Knowledge Management Applications for NIH

A Presentation to eRA Program User Group (ePUG)

January 14, 2003

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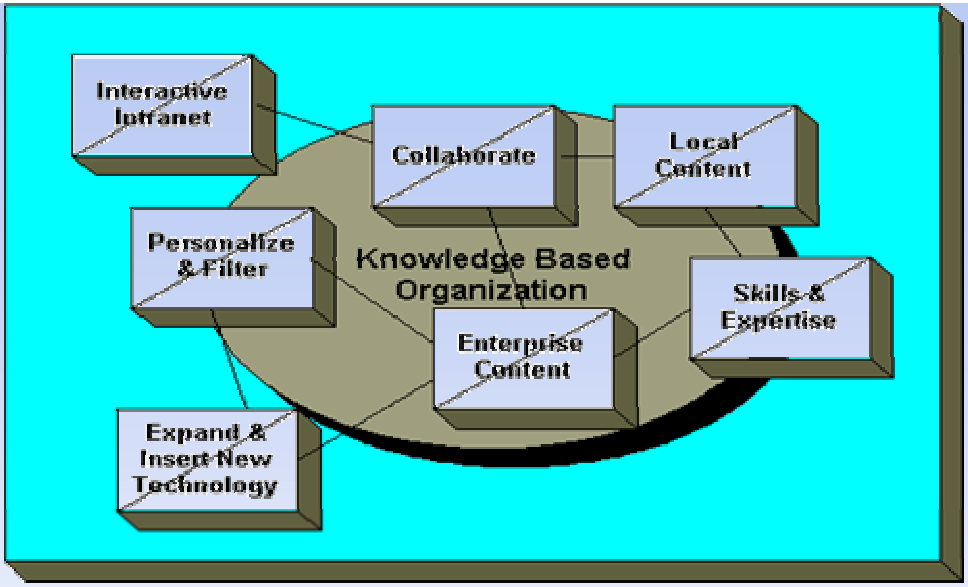
Agenda

- Brief Overview of KM Approaches and Technology
- Current KM Prototypes and Capabilities
- Grant Reviewer Selection System (GRS)
- Advanced GRS Capabilities
- Phrase Searching and Relationship Discovery
- Advanced KM Prototypes and Capabilities

What is Knowledge Management?



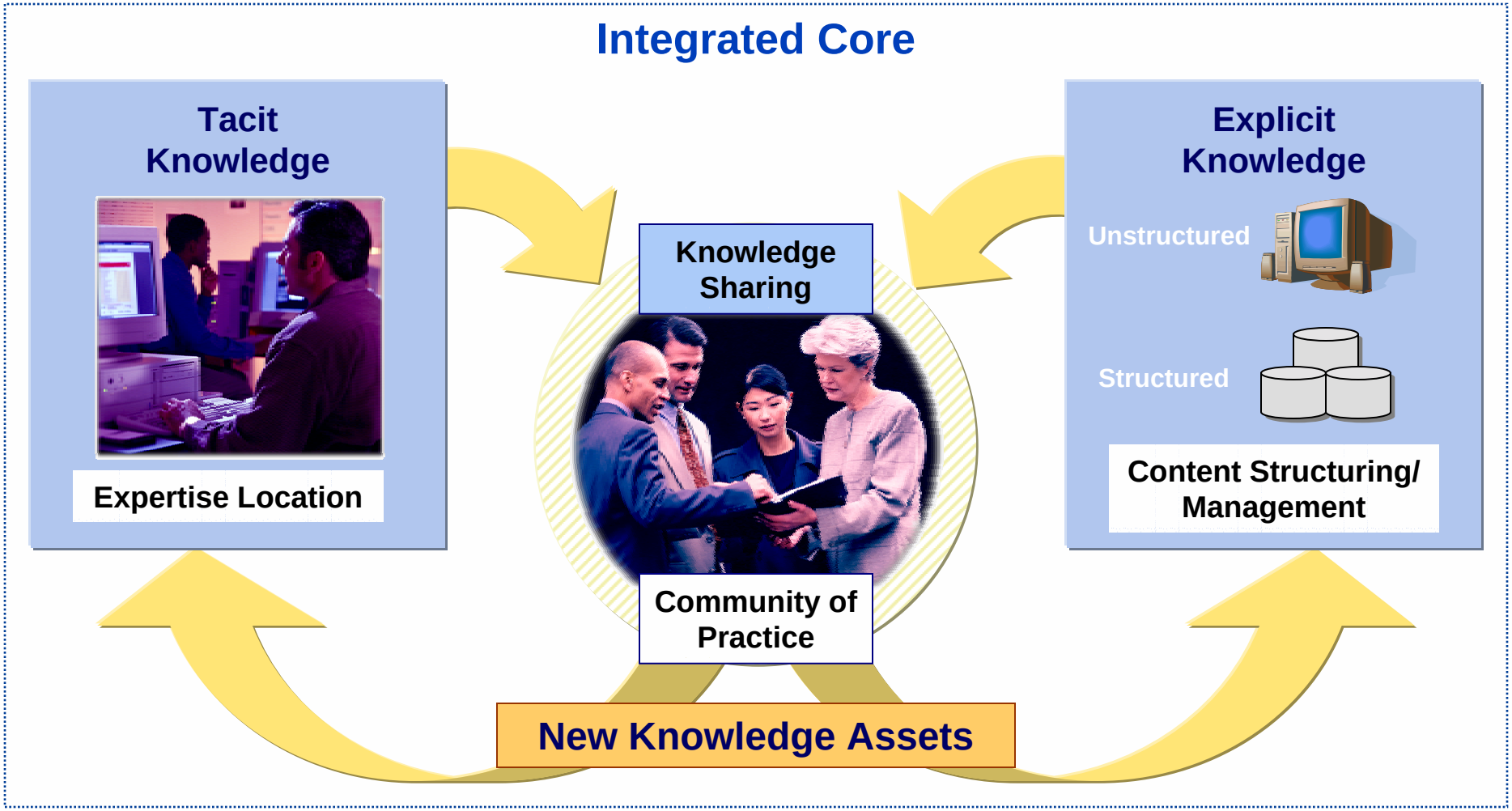
An Enabling Technology to help organizations "know what they know"

A System that networks people, organizations and documents to solve business problems

