

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF Informe de Paneles de Evaluación Internacionales

EVALUATION OF FONDECYT, PIA/FONDAP
AND FONDEF PROGRAMS
Report of International Review Panels



Marzo/March
2013



CONICYT
Ministerio de Educación

Gobierno de Chile

COMISIÓN NACIONAL DE INVESTIGACIÓN CIENTÍFICA Y TECNOLÓGICA, CONICYT

**EVALUACION DE LOS PROGRAMAS
FONDECYT, PIA/FONDAP Y FONDEF**

Informe de Paneles Internacionales de Evaluación

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Edición, Diseño y Producción / Edition, Design and Production
CONICYT

Impreso en Chile / Printed in Chile
Santiago, Marzo 2013

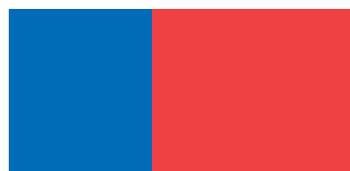


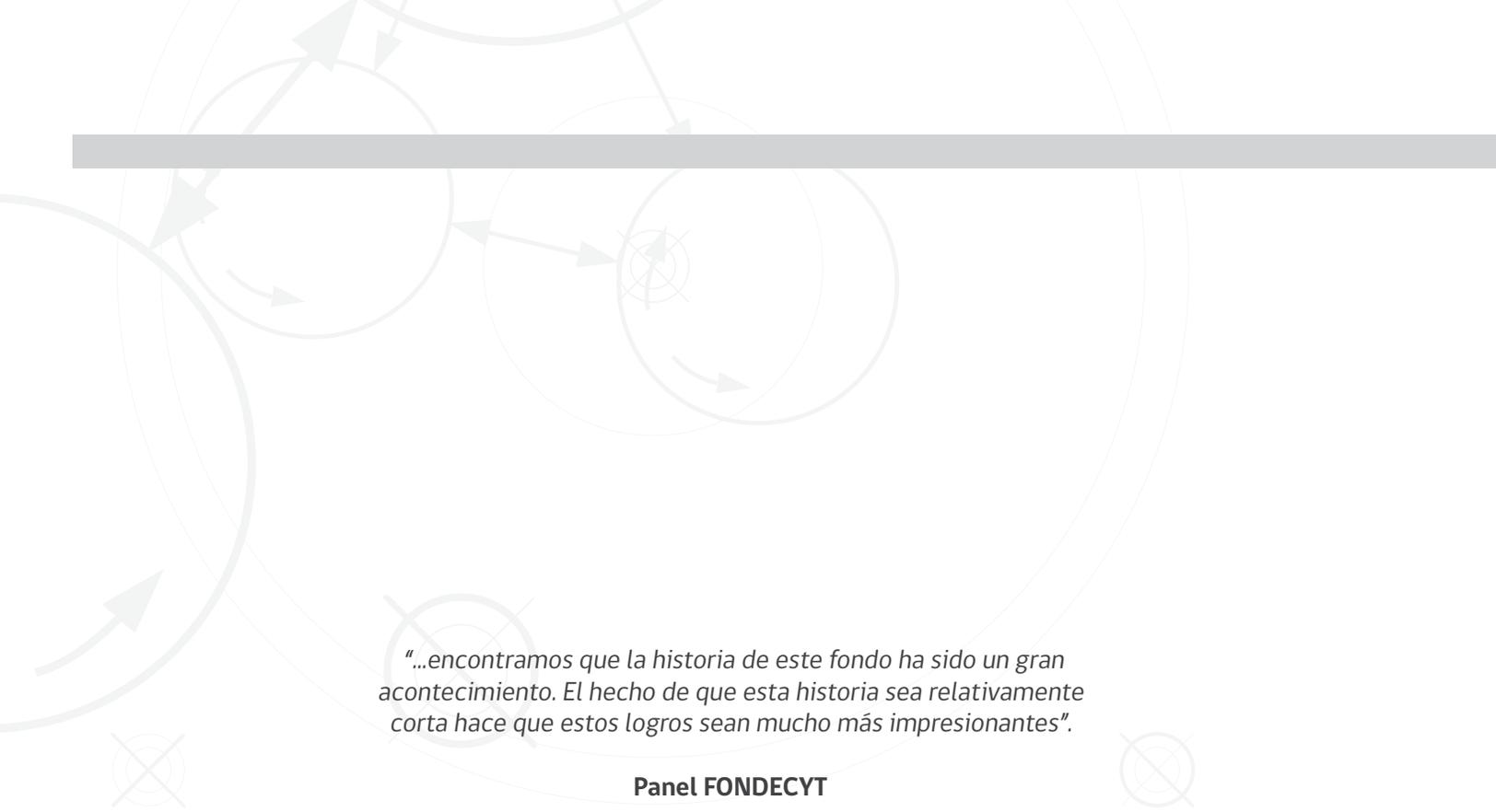
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"...encontramos que la historia de este fondo ha sido un gran acontecimiento. El hecho de que esta historia sea relativamente corta hace que estos logros sean mucho más impresionantes".

Panel FONDECYT

"FONDEF opera en una interface crucial para el desempeño de una economía del conocimiento... Encontramos que el FONDEF es un programa importante que ha dado valor a Chile".

Panel FONDEF

"Dado el nivel de fondos invertidos, los resultados de los científicos chilenos en términos de investigación, entrenamiento de capital humano a los estándares más altos, y alcance a la economía y la sociedad, son extraordinarios".

Panel FONDAP/PIA

"...we find the history of this research funding program to be one of its great achievements. The fact that this history is relatively short makes these achievements even more impressive".

FONDECYT Panel

"FONDEF operates on an interface that is crucial to the economic performance of a knowledge economy...We found FONDEF to be a useful program that has delivered value to Chile".

FONDEF Panel

"Given the amount of funds invested, the achievements of Chilean scientists in terms of research, training of human capacity to the highest standards, and outreach to the economy and society have been extraordinary".

FONDAP/PIA Panel

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

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PRESENTACIÓN

Desde hace 45 años la Comisión Nacional de Investigación Científica y Tecnológica, CONICYT, ha financiado la mayor parte de la actividad de investigación en el campo de las ciencias físicas y naturales, la medicina e ingenierías, las ciencias sociales y humanidades, y la ciencia aplicada. Durante este período, CONICYT ha operado casi exclusivamente a través de instrumentos que apoyan las ideas de investigadores individuales o de grupos de investigadores.

Uno de los ejes estratégicos de CONICYT para el período 2010-2014 es la sustentabilidad de la plataforma de investigación científica, formada básicamente por los instrumentos de financiamiento de los programas FONDECYT, FONDAP, PIA y FONDEF. Un elemento crítico para la visión futura de estos fondos era su evaluación en cuanto a los objetivos y el diseño de los instrumentos, la idoneidad de los procesos involucrados y los resultados e impactos alcanzados.

Los paneles de revisión por pares (peer review panels) son una forma bastante usada internacionalmente para la evaluación de la calidad científica de instituciones, programas e instrumentos¹. Por consiguiente, se escogió esta modalidad de evaluación para examinar el desempeño reciente de cuatro de los principales programas de CONICYT que representaron en 2012 cerca del 85% de los fondos concursables, alcanzando un desembolso anual aproximado de 110.000 millones de pesos, unos USD 220 millones.

En este documento se presentan los resultados de la evaluación realizada por 17 expertos internacionales de reconocido prestigio y experiencia en la materia, a quienes se solicitó expresamente que los criterios y estándares utilizados fueran los mismos que rigen en sus países de origen (ver perfiles de panelistas en página 35). Este documento contiene los informes finales originales en idioma inglés, editados solamente para darles un formato uniforme, puesto que la evaluación se llevó a cabo por tres grupos que trabajaron bajo un esquema similar pero en forma independiente. Adicionalmente se presenta un compendio en idioma español elaborado por CONICYT que da cuenta de las principales observaciones y conclusiones de los informes.

Es motivo de satisfacción para CONICYT presentar este análisis que identifica las debilidades y fortalezas de los respectivos programas, y sugiere cuáles son los principales desafíos a futuro. Aunque perfectible, estimamos que este tipo de evaluación -internacional, experta, por pares y directa- es la mejor manera para obtener una retroalimentación que dé cuenta del uso de los recursos públicos y sirva para orientar algunas decisiones estratégicas de mediano plazo.



José Miguel Aguilera R.
Presidente de CONICYT
Santiago, enero de 2013

¹ T. Luukkonen-Gronow, 1987. Scientific research evaluation: a review of methods and various contexts of their application. R&D Management 17 (3): 207-221.

PRESENTATION

For the past 45 years, the National Commission for Scientific and Technological Research (CONICYT) has funded most of the research activity in the fields of physical and natural sciences, medicine and engineering, humanities and social science, and applied science. During this period, CONICYT has operated almost exclusively through instruments that support the ideas of individual researchers or groups of researchers.

One of the strategic axes of CONICYT for the 2012–2014 period is the sustainability of the scientific research platform, basically constituted by the financing instruments of FONDECYT, FONDAP, PIA and FONDEF programs. A critical element for the future vision of these funds is their evaluation based on the objectives and the design of their instruments, the suitability of the involved processes, and their results and impacts.

Peer review panels are widely used internationally to assess the scientific quality of institutions, programs and instruments¹. Therefore, this evaluation mechanism was chosen to examine the recent performance of four of the main programs of CONICYT, which represented during 2012 nearly 85% of the available funds for competitions to support research in S&T, reaching an approximate annual disbursement of 110,000 million Chilean pesos, close to USD 220 million.

This document presents the results of the evaluation performed by 17 international experts of renowned prestige and experience in the field, who were explicitly requested to apply the same criteria and standards used in their countries of origin (see profiles of the panel members on page 35). This document contains the final original reports in English, edited only to provide them with a uniformed format, since the evaluation was carried out by three groups that worked under a similar scheme but independently. A summary prepared by CONICYT is also presented in Spanish and English, highlighting the main observations and conclusions of the reports.

It is gratifying for CONICYT to present this analysis which identifies the weaknesses and the strengths of the respective programs, and recommends what will be the main challenges for the future. Although there is room for improvement, we estimate that this type of evaluation – international, expert, by peers and direct – is the best way to obtain feedback on the use of public resources and helps guiding strategic decisions in the medium term.



José Miguel Aguilera R.
President of CONICYT
Santiago, January 2013

¹ T. Luukkonen–Gronow, 1987. Scientific research evaluation: a review of methods and various contexts of their application. *R&D Management* 17 (3): 207–221.



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EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

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RESUMEN EJECUTIVO

El presente documento muestra los resultados de la primera evaluación internacional por pares realizada por CONICYT a los principales programas de apoyo a la investigación científica que nuestro país desarrolla a través de esta institución. Esta evaluación se enmarca dentro del eje estratégico de “Sustentabilidad”, definido por CONICYT para el año 2012, y que apunta a tener instrumentos robustos y de largo plazo para disminuir la brecha en el desarrollo de ciencia y tecnología que separa a Chile de países con economías desarrolladas. La evaluación aquí presentada constituye uno de los acontecimientos más importantes para CONICYT durante el año 2012.

Un grupo de 17 expertos fue conformado por investigadores, académicos y especialistas en gestión de la investigación en ciencia y tecnología, además de directores de centros de investigación y de programas de agencias similares a CONICYT en EE.UU., Europa, Australia y Latinoamérica. El grupo fue convocado para formar tres paneles. Los programas FONDECYT y FONDEF fueron evaluados cada uno por un panel de cinco expertos, en cambio los programas asociativos FONDAP y PIA fueron evaluados en conjunto por un panel de siete expertos. En cuanto al programa PIA, se sometieron a evaluación únicamente los Anillos de Investigación y los Centros Basales, mientras que los demás programas fueron evaluados en su totalidad, considerando todos sus instrumentos. Cabe destacar que estos programas administraron en 2012 cerca del 85% del presupuesto que CONICYT destina al apoyo de la investigación en ciencia y tecnología, un equivalente USD 220 millones.

Las evaluaciones se centraron sobre tres factores que comprenden aspectos fundamentales de cada programa:

- Diseño y objetivos
- Procesos
- Resultados e impacto

La evaluación se llevó a cabo en dos etapas, una remota y otra presencial. Durante la etapa remota, cada experto recibió información en idioma inglés referente al contexto nacional, al Sistema Nacional de Innovación (SNI), a CONICYT e *in-extenso* acerca de los respectivos programas a evaluar. Los expertos contaron con un periodo de un mes para revisar el material y para completar un formulario diseñado por CONICYT que les permitiese entregar su opinión preliminar acerca del desempeño de cada uno de los programas, además de indicar a CONICYT cualquier requerimiento de información adicional que debía ser puesta a su disposición durante la siguiente etapa.

Durante la etapa presencial, los 17 expertos visitaron Santiago entre los días 26 y 30 de noviembre de 2012. Durante la visita los panelistas se reunieron con el Ministro de Educación, con el Presidente de CONICYT, con los directores de los programas evaluados, con directores de diferentes instituciones asociadas al SNI, visitaron universidades y centros tecnológicos, tanto en Santiago como en Valparaíso y Concepción, y se entrevistaron con beneficiarios de los programas evaluados. Al final de la visita, cada panel generó un reporte de consenso compilando sus observaciones y recomendaciones, considerando el desempeño de los programas de CONICYT dentro de un contexto de estándares mundiales. Cada informe fue presentado durante una sesión plenaria final a la cual asistieron representantes del Consejo Asesor de la Presidencia de CONICYT, y directores y ejecutivos tanto de los programas evaluados como de otros programas invitados.

En este documento se presentan los reportes finales de forma íntegra en el idioma original en que fueron generados (inglés). Adicionalmente se entrega un compilado con los principales resultados y recomendaciones en español e inglés, que en ningún caso reemplaza a los informes originales *in-extenso*.

Los principales contenidos de los informes de cada panel se presentan a continuación:

EXECUTIVE SUMMARY

This document shows the results of the first international peer review organized by CONICYT of the main support programs for scientific research that our country develops through this institution. This evaluation is framed under the strategic axis of "Sustainability", defined by CONICYT for the year 2012, which aims at having strong long-term instruments to bridge the gap in the development of science and technology that separates Chile from countries with developed economies. The evaluation presented here is one of the most important events for CONICYT during the year 2012.

