

Memoria Anual Núcleo Milenio
Centro de Investigación de la Web
Center for Web Research
2004

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Annual Report Millennium Nucleus
Centro de Investigación de la Web
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Ricardo Baeza-Yates

A handwritten signature in black ink, appearing to read 'Ricardo Baeza-Yates', with a horizontal line underneath.

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Presentation

In the third year, the project has entered into a full productivity stage, with a consolidated network of researchers and students inside and outside the Nucleus. The Center currently involves 10 researchers (2 postdocs) and more than 55 students. The research field of this project, which is very broad in extent, has been divided into two main areas: a) Databases and Information Retrieval, and b) Distributed Systems and Networks. Throughout the year 2004, many seminars and other events were organized, designed to attract motivated students to the subjects of the project.

We have increased the number of PhD students in the Center from 10 during 2003 to 15 this year, working in Chile, and two of them have finished. We are also working with other 4 Ph.D. students in Argentina and Spain. In addition, many invited professors came to present different subjects and technologies to our group, and to establish cooperation relationships with their institutions.

Summary

During this third year, the nucleus published 20 articles in international journals or series (17 of them ISI), 5 book chapters, 8 articles in international conferences, and 15 articles in national conferences or as technical reports. We also edited two conference proceedings and one workshop, all of them published abroad. Five grants for PhD students and four for MSc students were funded. More than 25 seminars were organized, by a similar number of invited professors.

The center organized three short courses, one international workshop (OSCAR in Distributed Programming) and one national meeting in Concepción (V Society and Information Technology). A national contest about the Web of the Future was organized for all student levels, and we participated in an international videoconference between Chilean and Colombian students. We also coordinated the team that defined the national norm for digital documents published by the government last December.

Introduction

The Center for Web Research was created to study all the technologies and scientific subjects associated to the Web. This makes the Center research subjects very broad and extensive, covering very diverse aspects of the computer science and networking technologies. We have focused the efforts in two main areas, to make easier the team work and to avoid a dispersion of the results:

a) Databases and Information Retrieval: This area covers multimedia retrieval, spatial information and semi-structured data. At the heart of them is combinatorial pattern matching, a research area that studies from a combinatorial point of view how to search for given patterns in regular and discrete structures such as sequences or graphs. Another research topic is how to add semantic information to the contents, as meta-data and the Semantic Web. Finally, we also include here Web Mining.

b) Distributed Systems and Networks: This area covers web application programming technologies (Web Agents, Web Services, Distributed Programming), new media communication protocols (Multimedia over IP) and technologies to improve performance of web tools (parallel search, crawling technologies).

In the near future, other areas could be included, depending on the research interests and the collaborations developed by the project researchers.

Technological and Scientific Research

A) Databases and Information Retrieval

Main Goals:

Create new technologies and algorithms to store and search the Web efficiently. We cover two sub-areas: multimedia analysis and searching techniques, and the semantic Web and Web Mining.

- Multimedia Analysis and Searching Techniques: Researchers: Ricardo Baeza-Yates, Gonzalo Navarro, Andrea Rodríguez, Javier Ruiz del Solar. Postdoc: Mark Cieliebak. PhD Students: G. Gutiérrez, R. Paredes, K. Figueroa, D. Arroyuelo, C. Castillo, A. Fariña, J. Adiego, N. Reyes. MSc Student: E. Davis, F. Godoy. Undergraduate Students: A. Salinger, R. Verschae, D. Yaksic. In general, this area covers all the textual and multimedia search problems. The main subjects are space searching algorithms, face recognition algorithms, and string matching algorithms.

Publications:

1. **[ISI]** Gonzalo Navarro. Pattern Matching. Journal of Applied Statistics 31(8) : 925-949, 2004. Special Issue on "Pattern Discovery".
2. Benjamin Bustos and Gonzalo Navarro. Probabilistic Proximity Search Algorithms Based on Compact Partitions. Journal of Discrete Algorithms 2(1):115-134, 2004. Elsevier.
3. Ricardo Baeza-Yates and Gonzalo Navarro. Text Searching: Theory and Practice. In C. Martin-Vide, V. Mitraná, and G. Paun (editors), Formal Languages and Applications, pages 565-597. Studies in Fuzziness and Soft Computing 148. Springer, Berlin, 2004.
4. Ricardo Baeza-Yates and Gonzalo Navarro. Modeling Text Databases. In R. Baeza-Yates, J. Glaz, H. Gzyl, J. Huesler, and J. L. Palacios (editors), Recent Advances in Applied Probability, pages 1-25. Springer, Berlin, 2004.
5. **[ISI]** Ricardo Baeza-Yates. Challenges in the Interaction of Information Retrieval and Natural Language Processing. In Proc. 5th International Conference on Computational Linguistics and Intelligent Text Processing (CICLing 2004), Seoul, Korea. Lecture Notes in Computer Science vol. 2945, pages 445-456, Springer.
6. **[ISI]** Andrea Rodríguez, Nico van Weghe, and Philippe De Maeyer. Simplifying Sets of Events by Selecting Temporal Relations. In M. Egenhofer, C. Freksa and H. Miller (editors), Geographic Information Science. Lecture Notes in Computer Science Vol. 3234, pp.269-284.
7. **[ISI]** Ricardo Baeza-Yates, Javier Ruiz-del-Solar, Rodrigo Verschae, Carlos Castillo, and Carlos Hurtado. Content-based Image Retrieval and Characterization on Specific Web Collections. Proc. 3rd International Conference on Image and Video Retrieval (CIVR 2004), Dublin, Ireland. Lecture Notes in Computer Science vol. 3115, pages 189-198, Springer.
8. **[ISI]** Kimmo Fredriksson, Veli Mäkinen and Gonzalo Navarro. Rotation and Lighting Invariant Template Matching. In Proc. 6th Latin American Symposium on Theoretical Informatics (LATIN 2004), Buenos Aires, Argentina. Lecture Notes in Computer Science vol. 2976, pages 39-48, Springer.
9. **[ISI]** Nikhil Bansal, Mark Cieliebak, and Zsuzsanna Lipták. Efficient Algorithms for Finding Submasses in Weighted Strings, Proceedings of the 15th Annual Combinatorial Pattern Matching Symposium. Istanbul, Turkey, July 2004. Springer, LNCS 3109, pp. 194-204, 2004.