- Collaboration
- Content Structuring
- Expertise Location and Skills Mining

A Set of Components that can be installed into existing systems

Integration of KM Components



Mitretek's Role at NIH

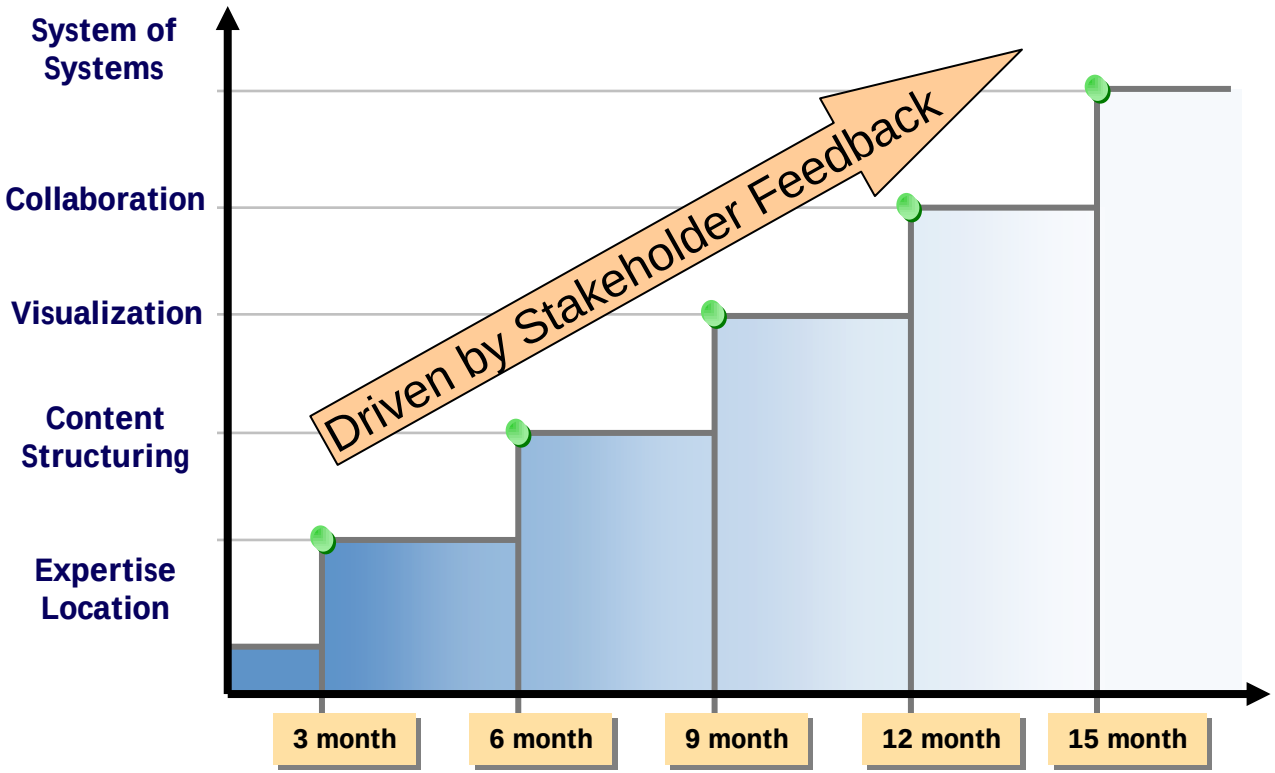
- NIH KM Initiative
  - Evaluate leading and emerging KM COTS products
  - Explore and Identify areas where KM can be applied to:
    - Improve existing NIH processes
    - Bring new capabilities to NIH
  - Establish a "conveyer belt" of ideas for KM projects
  - Conduct initial development of KM projects

General Approach towards Applying KM

How We Provide Low Cost, Low Risk Solutions

Evolutionary Development Process

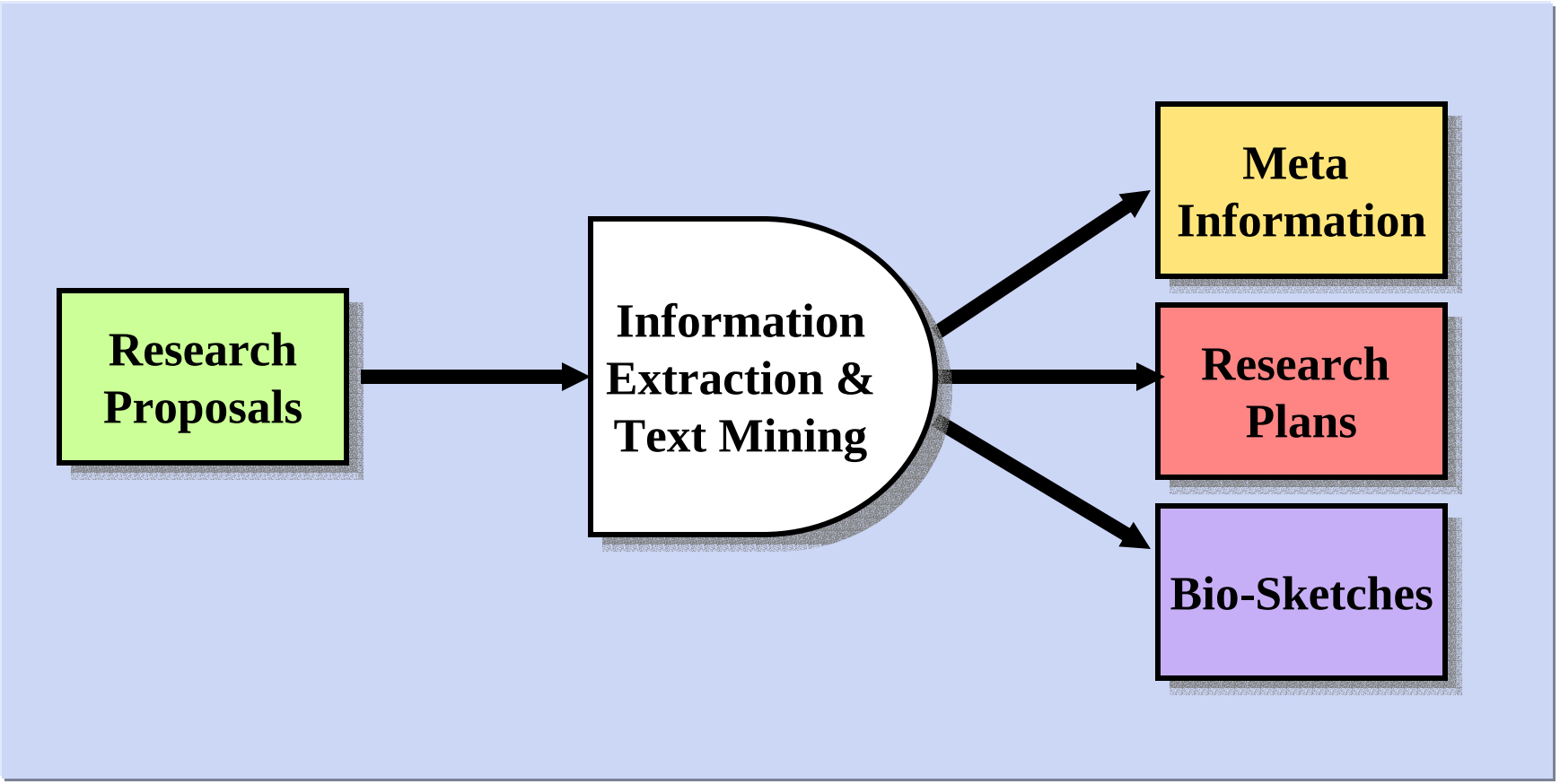
- Proof of Concept
- Prototype
- Pilot
  - -Incremental
  - -Metrics
- Limited Deployment
- Full Deployment



