Re-Inventing the Research University
Same old...same old...

What do university presidents usually talk about when they get together?

- Money (*Never enough...*)
- Politics (*Always too many...*)
- Students (*What are they up to now?...*)
- Intercollegiate athletics (*What is the next scandal?...*)
The View from 100,000 ft
100,000 ft level...

- The impact of current global economic crisis (particularly states).
- The rising costs of education and research.
- Rapidly changing demographics as minorities become majorities.
- The reshaping of learning and research by rapidly evolving technologies.
- The emergence of powerful market forces.
- University governance, management, and leadership.
- The inadequate public understanding of the importance of the contemporary university.
- The capacity for change.
The Spellings Commission

- Of particular importance here was the National Commission on the Future of Higher Education—the so-called Spellings Commission—launched by the Secretary of Education in 2005 to examine issues such as the access, affordability, accountability, and quality of our colleges and universities.

- This unusually broad commission, comprised of members from business, government, foundations, and higher education, reached several key conclusions:
Findings

“American higher education has become what in the business world would be called a mature enterprise, increasingly risk-averse, at times self-satisfied, and unduly expensive.

It is an enterprise that has yet to address the fundamental issues of how academic programs and institutions must be transformed to serve the changing educational needs of a knowledge economy.

It has yet to successfully confront the impact of globalization, rapidly evolving technologies, an increasingly diverse and aging population, and an evolving marketplace characterized by new needs and new paradigms.”
“Too few Americans prepare for, participate in, and complete higher education. Notwithstanding the nation’s egalitarian principles, there is ample evidence that qualified young people from families of modest means are far less likely to go to college than their affluent peers with similar qualifications. America’s higher-education financing system is increasingly dysfunctional. Government subsidies are declining; tuition is rising; and cost per student is increasing faster than inflation or family income.”
Two Areas of Particular Concern: Second

“Furthermore, at a time when the United States needs to be increasing the quality of learning outcomes and the economic value of a college education, there are disturbing signs that suggest higher education is moving in the opposite direction. Numerous recent studies suggest that today’s American college students are not really learning what they need to learn.”
Spellings Commission Recommendations

- Reaffirming America’s commitment to provide all students with the opportunity to pursue postsecondary education;
- Restructuring student financial aid programs to focus upon the needs of lower income and minority students;
- Adopting a culture of continuous innovation and quality improvement in higher education;
- Greatly increasing investment in key strategic areas such as science, engineering, medicine, and other knowledge-intensive professions essential to global competitiveness;
Spellings Commission Recommendations (cont)

- Ensuring that all citizens have access to high quality educational, learning, and training opportunities throughout their lives through a national strategy to provide lifelong learning opportunities at the postsecondary level; and

- Demanding transparency, accountability, and commitment to public purpose in the operation of our universities.
Note:

- No standardized testing...
- No tuition price fixing...
- No national (federal) accreditation...
- No "No Child Left Behind" or "A Nation at Risk"...
- No federalization of American higher education!

_The Economist_: "The strength of the American higher education system is that it has no system!"
The $L_1$ Point
The $L_1$ Point

A million miles away where the earth appears as a “big, blue marble"

- Knowledge and innovation driven economies
- Globalization
- Demographic change
- Global sustainability of humankind
The Knowledge Economy

- Today our world has entered a period of rapid and profound economic, social, and political transformation based upon a radically new system for creating wealth that depends upon the creation and application of new knowledge and hence upon educated people and their ideas.

- The strength, prosperity, and welfare of a nation in a global knowledge economy will demand a highly educated citizenry enabled by the development of a strong system of tertiary education.

