out of challenges. We deliberately opted to locate the fourteenth event we have chosen to focus on in this publication in the year 2114. That essay concerns itself with the topic of Artificial Intelligence, a crucial issue for our future.

¹ The author thanks Konrad Paul Liessmann, Philipp Saiko, Peter Schneider, Wilhelm Schneider and Anton Zeilinger for their valuable advice.

Hannes Androsch

♦

And Tomorrow's World?
Epilogue

♦

The completion of this book, in late July 2014, coincided with the commemoration of that day, 100 years ago, that marked the beginning of the First World War. Current events – heavy fighting in eastern Ukraine, a re-igniting of the conflict in the Middle East, ongoing bloody civil war in Syria, the advance of Islamists in Iraq, conflicts with immeasurable consequences in North Africa, West Africa and in Southern Sudan – illustrate that there is no “End of History”, as Francis Fukuyama postulated after 1989. It has been a quarter of a century since the fall of the Berlin Wall, the opening of the Iron Curtain and with it the farewell to bipolar geopolitics; however democracy and market economy have not, by any means, been able to take root everywhere. Samuel Huntington’s 1996 claim of a “Clash of Civilizations” was also insufficient: the armed conflicts with which we have been confronted since then are usually conflicts within “civilizations”. Nowadays, we no longer have bipolarity, nor do we have the global multi-polarity that many forecast – we are lacking a new world order for the various interests in the world. This vacuum allows old conflicts to be reignited and new ones to be fomented.

Many of the developments over the last 200 years outlined in the articles in this volume give us cause to reflect on how things will proceed. What could the world look like in 2114? And what conclusions does this mean for those with political responsibility?

We do not intend to be the Oracle of Delphi 2.0, nor to revive the Roman tradition of haruspices inspecting entrails or of astrologers gazing into crystal balls, as western heads of government were claimed to have still been doing in the second half of the twentieth century. Nevertheless, it is both useful and necessary to reflect on the major trends of, and possible developments in, the next century. It is only on this basis that political objectives can be formulated and their implementation planned. In order to plan for and shape the future, it is crucial to understand the direction in which the world is likely to develop. For there can often be decades between the conception of an idea and its realization. Anyone who can anticipate what is likely to change in the meantime will be better able to manage these long lead and development times.

Just as many of the spectacular ideas and technical fantasies in the utopias of Jules Verne finally came true, the development of a world, described in the 14th article in this work, in which Artificial Intelligence is increasingly replacing, if not significantly enhancing, human brain power is more than just a bold vision from today’s perspective. Much of what has once been precisely mapped out in someone’s head will one day be technically feasible. Much of what has become technically feasible is also being put into practice.

The most difficult thing is to divine the pace of change. For although history has periodically repeatedly witnessed significant innovations, from fire to writing to the wheel – until the first industrial revolution not as much happened as in the 200 years afterwards.

Prognoses extending far into the future have always been prone to error. The battlefields of the futurologists are littered with the corpses of their prognoses. Much of what was described in the world of Jules Verne has remained utopian. However, this understanding makes it possible to outline following trends:

- ◆ Towards the middle of the 21st century, the world will have nine billion inhabitants. In 2114 it could be over ten billion (although there is doubt that the ten billion mark will ever be exceeded). Given this population forecast, the question as to the *Limits to Growth*, raised by the Club of Rome in the early 1970s, is more relevant than ever. How can the co-existence of nine billion people ever be managed, how can they be fed and their basic needs satisfied without disturbing the balance of the planet? Mountains of plastic waste in the ocean, soil erosion, loss of biodiversity and wide-ranging deforestation are already visible warning signs that the rapid growth and development of recent decades has been at the expense of the environment. The hallmark of the Anthropocene is, after all, that we are no longer merely a part of nature but that we, ourselves, influence nature. Humankind is going to have to get used to global climate change. While climate change has always occurred throughout history, the fact that it is essentially caused by or exacerbated by humans is something new. However, we can also draw the optimistic conclusion that humanity is able to pull itself out of the swamp as it were. Just as, from the mid-1970s, the threat from chlorofluorocarbons (CFCs) was first identified, resulting in the 1990 London Convention for the Protection of the Ozone Layer banning greenhouse gases from 2000 onwards, humankind is able to react to the climate change it has caused. The main causes are well known: vehicle emissions and bovine methane gas emissions