Results Driven Incremental Deployment

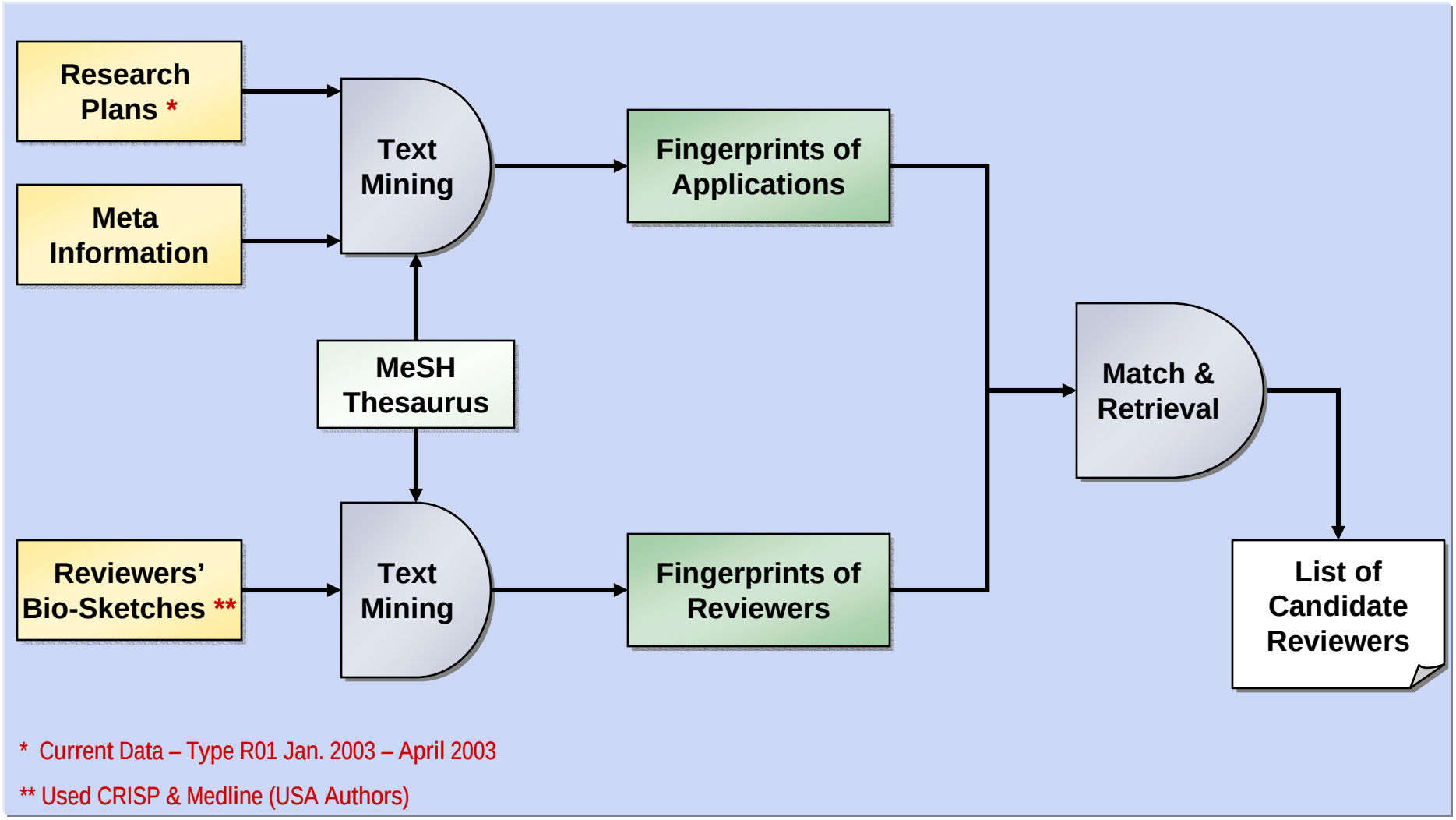
Current KM Prototypes and Capabilities

Making Sense Out of "Text"



Grant Reviewer Selection

High-Level Process

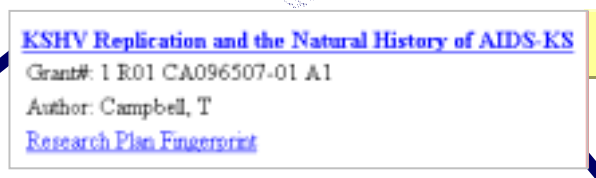


GRS Demonstrations

Creating Research Proposal Profiles

Based on MeSH Thesaurus

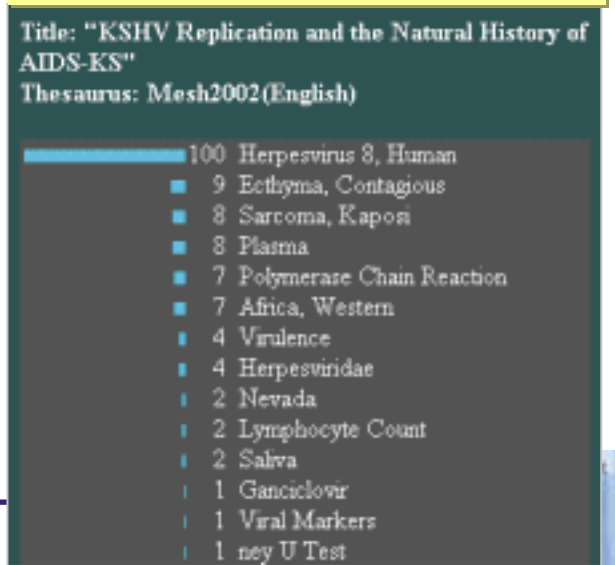
Search Proposals by Grant Number



View Entire Proposal

View Entire Research Plan

View Research Plan Fingerprint



NOTE: Fingerprint topics derived from MeSH Thesaurus

Interest"

Grant Reviewer Selection

Accurate handling of incoming grant proposals for the SRA

Enter Grant Number in single quotes

'1 R01 CA096507-01 A1' Find

List possible Candidate Reviewers based on topics within Research Proposal

Grant Reviewer Selection

KSHV Replication and the Natural History of AIDS-KS

Grant#: 1 R01 CA096507-01 A1 | Author: Campbell, T | ResearchPlan Fingerprint

Recommended Reviewer List	Institution	
Hayward, Gary S	JOHNS HOPKINS UNIVERSITY A	Compare
Chandran, Bala	UNIVERSITY OF KANSAS MEDICAL CENTER	Compare
Jung, Jae U	HARVARD UNIVERSITY (MEDICAL SCHOOL)	Compare
Hayward, S D	JOHNS HOPKINS UNIVERSITY A	Compare
Yuan, Yan	UNIVERSITY OF PENNSYLVANIA A	Compare
Wood, Charles	[illegible]	

Identify Qualified Reviewers by comparing fingerprints

Reviewer: Hayward, Gary S

Title: **KSHV Replication and the Natural History of AIDS-KS**

Name: Hayward, Gary S
Thesaurus: Mesh2002(English)

100	Herpesvirus 8, Human
100	Ecthyma, Contagious
100	Cytomegalovirus Infections
95	Immunoglobulin Class Switching
91	Virus Latency
83	Pregnancy Trimester, First
66	Retinitis
64	nors
64	Tumor Cells, Cultured
59	Immediate-Early Proteins
56	Monocytes
50	Infection Control
32	Hepatitis
32	Herpesvirus 2, Bovine

Title: "KSHV Replication and the Natural History of AIDS-KS"
Thesaurus: Mesh2002(English)

100	Herpesvirus 8, Human
9	Ecthyma, Contagious
8	Sarcoma, Kaposi
8	Plasma
7	Polymerase Chain Reaction
7	Africa, Western
4	Virulence
4	Herpesviridae
2	Nevada
2	Lymphocyte Count
2	Saliva
1	Ganciclovir
1	Viral Markers
1	ney U Test

Identify Similar Research Proposals

Current Proposed and Previously Funded Proposals

Enter Grant Number in single quotes

'1 R01 CA096507-01 A1' Find

List all Proposed and Funded Research Proposals containing similar research

Similar Proposals

KSHV Replication and the Natural History of AIDS-KS

Grant#: 1 R01 CA096507-01 A1 Author: Campbell, T Research Plan Fingerprint

Similar Proposed Proposals

Cytotoxic T Cell Responses to HHV-8	Compare
Functional Delineation Of KSHV Oncogene VIRF	Compare
Role of K8 bZip Protein in KSHV Lytic DNA Replication	Compare
Interactions of KSHV and Endothelial Cells	Compare

