American anticipations

Accelerating towards the future, 1900–1945

I. F. Clarke

The first half of the 20th century has seen some of the most far-reaching changes in the history of Western civilization, or for that matter in the history of all mankind. Many of these changes have had their origins in the USA, for the technological inventiveness of the Americans—Thomas Alva Edison and Henry Ford, for instance—has had effect throughout the planet. As this article argues, the exceptional and often spectacular success of American technology reinforced the idea of progress in the USA—the expectation that nations can always have their economic cakes and eat them. That optimistic belief managed to survive the worst years of the Depression, rather like the walking wounded of the First World War. And then came the supreme triumph of Western science and American technology—the first Atom Bomb. The USA and the world became central figures in the first act of a new Greek tragedy—exulting in the moment of victory but totally ignorant of what the Fates had predicted for their future.

By the beginning of the 20th century, as they said at the time, the USA had come of age. Only one generation on from the first centennial celebrations of the Declaration of Independence all the signs pointed to a future of continued material improvement and of growing industrial expansion. The Americans had every right to congratulate themselves on their quite exceptional achievements. They entered the new century as the richest nation in the world and they had become the principal industrial power. As one European observer noted in 1904, the Americans owed their success to a most fortunate combination of vast natural resources and a boundless confidence in their ability to shape their own destinies:[1]

I. F. Clarke was the Foundation Professor of English Studies in the University of Strathclyde, Glasgow. He is an authority of what is now called the history of the future, and has recently lectured to audiences in India on this subject.

> The Americans are filled with such an implicit and absolute confidence in their Union and in their future success, that any remark other than laudatory is unacceptable to the majority of them. We have had innumerable opportunities of hearing public speakers in America cast doubts upon the very existence of God and of Providence, question the historic nature of veracity of the whole fabric of Christianity, but never has it been our fortune to catch the slightest whisper of doubt, the slightest want of faith, in the chief god of America—unbounded belief in the future of America.

How could Americans show the slightest want of faith in the future of their country? Their most powerful myths spoke to them of the future—of enterprise, courage, energy, opportunity, and the decisions that lead to fame and fortune. Their most successful citizens—by one assessment—were entrepreneurs on a scale never seen before. Even more important, they were conspicuous examples of what men could do for them-

selves without any advantages of birth or inherited wealth. Andrew Carnegie, the weaver's son from Dunfermline in Scotland, created the US steel industry and then retired at 65 to spend his last 18 years in using his enormous fortune to endow public libraries. And there was John D. Rockefeller, the clever bookkeeper from Cleveland. He retired from Standard Oil in 1895, the first billionaire in American history, and he dedicated himself to giving away the $520 million he had acquired after smashing all opposition in the US oil industry.

In the first quarter of the 20th century the future lay all before the Americans. They had inherited, and were adding to, a potent imagery that revealed the world-changing powers of organization and mechanism. In the soaring skyscrapers of Chicago and New York they could see compelling evidence of the American capacity for innovation; for those spectacular constructions were, as Lewis Mumford says, '*expressions of the power and order that were inherent in the new mechanical complex.*'[2] They knew that maritime technology had offered the first colonists the great wilderness for the taking; and throughout the 19th century they had seen how the technologies of the steamship and the railroad had promised an ampler life to all who were prepared to cross the Atlantic. One portent of their future had been a major attraction at the Great Exhibition of 1851. It was the new mechanical reaper recently invented by Cyrus McCormick; it could do the work of five men, and in the opinion of *The Times* it was 'the most valuable contribution from abroad'. By the 1860s the McCormick factory in Chicago was producing 4000 machines a year. By the end of the century the new agricultural machinery—reapers, threshers, binders, combines—had helped to bring 400 million acres of new land under cultivation in the Midwest. As the advert explained: 'Westward the Course of Empire takes its Way with McCormick Reapers in the Van'. The machine had turned farming into an industry.

Genesis factor

This Genesis-factor, the ability to transform the human condition, was the core of the characteristic American belief that, even if the technological utopia might not arrive overnight, more and better inventions would certainly lead to a more abundant life. The notion that the entire nation was pressing forward in a glorious march of time owed much to the intensely personalizing policies of the American press. At every opportunity their newspapers and magazines would concentrate on the lives and the spectacular discoveries of American inventors. Editors delighted in men like Alexander Graham Bell who patented the first commercial telephone; George Eastman who gave the world the Kodak box camera; Isaac Singer who produced the first practical sewing machine; and so on to Frederick Winslow Taylor, a favourite with the press, who was a prime mover in the then new technologies of scientific management.

In those far-off days at the beginning of the 20th century, before the science correspondents knew that technological advances could generate their own problems, the press employed a special vocabulary—*first, biggest, fastest, most efficient*—in their accounts of the major scientific developments. As any editor might have said: If Edison, Henry Ford, and the Wright brothers had not existed, we would have invented them. Their astonishing achievements were read as confirmation of a God-given American capacity to change the world and as proof that there was a limitless future of technological progress waiting for exploitation. Indeed, their lives were often presented as modern illustrations of the old American belief that exceptional individuals control the course of human events. Thomas Alva Edison, for instance, displayed in an exemplary way the fruitful results of know-how and persistence. His education was brief—three months in a primary school—and then a series of jobs which led to a post as a telegraph operator at the age of 15. After

that the inventions began: the ticker-tape machine, the long-distance telephone, the lighting of the world with his carbon filament lamp, the beginning of the recording industry with his phonograph, and a major advance in cinematography with his kinetoscope. To the press Edison was the Wizard of Menlo Park,[3] the archetypal genius who knew how to shape the world of tomorrow in his laboratory.

