

Ray Kurzweil - Keynote Speaker

Sample Topics, Titles, and Abstracts

Ray Kurzweil is best known for presenting a thought provoking, long-term, big picture view of the future of technology and its implications for society; explaining the exponential growth of technology (what he has termed, "The Law of Accelerating Returns") and its path towards ubiquitous computing, reverse engineering the brain, full immersion virtual reality, nanotechnology, the merging of human and machine, and ultimately extreme human life extension. He describes a bright future in which technology will provide solutions to the most pressing social, economic, and environmental problems. These ideas form the core thesis of Kurzweil's lectures and his latest book *The Singularity is Near: When Humans Transcend Biology* (Viking).

Kurzweil's presentations are relevant across many industries and fields. After gathering background information about the event, audience, and host, Kurzweil is happy to (and accustomed to) tailor his speech. He often shapes his presentations around the following topics, each described in detail below:

- Innovation, p. 4
- Health and medicine, p. 5
- Education, p. 6, 7
- Business and Investing strategy, p. 8
- Energy, p. 9, 10
- Disabilities/assistive technologies, p. 11



General:

General title examples:

The Acceleration of Technology in the 21st Century: the Impact on Business, the Economy, and Society

The Web Within Us: When Minds and Machines Become One

Science, Technology, and Invention: Strategies to Create the Future

General abstracts:

Technology and the future (brief): At the onset of the 21st century, it will be an era in which the very nature of what it means to be human will be both enriched and challenged, as our species breaks the shackles of its genetic legacy, and

achieves inconceivable heights of intelligence, material progress, and longevity. The paradigm shift rate is now doubling every decade, so the twenty-first century will see 20,000 years of progress at today's rate. Computation, communication, biological technologies (for example, DNA sequencing), brain scanning, knowledge of the human brain, and human knowledge in general are all accelerating at an even faster pace, generally doubling price-performance, capacity, and bandwidth every year. Three-dimensional molecular computing will provide the hardware for human-level "strong" AI well before 2030. The more important software insights will be gained in part from the reverse-engineering of the human brain, a process well under way. While the social and philosophical ramifications of these changes will be profound, and the threats they pose considerable, celebrated futurist Ray Kurzweil presents an inspiring vision of our ultimate destiny in which we will merge with our machines, can live forever, and are a billion times more intelligent...all within the next three to four decades.

Technology and the future (full): The paradigm shift rate is now doubling every decade, so the twenty-first century will see 20,000 years of progress at today's rate. Computation, communication, biological technologies (for example, DNA sequencing), brain scanning, knowledge of the human brain, and human knowledge in general are all accelerating at an even faster pace, generally doubling price-performance, capacity, and bandwidth every year. The well-known Moore's Law is only one example of many of the inherent acceleration underlying this "law of accelerating returns." The size of the key features of technology is also shrinking, at a rate of about 4 per linear dimension per decade. Three-dimensional molecular computing will provide the hardware for human-level "strong" AI well before 2030. The more important software insights will be gained in part from the reverse-engineering of the human brain, a process well under way.

We are rapidly learning the software programs called genes that underlie biology. We are understanding disease and aging processes as information processes, and are gaining the tools to reprogram them. RNA interference, for example, allows us to turn selected genes off, and new forms of gene therapy are enabling us to effectively add new genes. Within one to two decades, we will be in a position to stop and reverse the progression of disease and aging resulting in dramatic gains in health and longevity.

The fraction of value of products and services comprised by software and related forms of information is rapidly asymptoting to 100 percent. The deflation rate for information technologies, both hardware and software, is about 50 percent per year, providing a powerful deflationary force in the economy. The portion of the economy comprised of information technology is itself growing exponentially and within a couple of decades, the bulk of the economy will be dominated by information and software.

As information technology achieves each new level of price-performance and capacity, new applications become feasible and existing business models lose their viability. The business models for the media industries (music, movies, newspapers, magazines, television, radio) are already under siege. Medicine is now in the early stages of a profound transformation from hit or miss techniques to precise strategies that reprogram the information processes underlying disease and aging. Ultimately every industry will be transformed as it becomes increasingly subject to the law of accelerating returns. The rate of change is now so rapid that even three to five year business plans need to consider that every level of an industry will undergo major changes during that period. It is feasible, however, to precisely predict the capabilities of each form of information technology in future periods and to factor these projections into entrepreneurial plans.