Similar Funded Proposals

ENVELOPE GLYCOPROTEINS OF HHV8	Compare
KSHV/HHV 8 IN AIDS LYMPHOMAS	
ENVELOPE GLYCOPROTEINS OF HHV8	

Identify Similar Proposals by comparing fingerprints

Title: **KSHV Replication and the Natural History of AIDS-KS**

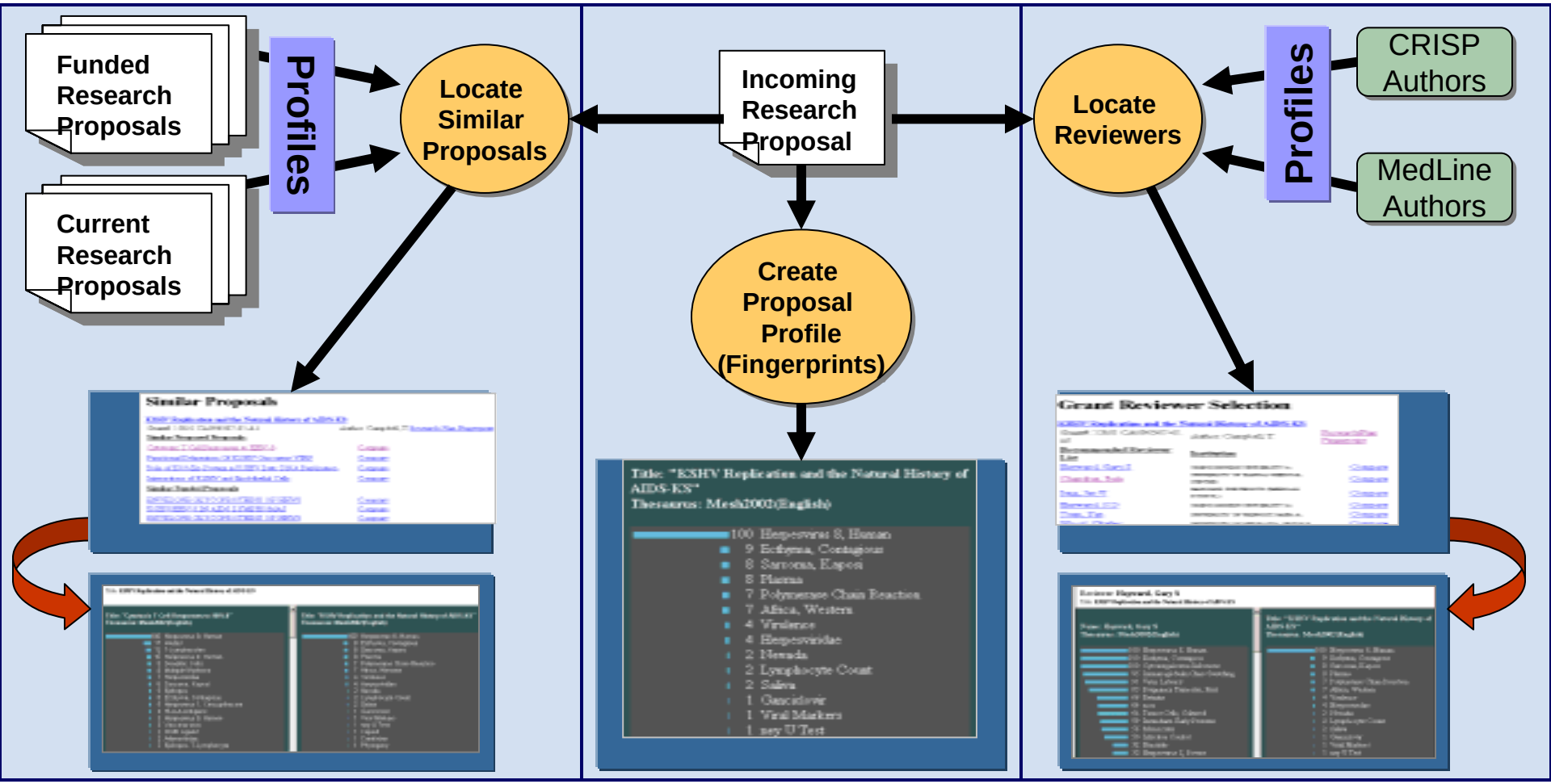
Title: "Cytotoxic T Cell Responses to HHV-8"
Thesaurus: Mesh2002(English)

100	Herpesvirus 8, Human
17	rinidad
12	T-Lymphocytes
10	Herpesvirus 4, Human
8	Dendritic Cells
8	Multiple Myeloma
7	Herpesviridae
6	Sarcoma, Kaposi
5	Epitopes
5	Ecthyma, Contagious
5	Herpesvirus 1, Cercopithecine
4	HLA-A Antigens
3	Herpesvirus 5, Human
3	Vaccinia virus
2	CD40 Ligand
2	Adenoviridae
2	Epitopes, T-Lymphocyte

Title: "KSHV Replication and the Natural History of AIDS-KS"
Thesaurus: Mesh2002(English)

100	Herpesvirus 8, Human
9	Ecthyma, Contagious
8	Sarcoma, Kaposi
8	Plasma
7	Polymerase Chain Reaction
7	Africa, Western
4	Virulence
4	Herpesviridae
2	Nevada
2	Lymphocyte Count
2	Saliva
1	Ganciclovir
1	Viral Markers
1	ney U Test
1	Capsid
1	Creatinine
1	Phylogeny

Summary of Basic GRS Capabilities



Dumais, S.T. and Nielsen, J. *"Automating the Assignment of Submitted Manuscripts to Reviewers"* In Proceedings of ACM SIGIR'92 ACM, 1992, pp. 233

Advanced GRS Capabilities

Conduct "What-If" Analysis

Augment Searches based on Concept Relevance

Enter Grant Number

'1 R01 CA096507-01 A1'

Search for similar proposals

Proposal Fingerprints

Similar Proposed Proposals	Grant #	Author	
Cytotoxic T Cell Responses to HHV-8	2 R01 CA082053-04	Rinaldo, C	Compare
Functional Delineation Of KSHV Oncogene VIRF	1 R01 CA097933-01	Gao, Shou-Jiang	Compare
Role of K8 bZip Protein in KSHV Lytic DNA Replication	1 R01 AI052789-01	YUAN, Y	Compare
Interactions of KSHV and Endothelial Cells	1 R01 CA097934-01	Lagunoff, M	Compare
Similar Funded Proposals	**Grant #**	**IRG**	
ENVELOPE GLYCOPROTEINS OF HHV8	5_R01CA082056-04	ZRG1	Compare
KSHV/HHV 8 IN AIDS LYMPHOMAS	5_R01CA068939-07	ZRG1	Compare
ENVELOPE GLYCOPROTEINS OF HHV8	R01CA82056-02	ZRG1	Compare
INTERACTIONS BETWEEN HIV AND KSHV	R01CA76958-03	ARRA	Compare
INDUCTION OF KSHV REPLICATION BY HIV 1	R55CA83527-01A1	ZRG1	Compare

Modify Search Criteria on the fly

Revised List

Similar Proposed Proposals	Grant #	Author	
KSHV Replication and the Natural History of AIDS-KS	1 R01 CA096507-01 A1	Campbell, T	Compare
Functional Delineation Of KSHV Oncogene VIRF	1 R01 CA097933-01	Gao, Shou-Jiang	Compare
Interactions of KSHV and Endothelial Cells	1 R01 CA097934-01	Lagunoff, M	Compare
Cytotoxic T Cell Responses to HHV-8	2 R01 CA082053-04	Rinaldo, C	Compare
Role of K8 bZip Protein in KSHV Lytic DNA Replication	1 R01 AI052789-01	YUAN, Y	Compare
Similar Funded Proposals	**Grant #**	**IRG**	
HUMAN HERPESVIRUS 8 INFECTION IN ZIMBABWE	R03TW01123-02	ZRG1	Compare
The Role of T1.1 RNA in KSHV Replication	5_F32CA088516-02	ZRG1	Compare
HYPERVARIABLE ORF-K1 SIGNALING PROTEIN OF KSHV/HHV8	R01CA81422-02	ZRG1	Compare
KAPOSIS SARCOMA ASSOCIATED HERPESVIRUS VIRAL INTERFERON REGULATORY FACTOR	P51RR0016B-39____0057	RIRG	Compare

Knowledge Layer (K-Layer)

