

# The Internet And Beyond

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**Beijing**

**October 31. 2014**

# 1969 Was an Incredible Year!

- The first man landed on the moon
- The Woodstock festival took place
- Charles Schulz won the Pulitzer Prize

and nobody noticed!!

Yet it had the most impact in the long run.



# What Makes the Internet Tick?

## 1. The People:

Almost 3 billion people make their work available to others on the net.

## 2. The Culture:

There is tremendous power in the early Internet's culture of being open, shared, cooperative, free, ethical and trusted.

**The Internet  
Creates Communities !**

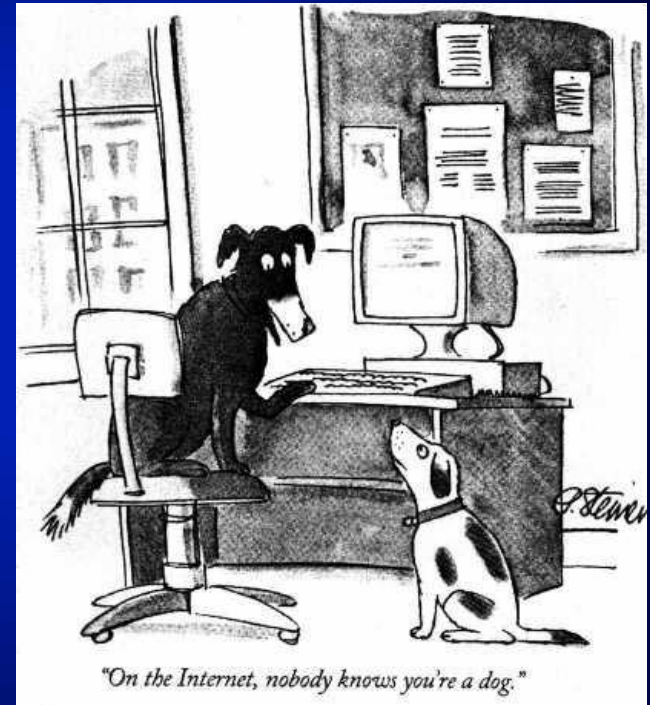
# The Internet Has Dramatically Changed Some Fundamentals

## It has:

- Reduced the barrier of **distance**
- Increased the **reach** of an individual
- Increased the **number** of people you can interact with
- Increased the **speed** of interaction
- Increased **anonymity**
- Reduced **cost** of communicating
- Expanded the **quantity** of accessible info.

# The Internet Has Removed Barriers for Interaction

- Political
- Economic
- Social
- Cultural
- Racial
- Physical handicaps
- Physical appearance.



**“On the Internet, nobody knows you’re a dog.”**

# The Future is Here

Today, everyone knows about the Internet.  
My 11 year-old granddaughter knows about it

My 99 year-old mother used it.



The Net is penetrating every phase of our lives:  
commercial, academic, social, ethical,  
educational, entertainment, etc.

Yet, the Internet has only entered its early  
**teenage** years ...

... and is exhibiting teenage behavior:  
mischievous  
erratic  
unruly  
disobedient.

# A Brief History of the Internet

# Before the Beginning!

- 1957 Sputnik launched
- 1958 The Advanced Research Projects Agency (ARPA) formed as a response

**The E**

**ARPA**

- 1962 J.C.R. Licklider at ARPA and creates the Information Processing Techniques Office (IPTO) articulating his vision for a Galactic Network
- 1964 Ivan Sutherland succeeds Licklider to establish a 3-node network at UCLA - network idea at ARPA
- 1965 Larry Roberts of MIT receives an ARPA contract and with Tom Marill and implements a dial-up connection across the U.S.





# The Early Role of ARPA

- **1966** Robert Taylor succeeds Sutherland as Director of IPTO. Taylor recognizes need for a network to connect together the computers of the ARPA researchers
- **1966** Roberts brought to ARPA IPTO as Chief Scientist to help create the network.

# Meanwhile

- We in the research community developed the elements of packet switching technology

**and nobody cared!!**

... was inadequate  
... data network technology  
... early 1960's we promoted the idea  
of packet switching networks.