Once nonbiological intelligence matches the range and subtlety of human intelligence, it will necessarily soar past it because of the continuing acceleration of information-based technologies, as well as the ability of machines to instantly share their knowledge. Intelligent nanorobots will be deeply integrated in the environment, our bodies and our brains, providing vastly extended longevity, full-immersion virtual reality incorporating all of the senses, experience "beaming," and enhanced human intelligence. The implication will be an intimate merger between the technology-creating species and the evolutionary process it spawned.

Technology and the future (questions): What is the Law of Accelerating Returns and how will it transform society? What are the challenges and opportunities of transcending biology: of nanobots, fuel cells, and bioterrorism? How will businesses manage innovation in an era of accelerating technologies? As information technology asymptotes to 100% of the value of products and services, how will business models and strategies change? When and how will human level AI be developed? How will biotechnology and nanotechnology impact our bodies and brains? When will we see full immersion virtual reality and how will it impact business? Renowned inventor, entrepreneur, best-selling author, widely sought after speaker and futurist, Ray Kurzweil will expand your mind as he shares his vision of the future.

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Innovation/Invention: As one of the leading inventors of our time, Ray was the principal developer of the first CCD flat-bed scanner, the first omni-font optical character recognition, the first print-to-speech reading machine for the blind, the first text-to-speech synthesizer, the first music synthesizer capable of recreating the grand piano and other orchestral instruments, and the first commercially marketed large-vocabulary speech recognition. In his presentations Kurzweil discusses the democratizing effects of technology, how to foster innovation in an organization, and how to bring inventions to market. He explains how the law of accelerating returns and the exponential growth of information technology are accelerating opportunities for innovation. In this talk, he draws upon his own history of innovation which led to his induction into the National Inventors Hall of Fame, founded by the U.S. Patent Office in 2002.

Innovation title examples:

The Democratization of Innovation in an Era of Accelerating Technologies

How to Manage Innovation in an Era of Accelerating Technologies

Innovation abstract:

The democratization of innovation is a turbulent process. Rapid creation and violent destruction. Many winners and many losers, both big and small. Are there patterns of success in the chaos? Ray Kurzweil definitely thinks so. He has been on the bleeding edge of innovation for decades and his track record is something to admire. Ray was the principal developer of the first CCD flat-bed scanner, the first omni-font optical character recognition, the first print-to-speech reading machine for the blind, the first text-to-speech synthesizer, the first music synthesizer capable of recreating the grand piano and other orchestral instruments, and the first commercially marketed large-vocabulary speech recognition. Ray is an ardent student of technology trends and had developed mathematical models of how technology in different areas evolves. These models show that the pace of innovation itself is doubling every decade. As information technology achieves each new level of price-performance and capacity, new applications become feasible and existing business models lose their viability. The rate of change is now so rapid that even three to five year business plans need to consider that every level of an industry will undergo major changes during that period. Ray will talk about the democratization of innovation in an era of accelerating technologies and how this will impact business, the economy, and society.

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Health and Medicine – Since the release of his book, *Fantastic Voyage: Live Long Enough to Live Forever* (2004) and with the recent release of a new health book, *TRANSCEND: Nine Steps to Living Well Forever* (2009), Kurzweil addresses many medical and health related audiences on the merger of science, technology, and medicine and its impact on the healthcare industry and human longevity.

Health/Medicine title examples:

The Acceleration of Technology in the 21st Century: the Impact on Healthcare and Medicine

Human Body Version 2.0: When Humans Transcend Biology

Reprogramming Biology: The New Paradigm

The Coming Merger of Human and Machine: the Radical Expansion of Human Longevity and Intelligence

Health/Medicine abstract:

We are now at a pivotal time in health technologies. With the collection of the genome in 2003 and the advent of techniques such as RNA interference that can actually turn off the genes that promote disease and aging, medicine has transformed itself into an information technology. As such, medicine is now subject to the “law of accelerating returns,” meaning that these technologies will be a thousand times more powerful than today in ten years, and a million times more powerful in 20 years. Up until recently, health interventions were hit or miss. We'd find something that seemed to work with only crude models of how they worked. Drug development was called "drug discovery," basically finding things that worked rather than designing them. Today it is within our grasp to slow the aging process and take full advantage of advances in bio- and nanotechnology that have already begun and will be occurring at an accelerating pace in the years ahead. Ultimately, we will merge with our machines, vastly extending human health and longevity, and greatly increasing our intelligence.