10. [ISI] Nieves Brisaboa, Antonio Fariña, Gonzalo Navarro, and José Paramá. Simple, Fast, and Efficient Natural Language Adaptive Compression. In Proc. 11th International Symposium on String Processing and Information Retrieval (SPIRE 2004), Padova, Italy. Lecture Notes in Computer Science vol. 3246, pages 230-241, Springer.
 11. Joaquín Adiego, Gonzalo Navarro and Pablo de la Fuente. Lempel-Ziv Compression of Structured Text. In Proc. 14th IEEE Data Compression Conference (DCC 2004), pages 112-121. Snowbird, Utah.
 12. Joaquín Adiego, Pablo de la Fuente and Gonzalo Navarro. Merging Prediction by Partial Matching with Structural Contexts Model. In Proc. 14th IEEE Data Compression Conference (DCC 2004), page 522 (poster). Snowbird, Utah.
 13. Gilberto Gutiérrez, Gonzalo Navarro and Andrea Rodríguez. An Access Method for Objects Moving among Fixed Regions. In Proc. III Chilean Database Workshop, JCC 2004, Arica, Chile. In CD-ROM.
 14. Joaquín Adiego, Pablo de la Fuente and Gonzalo Navarro. Una Técnica de Compresión para Documentos de Texto Considerando su Estructura. In Actas de las IX Jornadas de Ingeniería de Software y Bases de Datos (JISBD 2004), Spain, pages 399-410. In Spanish ("A compression technique for text documents considering their structure").
 15. Diego Arroyuelo, Verónica Ludueña, Nora Reyes and Gonzalo Navarro. Bases de Datos no Convencionales. In Proc. Workshop de Investigadores en Ciencias de la Computación (WICC 2004), Argentina, pages 27-31. In CD-ROM. In Spanish ("Non-conventional databases").
 16. Paolo Ferragina, Giovanni Manzini, Veli Makinen, and Gonzalo Navarro. Succinct Representation of Sequences. Technical Report TR/DCC-2004-5, Dept. Of Computer Science, Univ. Of Chile, August 2004.
 17. Szymon Grabowski and Gonzalo Navarro. O(mn log sigma) Time Transposition Invariant LCS Computation. Technical Report TR/DCC-2004-6, Dept. Of Computer Science, Univ. Of Chile, September 2004.
- Semantic Web, Web Mining and User Interfaces: Researchers: Ricardo Baeza-Yates, Claudio Gutiérrez, Carlos Hurtado. Postdocs: G. Dupret, B. Piwowarski. PhD Students: M. Mendoza, C. Rivera, R. Verschae. M.Sc. Students: B. Poblete. Undergraduate Students: E. Krsulovic, M. Calderón, C. Vásquez, J. Hayes, D. Yaksic. This area tries to advance the research on adding and mining semantic information to/from the web contents, using Meta-tags and other tools. New query languages, visualizations, and formats (such as XML) are also explored. This area also includes mining the structure and usage of the Web, as well as related topics like Web characterization, information architecture and usability.

Publications:

1. Ricardo Baeza-Yates, Carlos Castillo, and Felipe Saint-Jean. Web Dynamics, Structure and Page Quality. In M. Levene and A. Poulouvassilis (editors), *Web Dynamics*, pages 93-109. Springer-Verlag, 2004.
2. Ernesto Krsulovic and Claudio Gutiérrez. Structuring Information on the Web from Below: The Case of Educational Organizations in Chile. *Journal of Web Engineering* 2(4):295-304, 2004.
3. A. Jaimes, Javier Ruiz-del-Solar, Rodrigo Verschae, Dinko Yaksic, Ricardo Baeza-Yates, Emilio Davis, and Carlos Castillo. On the Image Content of a Web Segment: Chile as a Case Study. *Journal of Web Engineering* 3(2):153-168, 2004.
4. Ricardo Baeza-Yates. Web Usage Mining in Search Engines. In A. Scime (editor), *Web Mining: Applications and Techniques*, pages 307-321. Idea Group, 2004.
5. Ricardo Baeza-Yates and Cristian Vásquez. Estándares de Documentación en XML para el Desarrollo del Gobierno Digital. In M. Caridad Sebastián and J.T. Nogales Flores (editors), *La Información en la Postmodernidad: La Sociedad del Conocimiento en España e Iberoamérica*, pages 268-282. Editorial Universitaria Ramón Areces,

- Spain, 2004. In Spanish (“XML documentation standards for the development of digital government”).
6. Ricardo Baeza-Yates, Cuauhtémoc Rivera and Javier Velasco. Arquitectura de la Información y Usabilidad en la Web. *El Profesional de la Información* 13(3):168-178, 2004. In Spanish (“Information architecture and usability in the Web”).
 7. Claudio Gutiérrez, Carlos Hurtado, and Alberto Mendelzon. Foundations of Semantic Web Databases. In Proc. 23rd ACM SIGACT-SIGMOD-SIGART Symposium on Principles of Database Systems (PODS 2004), Paris, France, pages 95-106.
 8. **[ISI]** Jonathan Hayes and Claudio Gutiérrez. Bipartite Graphs as Intermediate Model for RDF. Proc. International Semantic Web Conference (ISWC 2004), Hiroshima, Japan. Lecture Notes in Computer Science vol. 3298, pages 123-138, Springer.
 9. **[ISI]** Katia Wechsler, Jorge Baier, Miguel Nussbaum, and Ricardo Baeza-Yates. Semantic Search in the WWW supported by a Cognitive Model. In Proc. 5th International Conference in Web-Age Information Management (WAIM 2004), Dalian, China. Lecture Notes in Computer Science vol. 3129, pages 315-324, Springer.
 10. **[ISI]** Ricardo Baeza-Yates, Carlos Hurtado, and Marcelo Mendoza. Query Recommendation using Query Logs in Search Engines. In Proc. International Workshop on Clustering Information over the Web (ClustWeb 2004, in conjunction with EDBT), Crete, Greece, pages 588-596. LNCS 3268.
 11. **[ISI]** Carlos Hurtado and Claudio Gutiérrez. Equivalence of OLAP Dimension Schemas. In Proc. 3rd International Symposium on Foundations of Information and Knowledge Systems (FolKS 2004), Vienna, Austria. Lecture Notes in Computer Science 2942, pages 176-195. Springer.
 12. Ricardo Baeza-Yates and Bárbara Poblete. Dynamics of the Chilean Web Structure. In Proc. 3rd Workshop on Web Dynamics, New York, USA, 2004.
 13. Ricardo Baeza-Yates and Javier Velasco. The User Experience from Design to Use, and Back: a Causal Model (poster). In Proc. Information Architecture Summit 2004, Austin, Texas, 2004.
 14. Cristian Gutiérrez, Confección de una Lista de Reversos Suplementaria: Midiendo la Materia Oscura de la Internet Chilena, XII Encuentro Chileno de Computación, Arica, Chile, Noviembre 2004. In Spanish (“Creating a supplementary list of reversals: measuring the dark matter of the Chilean Internet”).
 15. Renzo Angles, Claudio Gutiérrez and Jonathan Hayes. RDF Query Languages Need Support for Graph Properties. Technical Report TR/DCC-2004-3, Dept. of Computer Science, Univ. of Chile, June 2004.
 16. R. Baeza-Yates, F. Lalanne, C. Castillo, G. Dupret. Comparing the Characteristics of the Chilean and Korean Web. Technical Report, December 2004.