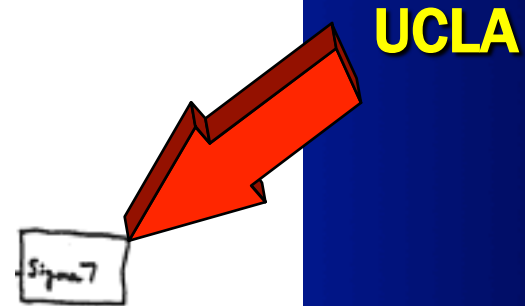
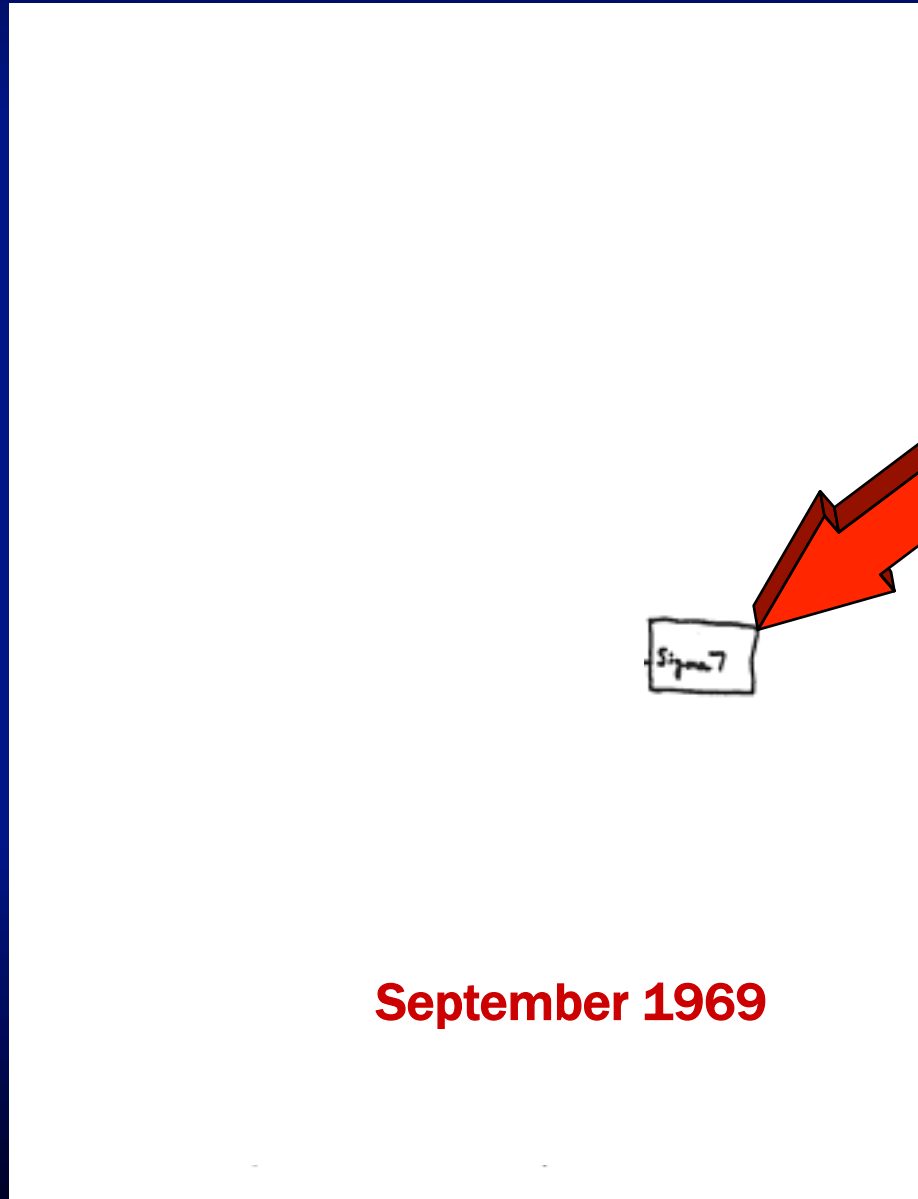
**ARPA was now poised to catalyze this work  
into a deployed network**

# ARPA Steps In

- Licklider had described a Galactic Network
- Packet network concepts and theory had emerged
- Sutherland had tried to fund a small network
- Taylor had seen the need for networked computers
- Roberts had arrived at ARPA to build a network
  - He was aware of my MIT research which had convinced him such a network would work.