A group of 17 experts was formed by researchers, professors and specialists on management of research on science and technology, in addition to the directors of research centers and programs from agencies similar to CONICYT in the United States, Australia, Europe and Latin America. The group was summoned to form three panels; FONDECYT and FONDEF programs were evaluated each by a panel of five experts, whereas the associative programs, FONDAP and PIA, were evaluated together by a panel of seven experts. In regards to PIA program, only the Team Grants (Rings) and Basal Centers were evaluated, while the other programs were evaluated considering all of their instruments. It is worth noting that these programs managed during 2012 nearly 85% of the budget that CONICYT allocates to support research in science and technology, which is equivalent to USD 220 million.

The evaluations were focused on three factors that comprise fundamental aspects in each program:

- Design and objectives
- Processes
- Results and impact

The evaluation was performed in two stages, remote and on-site. During the remote stage, each expert received information in English language regarding the national context, the National Innovation System (SNI by its acronym in Spanish), CONICYT and *in-extendo* on the respective programs to be evaluated. The experts had a one-month period to review the material and to complete a review form designed by CONICYT to allow them to give their preliminary opinion on the performance of each program, as well as to indicate to CONICYT any request for additional information for the following phase.

During the on-site stage, the 17 experts visited Santiago between November 26 and 30, 2012. During this visit, the panel members met with the Minister of Education, the President of CONICYT, the directors of the programs under evaluation, and directors of different institutions associated to the SNI. They also visited universities and technological centers in Santiago, as well as in Valparaíso and Concepción, and interviewed beneficiaries of the programs being evaluated. At the end of the visit, each panel generated a consensus report compiling their observations and recommendations, considering the performance of CONICYT programs within a context of world standards. Each report was presented during a final plenary session, which was attended by representatives of the Advisory Council of the Presidency of CONICYT, and directors and executives from the evaluated programs as well as from invited programs.

This document presents the full final reports in the language in which they were generated (English). Additionally, a compilation of the main results and recommendations in Spanish and English are presented, which under no circumstance replaces the original *in-extendo* reports.

The following are the main contents of the reports for each panel:

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

Informe de Paneles Internacionales de Evaluación

1. FONDECYT

El Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT, ha dado forma a la base científica de Chile durante los últimos 30 años, provocando avances impresionantes en el desarrollo y la estabilización de un sistema nacional de investigación.

Los instrumentos de FONDECYT están estructurados de manera tal que proporcionan una transición suave a través de la carrera de investigación. Gracias a este programa, algunos grupos nacionales participan en la comunidad científica mundial, y Chile actualmente cuenta con un capital humano que le permitiría dar un salto en su base científica y capacidad de investigación.

Sin embargo, el país parece no tener visión ni estrategia adecuadas para la Ciencia y la Innovación. Las principales observaciones y recomendaciones que se hacen al programa tienen que ver con:

- a. Aunque tanto el proceso de postulación como el de evaluación son adecuados y reconocidos por la comunidad científica, existen dificultades de acceso a revisores extranjeros y demasiado énfasis en los currículos de los investigadores.
- b. Las tasas de adjudicación de proyectos son muy altas según estándares internacionales.
- c. Los informes anuales son susceptibles de simplificación.
- d. Se aprecia una falta de coordinación con otros programas financiados por CONICYT e instrumentos similares.
- e. Se sugiere una mayor diversificación de instrumentos y su complementación con otros (becas de doctorado, FONDEQUIP, etc.).
- f. Debiera existir una mayor flexibilidad para acomodar temas nuevos o emergentes.
- g. La exigencia de los proyectos privilegia la cantidad de publicaciones y no da señales de que mejoren su calidad.

Se concluye que FONDECYT debe ser protegido y expandido vigorosamente, puesto que es el programa de financiamiento científico más exitoso de Chile, y sus procesos debiesen ser un ejemplo para otros programas de CONICYT.

2. FONDEF

El Fondo de Fomento al Desarrollo Científico y Tecnológico, FONDEF, es un programa que ha aportado valor a Chile y por tanto debe ser mantenido, pero mejorado en diferentes aspectos para incrementar su impacto. Dentro de este contexto se plantea una serie de comentarios y sugerencias destinadas a alcanzar los objetivos del FONDEF:

- a. Se requiere un mayor enfoque en las necesidades de la industria y sociedad, y una diferenciación clara de programas similares en otras instituciones.
- b. FONDEF debe contribuir a desarrollar habilidades y aptitudes entre los investigadores, que faciliten la interacción con la industria.
- c. El nuevo instrumento IDEa es más flexible, pero el presupuesto es más bajo y la duración de las etapas más corta, con el riesgo de interrupción.
- d. El instrumento VIU incentiva al emprendimiento de jóvenes en ciencia y tecnología, pero debiera ampliarse en cuanto a participantes y mentores.
- e. Los programas temáticos debiesen alinearse mejor con objetivos que promuevan el desarrollo económico y social.
- f. Para ciertos beneficiarios, tanto el proceso de evaluación como la administración del programa parecen ser, ocasionalmente, poco transparentes y técnicamente débiles.



Foto: "Sembrando en el mar", Investigador FONDEF, René Espinoza (Universidad de los Lagos).
Photo: "Farming in the sea", René Espinoza (Universidad de los Lagos), FONDEF Researcher.

EVALUATION OF FONDECYT, PIA/FONDAP AND FONDEF PROGRAMS

Report of International Review Panels

1. FONDECYT

FONDECYT has shaped the science base of Chile during the last 30 years, making impressive progress in the development and stabilization of a national research system.

The instruments of FONDECYT are structured so that they provide a smooth transition through the research career. Thanks to this program some national groups participate in the international scientific community and Chile currently has the human resources that will allow taking a leap in its scientific base and research capacity.

However, the country does not appear to have an adequate vision or strategy for Science and Innovation. The main observations and recommendations to the Program deal with:

- a. Even though both the application and the evaluation processes are adequate and recognized by the scientific community, there are difficulties to access external reviewers and too much emphasis is placed on the CV's of the researchers.
- b. The awarding rate for the projects is too high according to international standards.
- c. Annual reports may be simplified.
- d. A lack of coordination with other programs financed by CONICYT and other similar instruments is observed.
- e. A greater diversification of instruments and their complementation with others (doctoral scholarships, FONDEQUIP, etc.) is suggested.
- f. There should be greater flexibility to accommodate new or emerging topics.
- g. Project requirements favor the quantity of publications and do not give signs of them improving their quality.

It is concluded that FONDECYT must be protected and vigorously expanded, since it is the scientific funding program with greatest success in Chile, and its processes must be an example for other programs of CONICYT.

2. FONDEF

FONDEF is a program that has added value to Chile and, therefore, must be maintained but improved in different aspects in order to increment its impact. In this context, a series of comments and recommendations are made with the aim of reaching the objectives of FONDEF:

- a. A greater focus on the needs of the industry and society, and a clear differentiation from similar programs of other institutions is required.
- b. FONDEF must contribute to developing abilities and capacities among the researchers which will facilitate interaction with the industry.
- c. The new Research and Development in Action (IDEA by its acronym in Spanish) is more flexible, but the budget is lower and the duration of the phases is shorter, with the risk of interruption.
- d. The Valorization of Research in the University instrument (VIU by its acronym in Spanish) promotes entrepreneurship among young people in science and technology, but should be broadened in terms of participants and mentors.
- e. The thematic programs should be better aligned with objectives that promote economic and social development.
- f. For certain beneficiaries, both the evaluation process as well as the administration of the program appear occasionally as not being transparent enough and technically weak.



Foto: "Ecología marina de ambientes submareales", gentileza del investigador FONDECYT Alejandro Pérez (Universidad de Valparaíso).
Photo: "Marine ecology of subtidal environments", courtesy of Alejandro Pérez, FONDECYT Researcher (Universidad de Valparaíso).



Foto: "Generación de vacuna recombinante contra el virus sincicial", investigador FONDEF Alexis Kalergis (Universidad Católica).
Photo: "Creation of recombinant vaccine against syncytial virus", Alexis Kalergis, FONDEF Researcher (Universidad Católica).

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

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3. FONDAP

El Fondo de Financiamiento de Centros de Excelencia en Investigación en Áreas Prioritarias, FONDAP, ha sido un buen avance para el sistema de investigación, aumentando la calidad de la investigación fundamental y la cooperación entre investigadores. La misión de FONDAP es clara y sus objetivos son consistentes con ella. Es un programa bien diseñado y estable, que ha ayudado a mejorar los resultados de los científicos chilenos. El enfoque en áreas prioritarias es adecuado, pero debe existir mayor transparencia en la identificación de éstas. El esquema de apoyo de 5+5 años ha demostrado ser beneficioso para el establecimiento de nuevos centros. Se recomienda:

- a. Continuar con FONDAP mediante concursos efectuados en forma más regular.
- b. Las áreas prioritarias necesitan alinearse con las prioridades nacionales de investigación.
- c. Algunos procesos debieran ser simplificados.
- d. Se deben desarrollar indicadores de impacto, tanto cuantitativos como cualitativos.

4. PIA

El Programa de Investigación Asociativa, PIA, ha impulsado el progreso de la ciencia hacia estándares internacionales, incrementando la productividad científica y es deseable que continúe haciendo este aporte.

El instrumento Basal promueve la investigación colaborativa de forma abierta, sin priorización de áreas, lo que lo hace un programa flexible. Su énfasis en la transferencia tecnológica es positivo, pero la exigencia de crear patentes y resultados que puedan salir al mercado podría inducir a evitar la investigación de más alto riesgo. El sistema de financiamiento 5+5 es adecuado. Los Anillos de Investigación han inducido la cooperación entre diferentes disciplinas, pero los montos adjudicados no son adecuados en comparación con concursos individuales (FONDECYT). Los informes financieros son excesivos y hay poca flexibilidad para modificar objetivos y ajustar el presupuesto. El problema del bajo overhead es una limitante. Hay preocupación por aquellos investigadores que no tienen acceso a financiamiento por el programa, pues podrían no ser capaces de competir en el futuro. Se recomienda:

- a. Continuar con los fondos Basales y Anillos.
- b. Favorecer la interacción entre Basal y FONDEF.
- c. Reducir los requerimientos administrativos y la rigidez que impide incorporar nuevas orientaciones y objetivos durante el transcurso de los proyectos.



3. FONDAP

FONDAP has resulted in significant progress for the research system, increasing the quality of fundamental research and the cooperation among researchers. The mission of FONDAP is clear and its objectives are consistent with it. It is a well-designed and stable program that has aided in improving the results of Chilean scientists. The focus in priority areas is adequate, but there must be more transparency on their identification. The support scheme of 5+5 years has demonstrated to be beneficial for the establishment of new centers. The following recommendations are made:

- a. Continue with FONDAP through competitions held more regularly.
- b. The priority areas need to be aligned with the national research priorities.
- c. Some processes should be simplified.
- d. Impact indicators, both quantitative and qualitative, should be developed.

4. PIA

PIA has prompted the progress of science towards international standards, increasing the scientific productivity and it is desirable that it continue with this contribution.

The Basal instrument promotes research in an open collaborative manner, without prioritizing areas, which makes it a flexible program. Its focus on technology transfer is positive, but the demand for creating patents and results that can go into the market could lead to avoiding high risk research. The 5+5 funding system is adequate. The Team Grants have prompted the cooperation between different disciplines, but the amounts awarded are not adequate in comparison to the individual competitions (FONDECYT). The financial reports are excessive, and there is little flexibility to modify the objectives and adjust the budget. The problem of the low overhead is a limiting factor. There is concern among researchers who do not have access to funding through the program, since they could not be capable of competing in the future. The following recommendations are made:

- a. Continue with the Basal and Team Grant funds.
- b. Favor the interaction between the Basal funds and FONDEF program.
- c. Reduce the administrative requirement and the rigidity that prevents new directions and objectives to be incorporated during the course of the projects.

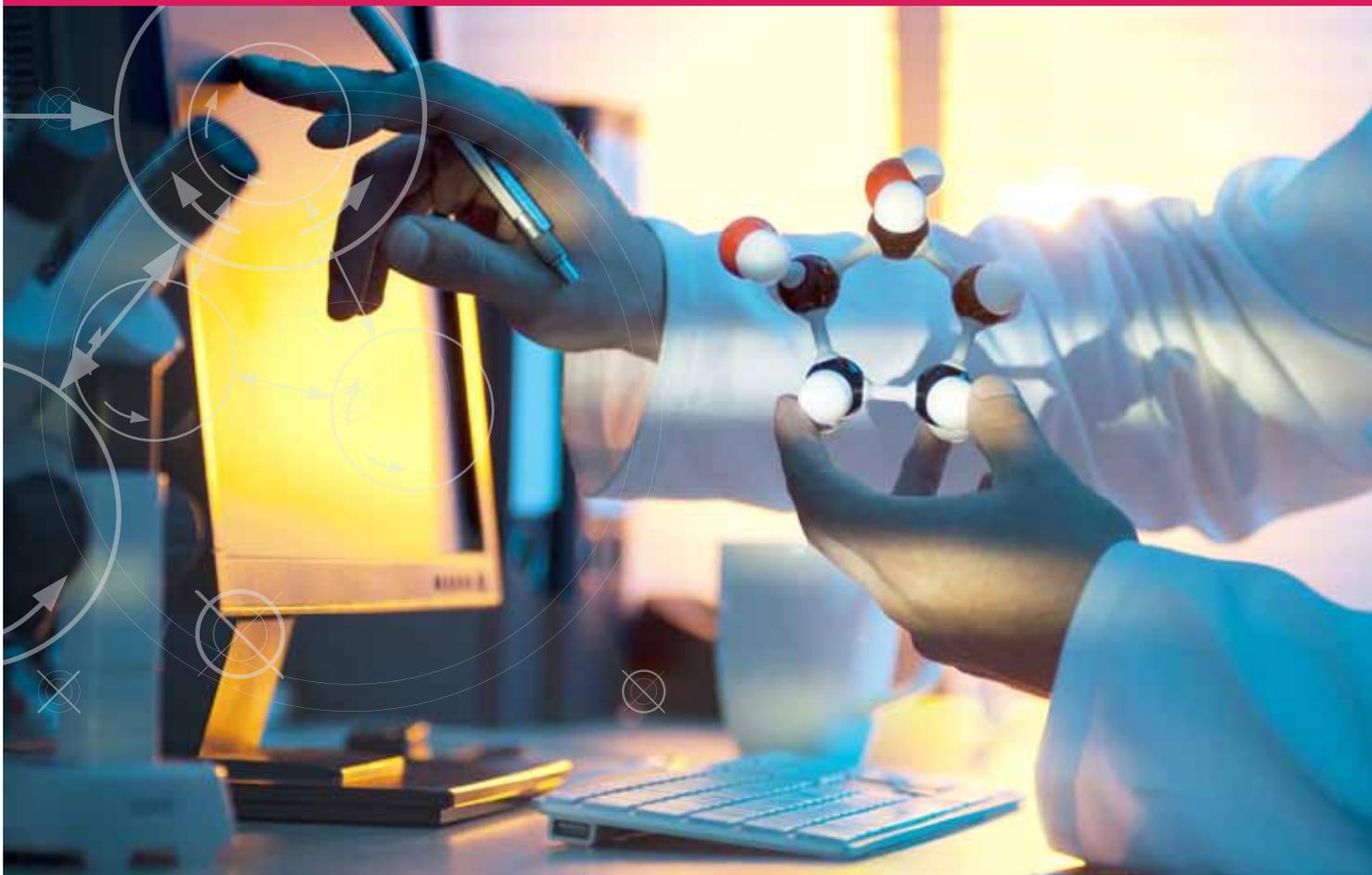


Foto: "Componentes de la tundra antártica", gentileza de la investigadora FONDECYT, Angélica Casanova.
Photo: "Components of the arctic tundra", courtesy of Angélica Casanova, FONDECYT Researcher.



