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1962-20

Joint ICTP-IAEA School of Nuclear Knowledge Management

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Knowledge Representation Methods and their Application

P. PUHR-WESTERHEIDE
*GRS mbH Forschungsinstitute
Boltzmannstrasse
P.O. Box 1221
85748 Munich
GERMANY*

Knowledge Representation Methods and their Application

School of Nuclear Knowledge Management

1-5 September 2008, Trieste, Italy

Peter Puhr-Westerheide

Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH

ppw@grs.de T. +49 (0)89 32004 353

Examples of well Introduced Shareable Knowledge Representations

- Operating manuals
- Patent specifications
- Medical treatment prescriptions
- Text books

-
- An illustration showing two stylized human profiles, one green and one blue, facing each other. Above their heads is a light blue, cloud-like archway filled with various letters (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) and symbols (%, &, @, #, \$, %, &). The background is a solid light blue.

Knowledge Representation

- To make knowledge shareable, its representation is of interest.
 - In the scientific / technical / business / administrative world, it is custom to record knowledge representation
- Reports, descriptions w/o formalisms
- Metadata, taxonomies, semantic nets, ontologies
- Canonical representation: no hope
 - One unaccomplished hope was that a canonical representation of knowledge could be achieved, i.e. a unique representation without redundancy. Except for special cases, uniqueness is nearly nowhere procurable. As an outcome, various representations of the same knowledge area can hardly be compared to show their equality.

Recent Knowledge Representation

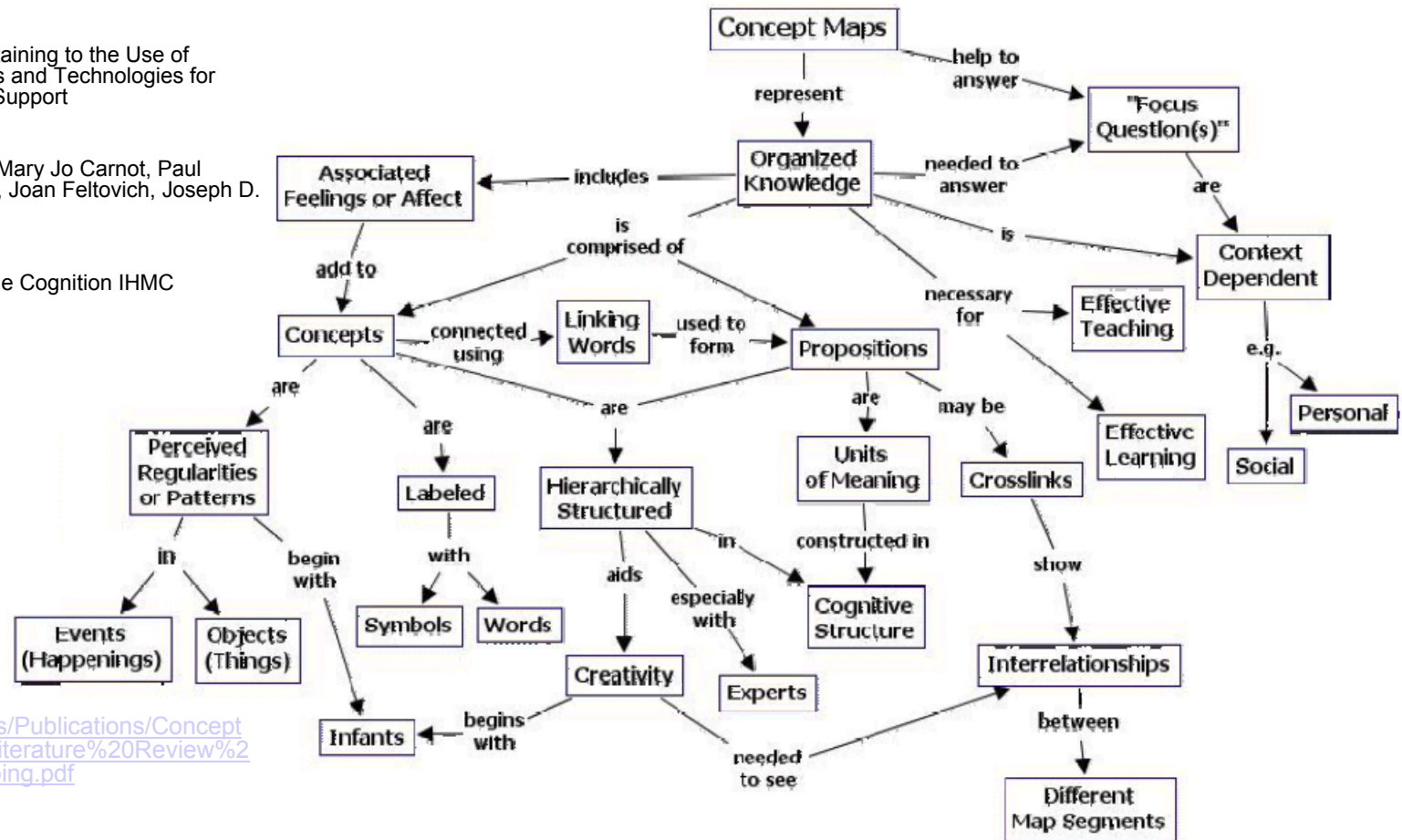
- “Classical” Web Sites
 - High maintenance efforts
- Dossiers, compendiums, textbooks
 - Mainly textual, with links to important documents etc.
 - Little flexibility, difficult to keep up to date
- Wikis (e.g. the Free Encyclopedia <http://www.wikipedia.org>)
 - promising development: “dynamic” , self- organising collaboration on web documents

