

ESTADO FINAL RESOLUCION DEL CONSEJO Observaciones: _____ _____	FECHA <div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> 1. APROBADO 2. PENDIENTE 3. RECHAZADO 4. A FISCALIA
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EVALUATION REPORT CENTERS FOR ADVANCED RESEARCH

I. PROJECT INFORMATION

CENTER'S NAME

Center of Mathematical Modeling

DIRECTOR

Jaime San Martin

II. EVALUATION PANEL

NAME	ORGANIZATION/ INSTITUTION	E-MAIL	SIGNATURE
REVIEWER 1			

III. PROGRAMS EVALUATION (please fill up as many forms as programs exist within the Center)

PROGRAM'S NAME

Probability theory

PRINCIPAL INVESTIGATOR

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program	x			
Quantity of the results reached regarding the objectives and goals	x			
Quality of reached outcomes related to proposal objectives and goals	x			
Degree of integration with other ongoing programs of the Center		x		
Diffusion of the results	x			

PROGRAM'S NAME

Optimization and equilibrium

PRINCIPAL INVESTIGATOR

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program	x			
Quantity of reached outcomes related to proposal objectives and goals	x			
Quality of reached outcomes related to proposal objectives and goals	x			
Degree of integration with other ongoing programs of the Center		x		
Diffusion of the results	x			

* If there had been none, please disregard this question

PROGRAM'S NAME Mathematical mechanics
PRINCIPAL INVESTIGATOR

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program	X			
Quantity of the results reached regarding the objectives and goals	X			
Quality of reached outcomes related to proposal objectives and goals	X			
Degree of integration with other ongoing programs of the Center		X		
Diffusion of the results	X			

PROGRAM'S NAME Discrete mathematics				
PRINCIPAL INVESTIGATOR				
ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program	X			
Quantity of reached outcomes related to proposal objectives and goals		X		
Quality of reached outcomes related to proposal objectives and goals	X			
Degree of integration with other ongoing programs of the Center		X		
Diffusion of the results	X			

* If there had been none, please disregard this question

PROGRAM'S NAME Nonlinear analysis in PDE
PRINCIPAL INVESTIGATOR

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program	x			
Quantity of the results reached regarding the objectives and goals	x			
Quality of reached outcomes related to proposal objectives and goals	x			
Degree of integration with other ongoing programs of the Center		x		
Diffusion of the results	x			

PROGRAM'S NAME Center for research in mathematical engineering (CI2MA)
PRINCIPAL INVESTIGATOR

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program	x			
Quantity of reached outcomes related to proposal objectives and goals	x			
Quality of reached outcomes related to proposal objectives and goals	x			
Degree of integration with other ongoing programs of the Center		x		
Diffusion of the results	x			

* If there had been none, please disregard this question

IV. CENTER EVALUATION

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Uso Interno
Degree of adoption of suggestions from the last report *		x		
Accomplishment of objectives and goals of the Center	x			
Quantity of reached outcomes related to proposal objectives and goals	x			
Quality of reached outcomes related to proposal objectives and goals	x			
Degree of integration between the programs of the Center		x		
Creation and reinforcement of international networks	x			
Outreach	x			
Diffusion of results	x			
Establishment and tasks of the Advisory Committee		x		

RECOMMENDATIONS (see following concepts)

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APPROVE	APPROVAL WITH SUGGESTIONS	ADDITIONAL INFO.	PENDING	REJECT	FONDECYT USE

26	11	09
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Evaluation Date

Signature reviewer

EVALUATION CONCEPTS ANNUAL REPORT

1. **Approve:** The reviewer recommends to accept the report in its present form since he/she considers objectives and goals fully accomplished and all relevant issues covered by the report.
2. **Approval with suggestions or minor observations**
 - 2.1 **Minor observations:** The reviewer recommends the approval of the report despite the justified incompleteness of some aspects that does not constitute an obstacle for the continuity of the Center activities.
 - 2.2 **Suggestions:** The reviewer recommends minor changes in order to improve the future performance of the Center.
3. **Additional information:** The reviewer requires additional documentation or specific explanations to fully evaluate the report.
4. **Pending:** The reviewer makes significant observations to the report and conditions its approval to the accomplishment of specific demands.
5. **Reject:** The reviewer has strong objections to the contents of the report.

EVALUATION COMMENTS: This center represents an activity initiated in a number of countries during the recent years. Mathematical modeling and computations has developed to be an indispensable tool in many areas of science and industrial research. Therefore, many centers which have the focus on such research have been created. The profile of these centers is usually slightly different than the profile of traditional mathematics departments at universities, with a stronger focus on applications and computations, but still with mathematics as their core subject.