- It also requires world-class research institutions with the capacity to discover new knowledge and transfer them into the marketplace.
Demographics

- Aging populations, out-migration, and shrinking workforces are seriously challenging the productivity of developed economies throughout Europe and Asia.
- Yet, here the **United States stands apart** because of another important demographic trend: **immigration**.
- Over 50% of U.S. population growth during past decade came from immigrants, and it is estimated they will boost our population to **450 million by 2050**.
- The **increasing diversity** of the American population with respect to race, ethnicity, and national origin is **one of our greatest strengths**, with minorities estimated to comprise 42% of U.S. population by 2050.
Globalization

- "We see globalization—the growing interconnectedness reflected in the expanded flows of information, technology, capital, goods, services, and people throughout the world—as an overarching mega-trend, a force so ubiquitous that it will substantially shape all the other major trends in the world of 2020."
  - National Intelligence Council Project 2020

- Markets characterized by instantaneous flows of knowledge, capital, and work drive practices such as outsourcing and off-shoring, a shift from public to private equity investment, and declining identification with or loyalty to national or regional interests. Market pressures increasingly trump public policy.
Global Sustainability

- Today the impact of human activities, ever more intense, globally distributed and interconnected, threatens the very sustainability of humankind on Earth.

- The daunting complexity of the challenges that confront us would be overwhelming if we were to depend only on existing knowledge, traditional resources, and conventional approaches. But universities have the capacity and responsibility to remove that dependence by the innovations they create.

- In a world of foreboding problems and looming threats, it is the high privilege of universities to nurture that creativity, to rekindle that resilience, and so provide hope for all of Earth’s peoples.
Some Implications for Higher Education
Changing education needs

- Education requirements of the knowledge economy
  - Secondary…Tertiary…Post-graduate…Lifelong
- “The driving force behind the 21st century economy is knowledge, and developing human capital is the best way to ensure prosperity.” (National Governors Assoc)
- The “skills race” is becoming a powerful political force.
Massification vs. league tables

- The need to dramatically broaden participation in higher education to build a competitive workforce…
- To build world-class research capability…
- And to reduce the burden on tax payers who face other public spending priorities such as health care, retirement, and security!

Not an easy task, indeed, because of the incompatibility of these requirements!
Mission differentiation

- The great diversity of higher education needs, both on the part of diverse constituencies (young students, professions, adult learners) and society (teaching, research, economic development, cultural richness) demand diverse ecosystem of institutional types.

- A differentiated system of higher education is necessary to accomplish the goals of massification and world-class quality, but it assigns different roles and different levels of support to various institutions.
Public policy vs. markets

- Economic, geopolitical, and demographic forces could drive a massive restructuring of higher education enterprise, similar to that experienced by other sectors (banking, communication, energy).
- Movement toward a revenue-driven, market-responsive higher education system since there is no way that our current tax systems can support both massification and quality in the face of other needs (e.g., of the elderly).
- Market forces are rapidly overwhelming public policy and public investment in determining the future course of higher education.
National Academy Study on Research Universities
A Congressional Request

“America’s research universities are admired throughout the world, and they have contributed immeasurably to our social and economic well-being. Our universities, to an extent unparalleled in other countries, are our nation’s primary source of long-term scientific, engineering, and medical research. We are concerned that they are at risk.

We ask the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine to assemble a distinguished group of individuals to assess the competitive position of American research universities, both public and private, and to respond to the following question:

What are the top ten actions that Congress, state governments, research universities, and others can take to maintain the excellence in research and doctoral education needed to help the United States compete, prosper, and achieve national goals for health, energy, the environment, and security in the global community of the 21st Century.”
SWOT Analysis

- Strengths
- Weaknesses
- Opportunities
- Threats
SWOT ANALYSIS

Forces of Change
- Age of Knowledge
- Globalization
- Demographics
- Technological Change
- Innovation
- Global Sustainability

Opportunities for Higher Ed
- Changing Student Needs
- Market/industry forces
- Game Changers

Possible Outcomes
- Evolution
- Revolution (Paradigm Shift)
- Extinction

Threats
- Financial Sustainability
- Intellectual property
- Obsolescence
- Innovation

Internal
- Faculty
- Enabling technology
- Innovation and development

External
- Funding
- Legislation
- Global economy

RECOMMENDATIONS

Recommendations (CDM)
- Increase curriculum offerings in STEM
- Expand partnerships with industry
- Enhance technology infrastructure

Chart: Impact of R&D

1. Support for research faculty
2. Economic development
3. Intellectual property
4. Technology transfer

Chart: CMOs

Chart: CMOs
Strengths

- National Priorities Requiring Research Universities
  - Security (Defense, Terrorism)
  - Economic Prosperity
  - Public Health
  - Preservation and Transmission of Culture
  - Citizens for a Democratic Society
  - Enlightened Criticism