# What It Looked Like in 1969

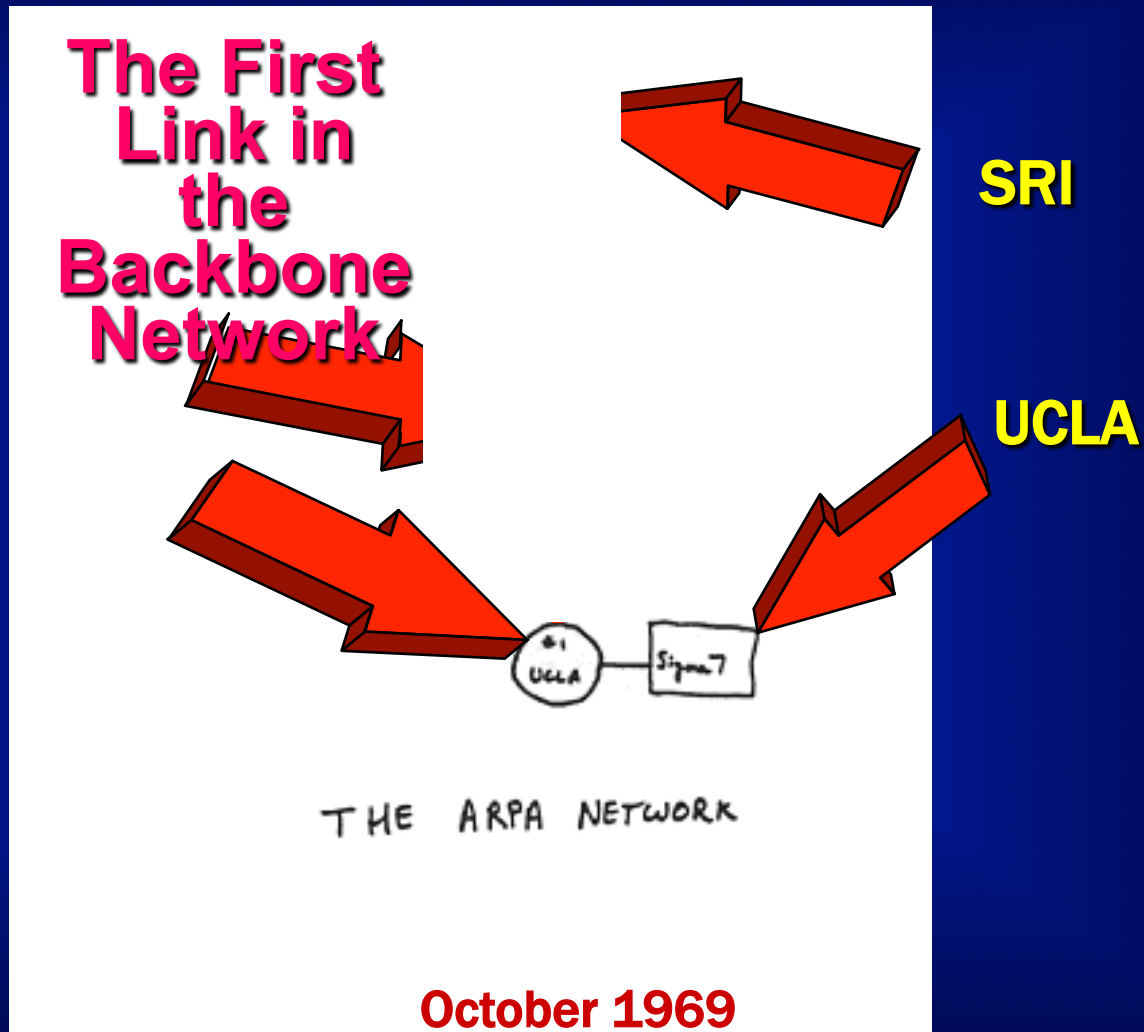
# What It Looked Like in 1969



September 1969



# What It Looked Like in 1969



UCLA

UNIVERSITY OF CALIFORNIA, LOS ANGELES  
Office of Public Information  
Avenue • Los Angeles, California 90024  
Dial: "UCLA-585"

Released July 3, 1969

Thursday, July 3, 1969

My 1969 vision ...

