

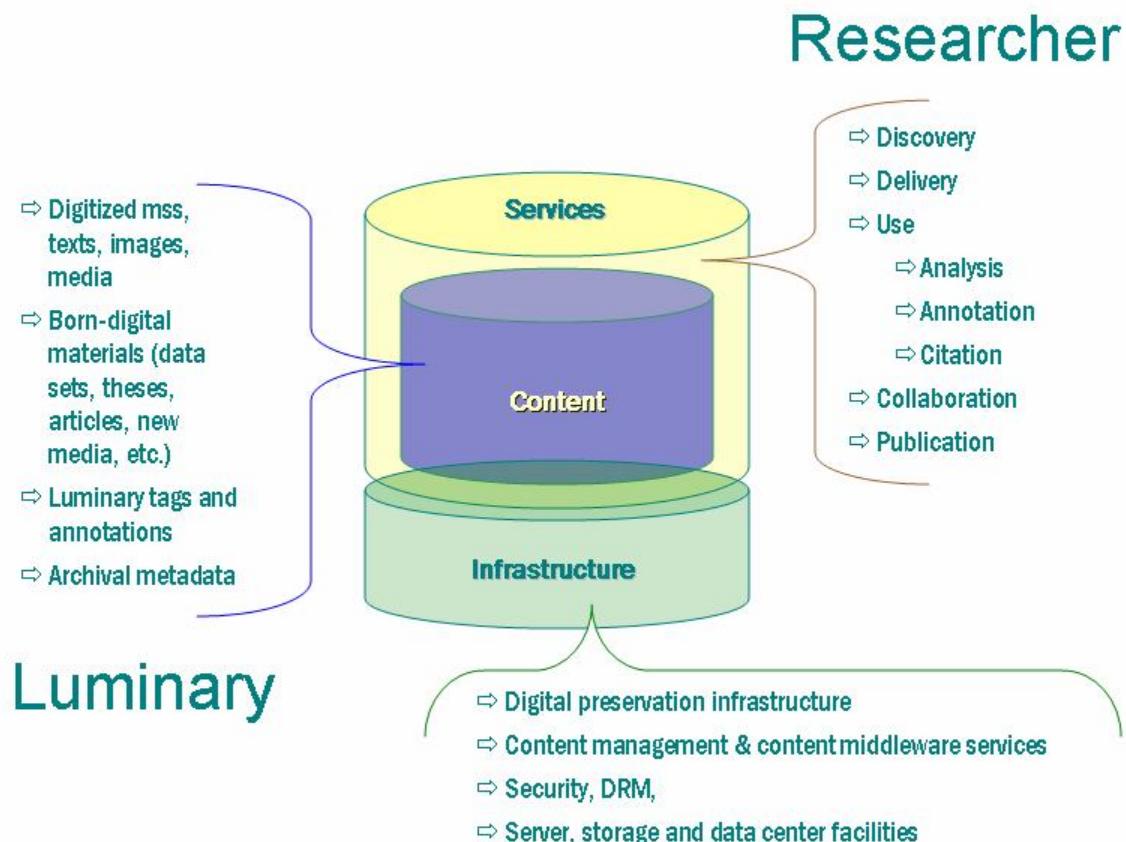


Self Archiving Legacy Toolkit

**Computer-assisted Semantic Annotation
of Scientific Life Works**

Will Snow, Project Manager
will.snow@stanford.edu

Stanford's digital library



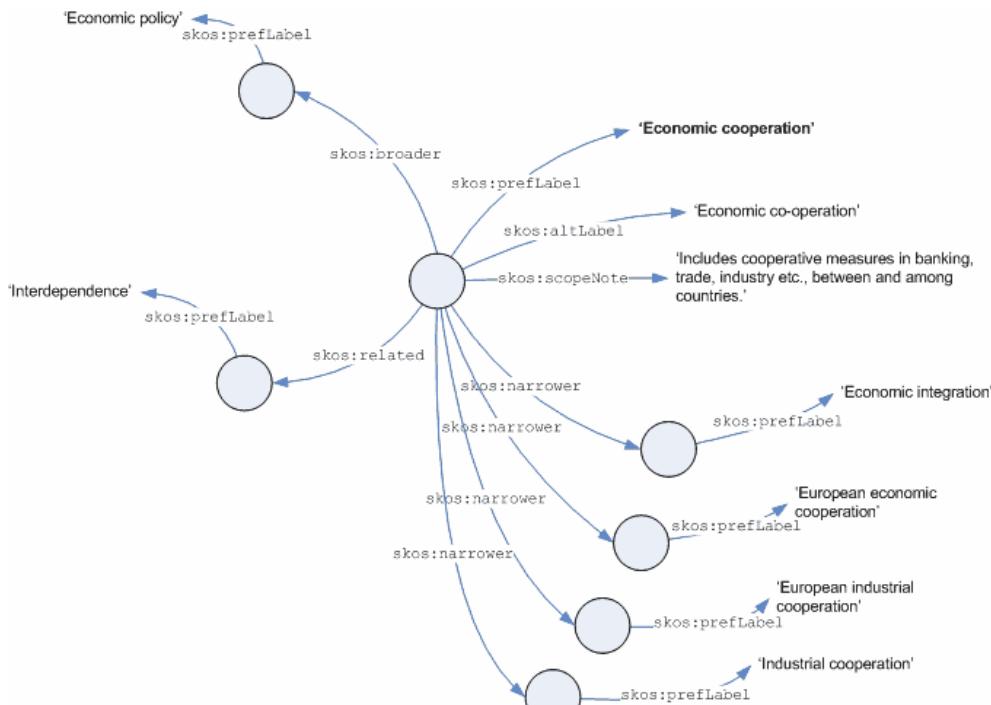
The problem

- Preservation and access
- Adding “context and content”



The opportunity

- Living Luminaries
- The Internet



prefix skos: <<http://www.w3.org/2004/02/skos/core#>>



Image: New York Times Photograph from the Year in Ideas by Zachary Scott December 12, 2004.

Hybrid archive

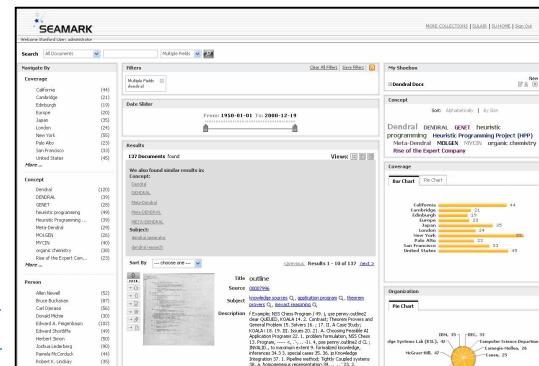
- Discovery tools
- Content and context
- Collection web page
- Finding aid
- Electronic archive
- Physical archive



The SALT project

- Next-Generation Discovery investigation
- Public Bio Site
- Luminary Toolkit
- Self Archiving workflow
- Adding Collections

[Navigational Search
\(Siderean\)](#)



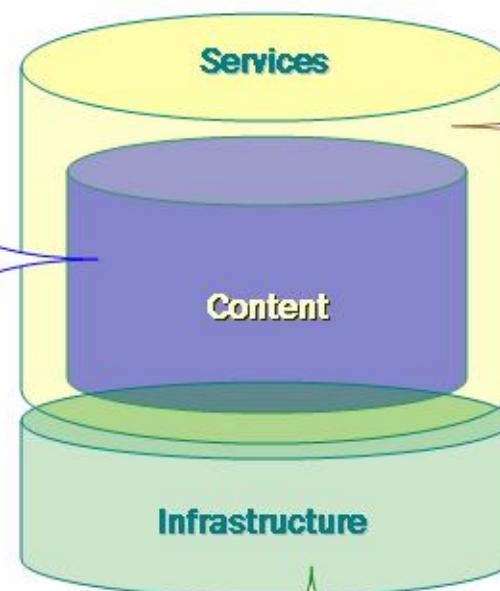
[Public Bio Site
\(Custom\)](#)