B) Distributed Systems and Networks

Main Goals:

Create new technologies and systems to program distributed applications for the web, communication protocols to traverse the web and to transmit multimedia content, and parallelism based on cluster technologies to improve the performance of the Database and Information Retrieval algorithms.

- Crawling and Ranking Techniques: Researchers: Ricardo Baeza-Yates, Mauricio Marín and Andrea Rodríguez. PhD Student: Carlos Castillo. The main subjects are how to crawl the whole web, gathering pages to index them to build efficient search engines. Many tradeoffs arise when a search system is designed, and we have proposed new technologies to improve the efficiency and accuracy of the searching technologies.

Publications:

1. **[ISI]** Fidel Cacheda and Ricardo Baeza-Yates. An Optimistic Model for Searching Web Directories. In Proc. 26th European Conference on IR Research (ECIR 2004),

- Sunderland, UK. Lecture Notes in Computer Science vol. 2997, pages 364-377, Springer.
2. **[ISI]** Ricardo Baeza-Yates and Carlos Castillo. Crawling the Infinite Web: Five Levels are Enough. In Proc. 3rd International Workshop on Algorithms and Models for the Web-Graph (WAW 2004), Rome, Italy. Lecture Notes in Computer Science vol. 3243, pages 156-167, Springer.
 3. **[ISI]** Ricardo Baeza-Yates, A Fast Set Intersection Algorithm for Sorted Sequences. Proc. 15th Annual Symposium on Combinatorial Pattern Matching (CPM 2004), Istanbul, Turkey. Lecture Notes in Computer Science vol. 3109, pages 400-408, Springer.
 4. **[ISI]** Ricardo Baeza-Yates, Carlos Hurtado, and Marcelo Mendoza. Query Clustering for Boosting Web Page Ranking. In Proc. 2nd International Atlantic Web Intelligence Conference (AWIC 2004), Cancun, Mexico. Lecture Notes in Computer Science vol. 3034, pages 164-175.
 5. Carlos Castillo, Mauricio Marín, Andrea Rodríguez, and Ricardo Baeza-Yates. Scheduling Algorithms for Web Crawling. In Proc. 2nd Latin American Web Conference (LA-Web 2004), Ribeirao Preto, Brazil, pages 10-17. IEEE Computer Society Press.
 6. Ricardo Baeza-Yates and Emilio Davis. Web Page Ranking using Link Attributes (poster), In Proc. WWW13, ACM Press, New York, USA, 2004.
 7. Ricardo Baeza-Yates and Emilio Davis. Ranking Global de Páginas Web Basado en Atributos de los Enlaces. Proc. Conferencia Latinoamericana de Informática (CLEI) 2004, Arequipa, Perú. In Spanish ("Global Web page ranking based on link attributes").
- Mobile Agents and Distributed Programming: Researcher: José Piquer. PhD students: Eric Tanter, Juan C. Vidal, Javier Bustos. We have developed a Reflection programming platform for Java (Reflex) to enable an easier agent development platform and to explore a reflexive model to link behavioral reflection and Aspect Oriented Programming. Juan C. Vidal is finishing his thesis on agent load balancing and Javier Bustos is starting a research area on Active Object load balancing for Grid Computing.

Publications:

1. Leonardo Rodriguez, Eric Tanter, and Jacques Noyé. Supporting Dynamic Crosscutting with Partial Behavioral Reflection: A Case Study. In Proc. XXIV International Conference of the Chilean Computer Science Society (SCCC 2004), Arica, Chile. IEEE Computer Society Press, pages 48-58.
 2. Eric Tanter and Jacques Noyé. Motivation and Requirements for a Versatile AOP Kernel. In Proc. European Interactive Workshop on Aspects in Software (EIWAS 2004), Berlin, Germany.
 3. **[ISI]** Denis Caromel, Luis Mateu and Eric Tanter. Sequential Object Monitors. In Proc. 18th European Conference on Object-Oriented Programming (ECOOP 2004), Oslo, Norway. Lecture Notes in Computer Science vol. 3086, pages 316-340, Springer-Verlag,
 4. Peter Ebraert and Eric Tanter. A Concern-Based Approach to Dynamic Software Evolution. In Proc. Dynamic Aspect Workshop (DAW 2003), in conjunction with the 3rd International Conference on Aspect-Oriented Software Development (AOSD 2004), Lancaster, U.K.
- Parallelism and Simulation: Researchers: Mauricio Marin, Gonzalo Navarro. MSc Student: J. Canuman. Undergraduate Students: Miguel Mora, Eduardo Salinas, Robinson Lienlaf, Josselyn Vega, Daniel González, José Alvarado, Maribel Araya, Javier León, Cristian Martínez,. A 10 PC cluster has been installed and is working at the Computer Science Department of the University of Chile. A master thesis doing work upon this cluster is in progress and is related to the efficient parallelization of index data structures for text databases. Research work on the development of parallel algorithms for text databases and distributed scheduling of simulation servers on the Internet. Is being pursued.