I. INTRODUCCIÓN

INTRODUCTION



I. INTRODUCCIÓN

La Comisión Nacional de Investigación Científica y Tecnológica de Chile, CONICYT, es un organismo autónomo dependiente del Ministerio de Educación, que fue creado en 1967 con el fin de asesorar al Presidente de la República en materias de ciencia y tecnología (C&T). El propósito último de CONICYT es contribuir al progreso económico, social y cultural del país.

Actualmente, la misión de la institución dentro del Sistema Nacional de Innovación (SNI) se encuadra en la ejecución de políticas públicas a través de dos grandes objetivos o pilares estratégicos: el fomento de la formación de capital humano avanzado y el fortalecimiento de la base científica y tecnológica del país.

El plan de acción de CONICYT hacia el 2014 se centra en una iniciativa denominada "El Atajo", la cual considera acortar distancias de manera rápida en aspectos críticos de C&T que apuntan a insertar al país en la sociedad del conocimiento.

"El Atajo" se rige por cuatro ejes-fuerza:

- Dar **Sustentabilidad** a un sistema científico-tecnológico que sea robusto y participativo, aportando el recurso humano avanzado que se necesitará en el futuro, y dando cada vez mayores oportunidades a los mejores investigadores nacionales para que contribuyan a la generación de conocimiento científico y tecnológico.
- Mejorar la **Competitividad** de la investigación en C&T, permitiendo acceder a equipamiento moderno de costo mediano, al uso de laboratorios internacionales de punta y proveer de manera gratuita la información científica clave para la investigación, desarrollo y la innovación.
- **Globalizar** la ciencia nacional para favorecer la inserción de científicos en las redes mundiales del conocimiento, establecer rápidamente masas críticas mediante la cooperación con centros internacionales y crear un benchmarking de primer nivel.
- Avanzar en el **Encantamiento** con la ciencia de todos los sectores de nuestra sociedad, con especial énfasis en el sector escolar, a través de una mejor y mayor difusión de los aportes de la ciencia y su contribución a mejorar la calidad de vida y crear una identidad nacional.

Dentro de las iniciativas estratégicas asociadas a los ejes-fuerza de "El Atajo" se encuentra la sustentabilidad de la plataforma de investigación científica formada básicamente por los instrumentos de financiamiento de cuatro de los principales programas de CONICYT:

- **El Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT**, es un programa público administrado por CONICYT, destinado a estimular y promover el desarrollo de la investigación científica básica en el país. Fue creado en 1981, inaugurando la modalidad de fondos concursables introducida por el Estado Chileno como criterio para la asignación de recursos en las áreas de Educación Superior y Desarrollo Científico y Tecnológico. Su misión es estimular, promover y fortalecer el desarrollo de la investigación científica y tecnológica en todas las áreas del conocimiento contribuyendo así al desarrollo sociocultural del país y al mejoramiento de las condiciones de vida de sus habitantes.
- **El Fondo de Fomento al Desarrollo Científico y Tecnológico, FONDEF**, es un programa dependiente de CONICYT, cuyo quehacer se orienta por los lineamientos de largo plazo propuestos por el Consejo Nacional de Innovación. FONDEF, creado en 1991, tiene como misión promover la vinculación y asociatividad entre instituciones de investigación, empresas y otras entidades, con el objetivo de desarrollar proyectos de investigación aplicada destinados a mejorar la competitividad del país y la calidad de vida de la población.
- **El Fondo de Financiamiento de Centros de Excelencia en Investigación en Áreas Prioritarias, FONDAP**, nace en 1997 y tiene la finalidad de crear centros de excelencia en investigación científica avanzada y de alto impacto, enmarcados en áreas prioritarias que respondan a problemas u oportunidades de gran relevancia para el país y orientados a la consolidación de equipos de investigación. Los centros deben organizarse al interior de una institución sin fines de lucro, con investigadores de experiencia demostrada y participación en educación de postgrado a nivel doctoral.
- **El Programa de Investigación Asociativa, PIA**, es heredero de un conjunto de instrumentos surgidos del Programa Bicentenario para la Ciencia y la Tecnología finalizado en el año 2008, y del Programa de Financiamiento Basal para Centros Científicos y Tecnológicos de Excelencia. Tiene como misión promover la articulación y asociación entre investigadores, junto con su vinculación con otros actores nacionales y/o internacionales, fomentando la creación y consolidación de grupos y centros científicos y tecnológicos.

I. INTRODUCTION

CONICYT is an autonomous institution, under the Ministry of Education, created in 1967 with the aim of advising the President of the Republic in matters relating to science and technology (S&T). The final purpose of CONICYT is to contribute to the economic, social and cultural progress of the country.

Nowadays, the mission of the institution within the National Innovation System (SNI by its acronym in Spanish) is to execute public policies through two great objectives or strategic lines: Fostering the development of advanced human capital and strengthening the scientific and technological base of the country.

CONICYT's action plan towards 2014 is centered on an initiative known as "The Shortcut", which considers catching up quickly in critical S&T aspects aim at inserting the country into the knowledge society.

"The Shortcut" has four strategic axes:

- Providing **Sustainability** to a scientific-technological system to make it stronger and participatory, contributing the advanced human capital that will be needed in the future, and providing progressively greater opportunities to the best national researchers so that they can contribute to the generation of scientific and technological knowledge.
- **Improving** the Competitiveness of the research in S&T, allowing the access to modern medium-cost equipment and the use of international state-of-the-art laboratories, and providing free key scientific information for research, development and innovation.
- **Globalizing** national science to favor the participation of scientists in the global knowledge networks, quickly establishing critical mass through the cooperation with international centers, and creating a first-class benchmarking.
- Advancing in the **Enchantment** with science in all sectors of our society, with a special emphasis on the schooling sector, through a better and greater dissemination of the contributions of science to improve the quality of life and create a national identity.

Among the strategic initiatives associated to the strategic axes of "The Shortcut", there is the sustainability of the platform of scientific research, basically made up by the funding instruments of the four main programs of CONICYT:

- **The National Fund for Scientific and Technological Research, FONDECYT**, is a public program managed by CONICYT, aimed at stimulating and promoting the development of basic scientific research in the country. It was created in 1981, inaugurating the modality of competitive funds introduced by the Chilean State as criteria for awarding resources in the areas of Higher Education and Scientific and Technological Development. Its mission is to stimulate, promote and strengthen the development of scientific and technological research in all areas of knowledge, thus contributing to the sociocultural development of the country and to improving the living conditions of its inhabitants.
- **The Fund for the Promotion of Scientific and Technological Development, FONDEF**, is a CONICYT program guided by the long-term goals proposed by the National Innovation Council. FONDEF, created in 1991, has the main mission of promoting the link and associativeness between research institutions, companies and other organizations, in order to develop applied research projects aimed at improving the competitiveness of the country and the quality of life of the population.
- **The Fund for Research Centers of Excellence in Priority Areas, FONDAP**, began in 1997 and has the objective of creating advanced high-impact scientific research centers of excellence focused on priority areas that address issues or opportunities of great relevance to the country and aim at consolidating research teams. The centers must be organized within a non-profit institution, with researchers who have demonstrated experience and participation in graduate education at the doctoral level.
- **The Associative Research Program**, (PIA by its acronym in Spanish), inherited a group of instruments resulting from the Bicentennial Program for Science and Technology, which ended in 2008, and the Basal Fund Program for Scientific and Technological Research Centers of Excellence. Its mission is to promote the articulation and association between researchers along with their linkage to other national and/or international stakeholders, fostering the creation and consolidation of scientific and technological groups and centers.

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

Informe de Paneles Internacionales de Evaluación

Un elemento crítico para la visión futura de estos fondos era su evaluación en cuanto a los objetivos y el diseño de los instrumentos, la idoneidad de los procesos involucrados, y los resultados e impactos alcanzados. Los objetivos específicos de la evaluación consideran:

- Revisar la **productividad y la calidad** de la investigación apoyada por CONICYT.
- Evaluar si los programas son un aporte significativo a la calidad y la productividad de la investigación teniendo en cuenta sus **objetivos y diseño**.
- Adquirir información útil que permita **modificar o desarrollar** nuevos indicadores, instrumentos, políticas o procesos de toma de decisión.

Cabe destacar que los cuatro programas evaluados administraron durante el año 2012 cerca del 85% del presupuesto que CONICYT destina al apoyo de la investigación en C&T, un equivalente a USD 220 millones. Dada la envergadura de esta evaluación, se convirtió en uno de los eventos más importantes para CONICYT durante el año 2012.

La evaluación se organizó en torno a la conformación de tres paneles de expertos internacionales constituidos por grupos de especialistas con renombrada experiencia en diferentes áreas, entre las cuales se incluye:

- Gestión de políticas públicas para desarrollo científico y tecnológico.
- Evaluación de políticas públicas para el desarrollo científico y tecnológico.
- Dirección de programas de financiamiento y/o agencias de financiamiento.
- Evaluación de programas de financiamiento público.
- Dirección de centros de investigación científica.
- Investigación y desarrollo.
- Ciencia y tecnología.

Es así como se reunió un grupo de 17 expertos provenientes de EE.UU., Europa, Australia y Latinoamérica. El grupo fue convocado para conformar tres paneles. Los programas FONDECYT y FONDEF fueron evaluados cada uno por un panel de cinco expertos, en cambio los programas FONDAP y PIA fueron evaluados en conjunto por un panel de siete expertos. En cuanto al programa PIA, se sometieron a evaluación únicamente los Anillos de Investigación y los Centros Basales, mientras que los demás programas fueron evaluados considerando todos sus instrumentos.

Los miembros que conformaron cada panel son (ver currículos en página 35):

FONDECYT

Dr. Dietrich Halm (Presidente del Panel)

German Research Foundation, Alemania.

Dr. Peter Kilpatrick (Ponente)

University of Notre Dame, EE.UU.

Dr. Luis Héctor Barbeito

Institut Pasteur de Montevideo, Uruguay.

Dr. Gilberte Chambaud

University of Marne la Vallée, Francia.

Dr. Maria Nedeva

University of Manchester, Reino Unido.

FONDEF

Dr. Terttu Luukkonen (Presidente del Panel)

Research Institute of the Finnish Economy, Finlandia.

Dr. Susan E. Cozzens (Ponente)

Georgia Institute of Technology, EE.UU.

Dr. Jesús Sebastián Audina

Consejo Superior de Investigaciones Científicas, España.

Dr. Calum Drummond

Commonwealth Scientific and Industrial Research Organization, Australia.

Dr. Alan Paau

Cornell University, EE.UU.

FONDAP-PIA

Dr. Carmen Huber (Presidente del Panel)

National Science Foundation, EE.UU.

Mr. Ronald Dekker

The Netherlands Organisation for Scientific Research, Países Bajos.

Dr. Liisa Hakamies-Blomqvist

Academy of Finland, Finlandia.

Dr. Malcolm McPherson

Harvard University, EE.UU.

Dr. Anthony James (Tony) Press

Antarctic Climate and Ecosystems Cooperative Research Centre, Australia.

Dr. Claudine Schmidt-Lainé

Centre National de Recherche Scientifique, Francia.

Dr. Jean-François Stéphan

Centre National de Recherche Scientifique, Francia.

EVALUATION OF FONDECYT, PIA/FONDAP AND FONDEF PROGRAMS

Report of International Review Panels

A critical element for the future vision of these funds was their evaluation in regards to the objectives and design of the instruments, the adequacy of the processes involved, and the reached results and impacts. The specific objectives of the evaluation consider:

- Revising the **productivity and the quality** of the research supported by CONICYT.
- Evaluating if the programs make a significant contribution to the quality and productivity of research taking into account their **objectives and design**.
- Acquiring useful information that allow the **modification or development** of new indicators, instruments, policies or decision-making processes.

It is worth noting that the four evaluated programs managed during 2012 nearly 85% of the budget that CONICYT allocates to support research in S&T, equivalent to USD 220 million. Due to the scope of this evaluation, it was one of the most important events for CONICYT during 2012.

The evaluation was organized through the set up of three panels of international experts made up by groups of specialists with renowned experience in different areas, such as the following:

- Management of public policies for scientific and technological development.
- Evaluation of public policies for scientific and technological development.
- Direction of funding programs and/or funding agencies.
- Evaluation of public funding programs.
- Direction of scientific research centers.
- Research and development.
- Science and technology.