[Luminary Toolkit
\(Drupal\)](#)

User Experience

- ⇒ Digitized mss, texts, images, media
- ⇒ Born-digital materials (data sets, theses, articles, new media, etc.)
- ⇒ Luminary tags and annotations
- ⇒ Archival metadata



Researcher

- ⇒ Discovery
- ⇒ Delivery
- ⇒ Use
- ⇒ Analysis
- ⇒ Annotation
- ⇒ Citation
- ⇒ Collaboration
- ⇒ Publication

Luminary

- ⇒ Digital preservation infrastructure
- ⇒ Content management & content middleware services
- ⇒ Security, DRM,
- ⇒ Server, storage and data center facilities

Next Generation Discovery



POWERED BY SIDEREAN



1) Aggregate content and data from everywhere

2) Automatically extract metadata to provide context and build relationships

3) Provide people with Web-based social navigation experiences that allow them to participate in discovery

4) Deliver feeds for sharing discoveries

Demo: Stanford and Siderean

SEAMARK
Welcome Stanford User: administrator

Search All Documents Multiple Fields

Categories

2039 Documents

Coverage	Concept	Box
America (201)	Blackboard Framework (48)	2005-101, Box 1, Folde... (41)
California (347)	Dendral (120)	2005-101, Box 1, Folde... (40)
Cambridge (91)	Fifth Generation (100)	2005-101, Box 13, Fold... (32)
Europe (149)	GENET (60)	2005-101, Box 16, Fold... (36)
Japan (323)	heuristic programming (139)	2005-101, Box 17, Fold... (35)
New York (253)	Heuristic Programming ... (127)	2005-101, Box 22, Fold... (45)
Palo Alto (230)	MOLGEN (53)	2005-101, Box 22, Fold... (34)
San Francisco (123)	MYCIN (64)	2005-101, Box 24, Fold... (54)
United States (439)	Rise of the Expert Com... (53)	2005-101, Box 4, Folde... (43)
Washington (194)	SUMEX-AIM (92)	2005-101, Box 6, Folde... (40)
More ...	More ...	More ...

Person	Subject	Organization
Allen Newell (107)	artificial intelligence (544)	Air Force (84)
Bruce Buchanan (157)	computer program (177)	Carnegie-Mellon (81)
Carl Djerassi (67)	computer science (592)	DARPA (91)
Douglas B. Lenat (66)	engineering (249)	DEC (105)
Edward A. Feigenbaum (553)	expert systems (185)	Hewlett Packard (88)
Edward Shortliffe (119)	knowledge engineering (256)	IBM (243)
Herbert Simon (102)	knowledge representation (176)	Knowledge Systems Lab ... (177)
John McCarthy (67)	knowledge systems (205)	MIT (101)
Joshua Lederberg (114)	problem solving (245)	stanford university (463)
Pamela McCorduck (120)	software (369)	Stanford University (423)
More ...	More ...	More ...

Dr. Feigenbaum's Document Archive

Edward Feigenbaum, Professor Emeritus
E-Mail Address: feigenbaum@cs.stanford.edu

KSL Affiliation/Position: Kumagai Professor of Computer Science and Co-Scientific Director, [Knowledge Systems Laboratory](#)

 Research/Professional Interests: Knowledge-Based Systems Research and Applications; Computer Industry Research; Defence Technology and Technology Policy

Personal Statement: Edward Feigenbaum is a Professor of Computer Science and Co-Scientific Director of the Knowledge Systems Laboratory at [Stanford University](#). Dr. Feigenbaum served as Chief Scientist of the United States Air Force from 1994 to 1997.

[Dr. Feigenbaum's Bio](#)

No Items

Concept

Sort: Alphabetically | By Size

Blackboard Framework Dendral Fifth Generation GENET heuristic programming Heuristic Programming Project (HPP) MOLGEN MYCIN Rise of the Expert Company SUMEX-AIM

Subject

Sort: Alphabetically | By Size

artificial intelligence computer program computer science engineering expert systems knowledge engineering knowledge representation knowledge systems problem solving software



Text search

SEAMARK

Welcome Stanford User: administrator

Search All Documents | Multiple Fields |

Navigate By

Coverage

California	(44)
Cambridge	(21)
Edinburgh	(19)
Europe	(20)
Japan	(35)
London	(24)
New York	(55)
Palo Alto	(23)
San Francisco	(33)
United States	(45)

More ...

Concept

Dendral	(120)
DENDRAL	(39)
GENET	(28)
heuristic programming	(49)
Heuristic Programming ...	(39)
Meta-Dendral	(29)
MOLGEN	(26)
MYCIN	(40)
organic chemistry	(38)
Rise of the Expert Com...	(23)

More ...

Person

Allen Newell	(52)
Bruce Buchanan	(87)
Carl Djerassi	(56)
Donald Michie	(30)
Edward A. Feigenbaum	(102)
Edward Shortliffe	(49)
Herbert Simon	(50)
Joshua Lederberg	(90)
Pamela McCorduck	(44)
Robert K. Lindsay	(35)

Filters

Multiple Fields dendral

Date Slider

From: 1950-01-01 To: 2000-12-19

Results

137 Documents found

Views:

We also found similar results in:

Concept:

- [Dendral](#)
- [DENDRAL](#)
- [Meta-Dendral](#)
- [Meta-DENDRAL](#)
- [META-DENDRAL](#)

Subject:

- [dendral generator](#)
- [dendral research](#)

Sort By: --- choose one ---

Title outline
Source: [00007996](#)
Subject: [knowledge sources](#), [application program](#), [theorem provers](#), [inexact reasoning](#)
Description: Example; NS5 Chess Program / 49, j, use penny.outline2 clear QUEUED; KOALA 14. 2. Contrast; Theorem Provers and General Problem 15. Solvers 16 ; 17. II. A Case Study; KOALA i 18. 19. III. Issues 20, 21. A. Choosing Feasible AI Application Programs 22. 1. problem formulation, NS5 Chess 13. Program, ---- <, ' , .. -1, 4, pse penny.outline2 cl CL ; INVALID, to maximum extent 9. formalized knowledge, inferences 34.3 3. special cases 35, 36. ip Knowledge Integration 37. 1. Pipeline method; Tightly Coupled systems 38. a. homogeneous representation 39,, '23. 2.

MORE COLLECTIONS | SULAIR | SU HOME | Sign Out

My Shoebox

Dendral Docs

New

Concept

Sort: Alphabetically | By Size

Dendral DENDRAL GENET heuristic programming Heuristic Programming Project (HPP) Meta-Dendral MOLGEN MYCIN organic chemistry Rise of the Expert Company

Coverage

Bar Chart Pie Chart

California 44
Cambridge 21
Edinburgh 19
Europe 20
Japan 35
London 24
New York 55
Palo Alto 23
San Francisco 33
United States 45

Organization

Pie Chart

edge Systems Lab (KSL), 42
IBM, 35
DEC, 33
Computer Science Department, 26
Carnegie-Mellon, 26
McGraw-Hill, 47
Canon, 25

Filter, tile

The screenshot shows the SEAMARK search interface. At the top, there is a navigation bar with links to 'MORE COLLECTIONS', 'SULAIR', 'SU HOME', and 'Sign Out'. Below the navigation bar is a search bar with dropdown menus for 'All Documents' and 'Multiple Fields', and a magnifying glass icon.

Filters: The filters section shows the current search criteria: Concept (Dendral) AND Person (Bruce Buchanan) AND Subject (chemistry) AND Coverage (Italy). There is also a 'Date Slider' set from 1950-01-01 to 2000-12-19.

Results: The results section displays 7 documents found. The results are shown in a grid view with a 'Sort By' dropdown menu. The first result is titled 'Hath Simon Wrought?' and includes a snippet of text: "DENDRAL and Meta-DENDRAL: roots of knowledge systems and expert system applications".