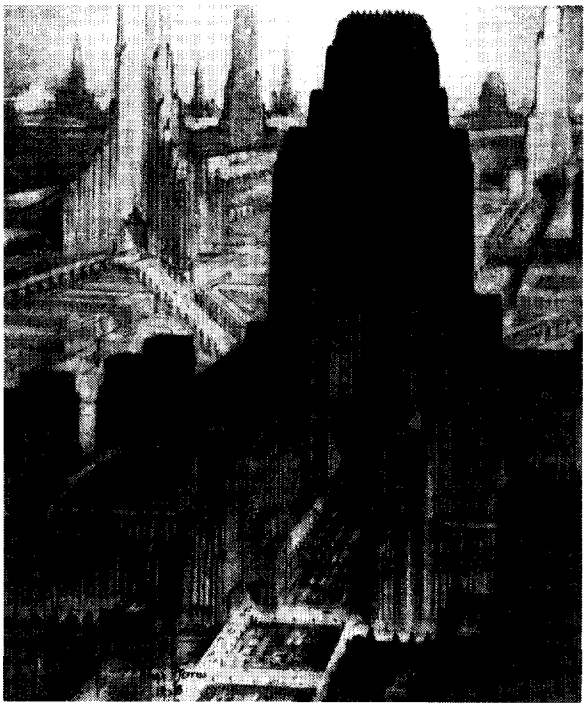
The same prodigious enterprise marked all the works of that other contemporary world-changer, Henry Ford. The press marvelled at the speed and efficiency of his assembly line techniques and at the low cost of his automobiles—$950 in 1913, $290 without a starter in 1924. The popular papers could not have enough of the man who announced the start of work on the Model-T in 1908 with the magnificent headline statement: 'I will build a motor car for the great multitude.' To the masses he was the folk hero who changed the lives of millions; and for the historians he was the technological genius who changed the economic and social condition of the USA in 20 years. *Fordism* was the word they coined for the system that produced the Model-T; and it was not until 1926, when Ford himself wrote the magisterial article on 'Mass Production' for the *Encyclopedia Britannica* (13th ed), that the modern term came into general use. New ideas from a new world.

The creative abilities of men like Edison and Ford confirmed belief in the American ideology of the constantly expanding future. This sanguine expectation was front-page material in the numerous popular-science magazines that have always filled a major section of the American press.[4] They gave their readers the most recent information about current progress in the sciences and technologies; and they provided illustrations that often conveyed in dynamic detail the power or the complexity of engineering works. Most influential of them all was the old *Scientific American* in the days before it became a high-brow journal. There was no comparable English-language publication that could match it for the range of information, the clarity of the explanations and reports, and the admirable line drawings which presented the new machines, bridges, railroads, and projected flying machines—everything from unsinkable ships and designs for the Chicago elevated railway to proposals for 'The Tunnel under the British Channel'. The many readers of these publications could have had no doubts about the marvellous possibilities of the future. Indeed, a modern American writer is convinced that these popular magazines played an important part in the transmission and the shaping of ideas about the future:[5]

> These periodicals, which spread information about recent scientific and technical developments and published numerous how-to-do-it and how-it-works articles, also inculcated the philosophy of social progress through technological change in frequent pieces about the future. Articles with titles such as 'Miracles You'll See in the Next Fifty Years' contained provocative illustrations of a future world in which ingenious structures, appliances, weapons, vehicles, and other machines would solve virtually every human problem.