- Unique Contributions of Research Universities
  - New knowledge (basic and applied R&D)
  - Scholars, scientists, researchers ("universitas magisterium et scholarium")
  - Knowledge-intensive professionals (engineers, doctors, teachers, etc.)
  - Knowledge-intensive services (clinical care, innovation, entrepreneurism)
  - Knowledge/culture repositories (libraries, museums, theaters)
  - Social criticism, leadership
Weaknesses

- Obsolete financial models
- Obsolete public policies (both federal and state)
- Inadequate alignment with U.S. priorities
- Mission creep
- Institutional competition ("winner take all", cost driver)
- STEM pipeline
- Obsolete governance, management, leadership
- Inadequate capacity for change
- Changing professoriate
- Obsolete doctoral/postdoc training (feudal system)
Opportunities

- Use crisis to stimulate change
- Develop new financial models for 21st Century
- Restructure graduate education ("Flexner Report" for the PhD)
- Rebalance competition and cooperation
- Redefine core mission ("core-in-cloud")
- Explore new paradigms (e.g., global, open-source, ecology)
Threats

- Globalization
- Human capital (changing demographics)
- Financial sustainability (particularly of flagship public universities)
- Technological change
- Public/political awareness
- Challenges to academic freedom and integrity
- Lack of a national strategy
The danger signs

- Federal policies no longer place a priority on university research and graduate education.
- In the face of economic challenges and the priorities of aging populations, states no longer are either capable or willing to support their public research universities at world-class levels.
- Business and industry have largely ceded their basic research to research universities but with only minimal corporate support.
- Research universities themselves have failed to achieve the cost efficiency and productivity enhancement in teaching and research required of an increasingly competitive world.
The Framework for Stakeholders

- **Public**: Rephrase Vannevar Bush Report for the 21st century (economy, health, and security). The nation’s research universities are still fundamentally strong, but today they are seriously threatened.

- **Government**: Both the states and the nation are seriously under investing in research universities and while obsolete policies and practices hinder their capacity to serve as a key asset necessary for economic prosperity, health, and security, putting our citizens at considerable risk.
The Framework (continued)

- **Business**: Stress the role of research universities as a primary source of intellectual and human output critical to an innovation-driven global economy. Build business-university-government partnerships to achieve mutual interests.

- **Universities**: Universities recognize current economic constraints, and they are prepared to work with government to address common goals and challenges, restructuring their activities and sacrificing as necessary.
For the past half-century, the research and graduate programs of the America’s research universities have been essential contributors to the nation’s prosperity, health, and security. Today our nation faces new challenges, a time of rapid and profound economic, social, and political transformation driven by the growth in knowledge and innovation. Educated people, the knowledge they produce, and the innovation and entrepreneurial skills they possess, particularly in the fields of science and engineering, have become the keys to America’s future. Therefore it is essential that as a nation we both reaffirm and revitalize the unique partnership that has long existed among the nation’s research universities, the federal government, the states, and business and industry.
Principles of the Partnership

- A balanced set of commitments by each of the partners (federal government, state government, research universities, and business and industry) to develop and implement enlightened policies, efficient operating practices, and necessary investments.

- Linkages and interdependencies among these commitments that provide strong incentives for participation at comparable levels by each partner.

- Sufficient flexibility to accommodate the differences among research universities and their various stakeholders.
A recognition of the importance of supporting the comprehensive nature of research university, spanning the full spectrum of academic and professional disciplines (including arts and humanities!!!).