My Shoebox: This section contains a collection named 'Dendral Docs'. It lists several items with purple highlights: 'Elementary Perceiver and Memorizer (EPAM)', 'GENET heuristic programming', 'Heuristic Programming Project (HPP)', 'IBM 701', 'Molgen MOLGEN MYCIN', 'organic chemistry', and 'Rise of the Expert Company'.

Coverage: This section features a horizontal bar chart comparing document counts across various locations. The data is as follows:

Coverage	Count
Amsterdam	2
Boorstein	2
Cambridge	4
Chinese	3
Edinburgh	5
Hansen	2
Japan	1
Los Angeles	4
Loveland	2
Mars	3
Meltzer	2
NYISAGE	3
Palo Alto	4
Philosophy	3
San Francisco	5
San Francisco Bay Area	3
United States	3
Welch Road	1

Organization: This section features a horizontal pie chart showing the distribution of documents by organization. The data is as follows:

Organization	Percentage
Dendral	6
Boorstein	5
Cambridge	4
Chinese	3
Edinburgh	2
Hansen	2
Japan	1
Los Angeles	3
Loveland	2
Mars	3
Meltzer	2
NYISAGE	4
Palo Alto	3
Philosophy	5
San Francisco	3
San Francisco Bay Area	1
United States	3
Welch Road	2

Personalize, save, alerts

SEAMARK

Welcome Stanford User: administrator

Search [All Docs]

Navigate By Coverage

- Amsterdam
- Bobrow
- Boorstein
- California
- Cambridge
- Chinese
- Edinburgh
- Hansen
- Japan
- Los Angeles
- Loveland
- Mars
- Meltzer
- NIVISAGE
- Palo Alto
- Philosophy
- San Fran
- San Franc
- United Sta
- Welch Ro
- More ...

Concept

- Elementary Perceiver a... (4)
- GENET (5)
- heuristic programming (6)
- Heuristic Programming ... (5)
- IBM 701 (4)
- Molgen (4)
- MOLGEN (4)
- MYCIN (4)
- organic chemistry (6)
- Rise of the Expert Com... (6)
- More ...

Person

Save Filter

Filter Properties

Name: My Filter

Filters: Concept : Dendral+Person : Bruce Buchanan+Subject : chemistry+Coverage : Italy

Alert me when new items are available for this search.

Frequency: Daily Weekly Monthly

By: Email: _____ (Comma separated) On Screen

Share Saved Filters with

User Group

Share User

- wendy
- jennifer
- gareth
- gus
- Administrator

Save Cancel

Clear All Filters Save Filters

2000-12-19

Views:

Results 1 - 7 of 7

References

784

ation processing Q, computer science Q, artificial intelligence Q, expert systems Q, problem solving Q, science Q, organic chemistry Q, chemistry Q, intelligence Q, op. cit. Goldstein, E.A., B. and Michie, Shortliffe, Lindsay, The Discoverers, New Y...

J.A. Feigenbaum, Pamela McCorduck, Edward Feigen, Gelernter, Herbert Simon, Joshua Lederberg, et al., Bruce Buchanan, Penny Ni, Douglas B. Lenat, Goldstein, Donald Michie, Papert, Hayes, Robert K. Lindsay, New York Q, Cambridge Q, Amsterdam Q, Italy Q, San Francisco Q, Hansen Q, Boorstein Q, Bobrow Q, Meltzer Q, Milan Q, Edinburgh Q, Loveland Q, Englewood Cliffs Q,

ACM Q, MIT Q, Addison Wesley Q, New Science of Management Decision Q, Edinburgh University Q, McGraw-Hill Q, Prentice-Hall Q, Intelligence Q

Dendral, heuristic programming, Fifth Generation, MYCIN, Heuristic Programming Project (HPP), DENDRAL, organic chemistry, Rise of the Expert Company

Box 2005-101, Box 1, Folder 15

Reviewed By 0 People

My Shoebox

Dendral Docs

Document: Expert Systems: P...
Document: Letter from Richa...

Concept

Sort: Alphabetically | By Size

Elementary Perceiver and Memorizer (EPAM) GENET heuristic programming Heuristic Programming Project (HPP) IBM 701 Molgen MOLGEN MYCIN organic chemistry Rise of the Expert Company

Coverage

Bar Chart Pie Chart

Coverage Category	Count
Chinese	3
Edinburgh	5
Hansen	2
Los Angeles	4
Mars	3
Meltzer	2
NIVISAGE	3
Palo Alto	4
Cambridge	6
California	4
Boorstein	2
Bobrow	2
United States	3
San Francisco Bay Area	3
San Francisco	5
Philosophy	3

Organization

Tag, rate, share

SEAMARK

Welcome Stanford User: administrator

Search All Documents | Multiple Fields |

Filters

Concept Dendral + Person Bruce Buchanan + Subject chemistry + Coverage Italy

Date Slider

From: 1950-01-01 To: 2000-12-19

Add/Edit Tags

Enter keywords that will help you locate this item in the future.

Tags:

Enclose each tag in quotation marks. To remove a tag, delete it from the field.

Save Cancel

Results

7 Documents found

Sort By: choose one

Views:

1 - 7 of 7 [next >](#)

Subject intelligence, expert systems, problem solving, cognitive science, organic chemistry, chemistry, machine intelligence

Description Hansen, op. cit. Goldstein, E.A., B. and Michie, Shortliffe, 1987 Lindsay, The Discoverers. New Y...

Person Edward A. Feigenbaum, Pamela McCorduck, Edward Shortliffe, Gelernter, Herbert Simon, Joshua Lederberg, Allen Newell, Bruce Buchanan, Penny Nii, Douglas B. Lenat, Goldstein, Donald Michie, Papert, Hayes, Robert K. Lindsay New York, Cambridge, Amsterdam, Italy, San Francisco, Hansen, Boorstein, Bobrow, Boorstein, Milan, Edinburgh, Loveland, Englewood Cliffs

Coverage ACM, MIT, Addison Wesley, New Science of Management Decision, edinburgh university, McGraw-Hill, Prentice-Hall, Intelligence

Organization Dendral, heuristic programming, Fifth Generation, MYCIN, Heuristic Programming Project (HPP), DENDRAL, organic chemistry, Rise of the Expert Company

Concept Chinese, 3, Cambridge, 6, California, 4, Boorstein, 2, Bobrow, 2, United States, 3, San Francisco Bay Area, 3, San Francisco, 5, Palo Alto, 4, Philosophy, 3

Box 2005-101, Box 1, Folder 15

Reviewed By 0 People

My Shoebox

Dendral Docs

Document: Expert Systems: P...
Document: Letter from Richa...

Concept

Sort: Alphabetically | By Size

Elementary Perceiver and Memorizer (EPAM) GENET heuristic programming Heuristic Programming Project (HPP) IBM 701 Molgen MOLGEN MYCIN organic chemistry Rise of the Expert Company

Coverage

Bar Chart Pie Chart

Category	Count
Chinese	3
Cambridge	6
California	4
Boorstein	2
Bobrow	2
United States	3
San Francisco Bay Area	3
San Francisco	5
Palo Alto	4
Philosophy	3
Chinese	3
Edinburgh	5
Hansen	2
Los Angeles	4
Mars	3
Meltzer	2
NVISAGE	3
Palo Alto	4
Philosophy	3
San Francisco	5
San Francisco Bay Area	3
United States	3
Welch Road	1

Organization

Bar Chart Pie Chart

Navigate the Graph

The screenshot shows the SEAMARK search interface. At the top, there's a navigation bar with links to 'MORE COLLECTIONS', 'SULAIR', 'SU HOME', and 'Sign Out'. Below the navigation bar, there are search fields for 'Search' (set to 'All Documents') and 'Multiple Fields', along with a search icon. To the right of the search fields are buttons for 'Clear All Filters' and 'Save Filters'.