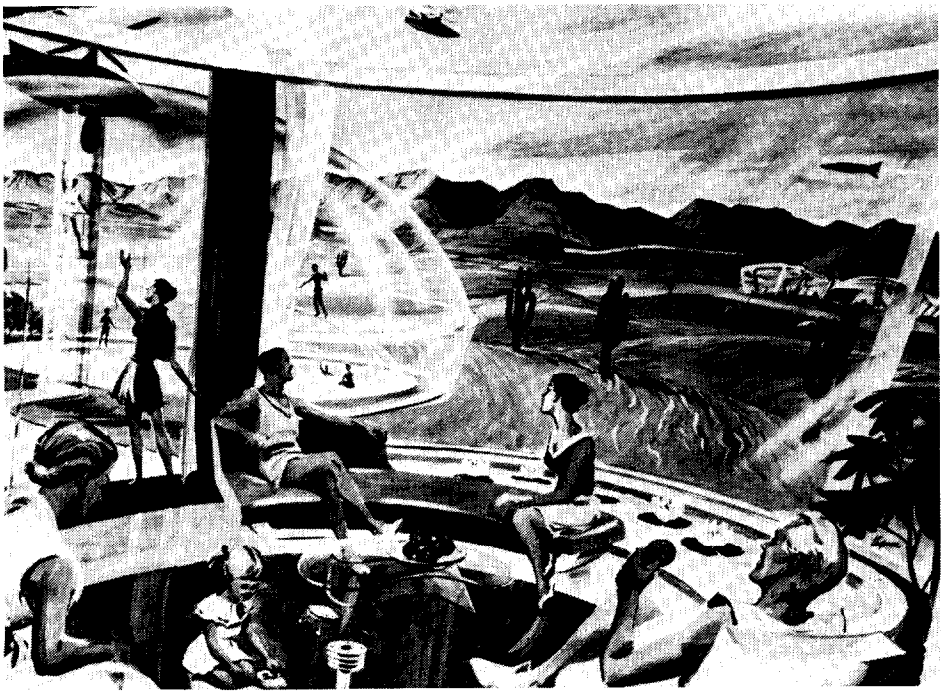
These expectations have their musical equivalent in the triumphant last movement of Dvorak's *Symphony from the New World.* The jubilant trumpets proclaim the energy, power, and the hopefulness of life in the USA at the turn of the century. The vastness and variety of the country—forests, plains, cities—are recurrent themes in the music; for the Czech director of the National Conservatory in New York (1892–95) had perceived how geography and history had furnished dominant ideas about space and time for everyman's home-made American philosophy.

These most persuasive ideas gave motive and direction to the lives of many Americans. For example, they shaped the thinking of Wendell Willkie, the man who might have beaten Roosevelt to the



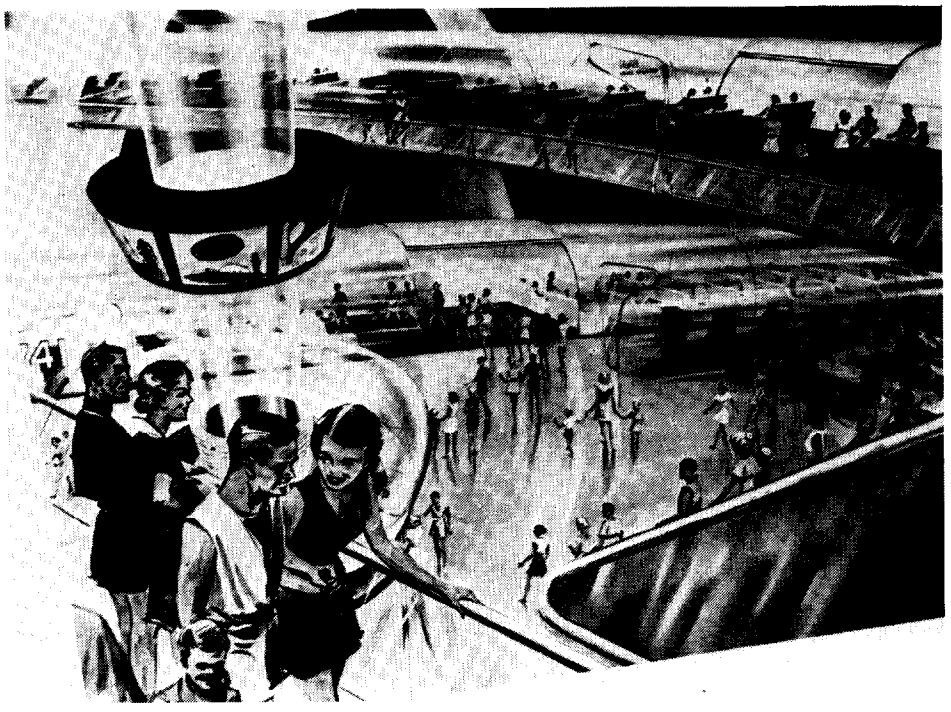
Visionary architecture of the 1930s—New York renewed in the designs of Hugh Ferriss . . .