In general, I find the quality of the research at CMM to be of very high. The research groups in probability theory, optimization, mathematical mechanics, and nonlinear analysis in PDE all have published papers in excellent international journals, and the level of these activities are comparable to similar research groups at many US or European universities. The research in discrete mathematics is also promising, even if this activity seems less developed than the others at this point. I find that there is reasonable balance between theory and applications in the research performed at the center. I am also impressed by the number of industrial projects. The center has a fair number of international partners and guests. The international scientific committee consists of an impressive list of top international researches.

The CMM also has a research group in numerical analysis organized as part of the Center for Research in Mathematical Engineering (CIME). The activity is quite reasonable, with focus on topics like numerical methods for optimization, finite element methods and its applications, and numerical solution of conservation laws. However, it would be clearly beneficial for the research if there were closer contacts between this group and, for example, the activities in mechanics and nonlinear analysis. In many of the research areas in these fields a close connection between theory and computations is necessary for further progress and the CMM should have the proper combination of researches to create such interdisciplinary research groups within mathematics.

ADDITIONAL INFORMATION REQUIRED FOR THE FULL EVALUATION OF THE ANNUAL REPORT:

If you require additional information or leave the evaluation pending, please indicate the documentation or explanations required to complete the evaluation. In case there are additional demands that the Center's director has to accomplish, these have to be explained so the director may take the necessary measures.

If you entirely reject the contents of the report (or significant portions of it) please indicate here the demands that should be posted to the Center' director.

RECOMMENDATIONS TO THE CENTER DIRECTOR:

(only if report is approved))

The director should try to initiate more cooperation between the activity in numerical analysis and the other main research directions in the center, in particular with the activity in mechanics and nonlinear analysis of PDE.

The center has an international scientific committee consisting of ten people. All of them are excellent scientists, and therefore very valuable contacts for the center. However, with such a large committee it is difficult to organize physical meetings. I think it would have been useful for the center to have such meetings, for example once a year. Therefore, the center should consider the possibility of having a smaller scientific committee, or to nominate part of this board as a core group that could meet more regularly.

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EVALUATION REPORT CENTERS FOR ADVANCED RESEARCH

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CENTER'S NAME

Center for Mathematical Modeling

DIRECTOR

Jaime San Martin

II. EVALUATION PANEL

NAME	ORGANIZATION/ INSTITUTION	E-MAIL	SIGNATURE
REVIEWER 2			

III. PROGRAMS EVALUATION (please fill up as many forms as programs exist within the Center)

PROGRAM'S NAME

Center for Mathematical Modeling -- applied to all programs within Center

PRINCIPAL INVESTIGATOR

Jaime San Martin

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *	X			
Accomplishment of objectives and goals of the reported program	X			
Quantity of the results reached regarding the objectives and goals	X			
Quality of reached outcomes related to proposal objectives and goals	X			
Degree of integration with other ongoing programs of the Center	X			
Diffusion of the results	X			

PROGRAM'S NAME

PRINCIPAL INVESTIGATOR

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Internal use
Degree of adoption of suggestions from the last report *				
Accomplishment of objectives and goals of the reported program				
Quantity of reached outcomes related to proposal objectives and goals				
Quality of reached outcomes related to proposal objectives and goals				
Degree of integration with other ongoing programs of the Center				
Diffusion of the results				

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IV. CENTER EVALUATION

ITEM	Total/ Good	Partial/ Regular	Insufficient/ Deficient	Uso Interno
Degree of adoption of suggestions from the last report *	X			
Accomplishment of objectives and goals of the Center	X			
Quantity of reached outcomes related to proposal objectives and goals	X			
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Degree of integration between the programs of the Center	X			
Creation and reinforcement of international networks	X			
Outreach	X			
Diffusion of results	X			
Establishment and tasks of the Advisory Committee	X			

RECOMMENDATIONS (see following concepts)					
<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">X</div>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; background-color: #e0ffff;"></div>
APPROVE	APPROVAL WITH SUGGESTIONS	ADDITIONAL INFO.	PENDING	REJECT	FONDECYT USE

Feb	22	2010
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Evaluation Date

Signature reviewer

EVALUATION CONCEPTS ANNUAL REPORT

2. **Approve:** The reviewer recommends to accept the report in its present form since he/she considers objectives and goals fully accomplished and all relevant issues covered by the report.
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5. **Reject:** The reviewer has strong objections to the contents of the report.

EVALUATION COMMENTS:

This document is an evaluation of the 2009 Annual Report submitted by the Center for Mathematical Modeling (CMM).

The report demonstrates the Center's truly outstanding performance in every aspect of its mission. As stated in previous evaluations, the Center for Mathematical Modeling is one of the world's most successful research centers in applied mathematics. This achievement is largely due to the ongoing outstanding leadership of the CMM and the high quality of the efforts of the participants. The CMM has continued to evolve in new and productive ways to achieve its mission and has achieved significant visibility in the international scientific community. Its ongoing vitality is without question.