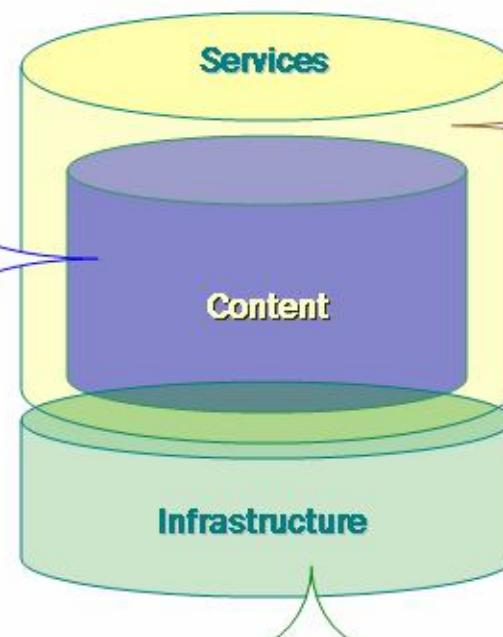
The main area features a 'Navigate By' sidebar on the left containing filters for 'Coverage', 'Concept', 'Person', 'Date', and 'Subject'. The 'Coverage' section lists locations like America, California, Europe, Germany, Japan, Mountain View, New York, Palo Alto, Redwood City, and San Francisco. The 'Person' section lists individuals such as Andersen, Daniel Okimoto, Edward A. Feigenbaum, Herbert Schorr, Hill, and John Seely Brown. The 'Date' section shows a range from 1901 to 2000. The 'Subject' section includes categories like computer applications, computer industry, general manager, information infrastructure, information technology, knowledge systems, software, and software industry.

In the center, a modal window titled 'Pivot Results: generic3d' displays a document titled 'LETTER FROM EDWARD A. FEIGENBAUM TO MR. SANJAY KUMAR'. The document is dated 1993-10-25 and is categorized as a 'Type: Document'. It contains a 'Description' field with text about software and business, and sections for 'Organization', 'Author', 'Coverage', and 'Title'. The title is 'Letter from Edward A. Feigenbaum to Mr. Sanjay Kumar'.

To the right of the modal, there's a 'My Shoebox' section with a 'Dendral Docs' link and a 'New' button. Below the modal, there's a horizontal timeline slider and a pie chart at the bottom right showing connections between entities like Hewlett Packard, CAI, Applications of Artificial Intelligence, Andersen Consulting, Space Administration, School of Engineering, and Xerox PARC.

User Experience

- ⇒ Digitized mss, texts, images, media
- ⇒ Born-digital materials (data sets, theses, articles, new media, etc.)
- ⇒ Luminary tags and annotations
- ⇒ Archival metadata



Researcher

- ⇒ Discovery
- ⇒ Delivery
- ⇒ Use
- ⇒ Analysis
- ⇒ Annotation
- ⇒ Citation
- ⇒ Collaboration
- ⇒ Publication

- ⇒ Digital preservation infrastructure
- ⇒ Content management & content middleware services
- ⇒ Security, DRM,
- ⇒ Server, storage and data center facilities

Public bio site

Stanford Luminary Archives SULAIR

Search

Overview
Biography
Resources
Work Highlights
Concepts
Timeline
Explore / Browse

EDWARD A. FEIGENBAUM



Redefine the Impossible.

"Intense desire not only creates its own possibilities, but its own talents. Don't be afraid to do something just because it's impossible." - Kobi Yamada

Welcome

Edward Albert Feigenbaum, known as "Father of Expert Systems," received the most prestigious computer science award, The Association of Computing Machinery Turing Award in 1993 "for pioneering the design and construction of large scale artificial intelligence systems, demonstrating the practical importance and potential commercial impact of artificial intelligence technology."

As part of its Luminary Archives project, Stanford University is digitizing and making available over the World Wide Web a selection of the Feigenbaum Collection, for use by educators and researchers.

This online Exhibit is designed to introduce you to the various phases of Feigenbaum's scientific career and professional life. One can view summaries of his biography, work highlights, concepts created, and view key topics in a timeline. The timeline and the search functionality offer access to 50 of the most important published and unpublished works as selected by Feigenbaum.



Biography

Stanford Luminary Archives SU²LAIR

Search

Overview

Biography

Resources

Work Highlights

Concepts

Timeline

Explore / Browse

Feigenbaum's Biography



Edward Albert Feigenbaum joined Stanford's faculty in 1965 as Associate Professor of Computer Science. That same year, he was appointed director of Stanford's Computation Center, overseeing Stanford's considerable computer facilities. He also served as Principal Investigator of the Heuristic Programming Project (HPP), later known as the Knowledge Systems Laboratory (KSL). Today Feigenbaum is co-director emeritus of KSL. KSL is a hub for advanced research in knowledge-based computer programs (expert systems) with applications in medicine and engineering. Feigenbaum was appointed Professor of Computer Science at Stanford in 1969. In 1995, he became the Kumagi Professor of Computer Science, a position he has held in emeritus since his retirement in 2001.

Feigenbaum began his academic career in 1960 at the University of California, Berkeley with a research appointment at the Center for Research in Management Science. He was appointed Associate Professor at Berkeley's School of Business Administration in 1964 before joining the newly launched Stanford's Artificial Intelligence Laboratory (SAIL) in 1965. During his more than four distinguished decades at Stanford in addition to his groundbreaking work at KSL, Feigenbaum has been Director of Stanford's Computation Center (1965-1968), Professor (by courtesy) to the Department of Psychology (1976-83), Chairman of the Computer Science Department (1976-81), Principal Investigator and then co-Principal Investigator of the SUMEX-AIM Project, a national computer resource for application of artificial intelligence to medicine and biology established by the National Institutes of Health (NIH) (1978-1992), and Founder and Co-Director of the Stanford Software Industry Project (1993-1998). Additionally, Feigenbaum has served as Chief Scientist of the United States Air Force (1994-1997) and as Senior Scientist to the United States Air Force Office of Scientific Research (2000-2001).

A pioneer in Artificial Intelligence (AI), often referred to as the "Father of Expert Systems", Feigenbaum and his colleagues at KSL invented and developed DENDRAL which is considered to be the first expert system. An expert system is a software system that models as perfectly as possible the best knowledge available in a field to provide problem analysis and solutions to the end-user of the software. DENDRAL successfully modeled the behavior of organic chemists in order to identify organic molecules by analyzing their mass spectra. DENDRAL's breakthrough automated analysis, diagnosis, and solution programming became the basis for the entire expert systems. Programs that built upon DENDRAL include: MYCIN, MOLGEN, MACSYMA, PROSPECTOR, XCON and STEAMER.

Feigenbaum has been instrumental in transferring expert systems technology to industry as a co-founder of three start-up companies in applied AI. He has served on the boards or advisory councils of [seven] companies and has founded or has been affiliated with dozens of industry, scientific and government organizations. Author or co-author of [ten- confirm] books as well as [X-number] papers, Feigenbaum has been the recipient of dozens of honors including, honorary degrees, lectureships, fellowships and awards, including the ACM's prestigious A.M. Turing Award.

Feigenbaum received a B.S. in Electrical Engineering at Carnegie Institute of Technology in 1956 and his Ph.D. in 1959 from the Graduate School of Industrial Administration, Carnegie Institute of Technology (now Carnegie-Mellon University).

Concepts

Stanford Luminary Archives SU²LAIR

Search

Overview
Biography
Resources
Work Highlights
Concepts
Timeline
Explore / Browse

Concepts

A pioneer in Artificial Intelligence (AI), often referred to as the "Father of Expert Systems", Feigenbaum and his colleagues at KSL invented and developed DENDRAL which is considered to be the first expert system. An expert system is a software system that models as perfectly as possible the best knowledge available in a field to provide problem analysis and solutions to the end-user of the software. DENDRAL successfully modeled the behavior of organic chemists in order to identify organic molecules by analyzing their mass spectra. DENDRAL's breakthrough automated analysis, diagnosis, and solution programming became the basis for the entire expert systems. Programs that built upon DENDRAL include: MYCIN, MOLGEN, MACSYMA, PROSPECTOR, XCON and STEAMER.