One Stop Search

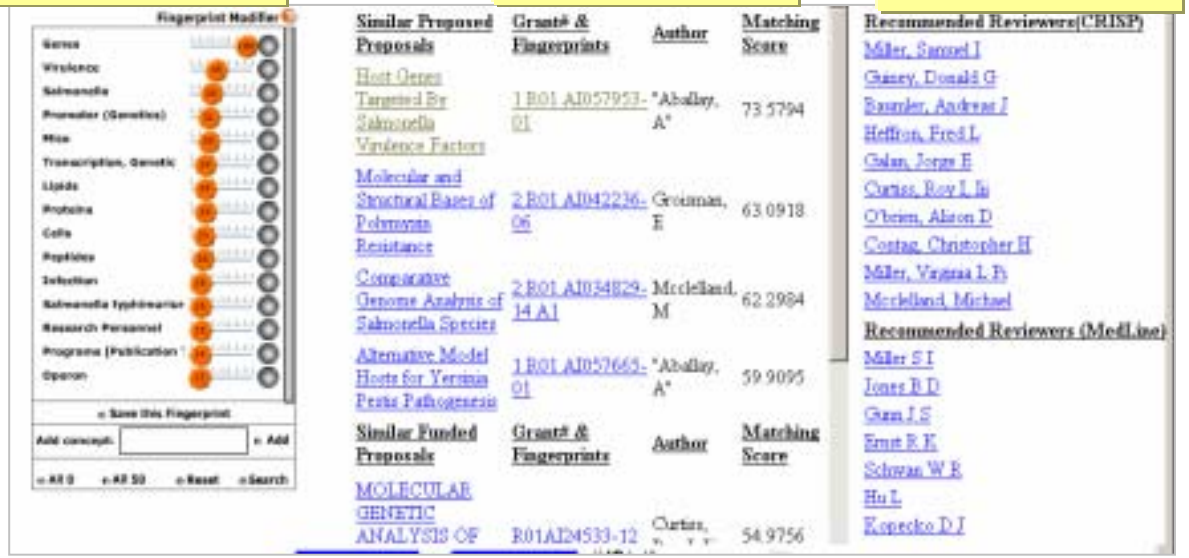
- OR -

Search by Proposal or Body of Text

Fingerprint

Similarity Finder

Expertise Locator



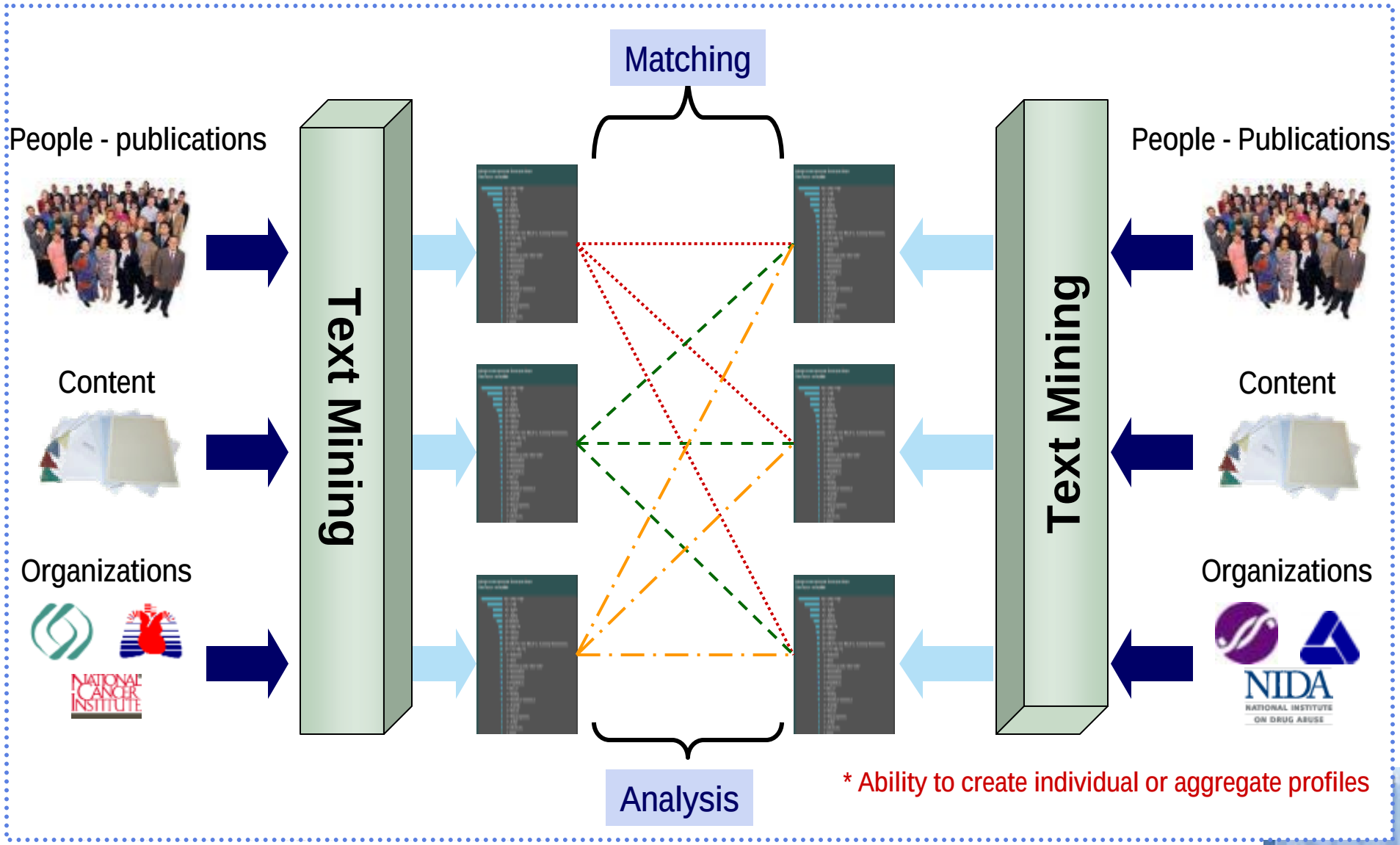
Modify Search Criteria on-the-fly

Modified Search Results

Advanced GRS Demonstration

Cross-Entity Profiling

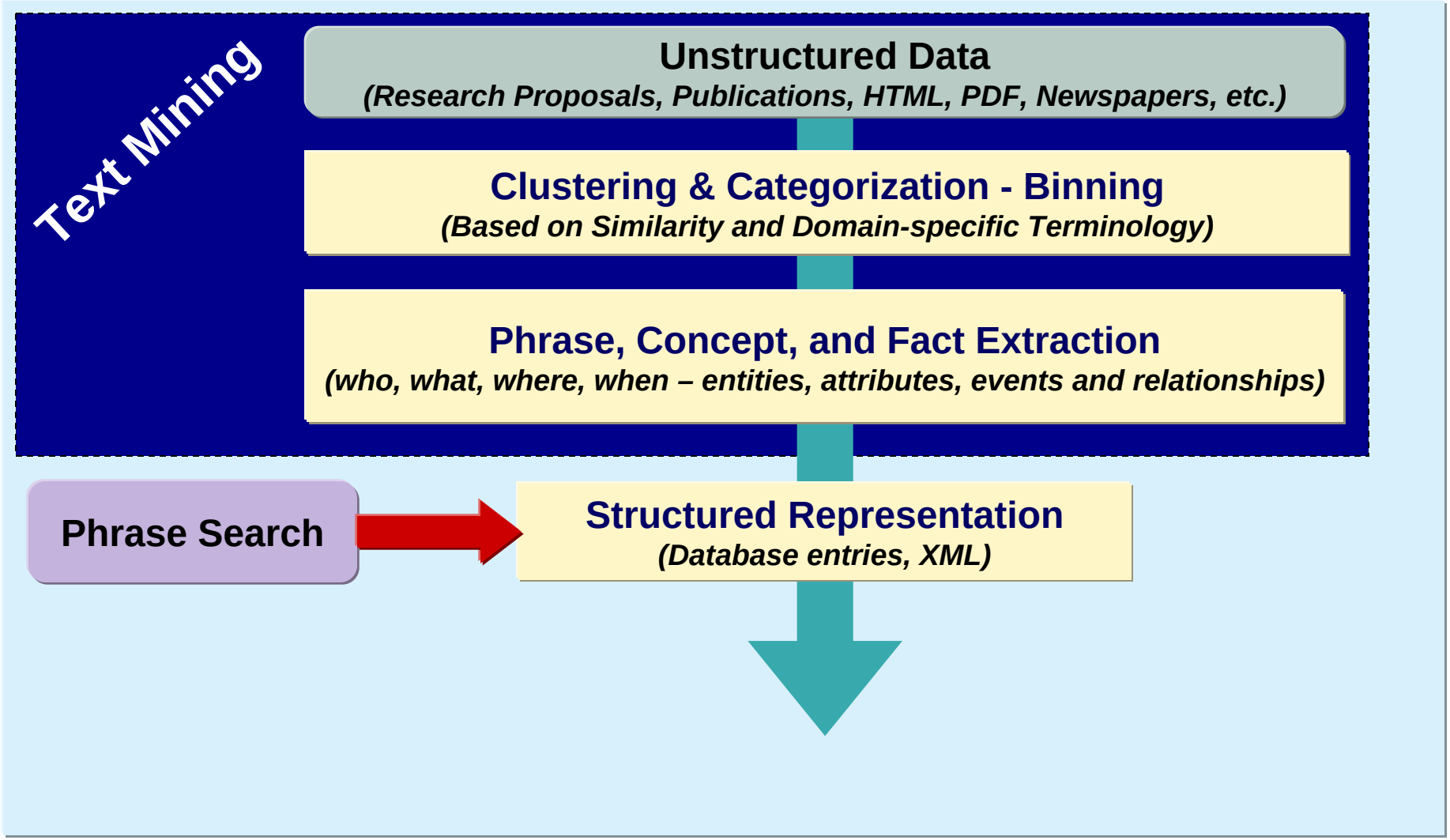
Matching People, Content, Organizations, Groups, etc.