Education - Kurzweil presents to many academic groups including educators, administrators, executive boards, and higher education IT specialists about the intersection of information technology (a broad perspective), education and human knowledge. He describes a future in which there is widespread and inexpensive access to education around the world, individualized learning through computer assisted instruction, full-immersion virtual reality classrooms and labs, and ultimately the ability to download knowledge and skills directly to our brains. He remarks on the key role of education in supporting the unique attribute of our species which is an exponential expanding knowledge base that we pass down from generation to generation. He notes that as jobs are destroyed at the bottom of the skill ladder and more satisfying and better paying jobs are added at the top, investment in education has increased to keep pace with the rising skill ladder. Specifically, in 1870 there were 60,000 college students and today there are over 6 million. Expenditures in K-12 education in constant dollars and on a per capita basis have multiplied by ten over the past century. Our economy is increasingly dominated by knowledge intensive jobs, hence the increasingly central role of education and technology.

Education title example:

The Acceleration of Technology in the 21st Century: the Impact on Education and Society

Education abstract:

The paradigm shift rate is now doubling every decade, so the twenty-first century will see 20,000 years of progress at today's rate. Computation, communication, biological technologies (for example, DNA sequencing), brain scanning, knowledge of the human brain, and human knowledge in general are all accelerating at an even faster pace, generally doubling price-performance, capacity, and bandwidth every year. The size of the key features of technology is also shrinking, at a rate of about 4 per linear dimension per decade. Three-dimensional molecular computing will provide the hardware for human-level artificial intelligence well before 2030. The more important software insights will be gained in part from the reverse-engineering of the human brain, a process well under way.

As with all of our other institutions we will ultimately move toward a decentralized educational system in which every person will have ready access to the highest-quality knowledge and instruction. We are now in the early stages of this transformation, but already the advent of the availability of vast knowledge

on the Web, useful search engines, high-quality open Web courseware, and increasingly effective computer-assisted instruction are providing widespread and inexpensive access to education.

The cost of the infrastructure for high-quality audiovisual Internet-based communication is continuing to fall rapidly, at a rate of about 50 percent per year. By the end of the decade it will be feasible for underdeveloped regions of the world to provide very inexpensive access to high-quality instruction for all grade levels from preschool to doctoral studies. Access to education will no longer be restricted by the lack of availability of trained teachers in each town and village.

As computer-assisted instruction (CAI) becomes more intelligent the ability to individualize the learning experience for each student will greatly improve. New generations of educational software are capable of modeling the strengths and weaknesses of each student and developing strategies to focus on the problem area of each learner.

In the early part of the second decade of this century visual-auditory virtual-reality environments will be full immersion, very high resolution, and very convincing. Students will increasingly attend classes virtually. Virtual environments will provide high-quality virtual laboratories where experiments can be conducted in chemistry, nuclear physics, or any other scientific field. Students will be able to interact with a virtual Thomas Jefferson or Thomas Edison or even to *become* a virtual Thomas Jefferson. Classes will be available for all grade levels in many languages. The devices needed to enter these high-quality, high-resolution virtual classrooms will be ubiquitous and affordable even in third world countries. Students at any age, from toddlers to adults, will be able to access the best education in the world at any time and from any place.

The nature of education will change once again when we merge with nonbiological intelligence. We will then have the ability to download knowledge and skills, at least into the nonbiological portion of our intelligence. Our machines do this routinely today. If you want to give your laptop state-of-the-art skills in speech or character recognition, language translation, or Internet searching, your computer has only to quickly download the right patterns (the software). We don't yet have comparable communication ports in our biological brains to quickly download the interneuronal connection and neurotransmitter patterns that represent our learning. That is one of many profound limitations of the biological paradigm we now use for our thinking, a limitation we will overcome.

Business/Investing - Kurzweil frequently presents to private equity firms and businesses on technology and the capital markets, business and technology trends, near- and long-term predictions, and strategy in an age of exponential technological growth. Despite the current economic turmoil, Mr. Kurzweil presents an optimistic argument that the exponential growth of information technology will continue unaffected during the economic downturn as it has in every past recession and during the Great Depression, noting that information technology goes beyond just computerized devices, but includes such disparate areas as health and medicine, and energy. In every past recession and the Great Depression, he notes that economic growth snapped back to where it would have been had the downturn never occurred. He presents a wealth of data showing that information technologies have the scale and the ability to overcome the major problems we face such as energy and the environment, health, and even poverty.