This led to the creation of a group of 17 experts who came from the United States, Europe, Australia and Latin America. The group was summoned to form three panels. FONDECYT and FONDEF programs were evaluated each one by a panel of five experts, whereas FONDAP and PIA programs were evaluated together by a panel of seven experts. In regards to the PIA program, only the Team Grants and the Basal Centers were evaluated, while the other programs were evaluated considering all of their instruments.

The experts that conformed each panel were (see resume on page 35):

FONDECYT

Dr. Dietrich Halm (Chairperson)

German Research Foundation, Germany.

Dr. Peter Kilpatrick (Rapporteur)

University of Notre Dame, United States.

Dr. Luis Héctor Barbeito

Institut Pasteur de Montevideo, Uruguay.

Dr. Gilberte Chambaud

University of Marne la Vallée, France.

Dr. Maria Nedeva

University of Manchester, United Kingdom.

FONDEF

Dr. Terttu Luukkonen (Chairperson)

Research Institute of the Finnish Economy, Finland.

Dr. Susan E. Cozzens (Rapporteur)

Georgia Institute of Technology, United States.

Dr. Jesús Sebastián Audina

Consejo Superior de Investigaciones Científicas, Spain.

Dr. Calum Drummond

Commonwealth Scientific and Industrial Research Organization, Australia.

Dr. Alan Paau

Cornell University, United States.

FONDAP-PIA

Dr. Carmen Huber (Chairperson)

National Science Foundation, United States.

Mr. Ronald Dekker

The Netherlands Organisation for Scientific Research, The Netherlands.

Dr. Liisa Hakamies-Blomqvist

Academy of Finland, Finland.

Dr. Malcolm McPherson

Harvard University, United States.

Dr. Anthony James (Tony) Press

Antarctic Climate and Ecosystems Cooperative Research Centre, Australia.

Dr. Claudine Schmidt-Lainé

Centre National de Recherche Scientifique, France.

Dr. Jean-François Stéphan

Centre National de Recherche Scientifique, France.

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

Informe de Paneles Internacionales de Evaluación

En cuanto a la estructura de la evaluación, ésta comprendió dos etapas: una remota y una presencial.

- Durante la **etapa remota**, los panelistas recibieron información (en idioma inglés) acerca del contexto nacional en el ámbito de C&T, de CONICYT, del SNI y de los programas que les correspondía evaluar. Esta información se incorporó en informes de auto-evaluación (Self-Assessment Reports) elaborados en conjunto por los respectivos Programas, la Presidencia de CONICYT y el Departamento de Estudios y Gestión Estratégica (DEGE). Adicionalmente, se puso a disposición de los evaluadores las bases de los concursos, los resultados de evaluaciones previas relacionadas a los programas o a sus instrumentos, y los resultados disponibles de productividad científica.

Los expertos contaron con un periodo de un mes para revisar el material y para completar un formulario de evaluación diseñado por CONICYT (Review Form) que les permitiese entregar su opinión preliminar acerca del desempeño de cada uno de los programas. Además, pudieron solicitar a CONICYT cualquier requerimiento de información adicional que debía ser puesta a su disposición durante la siguiente etapa. Los formularios de evaluación se centraron sobre tres factores que comprenden aspectos fundamentales de cada programa:

- » Diseño y objetivos
- » Procesos
- » Resultados e impacto

- Durante la **etapa presencial**, los 17 expertos visitaron Santiago entre los días 26 y 30 de noviembre. Durante la visita los panelistas se reunieron con el Ministro de Educación, con el Presidente de CONICYT y con los directores de los programas evaluados. Adicionalmente, el panel

de FONDECYT se reunió con miembros de los Consejos Superiores de Ciencia y Tecnología de ese programa, mientras que el panel de FONDEF se reunió con directivos de InnovaChile, del Ministerio de Economía y de la SOFOFA, y el panel de FONDAP-PIA se entrevistó con los directores de la Iniciativa Científica Milenio y del Instituto Antártico Chileno.

Todos los paneles realizaron visitas a universidades, tanto en Santiago (Pontificia Universidad Católica de Chile, Universidad de Chile) como en Valparaíso (Pontificia Universidad Católica de Valparaíso, Universidad Técnica Federico Santa María, Universidad de Valparaíso) y Concepción (Universidad del Bío-Bío, Universidad de Concepción), donde conocieron instalaciones destinadas a investigación y centros científicos tecnológicos, además de entrevistarse con directivos del área de investigación de cada universidad y con beneficiarios de diferentes fondos de CONICYT.

Al final de la etapa presencial, cada panel generó un reporte de consenso compilando sus observaciones y recomendaciones, considerando el desempeño de los programas de CONICYT dentro de un contexto mundial. Cada reporte fue presentado a CONICYT durante una sesión a la cual asistieron representantes de la Presidencia de CONICYT y de su Consejo Asesor, además de directores y ejecutivos tanto de los programas evaluados como de otros programas invitados.

A continuación se presentan en español las principales observaciones y recomendaciones emitidas por cada panel, además de una breve reflexión en torno a los resultados de la evaluación. Posteriormente se da una descripción biográfica de cada uno de los panelistas participantes en la evaluación. Finalmente se presentan los informes *in-extenso* de cada uno de los paneles en el idioma original en el que fueron escritos (inglés).



Foto: Panelistas se reúnen con el Presidente de CONICYT en jornada de apertura.
Photo: Panelists meet with the President of CONICYT on opening day.

EVALUATION OF FONDECYT, PIA/FONDAP AND FONDEF PROGRAMS

Report of International Review Panels

In regards to the structure of the evaluation, it comprised two stages: remote and on-site.

- During the **remote stage**, each panel member received information in English regarding the national context in the area of S&T, of CONICYT, the National Innovation System, and on the respective programs to be evaluated. This information included the Self-Assessment Reports prepared jointly by the respective Programs with the Presidency of CONICYT and the Department of Studies and Strategic Management (DEGE by its acronym in Spanish). Additionally, the evaluators had access to the competition guidelines, the results of previous evaluations related to the programs or to their instruments and the available results on scientific production.

The experts had a one-month time period to review the material and to complete a review form designed by CONICYT, to allow them to give their preliminary opinion on the performance of each one of the programs. They were also able to request from CONICYT any additional information for the following stage. The evaluations were focused on three factors that comprise fundamental aspects in each program:

- » Design and objectives
- » Processes
- » Results and impact

- During the **on-site stage**, the 17 experts visited Santiago between November 26 and 30, 2012. During this visit, the panel members met with the Minister of Education, the President of CONICYT and the directors of the programs under evaluation. In addition, the FONDECYT panel met with members of the Superior Councils for Science and Technology of this program, while the FONDEF panel met with directors of InnovaChile as well as representatives of the Ministry of Economy and the Association for the Promotion

of the Manufacturing Industry (SOFOFA by its acronym in Spanish), and the FONDAP-PIA panel carried out interviews with the directors of the Millenium Science Initiative (ICM by its acronym in Spanish) and the Chilean Antarctic Institute (INACH, by its initials in Spanish).

All of the panels visited universities and technological centers in Santiago (Pontificia Universidad Católica de Chile, Universidad de Chile), Valparaíso (Pontificia Universidad Católica de Valparaíso, Universidad Técnica Federico Santa María, Universidad de Valparaíso) and Concepción (Universidad del Bío-Bío, Universidad de Concepción), where they were able to see the facilities set aside for research and scientific technological centers as well as interviewing directors of the research area of each university and beneficiaries of the different CONICYT funds.

At the end of the on-site phase, each panel generated a consensus report compiling their observations and recommendations, considering the performance of CONICYT programs within a context of world standards. Each report was presented to CONICYT during a plenary session which was attended by representatives of the Presidency of CONICYT and its Advisory Council, as well as directors and executives from the evaluated programs as well as from other programs.

The next section presents the main observations and recommendations made by each panel, as well as a brief reflection on the results of the evaluation. These are followed by a biographic description of each of the panel members who participated in the evaluation. Finally, there is an *in-extenso* reports of each panel in English, the language they were written in.



Foto: Los panelistas presentan sus reportes de evaluación en la última jornada de trabajo.
Photo: Panelists presenting their evaluations reports in the last workday.



II. RESULTADOS DE LA EVALUACIÓN

RESULTS OF THE EVALUATION



Reporte de Evaluación Programa FONDECYT

II. RESULTADOS DE LA EVALUACIÓN

A continuación se presentan en español las principales observaciones y recomendaciones hechas por los expertos internacionales a los respectivos programas. Los detalles de cada reporte se pueden encontrar en la sección IV de este documento, en inglés.

1. Programa FONDECYT

El Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT, ha dado forma a la base científica chilena en los últimos 30 años, contribuyendo continuamente a la formación de capital humano, al desarrollo de competencias en investigación y al conocimiento científico-tecnológico.

Los miembros del panel afirman que la historia relativamente corta de este fondo ha sido un gran acontecimiento para la ciencia y la tecnología nacional: **es la joya del sistema chileno de investigación**. Gracias a FONDECYT, algunos grupos nacionales participan de la comunidad científica mundial y Chile cuenta con un capital humano que le permitiría dar un salto en su base científica y capacidad de investigación, pero para esto se necesita una mejor percepción del papel de la ciencia en la sociedad, mejoras en el financiamiento tanto a la ciencia como a la innovación, y un cambio en el sistema de investigación e innovación a nivel de universidades, centros de investigación y otros actores.

El informe se refiere extensamente al contexto general del sistema nacional de investigación e innovación, en particular, a la necesidad de aumentar la eficiencia y la coordinación entre las distintas fuentes de financiamiento, de articular la relación entre ciencia, economía y sociedad, y de constituirse en un vehículo para una mayor inversión en C&T+i. En particular, se hace ver que el financiamiento de proyectos individuales debe complementarse con una mayor inversión en *"block research grants"* que permitan el desarrollo de centros de excelencia, institutos y laboratorios nacionales, que den mayor capacidad y estabilidad presupuestaria a las universidades, y centros (por ejemplo: nueva infraestructura física para la investigación y mantención de equipos).

Se destaca el hecho que en los últimos seis años el presupuesto de FONDECYT se ha duplicado, pero se percibe que el presupuesto dedicado a la ciencia es considerado un "gasto" y no una "inversión a futuro". El programa ha sido lo suficientemente flexible para incorporar a través del tiempo nuevos instrumentos como los posdoctorados y el esquema de iniciación en investigación, que tendrán un impacto creciente y significativo en la formación de nuevos grupos. Sin embargo, se recoge una preocupación en la comunidad científica por la inserción de los nuevos doctores que

se forman a nivel nacional y en el extranjero, reconociéndose que parte del problema es la falta de empleo en el sector privado.

Los investigadores nacionales reconocen unánimemente que FONDECYT es el fondo de ciencia básica más valioso y transparente. Los procesos de postulación en línea son adecuados, pero deberían estar sujetos a modificaciones. La comunidad aprecia el proceso de evaluación de propuestas, aunque resiente en parte el análisis que se hace de los currículos, sugiriendo que se consideren solo las cinco publicaciones *top*. Se recomienda expandir la base de evaluadores coordinándose con otras bases internacionales. Los informes finales son innecesariamente detallados y deberían centrarse en publicaciones, patentes, alumnos graduados, y otros resultados significativos.

El panel nota una cierta descoordinación entre la acción del programa FONDECYT y los cuerpos que deciden sus políticas (los Consejos de FONDECYT) y presupuesto, como también con otros programas de CONICYT. Acogiendo opiniones de la comunidad científica, proponen que los proyectos FONDECYT se complementen mejor (y posiblemente a través de una "vía rápida") con apoyo de becas de doctorado, postdoctorado y equipamiento (FONDEQUIP). Los investigadores indican que gastan mucho tiempo en aspectos administrativos y en licitaciones de compras de varios proveedores, lo que les parece inadecuado. Se recomienda aumentar el porcentaje del *overhead* de los proyectos (y dedicar parte a administración), como también aumentar el ítem dedicado a equipamiento y su mantención. El porcentaje del presupuesto de FONDECYT dedicado a la administración es insuficiente y se propone aumentarlo. A la vez, se plantea "alivianar" los procesos administrativos, haciéndolos compatibles con la certificación ISO.

Se considera que la tasa de aprobación del Concurso Regular es inusualmente alta en comparación con estándares internacionales y podría atentar contra la excelencia de los proyectos financiados². En parte, las altas tasas se justifican en los concursos de posdoctorado y proyectos de iniciación, como manera de crear aceleradamente una capacidad nacional. Se sugiere crear un concurso más sencillo y expedito para "investigadores excepcionales" (con una larga y sobresaliente trayectoria en FONDECYT) y otro pequeño, para investigación exploratoria de alto riesgo, similar a *EAGER* de la "National Science Foundation" (NSF) en EE.UU., como también alargar la duración de algunos instrumentos, por ejemplo, el de Iniciación a cinco o seis años.

Por último, se comenta que el esfuerzo que hace FONDECYT por disseminar y popularizar los resultados científicos es muy pequeño en comparación con los alcances del programa, limitando el efecto en el encantamiento de la clase política y la sociedad.

² Las tasas de aprobación de los concursos más recientes fueron: Postdoctorado, 56%; Iniciación, 53%; Regular, 56%.

II. RESULTS OF THE EVALUATION

The following are the main observations and recommendations made by the international experts on the respective programs. The details of each report can be found on section IV of this document in English.

1. FONDECYT Program

The National Fund for Scientific and Technological Research, FONDECYT, has modeled the Chilean scientific basis over the past 30 years, continuously contributing to the development of human capital, the development of competence in research and scientific-technological knowledge.

The panel members confirm that the relatively short history of this fund has been a great achievement for national science and technology: **It is the gem of the Chilean research system.** Thanks to FONDECYT, some national groups participate in the global scientific community and Chile has human resources that will allow it to take a leap in its scientific basis and research capacity. However, the following conditions are needed to achieve this: A better perception of the role of science in society; improvements in funding for science as well as for innovation; and a change in the research and innovation system at the university level, in research centers and with other stakeholders.