- ◆ Population explosion, climate change, the formation of new centers of economic activity and ever accelerating technological change will – alongside the barely predictable armed conflicts – be the factors that redefine the *migration streams* of the future. In addition to the targeted and politically coordinated influx of highly qualified immigrants onto the global employment markets, there will continue to be considerable migration of economic migrants fleeing poverty and heading for Europe or leaving South and Central America and heading for the USA. Migration from east to west and from south to north is, however, gradually being replaced by a migration of young and rapidly growing populace from the countries of Southern Asia, the Middle East as well as North Africa and the countries of Sub-Saharan Africa towards the world's new centers of economic activity, which will increasingly be located in Asia and Africa, too. The destinations of these migratory movements are thus changing in line with global shifts in political and economic significance. It is not yet clear how the West – especially Europe, which has to prepare itself for increasingly ethnically

diverse societies – will manage, by successfully integrating this migrant populace, to slow down its relative decline in significance, if not even to reverse this trend completely.

♦ *Urbanization* is set to continue. The twenty-three megacities listed by the UN in 2010 will be joined by a further fourteen by 2025, including Cairo and Kinshasa in Africa, Wuhan and Tianjin in China, Bangalore and Hyderabad in India, Colombia's Bogotá in South America etc. These new metropolises will eclipse everything we know so far. If the Chinese government's plan to meld nine cities into one in the Pearl River Delta succeeds, we will see the emergence of a megalopolis that will be home to some 65 million inhabitants. America's National Intelligence Council forecasts that 80 percent of economic growth will be generated in urban centers; Africa will gradually succeed Asia as the region with the highest growth rate of urbanization. The challenges for urban planning, transport planning, for supply and disposal systems, crime prevention etc are evident. On the other hand, this development means that more agricultural land is being created, which enables more people to be fed. The Malthusian trap that we described in the Prologue is not about to snap shut in the 21st century.

♦ Since 1990 alone worldwide life expectancy has increased by six years – thanks to medical progress it will continue to increase. The number of centenarians in the world is set to increase tenfold by 2050 to 3.2 million. The ageing society has different residential requirements, different consumer and leisure behavior but also different illnesses. The epidemics of the 19th century such as cholera and childbed fever have been tackled successfully; the greying society has to overcome *new epidemics* such as Alzheimer's, dementia and Parkinson's disease. On the other hand, changes in behavior when it comes to working, eating and exercising in industrialized society have brought new challenges for healthcare policy: nowadays one third of the global population can be considered obese. Diabetes, cancer and cardio-vascular diseases are among the diseases of the civilized world that are already threatening to spread through some developing countries even before the level of prosperity in these countries has come anywhere near that enjoyed in western countries. Finally, we cannot rule out diseases such as tuberculosis and malaria, long since thought to have been eradicated, re-emerging on a wide scale in the west. All these diseases require massive resources, both financial and healthcare, and they will thus place an immense strain on both healthcare and nursing care systems.

♦ In the future, *energy and raw materials* will determine power more than ever. It was the substitution of muscle for machine power that made the jump in global population numbers in the 19th and 20th centuries possible – and with it, the means to feed them. This development was, however, thanks to fossil

fuels and our oil and gas resources are now depleted. Despite new, improved methods of drilling for oil and gas, it can be assumed that these fuels will have been replaced by new forms of energy and technologies by the end of the 21st century. While the solar energy that is potentially available will be sufficient to meet our energy needs, it is not yet clear how this energy “turning point” will be mastered – by whom, where and with which distribution strategies. Given the anticipated rise in the global middle classes from two billion people today to five billion by the middle of the century, one of the greatest challenges facing the world’s population will be how to supply these people with clean drinking water. The World Economic Forum considers a crisis in drinking water supply to be one of the five greatest threats of the future: by 2030 demand may exceed supply by over 40 per cent.