While merit and impact should continue to be the primary criteria for the awarding of research grants and contracts by federal agencies, investment in infrastructure should consider additional criteria such as institutional need, program scale (size), and opportunities for building new research capacity.
Principles (continued)

- A commitment to a decade-long effort when both challenges and opportunities are likely to change, evolving from an emphasis during the early phase developing policies and practices that facilitate research university productivity and cost containment during the current economic crisis to phasing in recommended investments in research and graduate education in later years as the economy improves.
The View from the Oort Cloud
The Oort Cloud

That place, a light year from the sun, where has-been university presidents are exiled, doomed to contemplate issues out-of-sight and out-of-mind…at least until they launch an occasional comet inward to perturb the solar system…
Conjecture

Over the next generation, the university will change so much that it may no longer be recognizable in today's terms:

- lifelong universities
- global universities
- "meta" universities
- universal access to knowledge and learning
- something old…and something new…
A historical example

The evolution of the University of Michigan:

1850
1900
1950
2000
2050???
Game Changers

- Lifelong learning
- Globalization
- Cyberinfrastructure
- Social networking
- Universal access to knowledge and learning

An interesting trilogy
- Wiki’s, crowd sourcing, immersive technology, sim-stim…
- Big data, clouds, digital Library of Alexandria…
- Watson, Analytics, AI agents,…
Paradigm Shifts

- Hybrid universities (private/public, state/national/global)
- Universities of and in the world
- Open and “open source” universities
- Meta universities (a la C. M. Vest!)
- A return to *Universitas Magistrorum et Scholarium*…but in cyberspace
- Learning networks and ecosystems
- The university as an emergent civilization
Lifelong Learning
Lifelong Learning

Why? Lengthening lifespans and careers (+ 20-30 y?)
   Increasing pace of new knowledge creation
   Challenges of global, knowledge economy
Democratic societies have a new responsibility to provide all of their citizens with the educational, learning, and training opportunities they need, throughout their lives, whenever, wherever, and however they need it, at high quality and affordable costs.

Of course, establishing as a national goal the universal access to lifelong learning would require not only a very considerable transformation and expansion of the existing postsecondary education enterprise, but it would also require entirely new paradigms for the conduct, organization, financing, leadership, and governance of higher education…
The Global University
The Global University

Both mature and developing nations are making major investments in building the knowledge infrastructure—schools, universities, research institutes, high-tech industry, cyberinfrastructure, public policies and programs—necessary to achieve prosperity and security in the knowledge economy.

In parallel with these trends, there is a strong sense that higher education is also in the early stages of globalization, both through the rapid growth in international partnerships among universities, and through the emergence of truly global universities that intend to compete in the global marketplace for students, faculty, and resources.
The Glion Colloquium, an influential think tank on higher education issues

Over the past decade the Glion Colloquium has established itself as an influential think tank on higher education issues, in particular related to research intensive universities.

Leaders from renowned universities

Every two years the colloquium brings together in Glion, Switzerland, around twenty leaders from renowned universities and university organizations, along with influential figures from business and government, especially from Northern America and Europe, but also from leading institutions in other parts of the world.

“The Glion Declaration: the University at the Millennium”


Already six major books made available to university leaders and decision makers

The papers presented at each colloquium is published in a book that is sent to leaders of the world’s best research universities and is available for purchase to the wider public. Most volumes have been published by ECONOMICIA in Paris and distributed by the Brookings Institution in Washington D.C. The volumes are also available online some time after their publication.

A non for profit Association based in Geneva

The supporting organizations: The colloquium are organised by the non-profit Association Glion Colloquium, registered in Geneva, which raises the necessary funds, organizes the meetings and produces all the publications.

Lead by James J. Duderstadt and Luc E. Weber

The organizations committee: The programme for each colloquium is organized by a different committee co-chaired by Professor Luc E. Weber (University of Geneva), Professor Werner Z. Misch (University of California), in 1998, 2000 and 2001; and, since 2003, Professor James J. Duderstadt (University of Michigan).
Universities of the world… and in the world

We might even see the emergence of "universities in and of the world"—institutions that not only address the opportunities provided by a global marketplace but define their public purpose beyond institutional, regional, or national needs and to encompass global imperatives such as global sustainability, world health, wealth disparities and poverty, and international development.
Early efforts?

- Open University (U.K.), IMD
- For-Profits (U. Phoenix, Laureate (Sylvan), etc.)
- EU Integration (Bologna, Lisbon)
- Consortia (Universitas 21, Nagoya, Glion?)
- Established universities? (MITx? Stanford? NYU?)
Cyberinfrastructure
We are entering a second revolution in information technology, one that may well usher in a new technological age that will dwarf, in sheer transformational scope and power, anything we have yet experienced in the current information age.