“As of now, computer networks are still in their infancy. But as they grow up and become more sophisticated, we will probably see the spread of ‘computer utilities’ which, like present electric and telephone utilities, will service individual homes and offices across the country.”

Web-based IP Services

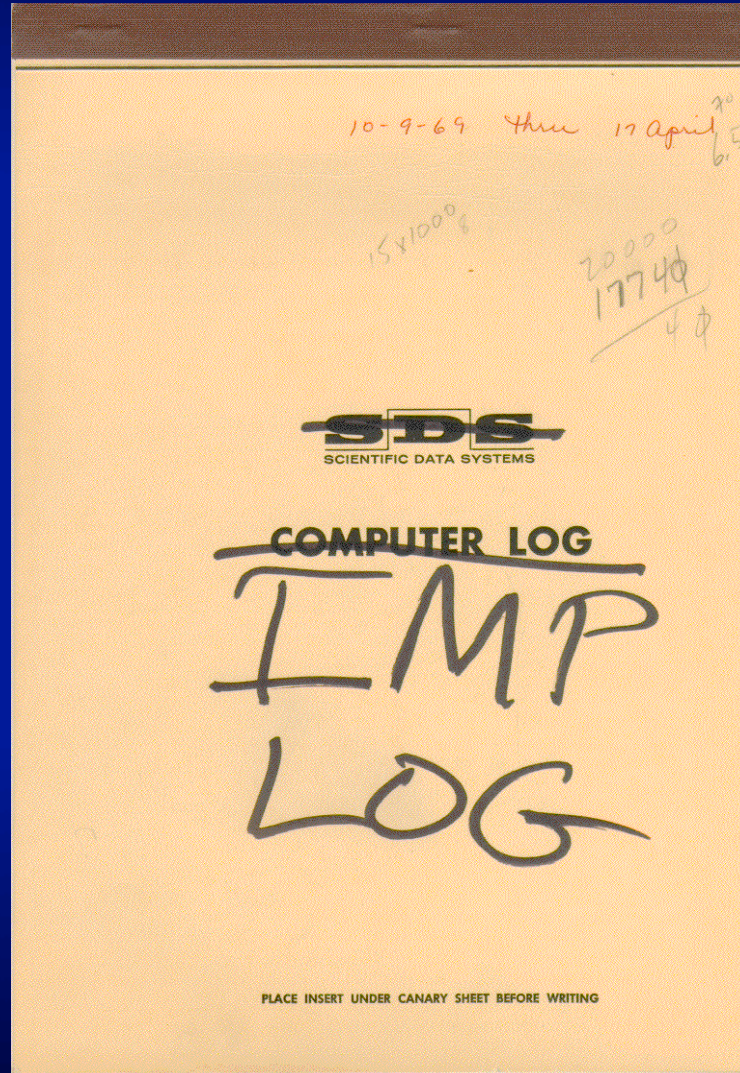
Always On Invisible

Ubiquitous

... system of the first, followed by the  
... ABRE reservation ... present time, the nation's electronically  
switched telephone ... largest computer network.  
However, ... specialized and single-purpose systems, in con-  
trast to ... system which will link a wide assortment of different com-  
puter ... range of unclassified research functions.  
... now, computer networks are still in their infancy," says Dr. Kleinrock.  
... as they grow up and become more sophisticated, we will probably see the spread  
of 'computer utilities', which, like present electric and telephone utilities,  
will service individual homes and offices across the country."