The Center is organized around six active areas in basic research: (1) probability theory, (2) optimization and equilibrium, (3) mathematical mechanics, (4) discrete mathematics, (5) nonlinear analysis in partial differential equations, and (6) numerical analysis. The members of these groups are extremely productive in research, much of it published in major international journals, and have received recognition for their work from international bodies. They interact with other scientists and engineers from a broad spectrum of fields, many of which represent areas of great opportunity and promise for collaboration and national/international impact.

There are a number of indicators that support the conclusion that the CMM is a major contributor to the scientific enterprise in Chile and to the wider scientific community. From the time of the Center's creation through the current reporting period, CMM researchers and collaborators have published over 500 papers (representing about 35% of Chilean publications in mathematics), many in prestigious international journals. In particular, during 2008, 82 papers by CMM researchers appeared and more than 80 visitors were hosted at the CMM for an average of one month. Also during the reporting period, 6 congresses, 10 workshops, and 72 seminars were organized. In particular, the congresses and workshops had a strong international presence. In addition, one patent was approved and one was submitted.

The CMM has an exceptional record in collaborations with industrial partners, national ministries, and educational institutions. The industrial projects included contracts with CODELCO divisions and its technology start-ups BIOSIGMA and MICOMO, Antofagasta Railway, IFOP, San Pedro Winery, Microsoft, SOLVAY, MOVISTAR, Geoaguas, Alstom, and Siemens (EU funds) and with government ministries, including the Chilean Ministry of Education and the Peruvian and Colombian Ministries of Telecommunication. The areas covered by these partnerships and other activities include applications to renewable resources, information security, planning in wineries, decision-making in the closure and productive restructuring process, water resources, modeling urban-guided rail systems, bioinformatics, leaching in copper mines, communications networks, geomechanics, atmospheric modeling, imaging and visualization, and high performance computing. These projects represent a wide array of applications that in turn require a broad spectrum of mathematical ideas and tools in order to make progress on the problems to be addressed and solved. Many of them involve problems in important sectors of the Chilean economy and thus contribute to the economic

well-being of the country. The projects were carefully chosen to match the available expertise of the CMM members and collaborators, and many of them have demonstrated considerable success and impact. These very strong connections fostered by the CMM between basic research in mathematics and applications to real world problems make this center one of the very few places where this integration is so successful.

The CMM also plays an important role in the education and training of the next generation of researchers and in the development of new tools for the improvement of the Chilean educational system. The Center enrolls around 40 Ph.D. candidates and 130 undergraduates, many of whom then go on to graduate study at leading international universities. During 2008, it hosted 9 postdoctoral fellows, produced 29 Ph.D. theses, and trained 3500 engineering undergraduate students in mathematics courses taught by CMM members. CMM also has a strong educational mission in the teaching and learning of mathematics, including involvement in teacher preparation and enhancement projects, development of standards, curriculum and materials development, and textbook evaluation. It also co-organized a national mathematics competition for high school students, as well as the primary school version of this tournament. A group from the Laboratory of Bioinformatics and Mathematics of Genome (LBMG) provided technical and creative support for an exhibition at the MIM in Santiago, which later toured other major cities in Chile.

CMM continues to have a strong international presence. About 85% of the papers produced at the center are in collaboration with researchers outside Chile, preponderantly from France, the rest of Europe, Latin America, the United States, and Canada> There are also emerging promising collaborations with China, India, and Japan. Each year, around 10 new postdocs arrive from all over the world. In addition to already being a long-time member of the Centre Nationale de Recherches Scientifiques (CNRS) of France, CMM belongs to an international network of centers including MITACS and CIRRELTs (Canada), PIMS (Canada-USA), MATHEON (Germany), MASCOS (Australia), and Paris VI (France). It also maintains strong links to IMPA and USP in Brazil. CMM co-founded PRIMA, a group of Pacific Ring mathematics participants and also actively participates in an international grid computing network, PRAGMA.

In summary, the CMM continues to maintain the highest standards of excellence in research, outreach, and education. I very strongly recommend accepting this report in its present form, as I believe that the CMM is fully addressing its goals and objectives as well as the issues covered by the report. Significant progress in all areas of its operation is being made -- the Center continues to evolve and enlarge its outreach and mission in highly productive directions. In my opinion, the positive comments included in the most recent visit of the review committee are still operative and significant progress has been made in addressing its recommendations. The CMM is an outstanding contributor to the excellence of Chilean science and engineering through its research, both basic and applied, and through its development of the next generation of mathematical scientists. Its achievements are truly impressive.

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If you entirely reject the contents of the report (or significant portions of it) please indicate here the demands that should be posted to the Center' director.

NONE REQUIRED – THE REPORT IS COMPLETE

RECOMMENDATIONS TO THE CENTER DIRECTOR:

(only if report is approved))

The only suggestions are to continue with the plans for programs, management, and governance as proposed in the annual report.