We are already intimately familiar with the first revolution, now well under way. Information, computer, and communications technologies have transformed nearly every aspect of our lives, creating entirely new opportunities and challenges, and trailing some inevitable surprises in their wake.
Cyberinfrastructure

- The new concept is “cyberinfrastructure”, the term used to describe hardware, software, people, organizations, and policies—similar to “e-science” in Europe and ICT elsewhere.
- The engine of change for the next revolution is cyberinfrastructure, a comprehensive phenomenon that involves the creation, dissemination, preservation, and application of knowledge. It adds new dimensions that greatly increase transformational potential.
Computing History and Exponentials

- 1890-1945
  - mechanical, relay
  - 7 year doubling
- 1945-1985
  - tube, transistor...
  - 2.3 year doubling
- 1985-2003
  - microprocessor
  - 1 year doubling
  - it is slowing (another talk 😊)

Exponentials
- chip transistor density: 2X in ~18 months
- graphics: 100X in three years
- WAN bandwidth: 64X in two years
- storage: 7X in two years

Source: Jim Gray, Microsoft
Infrastructure 2016

- **Storage**
  - personal petabytes
    - inexpensive and “disposable”
  - institutional storage
    - operationally infinite

- **Networks**
  - ubiquitous >100 Mb/s wireless
    - always on, always available
  - >1 Gb/s to the home
    - driven by consumer economics
  - >1 Tb/s research networks

- **Computing**
  - teraflop “personal computers”
    - >100-way multicore chips
    - complex and heterogeneous
  - >100 petaflop research systems
    - >1 million way parallelism

- **Situational sensors**
  - disposable, ~1 mm²
  - ambient powered

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UNC INFORMATION TECHNOLOGY SERVICES

renCI
renaissance computing institute
Some Other Possibilities

- **Ubiquitous computing?**
  - Computers disappear (just as electricity)
  - Calm technology, bodynets

- **Agents and avatars?**
  - Fusing together physical space and cyberspace
  - Plugging the nervous system into the Net

- **Emergent behavior?**
  - ... Self organization
  - ... Learning capacity
  - ... Consciousness (HAL 9000)
The "virtual" university

- Not your father's virtual university!!!
- Think Second Life!
- Virtual organizations
- "A global educational and collaboration environment in a virtual world"...
Western Governors University is a non-profit online university offering you a convenient, flexible online education. WGU is the only accredited university in the U.S. offering competency-based, online degrees. Founded by the governors of 19 western states, WGU delivers to its students an outstanding quality education under the guidance of dedicated faculty mentors and progress managers.

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- Graduate Programs

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- MBA Programs
- Bachelor's Degrees

Information Technology
- Six Different Bachelor's Degrees

Health Professions
- Graduate-Level Health Programs

WHAT'S NEW AT WGU...
- WGU Receives Utah's Best of State Medal
- Plan Now to Attend Summer Graduation

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The iTunes U app lets you take a free course, from start to finish, right on your iPad, iPhone, or iPod touch. Browse offerings from leading universities and learning institutions—courses include audio and video lectures, assignments, notes from the instructor, and course materials including PDFs, presentations, amazing new textbooks for iPad, and more. Download the app for free, then check out courses below.

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Hello and Welcome to MITX!

The digital world spins at 3,000 rpms, spawning opportunities that are transforming industries, economies and society. Marketers from every segment contend with these challenges, and with the demands for an increasingly seamless relationship between online and offline realities.

Marketers face the challenge of understanding how digital technologies are converging and impacting the traditional and non-traditional marketing and media landscape, and discovering the opportunities this represents. MITX was launched in 1996 to help meet that challenge, to help marketers understand "What’s Next," and to educate on how to best take advantage of those opportunities.

MITX today is the premier Internet business and marketing association in New England, and we’re dedicated to creating opportunities for businesses and individuals to connect, grow, and thrive. We do that through extensive programming designed to explore leading edge trends, networking opportunities for professionals to meet and exchange ideas, initiatives to cultivate the next generation of leaders in our young talent, and advancing the industry through well-publicized awards shows, research, and government relations.