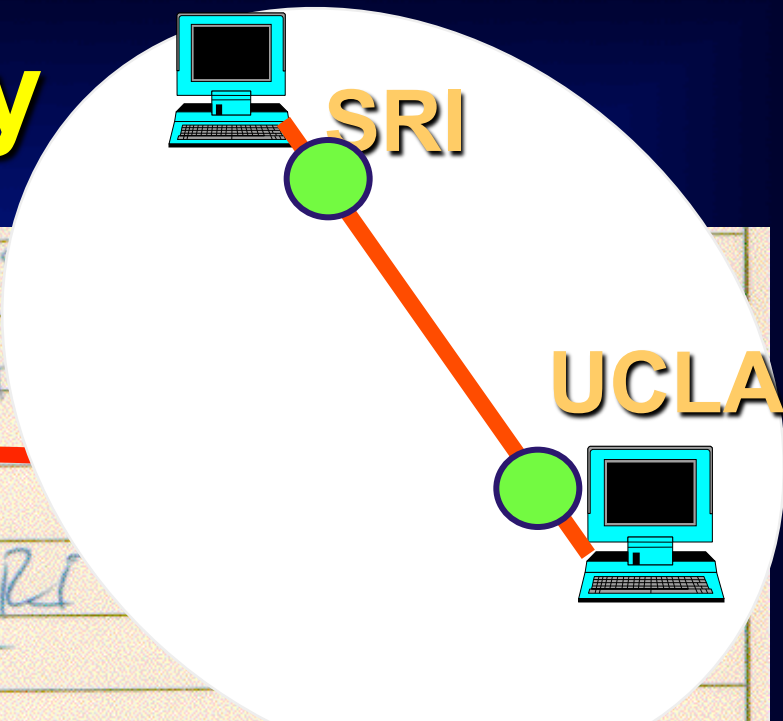
# We Decided to Keep a Log



# An Important Entry

29 OCT 69 2100 LOADED @P.  
E012 BEN BA  
BBN

22:30 Talked to SRI  
Host to Host



**First Message on  
the Internet  
- ever!**

But What Was ... e

F

LO

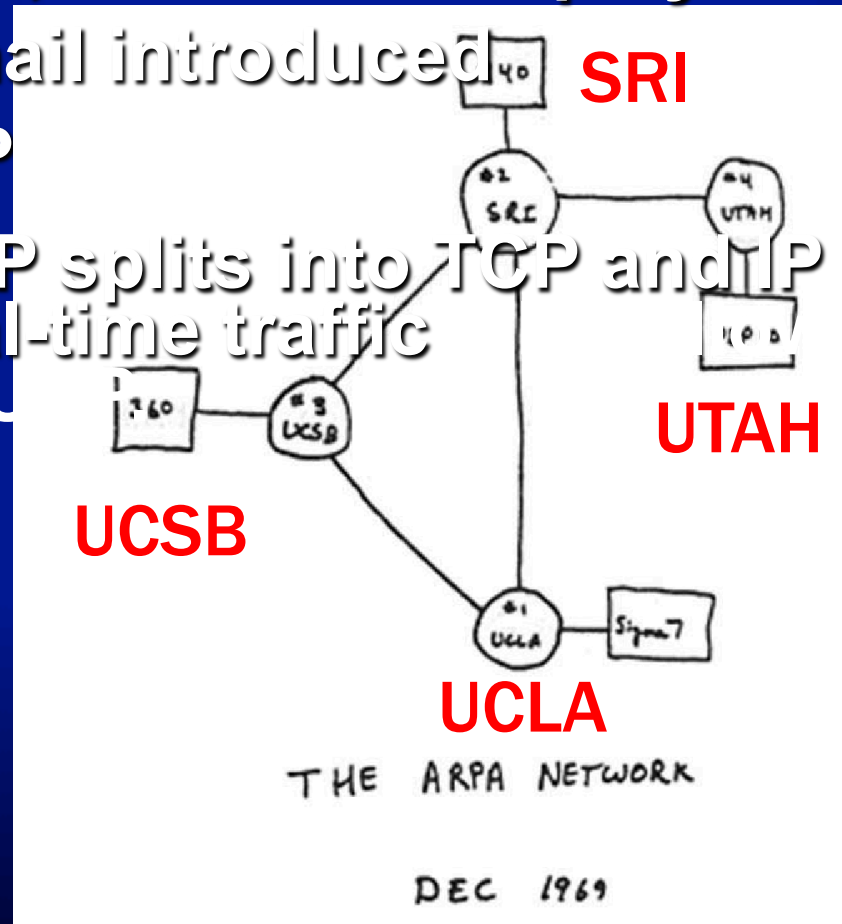
LO!

Lo and Behold!