Phrase Search and Relationship Discovery

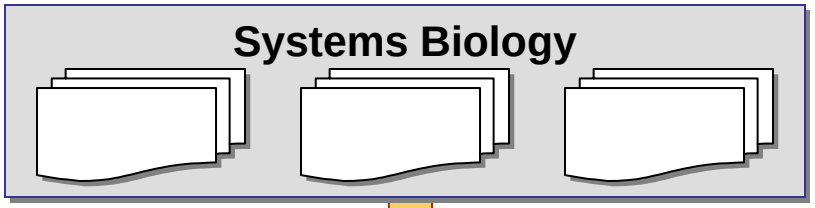
KM Functionality Overview

From Unstructured to Structured Data



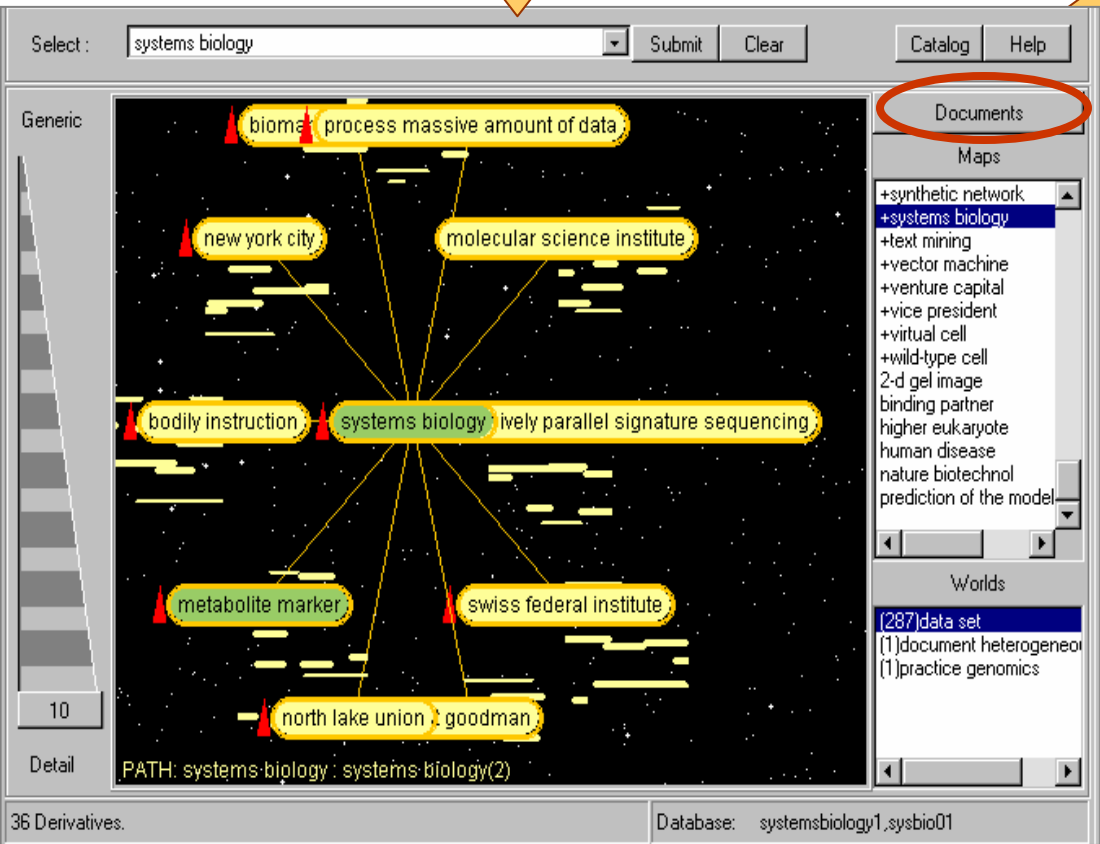
Relationship Discovery

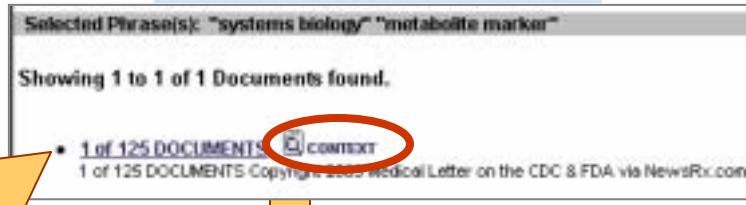
Explore Relationships of Concepts within Document Sets



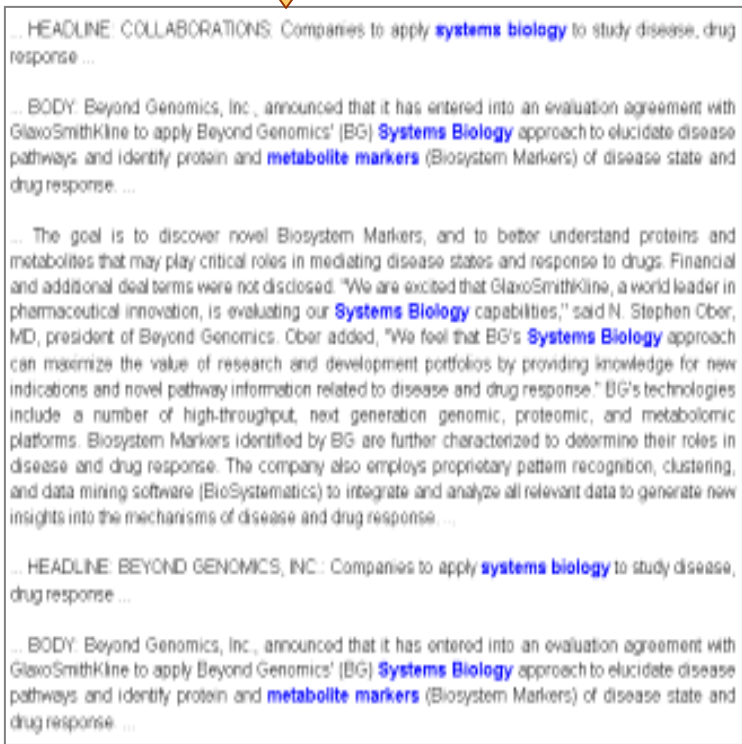
Relationships among concepts depicted by links