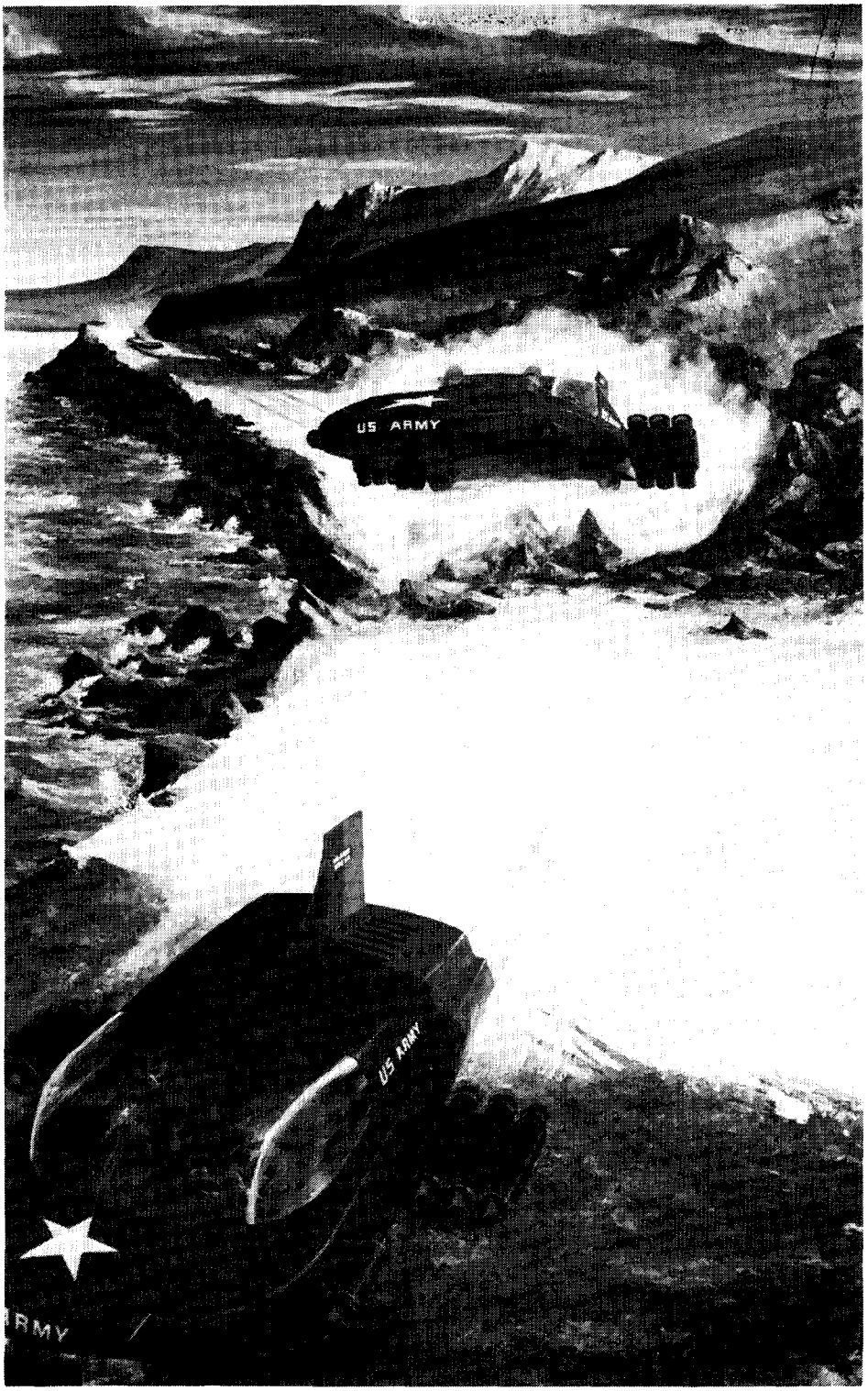
. . . and bridges raised well above contemporary levels.



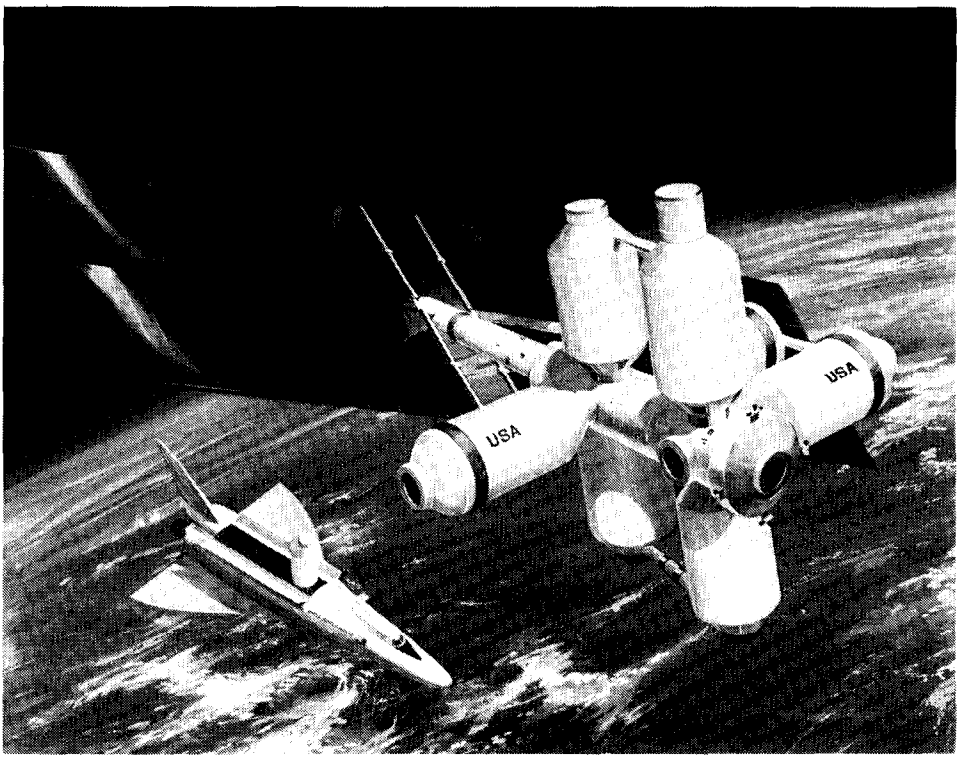
These projections of the ideal city . . .