Business/Investing title examples:

21st Century Technology and the Capital Markets

Exponentially Growing Ventures from Exponentially Shrinking Technology

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Energy - Kurzweil sat on the National Science Foundation (NSF) and National Academy of Engineering's (NAE) blue ribbon panel in 2006 which developed a road map called "Grand Challenges in Engineering." In addition to Kurzweil, the panel included Google cofounder Larry Page, Genome decoder Craig Venter, inventor Dean Kamen, former Secretary of Defense William Perry, and others. Their mission was to develop an engineering and technology road map to find solutions to the most pressing social, economic, and environmental problems. They developed 14 such road maps.

Larry Page and Kurzweil developed the plan for energy, basically to replace fossil fuels with solar energy (through nanoengineered solar panels and storing the energy in nanoengineered fuel cells) within twenty years. Mr. Kurzweil was also involved with plans for "Advance health informatics," "Engineer better medicines," "Provide access to clean water," "Advance personalized learning," and "Secure cyberspace."

On February 15, 2008, Kurzweil presented at the annual American Association for the Advancement of Science Conference in Boston about the findings of the NSF and NAE Grand Challenges panel. A special section in the Washington Post was published in coordination with the AAAS session. Mr. Kurzweil wrote the lead article for this section which I have attached here.

KurzweilAI.net news story on the release of the Grand Challenges report:
http://www.kurzweilai.net/news/frame.html?main=news_single.html?id%3D8018

Grand Challenges in Engineering Site: <http://www.engineeringchallenges.org/>

Energy title examples:

From Unlimited Clean Energy to Overcoming Disease: How Engineering Can Do It

10,000 Times More Sunlight Than We Need

Energy abstract:

Energy is certainly not an information technology today. 70% of our energy comes from fossil fuels, a nineteenth century technology. However, if we could capture one part in ten thousand of the sunlight that falls on the Earth we could meet 100 percent of our energy needs using this renewable and environmentally friendly source. We are unable to do that now because today's solar panels are also an old industrial technology that are expensive, inefficient, heavy, and hard to install. There is a new generation of solar panels based on "nanotechnology" (manipulating matter at the level of molecules) that is starting to overcome these

obstacles. The tipping point when energy from solar panels is actually less expensive than fossil fuels is only a few years away. This is following an exponential progression in solar energy that is similar to what we see in computers. The power we are generating from solar is doubling every two years. At that rate, it can meet *all* of our energy needs within twenty years.

Nanotechnology is an emerging area of technology in which matter and energy is reorganized at the molecular level using information processes. It is an information technology and therefore subject to what I call the “law of accelerating returns,” this continual doubling of capability about every year. There are billions of dollars now being invested in these new renewable energy technologies by venture capital organizations, and companies such as Google. An era in which we can obtain energy from sunlight using nanoengineered solar panels and store the energy in nanoengineered fuel cells (to overcome the intermittency of sunlight) at lower cost than environmentally damaging fossil fuels is close at hand.

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Disabilities and Assistive Technologies - Mr. Kurzweil explains that accelerating information technology will lead us to completely overcome handicaps associated with sensory and physical disabilities and describes the extent to which we have already done that for many handicaps. He predicts that in about a quarter century we will have millions of nanobots in our brains putting our brains on the Internet and providing high bandwidth communication directly with the brain, so vision will ultimately become obsolete. He can speak on a range of topics relating to blindness, disabilities, and assistive technologies in the 21st century. With his many assistive technology firsts, among them: the first pocket-sized print-to-speech reading machine for the blind (2006), the first Continuous Speech Natural Language Command and Control Software (1997), the first Speech Recognition Dictation System for Windows (1994), the first commercially marketed Large-Vocabulary Speech Recognition, the first Omni-Font (any type font) Optical Character Recognition (1976), and the first Print-to-Speech Reading Machine for the Blind (1976), Mr. Kurzweil speaks from experience about the future of disabilities in an age of accelerating technology.

Disabilities and Assistive Technologies title examples:

Technology Empowers People with Disabilities: Today and Tomorrow

The End of Handicaps in an Era of Accelerating Technology

Technology and Disabilities abstract:

Only technology can provide the scale to overcome the challenges with which human society has struggled for generations. Within a couple of decades non-biological intelligence will match the range and subtlety of human intelligence and will necessarily soar past it because of the continuing acceleration of information-based technologies, as well as the ability of machines to instantly share their knowledge. Intelligent nanorobots will be deeply integrated in the environment, our bodies and our brains, providing vastly extended longevity, full-immersion virtual reality incorporating all of the senses, experience ‘beaming’, and enhanced human intelligence. These emerging technologies will be a great leveler in eliminating the handicaps associated with sensory and physical disabilities.