# Brief History of the Internet

- 1969 Sept 2, First router installed (UCLA)
- 1969 Oct 29, First Internet message (UCLA → SRI)
- 1969 Dec, 4-node net deployed
- 1972 Email introduced
- 1973 TCP
- 1978 TCP splits into TCP and UDP to support real-time traffic of U



# Growth of the Internet

- From 1969 to 1988, the net grew
  - Rapidly
  - Friendly
  - Broadly
- Until . . .
- 1988 Robert Morris unleashes 1<sup>st</sup> Internet worm

Uh Oh!

Oh well.

# Growth of the Internet

- From 1988 to 1994, the net continued to grow
  - As the dot-coms came on line
  - As the backbone went to gigabit speeds
  - As the Web began to roll out.
- Until . . .
- 1994 Cantor & Siegel introduce spam

Uh Oh!

Ouch!

From: Laurence Canter (nike@indirect.com)  
Subject: Green Card Lottery- Final One?  
Newsgroups: alt.brother-jed, alt.pub.coffeehouse.amethyst  
View: Complete Thread (4 articles) | Original Format  
Date: 1994-04-12 00:40:42 PST

# The First Deliberate Mass Posting of Spam email

**Green Card Lottery 1994 May Be The Last One!  
THE DEADLINE HAS BEEN ANNOUNCED.**

The Green Card Lottery is a completely legal program giving away a certain annual allotment of Green Cards to persons born in certain countries. The lottery program was scheduled to continue on a permanent basis. However, recently, Senator Alan J Simpson introduced a bill into the U. S. Congress which could end any future lotteries. THE 1994 LOTTERY IS SCHEDULED TO TAKE PLACE SOON, BUT IT MAY BE THE VERY LAST ONE.

**PERSONS BORN IN MOST COUNTRIES QUALIFY, MANY FOR FIRST TIME.**

The only countries NOT qualifying are: Mexico; India; P.R. China; Taiwan, Philippines, North Korea, Canada, United Kingdom (except Northern Ireland), Jamaica, Dominican Republic, El Salvador and Vietnam.

Lottery registration will take place soon. 55,000 Green Cards will be given to those who register correctly. NO JOB IS REQUIRED.

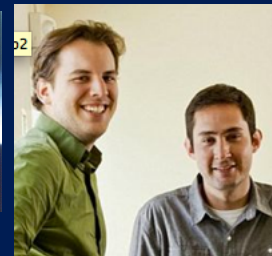
**THERE IS A STRICT JUNE DEADLINE. THE TIME TO START IS NOW!!**

**For FREE information via Email, send request to  
cslaw@indirect.com**

\*\*\*\*\*  
Canter & Siegel, Immigration Attorneys  
3333 E Camelback Road, Ste 250, Phoenix AZ 85018 USA  
cslaw@indirect.com telephone (602)661-3911 Fax (602) 451-7617

# The Personalities Who Brought Us All This Technology





# The Billionaires

# No Way Back

- The younger generation cannot conceive of a time when they could not
  - share their photos
  - chat with their friends
  - stream video
  - shop online.
- We can **never** turn the clock back to the pre-Internet world.

# Disruptive Forces

**Digitization of Practically Everything**



**Explosion of Broadband  
Flood of Streaming Media**

**Devices are Getting Smarter and  
Cheaper... A Lot Smarter and a Lot  
Cheaper... Really, Really Fast**



**And they're on the move!**

# The Future Internet Infrastructure

## 1. Nomadic Computing

- The system support to provide the nomadic user with trouble-free Internet service from any device, any place, at any time.

## 2. Embedded Technology

- Small intelligent devices embedded in the physical world and connected to the Internet

## 3. Intelligent Agents

- Intelligent **software agents** will be deployed across the network to mine data, give trends, etc

## 4. Ubiquity

- Internet service availability wherever the nomad travels on a global basis

# Applications and Services

- It has been the applications and services that have surprised us in the past
- They come out of the “blue”
- They have been mostly unanticipated
- Examples include
  - email
  - The World Wide Web
  - Peer-to-peer file sharing networks
  - Social networking
  - Blogs
  - Music, photo and video generation and sharing.
- It is safe to **predict** that we will **unable to predict** the sudden appearance and explosion of as-yet unanticipated applications and services.