Retrieve documents with co-occurring concepts





Go to exact instances of concepts in text



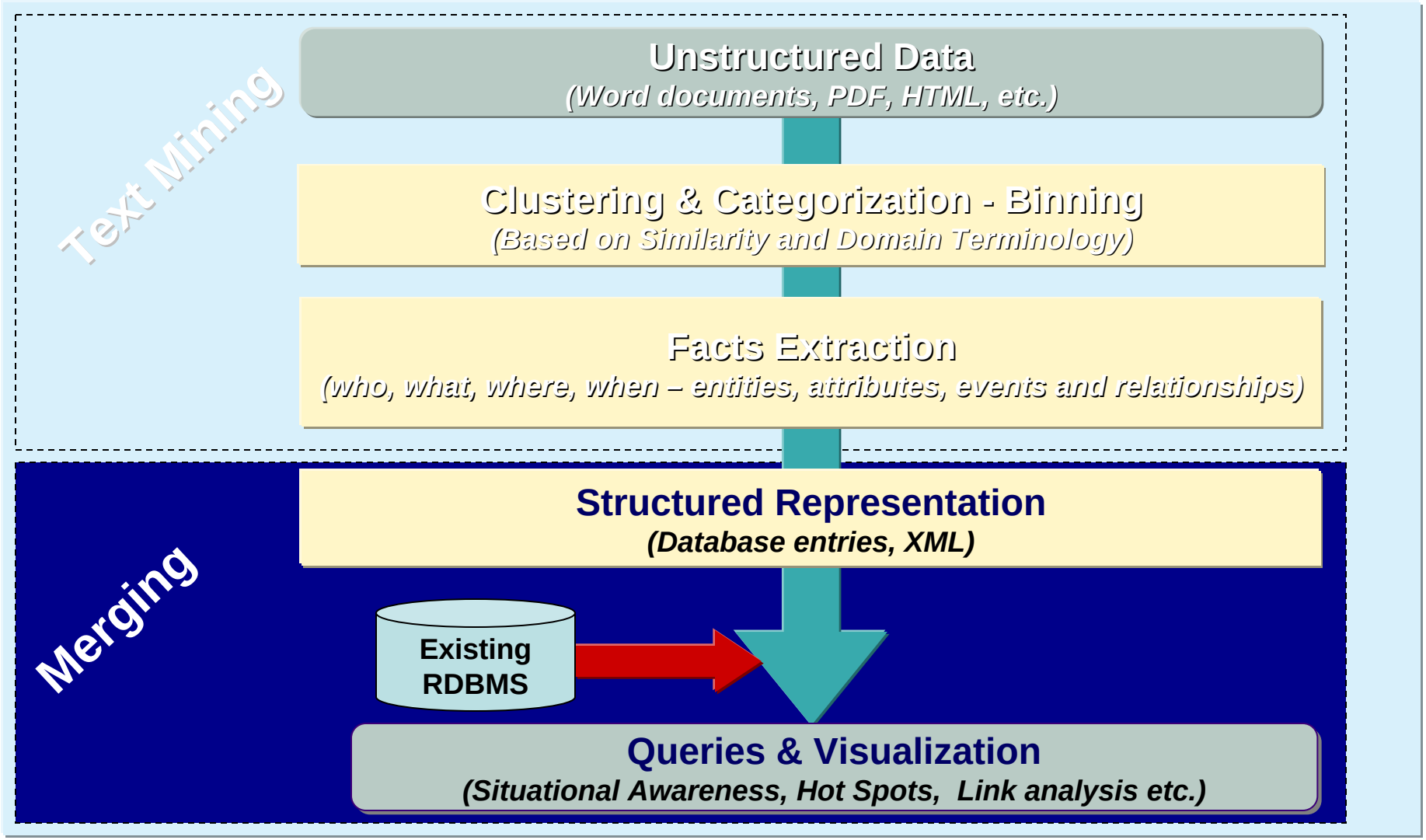
Relationship Discovery and Phrase Searching

Advanced KM Prototypes and Capabilities

Data Visualization – Heat Maps, Self-Organizing Maps, OLAP, etc.

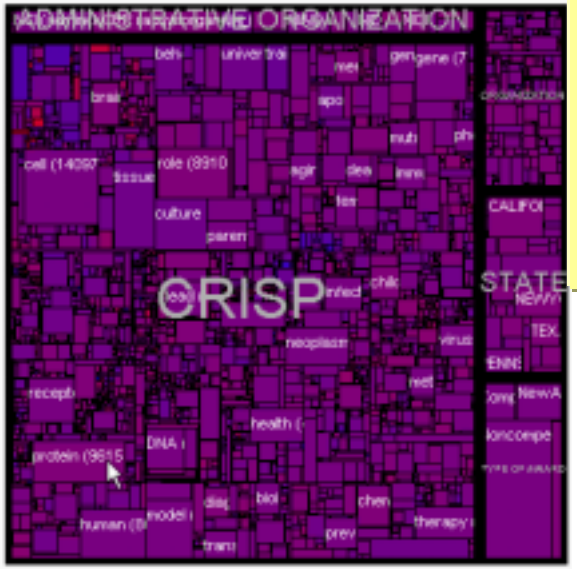
KM Functionality Overview

Unstructured and Structured Data



Scientific Trends

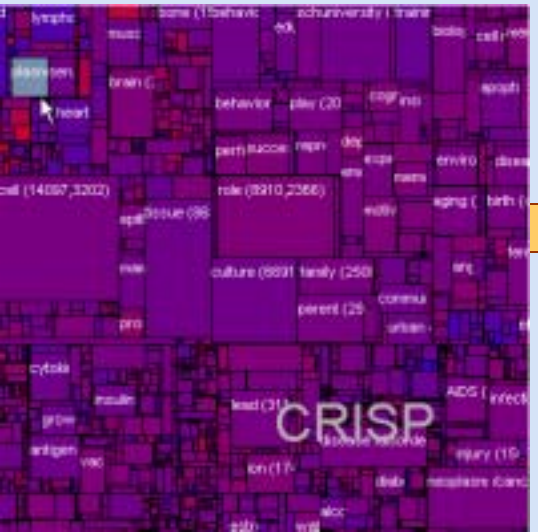
"Situational Awareness" and Hot Zones



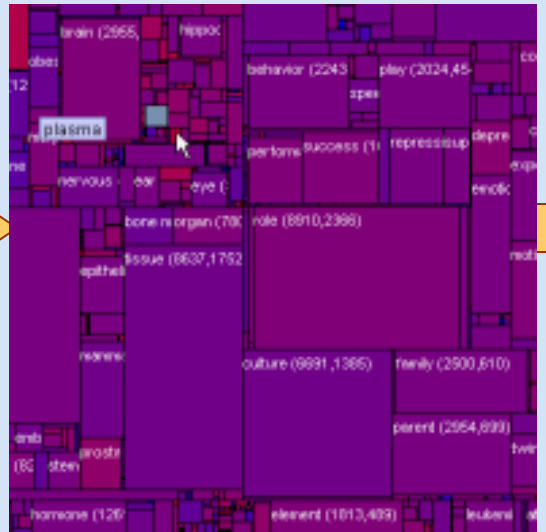
View extracted topics/ entities where:

- Size = # of documents
- Color Intensity = recency of funding

View Document Topics



Zoom in on Clusters



Locate Emerging Topic(s)