. . . speak for themselves.



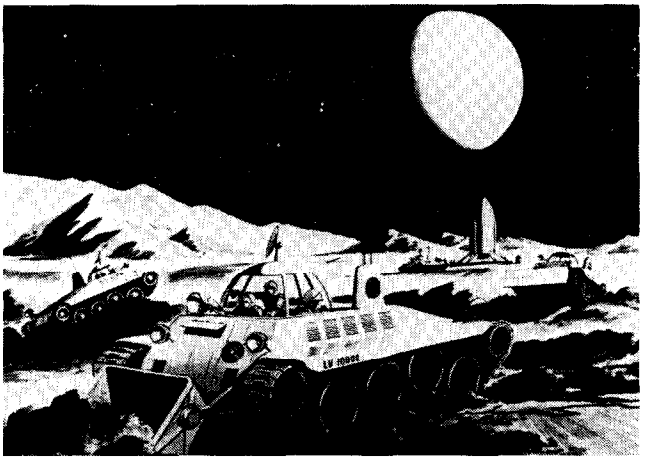


Recent projections of future warfare include the US Army anticipation of the jet-boosted jeep.



There is the fact of planned orbiting space stations . . .

. . . and there is the fiction that might become fact—lunar bulldozers at work.



White House in 1940. In death he found the ideal opportunity to carry on telling the world the reasons that made him say: 'I believe in America'. The visitor to his burial place at Rushville, Indiana, can see the inscription that sets out his reasons and beliefs. They end with affirmations of faith in the future that the Americans can have for the making: 'Because we are blessed with a natural and varied abundance. Because we have great dreams and because we have the opportunity to make those dreams come true.' No doubt Willkie had in mind the unstoppable advance to the Pacific which created a vast continental empire. Perhaps he recalled hearing of the time when he was an infant, when the frontier had vanished into settlements and the Americans began moving across the seas: in 1897 they annexed Hawaii, and after a brief war with Spain in 1898 they acquired Puerto Rico, Guam, and the Philippines. 'In no other country in the world', so an American historian writes, 'was expansion conceived to be as natural and as inevitable a part of the fulfilment of a nation's destiny as it was in America.'[6]

Changing future

Despite all their visions and expectations of what-would-be, the destiny of the USA proved as unknowable for the Americans as the future of the European nations was beyond the reach of their own prophets in the decade before the first world war. As the colossal engineering works on the Panama Canal went steadily forward and on schedule for the opening date in 1914, few could foresee how the coming war in Europe would inevitably involve the USA. By the time that the U-Boat sinkings and the stupendous artillery bombardments at Verdun had revealed the frightful power of modern armaments, many Americans were beginning to realize that part of their great dream about the future—growth, security, tranquillity—had been a wish-fulfilment fantasy. The world had changed with the new technologies, and the Americans had perforce to change their ideas about their future. The Atlantic was no longer the great barrier it had once been, and it was conceivable that the Royal Navy might not continue for ever as a sure bulwark against any hostile expeditions across the ocean. As the war dragged on in Europe, many Americans came to see that the USA could no longer exist in a vacuum, sealed off from the great turmoils outside. They began to accept what Admiral Mahan, the historian of sea power, had told them 20 years before in *The Interest of America in Sea Power* (1897) and had repeated more forcefully in *The Intereset of America in International Conditions* (1910). His message was: 'Whether they will or no, Americans must begin to look outward.'

By 1915 looking outward had come to mean considering a future Europe that might conceivably be dominated by a victorious and aggressive Germany. So, American writers responded to that possibility, as the British had done before them at the time of the Franco–German War of 1870, by generating their own admonitory tales of invasion and disaster. The American publisher, George Putnam, made that point in the preface he wrote in 1915 for Bernard Walker's *America Fallen! The Sequel to the European War.* Putnam drew on the example of Chesney's celebrated prototype, *The Battle of Dorking* (1871), to argue the case for American military preparedness. There was another preface by Cleveland Moffett to his tale of *The Conquest of America* (1916), 18 pages addressed 'To My Fellow Americans', in which the author proposed 'to give an idea of what might happen to America, being defenceless as at present, if she should be attacked, say at the close of the great European war, by a mighty and victorious power like Germany.' The beginning of the solution came in one word—conscription. The rest followed in the detailed, merciless demonstration of American

failures during the great German invasion of 1921. The story is devoted to convincing the American reader that the future will be different, that there can be no turning back from the new international realities. Of course, the Americans manage to defeat the Germans in the end, and the author gives his views to the nation through the person of the victorious American general:[7]

> I assure you, gentlemen, it is madness for us to count upon continued deliverance from the war peril because in the past we have been lucky, because in the past wide seas have guarded us, because in the past our enemies have quarrelled among themselves, or because American resourcefulness and ingenuity have been equal to sudden emergencies. To permanently base our hopes of national safety and integrity upon such grounds is to choose the course adopted by China and to invite for our descendants the humiliating fate that finally overwhelmed China. . . .