Knowledge Representation: A Cmap on Concept Maps

From: A Summary of Literature Pertaining to the Use of
Concept Mapping Techniques and Technologies for
Education and Performance Support

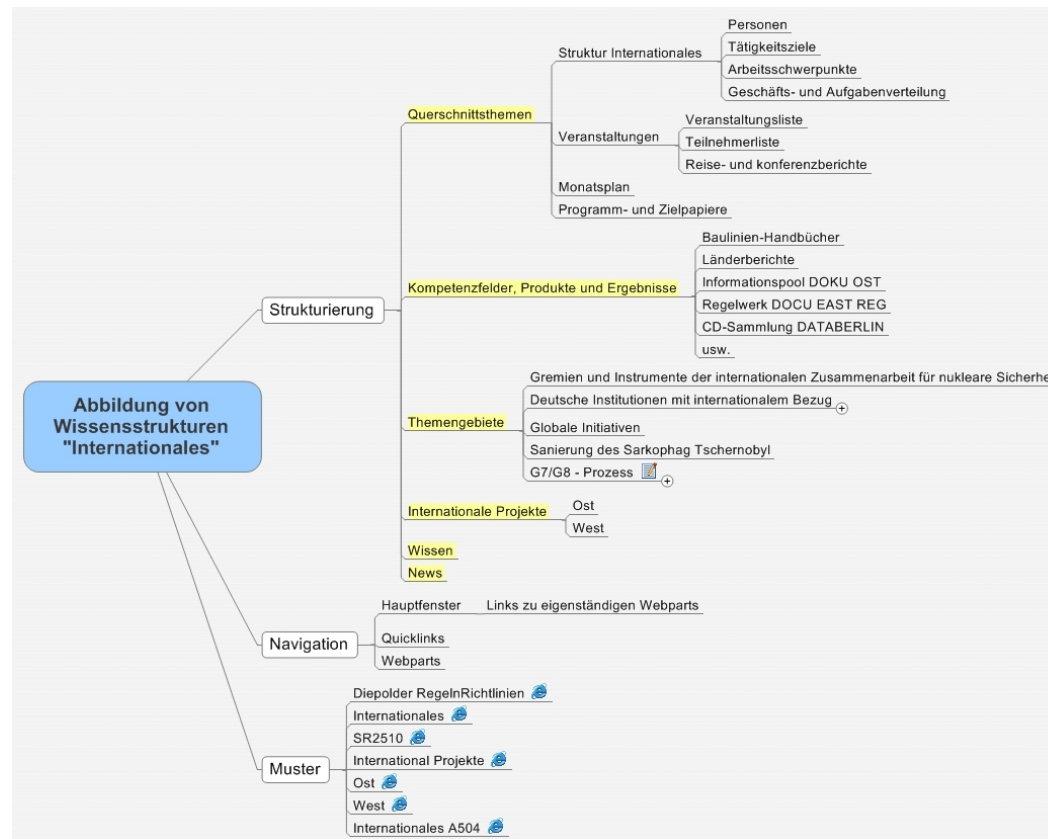
Alberto J. Cañas, John. W. Coffey, Mary Jo Carnot, Paul
Feltovich, Robert R. Hoffman, Joan Feltovich, Joseph D.
Novak

