New Technologies for Research Administration

Robert J. Robbins

Fred Hutchinson Cancer Research Center

rrobbins@fhcrc.org

Thesis

IT is transforming science and the relentless effect of Moore's Law is transforming that transformation.

Research and research administration are both affected...

Effect of Information Technology

IT reduces the effects of:

- *distance*
- *time*
- *complexity*

All of these significantly affect scientific research...

Effect of Information Technology

Effect of IT on tasks:

- *accomplishment*
- *coordination*
- *possibility*

This improves both efficiency and effectiveness, and even allows new strategies to be pursued.

Topics

- IT Transformed by Moore's Law
- Effects on Research Administration
- Agencies On-line
- Full ERA: Challenges and Problems
- Underlying Technologies

IT Transformed by Moore's Law

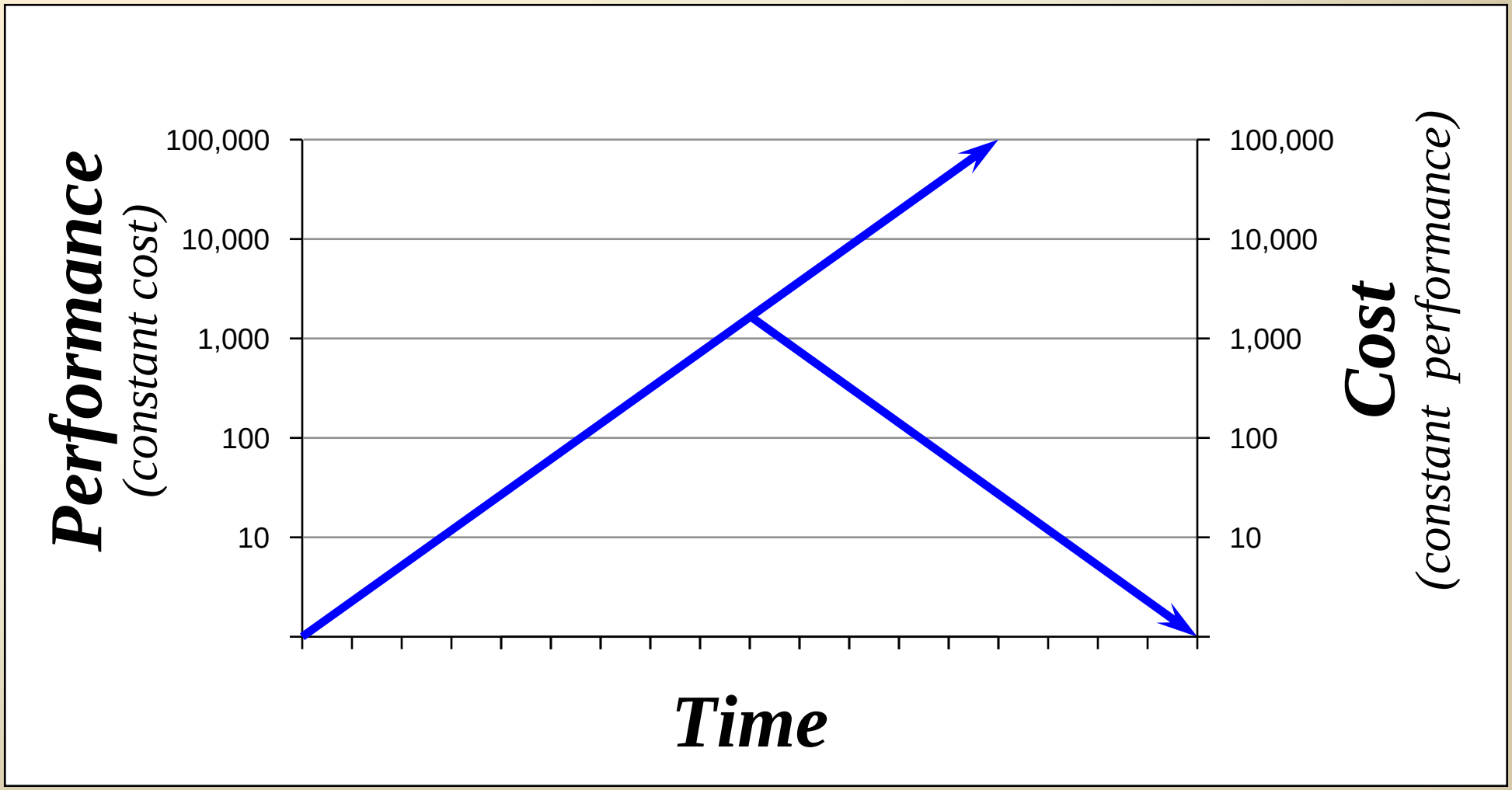
Fred **Hutchinson Cancer Research** Center

Moore's Law

Every eighteen months, the number of transistors that can be placed on a chip doubles.

Gordon Moore, co-founder of Intel...

Moore's Law



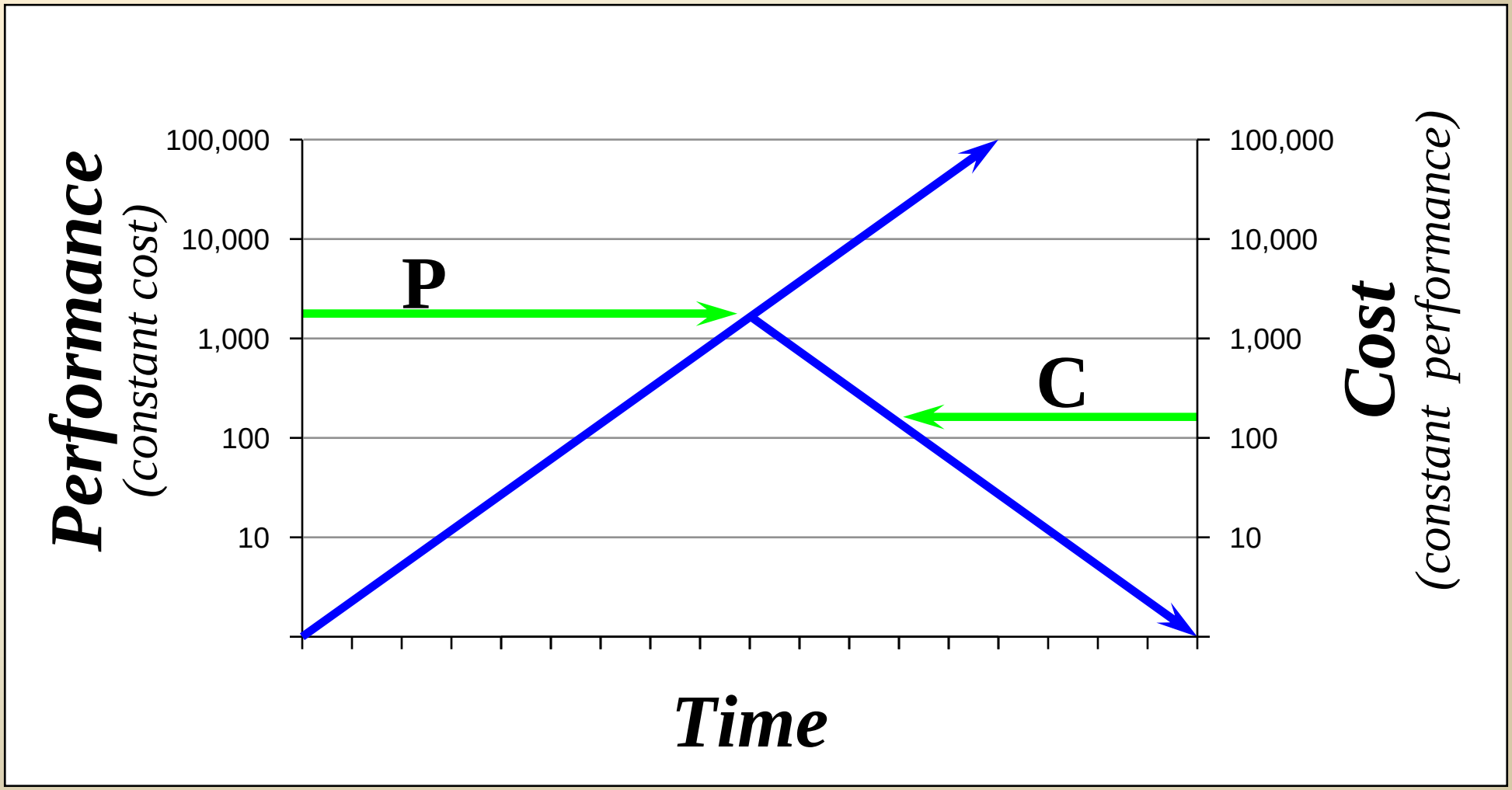
Fred Hutchinson Cancer Research Center

Moore's Law

Three standard phases of system development

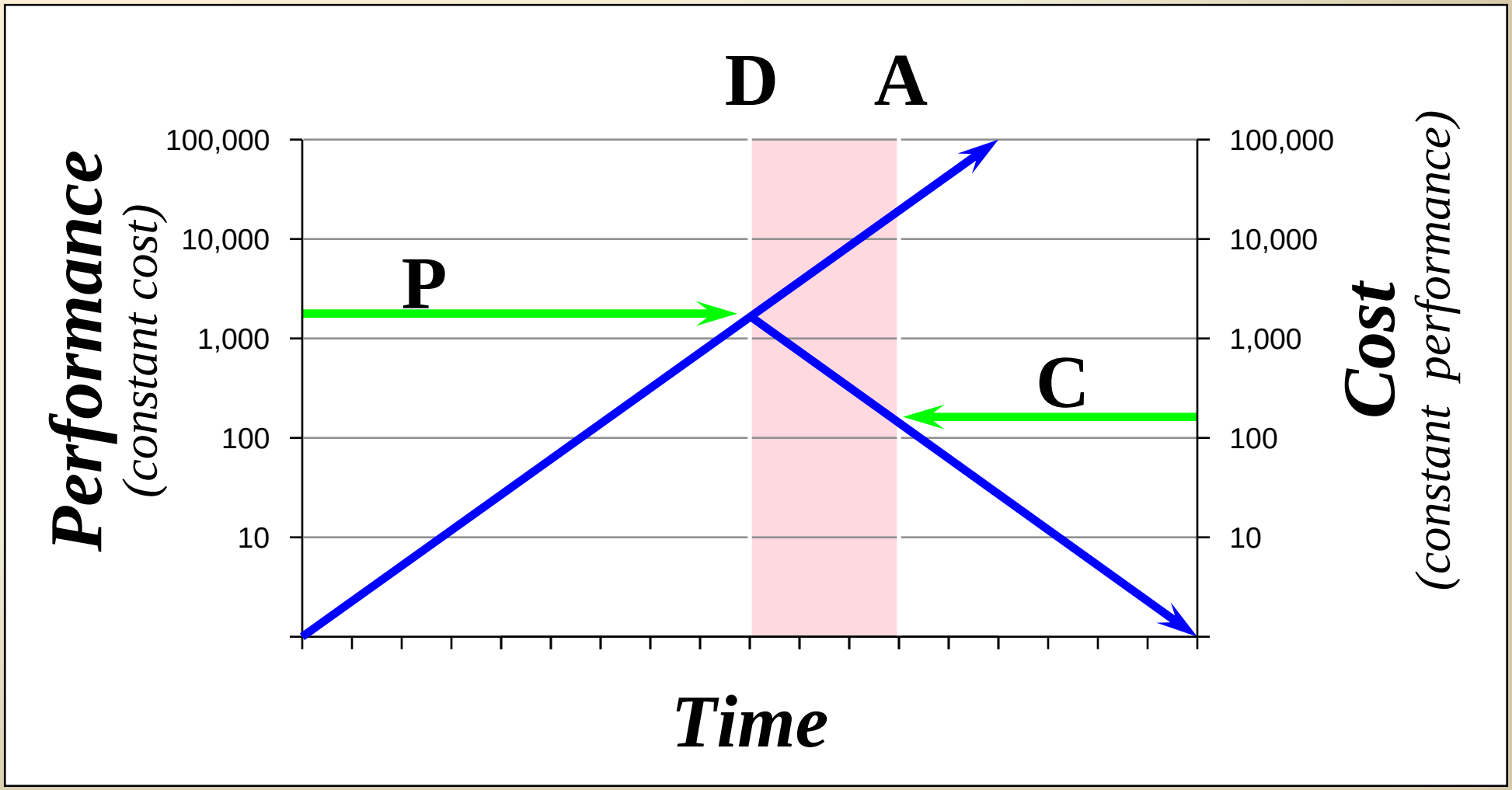
- *It's simply impossible*
- *It's way too expensive*
- *It's long overdue.*

Moore's Law



Fred Hutchinson Cancer Research Center

Moore's Law



Fred Hutchinson Cancer Research Center

Moore's Law

Corollary Effects

- *The number of things than can be computerized increases exponentially over time.*

Moore's Law

Corollary Effects

- *The number of things than can be computerized increases exponentially over time.*
- *The number of things than are computerized increases exponentially over time.*

Human Resource Issues

- Reduction in need for non-IT staff
- Increase in need for IT staff, especially "information engineers"

In biology, the general trend is to convert expert work into staff work and then into computation. New expertise is then required to design, carry out, and interpret continuing work.

EFFECTS ON RESEARCH ADMINISTRATION

Fred
Hutchinson
Cancer
Research
Center

New Technologies

Effects on Research Administration

- *More tools for administration*

New Technologies

Effects on Research Administration

- *More tools for administration*
- *Higher expectations*

New Technologies

Effects on Research Administration

- *More tools for administration*
- *Higher expectations*
- *More to administer*

New Technologies

Effects on Research Administration

- *More tools for administration*
- *Higher expectations*
- *More to administer*

If it can be done, it ***must*** be done...

New Technologies

Information Access

- *Better access to remote information*

  (agencies on-line)

- *Easier dissemination of information*

  (local information publishing)

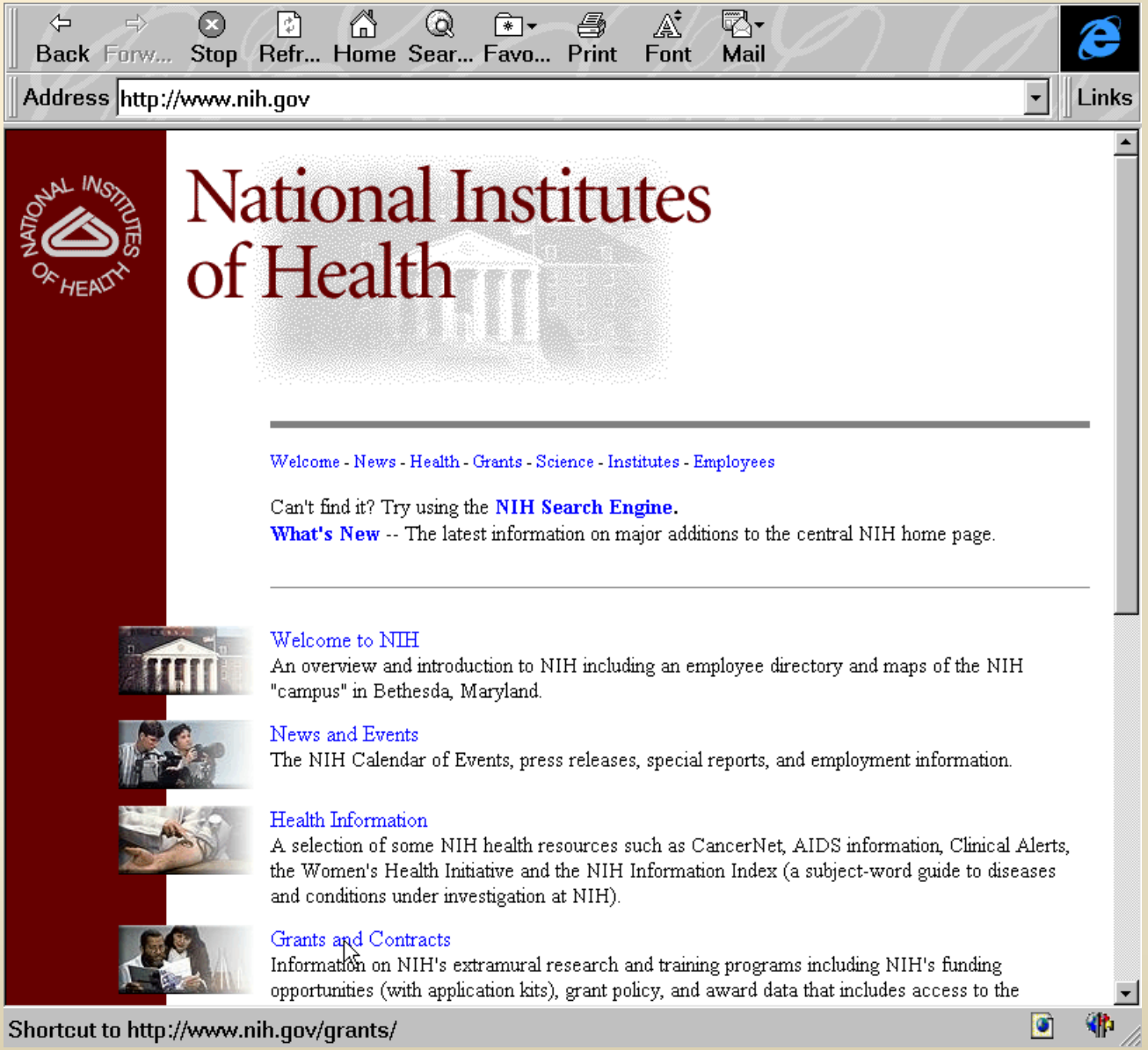
Fred Hutchinson Cancer Research Center

INFORMATION ACCESS

Fred
Hutchinson
Cancer
Research
Center

Agencies On-line

Fred
Hutchinson
Cancer
Research
Center



Fred Hutchinson Cancer Research Center

Back Forw... Stop Refr... Home Sear... Favo... Print Font Mail

Address http://www.nih.gov/grants/ Links

National Institutes of Health

Grants & Contracts

Grants Page -- Leads to information about NIH grant and fellowship programs, applying for a grant or fellowship, policy changes, administrative responsibilities of awardees, and the numbers and characteristics of awards made by the NIH. [Managed by the Office of Extramural Research (OER).]

Contracts Page -- This page is being constructed. It will contain information about Requests for Proposals and resources for those preparing proposals. Information on selected R&D Requests for Proposal (RFPs) can be accessed through the NIH Gopher directory. (Managed by the Office of Contracts Management (OCM).

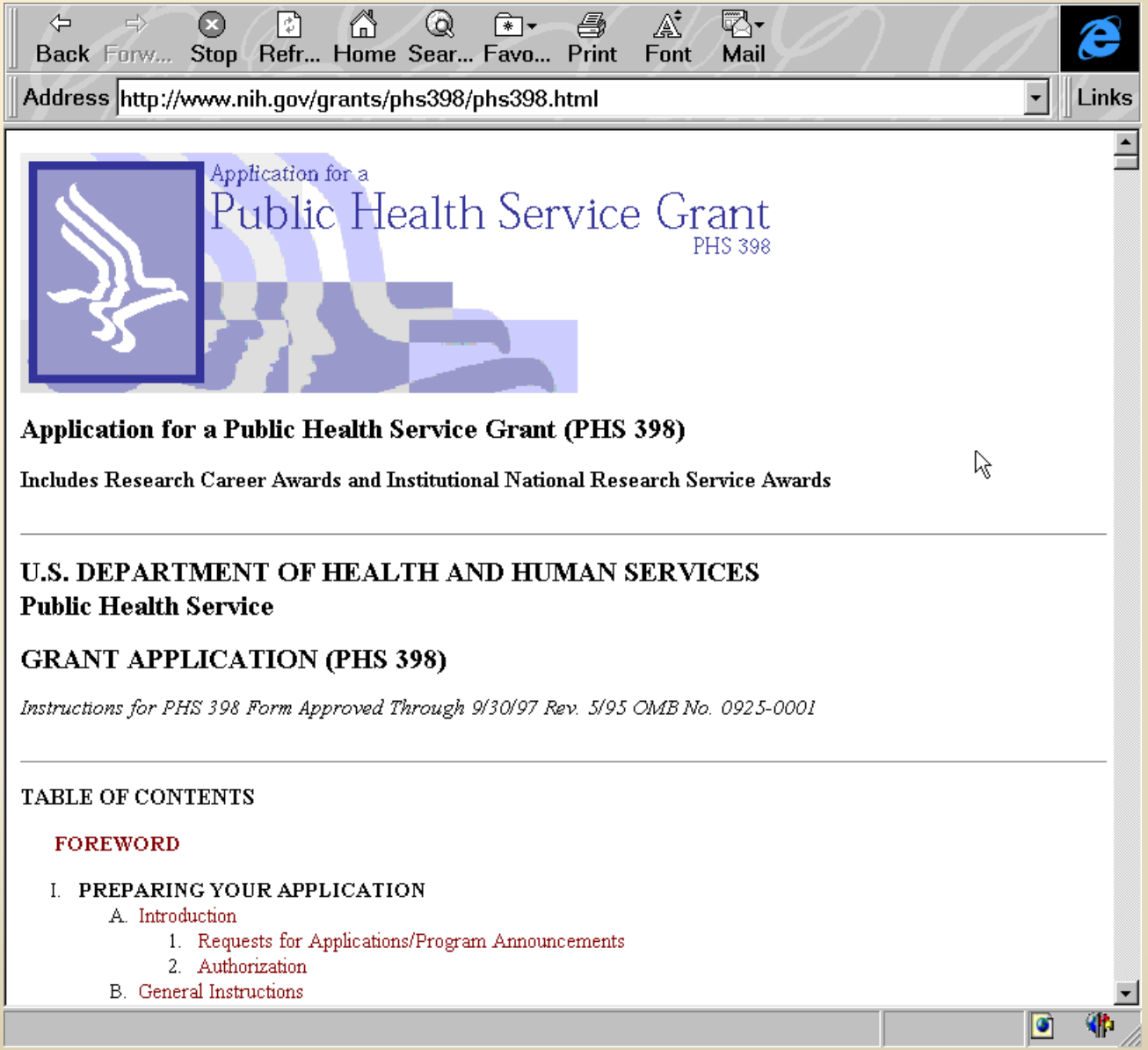
NIH Guide for Grants and Contracts -- The *Guide* is the official document for announcing the availability of NIH funds for biomedical and behavioral research and research training and disseminating policy and administrative information. It is currently available in 2 formats:

- NIH Official Gopher Version
- NYU WWW Version

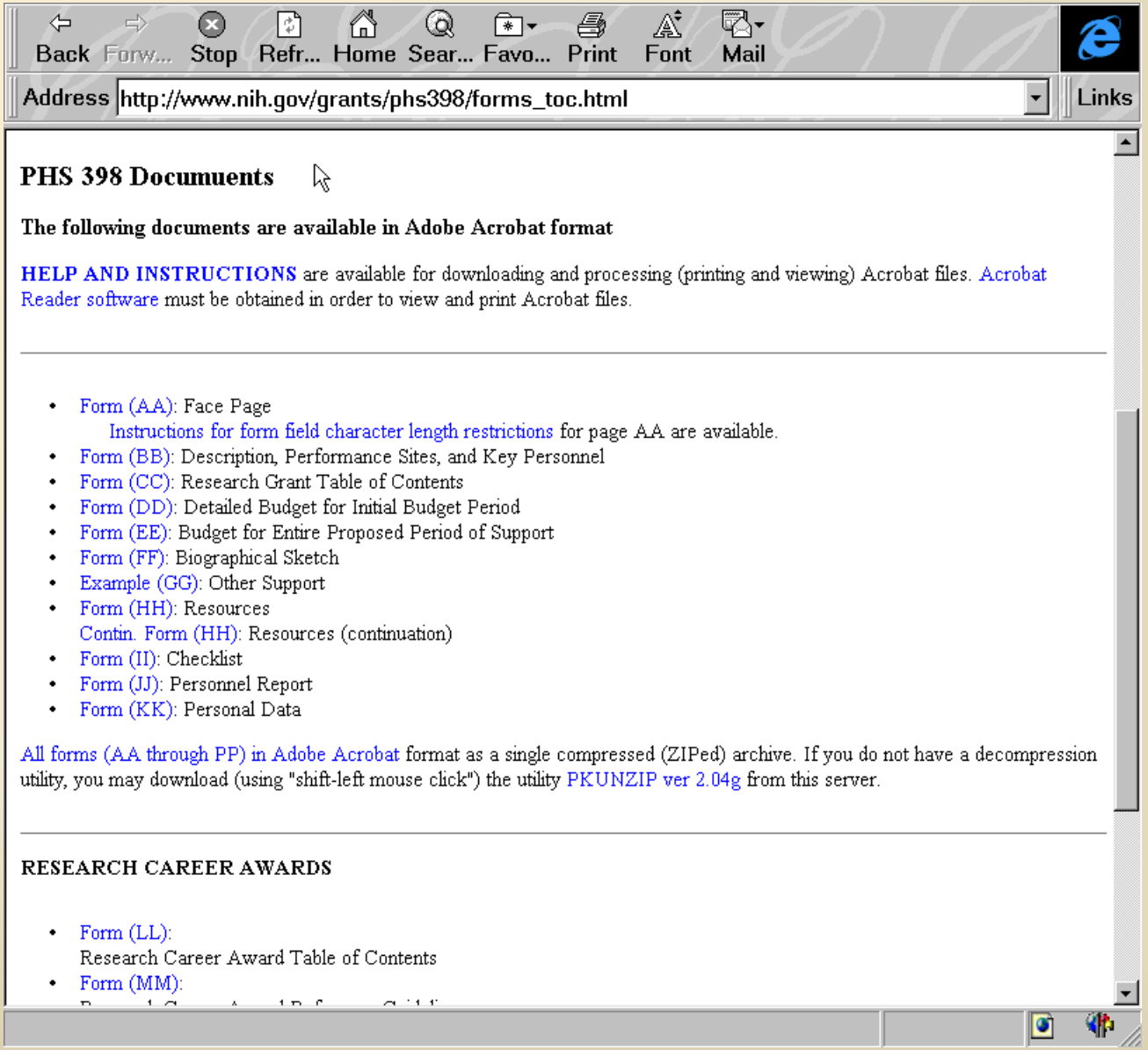
Pages of the Institutes, Centers, and Divisions -- Each major component of the NIH is managing a site that consolidates information of interest to the grantees and staff of that

Shortcut to http://www.nih.gov/grants/oer.htm

Fred Hutchinson Cancer Research Center



Fred Hutchinson Cancer Research Center



Fred Hutchinson Cancer Research Center

AA

Form Approved Through 9/30/97
OMB No. 0925-0001

Department of Health and Human Services
Public Health Service

Grant Application

Follow instructions carefully.
Do not exceed character length restrictions indicated on sample.