- ♦ As a consequence of digitalization, as well as of the nano- and bio-technological revolution, the world of employment will change so rapidly that entire occupational and professional groups will disappear within one single generation. It is doubtful whether the literacy of future generations will be as widespread as it is in current western societies. One thing is certain: the contemporary western *education system*, whose content, rhythms and didactical methods were conceived in the 18th century, will have to change radically if it is to enable as many people as possible to benefit from the opportunities offered by the digital age. Solving the problems of the future requires fundamentally different approaches. Theories of complexity and interdependence have demonstrated that the solutions of yesterday cannot be applied to problems of tomorrow. Emergence theory has provided an academic and scientific basis for the realization that the whole is more than the sum of its parts and for the understanding of collective intelligence. Considerable and systematic endeavors in research and the sciences are required to master all these challenges. The aim of education must be to provide as many people as possible with lifelong learning and equip them with the means to adjust to the rapidly changing circumstances in which they find themselves. Equality of outcomes will, on the other hand, remain a pipe dream.

- ♦ Industrial production will be revolutionized, 3-D printing, and the opportunities for individualization that it brings with it, is only the beginning. In this context it is reasonable to speak of a *fourth industrial revolution*: after the steam engine, the assembly line and electronics, the networking of objects is now the main focus. In production, machines are not only able to recognize the wear and tear on components themselves, but they can also initiate the order of the spare part at the same time. In agriculture, the romance of the farmyard may still exist in children’s fiction but, in practice, satellite-controlled combine harvesters and milking robots are the norm. This also puts traditional economic sectors under pressure. New providers are

challenging the seemingly unsinkable giants of industry and commerce. In 2114, the rankings of the world's largest corporations will no longer have much in common with those of 2014, where energy and commerce dominate. The rise, fall and resurgence of corporations will happen more quickly than the transformation of nation states.

♦ Even today, we are witnessing the emergence of an economy that has data as a central currency. The digital leviathans such as Google, Facebook and Amazon possess a treasure trove of knowledge about their users, who shop, debate and gather information online – and, whilst doing so, pay with information about themselves. The NSA scandal, exposed by the former NSA employee Edward Snowden, has demonstrated the potential for surveillance and abuse that has gone hand in hand with this development. The dangers of the *concentration of power* and manipulation are obvious. The fears of George Orwell in his book 1984 appear harmless by comparison. In the age of Big Data, the correlation of data is noticeably more important than the causality. Making citizens more aware of these processes, making control over this data transparent, preventing the emergence of data monopolies – the duties and responsibilities of politics in this regard in the next century are as evident as they are complex.

♦ The advance of new means of payment – from plastic money to electronic money – will continue to both speed up and change our economic and financial lives. As outlined in the Prologue, the financial system will remain fragile. It has been thrown out of joint and continues to be dominated by the dollar, which, in turn, continues to exploit its exorbitant privilege. Massive liquidity, untrammelled movements of capital and huge debt have allowed many bubbles to form which have not all yet burst. The consequence is stagnation, perhaps even deflation, but certainly lower growth. All this makes it more difficult to tackle poverty and creates additional poverty; the risk of rising unemployment is high. The citizens of many countries are threatened with poverty in old age because the funding of retirement provision and health services is linked to economic growth. Many societies will have grown old without ever becoming prosperous. The years and decades to come will thus be characterized by the attempt to find a new order for the global financial system, as proposed by former Chairman of the Federal Reserve Paul Volcker when he called for a new Bretton Woods.

♦ Deadlier and *deadlier weapons* falling into the hands of terrorists – this will be one of the main threats to world peace in the next century. What used to be a monopoly of the state is increasingly falling into the hands of small groups: precision-guided missiles, remote-controlled stealth drones, cyber-weapons, bi-terrorism. Some of them will be able to inflict unspeakable damage and destruction. Asymmetric warfare will be a characteristic of the armed conflicts

EPILOGUE

of the future. The shooting down of a civilian Malaysian Airlines aircraft over Eastern Ukraine in July 2014, with almost 300 casualties is just one extreme example that this development is already with us. The disappearance of an aircraft belonging to the same airline (MH 370) a few months previously also remains a mystery.

One central question arches above all these questions: how can we manage access to raw materials, to the labor market, to healthcare, to the social state, to mobility, to digital infrastructure, indeed even to culture in a way that is as fair as possible and on a global scale? Both within nation states and when comparing the regions of the world we find provocative inequalities in terms of opportunity. The greatest inequalities arise as a result of differing access to education. Stable societies need a minimum degree of fair equilibrium, of solidarity and of stakeholder participation; this is true for both tangibles and intangibles. Achieving this will be the greatest political challenge of the next century.