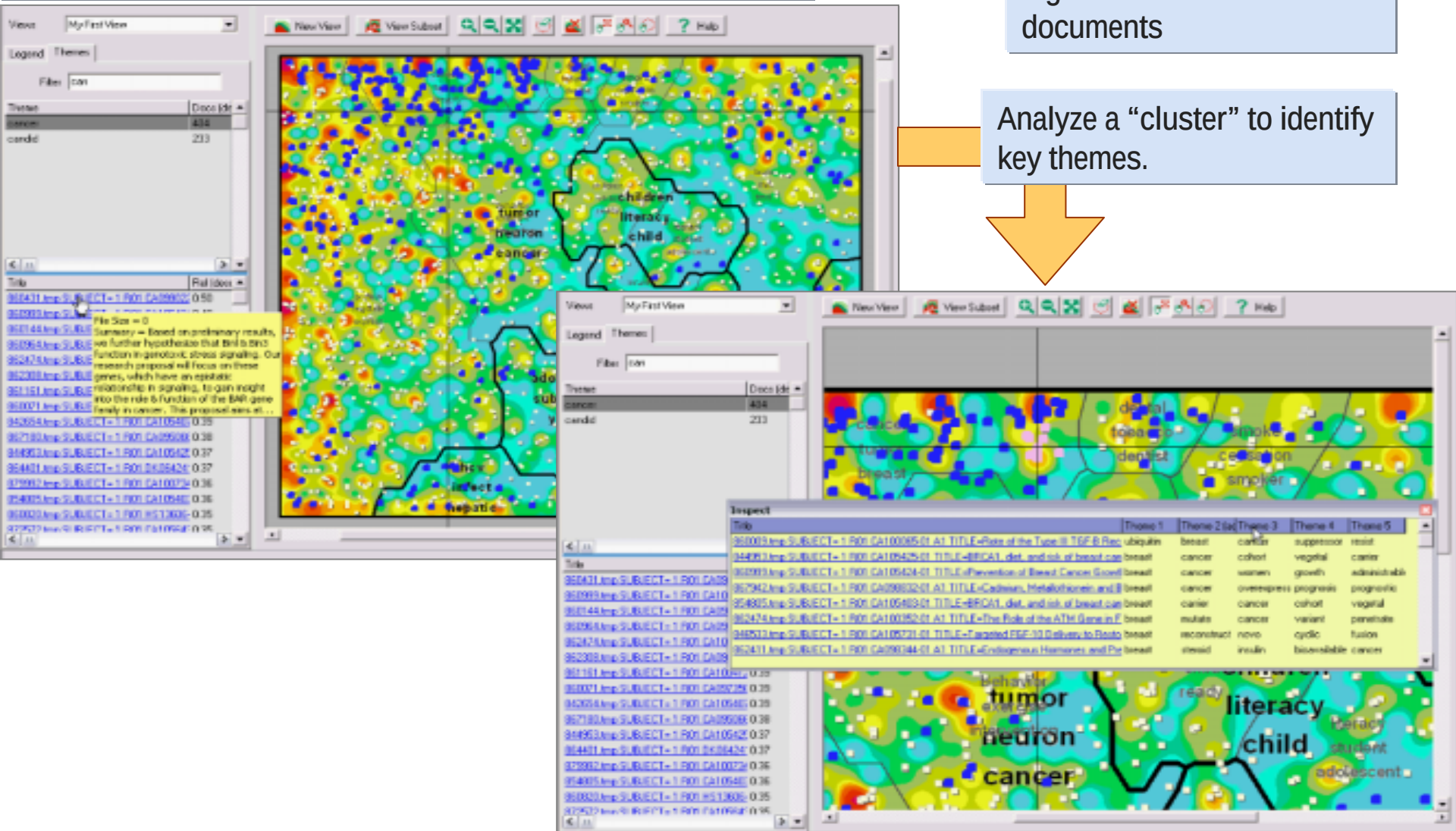
Relationships and Patterns from Text

"Situational Awareness" Perspective of Information

Click a "Theme" to highlight all related documents in the map

Color Intensity represents high concentrated cluster of documents

Analyze a "cluster" to identify key themes.



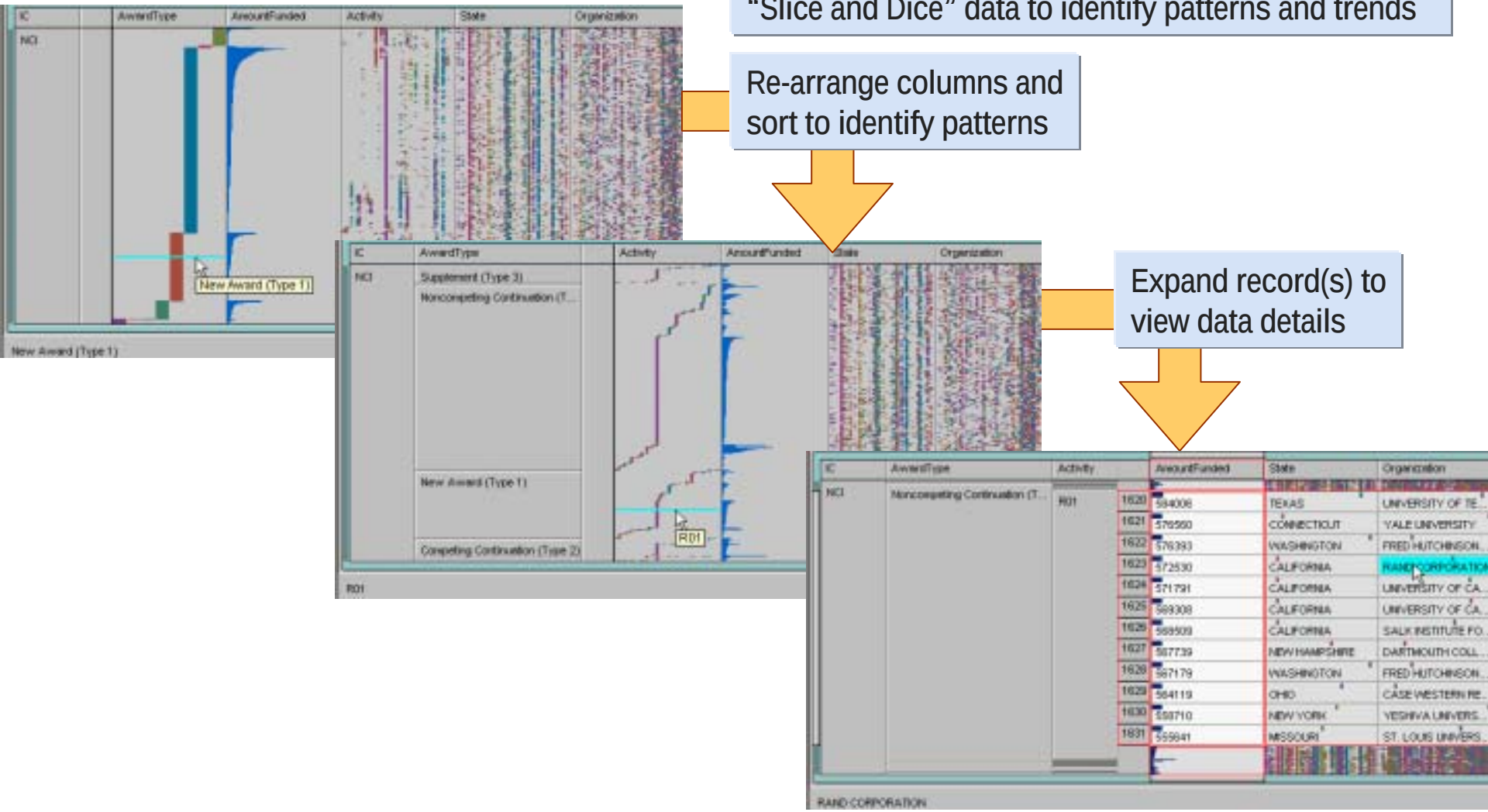
Online Analytical Processing

Identify Patterns and Trends in Relational Data

"Slice and Dice" data to identify patterns and trends

Re-arrange columns and sort to identify patterns

Expand record(s) to view data details



Questions?