LEAVE BLANK—FOR PHS USE ONLY.

Type	Activity	Number
Review Group	Formerly	
Council/Board (Month, Year)		Date Received

1. TITLE OF PROJECT

2. RESPONSE TO SPECIFIC REQUEST FOR APPLICATIONS OR PROGRAM ANNOUNCEMENT ☐ NO ☐ YES *(If "Yes," state number and title)*
Number: Title:

3. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR

3a. NAME *(Last, first, middle)*	3b. DEGREE(S)	3c. SOCIAL SECURITY NO.
3d. POSITION TITLE	3e. MAILING ADDRESS *(Street, city, state, zip code)*	
3f. DEPARTMENT, SERVICE, LABORATORY, OR EQUIVALENT		
3g. MAJOR SUBDIVISION		
3h. TELEPHONE AND FAX *(Area code, number and extension)* TEL: FAX:	E-MAIL ADDRESS:	

4. HUMAN SUBJECTS	4a. If "Yes," Exemption no. or IRB approval date	4b. Assurance of compliance no.	5. VERTEBRATE ANIMALS	5a. If "Yes," IACUC approval date	5b. Animal welfare assurance no.
☐ No ☐ Yes	☐ Full IRB or ☐ Expedited Review		☐ No ☐ Yes		

6. DATES OF PROPOSED PERIOD OF SUPPORT *(month, day, year—MM/DD/YY)*		7. COSTS REQUESTED FOR INITIAL BUDGET PERIOD		8. COSTS REQUESTED FOR PROPOSED PERIOD OF SUPPORT	
From	Through	7a. Direct Costs ($)	7b. Total Costs ($)	8a. Direct Costs ($)	8b. Total Costs ($)

9. APPLICANT ORGANIZATION	10. TYPE OF ORGANIZATION
Name Address	Public: ☐ Federal ☐ State ☐ Local Private: ☐ Private/Nonprofit Forprofit: ☐ General ☐ Small Business
	11. ORGANIZATIONAL COMPONENT CODE
	12. ENTITY IDENTIFICATION NUMBER / Congressional District

13. ADMINISTRATIVE OFFICIAL TO BE NOTIFIED IF AWARD IS MADE	14. OFFICIAL SIGNING FOR APPLICANT ORGANIZATION
Name Title Address Telephone FAX E-Mail Address	Name Title Address Phone FAX E-Mail Address

15. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR ASSURANCE: I certify that the statements herein are true, complete and accurate to the best of my knowledge. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if a grant is awarded as a result of this application.	SIGNATURE OF PI / PD NAMED IN 3a. *(In ink. "Per" signature not acceptable.)*	DATE
16. APPLICANT ORGANIZATION CERTIFICATION AND ACCEPTANCE: I certify that the statements herein are true, complete and accurate to the best of my knowledge, and accept the obligation to comply with Public Health Service terms and conditions if a grant is awarded as a result of this application. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties.	SIGNATURE OF OFFICIAL NAMED IN 14. *(In ink. "Per" signature not acceptable.)*	DATE

PHS 398 (Rev. 5/95) Face Page AA

BB

Principal Investigator/Program Director *(Last, first, middle)*:

DESCRIPTION. State the application's broad, long-term objectives and specific aims, making reference to the health relatedness of the project. Describe concisely the research design and methods for achieving these goals. Avoid summaries of past accomplishments and the use of the first person. This description is meant to serve as a succinct and accurate description of the proposed work when separated from the application. If the application is funded, this description, as is, will become public information. Therefore, do not include proprietary/confidential information. **DO NOT EXCEED THE SPACE PROVIDED.**

PERFORMANCE SITE(S) *(organization, city, state)*

KEY PERSONNEL. See instructions on Page 11. *Use continuation pages as needed* to provide the required information in the format shown below.

Name	Organization	Role on Project

PHS 398 (Rev. 5/95) Page 2 BB
Number pages consecutively at the bottom throughout the application. Do not use suffixes such as 3a, 3b.

CC Principal Investigator/Program Director *(Last, first, middle)*:

Type the name of the principal investigator/program director at the top of each printed page and each continuation page. (For type specifications, see instructions on page 6.)

RESEARCH GRANT

TABLE OF CONTENTS

*Type density and type size of the entire application must conform to limits provided in instructions on page 6.

Appendix *(Five collated sets. No page numbering necessary for Appendix.)*

☐ Check if Appendix is included

Number of publications and manuscripts accepted or submitted for publication *(not to exceed 10)* _____

Other items *(list)*:

DD Principal Investigator/Program Director *(Last, first, middle)*:

DETAILED BUDGET FOR INITIAL BUDGET PERIOD
DIRECT COSTS ONLY

FROM _____ THROUGH _____

PERSONNEL *(Applicant organization only)*					DOLLAR AMOUNT REQUESTED *(omit cents)*		
NAME	ROLE ON PROJECT	TYPE APPT. *(months)*	% EFFORT ON PROJ.	INST. BASE SALARY	SALARY REQUESTED	FRINGE BENEFITS	TOTALS
	Principal Investigator						
	SUBTOTALS →						

CONSULTANT COSTS		
EQUIPMENT *(Itemize)*		
SUPPLIES *(Itemize by category)*		
TRAVEL		
PATIENT CARE COSTS	INPATIENT	
	OUTPATIENT	
ALTERATIONS AND RENOVATIONS *(Itemize by category)*		
OTHER EXPENSES *(Itemize by category)*		
SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD		$
CONSORTIUM/CONTRACTUAL COSTS	DIRECT COSTS	
	INDIRECT COSTS	
TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD *(Item 7a, Face Page)* →		$

Fred **Hutchinson Cancer Research** Center

EE Principal Investigator/Program Director (Last, first, middle):

BUDGET FOR ENTIRE PROPOSED PERIOD OF SUPPORT
DIRECT COSTS ONLY

BUDGET CATEGORY TOTALS		INITIAL BUDGET PERIOD (from Form Page 4)	ADDITIONAL YEARS OF SUPPORT REQUESTED			
			2nd	3rd	4th	5th
PERSONNEL: *Salary and fringe benefits Applicant organization only*						
CONSULTANT COSTS						
EQUIPMENT						
SUPPLIES						
TRAVEL						
PATIENT CARE COSTS	INPATIENT					
	OUTPATIENT					
ALTERATIONS AND RENOVATIONS						
OTHER EXPENSES						
SUBTOTAL DIRECT COSTS						
CONSORTIUM/ CONTRACTUAL COSTS	DIRECT					
	INDIRECT					
TOTAL DIRECT COSTS						

TOTAL DIRECT COSTS FOR ENTIRE PROPOSED PERIOD OF SUPPORT *(Item 8a, Face Page)* → $

JUSTIFICATION. Follow the budget justification instructions exactly. Use continuation pages as needed.

FF Principal Investigator/Program Director (Last, first, middle):

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed on Form Page 2.
Photocopy this page or follow this format for each person.

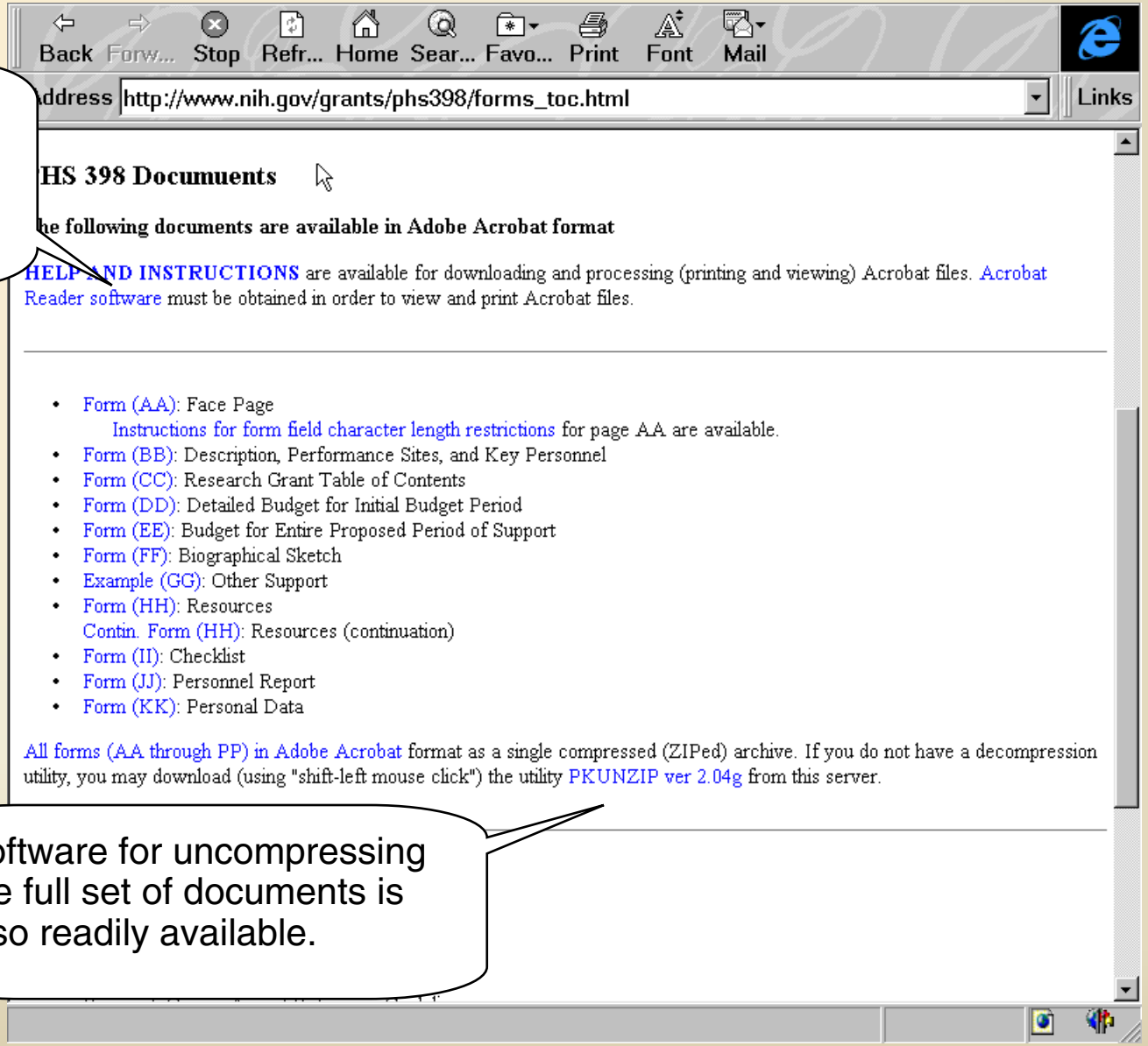
NAME	POSITION TITLE

EDUCATION/TRAINING. *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY

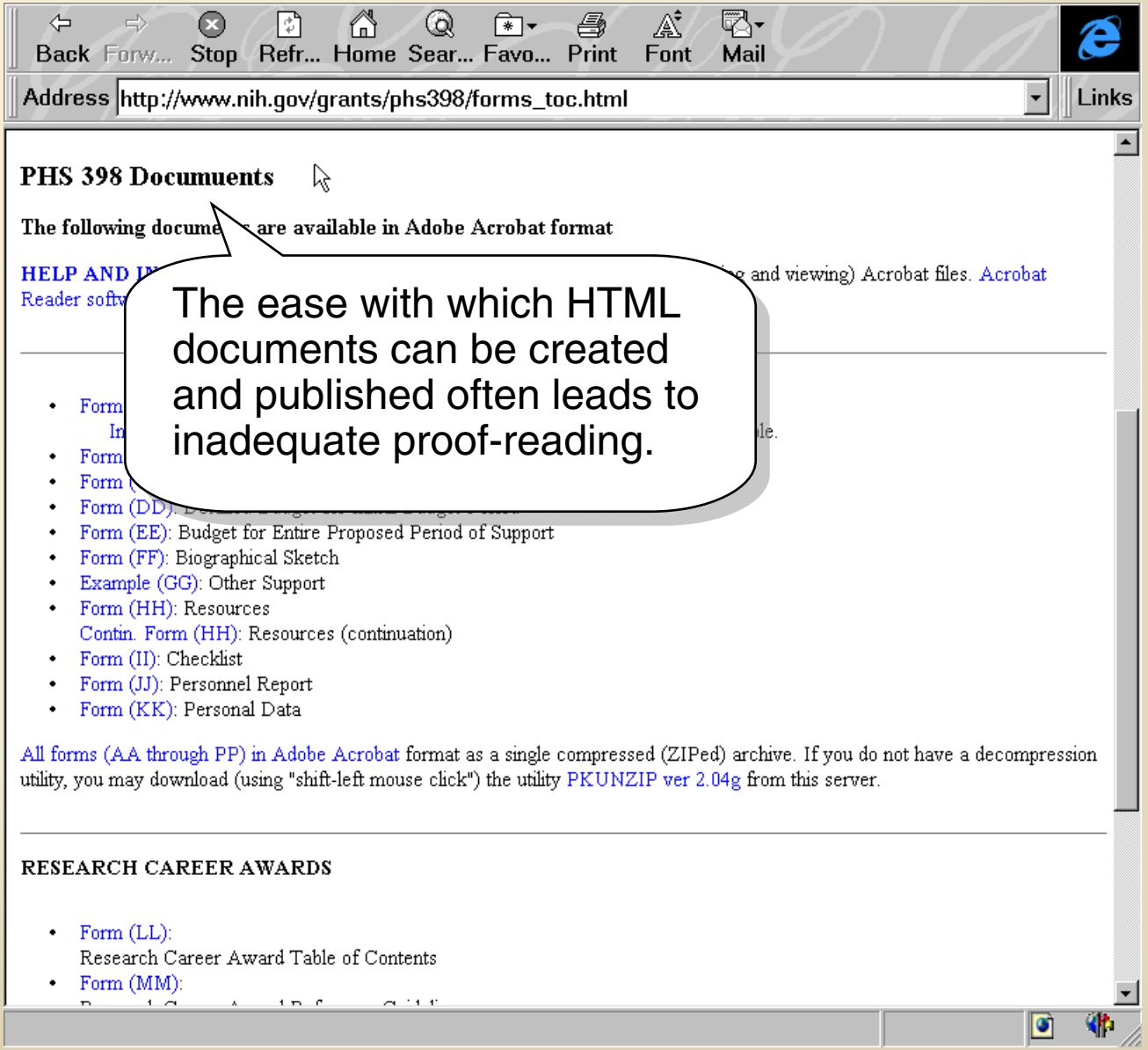
RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles, all authors, and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. If the list of publications in the last three years exceeds two pages, select the most pertinent publications. **DO NOT EXCEED TWO PAGES.**

Software to use the documents may be obtained on line.

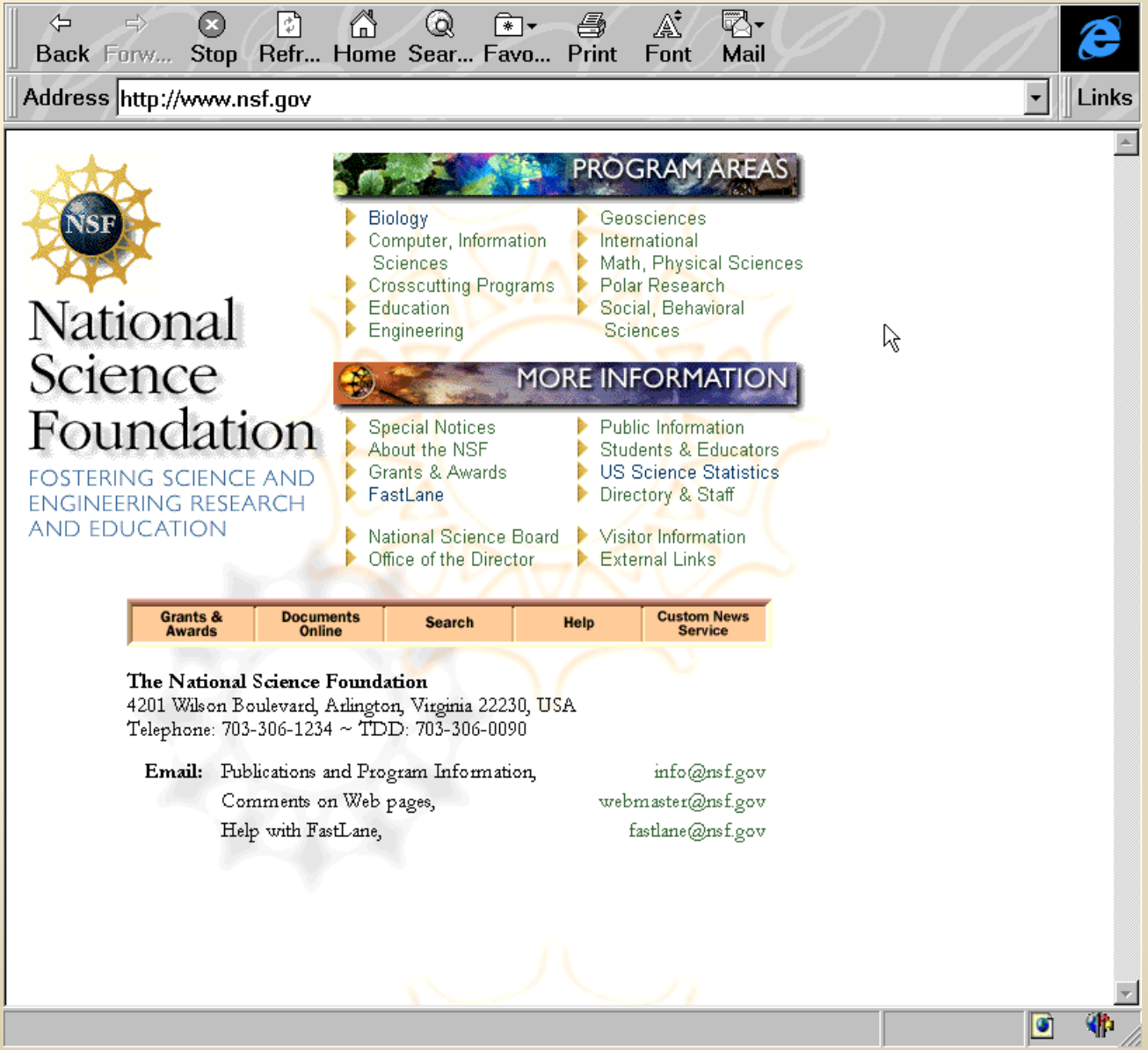


Software for uncompressing the full set of documents is also readily available.