That warning came in the year they elected Woodrow Wilson to a second term of office as President of the USA. By then the intensified German submarine campaign had caused Wilson to change his mind about the future role of his country. Isolationism and neutralism were slipping away. 'American cannot be an ostrich with its head in ths sand,' Wilson told the country. The phrase signalled the beginning of a profound change in the attitude of Americans to their role in the world and especially to their understanding of their destiny as a nation. The world was shrinking with the spread of the communication technologies. They worked their effect everywhere—cancelling the significance of frontiers, herding the nations into even closer contact with one another, calling in the new world to adjust the balance of the old.

When the USA declared war on Germany, 2 April 1917, there was a major shift in the pattern of expectation everywhere. In the November of that year the arch-prophet of the future, H. G. Wells, drafted a long letter for the attention of the President. His main point was that the belligerent nations had to be guided to a peaceful future, and that it was 'from America alone that the lead can come which will take mankind out of this war.' Talk about a future League of Nations made no sense, Wells wrote, if there was not to be a supranational authority. His hopes centred on enlightened American action:[8]

> America in the last three years has made great strides from its traditional isolation towards a responsible share in framing the common destinies of mankind. But America has to travel further on the same road. The future of America is now manifestly bound up with the peace of Europe, for that peace cannot be secured unless these sources of contention in the supply of tropical raw material and in the transport and trading facilities of the world are so controlled as to be no longer sources of contention.

The Wellsian proposition about 'the future of America' was the first of three major challenges that the USA has had to face in the 20th century—the League of Nations, the Great Depression, and the consequences of the Second World War. Unfortunately for the world the Americans could not bring themselves to accept the future role in world affairs that Woodrow Wilson set before them. The Congress of the USA refused to subscribe to the Covenant of the League which offered all its members the opportunity to collaborate for the future well-being of the nations: 'In order to promote international co-operation and to achieve international peace and security, by the acceptance of the obligation not to resort to war . . .' After all the undoubted idealism, the foresightedness and dedication of so many Americans, Congress made a sad ending to what might have been. The exultant notes of *The Yanks are Coming* fell flat. Faced with a choice about the future role of their nation, Americans turned to the known certainties of the past, to the comforting visions of a by-gone USA in the days when the Union could steer its own

course well clear of any dangerous foreign entanglements.

The Americans chose to make their own way through the booming, optimistic years of the 1920s. For them it was a time of steady economic progress—automobiles, new highways, mail-order catalogues, radios, refrigerators, cinemas. The American way of life was a certain formula for success. After all, the first man to make a solo flight across the Atlantic was an American. And yet, by the time Charles Lindbergh landed at Le Bourget, 20 May 1927, some Americans were growing anxious about the future stability of their finance system. The reality turned out to be far worse than they had ever imagined—the Wall Street Crash in 1929 and the Recession of 1929–30 which grew into the Great Depression. By the winter of 1932–33 one-quarter of the workforce was unemployed, factory output had dropped by three-quarters, and the land of opportunity seemed to be facing the worst of all possible futures since the outbreak of the Civil War. All the images —the breadline, soup kitchens, homeless Veterans, squalid Hoovervilles—all were warning signs of a fearful future.

The most menacing symbol of all appeared like an Old Testament punishment on the newsreels of the cinemas. In the dry summer of 1934 all could see the winds that were turning the fertile Midwest into the Dust Bowl. That disaster seemed, in particular, to deny all the hopes that Americans had so long and so ardently entertained for their country. Millions moved away in search of land and a living. John Steinbeck set it all down in *The Grapes of Wrath*, in his account of the ordinary men and women who despaired of the future:[9]

> And then the dispossessed were drawn west —from Kansas, Oklahoma, Texas, New Mexico; from Nevada and Arkansas, families, tribes, dusted out, tractored out. Car-loads, caravans, homeless and hungry; twenty thousand and fifty thousand and a hundred thousand and two hundred thousand. They streamed over the mountains, hungry and restless—restless as ants, scurrying to find work to do—to lift, to push, to pull, to pick, to cut—anything, any burden to bear, for food. Like ants scurrying for work, for food, and most of all for land.

New Deal

It was a cruel and testing time for the Americans—an experience which had no place in their popular mythology of the future. However, the change in their fortunes began in November 1932, when they elected a man of great energy and administrative ability to be their 32nd President. As soon as Franklin Delano Roosevelt had delivered his inaugural address to the nation on 4 March 1933, he began to push a series of radical measures through Congress. It was the beginning of the New Deal, the start of pragmatic planning decisions that aimed at the future recovery of the nation. One early success came when Roosevelt took the USA off the gold standard; and in doing this he was following the theories of the Cambridge economist, John Maynard Keynes.