The Institute for Human and Machine Cognition IHMC



<http://www.ihmc.us/users/acanas/Publications/ConceptMapLitReview/IHMC%20Literature%20Review%20on%20Concept%20Mapping.pdf>

Knowledge Representation: Knowledge Structure Example with Mindmap



Knowledge Representation: Mindmap Web Document

Chronologie Projekt SR 2510

[Startseite](#) | [Inhalt](#) | [Übersichtsmap](#) | [Iconlegende](#)

Ihre Kontaktinformation hartmut.melchior@grs.de

Startseite

1. Armenien - Medzamor
2. CONCERT/ENERG
3. G7/G8
4. G8GP
5. IAEA
6. II-KI-BIDSF
7. Kazakhstan BN-350
8. Kreuzer Ushakov
9. NSSG
10. PTEG
11. RAMG
12. RF/RA/06
13. Russland - NDEP
14. SR 2510
15. Tacis/Phare
16. Ukraine
 - Ukraine - CSF
 - Ukraine - ICC
 - Ukraine-ISF-2
 - NSA
17. Alles

Chronologie Projekt SR 2510

Chronologie

zu Informationen, Protokollinhalten und Terminen im Rahmen der Projektabwicklung zum Projekt **SR 2510**

Untersuchungen zur nuklearen Sicherheit von Kernkraftwerken in Mittel- und Osteuropa sowie Beratung des BMU zur Minderung von Risiken

- Durchführung übergeordneter fachlicher und organisatorischer Aufgaben-

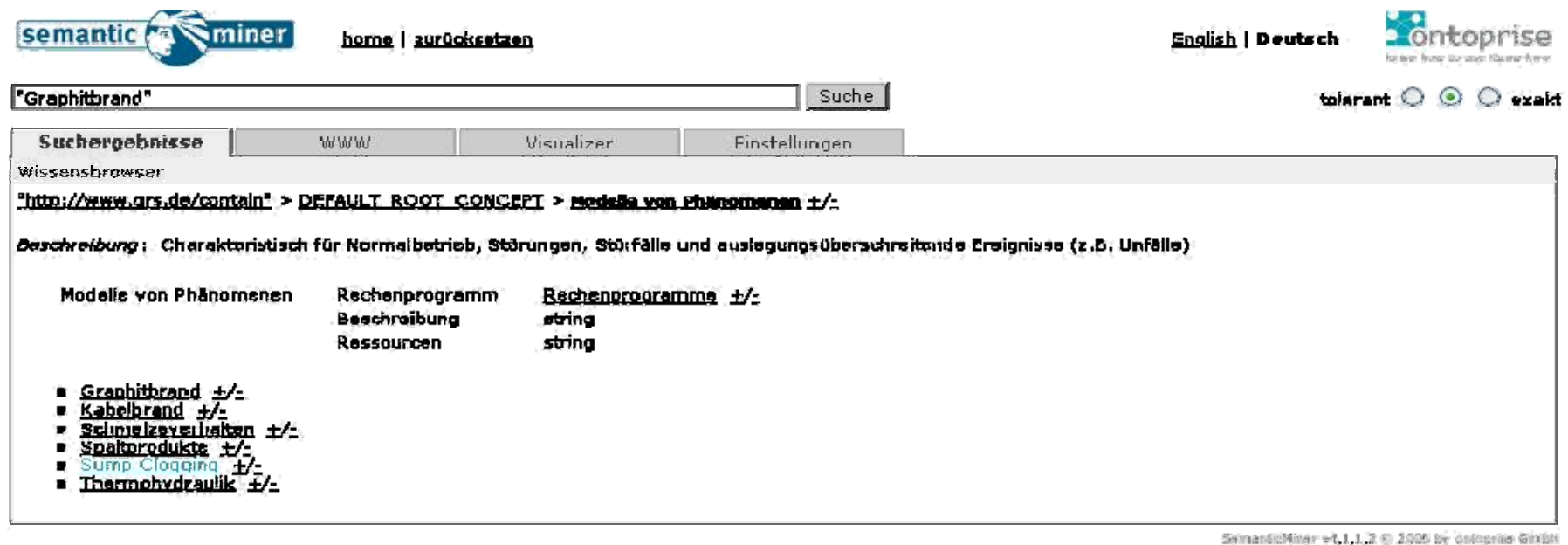
Die Gliederung umfaßt 20 Themengruppen, die man auf der [linken Seite](#) findet.