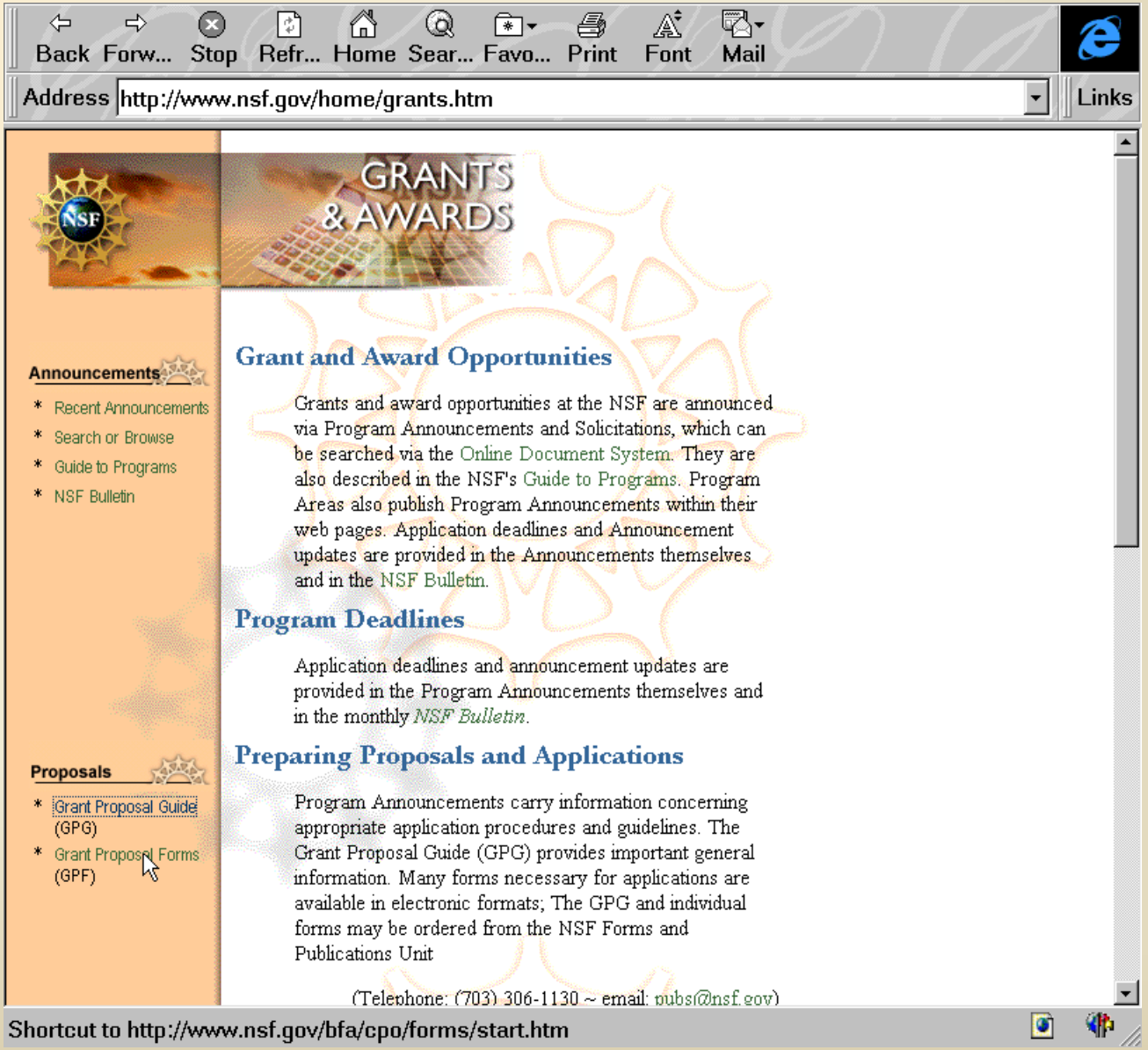
Fred Hutchinson Cancer Research Center



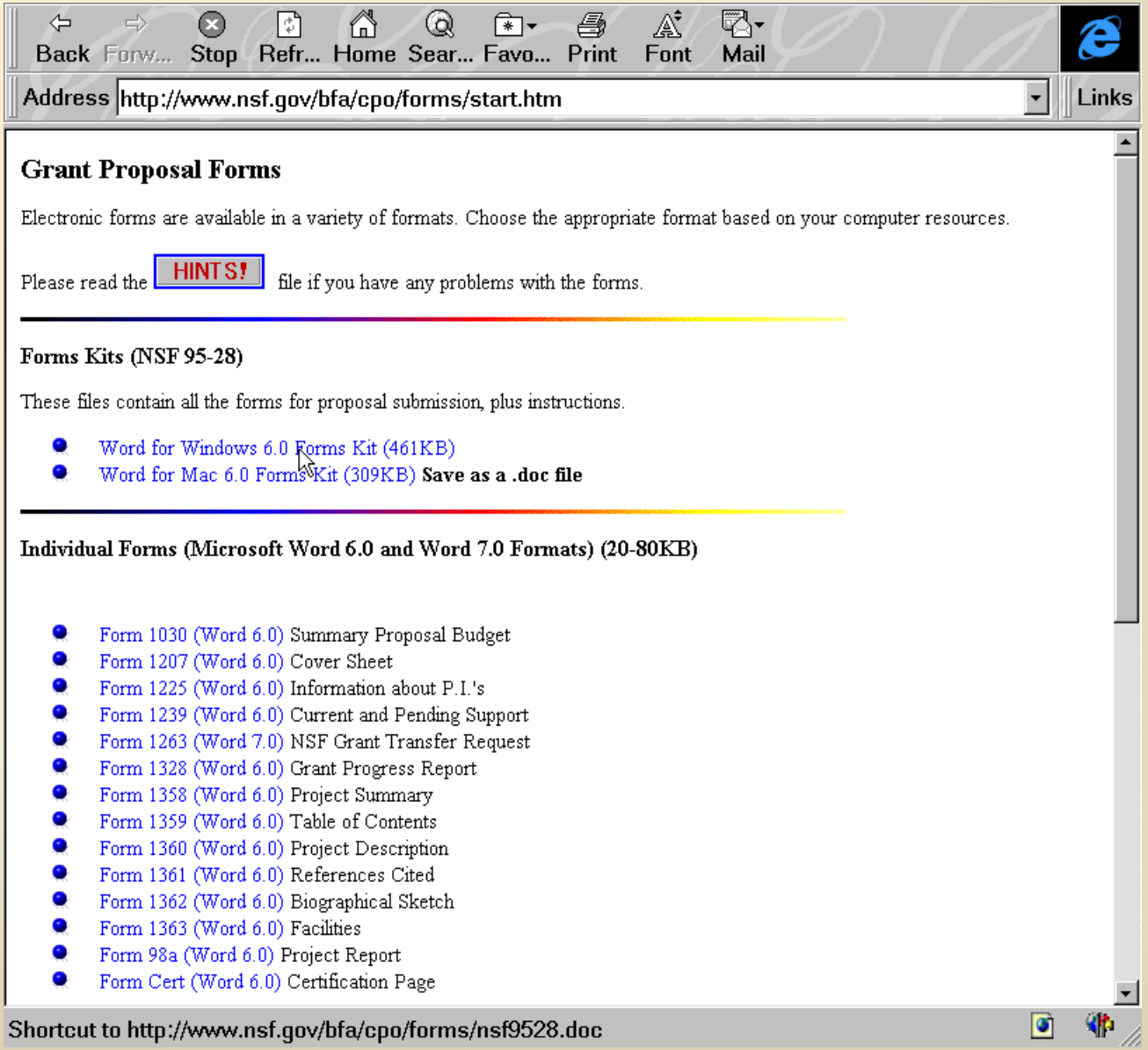
Fred Hutchinson Cancer Research Center

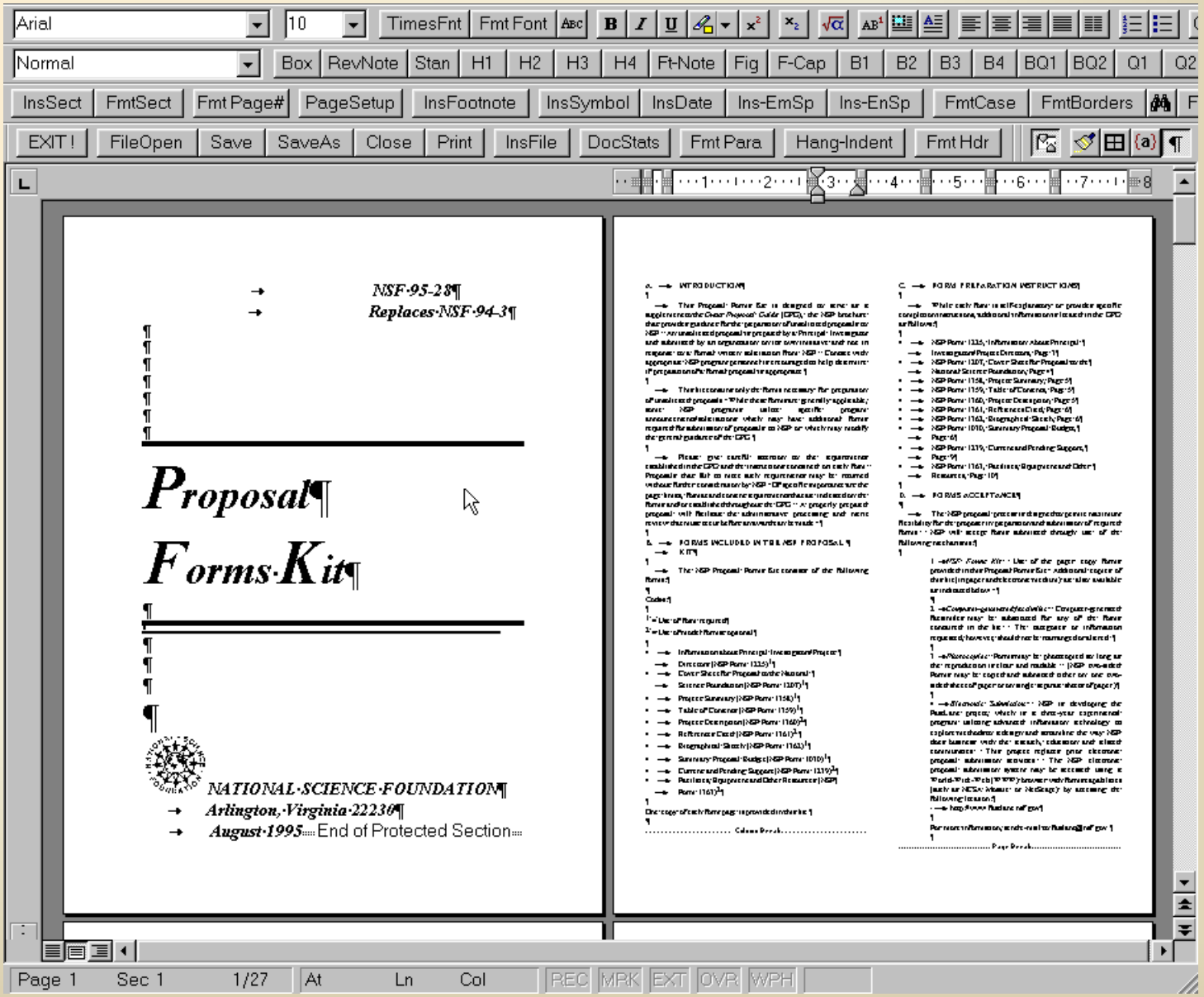


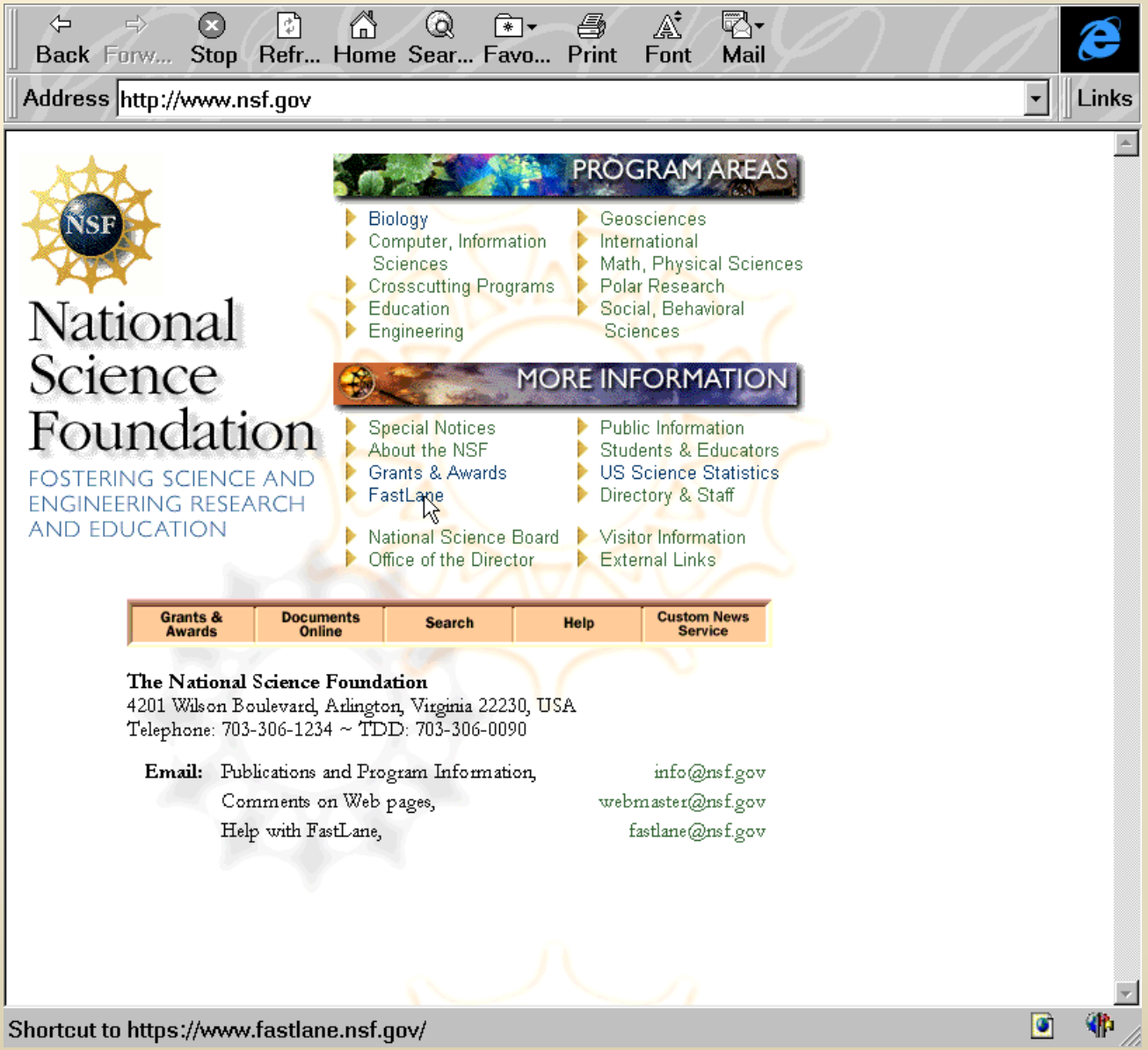
Fred Hutchinson Cancer Research Center



Fred Hutchinson Cancer Research Center



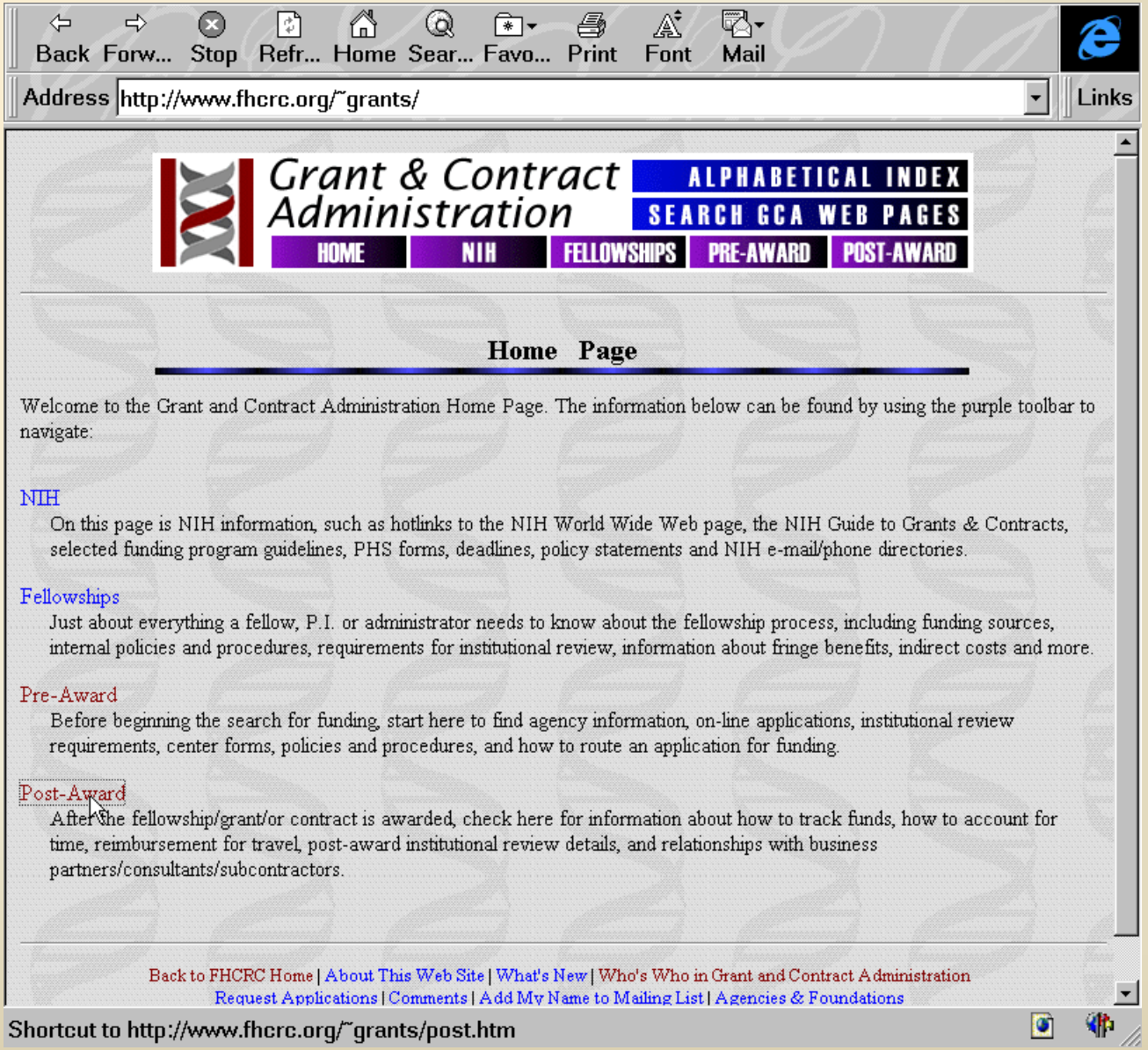




Fred Hutchinson Cancer Research Center

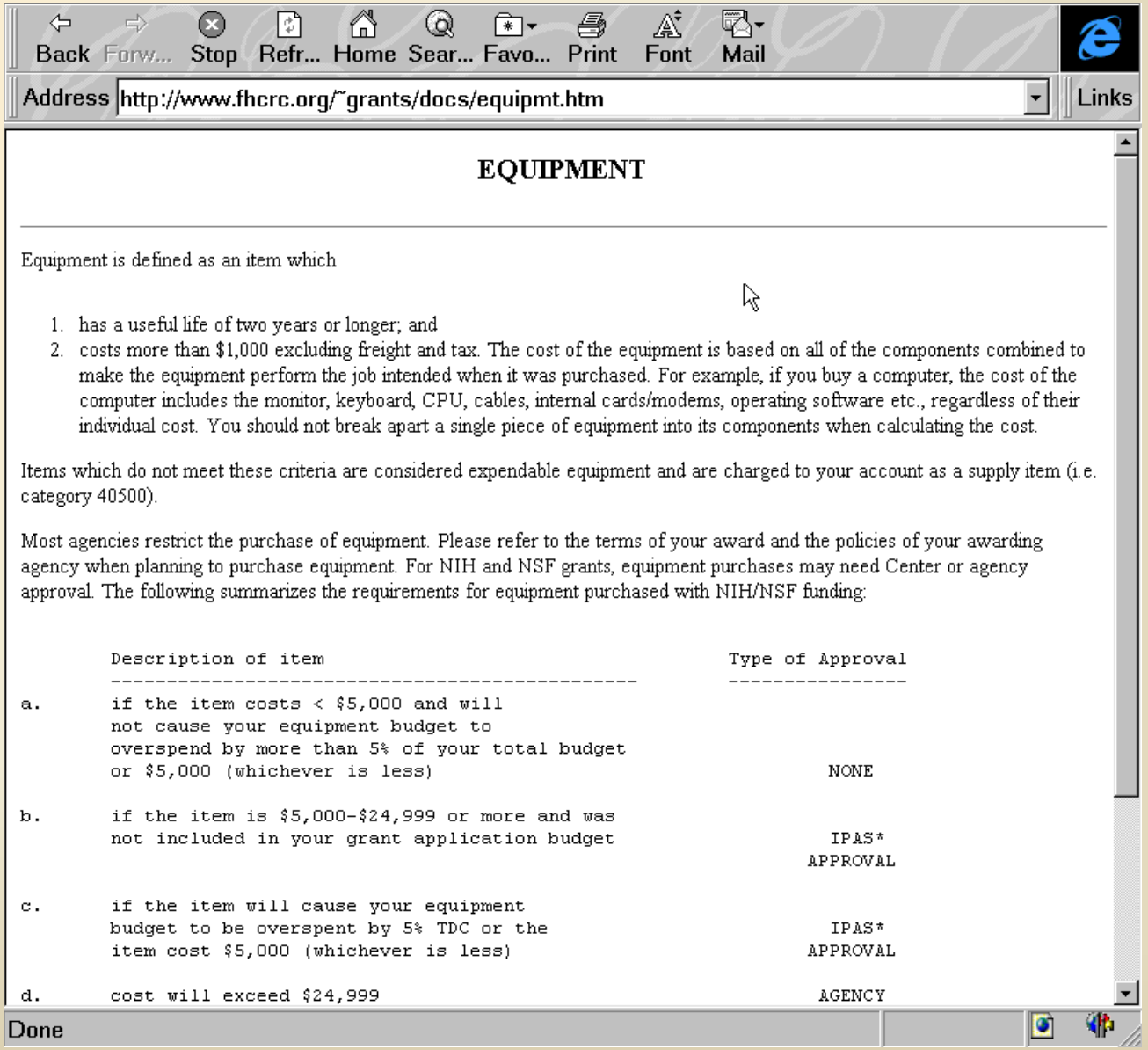
Local Information Publishing

Fred
Hutchinson
Cancer
Research
Center



Fred Hutchinson Cancer Research Center

Fred Hutchinson Cancer Research Center



FULL ERA: CHALLENGES & PROBLEMS

Fred
Hutchinson
Cancer
Research
Center

Full Electronic Research Administration

Requirements and Expectations

- *Fully electronic interactions with agencies*
- *Integrated administrative databases*
- *Automated grant preparation*

Fred Hutchinson Cancer Research Center

Full Electronic Research Administration

Requirements and Expectations

- *Fully electronic interactions with agencies*

… are very hard to achieve. Requires ability to integrate and interoperate with **all** of the systems of **all** of the relevant agencies, and requires the ability to track and match all of their changes.

Fred **Hutchinson Cancer Research** Center

Full Electronic Research Administration

R

True database integration is very difficult to achieve. Necessary trade-offs between flexibility and tractability can lead either to integrated systems no one wants to use, or popular systems that cannot be integrated.

- *Integrated administrative databases*
- *Automated grant preparation*

Fred Hutchinson Cancer Research Center

Full Electronic Research Administration

Requirements and Expectations

- *Fully electronic interactions*

Requires user participation and thus must be easier (or more valuable in some other way) than traditional methods. The absence of electronic white-out offers real challenges...

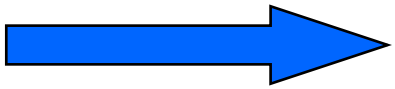
- *Automated grant preparation*

Full Electronic Research Administration

Requirements and Expectations

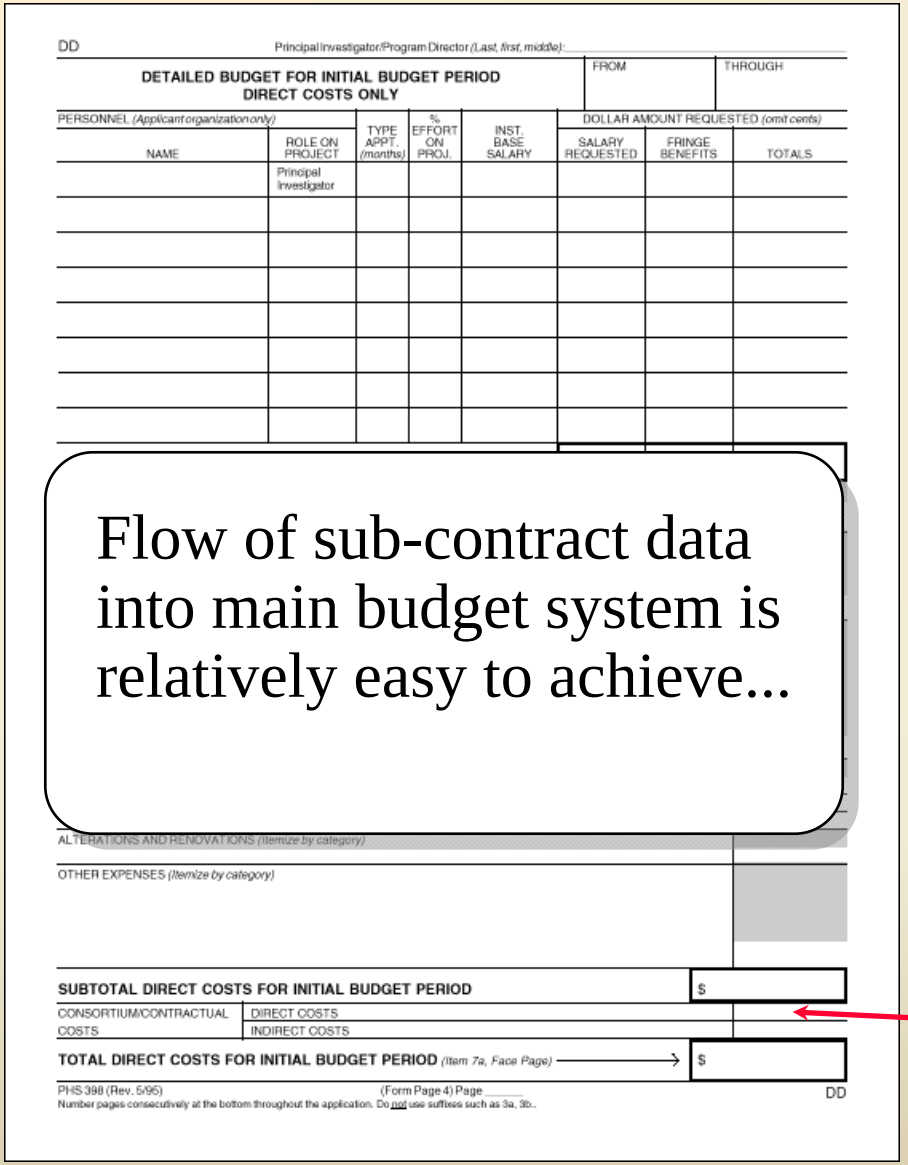
- *Fully electronic interactions*

Example of very useful system likely to attract user participation: object-oriented budget preparation software, closely linked to budget justification module...



- *Automated grant preparation*

Fred Hutchinson Cancer Research Center



DD

Principal Investigator/Program Director (Last, first, middle):

DETAILED BUDGET FOR INITIAL BUDGET PERIOD
DIRECT COSTS ONLY

FROM | THROUGH

PERSONNEL (Applicant organization only) NAME	ROLE ON PROJECT	TYPE APPT. (months)	% EFFORT ON PROJ.	INST. BASE SALARY	DOLLAR AMOUNT REQUESTED (omit cents) SALARY REQUESTED	FRINGE BENEFITS	TOTALS
	Principal Investigator						

ALTERATIONS AND RENOVATIONS (Itemize by category)

OTHER EXPENSES (Itemize by category)

SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD $

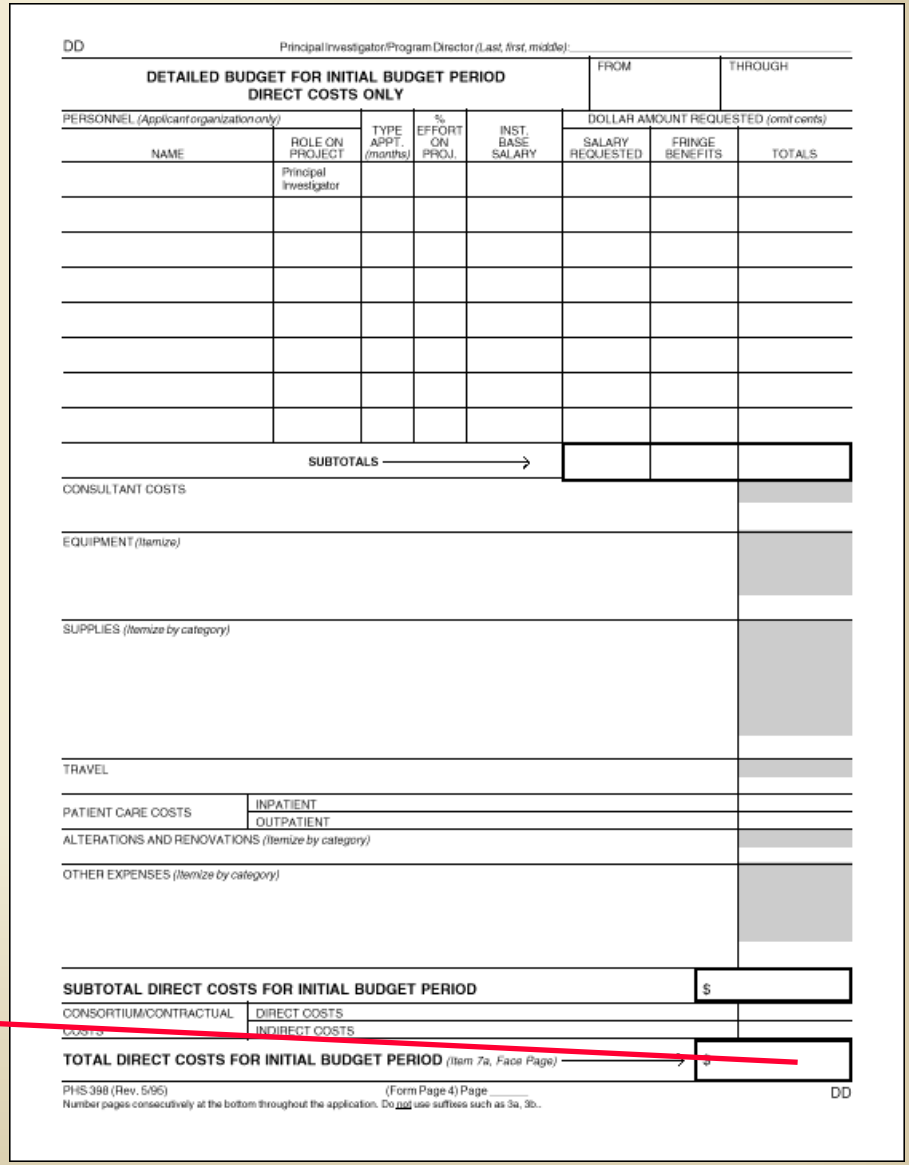
CONSORTIUM/CONTRACTUAL COSTS: DIRECT COSTS / INDIRECT COSTS

TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD (Item 7a, Face Page) → $

PHS 398 (Rev. 5/95) (Form Page 4) Page _____ DD

Number pages consecutively at the bottom throughout the application. Do not use suffixes such as 3a, 3b..

Flow of sub-contract data into main budget system is relatively easy to achieve...