The first formulation of Keynesian economics had appeared in *A Treatise on Money* (1930), where Keynes had argued that the cure for a failing economy was massive state spending and maximum tax reductions. According to Elliott Roosevelt, that revolutionary proposition had come to Roosevelt by way of William Waldorf Astor, husband of the formidable Nancy Astor, MP. The son reports:[10]

> A brain as nimble as father's found Keynes' unorthodoxy fascinating, much more so than the staider views of most American economists. My parent regarded the Wall Street crash as the inevitable finale to an era in history. In April, 1933, he had no clear-cut idea of what the next chapter might be, but he was already feeling his way to the maxim that 'recovery is not enough.' He cast around for practical means of restoring economic health to the patient without pretending to himself or the people that he had yet found the answers . . . But inflation was worth a try; it might work like a shot of adrenalin to stimulate the

heartbeat of the economy. A surefire method of forcing up prices would be to devalue the dollar. How to manage that? By abandoning the so-called gold standard . . .

It was not quite the seemingly chance decision that Elliott Roosevelt records. The plan developed out of the growing body of accurate information about the dynamics of society that had been accumulating ever since the First World War. As earlier articles have sought to show, the unprecedented scale of the war had led to almost total disruption between the old expectations of the future and the new forecasts of what the nations would have to face. The accelerating growth of the technologies, the more extensive application of statistical methods in government departments, the increasing numbers of sociological surveys, and the inescapable questions about the economic prospects of the nations—these were major factors that directed the attention towards the future.

Chicago sociologists

The writings of John Maynard Keynes offered one way out of the dilemmas of the Depression. At the same time the investigations of some sociologists provided important indications of the strengths and weakness of the nation. In 1929 Hoover had appointed the President's Research Committee on Social Trends—a determined attempt to arrive at a clear view of the potentialities and possibilities of the economy. The findings of the committee—the first of its kind—came out after Roosevelt's election as the *Report of the President's Research Committee on Social Trends*. This invaluable source of information owed much to the research carried out by the Department of Sociology in the University of Chicago and especially to the work of William Fielding Ogburn who directed the committee.[11]

During the early postwar years Ogburn had become keenly aware, both as a sociologist and as a citizen, of the many ways in which changes in one sector of society can affect the whole nation. In 1922 he published an early classic in the field of investigative sociology, *Social Change with Respect to Culture and Original Nature*. There he emphasized the crucial role of inventions and discoveries, and he introduced the concept of *cultural lag*, or, as the layman would say, the failure to keep up with the times. Under his direction at Chicago sociologists turned their attention to the measurement and quantification—statistical and descriptive—of the changes taking place in the family, population, communications, industry. In 1929 he collected their findings in the publication *Recent Social Changes in the United States since the War, and particularly in 1927*. It was the first of a series of regular reports which noted what was going on in the nation. Part of Ogburn's thinking was the interest of a sociologist in people and social systems; and part was the old pioneer desire to know what in order to know how. One of his statements in the 1929 publication is central to the evolutions of futures thinking in the USA:[12]

> The social sciences ought to render aid in these times of change and uncertainty. Unfortunately as sciences they are young. Indeed, their achievements in the exact measurement of the relationship of social phenomena are meager, too much so for reliable prediction. Nor do we know that the social sciences will ever attain the state of accurate prediction in the whole realm of sociology. But one generalization does stand out sharply in our social and historical studies. It is that there is a continuity in social change; one event grows out of another. An invention is a co-ordination of existing elements. Discoveries are based on previous knowledge . . . Our various studies of statistical time series show a very important thing, namely that the measured trend of events and phenomena is the best guide we yet have to prediction of the future.

Ogburn and his associates created a pool of information about movement and change in American society, and this provided the raw material for predictions

of future developments. Ogburn's recommendations help to improve the data-collecting system of the US census, and he played a leading part in the National Resources Committee. In 1937 that body published their report on *Technological Trends and National Policy: Including the Social Implications of New Inventions*. This voluminous and valuable study pointed to the eternal necessity in any advanced technological society of preparing for the future consequences of tomorrow's developments. In effect, they were suggesting that the future is far too complicated to be left to politicians. In fact, had the American politicians read and acted on the recommendations of the report, they might have prepared the nation for the social and economic problems that would follow—and did follow—from the mechanization of the cotton industry in the South.

Progress, USA

Not even the Depression could shake the inherited optimism of many Americans. In the year when the world was learning how to read progress backwards in the black projections of Huxley's *Brave New World*, the popular-science magazines continued to report on the good things to come. Indeed, in December 1932 a new monthly magazine appeared in New York with a title which meant exactly what it said—*Progress*. In the first number the editor told his readers that 'year after year, century after century, the march of civilization goes forward. That is Progress. Some go out as scouts to blaze the way. Others follow to make the road.' The more encouraging news for the marchers appeared under *Progress-O-Grams*, or 'Snapshots of Progress on Many Fronts': bricks from sawdust, the future of television, direct seaplane flights to Europe, the 100 mph Super-highway, the delights of the plastic age. Reports of this kind reinforced the dominant belief that technological advances would always improve the quality and convenience of life. The most powerful idea, for instance, decided the style of all the major displays at the Chicago Exhibition of 1933–34. The repeated image presented to the visitors to the Century of Progress Exposition was the vision of benign technologies ceaselessly working for an ever-advancing America. The pavilions and demonstrations were, in fact, the nearest designers have ever come—the cinema apart—to giving the public the right of entry to the ideal world of the future. What the visitors saw was to the eye more real and more certain than anything they may have read in the old literary utopias. They looked on the future and they saw that it would work. An American writer has this to say:[13]

> The transition from the literary presentations of utopian visions to their actualization in visual form was made possible by the physicality of world's fairs as architectural creations, by the attitude towards technology in the United States in the 1930s, and by the activity of industrial designers. In the first place, these fairs existed as tangible, three-dimensional realities. Second, the technocracy crusade of the 1930s and the engineering ethos it embraced heightened the perception of utopias as feasible. To the adherents of technocracy, engineers were capable of solving all problems with despatch, and technology was capable of creating a perfect society.