Nach **Anklicken des Themas ist man** in den relevanten Informationen, welche zahlreiche weiterführende Links zu den Dokumenten aber auch zu Ankündigungen, Gremien, Organisationen, staatlichen Stellen usw. enthalten.

Über **Zurück** auf dem Explorer oben links gelangt man in das Ursprungsdokument zurück.

Knowledge Visualization: Semantic Miner

- Developed by Ontoprise
 - Pilot project on development of a “Containment”-Ontology
 - 2-days Workshop with 4 field and 3 KM experts: first draft
 - Refined by other experts



semantic miner

home | zurücksetzen

English | Deutsch

ontoprise

tolerant ☐ ☒ ☐ exakt

Suche

Suchergebnisse

Wissensbrowser

"http://www.grs.de/contain" > DEFAULT ROOT CONCEPT > Modelle von Phänomenen +/-

Beschreibung: Charakteristisch für Normalbetrieb, Störungen, Störfälle und auslegungsüberschreitende Ereignisse (z.B. Unfälle)

Modelle von Phänomenen	Rechenprogramm	Rechenprogramme +/-
Beschreibung		string
Ressourcen		string

- Graphitbrand +/-
- Kabelbrand +/-
- Schmelzeverhalten +/-
- Spaltprodukte +/-
- Sump Clogging +/-
- Thermohydraulik +/-

SemanticMiner v1.1.1.2 © 2005 by ontoprise GmbH

Knowledge Visualization: Semantic Miner

semantic miner home | zurücksetzen English | Deutsch  know how to use Know-how

"Sump Clogging" Suche tolerant ☐ ☒ exakt

Suchergebnisse WWW Visualizer Einstellungen

Wissensbrowser
Sump Clogging +/-

 GRS-Portal
OntoSearch

Suchen in X

und

und

Suchen Neue Suche Normal

Suche nach 'sump clogging' in Alle Quellen [Hilfe](#)
Mehr als 40 Ergebnisse zurückgegeben, Einträge 1 - 40 werden angezeigt