DD

Principal Investigator/Program Director (Last, first, middle):

DETAILED BUDGET FOR INITIAL BUDGET PERIOD
DIRECT COSTS ONLY

FROM | THROUGH

PERSONNEL (Applicant organization only) NAME	ROLE ON PROJECT	TYPE APPT. (months)	% EFFORT ON PROJ.	INST. BASE SALARY	DOLLAR AMOUNT REQUESTED (omit cents) SALARY REQUESTED	FRINGE BENEFITS	TOTALS
	Principal Investigator						

SUBTOTALS →

CONSULTANT COSTS

EQUIPMENT (Itemize)

SUPPLIES (Itemize by category)

TRAVEL

PATIENT CARE COSTS: INPATIENT / OUTPATIENT

ALTERATIONS AND RENOVATIONS (Itemize by category)

OTHER EXPENSES (Itemize by category)

SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD $

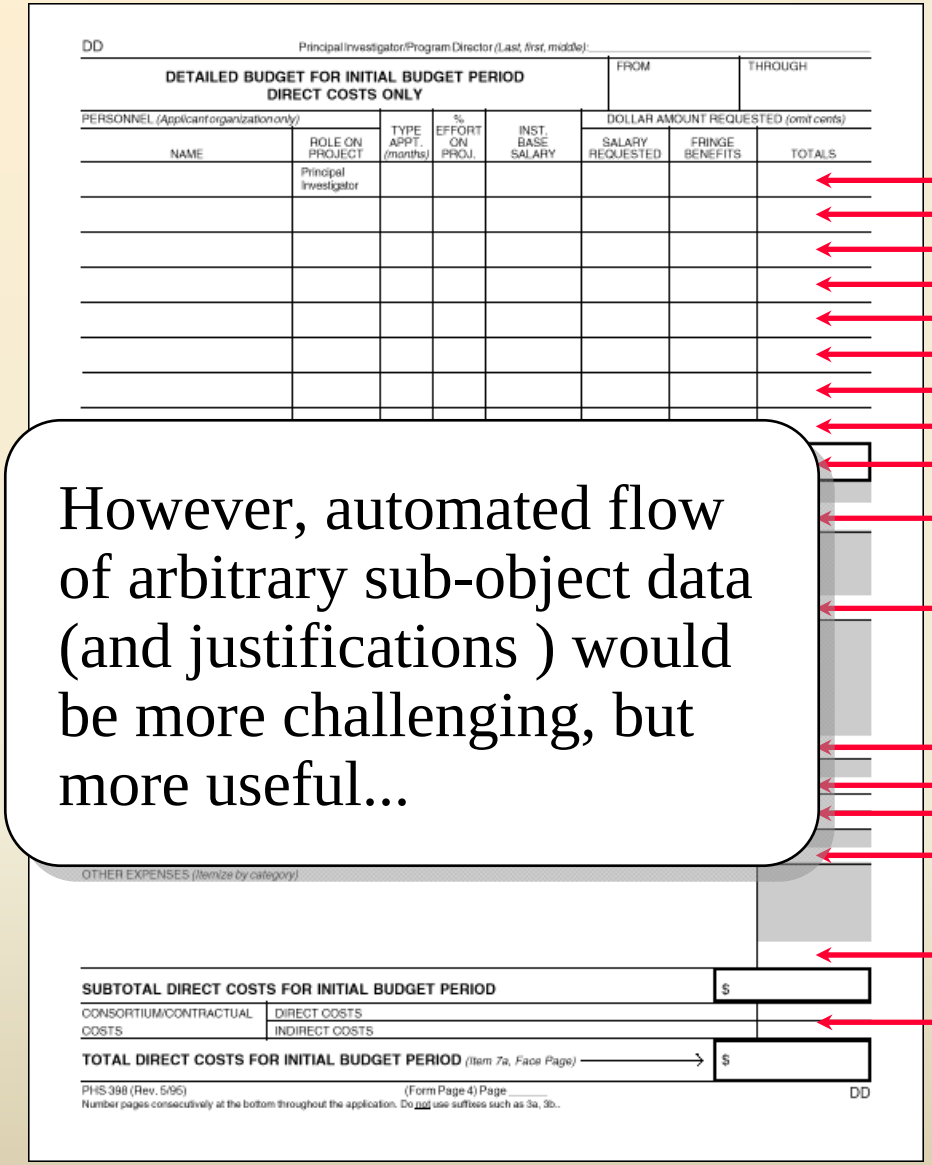
CONSORTIUM/CONTRACTUAL COSTS: DIRECT COSTS / INDIRECT COSTS

TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD (Item 7a, Face Page) → $

PHS 398 (Rev. 5/95) (Form Page 4) Page _____ DD

Number pages consecutively at the bottom throughout the application. Do not use suffixes such as 3a, 3b..

Fred **Hutchinson Cancer Research** Center



DD Principal Investigator/Program Director (Last, first, middle):

DETAILED BUDGET FOR INITIAL BUDGET PERIOD
DIRECT COSTS ONLY

FROM THROUGH

PERSONNEL (Applicant organization only)

NAME	ROLE ON PROJECT	TYPE APPT. (months)	% EFFORT ON PROJ.	INST. BASE SALARY	DOLLAR AMOUNT REQUESTED (omit cents) SALARY REQUESTED	FRINGE BENEFITS	TOTALS
	Principal Investigator						

SUBTOTALS →

CONSULTANT COSTS

EQUIPMENT (Itemize)

SUPPLIES (Itemize by category)

TRAVEL

PATIENT CARE COSTS — INPATIENT / OUTPATIENT

ALTERATIONS AND RENOVATIONS (Itemize by category)

OTHER EXPENSES (Itemize by category)

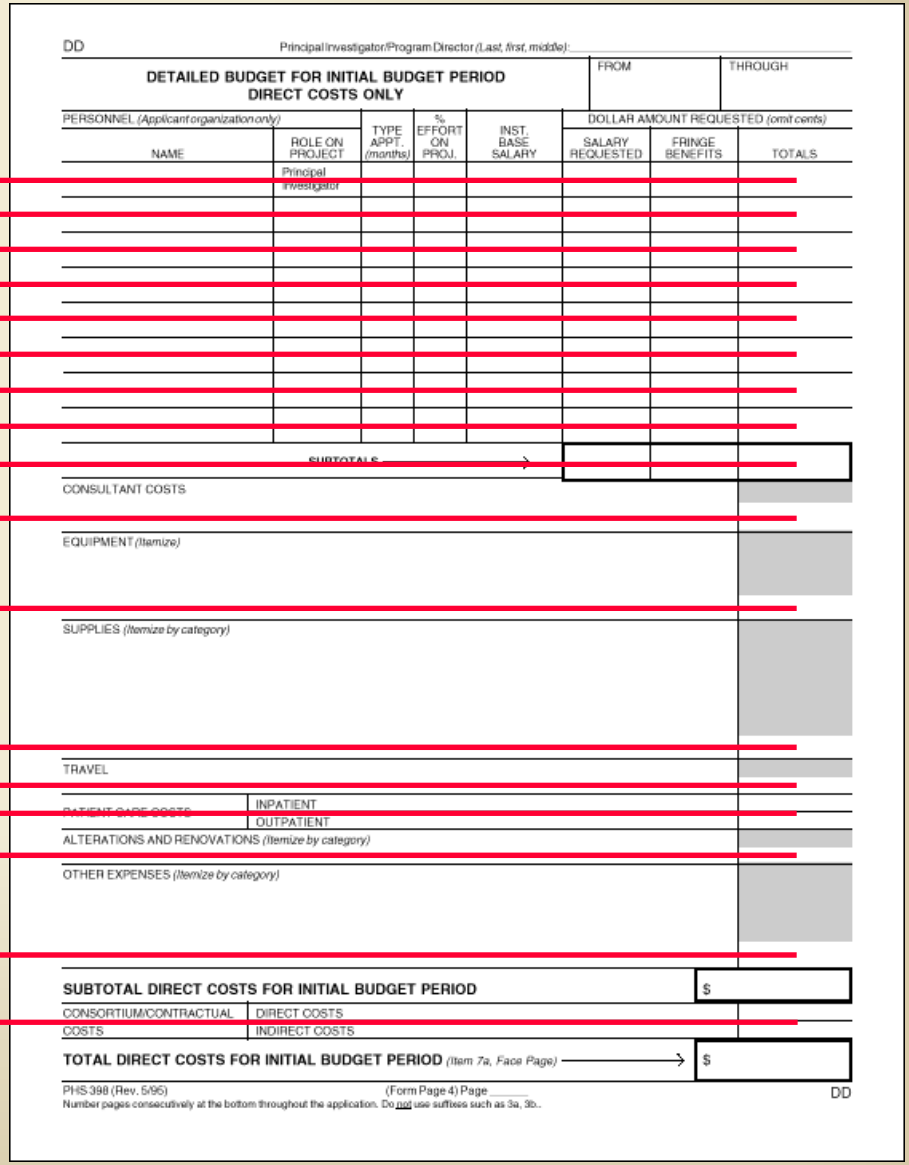
SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD $

CONSORTIUM/CONTRACTUAL COSTS — DIRECT COSTS / INDIRECT COSTS

TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD (Item 7a, Face Page) → $

PHS 398 (Rev. 5/95) (Form Page 4) Page _____ DD

Number pages consecutively at the bottom throughout the application. Do not use suffixes such as 3a, 3b..



DD Principal Investigator/Program Director (Last, first, middle):

DETAILED BUDGET FOR INITIAL BUDGET PERIOD
DIRECT COSTS ONLY

FROM THROUGH

PERSONNEL (Applicant organization only)

NAME	ROLE ON PROJECT	TYPE APPT. (months)	% EFFORT ON PROJ.	INST. BASE SALARY	DOLLAR AMOUNT REQUESTED (omit cents) SALARY REQUESTED	FRINGE BENEFITS	TOTALS
	Principal Investigator						

SUBTOTALS →

CONSULTANT COSTS

EQUIPMENT (Itemize)

SUPPLIES (Itemize by category)

TRAVEL

PATIENT CARE COSTS — INPATIENT / OUTPATIENT

ALTERATIONS AND RENOVATIONS (Itemize by category)

OTHER EXPENSES (Itemize by category)

SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD $

CONSORTIUM/CONTRACTUAL COSTS — DIRECT COSTS / INDIRECT COSTS

TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD (Item 7a, Face Page) → $

PHS 398 (Rev. 5/95) (Form Page 4) Page _____ DD

Number pages consecutively at the bottom throughout the application. Do not use suffixes such as 3a, 3b..

However, automated flow of arbitrary sub-object data (and justifications) would be more challenging, but more useful...

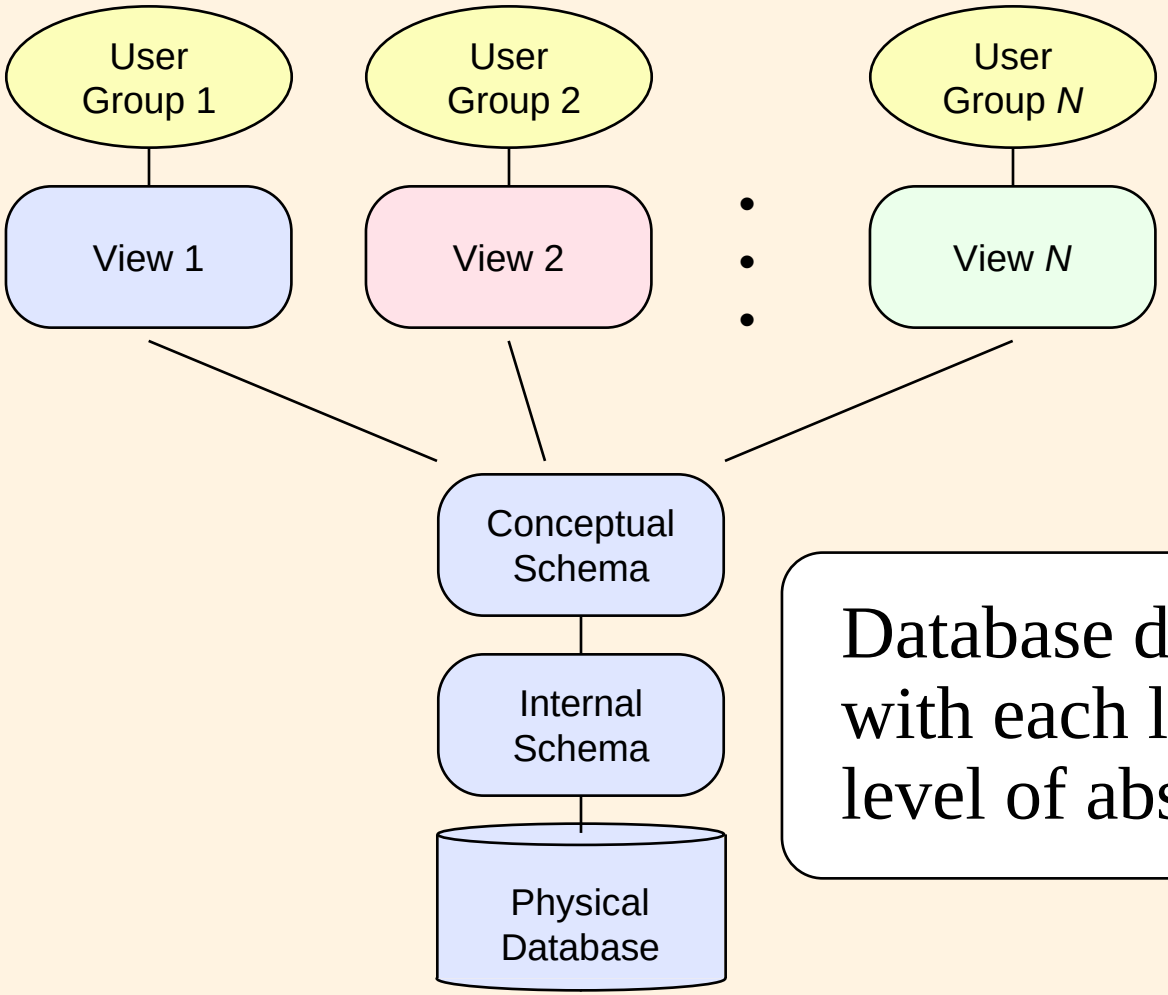
Fred **Hutchinson Cancer Research** Center

UNDERLYING TECHNOLOGIES

Fred
Hutchinson
Cancer
Research
Center

Database Integration

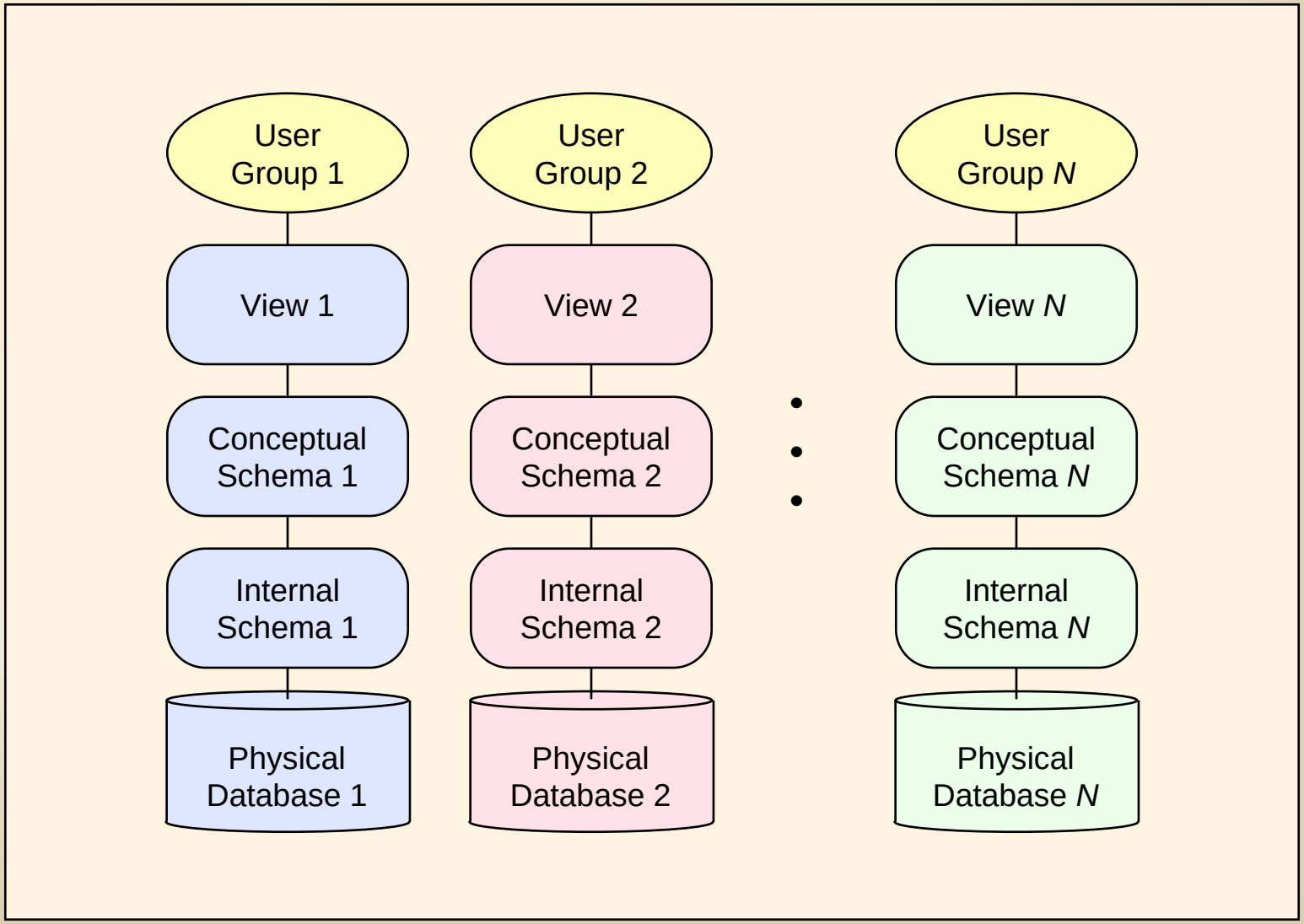
Multiple Views



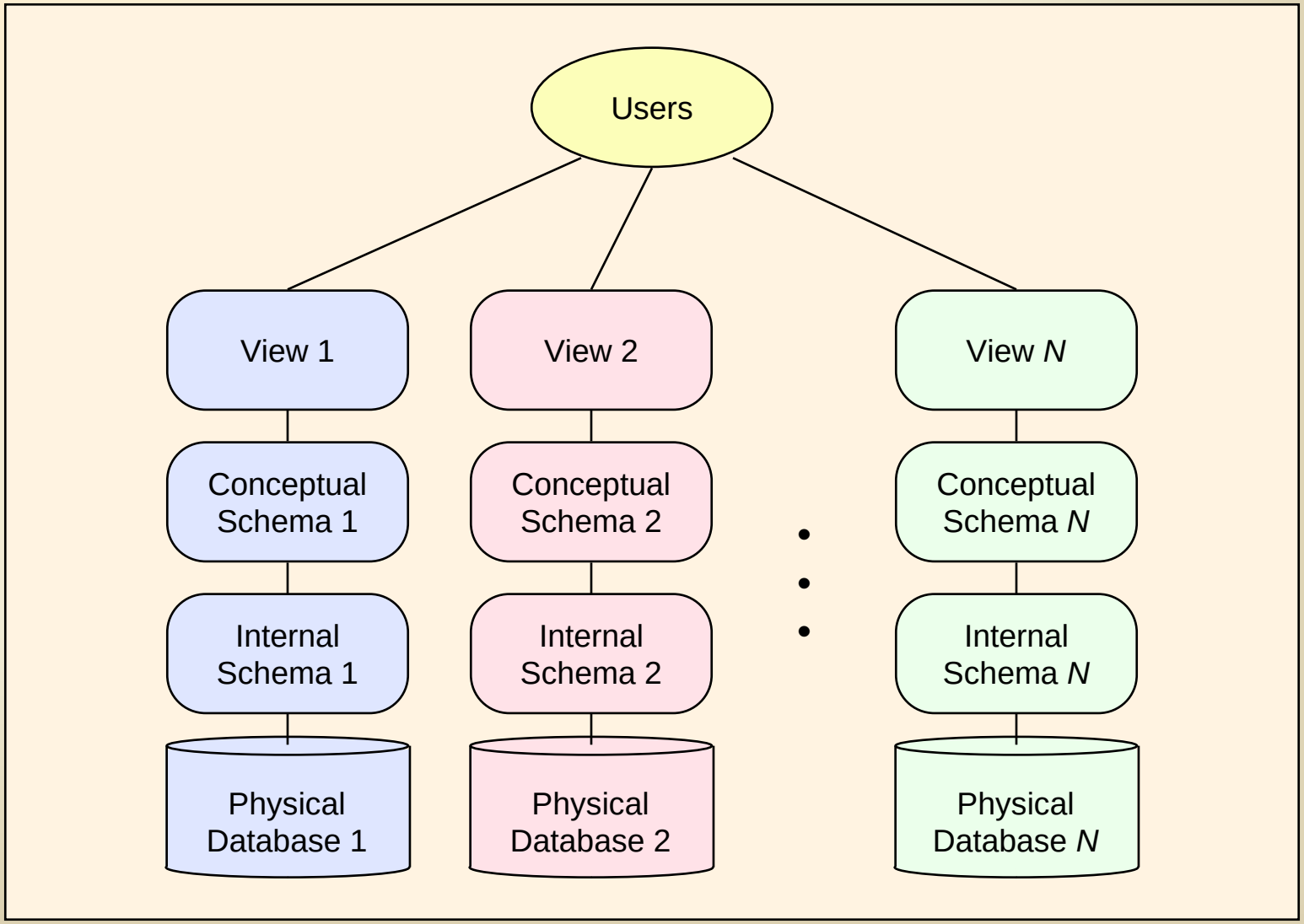
Database designs are layered, with each layer at a different level of abstraction.