The diagram illustrates the evolution of AI concepts over time:

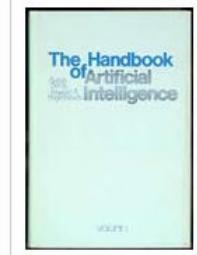
- EPAM** (1956) leads to **Dendral** (1965).
- Dendral** leads to **MetaDendral** (1970) and **MYCIN** (1970).
- HPP** (1970) leads to **KSL** (1982).
- HPP** leads to **Hasp** (1973), which leads to **SIAP** (1976).
- HPP** also leads to **Molgen** (1976), which leads to **GENET** (1980).
- SUMEX-AIM** (1974) leads to **GENET** (1980).

Funders | Contact | Site Map | Privacy Policy ©2008 The Board of Trustees of the Leland

Timeline



a microcomputer-controlled laser printer system led to the founding of Imagen Corporation by a Stanford post-doctoral researcher. In 1981, a SUMEX-AIM researcher developed the first multiple-protocol router. A version of this router was later licensed by Stanford start-up company, Cisco Systems in 1986. [20]



1981-1989

The Handbook of Artificial Intelligence

Now in its fifth edition, *The Handbook of Artificial Intelligence* describes the early stars of Artificial Intelligence. First published by Stanford's Heuris Tech Press in 1981, the AI Handbook was co-edited by Feigenbaum, Avron Barr and Paul Cohen. [21]

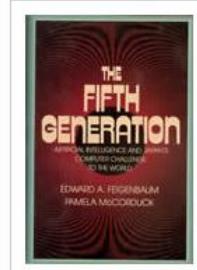
[Handbook of AI](#) |

1981

Knowledge Systems Laboratory

In 1982, Feigenbaum founded Stanford's Knowledge Systems Laboratory (KSL) along with colleague Bruce Buchanan as a forum for research and publication of reports in the areas of expert systems across all disciplines. KSL has become a center for research and an information clearing house for knowledge-based systems. Since its inception, researchers have published hundreds of reports on the work they have done at KSL. Current research areas include: the semantic web, hybrid reasoning, knowledge aggregation and ontology engineering. [22]

[KSL Reports ...](#) | [How Things Work ...](#) |



1983

The Fifth Generation

In 1983, Feigenbaum and co-author Pamela McCorduck published a best-selling technical book that read like a novel, *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World*. The Fifth Generation Computer Systems project (FGCS) began in 1982. A joint effort between Japan's Ministry of Trade and the Japanese electronics industry, FGCS was supposed to create a fifth generation computer to give the Japanese the technological and therefore the commercial advantage over the fourth generation computers running on microprocessors in the U.S. Even though FGCS did not deliver as planned, Feigenbaum's book captured the excitement surrounding the project and still provides an excellent historic perspective on the Computer industry in the early 80s. [23]

[The Fifth Generation](#) | [Peninsula Times ...](#) |

1981-1986

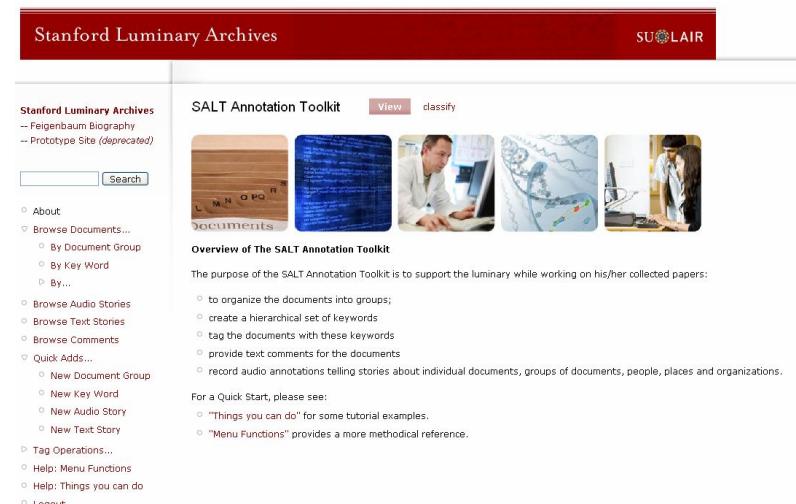
Start-Up Companies

In September 1980, Feigenbaum founded IntelliGenetics, Inc. with Stanford Ph.D. Douglas Brutlag (now a professor of Biochemistry at Stanford), Stanford Medical Professor Laurence Kedes (now a professor of Medicine at UCLA), and Peter Friedland, Research Director of MOLGEN. IntelliGenetics' narrow focus – to commercialize computer programs and applications for research in recombinant DNA



The Luminary Toolkit

- View Docs: thumbs and metadata
- Add Keywords from extracted entities
- Add comments
- Group docs
- Synonyms
- Links



The screenshot shows the Stanford Luminary Archives interface. At the top, there's a red header bar with the text "Stanford Luminary Archives" and the SU LAIR logo. Below the header, on the left, is a sidebar menu with options like "About", "Browse Documents...", "Quick Adds...", "Tag Operations...", and "Logout". In the center, there's a main content area titled "SALT Annotation Toolkit" with tabs for "View" and "classify". Below the tabs, there are four small thumbnail images: one of a document labeled "Documents", one of a blue waveform labeled "Audio Stories", one of a person working at a computer labeled "Text Stories", and one of a map labeled "Comments". To the right of these thumbnails is a section titled "Overview of The SALT Annotation Toolkit" which contains a bulleted list of purposes: "to organize the documents into groups; create a hierarchical set of keywords; tag the documents with these keywords; provide text comments for the documents; record audio annotations telling stories about individual documents, groups of documents, people, places and organizations." Below this overview is another bulleted list under "For a Quick Start, please see:".



Provenance View

Stanford Luminary Archives

SU LAIR

Home

Stanford Luminary Archives

- Feigenbaum Biography
- Prototype Site (*deprecated*)

-
- About
- ▽ Browse Documents...
 - By Document Group
 - By Key Word
 - ▷ By...
- Browse Audio Stories
- Browse Text Stories
- Browse Comments
- ▽ Quick Adds...
 - New Document Group
 - New Key Word
 - New Audio Story
 - New Text Story
- ▷ Tag Operations...
- Help: Menu Functions
- Help: Things you can do
- Logout

will

- ▷ Audio
- ▷ Create content

Document List

SALT ID	Doc Grp.	Keys	Box	Date	Status	Rating	Title
			2005-101, Box 1, Folder 1	1994-09-01			ACM Membership Card
			2005-101, Box 1, Folder 2	1990-08-01			Abstract: Knowledge Engines - Economic Payoff and Prospects for the Future
			2005-101, Box 1, Folder 2	(unknown)			Abstract: Monday Speech: The Payoff from Expert Systems; Tuesday Speech: Knowledge Engines
			2005-101, Box 1, Folder 2	(unknown)			(untitled)
			2005-101, Box 1, Folder 2	(unknown)			"Dertouzos"
			2005-101, Box 1, Folder 2	1988-01-16			Edward A. Feigenbaum
			2005-101, Box 1, Folder 2	2008-01-14			Working Smarter; Expert Systems, Productivity, and Economic Gain
			2005-101, Box 1, Folder 2	1987-12-01	***		Presentation of Edward A. Feigenbaum: Stanford - IBM Discussion of Knowledge-Based Systems
			2005-101, Box 1, Folder 2	(unknown)			Working Smarter: Expert Systems, Productivity, and Economic Gain
			2005-101, Box 1, Folder 3	(unknown)			Department of the Air Force: Research Initiative Announcement: IRTPS - Phase III
			2005-101, Box 1, Folder 5	1981-08-17			Agenda for AAAI Council Meeting, August 24, 1981
			2005-101, Box 1, Folder 5	(unknown)			AAAI logos

Document View

Stanford Luminary Archives SU^LAIR

Home

Stanford Luminary Archives
-- Feigenbaum Biography
-- Prototype Site (*deprecated*)

Search

- About
- ▽ Browse Documents...
 - By Document Group
 - By Key Word
 - ▷ By...
- Browse Audio Stories
- Browse Text Stories
- Browse Comments
- ▽ Quick Adds...
 - New Document Group
 - New Key Word
 - New Audio Story
 - New Text Story
- ▷ Tag Operations...
- Help: Menu Functions
- Help: Things you can do
- Logout

will

- ▷ Audio
- ▷ Create content
- Recent posts

ACM Membership Card [View](#) [classify](#)



Date: 1994-09-01
Box: 2005-101, Box 1, Folder 1
SALT ID: 00004728

_organization: ACM | Association for Computing Machinery | Elsevier _place: New York _email: acmhelp@acm.org _aboutness: computer science | conference proceedings | information processing | knowledge base | professional develop | special interest

Comments

Post new comment

Your name:
will

Comment: *

Named Topics

Stanford Luminary Archives SU²LAIR

Home > Browse Documents... > By...