With 250 member companies representing over 7,500 professionals, MITX is a dynamic and growing community of thought leaders, collaborators, and individuals in search of insight, education and opportunity.

If you want to be part of What’s Next, join MITX.

Debi Kleiman
President, MITX
Universal Access to Knowledge and Learning
Open Education Resources

- OpenCourseWare Initiative (MIT, OU, …)
- Open Knowledge Management (Sakai, Moodle, …)
- Open Learning Initiatives (Rice, CMU, …)
- Open Authoring Environments (Connexion)
- OER Providers (iTunes U)
- Open Content (JSTOR, Google Books, HathiTrust)
- Open Participatory Learning (Wikipedia…)
- **Question:** How is the Internet going to be used in education, and what is your university going to do about it?
- An answer from the MIT faculty is this: Use it to provide free access to the primary materials for virtually all our courses. We are going to make our educational material available to students, faculty, and other learners, anywhere in the world, at any time, for free.

MIT President Charles Vest  
*President’s Report, Fall 2001*

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- Can I see a copy of a contract you have with a library partner?
- More...

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Kelly recalls the age old dream of having in one place all knowledge, past and present. All books, all documents, all conceptual works, in all languages.

He noted that the closest we ever came was the great library at Alexandria, constructed around 300 B.C., which once held between 30 and 70 percent of all books in existence then. Yet this dream was quickly overwhelmed by the explosion of civilization and knowledge throughout the world and became an impossibility.
Until now...

- "When Google announced in December 2004 that it would digitally scan the books of five major research libraries to make their contents searchable, the promise of a universal library was resurrected.

- Might the long-heralded great library of all knowledge really be within our grasp. We can provide all the works of humankind to all the people of the world. It will be an achievement remembered for all time, like putting a man on the moon."

- And unlike the libraries of old, which were restricted to the elite, this library would be truly democratic, offering every book to every person."
HathiTrust

- CIC + UC + Triangle + 60 institutions…and growing
- Currently at 9.8 million titles
- Note: 2.7 million in public domain
- Goal: Putting as much full-text access into the public domain as possible
- Pre-1923…today!!!
- Orphan works…tomorrow?
- “Fair use”…possibly!
- Search analytics? Now!
Social Networking

- Instant messaging
- Facebook, Twitter
- Virtual environments (e.g., Second Life)
- Immersive games (World of Warcraft)
- Simulation (Enders Game)
- Avatars (Snowcrash)
The "meta" university

- Open source, open content, open learning, and other “open” technologies, along with cyberinfrastructure, the term used to describe the software, hardware, people, organizations, and policies characterizing digital technology, become the scaffolding on which to build truly global universities—what Chuck Vest terms the “meta” university.

- Cyberinfrastructure provides the technology and the open paradigms use it to distribute knowledge and learning opportunities to the world.
As Vest suggests

- It is becoming increasingly clear that the current approaches to higher education are simply inadequate to meet the exploding needs for education and knowledge throughout the world. As Vest observes, “the incredibly large scale of education world wide; the huge diversity of cultural, political, and economic contexts; and the distribution of public and private financial resources to devote to education are too great.”

- Instead Vest suggests that “through the array of open paradigms, we are seeing the early emergence of a Meta University – a transcendent, accessible, empowering, dynamic, communally-constructed framework of open materials and platforms on which much of higher education world wide can be constructed or enhanced.”
The Meta University

- Will enable -- not replace -- residential campuses
- Will bring cost efficiencies to institutions through shared development;
- Will be adaptable -- not prescriptive;
- Will serve both teachers and learners;
- Will speed the propagation of high-quality education and scholarship;
- Will build capacity for economic development;
- Will build bridges across cultures and political boundaries; and
- Will be particularly important to the developing world.
New Reach: Opportunity in the Developing World

Tavan Village, Vietnam
Over the Horizon
Put it all together…

- Open source knowledge and learning technologies…
- Open content distribution through library digitization…
- Open participatory, collaborative learning…
- Immersive environments, simulation
- Ubiquitous connectivity*

…All built on a substrate of cyberinfrastructure evolving at a rate of 100 to 1,000 times a decade…

*Note: Today, over 4 billion cellphone users and 500 million with broadband connectivity!
Shifts in How Computing Services are Provided, Used, and Perceived

- Batch Main Frame
- Time-Shared Main Frame
- Personal and Mini Computers
- Client-Server Distributed Computing
- Internet/WWW as the "computer"

How should we respond?