Fred Hutchinson Cancer Research Center

Multiple Databases

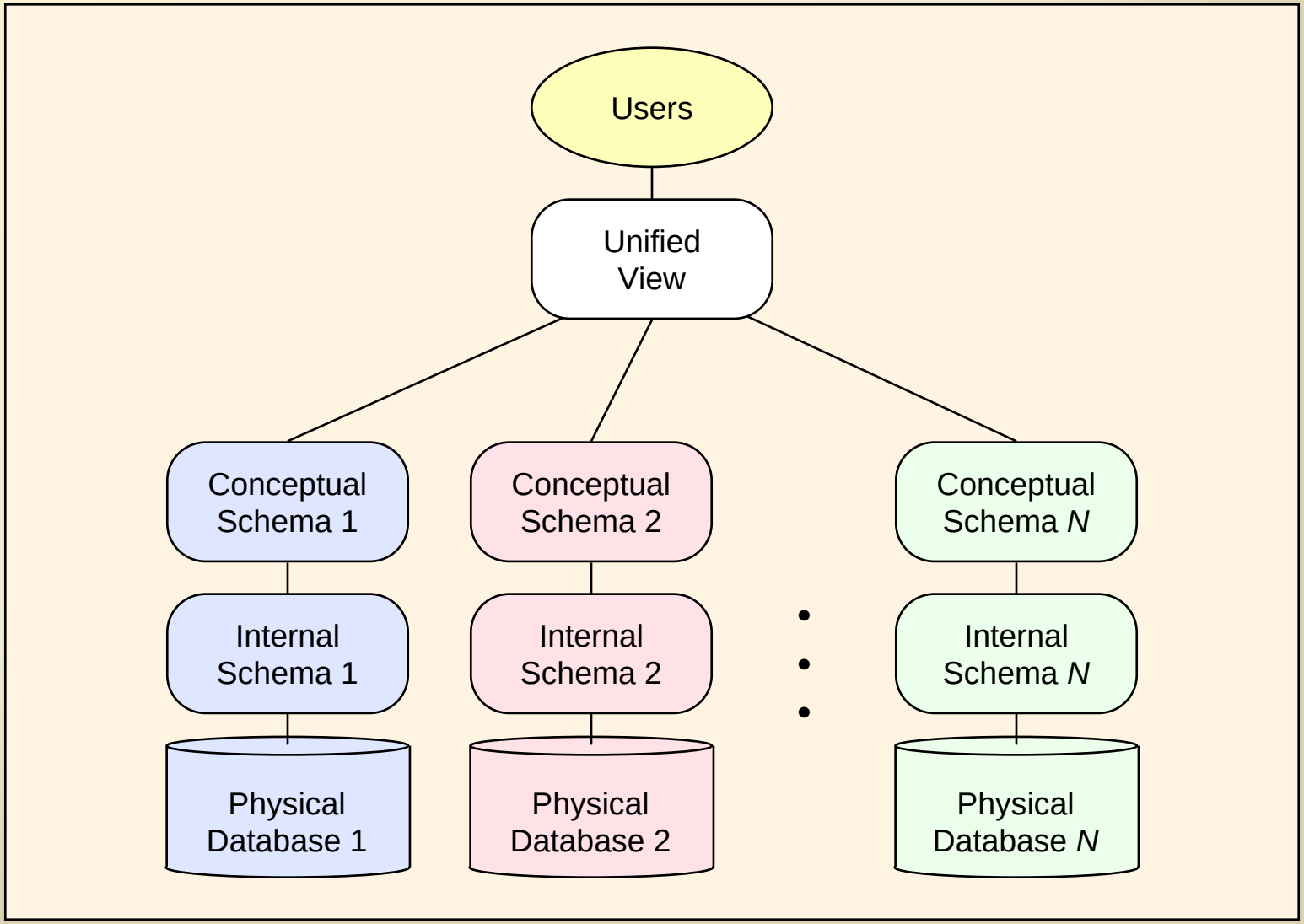


Common Situation



Fred Hutchinson Cancer Research Center

Desired Situation

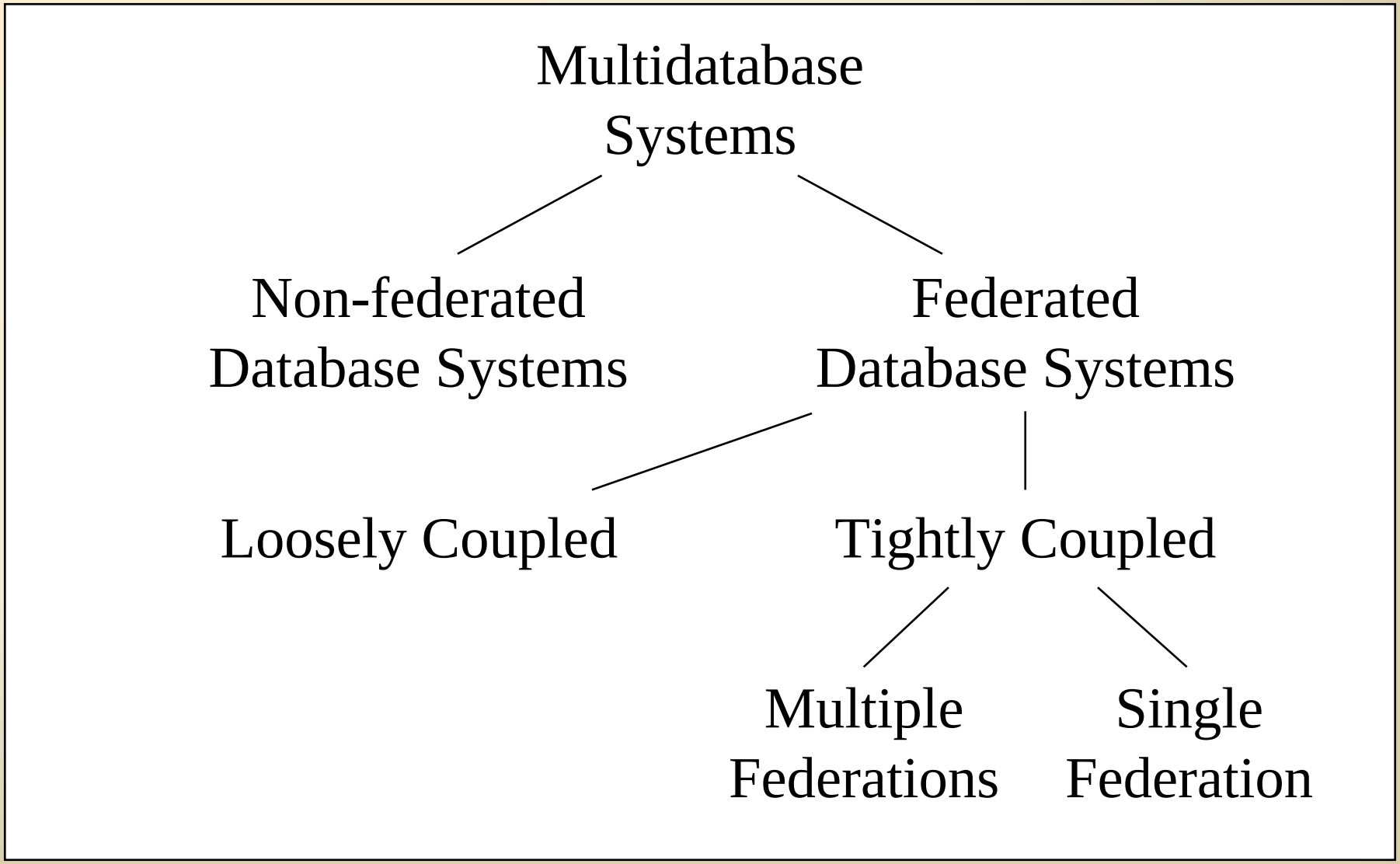


Fred Hutchinson Cancer Research Center

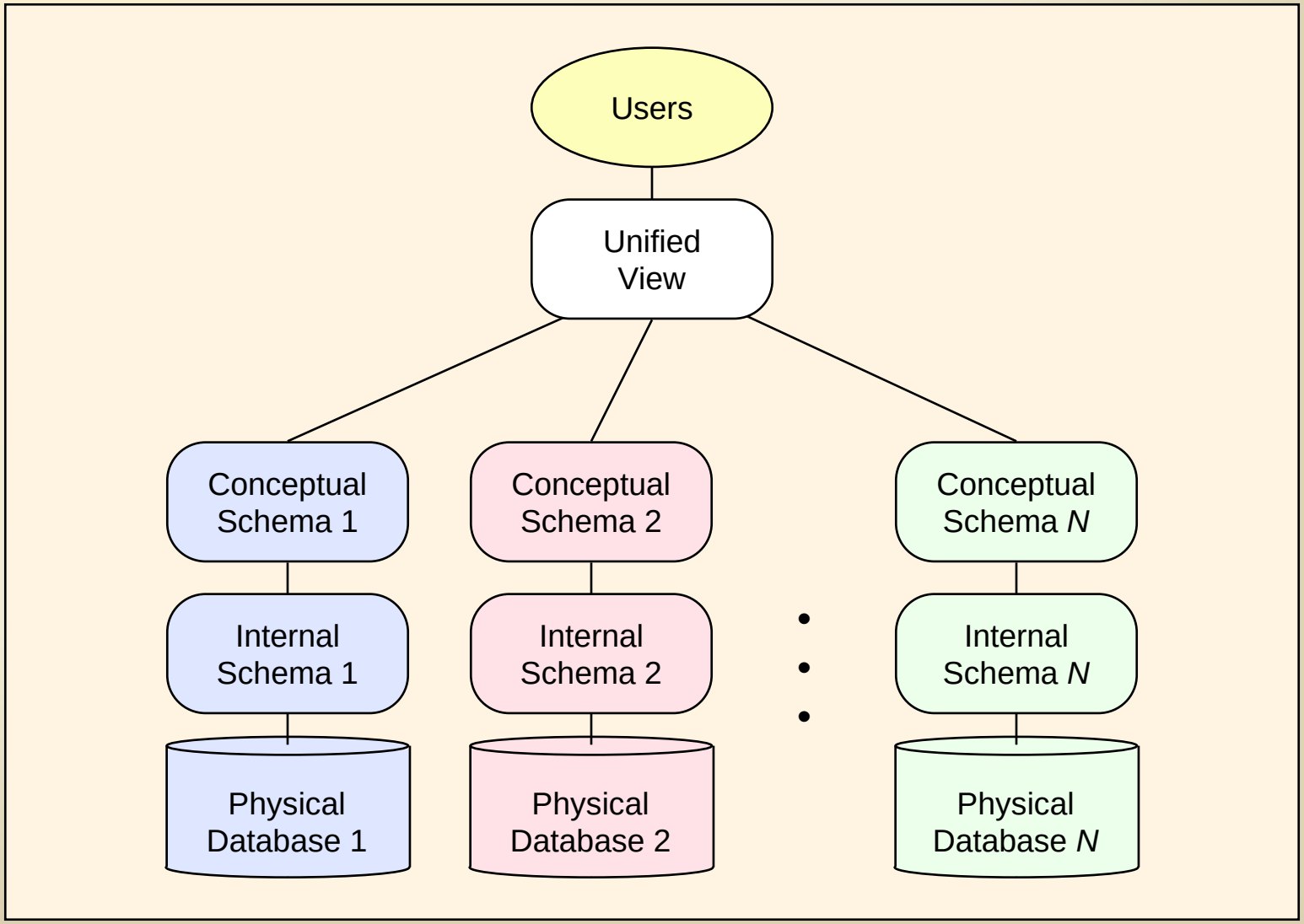
Taxonomy of Multidatabase Systems

A ***multidatabase system*** (MDBS) supports simultaneous operations on multiple (perhaps different) component databases. A ***federated database system*** (FDBS) has autonomous components, whereas ***non-federated database systems*** are unitary. A federated system with no strong central federation management is considered ***loosely coupled***. One with strong central management and with federation database administrators controlling access to the components is ***tightly coupled*** . A ***single federation*** allows only one centrally managed federated schema; a ***multiple federation*** allows multiple centrally managed schemas.

Taxonomy of Multidatabase Systems

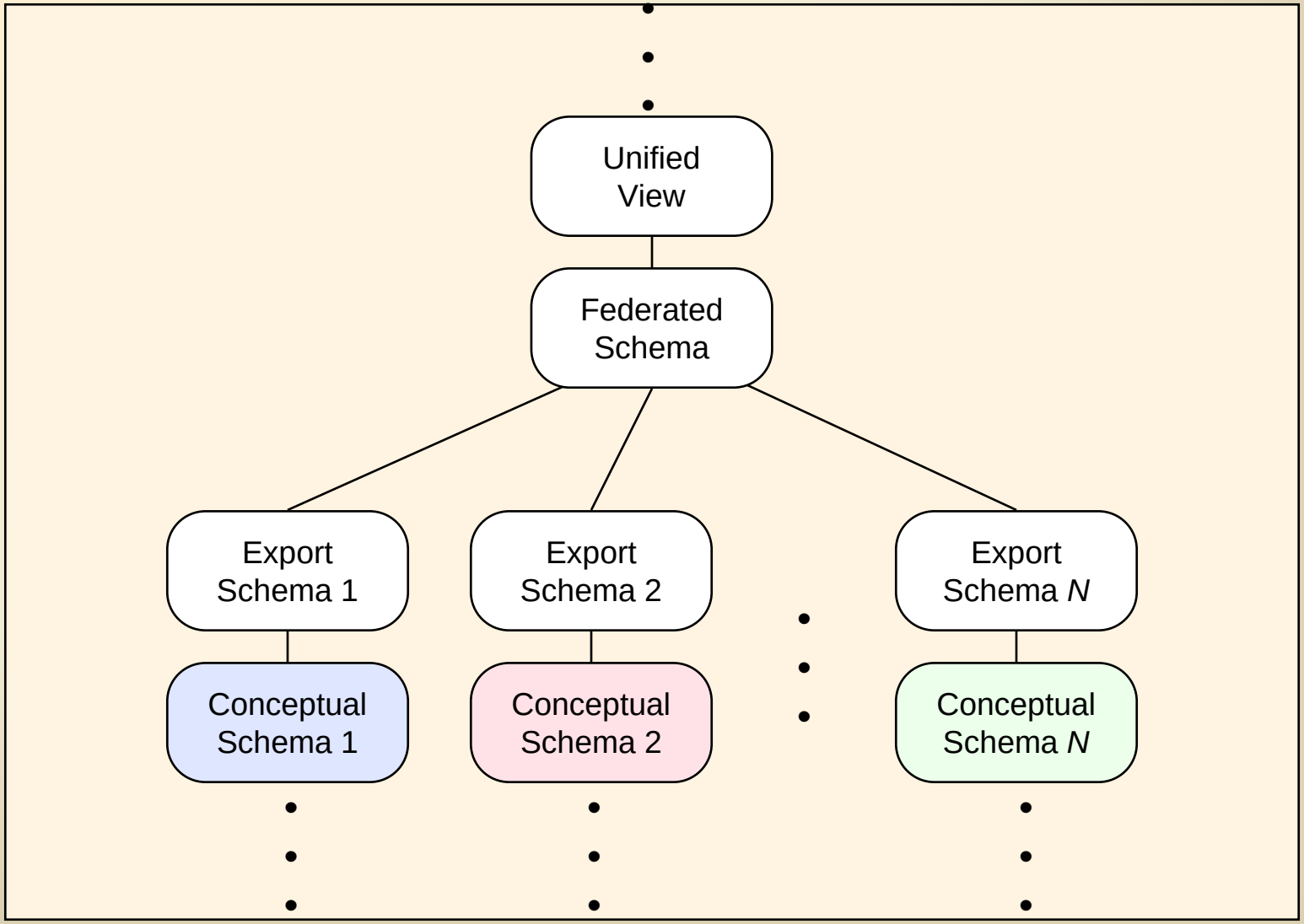


Desired Situation



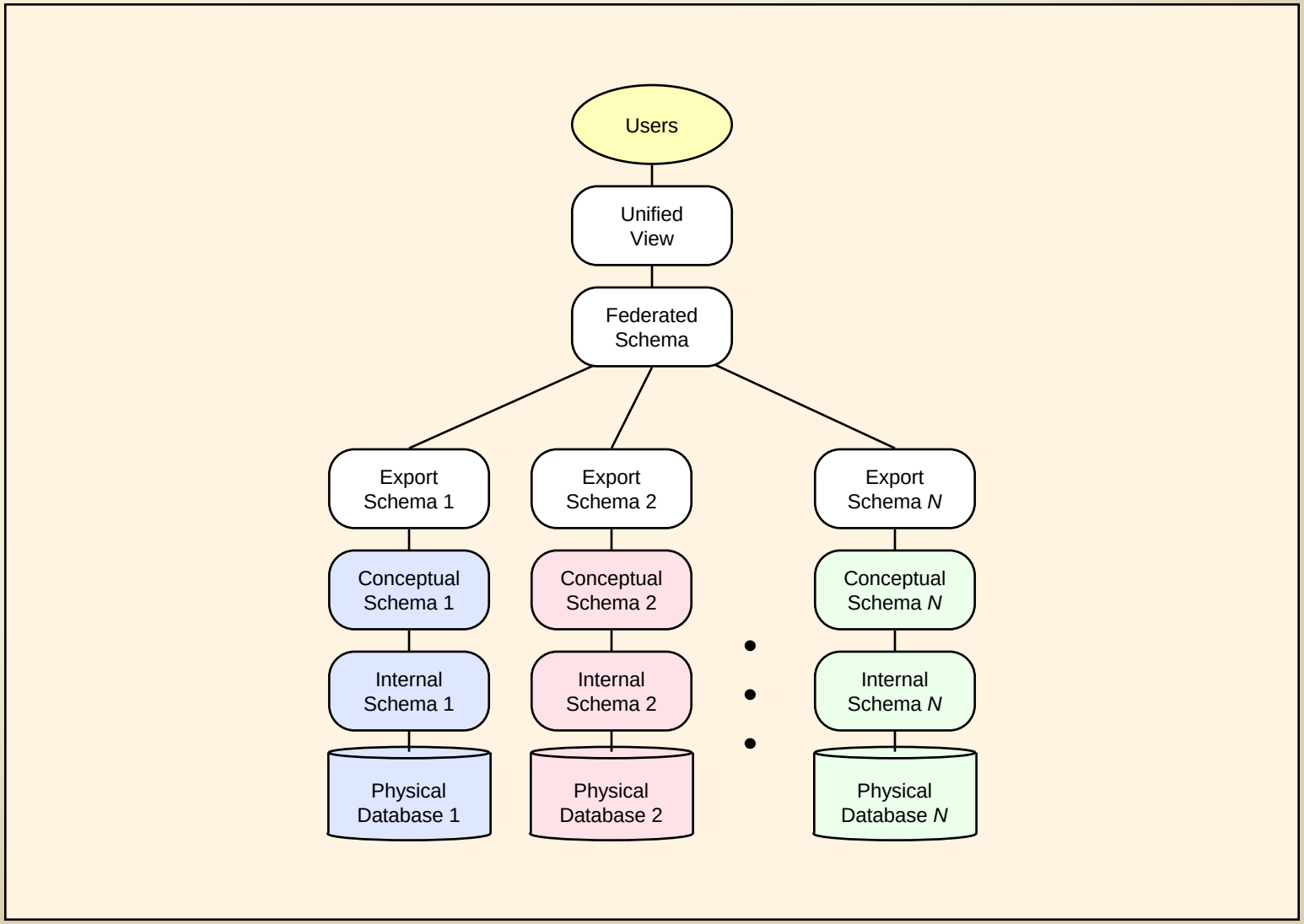
Fred Hutchinson Cancer Research Center

More Layers



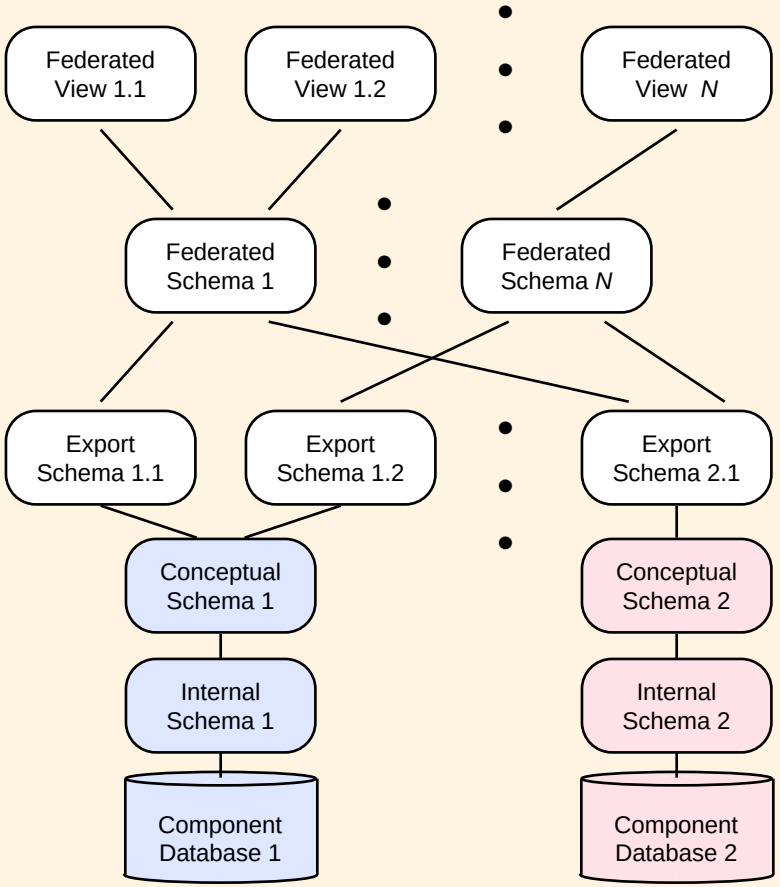
Fred Hutchinson Cancer Research Center

Federated Schema



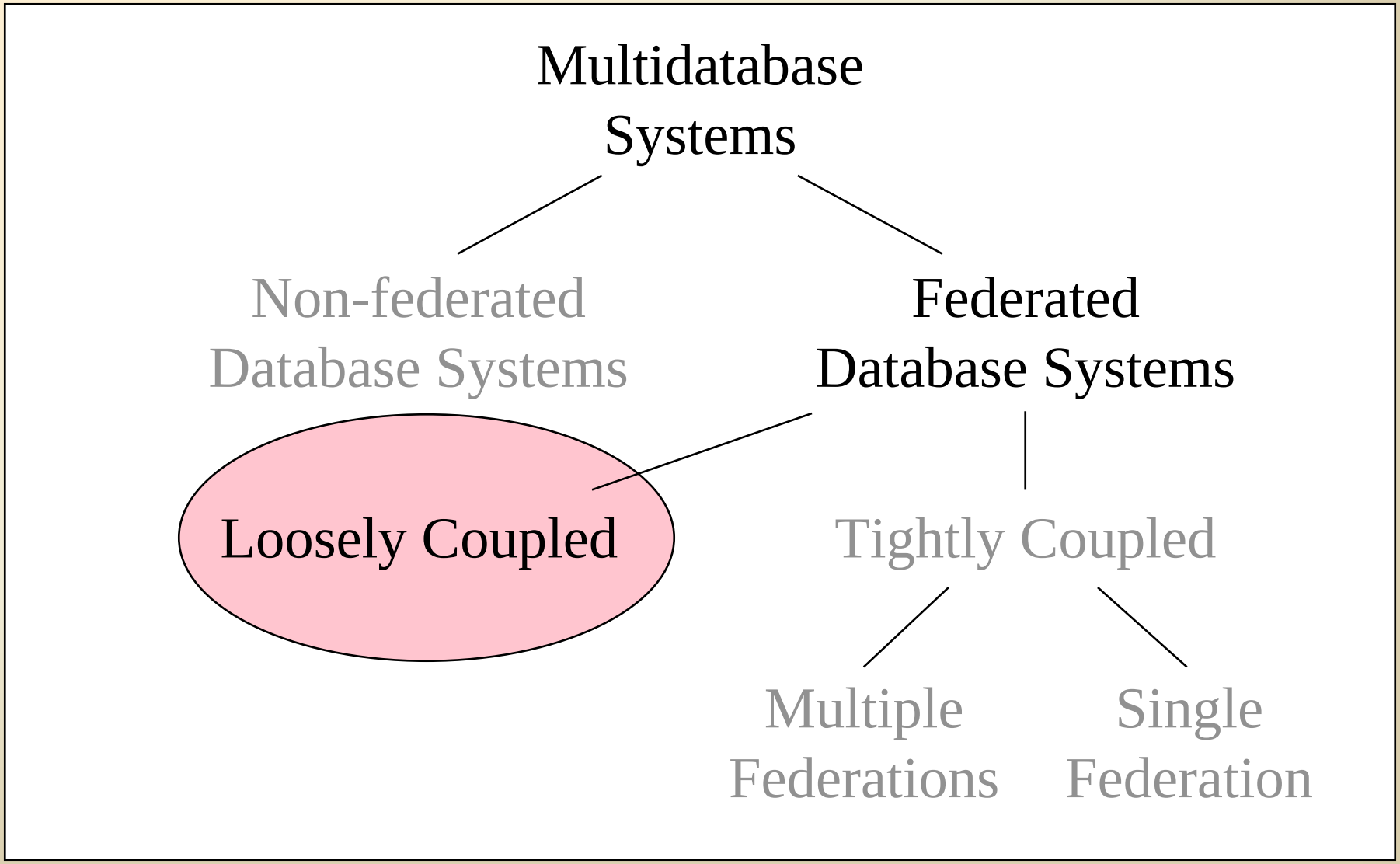
Fred Hutchinson Cancer Research Center

Multiple Federations

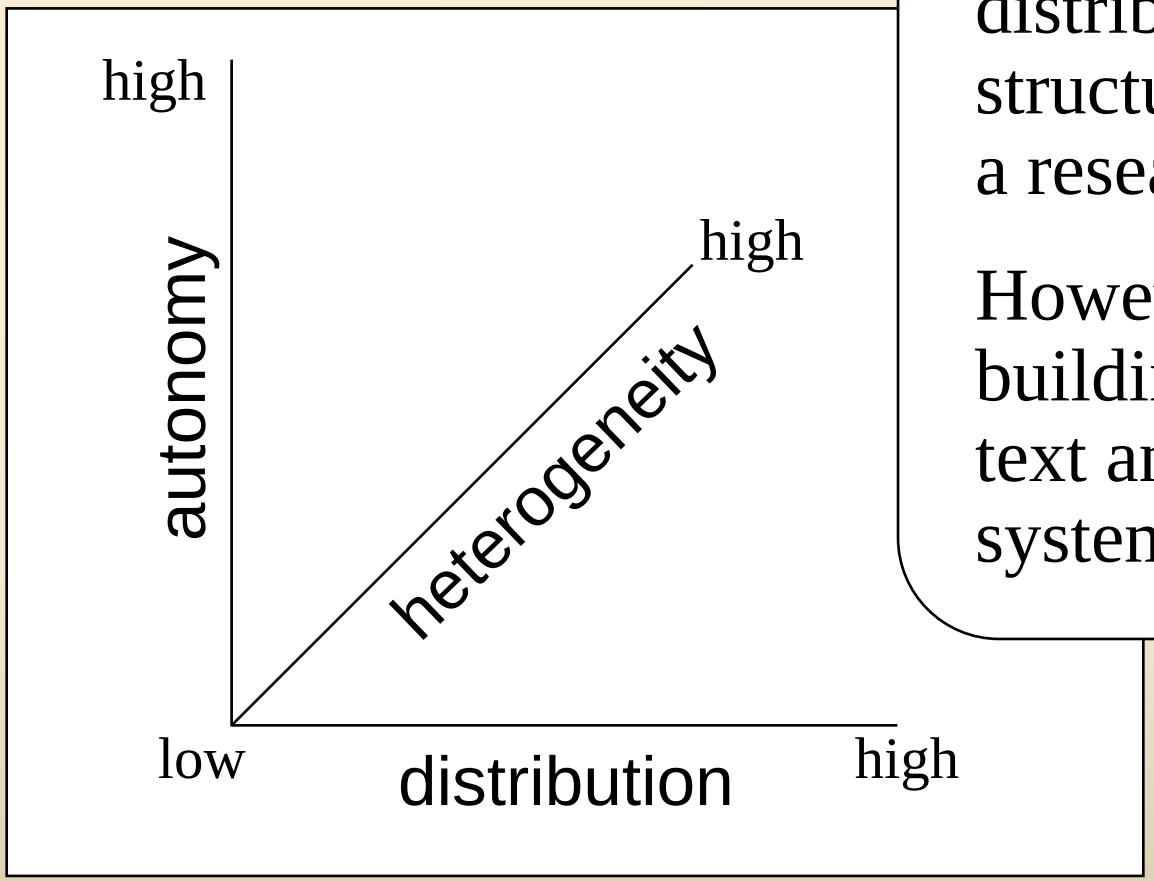


Fred Hutchinson Cancer Research Center

Taxonomy of Multidatabase Systems



Multidatabase Systems: Difficulty Dimensions



Building tightly coupled distributed, heterogeneous, structured databases is still a research problem.

However, methods for building loosely coupled text and file retrieval systems are proliferating...

Fred Hutchinson Cancer Research Center

Generic Client-Server Systems

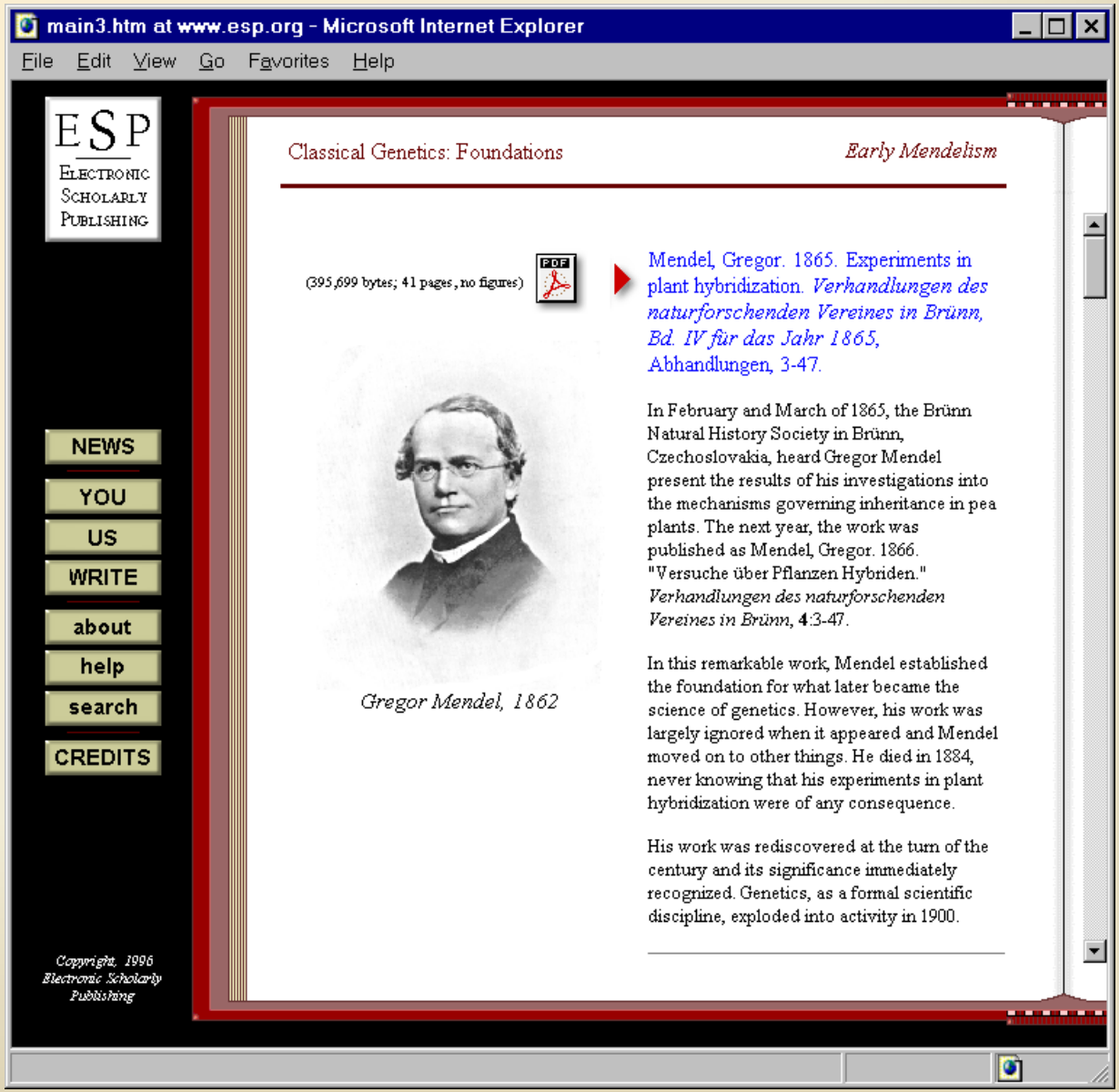
Early information systems operated as complete packages on single computers.