The report refers *in-extenso* to the general context of the national research and innovation system, particularly, to the need of increasing the efficiency and the coordination among different sources of funding, articulating the relation between science, economy and society, and becoming a means for greater investment in S&T+i. It also explains that the funding of individual projects should be complemented with a greater investment in “block research grants” that will allow the development of research centers of excellence, national institutes and laboratories, that will provide greater capacity and budget stability to universities and centers (for example, new physical infrastructure for research and maintenance of equipment).

The fact that the budget of FONDECYT has been duplicated over the past six years is highlighted, but it is perceived that the budget allocated to science is considered as an “expenditure” and not as an investment for the future. The program has been sufficiently flexible to incorporate new instruments through the time such as the post-doc and the scheme of initiation in research which will have an increasing and significant impact in the development of new groups. However, a concern in the scientific community about the integration of new doctors who are trained nationally and internationally is revealed, recognizing that part of the problem is the lack of employment in the private sector.

National researchers unanimously recognize that FONDECYT is the most valuable and transparent basic science fund. The online application processes are adequate but should be subject to modifications. The community appreciates the evaluation process of the proposals, although it partly resents the analysis made of the resumes, suggesting that only the top five publications were considered. It is recommended to expand the base of evaluators through the coordination with other international bases. The final reports are unnecessarily detailed and should focus on publications, patents, graduate students and other significant results.

The panel identifies a certain lack of coordination between the FONDECYT action program and the bodies in charge of its policies (FONDECYT’s Councils) and the budget, as well as with other programs of CONICYT. The panel embraced opinions of the scientific community and, based on them, proposes that FONDECYT projects will be better complemented (and possibly through a “fast track”) with scholarship support for doctorates, post-doctorates and equipment (FONDEQUIP). The researchers indicate that they spend a lot of time in administrative aspects and on purchase tenders from several suppliers, which seems inadequate. It is recommended to increase the overhead percentage of the projects (and dedicate part of them to administration) as well as to increase the item set aside for equipment and its maintenance. The percentage of FONDECYT’s budget allocated to administration is insufficient and the proposal is to increase it. As the same time, there is a suggestion to “alleviate” administrative processes, making them compatible with the ISO certification.

The awarding rate of the Regular Competition is considered unusually high in comparison with international standards, which could hinder the excellence of the funded projects³. The high rates are partly justified in the post-doctorate and initiation project competitions, as a way to accelerate the building of national capacity. The creation of a simpler and more expedite competition is suggested for “exceptional researchers” (with a long and outstanding career in FONDECYT) and another small one, for exploratory high-risk research, similar to EAGER of the National Science Foundation (NSF), as well as extending the duration of some instruments, for example, the Initiation to five or six years.

Finally, it is mentioned that the effort made by FONDECYT to disseminate scientific results is very little in comparison with the outreach of the program, limiting its charming effect on the political class and society.

² The approval rates of the most recent competitions were: Post-doctorate, 56%; Initiation, 53%; Regular, 56%.

Reporte de Evaluación Programa FONDEF

2. Programa FONDEF

El Fondo de Fomento al Desarrollo Científico y Tecnológico, FONDEF, aspira a aumentar la competitividad de la economía chilena favoreciendo los proyectos de ciencia aplicada e investigación y desarrollo (I+D). FONDEF opera en una interface crucial para el desempeño de una economía del conocimiento, que requiere la ciencia aplicada y el desarrollo para su propio beneficio. El análisis efectuado por el panel compara la estrategia, diseño, operación, impactos y resultados de FONDEF a la luz de programas internacionales similares.

FONDEF es un programa importante que ha dado valor a Chile, pero para incrementar su impacto requiere focalizarse más en las necesidades específicas de la industria y de la sociedad. Durante su historia, FONDEF ha apoyado sobre 900 proyectos, pero en su documento de autoevaluación se aprecian modestos niveles de publicaciones y patentes, como también de involucramiento de alumnos. El programa informa que se realiza un seguimiento sistemático de los resultados en el largo plazo, pero la información disponible en términos de indicadores y métricas es limitada y no está disponible en forma amplia al público.

FONDEF debiera establecer su propio plan estratégico que incluya misiones amplias que lo diferencian de otras organizaciones y programas existentes (p. ej., InnovaChile de CORFO) y definir su nicho con objetivos específicos que permitan medir los progresos alcanzados. Debiera construir capacidades y actitudes entre los investigadores e inducir un cambio en su actitud para apoyar a la industria, lo que no promueve de manera consciente. El diseño del programa pareciera asumir que los investigadores en las universidades sabrían lo que la industria y la sociedad requieren,

pero no proporciona ayuda suficiente para que éstos entiendan lo que la industria necesita; el programa funciona de abajo-hacia-arriba y en base a proyectos (presentados por investigadores).

El reciente rediseño del instrumento para proyectos de I+D de tres años en el nuevo instrumento IDeA³, lo hace más flexible, pero de acuerdo a los investigadores, los fondos serán menores, los períodos más cortos y con el riesgo de una interrupción. El instrumento VIU, que da posibilidades a investigadores incipientes de aplicación, comercialización y emprendimiento a partir de sus memorias y tesis, debiera ampliarse en varios aspectos. Los programas temáticos de FONDEF tienen áreas estrechas, con sobrerrepresentación de ciertas disciplinas, y debieran estar alineados con objetivos estratégicos que promuevan el desarrollo económico y social.

Tanto los procesos de evaluación y de gestión de los instrumentos de FONDEF son a veces percibidos como poco transparentes, y las revisiones de vez en cuando como técnicamente incompetentes. Los procesos de evaluación debiesen incluir normas de conflicto de interés, más críticas de personas con competencia técnica específica para cada proyecto, y la revisión internacional. Los informes técnicos y financieros deben ser disminuidos, pues son percibidos como una carga por los investigadores.

Se detecta que hay poca información disponible sobre los posibles resultados más importantes de los instrumentos de FONDEF, frente a lo cual se recomienda que el programa desarrolle mejores indicadores y mediciones de sus impactos, incluyendo un conjunto más amplio de medidas y resultados a más largo plazo que sean accesibles para el público y las partes interesadas.



³ El instrumento IDeA opera a través de dos concursos: Ciencia Aplicada e Investigación Tecnológica, con duración de 24 meses cada uno.

2. FONDEF Program

The Fund for the Promotion of Scientific and Technological Development, FONDEF, seeks to increase the competitiveness of the Chilean economy favoring projects in applied science and research and development (R+D). FONDEF operates on an interface that is crucial to the performance of a knowledge economy that requires applied science and development for its own benefit. The analysis made by the panel compares the strategy, operational design, impacts and results of FONDEF with similar international programs.

FONDEF is an important program that has added value to Chile, but in order to increase its impact it is necessary more focus on specific needs of the industry and society. During its history, FONDEF has supported over 900 projects, but its self-assessment report presents modest levels of publications and patents as well as involvement of students. The program reports that a systematic follow-up of long-term results is carried out, but the information available in terms of indicators and measurements is limited and is not widely available to the public.

FONDEF should establish its own strategic plan which should include broad missions that differentiate it from other existing organizations and programs (for example, InnovaChile of CORFO) and define its niche with specific objectives that allow the measurement of progress made. It should build capacities and attitudes among the researchers to bring about a change in their attitude towards supporting the industry, which is not promoted in a conscious manner. The design of the program seems to assume that the university researchers will know what the industry and society require, but it does not provide enough help

for them to understand what the industry needs; the program applies the bottom-up approach based on projects (presented by researchers).

The recent re-design of the instrument for the three-year R+D projects in the new IDeA³ makes it more flexible. However, according to the researchers, the funds will be reduced and the periods will be shorter, with the risk of an interruption. The VIU instrument, which gives the possibility to beginning researchers on application, marketing and entrepreneurship based on their thesis or degree project, must be expanded in several aspects. FONDEF thematic programs have narrow areas, with excessive representation of certain disciplines. They should be aligned with strategic objectives that promote economic and social development.

Both the evaluation processes as well as the management of FONDEF programs are sometimes perceived as lacking transparency and the revisions, every now and then, are seen as technically incompetent. The evaluation processes should include regulations on conflict of interests, in addition to critical analysis by people with specific technical competence for each project and international revision. The technical and financial reports must be reduced, since they are perceived as a burden by the researchers.

It is detected that there is little information available on the most important possible results of FONDEF programs. The recommendation for this is that the program develop better indicators and measurements of its impacts, including a broader group of measures and results for a longer term that are made available to the public and all the interested parties.



Foto: "Variedades y estrategias para la producción y comercialización de la Murtilla en el mercado global", investigadora FONDEF, Ivette Segel (INIA).
Photo: "Varieties and strategies for production and marketing of Myrtleberry in the global market", Ivette Segel (INIA), FONDEF Researcher.



³ IDeA operates through two competitions: Applied Science and Technological Research, each with a duration of 24 months.

Reportes de Evaluación Programas FONDAP y PIA

3. Programa FONDAP

El Fondo de Financiamiento de Centros de Excelencia en Investigación en Áreas Prioritarias, FONDAP, es un buen avance para el sistema de investigación, pues aumenta la calidad de la investigación fundamental y la cooperación entre investigadores. Es un instrumento bien diseñado y estable que permite un horizonte por períodos de hasta 10 años, aunque su financiamiento ha sido errático (no hubo concursos entre 2001 y 2009, y se volvió a llamados en áreas prioritarias en 2012). Dado el nivel de fondos invertidos, los logros de los científicos chilenos en términos de investigación, entrenamiento de capital humano a los estándares más altos, y su repercusión en la economía y la sociedad, son extraordinarios.

Los procesos usados en las llamadas, evaluación, asignación y seguimiento son adecuados, pero entrabados y costosos. El panel advirtió algunos ejemplos excelentes de cómo los fondos FONDAP invierten en temas de importancia regional y nacional, y sugiere que el proceso a través del cual se identifican las áreas prioritarias debe ser más transparente e involucrar a toda la comunidad científica.

El panel recomienda el desarrollo de indicadores cualitativos y cuantitativos que permitan especificar el impacto del programa, particularmente en transferencia tecnológica y beneficios a la sociedad. También recomiendan una revisión más comprensiva de los resultados de los centros al término de su periodo de financiamiento, lo que podría proveer una visión más completa del impacto del financiamiento.

Los procesos de FONDAP son innecesariamente rígidos, mecánicos y demasiado dependientes de medidas que tienden a la aplicación y seguimiento de criterios cuantitativos. Esto coloca a las ciencias sociales y humanidades en desventaja en los concursos para fondos de investigación. El panel recomienda reducir los costos de postulación y cumplimiento, además de aumentar las posibilidades de los entornos de investigación, fuera de la Región Metropolitana, para competir y beneficiarse de la oferta de recursos para la investigación, la cual es limitada.

Las actividades de investigación básica realizadas en los centros FONDAP constituyen una base indispensable para el desarrollo a largo plazo de la ciencia chilena y de un ambiente creativo para formar a los futuros científicos de vanguardia.



3. FONDAP Program

The Fund for Research Centers of Excellence in Priority Areas, FONDAP, is a good progress in the research system since it increases the quality of fundamental research and cooperation among researchers. It is a well-designed and stable instrument that allows a horizon for periods of up to 10 years, even though its funding has been erratic (there were no competitions in 2001 and 2009, and the call for projects in priority areas was renewed in 2012). Given the amount of funds invested, the achievements of Chilean scientists in terms of research, training of human resources to the highest standards, and economic and social reach have been extraordinary.

The processes used in the calls for projects, evaluation, awarding of funds and follow-up are adequate, but complicated and expensive. The panel pointed out some excellent examples as to how the FONDAP funds invest in issues of regional and national importance. It is suggested that the process through which the priority areas are identified must be transparent and involve the entire scientific community. The panel recommends the

development of qualitative and quantitative indicators that allow the specification of the impact of the program, particularly in technological transfer and benefits to society. They also recommend a more comprehensive revision of the results of the centers at the end of the funded period, which could provide a more complete view of the impact of these funds.

The processes of the FONDAP are unnecessarily rigid, mechanical and too dependent on the measures that lead to the application and follow-up of quantitative criteria. This places both human and social sciences at a disadvantage in the competitions for research funds. The panel offers a series of recommendations for improvements aimed at reducing application costs and compliance and improvement of the possibilities so that research environments, besides those of the Metropolitan Region, will have the same opportunity of competing and benefiting from the limited resource offer for research.

The basic research activities carried out in the FONDAP centers constitute an essential basis for the long-term development of Chilean science and a creative environment to train future cutting-edge scientists.



Foto: "Reevaluación tafonómica de la interacción entre cazadores recolectores y fauna extinta a fines del Pleistoceno en Patagonia Meridional", gentileza de la investigadora FONDECYT, Fabiana Martín.
Photo: "Tafonic re-evaluation of the interaction between hunter-gatherers and extinct fauna towards the end of the Pleistocene in southern Patagonia", courtesy of Fabiana Martín, FONDECYT Researcher.

Reportes de Evaluación Programas FONDAP y PIA

4. Programa PIA

El instrumento de Centros Basales del PIA contribuye a zanjarse la brecha entre la ciencia y los sectores industriales y públicos, de manera flexible y con gran énfasis en aplicaciones y transferencia de conocimiento. Promueve la investigación colaborativa de manera abierta, de abajo hacia arriba, sin áreas prioritarias predefinidas. Se observa demasiado énfasis en el desarrollo de aplicaciones y/o transferencia tecnológica, lo que favorece las líneas de investigación seguras en vez de la investigación innovadora y de alto riesgo. Esta última requiere de experticia especializada que actualmente no se ha desarrollado bien en los centros ni en las universidades. El financiamiento de 5+5 años, con una evaluación luego de dos años y medio, proporciona una retroalimentación a los investigadores y a CONICYT.

La información entregada muestra que PIA ha impulsado el progreso de la ciencia hacia estándares internacionales, incrementando la productividad científica, y es posible que continúe haciendo este aporte. El instrumento Basal ha proporcionado algunos buenos ejemplos de investigación, tecnología e innovación que promueven el desarrollo de productos, licencias, servicios y patentes con posibilidades comerciales, y que tienen el potencial de crear beneficios significativos a nivel nacional y regional.