Publications:

1. **[ISI]** Veli Mäkinen, Gonzalo Navarro, and Kunihiko Sadakane. Advantages of Backward Searching -- Efficient Secondary Memory and Distributed Implementation of Compressed Suffix Arrays. In Proc. 15th Annual International Symposium on Algorithms and Computation (ISAAC 2004), Hong Kong, China. Lecture Notes in Computer Science vol. 3341, pages 681-692, Springer.
2. Manuel Osorio, Andrea Rodríguez, and Mauricio Marín. Collecting Data about Moving Objects in a Distributed Environment. In Proc. XXIV International Conference of the Chilean Computer Science Society (SCCC 2004), Arica, Chile, pages 113-120. IEEE Computer Society Press.
3. Carolina Bonacic and Mauricio Marín. Concurrency Control on Inverted Files. In Proc. Workshop Chileno de Bases de Datos, Arica, Chile, 2004.
4. Carolina Bonacic. Crawler con Colas de Prioridad en Paralelo. In Proc. Workshop Chileno de Sistemas Distribuidos, Arica, Chile, 2004. In Spanish ("Crawler with parallel priority queues").

Finally, we edited two conference proceedings and one workshop material that include several of the topics already mentioned:

1. Gonzalo Navarro (editor), Proceedings of the XXIV International Conference of the Chilean Computer Science Society (SCCC 2004), IEEE Computer Society Press, CA, USA, November 2004.
2. Ricardo Baeza-Yates, José Luis Marroquin and Edgar Chávez (editors), Proceedings of the Fifth Mexican International Conference on Computer Science (ENC 2004). IEEE Computer Society Press, CA, USA, September 2004.
3. Ricardo Baeza-Yates, Yoelle Maarek, Thomas Roelleke, Arjen de Vries, III Workshop on XML Retrieval & I Workshop on Databases-IR Integration, Sheffield, UK, July 2004.

Education and Students

One of the main goals of the project is to detect the best available students and promote the research field among them. During the year 2004, four post-doctorate position, 4 PhD students (two of them finished) and 4 MSc (one of them finished) were funded by the project, at the different departments involved. Also, 2 research assistants have been funded at University of Chile, both at the Computer Science and the Electrical Engineering Depts.

During 2004, the following students and young researchers were funded by the Center:

- Post-docs: Carlos Hurtado (Chile), Mark Cieliebak (Switzerland), Benjamin Piwowarski (France), Georges Dupret (Belgium).
- PhD grants: Eric Tanter (France), Rodrigo Paredes, Carlos Castillo, Rodrigo Verschae, Cuauhtemoc Rivera (Mexico).
- MSc grants: Barbara Poblete, Carolina Bonacic, Rodrigo Frez, Simón Smith.
- Research Assistants: Mauricio Gaete, Felipe Ortiz (Colombia)

Also, working on projects for the Center, but with external funding:

- PhD students: Diego Arroyuelo (Argentina), Karina Figueroa (Mexico), Renzo Angles (Peru), Javier Bustos, Verónica Gil Costa (Argentina), Nora Reyes (Argentina), Juan Carlos Vidal (Colombia), Julio Quinteros, Joaquín Adiego (Spain), Antonio Fariña (Spain), Marcelo Mendoza, Rodrigo González, Gilberto Gutiérrez, Ricardo Verschae.
- MSc students: Mario Fernández, Iván Armijo, Andrea Pérsico, Roberto Uribe, José Canumán, Verónica Ludueña (Argentina), Andrés Bilbao.
- Undergraduate Students: José Selman, Ricardo Araos, Franco Canepa, Francisco Riquelme, Silvia Menichetti, Miguel Mora, Daniela Turina, Eduardo Salinas, Laura Galarce, Ernesto Miranda, Eduardo Soto, Manuel Osorio, Angela Parada, Carolina Galleguillos, Carla Paredes, Valeria Herskovic, Cristián Barrera, Alvaro Graves, Dinko Yaksic, Javier León, Alex Alvarado, José Alvarado, Josselyn Vega, and Jonathan Hayes (visiting from Darmstadt Univ., Germany).

Among these students, three of them finished their PhD. Theses (Eric Tanter, Carlos Castillo and Joaquín Adiego), one her M.Sc. Thesis (Barbara Poblete) and seven of them their Engineering Degree (Ricardo Araos, Franco Canepa, Javier León, Alex Alvarado, José Alvarado, Josselyn Vega, and Manuel Osorio) during 2004.

The geographic distribution of students in the three universities involved are:

- Ph.D.: All at the University of Chile with the following procedence: Chile (8), Argentina (1), Mexico (2), France (1), Perú (1), and Colombia (1). The group is also co-guiding Ph.D. thesis of 2 persons in Argentina and Spain.
- M.Sc.: Ten at the University of Chile (all Chileans except one from Argentina, two of them coming from University of Magallanes), and one at University of Concepción (Chilean)).
- Undergraduate: Ten from University of Magallanes and nine from University of Chile.

The theses finished are:

- Carlos Castillo, Efficient Web Crawling, Computer Science, PhD thesis, University of Chile, Chile. November 2004. Supervisor: Ricardo Baeza-Yates.
- Eric Tanter, From Metaobject Protocols to Versatile Kernels for Aspect-Oriented Programming, Computer Science PhD thesis, University of Nantes, France, and

University of Chile, Chile. November 2004. Supervisors: José Miguel Piquer, Jacques Noye and Pierre Cointe.

- Joaquín Adiego, The Structure of Documents in Information Retrieval: Compression, Indexing and Retrieval, Universidad de Valladolid, Spain, 2004. Supervisors: Pablo de la Fuente (Spain) and Gonzalo Navarro. In Spanish.
- Poblete, B. A Web Mining Model and Tool centred in Queries (In Spanish). Computer Science, M.Sc. thesis, Univ. de Chile, Nov 2004. Supervisor: Ricardo Baeza-Yates.

Undergraduate Final Computing Engineering Report (all in Spanish):

- Josselyn Vega, Experiments with Parallel Suffix Arrays, Universidad de Magallanes, Dic. 2004.
- Jose Alvarado, Searching using Regular Expressions, Univ. de Magallanes, Sept. 2004.
- Manuel Osorio, Evaluation of Traversal Strategies in a Distributed System of Moving Objects, Univ. de Concepción, Aug 2004.
- Alex Alvarado, Graphical Interface to Define Simulation Models, Univ. de Magallanes, April 2004.
- Javier León, Synchronization Protocol CMB for Parallel Discrete Simulation, Univ. de Magallanes, March 2004.
- Ricardo Araos, Semantic Search for University Ontologies, Univ. de Chile, 2004.
- Franco Cánepa, System for Tagging, Cataloguing and Searching Engineering Theses using Metadata Technology, Univ. de Chile, 2004.