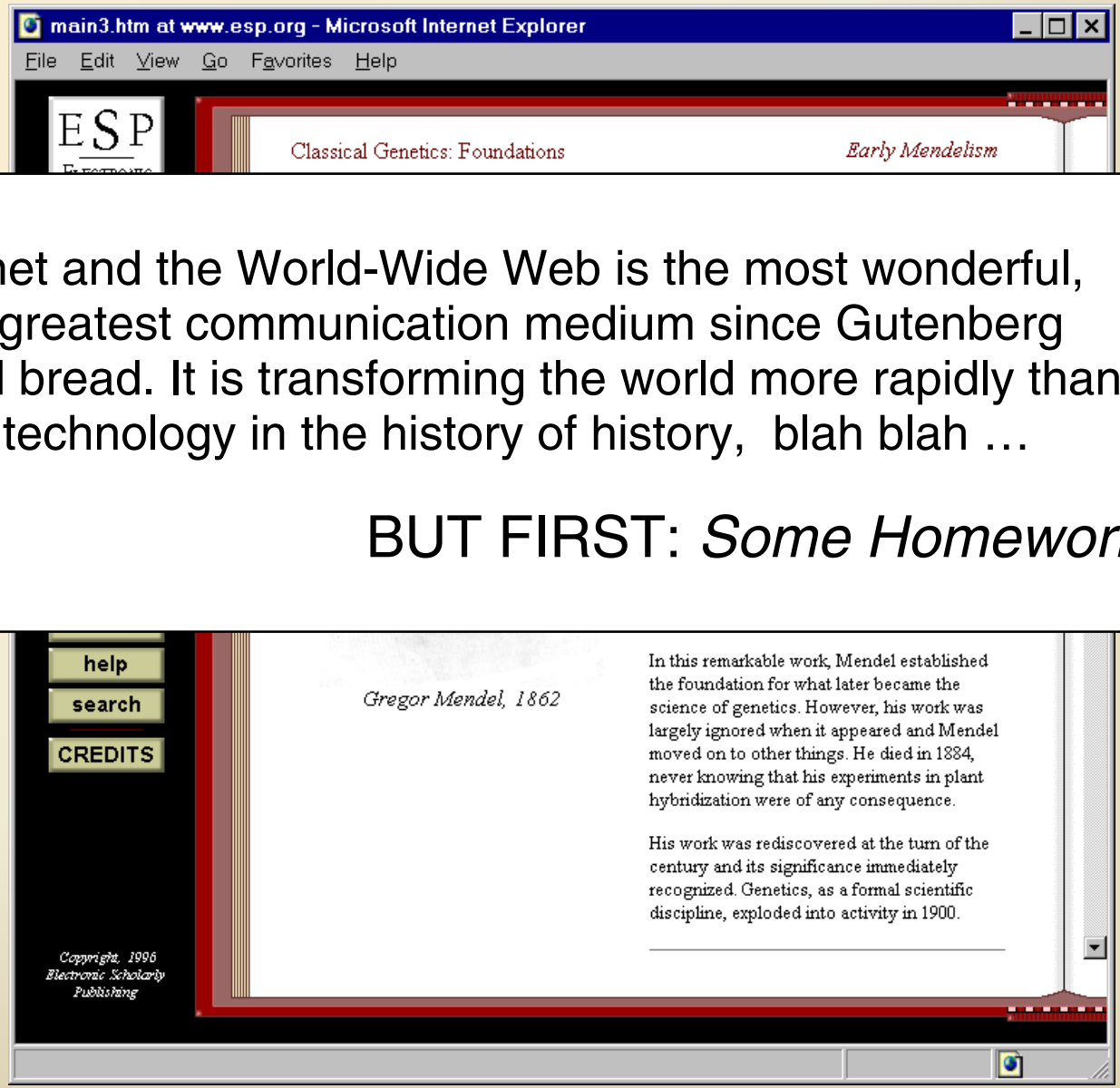
Client-server systems moved the information resource to the server, leaving only dedicated client software on the user's computer.

Generic client-server systems are data-driven systems that allow access to multiple servers through a single client.

The Internet & the WWW

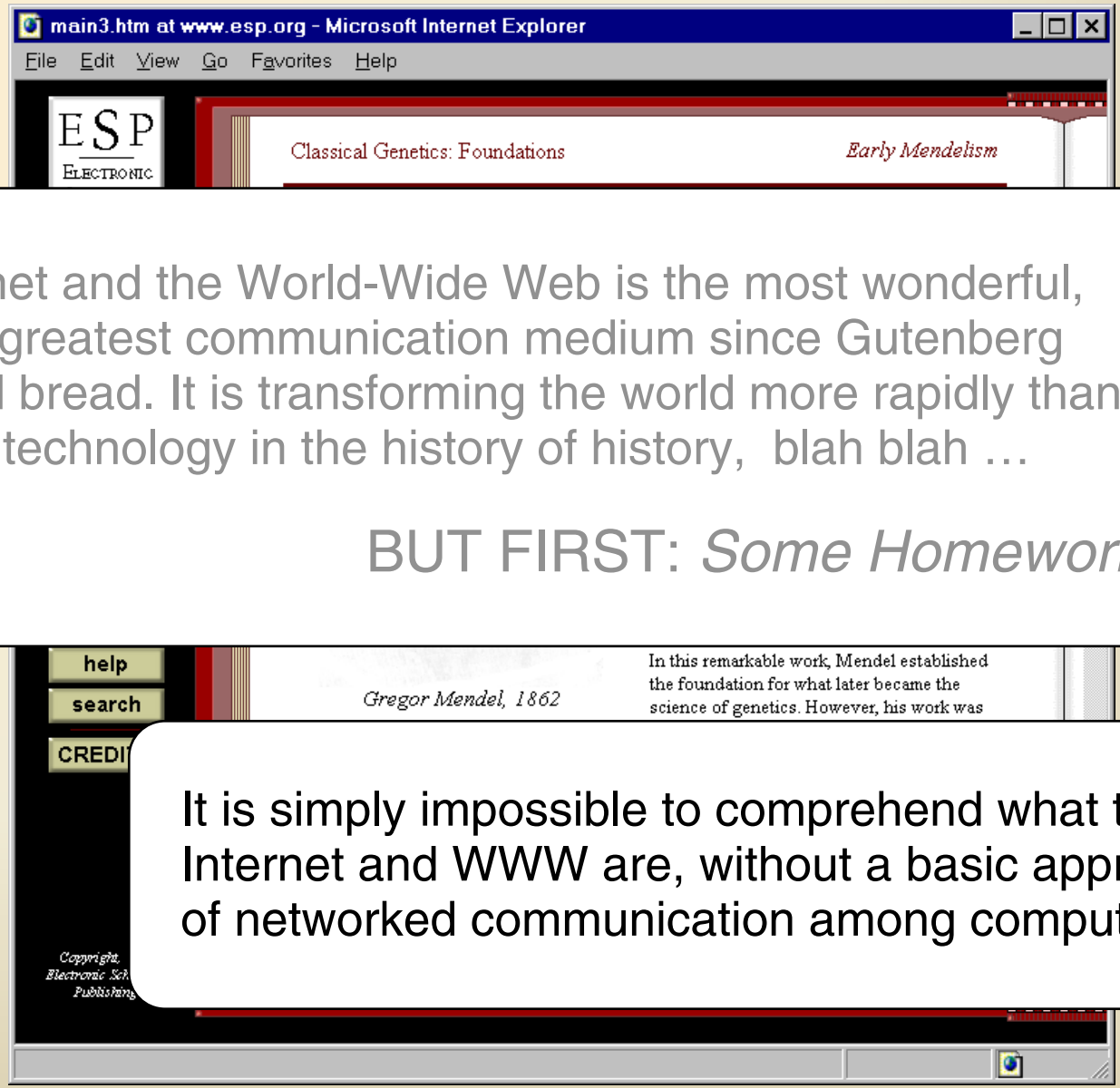
What Are They
How They Work
Limitations and Future Changes
Who's in Charge ...





The Internet and the World-Wide Web is the most wonderful, amazing, greatest communication medium since Gutenberg and sliced bread. It is transforming the world more rapidly than any other technology in the history of history, blah blah …

BUT FIRST: *Some Homework*

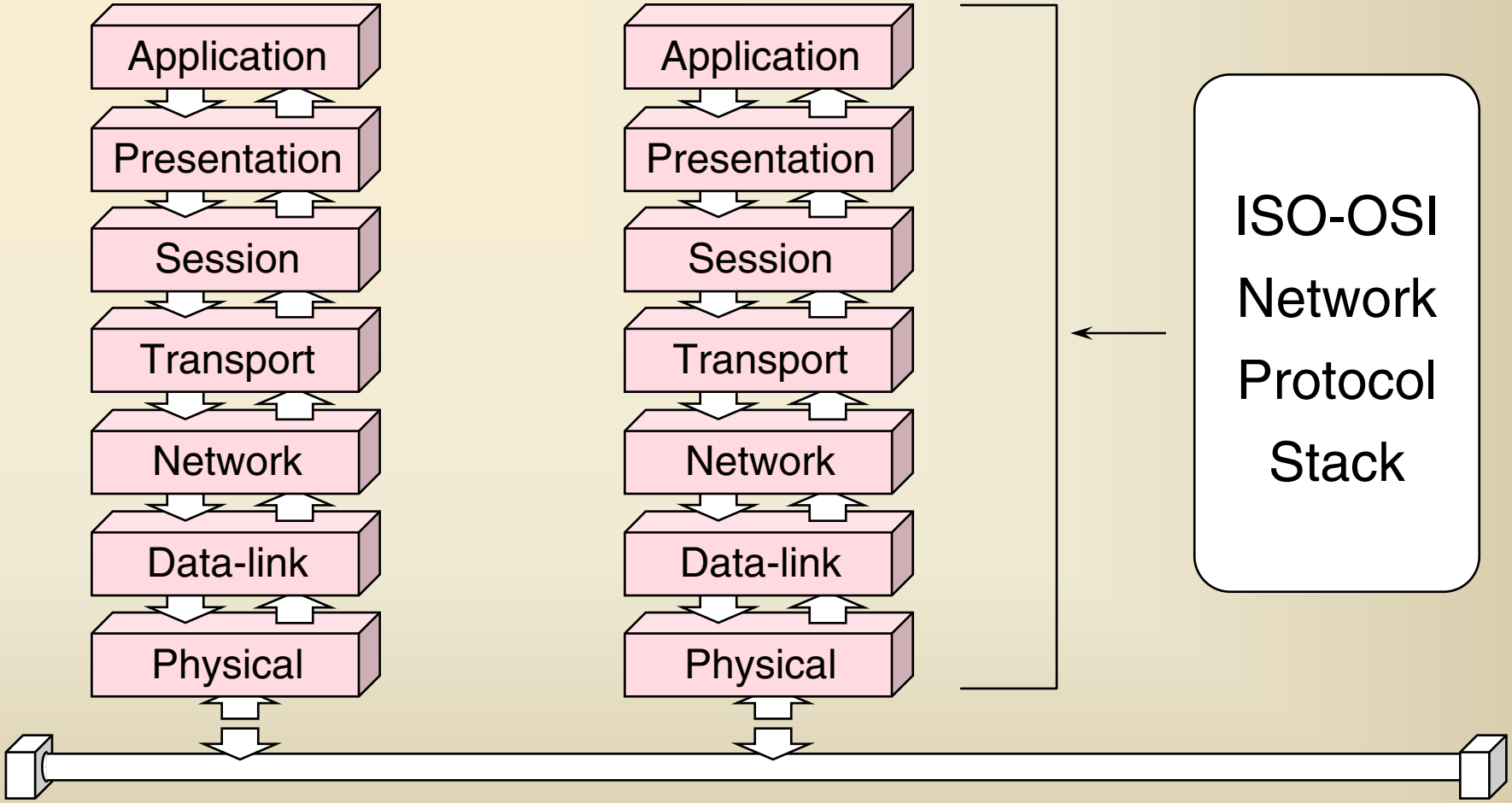


The Internet and the World-Wide Web is the most wonderful, amazing, greatest communication medium since Gutenberg and sliced bread. It is transforming the world more rapidly than any other technology in the history of history, blah blah …

BUT FIRST: *Some Homework*

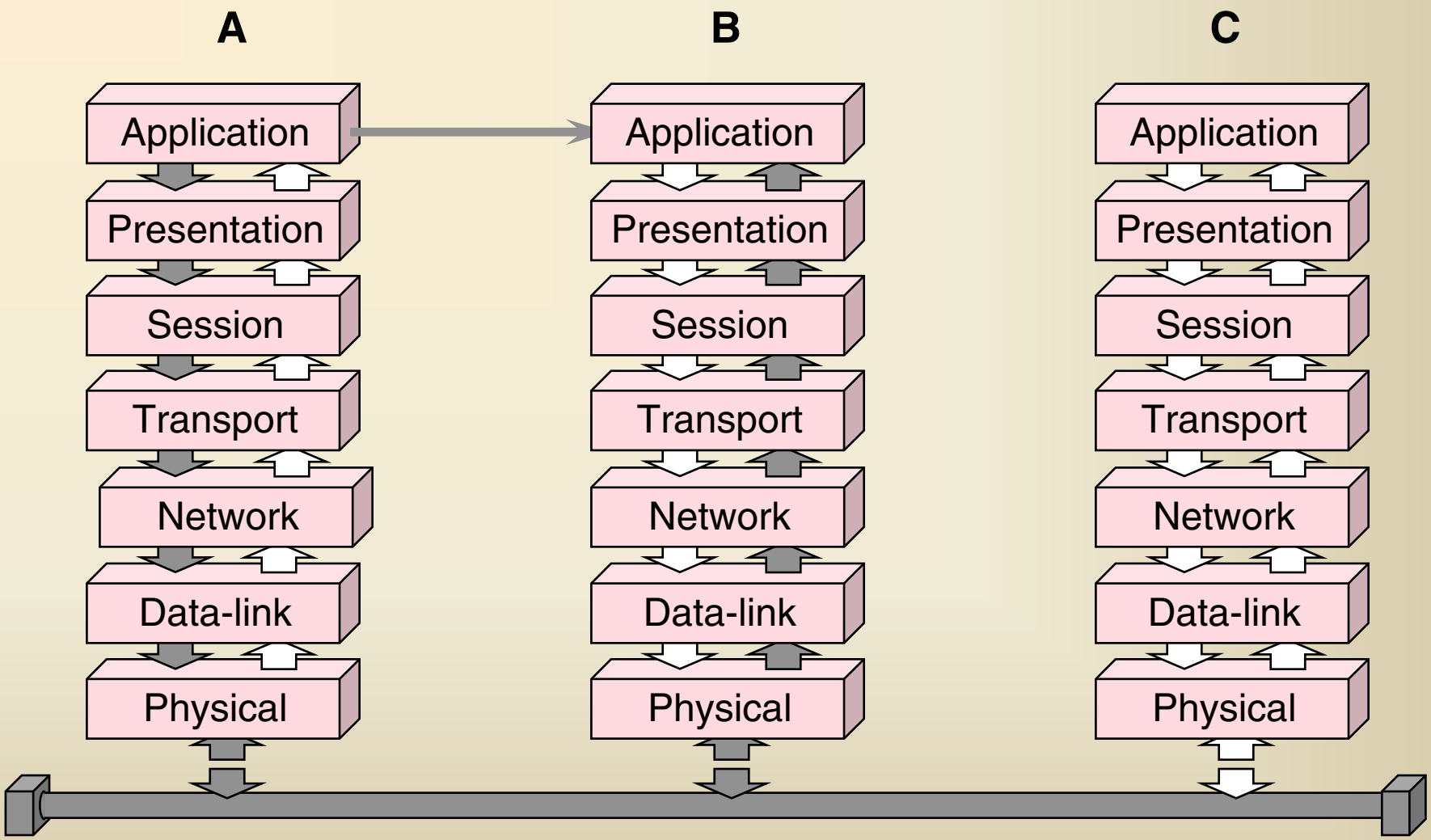
It is simply impossible to comprehend what the Internet and WWW are, without a basic appreciation of networked communication among computers, so...