Stanford Luminary Archives

-- Feigenbaum Biography
-- Prototype Site (*deprecated*)

○ About
▽ Browse Documents...
 ○ By Document Group
 ○ By Key Word
 ▽ By...
 ○ Status
 ○ Rating
 ○ _named_topic
 ○ _person
 ○ _organization
 ○ _place
 ○ _email
 ○ _aboutness
○ Browse Audio Stories
○ Browse Text Stories
○ Browse Comments
▽ Quick Adds...
 ○ New Document Group
 ○ New Key Word
 ○ New Audio Story
 ○ New Text Story

_named_topic
Advanced Computer Architectures Advanced Reasoning Tool AI Research Algol Applications of Artificial Intelligence for Organic Chemistry Applied Chemistry Behavioral Science BIONET Blackboard Framework Chief Scientist cloning connection machine control system decision theory defense department Dendral Design Power diagnose discrimination net DNA sequencing educated guess Electrical Engineering Elementary Perceiver and Memorizer (EPAM) FGCS Fifth Generation Fortran Fulbright Scholar game theory GENET Handbook of Artificial Intelligence HASP HASP/SIAP HEARSAY heuristic programming Heuristic Programming Project (HPP) human behavior Human Problem Solving IBM 360 IBM 650 IBM 701 IBM 704 IBM 7090 Information Processing Language (IPL) Intelligenetics Japanese Industry Kee System Knowledge is Power language skills Lisp Lisp Machine Lotus Mathematica Meta-Dendral MO MOLGEN Mountain View MYCIN National Physical Laboratory nerve impulse Nobel prize ontology Opera organic chemistry Pascal Peter Friedland Piano recombinant DNA Rise of the Expert Company Robotics SAIL SCIP SIAP Smalltalk speech recognition Sputnik Stanford Chorus Stanford Computation Center start-up SUMEX-AIM Teknowledge Tetrahedron Turing Award UNIVAC UNIX VLSI von Neumann

Home > Documents

By Key
Dendral EPAM Hasp HPP KSL Meta-Dendral

Person Entities

Stanford Luminary Archives  SUNLAIR

Home > Browse Documents... > By...

Stanford Luminary Archives

-- Feigenbaum Biography
-- Prototype Site (*deprecated*)

○ About
▽ Browse Documents...
 ○ By Document Group
 ○ By Key Word
▽ By...
 ○ Status
 ○ Rating
 ○ _named_topic
 ○ _person
 ○ _organization
 ○ _place
 ○ _email
 ○ _aboutness
○ Browse Audio Stories
○ Browse Text Stories
○ Browse Comments
▽ Quick Adds...
 ○ New Document Group
 ○ New Key Word
 ○ New Audio Story
 ○ New Text Story

person

A. B. Delfino A. Buchs A.K. Long A.K. Schrock A. Lavanchy A. Levy A. M. Duffield A. Morgan A.P. Johnson A. Rappaport A. V. Robertson A. Vezza A. Yeo Ackerman Aiello Alan Kay Albert Gore Al Bien Alexander H. Flax Allen Newell Alvey Andersen Anderson Andy DiPaolo Ann Dilworth Anne Feibelman Anthony Stentz Antti Ahlstrom Arthur Andersen Athena Atkinson Avron Barr Axline B.A. Votteri B. Chandrasekaran B.D. Clayton B. Meltzer B. Nathwani B. Sawyer B. Williams Babbage Bach Barbara Hayes-Roth Barnett Bennett Bernard Chern Bernstein Bertrand Russell Blair Blanchard Blaustein Blum Bob Blum Bobby Inman Bob Fallat Bob Kahn Bonnie Lynn Webber Bower Brian Falkenhainer Bruce Buchanan Bruce Delagi Bruce Lowerre Brunswick C. Flagle C. GATEWOOD C. McDonald C. Rindfleisch C.W. Crandell C. Yanofsky Carhart Carl Djerassi Carolyn Schultz Carolyn Tajnai Charles Rich Charles Yanofsky Chomsky Christopher Tong Clement J. McDonald Clin Cohen Collins Connelly Cordell Green Corte Madera Crawford D.H. Smith D. H. Smith D. H. Williams D. Heckerman D. Simborg Daniel I. Okimoto Daniel Okimoto Dan Sestak David Barstow David C. Wilkins David E. Smith David Smith DAVIS DAYHOFF de Kleer Derek Sleeman Don A. Waterman Donald Kennedy Donald Knuth Donald Lindberg Donald Michie Douglas B. Lenat Douglas Brutlag Douglas Hofstadter Douglas Murray Douglass Brutlag Dr. Austin Dr. Dennis Smith Dr. Don E. Detmer Dr. Edward N. Brandt Dr. Faye G. Abdellah Dr. Gray Dr. Stimler Duncan E. Gabrielli E. Hammond E. Hinman E. Horvitz E. VanBrunt Ed Maher Ed Patterson Edward A. Feigenbaum Edward Kennedy Edward Shortliffe Einstein Elementary Perceiver Ellie Engelmore Ellie Englemore Elliott Soloway ELMER R. GABRIELI Engelmore Eric Horvitz Eric Roberts Erman F. Rosenschein FEINSTEIN Fikes Firebaugh Forbus Fraser Fred Brooks Frederick Frederick Hayes-Roth Freeman Fuchi G.I. Ouchi G. Lodwick G.M. Schwenzer G. O. Barnett G. Schroll G. Wiederhold Galileo Galernter George Polya George Wheaton Gio Glenn Rennels Goldstein Gordon Bell Gordon Foyster Gordon Novak Grant Grant Dove Gray Gregory F. Cooper Gregory Gibbons Greiner Guha Gurst H. Budzikiewicz H. Orthner H. Schorr H. Warner Hamilton Harmon Harold Brown Harold Cohen Harper Harris Harrison Harry Pople Harry W. Brooks Hayes Hayes-Roth HELMUTH F. ORTHNER Henderson Henze Herbert Simon Hersh Hewitt Hillsdale Hiroshi Kawabuchi Hisayuki Mori Horn Howard E. Fauver Howard Shrobe Hsu Hubert Dreyfus Hubert L. Dreyfus Hunter Inman Iris Propeller Iwasaki J. Bacteriol J. Chem J.E. Gurst J.E. Hayes J. Feldman J.G. Nourse J. Myers J. Presper Eckert J.S. Brown J. Shurkin J. Smith Jack Myers Jacobsen Jacobson James Brinkley James F. Gibbons James S. Bennett Jan Clayton Jardetzky Jay Liebowitz Jay Seward Jeffrey JEROME R. COX Jerry Hobbs Jinman JOEL MOSES Joe Rockmore Johan de Kleer John Backus John Lewis John Mauchly John McCarthy John McDermott John Searle John Seely Brown John Shaw Johns Hopkins Johnson John Sowa John Von Neumann John Wiley Joseph Weizenbaum Joshua Lederberg Julian Blaustein Julian Feldman Kahn Kaplan Karp Katajamaki Kazuhiro Fuchi Kehler Keith Uncapher Kennedy Kepler Kestrel Ketonic Klatt Krister Ahlstrom Kruger L. Creary L. Hjelmeland L. Kingsland L. Masinter L. Pagan Lael Gatewood Laurence H. Kedes Lawrence Erlbaum Lawrence M. Fagan Les Belady Lesser Lester Thurow Lewis Licklider Louis I. Steinberg Lucy Suchman M. Ackerman M. Jenkins M. Peairs M.R. Lindley M.S. Blois M. Stefk M. van Cleemput M. Walker Machine Makoto Nagao Marconi Marina Del Rey Marion J. Ball Marjory S. Blumenthal Mark Cutkosky Mark Miller Mark Musen Markovian Mark Stefk Marsden S. Biois Marsden S. Biois Marsha Jo Hanna Martian Martin Marietta Marty Tenenbaum Marvin Minsky Matthew L. Ginsberg Maxam MCNEIL Meg Knemeyer Meltzer Memorizer Michael J. Michael J. Kelly Michael L. Dertouzos Michael R.