Collaboration Networks

During the year, two coordination meetings with all the researchers involved were organized (April 19, November 18). Besides the interaction inside the project (Universities of Chile, Concepción and Magallanes), the Center is currently collaborating with the following institutions:

- University of Toronto, Canada (Alberto Mendelzon)
- Federal University of Minas Gerais, Brazil (Berthier Ribeiro-Neto, Nivio Ziviani)
- Universitat Pompeu Fabra, Spain (Vicente López)
- Information and Communication Univ., South Korea (Sung Myaeng)
- Universidad Michoacana, México (Edgar Chávez)
- University of Helsinki, Finland (Kimmo Fredriksson, Veli Makinen, Esko Ukkonen)
- University of Tampere, Finland (Heikki Hyyro)
- University of Pisa, Italy (Paolo Ferragina)
- University of Piemonte Orientale, Italy (Giovanni Manzini)
- Kyushu University, Japan (Kunihiko Sadakane, Masayuki Takeda, Ayumi Shinohara)
- Technical University of Lodz, Poland (Szymon Grabowski)
- Helsinki University of Technology, Finland (Jorma Tarhio)
- Ghent University, Belgium (Nico Van de Weghe)
- University of A Coruña, Spain (Nieves Brisaboa, Antonio Fariña, José Paramá, Fidel Casheda)
- University of Valladolid, Spain (Pablo de la Fuente, Joaquín Adiego)
- Universidad Nacional de San Luis, Argentina (Nora Reyes, Norma Herrera)
- Universidad Nacional de La Patagonia, Argentina (M. Printista, G. Costa)
- University of Marne-la-Vallee, France (Maxime Crochemore)
- INRIA Sophia-Antipolis, France (Denis Caromel)
- Ecole des Mines de Nantes: (Jacques Noye, Pierre Cointe)
- Oracle Corporation, USA (Omar Alonso)
- Universidad Católica de Chile (Miguel Nussbaum)

The project leader also visited University of Sydney (Australia), University of Canterbury (New Zealand), and Pompeu Fabra University (Spain) to start new research collaborations. He also participated representing the Chilean delegation with Eric Goles (President of CONICYT) in the APEC Science & Technology meeting held in Christchurch, New Zealand in March 2004.

During the year 2004 we received twenty six researchers (mostly foreign) visiting the Center (three of them to stay as postdocs), most of them giving technical talks, creating the potential for more research collaborations:

- Jean-Pierre Briot, Towards adaptive and self-adaptive component and agent applications, Laboratoire d'Informatique de Paris 6 (LIP6), Université Pierre et Marie Curie (Paris 6) & CNRS, Paris, France (January)
- Alex. Gerbessiotis, Architecture independent design and analysis of latency tolerant parallel algorithms with library-independent implementations. CS Department, NJIT, USA (January)
- Anselmo Peñas, Linguistic Techniques applied to Text Retrieval, UNED, Spain (March)
- Eduardo Rodriguez, Design and Evaluation of Spam Detection Techniques, CASLAB, U. de Chile (April)
- Veli Makinen, On Succinct Full-text Indexes, University of Helsinki, Finland (April)
- Mark Cieliebak, Efficient Protein Identification Techniques, postdoc from Switzerland (April)

- Gert Lanckriet, Kernel Methods: Support Vector Machines and Integration of Heterogeneous Data, Department of Electrical Engineering and Computer Science, University of California, Berkeley (April)
- Eduardo B. Fernandez, Web Services Security: Architectures, standards, and patterns. Dept. of Computer Science and Engineerin, Florida Atlantic University, Boca Raton, FL , USA (June)
- Luis Olsina, The Semantic Web: The New Web Revolution?, Univ. Nacional de la Pampa, Argentina (June)
- Clement Houtmann, An Algorithm for Computing the Core of a Simple RDF Graph, Dpt informatique, ENS Cachan, France (July)
- Boris Mejias, Mozart – an Implementation of the Oz Programming Language, Univ. Católica de Lovaina, Belgium (August)
- Sung Myaeng, Automatic Identification of Web Page Text Genres and Their Roles in Subject-Based Categorization, Information & Communication University, Daejon, South Korea (August)
- Cristofol Rovira, Conceptual Navigation Maps, Univ. Pompeu Fabra, Spain (August)
- Benjamin Piwowarski, XML Information Retrieval, postdoc from France (October)
- Marcelo Mendoza , Mining query sessions from search engine logs, Univ. de Valparaíso, Chile (November)
- Alejandro Vaisman, Temporal data in XML, Univ. of Buenos Aires, Argentina (November)
- Berthier Ribeiro-Neto , Content-Targeted Advertising: Issues and First Solutions, DCC/Univ. Fed. de Minas Gerais, Brazil (November)
- Georges Dupret, Document Ranking using Search Engine Logs, postdoc from Belgium (November)
- Theo D'Hondt, Language Design for Open Networks, VUB, Belgium (November)
- Dr Pierre Cointe, From Reflection to Aspects, EMN, France (November)
- Shigeru Chiba, Distributed aspect-oriented programming, TITECH, Japan (November)
- Jacques Noyé, Component protocols, EMN, France (November)
- Alistair Moffat, What does it mean to "Measure Performance"?. CS Dept., University of Melbourne, Australia (November)
- Albert-Laszlo Barabasi, The Architecture of Complexity: from Web based communication to the cell. Emil T. Hofman Professor of Physics, Department of Physics, University of Notre Dame, USA (December)
- Franck Thollard, Probabilistic Finite State Machines (Using and Building), EURISE - Faculté des Sciences et Techniques, France (January 2005)

Visitors that did not give talks: Nivio Ziviani, Univ. Fed. de Minais Gerais (Brazil)

We also organized a Workshop on Distributed Programming related to the project OSCAR which is the collaboration with INRIA Sophia Antipolis. This was held at the Center from November 8-10 and was attended by 15 people. In this workshop participated Denis Caromel and Eric Madeleine from INRIA, Shigeru Chiba from TITECH, Japan, and members of the Center.

Outreach

The main goal of the projects outreach is to promote web technology in the Chilean society and to develop some relations with the industry in Chile and abroad. During this year, we organized two special events and several short courses to promote the knowledge and understanding of the underlying technology on the Web.