ISO-OSI Network Model



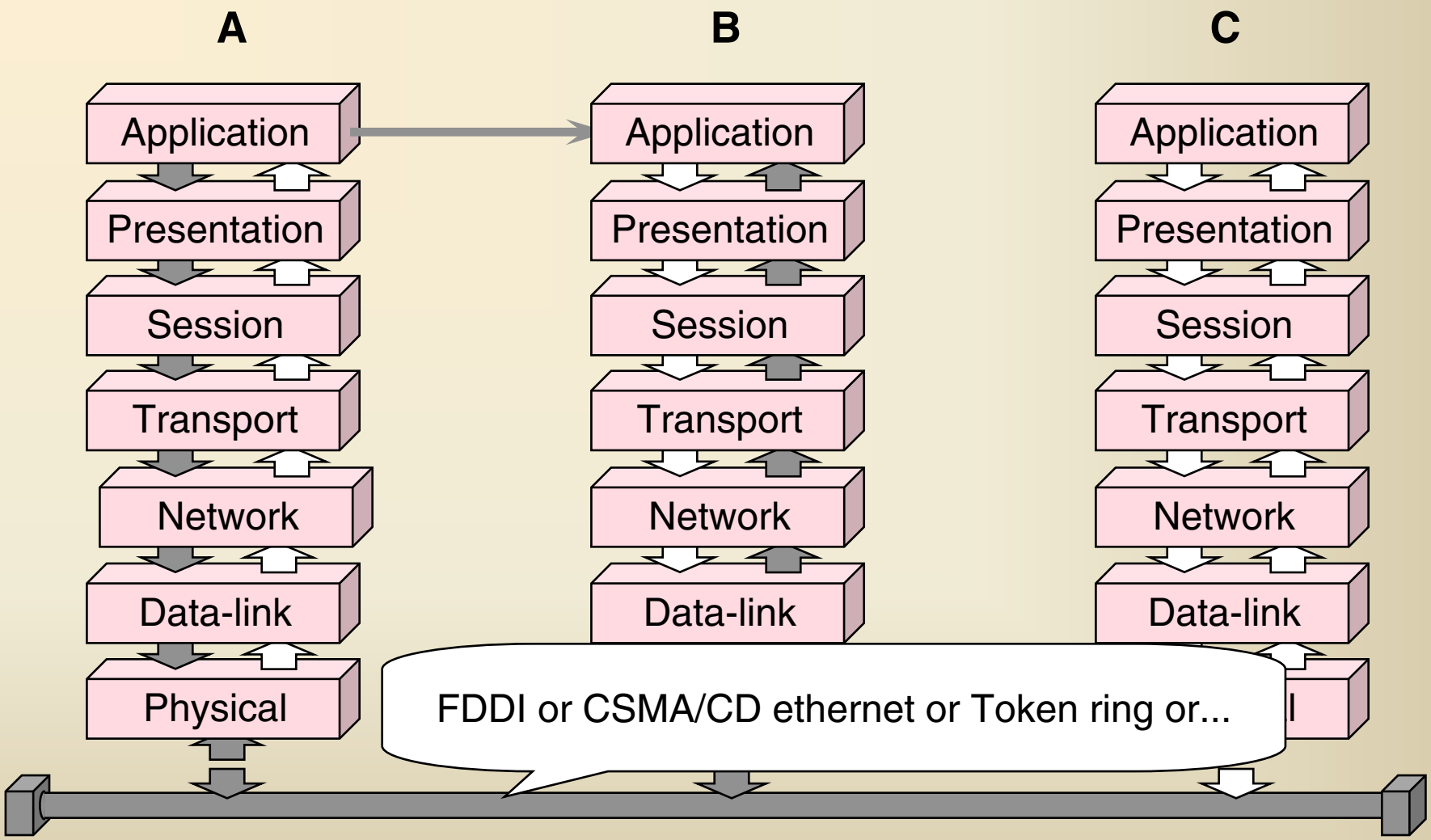
Fred Hutchinson Cancer Research Center

ISO-OSI Network Model



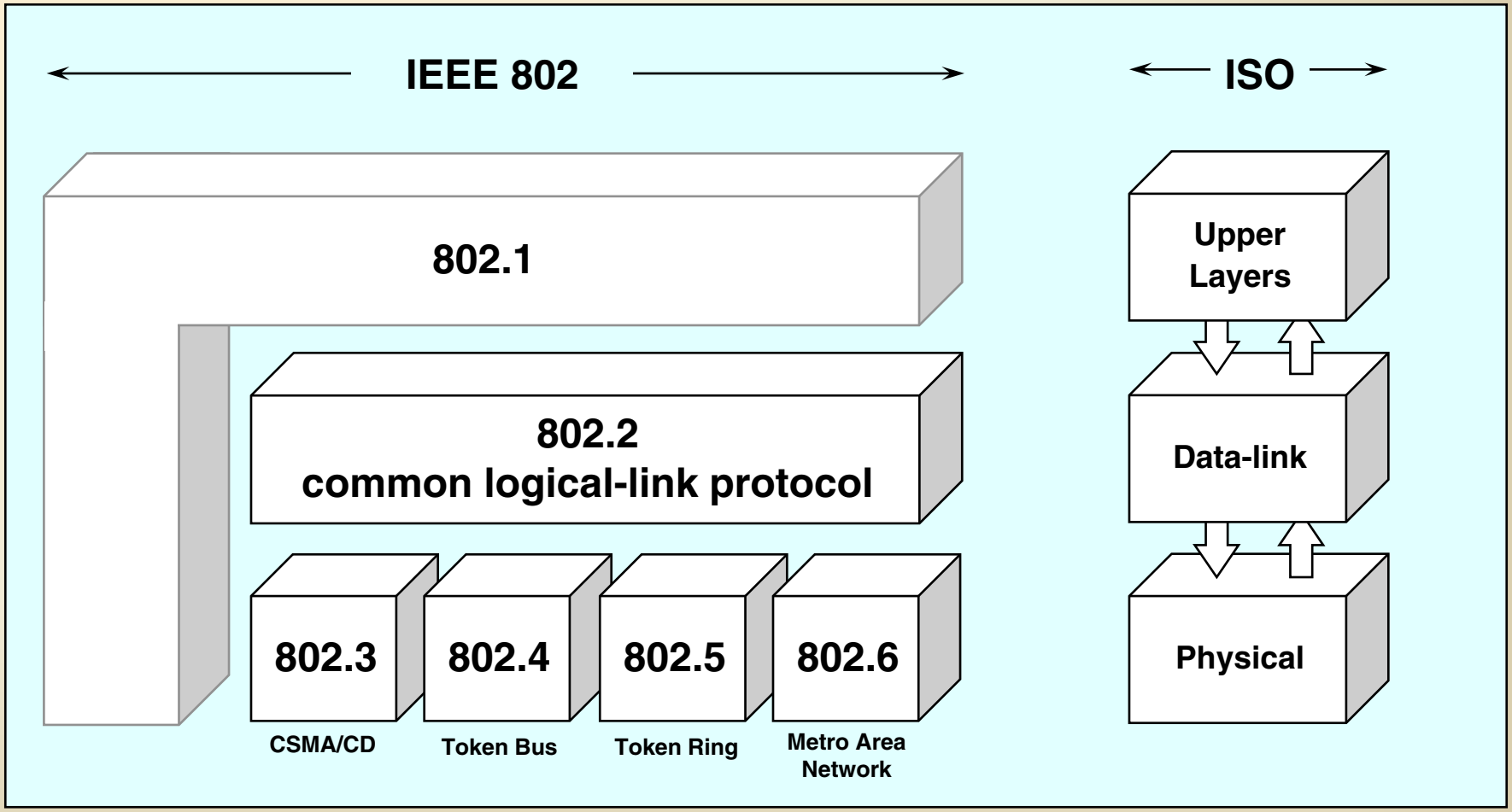
Fred Hutchinson Cancer Research Center

ISO-OSI Network Model

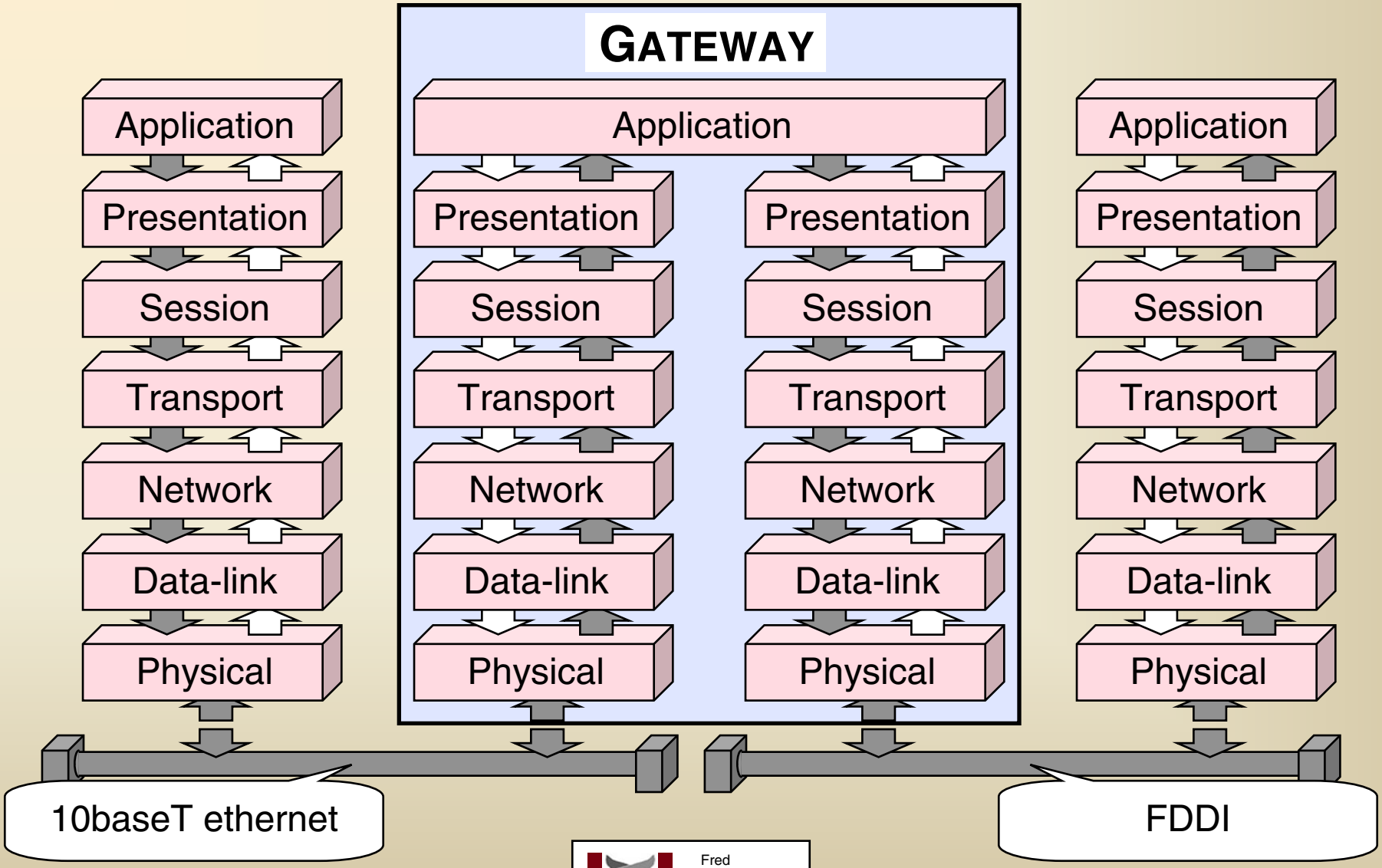


Fred Hutchinson Cancer Research Center

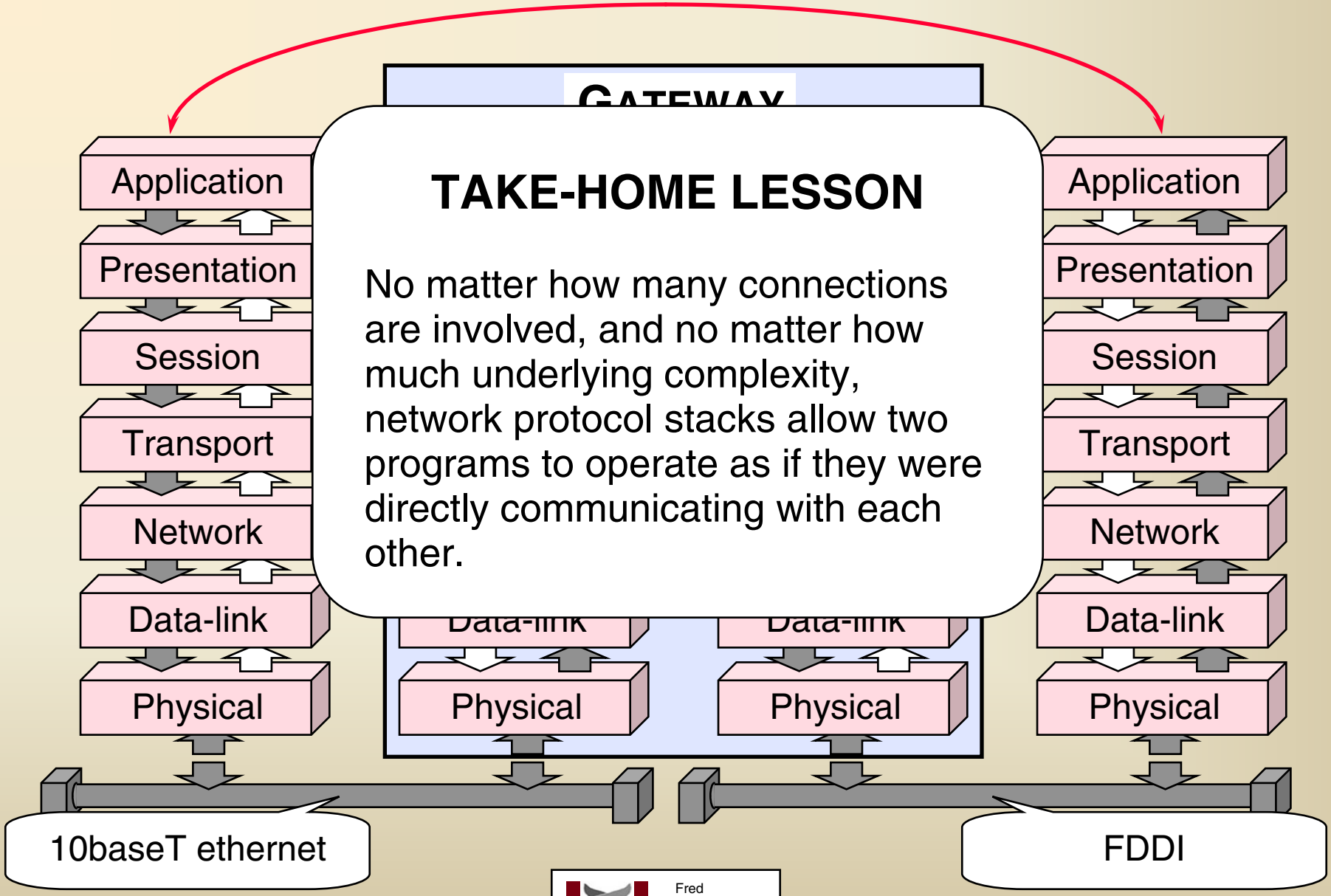
Physical Layer Protocols



ISO-OSI Network Model



Fred Hutchinson Cancer Research Center

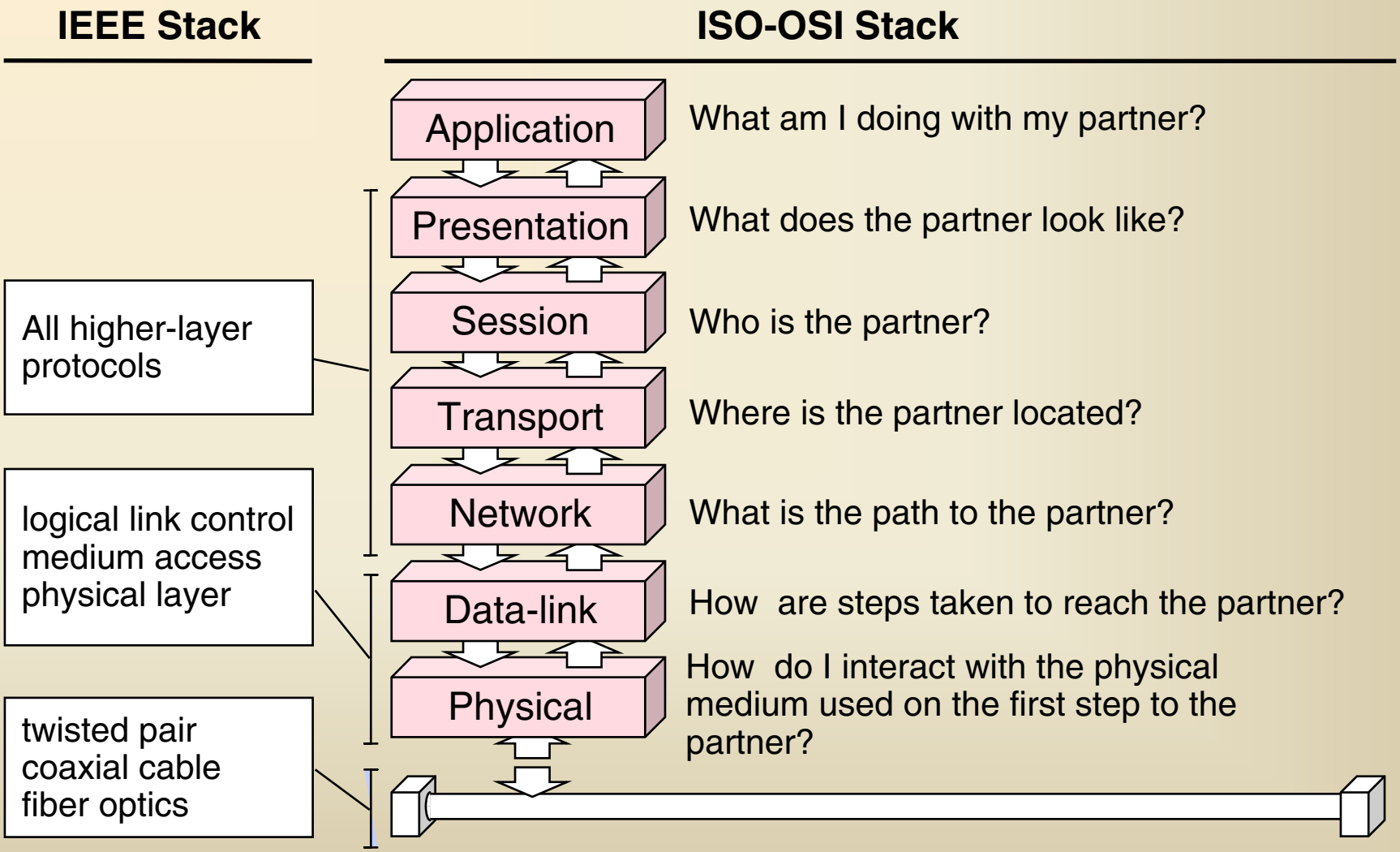


TAKE-HOME LESSON

No matter how many connections are involved, and no matter how much underlying complexity, network protocol stacks allow two programs to operate as if they were directly communicating with each other.

Fred Hutchinson Cancer Research Center

ISO-OSI Network Model



Fred Hutchinson Cancer Research Center

Network Protocol Stacks

layer	ISO	TCP / IP	SNA	DECNET
7	Application	User	End User	Application
6	Presentation	ftp, telnet	NAU Services	
5	Session	(none)	Data-Flow Control	(none)
4	Transport	Host-Host	Transmission Control	Network Services
3	Network	Source to destination IMP	Path Control	Transport
2	Data-Link	IMP-IMP	Data-Link Control	Data-Link Control
1	Physical	Physical	Physical	Physical

Network Protocol Stacks

layer	ISO	TCP / IP	SNA	DECNET
7	Application	User	End User	Application
6	Presentation	ftp, telnet	NAU Services	
5	Session	(none)	Data-Flow Control	(none)
			Transmission Control	
4	Transport	Host-Host		Network Services
		Source to ion IMP	Path Control	Transport
		MP	Data-Link Control	Data-Link Control
		ical	Physical	Physical

TCP / IP protocols were developed by the Department of Defense to allow robust communication among distributed, heterogeneous computer systems, even under severely adverse conditions.

Fred Hutchinson Cancer Research Center

Network Protocol Stacks

The Internet uses TCP / IP

layer	ISO	TCP / IP	SNA	DECNET
7	Application	User	End User	Application
6	Presentation	ftp, telnet	NAU Services	
5	Session	(none)	Data-Flow Control	(none)
4	Transport	Host-Host	Transmission Control	Network Services
		Source to ion IMP	Path Control	Transport
		MP	Data-Link Control	Data-Link Control
		ical	Physical	Physical

TCP / IP protocols were developed by the Department of Defense to allow robust communication among distributed, heterogeneous computer systems, even under severely adverse conditions.

Fred Hutchinson Cancer Research Center

Network Protocol Stacks

add HTTP, create the WWW

layer	ISO	TCP / IP	NET	
7	Application	User		Application
6	Presentation	ftp, telnet	NAU Services	
5	Session	(none)	Data-Flow Control	(none)
4	Transport	Host-Host	Transmission Control	Network Services
3	Network	Source to destination IMP	Path Control	Transport
2	Data-Link	IMP-IMP	Data-Link Control	Data-Link Control
1	Physical	Physical	Physical	Physical

Network Protocol Stacks

add HTTP, create the WWW
and get very, very rich...

layer	ISO	TCP / IP		NET
7	Application	User		Application
6	Presentation	ftp, telnet	NAU Services	
5	Session	(none)	Data-Flow Control	(none)
4	Transport	Host-Host	Transmission Control	Network Services
3	Network	Source to destination IMP	Path Control	Transport
2	Data-Link	IMP-IMP	Data-Link Control	Data-Link Control
1	Physical	Physical	Physical	Physical

Buzzword Alert...

An ***intranet*** is any set of locally connected ***computers*** running the TCP/IP protocol stack.

An ***internet*** is any set of connected ***networks*** running the TCP/IP protocol stack.

Buzzword Alert...

The Internet is the global set of connected networks running the TCP/IP protocol stack ***and*** sharing a common naming convention.

Fred **Hutchinson Cancer Research** Center

Internet Naming Conventions

Name: www.fhcrc.org

Address: 140.107.42.20

Fred
Hutchinson
Cancer
Research
Center

Internet Naming Conventions

Name: www.fhcrc.org
host domain

Address: 140.107.42.20
network host

What is theWorld-Wide Web?

The machinery of the WWW consists of all ***Internet computers*** that use ***http*** to communicate information represented in the ***HTML*** syntax.

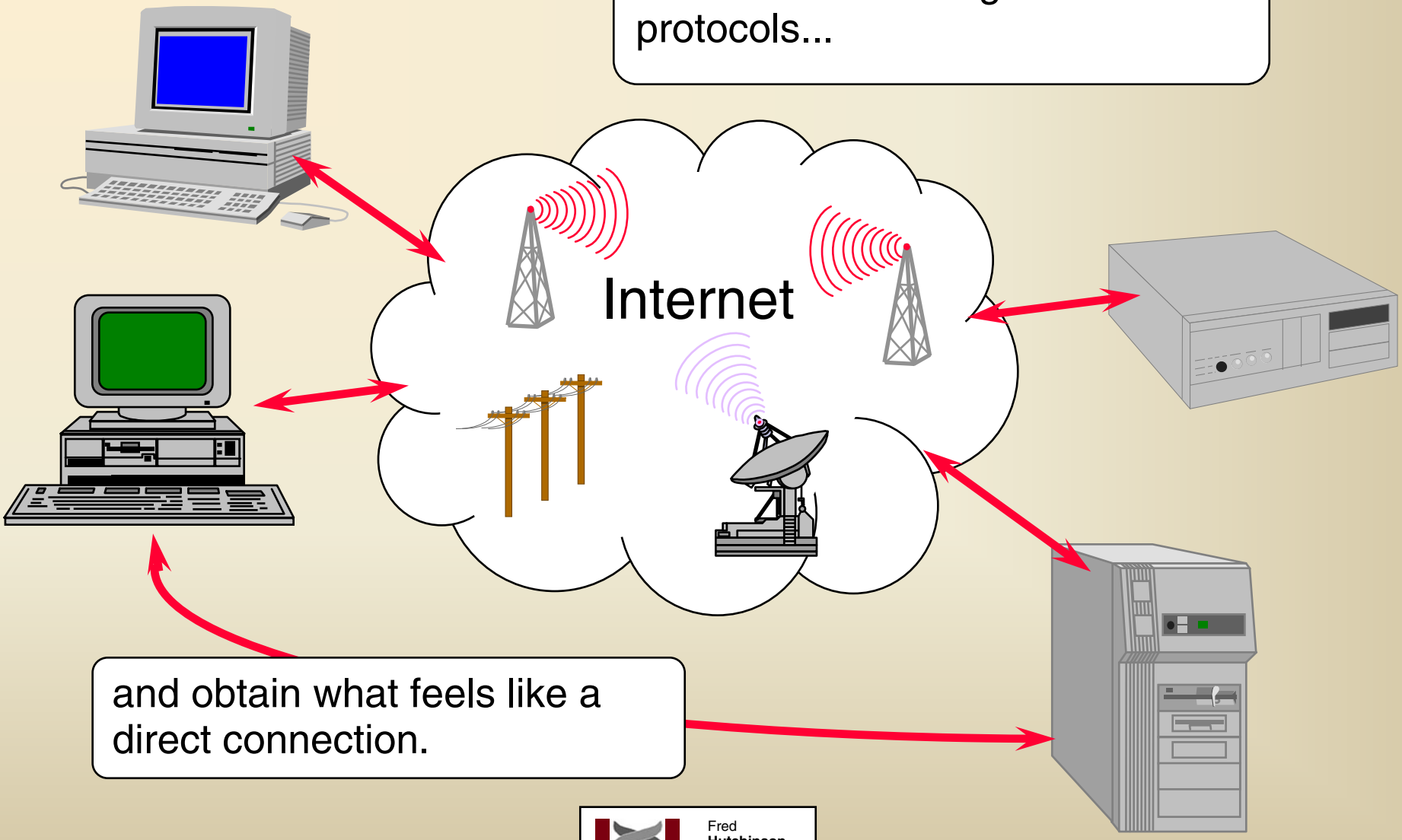
What is the World-Wide Web?

The machinery of the WWW consists of all ***Internet computers*** that use ***http*** to communicate information represented in the ***HTML*** syntax.

The ***content*** of the WWW is the set of all files that are distributed using WWW technology.

The Internet

Any machine can connect to any other machine using TCP/IP protocols...

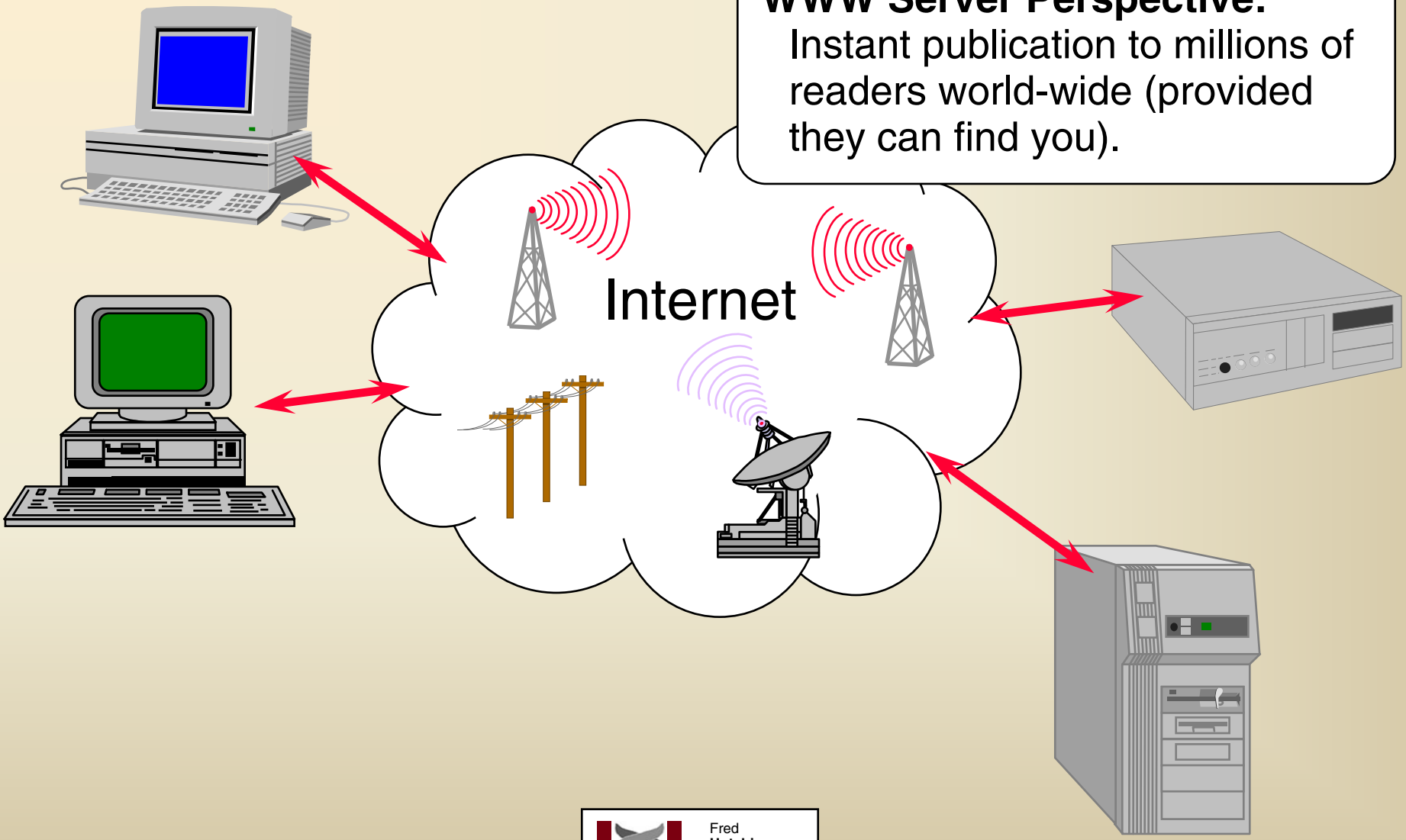


and obtain what feels like a direct connection.

Fred Hutchinson Cancer Research Center

The World-Wide Web

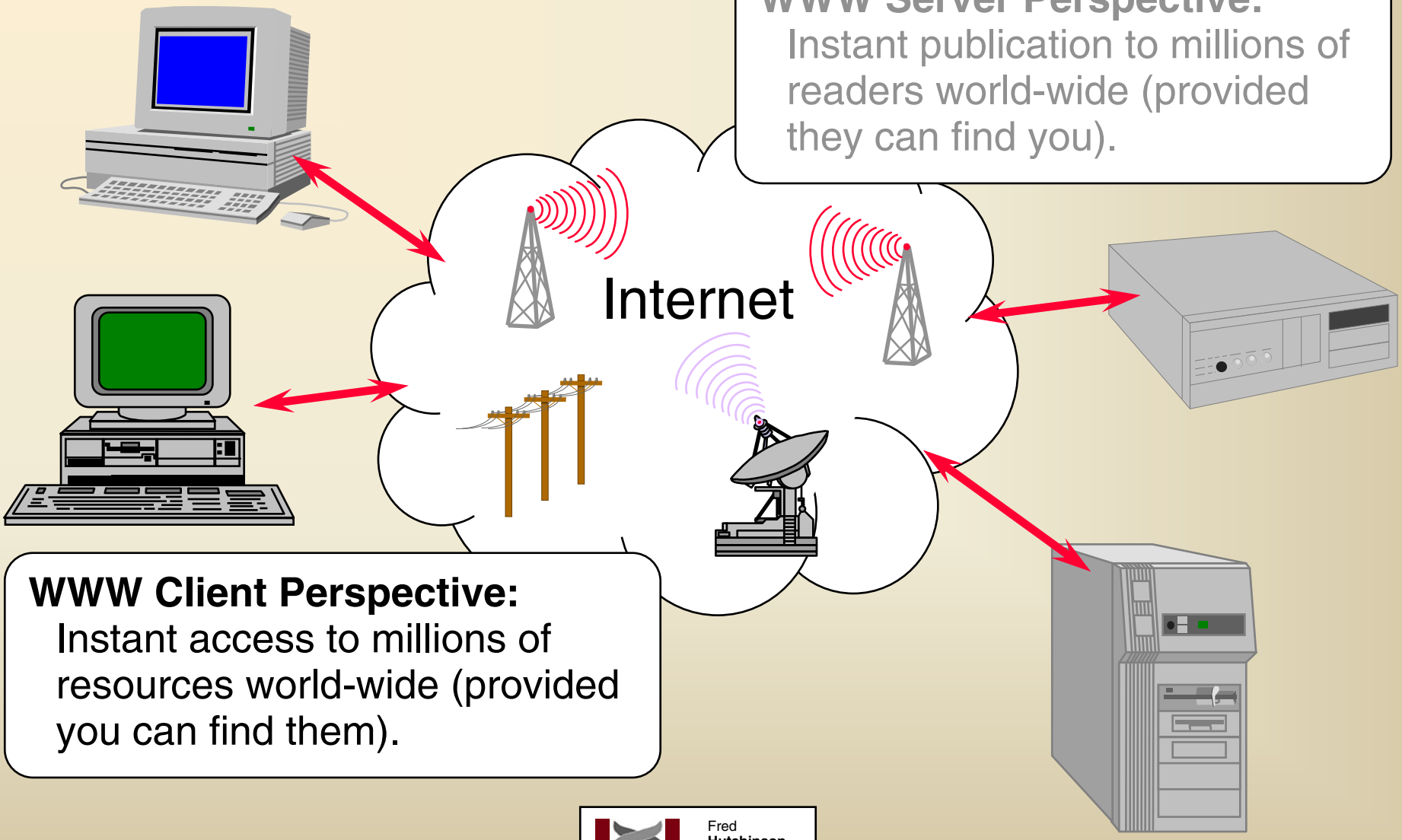
WWW Server Perspective:
Instant publication to millions of readers world-wide (provided they can find you).



Fred Hutchinson Cancer Research Center

The World-Wide Web

WWW Server Perspective:
Instant publication to millions of readers world-wide (provided they can find you).



WWW Client Perspective:
Instant access to millions of resources world-wide (provided you can find them).

Fred Hutchinson Cancer Research Center

A Problem

The WWW is a disorganized set of unclassified publications.

Consequently, on the WWW, it can be difficult to distinguish between publications of the National Academy and the National Inquirer.

Example

An AltaVista search for “cancer treatment” returns both:

- NCI Kidney Cancer Treatment and Research: Bibliography
- Paul Hagemeister's Lung Cancer Treatment

Example

An AltaVista s
treatment" retu

- NCI Kidney
  Research: Bibli graphy
- Paul Hagemeister's Lung Cancer Treatment

ACTUAL QUOTE:

This report outlines Mr. Hagemeister's successful battle with lung cancer and his very individualized treatment through the use of traditional medical treatment, spiritual faith healing, and shark cartilage supplementation.

Comparison with Traditional Publishing

There is no shortage of dreadful trash published via traditional means.

Why does sorting out the good, the bad, and the ugly seem easier with paper?