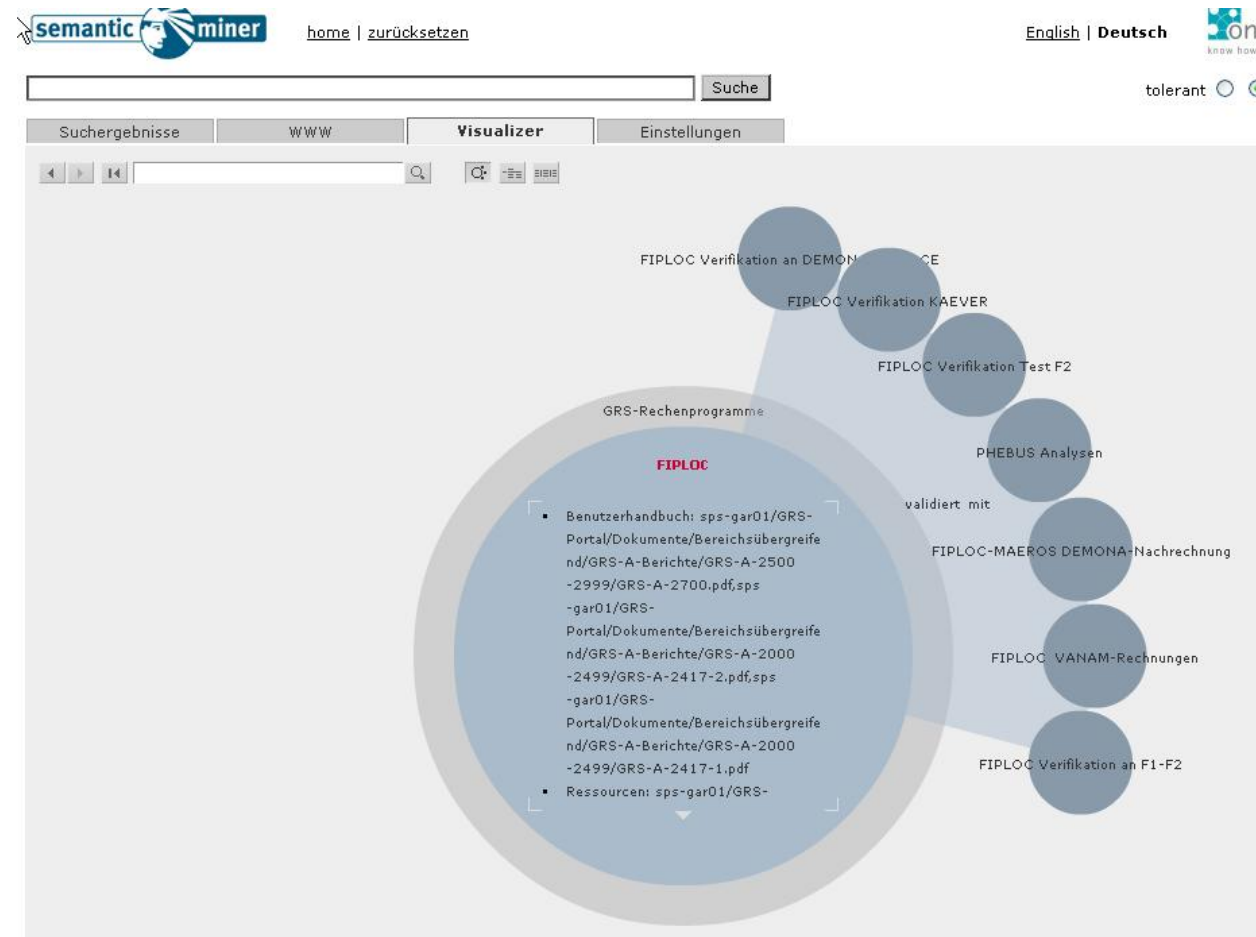
Sortierung durch Relevanz gruppiert dann durch Website [Zu meinen Hyperlinks hinzufügen](#) | [Benachrichtigen](#)

Gruppen: INT 9152 Generische Sicherheitsfragen (9) GRS-Portal (12) SR 2472 Internationaler Regelwerksvergleich (1) SR 2475 Projektportal (4) A1140 (1) SR 2440 Projektportal (8) SR 2510 Projektportal (2) A503 (2) SR 2486 Nukleare Sicherheitskonvention (1)