Cloud-based ubiquitous computing services

Five Pillars
Emerging IT environments are built upon these five pillars:

- **Social** - Collaboration, sharing
- **Mobile** - Many types of internet appliances with increasing multimedia and sensory ability.
- **Cloud** - {Infrastructure | Platform | Software} as a Service
  See [Doug Orr Talk](#)
- **Big Data** - Storing and operating on data with essentially unlimited storage and processing.
- **Cyber-Physical** - Sensors-activators to couple the digital electronic world with the physical world. A source of big data.

All of this requires ubiquitous, high capacity networking.
The Emerging Model

Cloud Platform with a rich collection of software modules, APIs, general & special purpose computation, and data storage to enable building amazing services (general to specific).

Global Data Network - Wired and Wireless

Billions ofEndpoints: multi-function, multi-media, multi-sensor

Humans

Physical World
A Puzzle

Diagram:
- Wikipedia
- Watson
- Google

Relationships:
- Wikipedia to Watson
- Wikipedia to Google
- Watson to Google
Today's featured article

Evelyn Waugh (1903–1966) was an English writer of novels, travel books and biographies. He was also a prolific journalist and reviewer. His best-known works include his early satires Decline and Fall (1928) and A Handful of Dust (1934), his novel Brideshead Revisited (1945) and his trilogy of Second World War novels collectively known as Sword of Honour (1952–61). Waugh, a conservative Roman Catholic whose views were often trenchantly expressed, is widely recognised as one of the great prose stylists of the 20th century. In the 1930s he travelled extensively, often as a special newspaper correspondent. He served in the British armed forces throughout the Second World War, first in the Royal Marines and later in the Royal Horse Guards. All these experiences, and the wide range of people he encountered, were used in Waugh's fiction, generally to humorous effect; even his own mental breakdown in the early 1950s, brought about by misuse of drugs, was fictionalised. After his death in 1966 he acquired a new following through film and television versions of his work, most memorably Brideshead Revisited in 1982. (more...)

Recently featured: The Hitchhiker's Guide to the Galaxy – Tiny Thompson – Boletus edulis

Archive – By email – More featured articles...

Did you know...

From Wikipedia's newest articles:

- that the approximately 1,400 caves of China's Longmen Grottoes contain about 100,000 statues, some of which are only 1 inch (25 mm) high, while the largest Buddha statue (pictured) is 57 feet (17 m) in height?
- that Arthur Bedford commanded HMS Kent in the 1914 Battle of the Falkland Islands and sank the German cruiser Nürnberg?
Google Books Library Project – An enhanced card catalog of the world’s books

We’re working with several major libraries to include their collections in Google Books and, like a card catalog, show users information about the book, and in many cases, a few snippets – a few sentences to display the search term in context.

What does a Google Books Library Project book look like?
When you click on a search result for a book from the Library Project, you’ll see basic bibliographic information about the book, and in many cases, a few snippets – a few sentences showing your search term in context. If the book is out of copyright, you’ll be able to view and download the entire book. In all cases, you’ll see links directing you to online bookstores where you can buy the book and libraries where you can borrow it.

To see close-ups of these pages and to learn more about Google Books features, view our Screenshots.

What’s the goal of this project?
The Library Project’s aim is simple: make it easier for people to find relevant books – specifically, books they wouldn’t find any other way such as those that are out of print – while carefully respecting authors’ and publishers’ copyrights. Our ultimate goal is to work with publishers and libraries to create a comprehensive, searchable, virtual card catalog of all books in all languages that helps users discover new books and publishers discover new readers.
A Puzzle

- Wikipedia → the capacity to create enormous learning communities, a collective ability to digest and analyze information, self-correcting and evolving very rapidly…”crowd sourcing”…emergent phenomena…

- Google → a world in which all knowledge is available in the cloud, digitized, accessible, seachable…everything every printed, measured, sensed, created…”big data”…

- Watson → the capacity to analyze information, trillions of transactions per second, identifying correlations, curating information, authenticating knowledge, certifying learning, and providing ubiquitous access (“Siri, does the Higgs boson really exist?”…)
What is this?