First, we co-organized the Fifth Workshop entitled: Society and Information Technology held at Concepción, December 2-3. The event included invited speakers and some contributed presentations. The invited speakers were:

- Fernando Flores, Senator of the Republic of Chile
- Jaime Toha González, Governor of the Bio-Bio Region
- Claudio Orrego, Major of Peñalolén and ex-Minister of Housing.
- Christian Nicolai, Undersecretary of Transportation and Telecommunications
- Carlos Vignolo, Associate Professor & Director of the Program on High Direction Skills
- Ricardo Baeza-Yates, Director of the Center for Web Research, Univ. of Chile
- Miguel Nussbaum, Chair of Dept. of Computer Science, P. Universidad Católica de Chile.
- Pedro Hepp, Board member of Fundación País Digital, TIDE S.A
- Alfredo Piquer, President of ACTI & Optimisa
- Fernando Prieto, Vicepresident of Fundación País Digital
- José Pepe Flores, Director and Creative Partner of Newtonberg.
- Federico Heinz, Consultor and Cofounder of La Fundación Vía Libre, Argentina.
- Hernan Saavedra, Manager On-line Banking, BancoEstado

The workshop was attended by 200 people and had wide coverage in the press, in particular at the main newspaper in Concepción: Diario El Sur, that had twelve notes about it (attached to this report). More information in <http://www.ciencia.cl/encuentro/>.

We also organized a Summer Course on Emerging Web Topics that was attended by 40 graduate or last-year engineering students, many of them from outside Santiago. The course was held at the Center on January 18 & 19, 2005. The topics were Web Characteristics (R. Baeza-Yates), Search Engines (G. Navarro & M. Marín), Video on the Web (R. Arenas), Image Retrieval (J. Ruiz del Solar), Semantic Web (C. Gutierrez), Web Mining (C. Hurtado) and Spatial Information in the Web (A. Rodriguez).

During 2004 we organized two short courses in Information Architecture and Usability on the Web. The first in March was done with Henning Breuer. The second, in November, was done with Marcelo Garrido. In total, about 50 people from different areas attended these courses.

Regarding educational outreach activities, we collaborated with the “Junior Digital Parliament: Opening Windows for Chilean Children” initiative by handling the technical coordination of a videoconference between students in Chile and students in Colombia. The event held in Santiago on August 6, had the participation of about 50 basic school students at each of the sides and had good coverage by the press.

We also organized a the second national contest on “The Web of the Future”, for basic and high school students as well as university students, which received more than 20 submissions from Arica to Punta Arenas. The final results were published in the Center Web site. This contest was co-funded by NIC Chile.

We continued acting as the executive secretariat for the Economy Ministry group for the Digital Document Standard. During this year we worked on metadata and storage standards (R. Baeza-Yates, C. Gutierrez, C. Hurtado), and the work of 2003 was published by the INN (National Norms Institute) in December 2004. This norm will have an important impact on digital government and their interaction with other institutions.

We started the Semantic Thursdays serie of seminars, coordinated by Claudio Gutiérrez, with presentations done mainly by students or visiting researchers (in that case together with CIW Seminars). The presentations were:

- Rodrigo Frez , Administración de Servicios Web a Nivel Semántico con OWL-S, April.
- Carlos Hurtado, Clustering de consultas en buscadores Web, May
- Juan Manuel Barrios , Buscadores Semánticos, May
- Franco Canepa, Sistema para descripción y consulta de memorias usando metadatos, May
- Renzo Angles, ¿Qué propiedades de grafos es posible consultar en los actuales lenguajes de consulta para RDF?, June.
- Claudio Gutierrez, Foundations of Semantic Web Databases, June.
- Andrés Bilbao, Buscador Semántico para Comercio Electrónico, July
- Claudio Gutiérrez, Web Semántica: Estado, Perspectivas y Tendencias, July
- Draltan Marín, Aspectos lógicos del modelo RDF, July
- Clement Houtmann, An Algorithm for Computing the Core of a Simple RDF Graph, ENS Cachan, France, July.
- Andrés Neyem, Infraestructura Tecnológica para el Desarrollo y Uso de Web Services, August.
- Rodrigo Frez, Directorio UDDI de Servicios Web utilizando integración semántica OWL-S, complementado con WSIL, September
- Benjamin Piwowarski, XML Information Retrieval, October
- Marcelo Mendoza, Mining query sessions from search engine logs, November
- Georges Dupret, Using query logs to improve document search engines: a Bayesian Model, November

The presentation by Albert-Laszlo Barabasi (Dept. of Physics, University of Notre Dame), The Architecture of Complexity: from Web based communication to the cell, was jointly organized with the Millennium Initiative and had about 30 attendees.

The members of the Center also gave invited talks in several places outside and inside Chile as follows:

- Ricardo Baeza-Yates. Web Mining in Search Engines. Australasian Computer Science Conference, Dunedin, New Zealand (January)
- Ricardo Baeza-Yates, Mining the Web: Search Engines, Univ. of Canterbury, Christchurch, NZ (February)
- Ricardo Baeza-Yates, Challenges in the Interaction of IR & NLP, CICLING 2004, Seoul, Korea (February)
- Ricardo Baeza-Yates, Mining the Web: Search Engines, Seoul National University, Korea (February)
- Ricardo Baeza-Yates, Web Mining, ETRI, Daejeon, Korea (February)
- Ricardo Baeza-Yates, Short Graduate Course on Information Retrieval, Univ. Nac. del Sur, Argentina (March) Univ. Pompeu Fabra & Polytechnic Univ. of Catalunya, Spain (May), and Univ. Rovira i Virgili, Spain (December)
- Georges Dupret, Models for Latent Semantic Indexing: Indexing Quality and Number of Terms, UNED, Madrid (April)
- Ricardo Baeza-Yates. Mining Search Engine Logs: Clustering Query Traces, UNED, Madrid, Spain (May)
- Gonzalo Navarro, Current Challenges in Textual Databases, Univ. de A Coruña, Spain (June)
- Ricardo Baeza-Yates, Challenges in the Interaction of IR & NLP, Spanish Symposium of Natural Language Processing, Barcelona, Spain (July)
- Ricardo Baeza-Yates, Mariano Consens. Tutorial on Databases-Information Retrieval Integration, Very Large Databases Conference, Toronto, Canada (July)
- Claudio Gutierrez, Semantic Web Challenges, Workshop on Semantic Web, Buenos Aires, Argentina (August)
- Ricardo Baeza-Yates, Impact of Search Engines and Search Mining in E-Commerce, COLLECTER LatAm, Santiago, Chile (September)