INT 9152 Generische Sicherheitsfragen

 Kein Folientitel Clogging-GPR/RSK http://project-gar01/projekte/INT9152/Arbeitsakte/07_Beigestellte_Unterlagen/GPR... - 221 KB Zu meinen Hyperlinks hinzufügen Benachrichtigen Zur Dokumentenbibliothek Eintragsdetails	Kersting	11.07.2005
 GRSFolie_h Clogging NEA_Stockholm http://project-gar01/projekte/INT9152/Arbeitsakte/07_Beigestellte_Unterlagen/Sum... - 90 KB Zu meinen Hyperlinks hinzufügen Benachrichtigen Zur Dokumentenbibliothek Eintragsdetails	Maqua	11.07.2005
 Bewertung (Ranking) der Issues Folie Ergebnisbericht,Projektgespräch am 13.07.05 http://project-gar01/projekte/INT9152/Zentralakte/04_Arbeitsergebnisse/Projektge... - 59 KB Zu meinen Hyperlinks hinzufügen Benachrichtigen Zur Dokumentenbibliothek Eintragsdetails	Simon	14.07.2005

Knowledge Visualization: Containment Ontology



Some Odds of Knowledge

- Making explicit of what is not necessary to become explicit (wrong effort; a cat has not to express the distance to a mouse in centimeters in order to catch it)
- The 'Bad Four F' whenever modelling an issue: Freezing, Flattening, Faulting, Forgetting
- Spurious Knowledge
 - Systematic Disinformation
 - Disinformation by Negligence
- Inundation by non goal- oriented information
- Lack of order criterias / schemes for information

Representing Knowledge

- Dossiers
 - Mainly textual, with links in the text to important documents etc.
 - Little flexibility, difficult to keep up to date
 - promising development: Wiki (e.g. the Free Encyclopedia <http://www.wikipedia.org>) : dynamic” collaboration on web documents
- “Classical” Web Sites
 - High maintenance efforts

- “Knowledge Representation” in a more formal sense
 - Method: Conceptualization of a Knowledge Domain (Model)
 - Collection of relevant facts and objects (“concepts”) in the domain
 - Characterization of the concepts by its properties (“attributes”)
 - Description of the relation between concepts (“relations”)
 - Assignment of individuals (“instances”) to concepts
 - Knowledge Nets (Topic Maps, Concept Maps, Ontologies, Semantic Nets ...)
 - Systematic Approach
 - (semi)formalized: may be understood by machines
 - Inferences may be drawn (queries)
 - Consistency checks
 - Controlled Vocabulary defined by experts
 - Visualization for ease of navigation

Experience gained

- Capturing Knowledge of Leaving Experts
 - ⊖ identification of critical knowledge still very informal
 - ⊖⊖ to date, no formal process in place; few activities, time is running out
 - ⊕ Strategies to include leaving experts in knowledge representation activities
- Knowledge representation and mapping
 - ⊕ Tools in place
 - ⊕ The notion is spreading, interest in some fields after demonstrating pilot applications
 - ⊕ Appreciable navigation and retrieval improvements
- Process-oriented KM
 - ⊕ ground has been laid
 - ⊖ extensive application still missing

Knowledge Activities related to Standards of Safety

- Sharing of knowledge on relevant safety issues
 - discussions and exchange of information in working groups
 - the exchange of recent knowledge on specific topics
 - definition of requirements for safety assessment methods
 - discussion of cross-cutting issues by multi-disciplinary expert groups (for example the activities on safety margins)
 - the definition of state of art and collective opinions on key safety issues
- Generation of new scientific information
 - specification of primary research areas
 - experimental projects and analytical exercises such as benchmarks and international standards
 - information collection on safety relevant events and their evaluation

Knowledge Activities related to Standards of Safety (cont.)

- Contribution to competence maintenance
 - transfer of information to countries with shrinking resources in nuclear safety research
 - training of young scientific people through involvement in national and international research projects
 - contribution to maintenance of unique experimental facilities and capabilities
- Archiving and distributing information
 - document management on joint programs
 - management of experimental data
 - conducting seminars and conferences
 - release of reports to the public.

Thank you for your Attention