La mayoría de los procesos establecidos para las llamadas, aprobación y seguimiento son consistentes con las buenas prácticas internacionales, pero son innecesariamente detallistas y han tenido efectos adversos (no intencionados) en la eficiencia de la colaboración. En particular se recoge la "queja" de que los informes financieros cuatrimestrales son excesivos y que hay poca flexibilidad para modificar objetivos y ajustar el presupuesto. El panel recomienda que los centros, previa consulta a CONICYT, debieran ser capaces de seguir las avenidas más prometedoras

para alcanzar sus metas, aun cuando se requiera alterar los objetivos originales. Esto debe ir acompañado por una flexibilidad complementaria en la localización de fondos. A partir de un caso particular, se encuentra extraño que solo la institución beneficiaria pueda recibir financiamiento para equipos.

Los Anillos de Investigación representan una manera productiva de incentivar una cooperación, que no habría sido posible en ausencia del instrumento. Se detectaron algunos problemas de repostulación de investigadores responsables (IRs) y un prejuicio "sistémico" en contra de las ciencias sociales. El problema del bajo *overhead* es una limitante como también los problemas de género.

Toda la información recopilada apunta a que el financiamiento PIA conduce a un *benchmarking* internacional, al aumento de la productividad científica de nivel internacional y a la diseminación de los resultados científicos. Sin embargo, se debe incrementar la producción de patentes y la capacidad de investigadores y centros de transferir el conocimiento a los encargados de políticas públicas, empresas y la sociedad en su conjunto.

En resumen, el Panel quedó impresionado con los resultados del Programa PIA, particularmente con lo que se refiere a la formación de recurso humano de excelencia, a la capacidad de realizar investigación científica, el financiamiento de equipamiento y el establecimiento de colaboración internacional a través de redes formales. Hay preocupación porque aquellos investigadores que no tienen acceso a financiamiento por el programa no sean capaces de competir en el futuro, creándose una brecha amplia dentro de la comunidad científica. Se recomienda continuar con el Programa, favorecer la interacción entre el instrumento Basal y FONDEF, y reducir los requerimientos administrativos superfluos y la rigidez que impide incorporar nuevas orientaciones y objetivos durante el transcurso del proyecto.



Foto: "Nanotubos", gentileza de CEDENNA (Universidad de Santiago), Centro Basal financiado por PIA.
Photo: "Nanotubos", courtesy of CEDENNA (Universidad de Santiago), Basal Center financed by PIA.

4. PIA Program

The Basal Centers instrument of the Associative Research Program (PIA-Basal by its acronym in Spanish), contributes to reducing the gap between science and the industrial and public sectors, in a flexible manner with a great emphasis on applications and knowledge transfer. It promotes collaborative research in an open manner, with a bottom-up approach, without predefined priority areas. Too much emphasis in the development of applications and technology transfer is observed. This favors safe research lines instead of innovative and high-risk research, the last requiring specialized expertise that has not been well developed at Universities and Centers. The 5+5 year funding with an evaluation after 2.5 years gives feedback to the researchers and CONICYT.

The information provided shows that the PIA has prompted the progress of science towards international standards, increasing scientific productivity, and it is possible that it continues making this contribution. The Basal program has produced some good examples of research, technology and innovation that promote the development of products, licenses, services and patents with commercial possibilities and that have the potential of generating significant benefits at the national and regional levels.

Most of the processes established for the call for projects, approval and follow-up are consistent with good international practices, but are unnecessarily detailed and have had adverse effects (unintentional) in the efficiency of collaboration. The "complain" that the quarterly financial reports are excessive and there is little flexibility to modify objectives and adjust budgets is particularly highlighted. The panel recommends that the centers, after a previous consultation to CONICYT, should be capable of following more promising roads even when

it is required to alter the original objectives. This should be accompanied by a complementary flexibility on funds allocation. Based on a specific case, it is considered unusual that only the beneficiary institution can receive funding for equipment.

The Team Grants Rings represent a productive way of promoting a cooperation that could not have been made possible in the absence of this instrument. Some problems with the re-application of principal investigators (PI's) were detected as well as a "systematic" prejudice against social sciences. The problem of the low overhead is a limiting issue, as well as the gender issues.

All of the information compiled points towards the fact that the PIA funding leads to an international benchmarking, to the increase in scientific productivity at an international level and to the reduction of scientific results. However, it is necessary to increase the production of patents and the capacity of researchers and centers to transfer knowledge to those in charge of public policies, companies and society as a whole.

In synthesis, the Panel is impressed with the results of the PIA Program, particularly, in relation to the development of human resources of excellence and the capacity to carry out scientific research, the funding of equipment, and the establishment of international collaboration through formal networks. There is concern that those researchers who do not have access to funding by the program will not be able to compete in the future, thus generating a wide gap within the scientific community. The recommendation is to continue with the Program, favoring the interaction between the Basal fund and FONDEF, and to reduce the superfluous administrative requirements and the rigidity that prevents new orientations and objectives to be incorporated during the execution of the project.



Foto: "Estados de polarización de luz láser y su aplicación en pinzas ópticas", gentileza del investigador FONDECYT, Asticio Vargas (Universidad de La Frontera).
Photo: "Polarization states of laser light and its application in optical tweezers", courtesy of Asticio Vargas, FONDECYT Researcher (Universidad de La Frontera).

5. Observaciones Comunes y Respuestas

- a. CONICYT y los programas evaluados han proporcionado un apoyo continuo al crecimiento de la ciencia en Chile y este esfuerzo es apreciado por la comunidad científica nacional.
- b. Hace falta una hoja de ruta para la ciencia en Chile, que provea de un marco para la planificación y financiamiento de la investigación. En particular, un panel (FONDECYT) sugirió considerar una estrategia y política nacional para la investigación científica, aspectos relativos al financiamiento y organización del sistema de investigación/innovación.
- c. Un punto común en todas las evaluaciones, y que proviene posiblemente de las entrevistas con beneficiarios, se relaciona con aspectos administrativos que coartan "... la creatividad, la colaboración efectiva y la continuidad de los proyectos" (p. ej. Anillos de Investigación). Es comprensible que los panelistas no hayan podido interiorizarse de los requisitos impuestos al manejo de fondos públicos y los aspectos jurídicos y administrativos subyacentes.
- d. En general, hay comentarios sobre los relativamente bajos niveles de financiamiento (incluyendo los *overheads*), probablemente desconociendo que la mayoría de los investigadores en programas asociativos (FONDAP, Basales y Anillos de Investigación) reciben también fondos a través de FONDECYT.
- e. Una recomendación que cruza a todos los instrumentos y programas de CONICYT se refiere a ver maneras de aumentar la capacidad de los investigadores para transferir conocimiento a los gestores de políticas, las empresas y la sociedad.
- f. Se detecta que los parámetros de medición del éxito de los programas ponen en desventaja a las ciencias sociales y humanidades, y posiblemente a regiones (FONDAP).

6. Comentarios Finales

Aun cuando la postulación a centros asociativos (Fondap, Basales, Anillos de Investigación) como sus evaluaciones intermedias son realizadas por paneles internacionales, la evaluación de los programas FONDECYT, FONDEF y PIA/FONDAP ha sido una experiencia importante pues ha permitido desarrollar capacidades dentro de la institución que podrán ser utilizadas en el futuro para la evaluar otros programas o evaluar nuevamente a los de este documento. El trabajo de preparación del material enviado a los panelistas (en inglés) fue intenso y profesional, y los esfuerzos de ejecutivos y personal de los programas son ampliamente reconocidos. El éxito de esta misión se debe además al apoyo y participación de la Dirección Ejecutiva y del Departamento de Estudios y Gestión Estratégica (DEGE) de CONICYT, en particular, de la Dra. María Carolina Moreno, Denise Gómez, Felipe Bahamondes y Camila Serra. Adicionalmente, la contribución del Dr. Roberto Álvarez Espinoza, perteneciente al Departamento de Economía de la Universidad de Chile, fue valiosa en la preparación del material para la primera etapa de la evaluación.

El alto nivel y competencia de los panelistas, como también su disposición a invertir parte de su tiempo en evaluar la ciencia chilena es encomiable y habla favorablemente de la experiencia científica nacional. Van nuestros agradecimientos a todos aquellos que se tomaron la tarea con dedicación y entusiasmo.

También se agradece el apoyo de la Dirección de Presupuesto (DIPRES) que apoyó entusiastamente la idea de la evaluación internacional y separó los fondos necesarios para que ésta se llevara a cabo.

Los paneles agradecieron al Presidente de CONICYT y sus asesores por el apoyo y hospitalidad en su visita, expresando que **"El Gobierno de Chile y CONICYT debieran sentirse orgullosos tanto en términos del apoyo brindado a la ciencia y la tecnología como a la disposición a modificar las condiciones que este apoyo requiere bajo diversas circunstancias"**⁴.

⁴ En base al informe del panel de FONDAP y expresiones vertidas en reunión con el Ministro de Educación, Harald Beyer.

EVALUATION OF FONDECYT, PIA/FONDAP AND FONDEF PROGRAMS

Report of International Review Panels

5. Common Observations and Responses

- a. CONICYT and the evaluated programs have provided a continuous support to the growth of science in Chile and this effort is appreciated by the national scientific community.
- b. It is necessary to have a Roadmap for science in Chile that provides a framework for planning and funding research. One panel in particular (FONDECYT) suggested the consideration of a national strategy and policy for scientific research, covering aspects dealing with funding and organization of the research/innovation system.
- c. All of the evaluations had one point in common which possibly derives from the interviews with the beneficiaries. It is related to the administrative aspects since there is a risk of "...obstructing creativity and of discontinuity of successful projects because of administrative rules, i.e., there is rigidity on continuation of RINGS projects". It is understandable that the panel members could not learn more about the requirement imposed to the management of public funds and the underlining judicial and administrative aspects.
- d. In general, there are comments on the relatively low levels of funding (including the overheads), probably from the lack of knowledge that most of the researchers from associative programs (FONDAP, Basal and Team Grants) also receive funds through FONDECYT.
- e. One recommendation that crosses all of the CONICYT instruments and programs refers to searching for ways to increase the capacity of researchers to transfer knowledge to policy developers, companies and society.
- f. It is detected that the parameters to measure the success of the programs place social sciences and humanity, and possibly also regions outside from Santiago, at a disadvantage (FONDAP).

6. Final Comments

Even when the application to associative centers (FONDAP, Basal, Team Grants) as well as their intermediate evaluations are carried out by international panels, the evaluation of FONDECYT, FONDEF and PIA/FONDAP programs has been an important experience since it has allowed the development of capacities within the institution that could be used in the future to evaluate other programs or re-evaluate those in this document. The task of preparing the material sent to the panel members in English was intense and professional and the efforts of executives and personnel of the programs are broadly acknowledged. The success of this mission is also attributed to the support and participation of the Executive Directorate and the Department of Studies and Strategic Management (DEGE by its acronym in Spanish) of CONICYT, particularly of Dr. María Carolina Moreno, Denise Gómez, Felipe Bahamondes and Camila Serra. Additionally, the contribution of Dr. Roberto Álvarez Espinoza, who is a member of the Department of Economy of the University of Chile, was valuable in the preparation of material for the first phase of the evaluation.

The high level and competence of the panel members, as well as their disposition to invest part of their time to evaluating Chilean science is commendable and speaks well of the national scientific experience. We thank all of those who carried out this task with dedication and enthusiasm.

We also express our gratitude to the Budget Directorate (DIPRES by its acronym in Spanish), which enthusiastically supported the idea of an international evaluation and set aside the necessary funds so that it could be carried out.

The panels thanked the President of CONICYT and its advisors for the support and hospitality during their visit, expressing that **"The Government of Chile and CONICYT should feel proud both in terms of the support provided to science and technology as well as of the disposition to modify the conditions that this support requires under diverse circumstances"**⁴.

⁴ Based on the report from the FONDAP panel and opinions shared during a meeting with Minister Beyer.



III. INFORMACIÓN BIOGRÁFICA DE LOS PANELISTAS

BIODATA OF PANELISTS



1. FONDECYT



Luis Héctor Barbeito
Uruguay

El Dr. Luis Barbeito (1956) es doctor en medicina (Uruguay, 1982) con estudios postdoctorales en neurofarmacología (College de France, París, 1985-1988). Ha sido profesor de Neuroquímica en la Universidad de la República, Uruguay (1990-1994); Jefe de la División de Neurociencia Celular y Molecular en el Instituto Clemente Estable, Uruguay (1994-2010), y Jefe del Laboratorio de Neurodegeneración en el Institut Pasteur de Montevideo desde el año 2006. Como investigador, ha contribuido a crear un grupo de investigación que estudia los mecanismos moleculares que conducen a la muerte neuronal progresiva en las enfermedades neurodegenerativas. Su investigación ha llevado a casi un centenar de publicaciones y a tres patentes internacionales. Ha participado en redes internacionales y recibido financiamiento de diversos organismos internacionales. Luis Barbeito también ha contribuido al desarrollo de instituciones de investigación, siendo Presidente del Instituto Clemente Estable (1996-1999 y 2003-2005), Director de Investigación (2006-2009) y Director Ejecutivo (desde 2010) del Institut Pasteur de Montevideo. Fue Presidente del CONICYT uruguayo (2005-2009), participando en la redacción de la Ley de la Ciencia, Tecnología e Innovación aprobada el año 2006. Por último, tiene amplia experiencia como revisor de instituciones de investigación y programas de investigación, tanto a nivel nacional como internacional.