# Where To From

- Considerable convergence
  - Content, Function
- Significant

The Internet will essentially be a pervasive global nervous system.

We have created a global system for shocking us with surprises.

easy

hard

Apps & Services are hard to predict.

# Advice to Students

- As students you are being handed an unbelievable gift, namely, the jewels of 4000 years of wisdom.
- This wisdom came as a result of hard devoted work.
- Believe that you, too, can achieve
- This involves
  - curiosity
  - exploration
  - deep critical thinking
  - innovation
  - dedication and hard work
  - not only memorization, rote learning and test preparation.

# More Advice to Students

- Many youth feel there is no great work left to be done.
- Not true – the golden era continues.
- There are lots of challenging problems left.
- And their impact will be great in
  - today's global economy
  - and in tomorrow's unimaginable world.
- Unanticipated choices will come your way – keep your eyes open for them.
- Choose your peers and mentors wisely
- These are times of enormous change.
- And times of enormous opportunity.

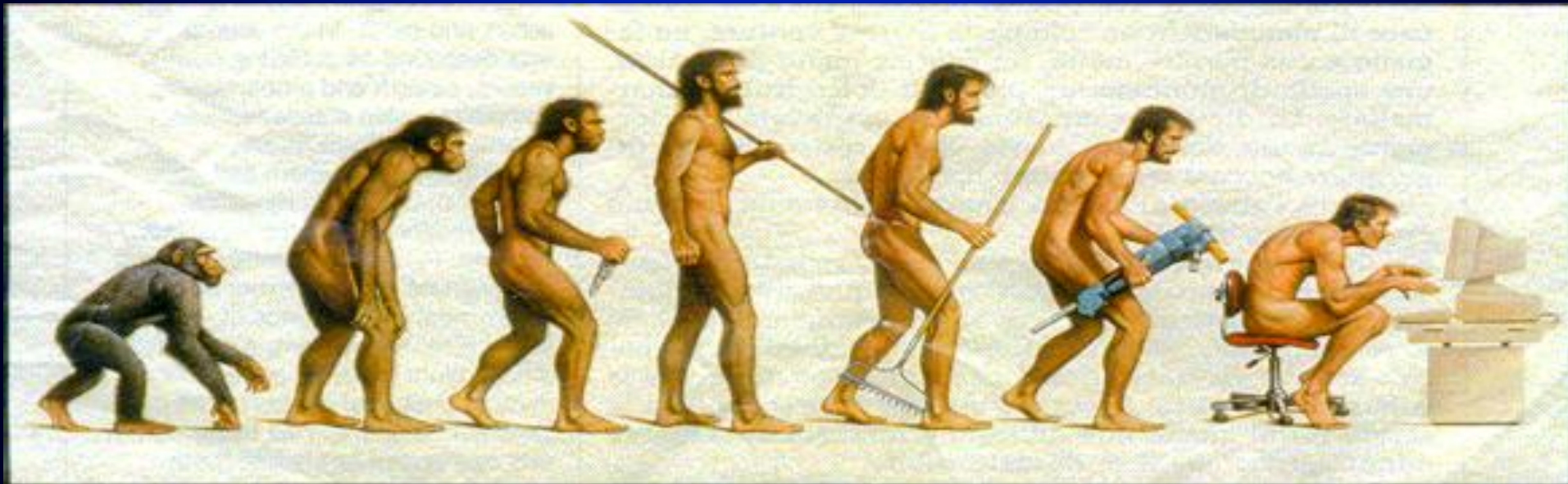


# Yet More Advice to Students

- **Don't follow the pack.**
  - **Have the courage to stake out new territory, develop new ideas, and go for the high ground.**
- **Reach beyond your grasp.**
  - **Failure is acceptable**
- **Will your work be remembered 100 years from now?**
- **It's hard to recognize critical events as they occur, so treat all your work as special and do each one well.**
- **Avoid mindless computing and simulation**
- **Extract key concepts, understanding and insight**
- **If something looks strange, examine it!**

# We Have Come a Long Way

## ... or Have We ?





# Thank You

[www.lk.cs.ucla.edu](http://www.lk.cs.ucla.edu)