Text Annotations

Stanford Luminary Archives

SU^LLAIR

Home

Stanford Luminary Archives
-- Feigenbaum Biography
-- Prototype Site (*deprecated*)

- About
- Browse Documents...
 - By Document Group
 - By Key Word
 - By...
- Browse Audio Stories
- Browse Text Stories
- Browse Comments
- Quick Adds...
 - New Document Group
 - New Key Word
 - New Audio Story
 - New Text Story
- Tag Operations...
 - Help: Menu Functions
 - Help: Things you can do
- Logout

will

- Audio
- Create content

DENDRAL - The First Expert System

Author: Contract Writer

In the forward to Computers and Thought, Feigenbaum called for using computers to explore the processes of inductive thinking. In contrast to deduction-based systems, a system based on induction would allow computers to make "educated guesses" which could evolve when new knowledge was given. In 1964, a year before coming to Stanford, Feigenbaum met Joshua Lederberg while attending meetings at Stanford's Center for Advanced Studies in Behavioral Science. Lederberg, chairman of the genetics department at Stanford and a Nobel Prize laureate, was working on instruments for a Mars Lander, especially a mass spectrometer that could be used to determine the structure of possible life precursor molecules such as amino acids. Feigenbaum realized that Lederberg's problem was essentially one of induction. Could a computer analyze an array of data and then propose a candidate structure based on the data? Could a computer be programmed to induce theories from data? Feigenbaum quickly embraced the Lederberg challenge, and the two began working on a program to model scientific empirical induction. It soon became clear, however, that an expert knowledge of chemistry was necessary for the success of the project. Feigenbaum knew no mass spectrometry and Lederberg some. They recruited Carl Djerassi, an organic chemist at Stanford and not coincidentally an expert in mass spectrometry, to provide the knowledge base for the program. With the help of Djerassi's team and Feigenbaum's team, the resulting successful software program became known as DENDRAL, an acronym of the phrase "dendritic algorithm," a precursor program that Lederberg had written. (A dendrite refers to the branching parts of a neuron that transmit and receive nerve impulses.) DENDRAL is considered to be the first expert system because the main source of its excellent problem solving skills was knowledge "extracted" from chemists. The DENDRAL program could solve many mass spectral analysis problems at the level of an expert chemist, or beyond. In essence the computer modeled an organic chemist.

Comments

Post new comment

Your name:

will

Comment: *

Audio Annotations



Stanford Luminary Archives

SU LAIR

Home > View

Stanford Luminary Archives
-- Feigenbaum Biography
-- Prototype Site (*deprecated*)

- About
- Browse Documents...
 - By Document Group
 - By Key Word
 - By...
- Browse Audio Stories
- Browse Text Stories
- Browse Comments
- Quick Adds...
 - New Document Group
 - New Key Word
 - New Audio Story
 - New Text Story
- Tag Operations...
- Help: Menu Functions
- Help: Things you can do
- Logout

will

- Audio
- Create content
- Recent posts

Remembering Joshua Lederberg, part 1



- Click to play
- Length: 16.22 MB
- Format:

Date: 04/16/2008

[Download audio file](#)

Comments

Remembering Joshua

Tue, 04/22/2008 - 22:20 — will

Remembering Joshua Lederberg, Part 1

On April 16, 2008—

EF = Edward Feigenbaum (Professor, Computer Science Department).

EF: A colleague of mine Joshua Lederberg...uh died in, uh, early February of 2-0-0-8 at the age of 82. Uh, there, uh (voice cracks) there have been, umm, numerous, uh, mem-memorial pieces, umm, memory pieces, obituaries written about, umm, this, uh, giant of, uh, 20th century science. Umm, uh, even last night, and, uh, and I'm talking now about, uh, April of, uh, 2-0-0-8. Uh, I was working on a portion of a, uh, memoir about, uh, Lederberg, uh, that is to appear, umm, uh, as part of, uh, a, uh, volume for the National Academy of Science. Umm, being prepared by a biologist, uh, with additions by me about Lederberg's contribution to, uh, computer science.

Uh, I met, umm, Joshua Lederberg in 19...64. Uh, Lederberg was...at Stanford..I was at Berkeley. This was the year before I, uh, changed jobs and came to Stanford. Uh, Lederberg was a professor in the school of medicine, chairman of the genetics department. Uh, and (clears throat), he had, uh, uh, shared the Nobel Prize in 1959 for, uh...biological discoveries that are among the basic, most basic that have ev-ever been made that, uh, opened, uh, opened the gates to modern, uh, genetic engineering, recombinant DNA processing, umm, and modern molecular biology and m-molecular genetics. It, it was just a very, very important, uh, contribution.

Uh, in the years after his, uh, arrival at Stanford in 1959, he, umm, his interests broadened considerably, uh, beyond genetics, uh, perhaps in his thinking uh, he had reached the peak of, uh, of the mountain. He had climbed Mount Everest in winning the Nobel Prize in making this great, uh, discovery and now it was time to, uh, think about some other things. That's just a guess of mine.

Umm, well, what, what to think about? Uh, in remembering, uh, Josh Lederberg, and I'll just refer to him as Josh for the rest of this, uh, note. Umm, it struck me that we in computer science were, uh, extremely fortunate that of the very, very many things that Lederberg could have turned his attention to, uh, at a critical, at an important and highly innovative time of his life, uh, he turned his attention in our direction. Uh, he started, he reacquainted himself with computing. Uh, in