Dr. Luis Barbeito (1956) is a medical doctor (Uruguay, 1982) with postdoctoral studies in neuropharmacology (College de France, Paris, 1985-1988). He has been professor of Neurochemistry at the University of the Republic, Uruguay (1990-1994); Head of the Division of Cellular and Molecular Neuroscience at the Instituto Clemente Estable, Uruguay (1994-2010), and Head of the Laboratory of Neurodegeneration at the Institut Pasteur de Montevideo since 2006. As researcher, he has contributed to build a research group studying the molecular mechanisms leading to progressive neuronal death in neurodegenerative diseases. His research has led to almost one hundred publications and three international patents applications. He has participated in international networks and received funding from various international agencies. Luis Barbeito has also contributed to the development of research institutions, being President of the Instituto Clemente Estable (1996-1999 and 2003-2005), Research Director (2006-2009) and Executive Director (since 2010) of the Institut Pasteur de Montevideo. He was President of the Uruguayan CONICYT (2005-2009), participating in redaction of the Law of Science, Technology and Innovation approved in 2006. Finally, he has large experience as reviewer of research institutions and research programs, both at national and international level.

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Gilberte Chambaud
Francia / France

La Dra. Gilberte Chambaud es profesora en la Universidad de Marne la Vallée. Se graduó en Ciencias Químicas y Físicas de la Ecole Normale Supérieure (ENS) en Fontenay aux Roses. En 1972, se convirtió en Profesora Asistente y más tarde en Profesora Titular (1987) en la ENS de París. Defendió su Doctorado en 1980. Fue nombrada Profesora Visitante en la Universidad de Frankfurt am Main (Alemania) en 1991. Finalmente se incorporó a la Universidad de Marne-la-Vallée en 1992 como Profesora Titular en Química y fue presidenta del Consejo Administrativo de esa Universidad (2001-2005). Fue Directora Adjunta de Química en el Ministerio de Investigación y Educación en el período 2003-2005. Desde enero de 2006 hasta mayo de 2011 se desempeñó como Directora Científica del Instituto de Química en el CNRS (Centro Nacional de Investigación Científica, París). Desde septiembre de 2011 es asesora científica de la Agencia Nacional Francesa para la Evaluación de la Investigación y la Formación en la evaluación de los laboratorios de química. Sus actividades de investigación se orientan a la química teórica y a la química y la física molecular teórica, incluyendo predicciones confiables en términos de reactividad, estabilidad e identificación de especies moleculares intermedias, determinación estructural de los sistemas moleculares y caracterización espectroscópica precisa. Contribuyó al desarrollo de códigos para la espectroscopia rovibracional. Recientemente orienta su interés en las propiedades mecánicas y piezoeléctricas de nanocables de semiconductores como ZnO, AlN. Ha supervisado a más de 15 estudiantes de Doctorado y ha escrito más de 125 publicaciones en revistas internacionales, 150 actas de congresos, y ha sido invitada a más de 70 congresos nacionales e internacionales. Fue Presidenta de la División de Educación de la Sociedad Química Francesa (SCF) en 2000-2004 y ahora es Vice-Presidente de la SCF. Ella creó en 2006 la Red Francesa de Química Teórica. Ha sido administradora de la Industria Química Francesa y del sincrotrón SOLEIL. Fue distinguida por la Legión de Honor francesa en 2007 y Oficial de Palmes Académiques, 2012.

Dr. Gilberte Chambaud is Professor in the University of Marne la Vallée. She graduated in Chemistry and Physical Sciences at the Ecole Normale Supérieure (ENS) in Fontenay aux Roses. In 1972, she became Assistant-Professor and later Professor (1987) in the ENS in Paris. She defended her Doctorat in 1980. She was appointed as Guest Professor at University of Frankfurt am Main (Germany) in 1991. Finally, she joined the University of Marne-la-Vallée in 1992 as Professor in Chemistry. She was president of the Administration Council of this University (2001-2005). She was Deputy Director for Chemistry in the Ministry of Research and Education in 2003-2005. From January 2006 until May 2011, she was the Scientific Director of the Institute of Chemistry at CNRS (National Center for Scientific Research, Paris). Since September 2011, she is Scientific advisor at the National French Agency for Evaluation of Research and Formation, for the evaluation of the chemistry laboratories. Her research activities are oriented in theoretical chemistry towards theoretical molecular physical chemistry, including reliable predictions in terms of reactivity, stability and identification of intermediate molecular species, structural determination of molecular systems and accurate spectroscopic characterization. She contributed to the development of codes for rovibrational spectroscopy. Recently, she oriented her interest on mechanical and piezoelectric properties of nanowires of semiconductors as ZnO, AlN. She has supervised over 15 PhD students and has written more than 125 publications in international journals, 150 conference proceedings and was invited in more than 70 national and international conferences. She was President of the Education Division in the French Chemical Society (SCF) in 2000-2004, and now is Vice-President of the SCF. She created in 2006 the French Network of Theoretical Chemistry. She has been administrator of the French Chemical Industry and of the synchrotron SOLEIL. She was distinguished by the French Legion d'Honneur in 2007, and Officer of Palmes Académiques 2012.

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Dietrich Halm
Alemania / Germany

El Dr. Dietrich Halm (alemán, nacido en 1965) es el director de la Oficina de América Latina de la Fundación Alemana de Investigación (DFG), en São Paulo, Brasil. Coordina la cooperación científica de la DFG con investigadores, universidades, instituciones de investigación e instituciones que financian investigación en América Latina. En conjunto con las instituciones asociadas de América Latina, el Dr. Halm ha desarrollado el financiamiento de la investigación colaborativa y de programas de evaluación. Hasta ahora ha administrado cientos de propuestas de investigación, como los proyectos de movilidad, de financiamiento individual, y programas de investigación coordinada. Entre los años 2005 y 2010, fue director del programa para la cooperación internacional con América Latina y para geología (2007) en la Sede de la DFG en Bonn, Alemania. El Dr. Halm estudió geología en Tübingen, enfocándose principalmente en hidrogeología y ciencia del suelo. Durante algunos años (1995 - 2000), mientras tenía el puesto de investigador en la Universidad de Stuttgart-Hohenheim, se dedicó a investigar sobre los problemas de escasez de agua en Brasil. En el año 2000 recibió su doctorado de la Facultad de Ciencias de la Tierra de la Universidad Eberhard Karls de Tübingen. Entre los años 2000 y 2005, el Dr. Halm mantuvo una posición de Postdoctoral en el Centro de Geociencias Aplicadas (CAG) en Tübingen con foco en la coordinación científica y administrativa de diversos proyectos de investigación integrada de protección del suelo y del agua en Europa, Argentina y Brasil. El Dr. Halm es miembro de la Junta Directiva de la Cámara Alemana de Ciencia de Innovación (DWIH) en São Paulo, Brasil.

Dr. Dietrich Halm (German, born 1965) is the director of the Latin America Office of the German Research Foundation (DFG) in São Paulo, Brazil. He coordinates the scientific co-operation of the DFG with researchers, universities, research institutions, and research funding institutions in Latin America. Together with Latin American partner institutions, Dr. Halm developed joint research funding and evaluation programs. So far, he administrated hundreds of research proposals such as mobility projects, individual grants, and coordinated research programs. From 2005 to 2010, he was program director for the international cooperation with Latin America and for geology (2007) in the DFG Head Office in Bonn, Germany. Dr. Halm studied geology in Tübingen with a main focus on hydrogeology and soil science. For several years (1995- 2000) he researched on water scarcity problems in Brazil when he held a researcher position at the University of Stuttgart-Hohenheim. In 2000 he received his PhD from the Geoscience Faculty of the Eberhard Karls University Tübingen. From 2000 to 2005, Dr. Halm held a Post-Doc position at the Center for Applied Geoscience (CAG) in Tübingen with a focus on the scientific an administrative coordination of various research projects on integrated soil and water protection in Europe, Argentina and Brazil. Dr. Halm is member of the steering board of the German House of Science an Innovation (DWIH) in São Paulo, Brazil.

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Peter Kilpatrick
EE.UU. / USA

El Dr. Peter Kilpatrick es el Decano de Ingeniería Matthew H. McCloskey de la Universidad de Notre Dame, cargo que ocupa desde enero de 2008. También es Profesor de Ingeniería Química y Biomolecular en esa universidad. Recibió el grado de Bachiller en Química con máxima distinción del Occidental College en 1978 y el grado de Doctor en Ingeniería Química de la Universidad de Minnesota en 1983. Fue miembro de la facultad de la Universidad Estatal de Carolina del Norte desde 1983 hasta 2007 llegando al rango de Profesor Titular y desempeñándose como Jefe Departamento desde 1999 a 2007. También se desempeñó como Director Fundador del "Biomanufacturing Training and Education Center" de Carolina del Norte, una instalación de aprendizaje y entrenamiento único que fue diseñada para entrenar a la próxima generación de profesionales en Biofarmacéutica y los profesionales de la industria Biotecnológica. El Dr. Kilpatrick ha ganado diversos premios en enseñanza e investigación tanto a nivel local (Estado de Carolina del Norte) como regional, incluyendo el premio Docente Regional ASEE. Actualmente es miembro de la Junta Directiva de la Fundación AIChE, del Consejo Asesor externo de la Universidad de Texas en la Facultad de Ingeniería en El Paso, y es parte de la M-SETUP, organización emergente para aumentar dramáticamente el número y las tasas de graduación de Ingenieros Latinos, un papel que comparte con Richard Schoephoerster (UTEP), Amir Mirmiran (FIU), y Keith Moo-Young (Cal State LA). El Dr. Kilpatrick es el autor de más de 90 artículos en revistas científicas en las áreas de ciencia interfacial y coloidal, y auto-ensamblaje molecular, sobre todo cuando se aplican a energía y al bioseparaciones. También el titular de 13 patentes y ha participado activamente en dos Start Ups. En Notre Dame ha colaborado con la Facultad de Ciencias, la Escuela de Negocios y la Escuela de Derecho para ayudar a poner en marcha dos programas de magíster en emprendimiento y patentamiento. Durante su tiempo en Notre Dame, la Universidad el número de facultativos ha crecido en un 40%, y el financiamiento externo para investigación en más de 60%.

Dr. Peter Kilpatrick is the Matthew H. McCloskey Dean of Engineering at the University of Notre Dame, a position he has held since January 2008. He is also Professor of Chemical and Biomolecular Engineering there. He received his A.B. in Chemistry, summa cum laude, from Occidental College in 1978 and his PhD in Chemical Engineering from the University of Minnesota in 1983. He served on the faculty of North Carolina State University in Chemical Engineering from 1983 to 2007, rising to the rank of Professor, and served as the Department Head from 1999 to 2007. He also served as the Founding Director of the North Carolina Biomanufacturing Training and Education Center, a unique learning and training facility that was designed to train the next generation of Biopharmaceutical professionals and Biotechnology industry professionals. Dr. Kilpatrick has won a number of local (NC State) and regional teaching and research awards, including the ASEE Regional Teaching award. He currently serves on the AIChE Foundation Board of Trustees, on the external Advisory Council for the University of Texas at El Paso College of Engineering, and he is active in M-SETUP, the emerging organization to dramatically increase the numbers and graduation rates of Latino and Latina engineers, a role he shares with Richard Schoephoerster (UTEP), Amir Mirmiran (FIU), and Keith Moo-Young (Cal State LA). Dr. Kilpatrick is the author of more than 90 refereed journal articles in the areas of colloid and interfacial science, and molecular self-assembly, particularly as they apply to energy and to bioseparations. He is also the holder of 13 patents and has been actively engaged in two startups. At Notre Dame, he has collaborated with the College of Science, the College of Business, and the Law School to help launch two MS degree programs in entrepreneurship and patent law. During his time at Notre Dame, the College has grown by 40% in number of faculty members, and more than 60% in external research funding.

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Maria Nedeva
Inglaterra / England

La Dra. Maria Nedeva es profesora titular en la Escuela de Negocios (MBS) de la Universidad de Manchester. En términos generales, su investigación puede ser caracterizada como “investigación para la política” y se compone de tres líneas diferentes. En primer lugar, ella trabaja en la dinámica de la ciencia y desarrollando un concepto de ciencia como una relación entre los “campos de investigación” y los “espacios de investigación”. Esto permitiría a los estudiantes de ciencia y de política científica ser capaces de establecer vínculos “causales” entre las políticas (y la presión política) y el conocimiento como el objetivo último de estas políticas. En segundo lugar, trabaja en el cambio organizacional, concretamente, sobre las transformaciones que están experimentando las universidades contemporáneas y los efectos que estas pueden tener para las organizaciones, comunidades de conocimiento y la naturaleza del conocimiento que generan. En tercer lugar, ha contribuido a los debates sobre cuestiones de política, sobre todo en vínculos academia-industria y formas de medir y atribuir el impacto de las organizaciones de financiamiento de la investigación científica. Estas líneas de investigación son evidentes a través de sus publicaciones. Además, es profesora de Filosofía de la Ciencia a los investigadores de doctorado en la MBS, de Métodos de Investigación para estudiantes de Magíster y está desarrollando un curso de pregrado sobre fundamentos de gestión de la innovación. Entre 2003 y 2006 se desempeñó como Directora de Investigación de Posgrado del MBS y en este papel creó una Escuela de Doctorado y el programa de formación en investigación; la Escuela de Doctorado actualmente ocupa el primer lugar en el mundo y ha tenido un gran éxito en el reclutamiento de estudiantes de doctorado de primera clase en todo el mundo. Entre 2006 y 2009 fue Decano Asociado de Investigación de Posgrado de la Facultad de Humanidades de la Universidad de Manchester. Aparte de ser un miembro activo de varias comunidades de conocimiento, tiene experiencia - tanto en la investigación como en la práctica - en la evaluación de la investigación y de programas de investigación.

Dr. Maria Nedeva is a Senior Lecturer at Manchester Business School, the University of Manchester. Broadly, her research can be characterized as ‘research for policy’ and consists of three different strands. First, she is working on science dynamics and developing a notion of science as a relationship between ‘research fields’ and ‘research spaces’. This would allow students of science and science policy to be able to establish ‘causal’ links between policies (and policy pressure) and knowledge as the ultimate target of these policies. Second, she works on organizational change and more specifically on the transformations that contemporary universities are undergoing and the effects that these may have for organizations, knowledge communities and the nature of knowledge these generate. And third, she has contributed to debates on policy issues most notably academy-industry links and the ways to measure and attribute the impact of research funding organizations on science. These research lines are evident through her publications. Furthermore, she teaches Philosophy of Science to PhD researchers at Manchester Business School (MBS), Research Methods to Masters’ students and is developing an undergraduate course on the fundamentals of innovation management. Between 2003 and 2006, she was the Postgraduate Research Director of MBS and in this role she set up a Doctoral School and research training program; this Doctoral School is currently ranked first in the world and has been highly successful in recruiting top class PhD students from around the world. Between 2006 and 2009 she was the Associate Dean for Postgraduate Research of the Faculty of Humanities of Manchester University which is the size of a medium size university). Apart from being an active member of several knowledge communities, she has experience -both research and practical- in evaluation of research and research programs.