In the 1930s, however, Americans had some grounds for continuing to think that technology might yet bring in the millennium. In sharp contrast to the great variation in European utopias of the future, the American scheme for the ideal state had always been decidedly technological. The earliest of them had the appropriate title of *The Paradise within the Reach of All Men* (1833), and the author, J. A. Etzler, promised the reader 'to show the means for creating a paradise within ten years, where everything desirable for human life may be had for every man in superabundance.' That promise informed most of the American utopias of the future up to the great divide of the Second World War.

Their authors generally started from the proposition that the unity, power and prosperity of the nation had come from the great works of technology.

The reflection of that belief shows in the proliferation of science fiction magazines in the USA during the 1930s and in the mass readership for the comic strip wonder-men: Buck Rogers, Captain Future, Doc Savage, Flash Gordon, and the everlasting hero—Superman. They were prime candidates for the perfect time machine of the cinema. Ageing readers may recall the most famous serial films of the 1930s, when Buster Crabbe in the role of Flash Gordon battled through 13 episodes against Ming the Merciless and then re-appeared as Flash Gordon to fight the Zuggs of Saturn in 12 rounds of inter-planetary mayhem. For the 1930s they represented the marvels of technology at their most perfect.

In the worst years of the Depression even the most pessimistic Americans could see that Roosevelt's Public Works Administration (PWA) had set the engineers to work on the construction of roads, bridges, and dams. Today's tourists who follow the series of causeways that link Miami with Key West have the PWA to thank for the road and bridge system that makes their journey possible. If those tourists travel West to the borders of Arizona and Nevada, they can contemplate one of the great engineering projects of the 20th century —the Hoover Dam, begun in 1931, last concrete poured in 1935 two years ahead of schedule, dedicated by President Roosevelt on 30 September 1935. It had no precedent; it was the greatest dam of the period and is still the highest concrete dam in the Western Hemisphere.

An even more spectacular demonstration of technological progress and economic planning was the work of the Tennessee Valley Authority. It took on the immense task of controlling the floods and improving the land in some 40000 square miles of the watershed, providing hydroelectric power for the subsequent developments, creating new forests, setting up new industries. These extraordinary enterprises spoke to the nation of technology at its most perfect and most utopian—changing the face of the earth for the benefit of the people. One entirely unforeseeable consequence of the TVA scheme was the making of the atomic bomb. Had it not been for the great quantities of electricity the system produced, it is probable that the USA would never have had enough power to carry through the Manhattan Project. Success came, as predicted, at 05.29 hours on the morning of 16 July 1945 at the Alamogordo bombing range. The first atomic bomb in human history exploded in an eruption of red soil and incandescent light. As the mushroom cloud rose in the blue sky, Robert Oppenheimer thought of the words of Vishnu in the *Bhaqavad Ghita*: 'I am become Death, the Destroyer of Worlds.' In an instant the greatest of modern technological creations had changed the shape of the future for all mankind.

References

1. Emil Reich, *Success Among Nations*, 1904, pages 244–245.
2. Lewis Mumford, *The Culture of Cities* (1938), 1944, page 209. Italics as in the original text.
3. Edison was also the prototype of the inventor-genius in contemporary science fiction stories: eg in *L'Eve future* (1886) Villiers de l'Isle-Adam uses Edison to create an android. Garret P. Serviss went much further in *Edison's Conquest of Mars* (1898).
4. The more important of these were: *Electrical World, Electrical Experimenter* (later *Science & Invention*), *Mechanix Illustrated, Popular Science Monthly, Scientific American.*
5. Joseph J. Corn, ed, *Imagining Tomorrow*, 1986, page 5.
6. Stephen Kern, *The Culture of Time and Space, 1880–1918*, 1983, page 239.
7. Cleveland Moffett, *The Conquest of America*, 1916, page 308.

8. H. G. Wells, *Experiment in Autobiography*, 1934, Vol 2, page 712.
9. John Steinbeck, *The Grapes of Wrath* (1939), 1955, page 214.
10. Elliott Roosevelt and James Brough, *A Rendezvous with Destiny*, 1977, page 50.
11. See: I. F. Clarke, 'Science and Society, 1815–1945', *Futures*, February 1985, pages 57–67.
12. O. D. Duncan, *William F. Ogburn on Culture and Social Change*, 1964, page 101.
13. Folke T. Kihlstedt, 'Utopia realized: The World's Fairs of the 1930s', page 98 in Joseph J. Corn, *op cit*, reference 5.