Findings so far

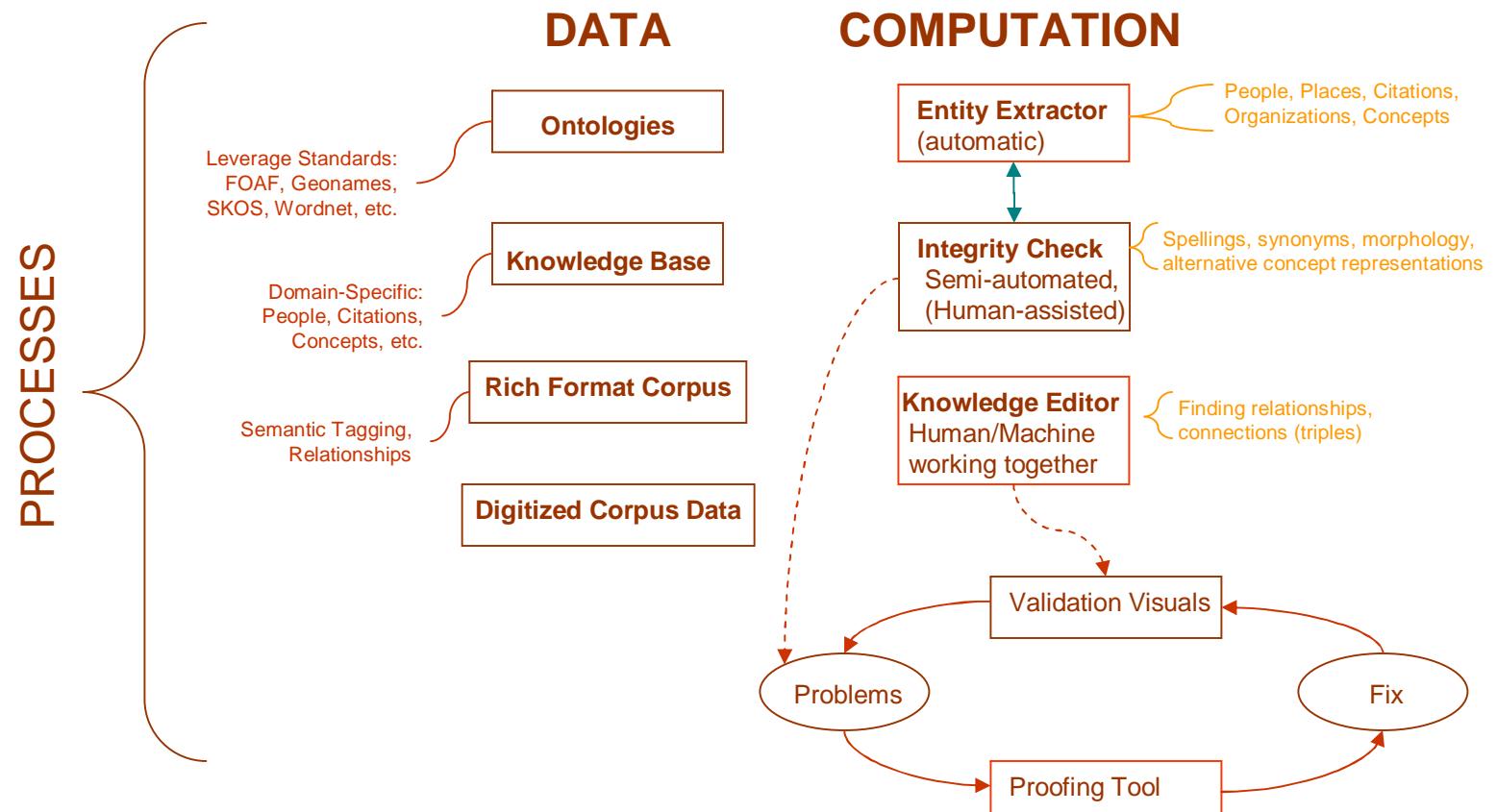
- From provenance view to tags
- Ratings
- Physical limitations
- Audio annotations
- Need for multitasking
- Need a timeline metaphor
- Grouping



Entity extraction on 2000 docs

■ Person	13,000	900
■ Place	5,000	1,000
■ Organizations	25,000	1,000
■ Aboutness	82,000	1,200
■ Email	600	600
■ Named Topic	200	200
	Algor: NEE	Algor: Custom

Vision for Workflow



Self Archiving

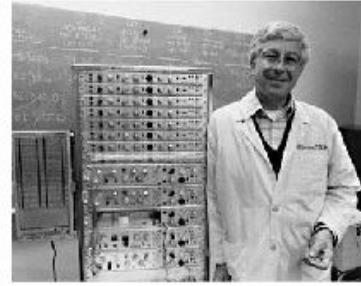
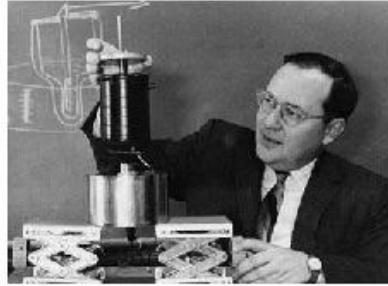
- Born digital
- Re-born digital



Stanford Luminary Archive

Stanford Luminary Archives

Text: A A A



Welcome to the Stanford Luminary Archives

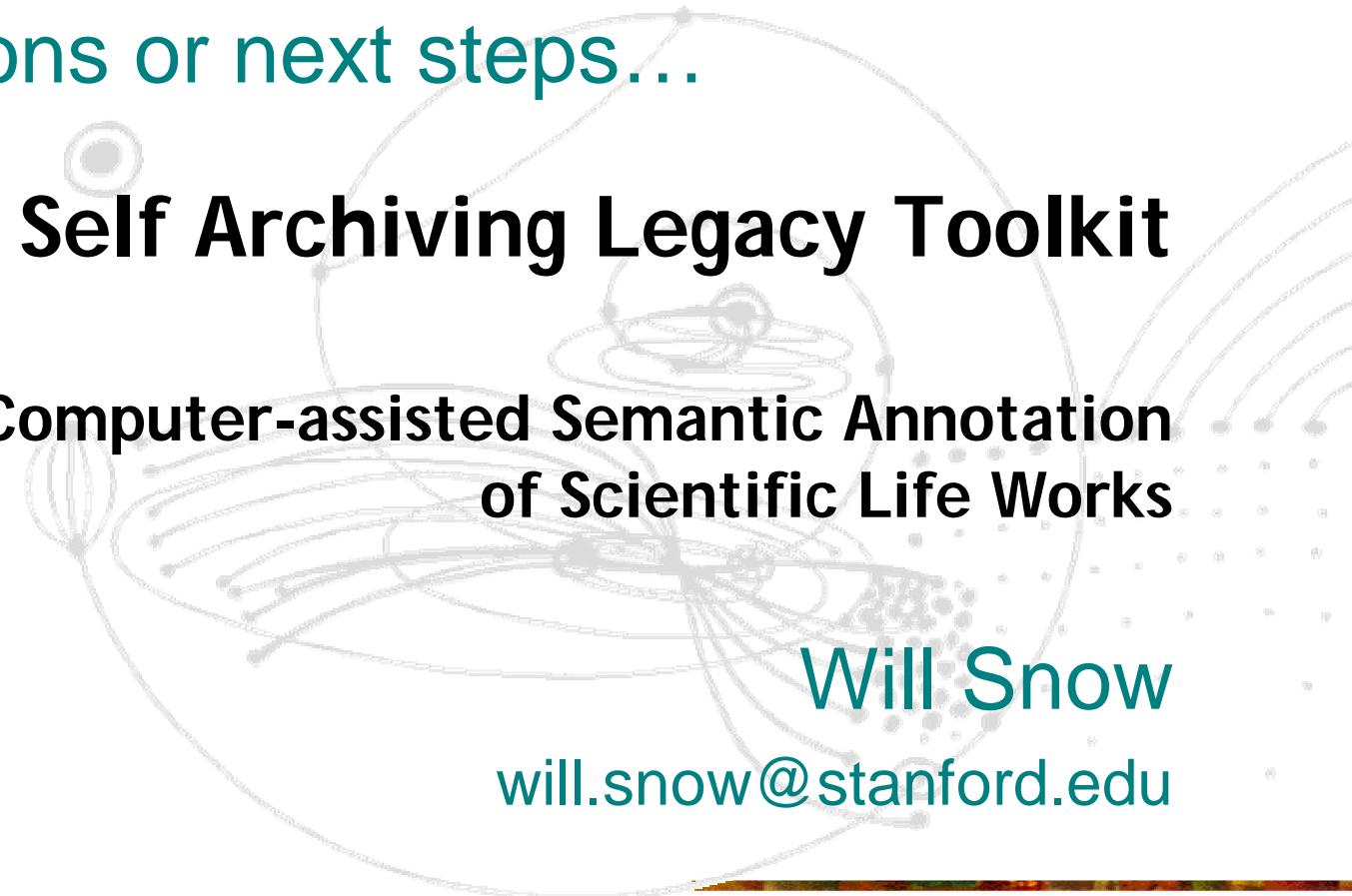
The Stanford Luminary Archives is a multi-year initiative within Stanford University Libraries and Academic Information Resources (SULAIR) to enhance the University Archives' ability to capture, preserve, and add context to the life-work collections of eminent faculty and researchers, which are increasingly digital in their nature, and make them available via the Internet.

Seeking insight

- Navigational search for researchers
 - Partnering in the semantic web space
 - Luminary motivation
 - Copyright issues
 - Born-digital material
 - Funding fit
-

Call to action

- For questions or next steps...



Self Archiving Legacy Toolkit

**Computer-assisted Semantic Annotation
of Scientific Life Works**

Will Snow

will.snow@stanford.edu