- Ricardo Baeza-Yates, The Power of Search, Millennium Seminar, Santiago, Chile (September). This talk was covered in newspapers (enclosed)
- Ricardo Baeza-Yates, Mining Web Queries, Argentinian Symposium on Information Systems, Cordoba, Argentina (September)
- Ricardo Baeza-Yates, Mining Web Queries, XXX Latin American Conference in Informatics, Arequipa, Peru (September)
- Gonzalo Navarro, Current Challenges in Textual Databases, Univ. de Valladolid, Spain (October)
- Ricardo Baeza-Yates, Sequence Comparison Algorithms, Brazilian Symposium on Bioinformatics, Brasilia, Brazil (October)
- Ricardo Baeza-Yates, The Power of Search, Latinamerican Student Confress of Industrial Engineering, Rosario, Argentina (November)
- Ricardo Baeza-Yates, Web Query Mining, Univ. Nac. de Rosario, Argentina (November)
- Ricardo Baeza-Yates, Mining Web Queries, Chilean Computing Week, Arica, Chile (November)
- Javier Ruiz del Solar, Face Detection Using Statistical Learning, First Latin-American Summer School on Computational Intelligence, Santiago, Chile (December)
- Ricardo Baeza-Yates, Tutorial on Databases-Information Retrieval Integration, Conference on Data Management, Goa, India (January 2005)

We have continued improving our web site, including more information and documents in Spanish (www.ciw.cl) and English (www.cwr.cl).

The Center also was mentioned in news and extension articles (URLs or articles enclosed):

- Revista del Colegio de Ingenieros
- Revista Punto.Net (Terra)
- Universia: http://www.universia.cl/portada/actualidad/noticia_actualidad.jsp?noticia=71358
- Bioplanet: http://www.bioplanet.net/magazine/bio_sepoct_2004/bio_2004_sepoct_biotipos.htm

Team work and between centers

The level of joint work inside the team has been increasing every year from 1 at the beginning to 7 in 2004. This is shown by the number of joint papers of the team members. Regarding work with other ICM centers, we have collaborated in bioinformatics with the Millennium Nucleus of Cellular Vegetable Biology.

Flexibility

The flexibility degree is high and did improve from 8 in the two first years to 9 in 2004.

Administration

Scientific Staff:

Ricardo Baeza Yates, Leader, 100%
Gonzalo Navarro, Alternate Leader, 100%
José Miguel Piquer, Senior Researcher, 50%
Mauricio Marín, Researcher, 65%
Andrea Rodríguez, Senior Researcher, 60%
Claudio Gutiérrez, Associate Researcher, 25%
Javier Ruiz del Solar, Associate Researcher, 25%
Carlos Hurtado, Young Researcher, 100%
Mark Cieliebak, Postdoc, 100% (6 months)
Benjamin Piwowarski, Postdoc, 100% (6 months)
Georges Dupret, Postdoc, 100% (2 months)

Administrative Staff

Magna Bornand, Finance Assistant, 25%
Felipe Ortiz, Webmaster, 50%
Guillermo Morales, Staff, 10%

The hosting institution provides offices, connectivity, equipment and support for the Center, as well as most of the operational costs.

Finances

Iniciativa Científica Milenio Memoria Anual: Estado de Situación (\$ x 1.000)

	Año 2004			Acumulado años (año de inicio 2001 ó 2002) a 2004		
	Fondos de Proyecto	Fondos Redes y Proyección Externa	Total	Fondos de Proyecto	Fondos Redes y Proyección Externa	Total
Presupuesto Total del Proyecto (.... años)	416.000.000,00	29.540.000,00	445.540.000,00	416.000.000,00	29.540.000,00	445.540.000,00
Presupuesto total del año	150.000.000,00	250.000,00	150.250.000,00	150.000.000,00	250.000,00	150.250.000,00
(A) Total presupuesto traspasado al 31/12/04	416.000.000,00	29.540.000,00	445.540.000,00	416.000.000,00	29.540.000,00	445.540.000,00
(B) Total presupuesto rendido al 31/12/04	404.240.674,00	29.290.000,00	433.530.674,00	404.240.674,00	29.290.000,00	433.530.674,00
Saldo por rendir (A-B)	11.759.326,00	250.000,00	12.009.326,00	11.759.326,00	250.000,00	12.009.326,00

Iniciativa Científica Milenio
Memoria Anual 2005: Estructura de ingresos y gastos (\$ x 1.000)

	Año 2004			Acumulado años (inicio: 2001 ó 2002) a 2004		
	Fondos de Proyecto	Fondos Redes y Proyección Externa	Total	Fondos de Proyecto	Fondos Redes y Proyección Externa	Total
Ingresos	150.000.000,00	250.000,00	150.250.000,00	416.000.000,00	29.540.000,00	445.540.000,00
Egresos						
Honorarios	93.370.000,00		93.370.000,00	281.910.000,00		281.910.000,00
Pasajes, viáticos, congresos	25.847.987,00		25.847.987,00	63.688.830,00		63.688.830,00
Bienes y Equipos	3.313.621,00	0,00	3.313.621,00	17.558.961,00	0,00	3.419.486,00
Infraestructura2	0,00		0,00	0,00		17.558.961,00
Gastos de Administración	4.436.582,00		4.436.582,00	12.989.868,00		0,00
Gastos de pólizas	0,00		0,00	0,00		12.989.868,00
Publicaciones y suscripciones	173.529,00		173.529,00	173.529,00		0,00
Consultorías	6.000.000,00	0,00	6.000.000,00	6.000.000,00	29.290.000,00	173.529,00
Gastos de Institución Albergante	3.500.000,00		3.500.000,00	18.500.000,00		35.290.000,00
Imprevistos	0,00		0,00	0,00		18.500.000,00
Total de egresos	138.240.674,00	0,00	138.240.674,00	404.240.674,00	250.000,00	0,00
						433.530.674,00
Saldo al 31/12/04	11.759.326,00	250.000,00	12.009.326,00	11.759.326,00	250.000,00	12.009.326,00

Annexes
Publications attached.