- Recall the core competencies of the university (a la JSB):
  - Providing the capacity to form learning communities.
  - Providing access to knowledge (libraries, faculties, laboratories, etc.).
  - Authenticating that knowledge is true and certifying that learning has occurred.

A postmodernist university???
Perhaps it is something else…

- A new epistemology for the 21st century?
- The foundation for a 21st analog to the renaissance…or even the age of enlightenment?
- Brave New World?
- A hive culture? Enders Game?
- A technological singularity (von Neumann and Kurzweil)?
- Or perhaps…
Imagine a world...

- Imagine a time in the near future where anyone with even a modest Internet connection has access to all of the recorded knowledge of human history along with ubiquitous learning opportunities.

- Imagine further the linking together of a substantial part of the world’s population with limitless access to knowledge and learning opportunities enabled by rapidly evolving cyberinfrastructure increasing a thousand-fold in power every decade.
Perhaps…

- Perhaps this could trigger the emergence of a **new form of collective human intelligence**, as billions of world citizens interact together, unconstrained by today’s monopolies on knowledge or learning opportunities.

- Perhaps this, then, is the most exciting vision for the future of the university—no longer constrained by space, time, monopoly, or archaic laws—but rather unleashed by cyberinfrastructure to empower the emergence of a new global civilization of humankind.
Preparing for Unknowable Futures
Change and the University

● Today the university looks very much like it has for decades.
● It is still organized into academic and professional disciplines with traditional degrees at the UG, grad, and professional levels.
● We can always fall back on that famous quote of Clark Kerr’s: “About 85 institutions in the Western World established by 1520 still exist in recognizable forms, with similar functions and with unbroken histories, including the Catholic Church, the Parliaments of the Isle of Man, of Iceland, and of Great Britain, several Swiss cantons, and… 70 universities.”
Yet... change is everywhere

- Students utilize the Internet to access information and services, social networking to interact, gaming to learn...
- Faculty members interact more with colleagues around the world than across the hall...
- The library has evolved from stacks to Starbuck’s...
- Scholarship is shifting from publisher monopolies to open access distribution...
Universities are adaptive

- Universities are extraordinarily adaptable organizations, tolerating redundancy and diversity.
- Technological change tends to evolve much more rapidly than social change…universities do not evolve on the timescale of tech turns.
- Change is evolutionary rather than revolutionary, beginning at the edge rather than the core of the university.
- To the university, the IT revolution is more like a tsunami that they can float through out at sea rather than a cresting wave crashing on the beach.
Yet change will occur

- Most universities will continue to exist as a place, although since IT enables human interaction at a distance with arbitrarily high fidelity, learning should not be bound too tightly to campuses.

- While learning will continue to depend on communities, we should not assure that current forms will continue (e.g., four-quadrant, immersive simulations).

- Remember as well Christensen’s innovator’s dilemma.

- However, we can take heart with a note of reassurance from Frank Rhodes:
“For a thousand years, the university has benefited our civilization as a learning community where both the young and the experienced could acquire not only knowledge and skills, but the values and discipline of the educated mind. It has defended and propagated our cultural and intellectual heritage, while challenging our norms and beliefs. It has produced the leaders of our governments, commerce, and professions. It has both created and applied new knowledge to serve our society. And it has done so while preserving those values and principles so essential to academic learning: the freedom of inquiry, an openness to new ideas, a commitment to rigorous study, and a love of learning.

There seems little doubt that these roles will continue to be needed by our civilization. There is little doubt as well that the university, in some form, will be needed to provide them.

The university of the twenty-first century may be as different from today’s institutions as the research university is from the colonial college. But its form and its continued evolution will be a consequence of transformations necessary to provide its ancient values and contributions to a changing world.”

Glion III Declaration (Frank Rhodes)