Fred **Hutchinson Cancer Research** Center

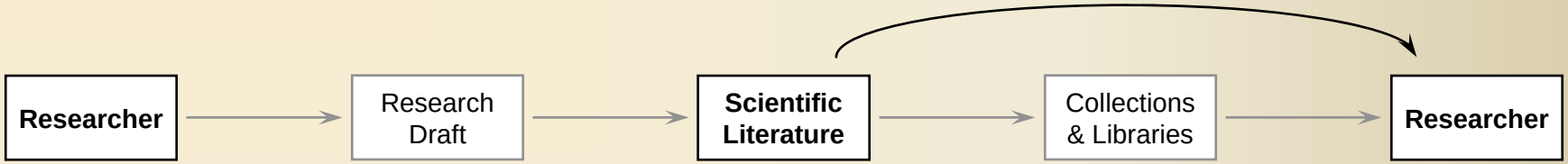
Paper Publishing

Apparent Process

Fred Hutchinson Cancer Research Center

Paper Publishing

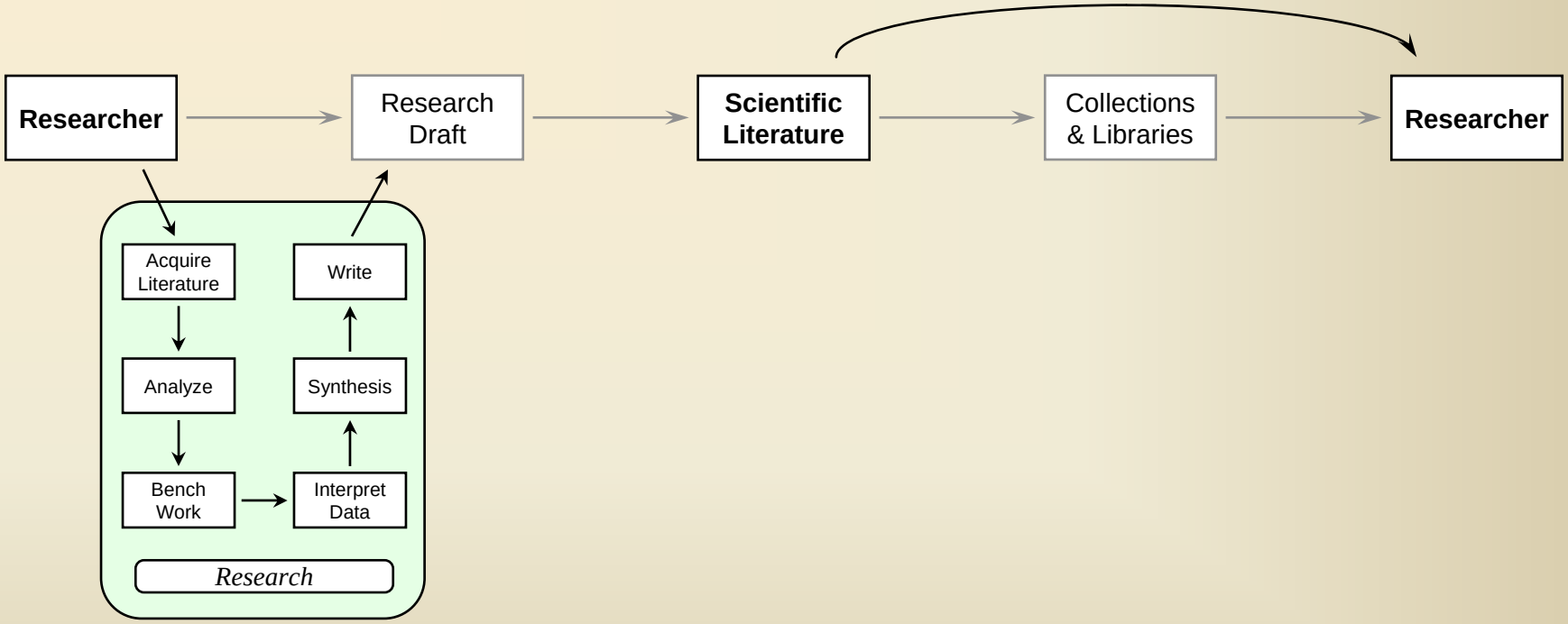
Actual Value-adding Infrastructure



Fred Hutchinson Cancer Research Center

Paper Publishing

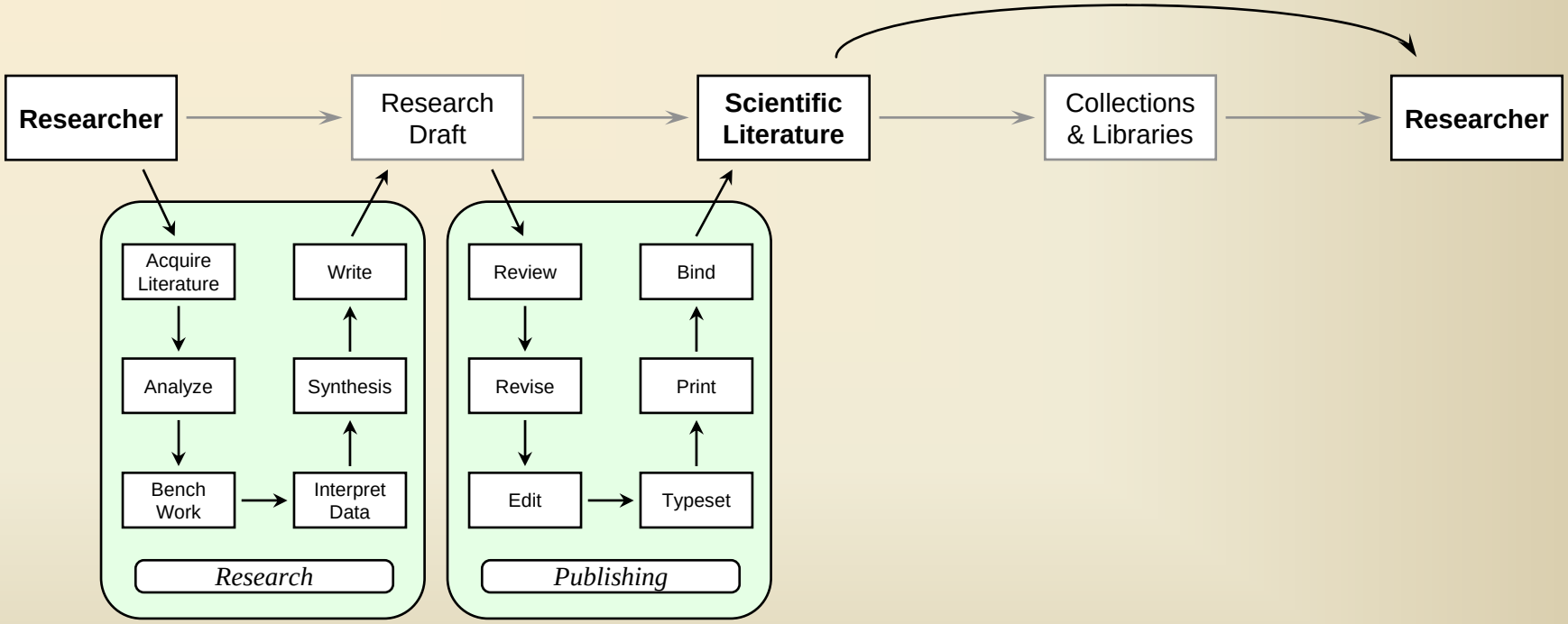
Actual Value-adding Infrastructure



Fred Hutchinson Cancer Research Center

Paper Publishing

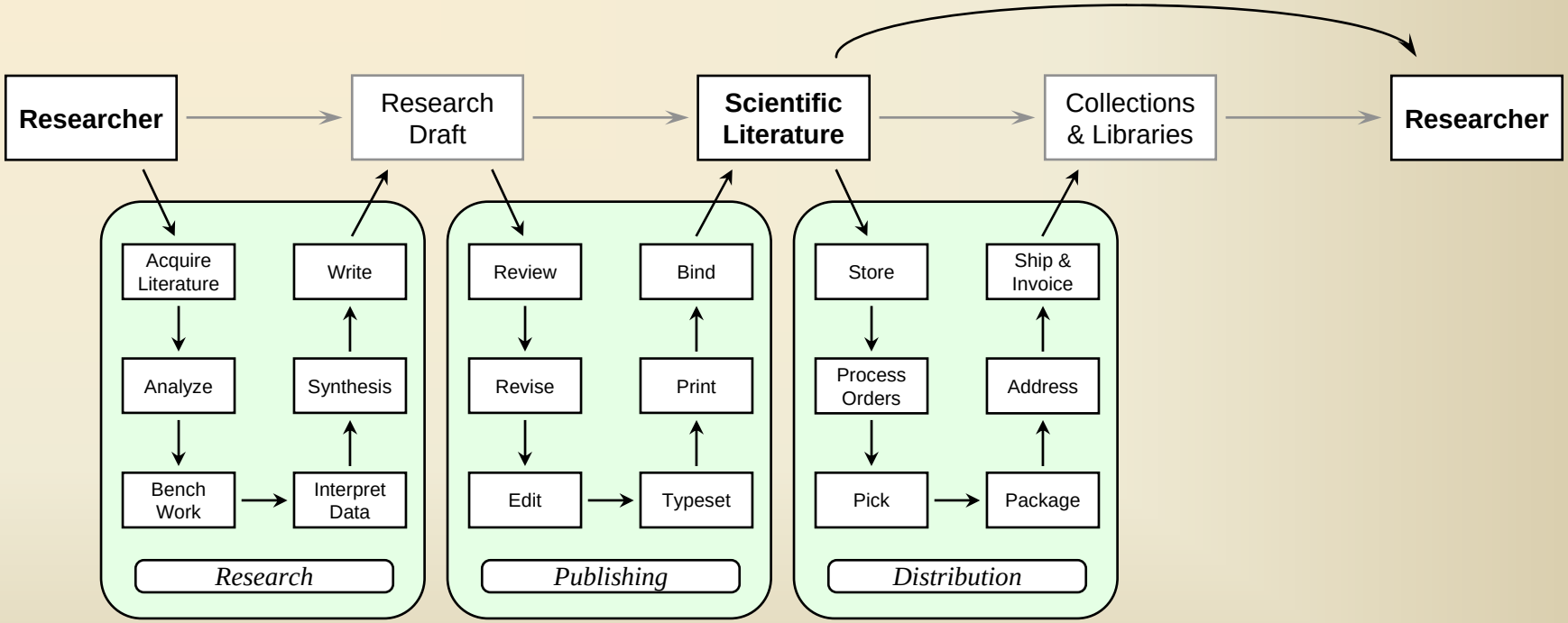
Actual Value-adding Infrastructure



Fred Hutchinson Cancer Research Center

Paper Publishing

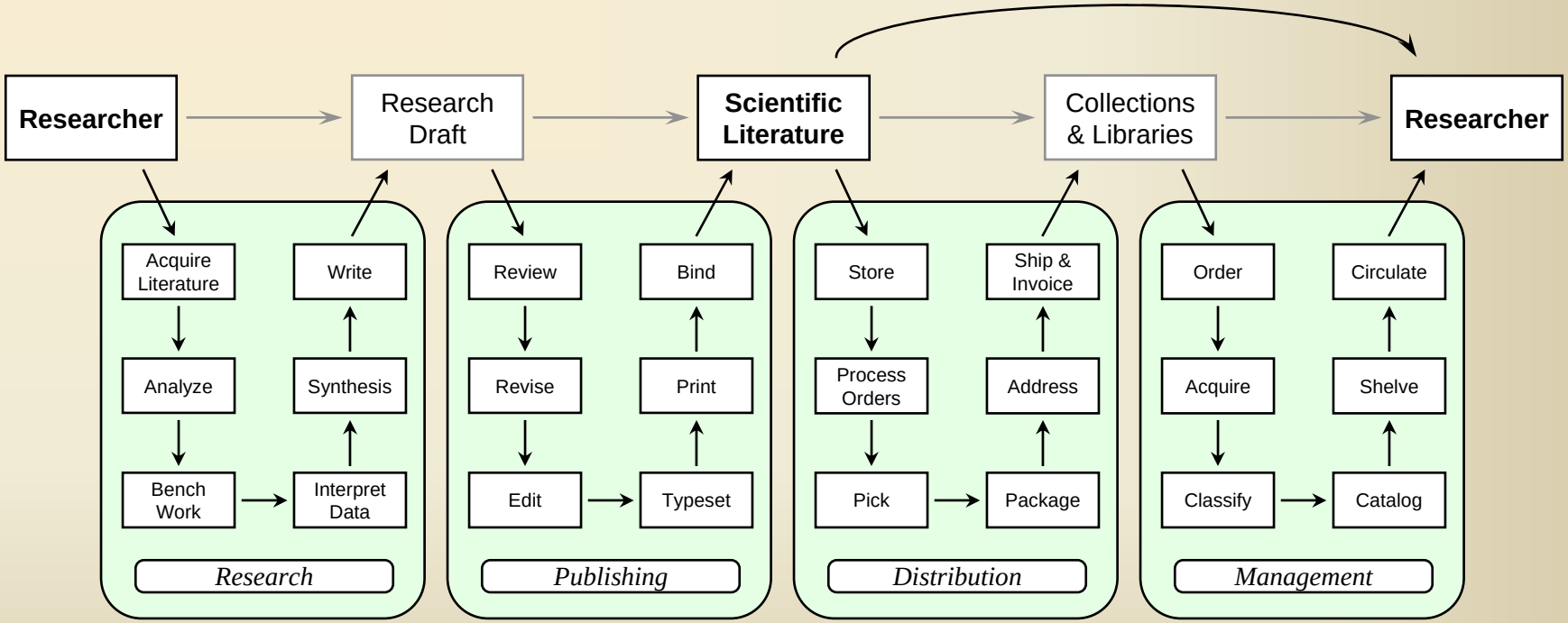
Actual Value-adding Infrastructure



Fred Hutchinson Cancer Research Center

Paper Publishing

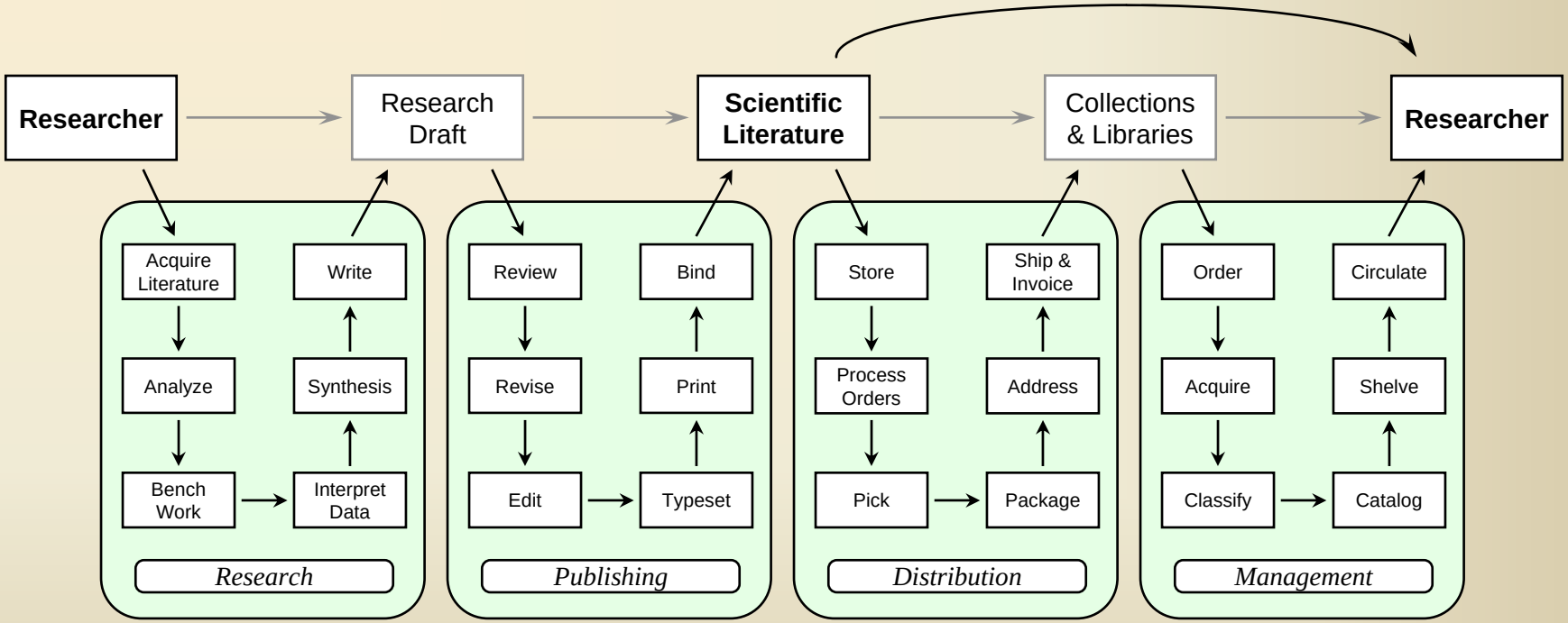
Actual Value-adding Infrastructure



Fred Hutchinson Cancer Research Center

Paper Publishing

Actual Value-adding Infrastructure



Now, for WWW...

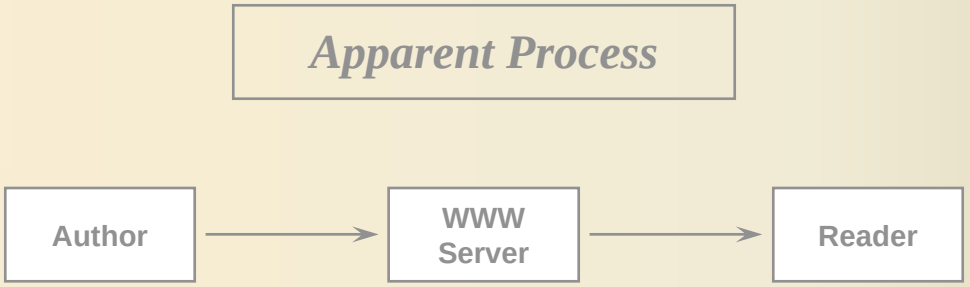
Fred **Hutchinson Cancer Research** Center

WWW Publishing

Apparent Process

Fred Hutchinson Cancer Research Center

WWW Publishing

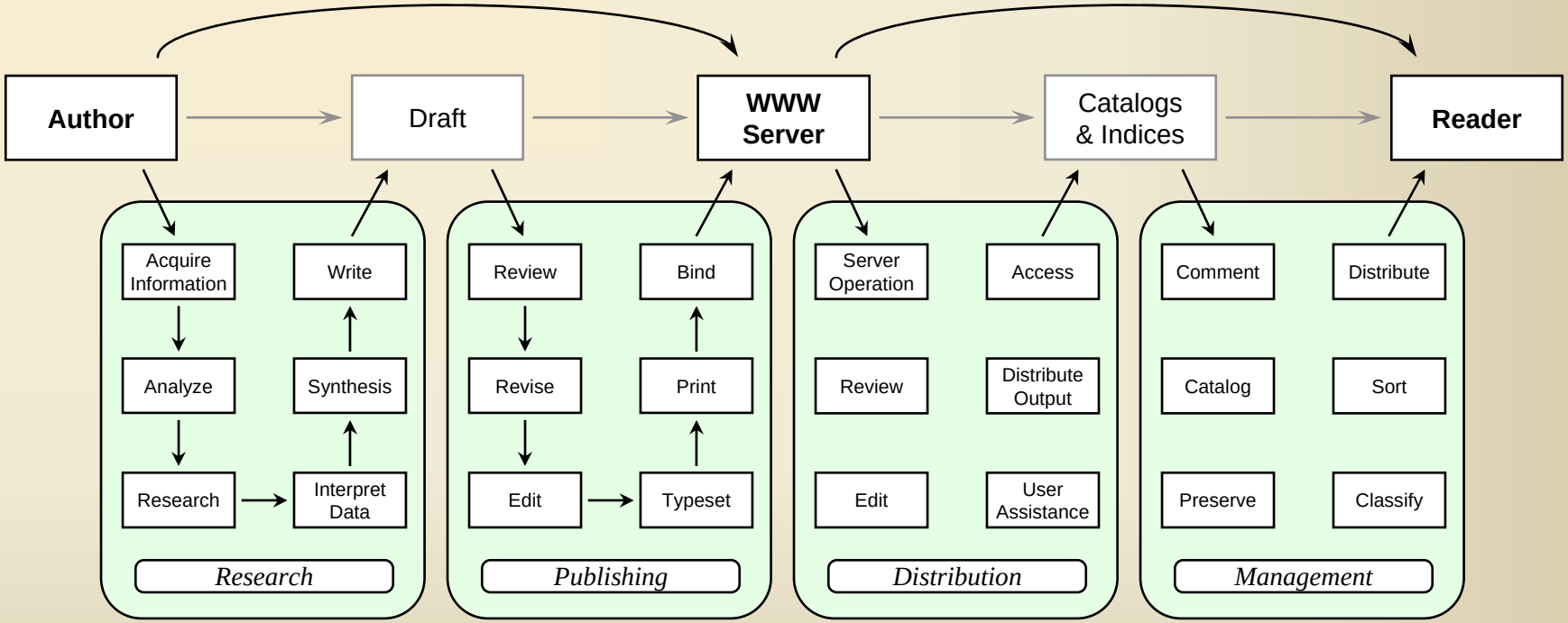


Actual Process

Fred Hutchinson Cancer Research Center

WWW Publishing

Possible Value-adding Infrastructure



Problems...

Fred **Hutchinson Cancer Research** Center

WWW Naming Conventions (URLs)

http://www.abc.org:80/admin/stats.html

Fred
Hutchinson
Cancer
Research
Center

WWW Naming Conventions (URLs)

protocol process document

http://www.abc.org:80/admin/stats.html

host path

Problem

URLs cannot support value-adding activities, because:

- They are too specific.
- They are not guaranteed stable.

URLs as (mis)Identifiers

Users should beware that there is no general guarantee that a URL which at one time points to a given object continues to do so, and does not even at some later time point to a different object...

Berners-Lee, T. 1994. Uniform Resource Locators (draft-ietf-uri-url-03.ps)

Who's In Charge

The Internet consists all connected computers on earth running TCP / IP protocols:

- Who's in charge of the Internet?

Who's In Charge

The Internet consists all connected computers on earth running TCP / IP protocols:

- Who's in charge of the Internet?
- Who's in charge of the world's phone system?

Who's In Charge

The WWW consists all internet computers on earth sharing HTML files via http:

- Who's in charge of the WWW?

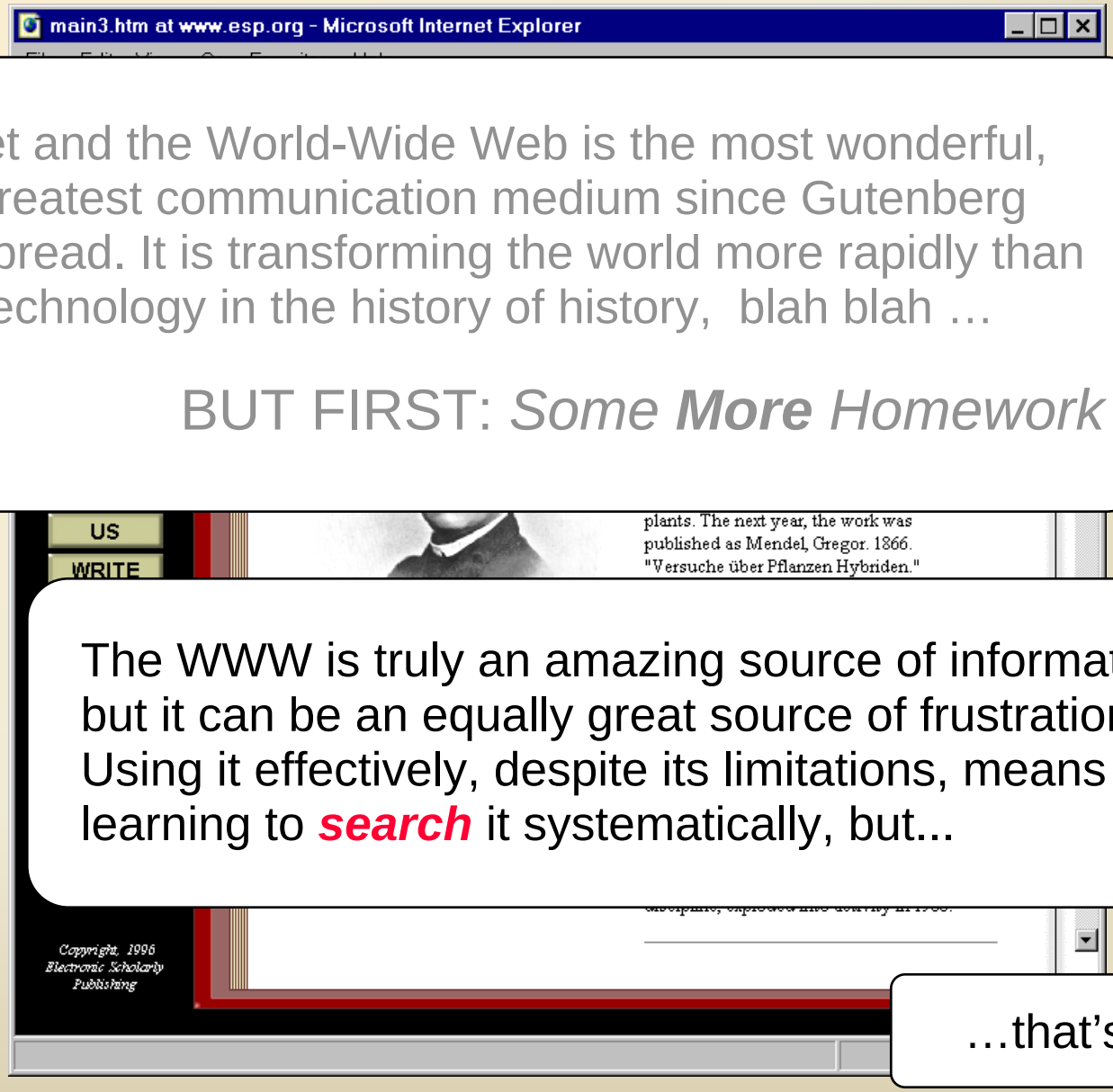
Who's In Charge

The WWW consists all internet computers on earth sharing HTML files via http:

- Who's in charge of the WWW?
- Who's in charge of speaking English on the world's phone system?

The Internet and the World-Wide Web is the most wonderful, amazing, greatest communication medium since Gutenberg and sliced bread. It is transforming the world more rapidly than any other technology in the history of history, blah blah …

BUT FIRST: *Some **More** Homework*



The WWW is truly an amazing source of information, but it can be an equally great source of frustration. Using it effectively, despite its limitations, means learning to ***search*** it systematically, but...

…that's another story.

END
SLIDES

Fred
Hutchinson
Cancer
Research
Center

http://www.esp.org/sra/sra.pdf