ANEXOS DE TABLAS

Publicaciones Anexo 1:

Status de la publicación	Con apoyo financiero de la ICM y especificando agradecimientos a la ICM N° de publicaciones	Con otras fuentes de financiamiento no ICM N° de publicaciones	Total N° de Publicaciones
(a) Artículos¹			
Publicados	1(*)	3	4
Aceptados o en prensa	7	3	10
Enviados	11	0	11
Total artículos	19	6	25
(b) Libros, capítulos libros y otras publicaciones			
Publicados	48	15	63
Aceptados o en prensa	7	5	12
Enviados	5	4	9
Total libros	60	24	84
Total publicaciones (a+b)	79	30	109

(*) No incluimos aquí 16 artículos en conferencias LNCS, que efectivamente son indexadas por ISI. Lo mismo en toda la parte (a).

Congresos Anexo 2:

Tipo de congreso	N° de viajes financiado por fondos ICM	N° de viajes financiado por otras fuentes de financiamiento	Total
Internacional	9	11	20
Nacional	1	3	4
Total	10	14	24

Patentes Anexo 3:

Patente*	N° Solicitadas	N° Otorgadas	N° En trámite
En Chile			
En el extranjero			
Total			

*: Identificar cada patente con Número de registro de ésta

Presentaciones en congresos Anexo 4:

¹ Comprende artículos, revisiones de literatura y notas científicas, todas en revistas ISI.

Tipo de exposición o conferencia	Nº Nacional	Nº Internacional
Conferencias o charlas	3	20
Comunicaciones Orales o Pósters	0	1

Comités Editoriales y revisión de artículos científicos Anexo 5:

Miembro de Comité Editorial	Identificación de la revista o publicación	Período
Ricardo Baeza Yates	ACM Transactions on Information Systems (USA), 2003- VLDB Journal (USA), 2003- Information Systems (USA), 2002- Information and Management (Netherlands), 2004- Journal of Web Engineering (USA), 2003- Theoretical Informatics and Applications - RAIRO (France), 2001- Information and Software Technology (Netherlands), 1995- International Journal of Web Information Systems (UK), 2004- Grammars (Spain), 2004- Journal of Digital Management (South Korea), 2003- Journal of the SBC (Brazil), 2000- First Monday (USA), 2001- El Profesional de la Información (Spain), 2002- Revista de la SCCC (Chile), 1998- Revista Colombiana de Informática, 2000-	
Gonzalo Navarro	Information Retrieval, 2004-	
Arbitro de publicaciones de revistas de la especialidad	Identificación de la revista o publicación	Período

Ricardo Baeza-Yates	Communications of the ACM, Journal of the ACM, IEEE Trans. on Computers, IEEE Trans. on Data and Knowledge Engineering, IEEE Trans. on Circuits and Systems, Journal of Algorithms, BIT/Nordic Journal of Computing, Algorithmica, ACM Computing Surveys, ACM Trans. on Database Systems, VLDB Journal, ACM Trans. on Information Systems, Information Systems, SIAM Journal on Discrete Mathematics, SIAM Journal on Computing, Computational Geometry: Theory and Applications, Journal on Combinatorial Theory (A), Information and Computation, Information Processing Letters, VLDB Journal, Artificial Intelligence, Random Structures & Algorithms, Theoretical Computer Science, Software-Practice and Experience, Combinatorics, Probability & Computing, Parallel Computing, Journal of Automata, Languages & Combinatorics, Acta Informática, The Computer Journal, Mathematical Reviews, Information and Software Technology.	
Gonzalo Navarro	Algorithmica, IEEE Trans. on Information Theory, Information Sciences, Information Processing Letters, J. of Algorithms, Languages, and Computation, J. of Discrete Algorithms, Theoretical Computer Science, ACM Trans. on Information Systems, IEEE IEEE/ACM Transactions on Computational Biology and Bioinformatics.	2004
Andrea Rodríguez	ETRI Journal	2004

Organización de eventos internacionales Anexo 6:

Nombre del evento internacional (conferencia, congreso, simposio, seminarios, otros)	Año	Características del evento (cifras aproximadas)					Responsabilidad. Marque con una X	
		Participantes [Número]	Total Expositores [Número]	Expositores Extranjeros [Número]	Duración [días]	Público Objetivo ²	Director	Miembro del Comité Organizador

NOMENCLATURA:
Publico Objetivo

² Según la nomenclatura entregada, coloque el (los) número(s) correspondiente al público objetivo del evento.

1 : Docentes Universitarios docentes	3: Estudiantes de postgrado	5: Otros
2: Estudiantes de pregrado Comunidad en General	4: Comunidad científica	6:
7: Otros		

Educación y formación de personas Anexo 7:

Identificar con el nombre a cada becario, y demarcar todos aquellos que ingresaron al centro durante el año correspondiente al período de esta Memoria.

** : Debe considerarse beca parcial o completa de ICM.

Programa*	Beca financiada por ICM**	Beca financiada por otras fuentes de financiamiento	Total
	Monto \$	Monto \$	Monto \$
Postdoctorado			
Carlos A. Hurtado	6.500.000		6.500.000
Doctorado			
Rodrigo Paredes	5.000.000		5.000.000
Carlos Castillo	5.000.000		5.000.000
Eric Tanter	5.000.000		5.000.000
Cuauhtemoc Rivera	1.600.000	1.200.000	2.800.000
Magíster			
Barbara Poblete	1.500.000		1.500.000
Carolina Bonacic*	1.200.000		1.200.000
Rodrigo Frez*	1.200.000		1.200.000
Simón Smith	2.000.000		2.000.000
Licenciatura			
Total	29.000.000	1.200.000	30.200.000

Gestión financiera Anexo 8:

Fondos	Monto en M\$	Porcentaje de recursos utilizados en el Instituto/Núcleo¹	Total Aporte ajustado en M\$²
Fondecyt	45	20	9.0
FONDEF			
FONDAP			
FONTEC			
Universidad			8.0
Fundaciones			
Gobierno regional			
Empresas privadas			
Fondos instituciones gobierno de Chile			
Proy. Chile Corea	25	40	10.0
Otros fondos RIBIDI (CYTED)	30	30	9.0
Otros fondos PROYECTO ALFA	8	10	0.8
Otros fondos NIC CHILE			0.5
TOTAL			37.3

1: Corresponde al monto de los recursos del fondo utilizados para la operación del Instituto o

2: Monto Núcleo total ajustado por la proposición declarada al Instituto / Núcleo