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2. FONDEF



Jesús Sebastián Audina
España / Spain

El Dr. Jesús Sebastián Audina obtuvo el grado de Doctor en Ciencias Biológicas en la Universidad Complutense de Madrid y fue Investigador Científico del Consejo Superior de Investigaciones Científicas (CSIC) (1974-2011). Ha sido investigador en las Universidades de Wisconsin y Brandeis (1971-1973); Catedrático de Bioquímica de la Facultad de Medicina de la Universidad Autónoma de Madrid; Director Adjunto del Instituto de Enzimología y Patología Molecular del CSIC; Vicepresidente del CSIC en Política Científica (1983-1988); Director Adjunto de la Agencia Española de Cooperación Internacional (AECI) (1989-1992); y Secretario General del Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo (CYTED) (1989-1996). De 1997 a 2011, el Dr. Sebastián se desempeñó como investigador en el Instituto de Estudios Documentales sobre Ciencia y Tecnología (EDCYT) trabajando en enseñanza, investigación y la asesoría internacional en políticas y gestión de la I+D y la cooperación internacional. De 2005 a 2011 ha sido coordinador de la Red CTI en estudios políticos, económicos y sociales sobre la ciencia, la tecnología y la innovación. De 2008 a 2012 fue miembro del Grupo Consultivo de Expertos sobre Cooperación Internacional de la Comisión Europea. Entre sus publicaciones recientes se encuentran "Cooperación e Internacionalización de las Universidades" (Editorial Biblos, 2004) "Radiografía de la Investigación Pública en España" (Editorial Biblioteca Nueva, 2006), "Ciencia, Tecnología y Desarrollo" (AECI, 2007), "Claves del Desarrollo Científico y Tecnológico de América Latina" (Editorial Siglo XXI y F. Carolina, 2007) "¿Hacia dónde va la política científica (y tecnológica) en España?" (CSIC, 2008), "Organización y funciones del sistema público de I + D en España" (Fundación IDEAS, 2010) y "Trayectorias de las Políticas Científicas y universitarias en Argentina y España" (CSIC, 2011). Ha sido Director Adjunto de Arbor, Revista de Ciencia, Pensamiento y Cultura, y presidente del Consejo Editorial de la Fundación Carolina.

Dr. Jesús Sebastián obtained his Ph.D. degree in Biological Sciences by the Universidad Complutense de Madrid and was Research Scientist at the Consejo Superior de Investigaciones Científicas (CSIC) (1974-2011). He has been Research Fellow at the Universities of Wisconsin and Brandeis (1971-1973), Professor of Biochemistry at the Faculty of Medicine, Autonomous University of Madrid, Deputy Director of the Institute of Enzymology and Molecular Pathology of the CSIC, vicepresident of CSIC on Scientific Policy (1983-1988). Deputy Director of the Spanish Agency for International Cooperation (AECI) (1989-1992), and Secretary General of the Iberoamerican Program on Science and Technology for Development (CYTED) (1989-1996). From 1997 to 2011, Dr. Sebastián has been a researcher in the Institute of Documental Studies on Science and Technology (EDCYT) working in teaching, research and international advice on policies and management of R & D and international cooperation. From 2005 to 2011 has been coordinator of the CTI Network on "Political, economic and social studies on science, technology and innovation". From 2008 to 2012 was a member of the "Expert Advisory Group on International Cooperation" of the European Commission. Among his recent publications are "Cooperación e Internacionalización de las Universidades" (Editorial Biblos, 2004) "Radiografía de la investigación pública en España" (Editorial Biblioteca Nueva, 2006), "Ciencia, Tecnología y Desarrollo" (AECI, 2007), "Claves del desarrollo científico y tecnológico de América Latina" (Editorial Siglo XXI y F. Carolina, 2007) "¿Hacia dónde va la política científica (y tecnológica) en España?" (CSIC, 2008), "Organización y funciones del sistema público de I+D en España" (Fundación IDEAS, 2010) y "Trayectorias de las políticas científicas y universitarias en Argentina y España" (CSIC, 2011). He has been Deputy Director of Arbor, Magazine of Science, Thought and Culture and Chairman of the Editorial Board of the Carolina Foundation.

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Susan Elisabeth Cozzens
EE.UU. / USA

La Dra. Susan E. Cozzens es Vicerrectora de Estudios de pregrado y posgrado del Instituto Tecnológico de Georgia (Georgia Tech), después de servir como Decano Asociado de Investigación en el Ivan Allen College. Además, tiene el título de Profesora Titular de Políticas Públicas. La Dra. Cozzens llegó a Georgia Tech en 1998 como jefa de Políticas Públicas. Recibió su grado de bachiller de la Universidad Estatal de Michigan y su Doctorado de la Universidad de Columbia. La Dra. Cozzens es beneficiaria del premio "Early Career" de Rensselaer, miembro de Phi Beta Kappa y Phi Kappa Phi y miembro de la Asociación Americana para el Avance de la Ciencia. Los intereses de investigación de la Dra. Cozzens se centran en las políticas de ciencia, tecnología e innovación en los países en desarrollo, incluidas cuestiones de equidad, igualdad y desarrollo. Ella es activa a nivel internacional en el desarrollo de métodos para la evaluación de la investigación e indicadores de ciencia y tecnología. Sus proyectos actuales se centran en las tecnologías del agua y la energía, la nanotecnología y el emprendimiento social; programas de tecnología en favor de los pobres y la colaboración internacional en investigación. La Dra. Cozzens se ha desempeñado como asesora de la Comisión de Ciencia, Ingeniería y Políticas Públicas del Consejo Nacional de Investigación, de la Oficina de Política de Ciencia y Tecnología, de la National Science Foundation (NSF) de EE.UU., del Instituto de Medicina, de la Oficina de Evaluación Tecnológica, General Accounting Office, Instituto Nacional del Cáncer, Instituto Nacional del Envejecimiento, de los Institutos Nacionales de Salud, y el Instituto Nacional de Seguridad Ocupacional y Salud, y en los comités asesores de la Asociación Americana para el Avance de la Ciencia (Educación Liberal y las Ciencias, Evaluación EPSCoR), la Academia Nacional de Ciencias (que toma las decisiones de NSF para premios mayores), y la Oficina de Evaluación Tecnológica (Proyecto Genoma Humano).

Dr. Susan E. Cozzens is the Vice Provost for Graduate and Undergraduate Studies at Georgia Tech, after serving as the Associate Dean of Research in the Ivan Allen College. She also holds the title of Professor in Public Policy. Dr. Cozzens came to Georgia Tech in 1998 as the Chair of Public Policy. She received her bachelor's degree from Michigan State University and her Ph.D. from Columbia University. Dr. Cozzens' is a recipient of Rensselaer's Early Career Award, a member of Phi Beta Kappa and Phi Kappa Phi and a Fellow of the American Association for the Advancement of Science. Dr. Cozzens' research interests are in science, technology, and innovation policies in developing countries, including issues of equity, equality, and development. She is active internationally in developing methods for research assessment and science and technology indicators. Her current projects are on water and energy technologies; nanotechnology; social entrepreneurship; pro-poor technology programs; and international research collaboration. Dr. Cozzens has served as a consultant to the Committee on Science, Engineering, and Public Policy of the National Research Council, Office of Science and Technology Policy, National Science Foundation, Institute of Medicine, Office of Technology Assessment, General Accounting Office, National Cancer Institute, National Institute on Aging, the National Institutes of Health, and the National Institute on Occupational Safety and Health, and on advisory committees for the American Association for the Advancement of Science (Liberal Education and the Sciences, EPSCOR Evaluation), the National Academy of Sciences (NSF Decision-making for Major Awards), and the Office of Technology Assessment (Human Genome Project).

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Calum Drummond
Australia

El Dr. Drummond recibió el grado de Doctor en Química Física de la Universidad de Melbourne en 1987. Es Ejecutivo del Grupo de Manufactura, Materiales y Minerales de CSIRO, que comprende 1.300 investigadores y personal de apoyo a la investigación y un presupuesto anual de USD 260 millones. Inmediatamente antes de este cargo, fue Jefe de Ciencia de los Materiales e Ingeniería (CMSE) de CSIRO y mantuvo una beca del Consejo de Investigación Australiano (ARC). Antes de convertirse en Jefe, Calum fue secundado por CSIRO para ser el vicepresidente de investigación inaugural en el CAP-XX, una compañía de cartera de Intel. CAP-XX desarrolla supercondensadores para los productos electrónicos. El Foro Económico Mundial designó a CAP-XX como Pionero Tecnológico Global en 2005. CAP-XX fue galardonado con el premio Frost & Sullivan 2006. En abril de 2006 CAP-XX cotiza en el AIM de Londres con una capitalización bursátil de USD 110 millones. Los intereses de investigación Calum están en el área de materiales avanzados, incluyendo la aplicación de almacenamiento de energía y productos biomédicos. Calum tiene un gran interés y pasión por la comercialización de los resultados de la investigación. Ha sido autor de más de 200 publicaciones, incluyendo cuatro capítulos de libros, más de 150 artículos en revistas científicas, nueve patentes y 54 informes de CSIRO para empresas. Los artículos que ha publicado han recibido más de 5.000 citas, y los indicadores de Thomson Reuters ISI Essential Science han incluido Calum en el 1% superior de químicos a nivel mundial. Calum es un compañero y un miembro de la Junta Directiva de la Academia Australiana de Ciencias Tecnológicas e Ingeniería (FTSE), miembro del Instituto Australiano de Directores de Empresas (FAICD), miembro de Instituto Químico (Royal Australian (FRACI), miembro pasado del Consejo RACI, y miembro de la Royal Society of Chemistry (FRSC; sede en Reino Unido).

Dr. Calum Drummond received a PhD in Physical Chemistry from The University of Melbourne in 1987. He is CSIRO Group Executive for Manufacturing, Materials and Minerals comprising 1300 researchers and research support staff and an annual budget of US\$260 million. Immediately prior to this Group Executive appointment, he was Chief of CSIRO Materials Science and Engineering (CMSE) and held an Australian Research Council (ARC) Federation Fellowship. Prior to becoming a Chief, Calum was seconded from CSIRO to be the inaugural Vice President Research at CAP-XX, an Intel portfolio company. CAP-XX develops supercapacitors for consumer electronic products. The World Economic Forum designated CAP-XX as a 2005 Global Technology Pioneer. CAP-XX was awarded the Frost & Sullivan 2006 Nanotechnology-enabled Energy Devices Technology Innovation of the Year Award. In April 2006 CAP-XX listed on the London AIM with a market capitalisation of US\$110 million. Calum's personal research interests are in the area of advanced materials, including application to energy storage and biomedical products. Calum has a strong interest and passion for the commercialisation of research outcomes. He has been an author of over 200 publications including 4 invited book chapters, over 150 refereed journal papers, 9 patents and 54 CSIRO reports for companies. The refereed journal papers have received more than 5000 citations, and the Thomson Reuters ISI Essential Science Indicators has listed Calum in the top 1% of chemists globally. Calum is a Fellow and a member of the Board of Directors of the Australian Academy of Technological Sciences and Engineering (FTSE), a Fellow of the Australian Institute of Company Directors (FAICD), a Fellow of the Royal Australian Chemical Institute (FRACI) and past RACI Honorary General Treasurer and Council member, and a Fellow of the Royal Society of Chemistry (FRSC; UK-based).

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Terttu Luukkonen
Finlandia / Finland

La Dra. Terttu Luukkonen es Jefe de Investigación Científica en el Instituto de Investigaciones de la Economía Finlandesa. Anteriormente ocupó cargos en el Centro de Investigación Técnica de Finlandia (Investigadora Científica Jefe, Directora de Grupo VTT de Estudios Tecnológicos, 1995–2001) y la Academia de Finlandia (1974–1995). Su experiencia abarca una amplia gama de preguntas en torno a políticas de investigación e innovación. La Dra. Luukkonen ha evaluado y proseguido investigación acerca del apoyo público a las actividades de investigación e innovación. Recientemente fue parte de dos proyectos financiados por el FP7, uno de financiamiento de proyectos empresariales en Europa (VICO) y otro sobre el papel del Consejo Europeo de Investigación (ERC) en ERA y el cambiante panorama de financiamiento de la investigación europea (EURECIA). Ella presenta una importante lista de publicaciones y contribuciones en congresos internacionales relacionados a preguntas sobre políticas de investigación e innovación. Ha sostenido becas de visitante en el Reino Unido (SPRU de la Universidad de Sussex y la Universidad de Brunel) y Francia (Ecole des Mines), y pertenece a las juntas Editoriales de varias revistas en el área, incluyendo Research Policy. Ha asesorado y evaluado políticas para ciencia e innovación para diferentes gobiernos (Finlandia, Irlanda, Estonia y Austria) y ha estado en juntas de expertos en Francia, Suecia y Chile. También ha sido asesora de diversas organizaciones internacionales (European Commission, European Court of Auditors, OECD, UN ECE, y el Nordic Council of Ministers). La Dra. Luukkonen participó en varios paneles de expertos para evaluar el impacto de los programas marco de la UE (Grupo de Evaluación 5-Años del Programa de Tecnología de la Información y la Comunicación (TIC) de la UE, 2004; Evaluación Interina de TIC del FP7, 2009–2010; Primera y Segunda Evaluación Interina de las Iniciativas de Tecnología Conjunta de ARTEMIS y ENIAC, 2010, 2011–12; evaluación del Programa de Apoyo de TIC en la Competitividad y el Programa Marco para la Innovación, 2011). Fue miembro del equipo de la OCDE que revisó el sistema holandés de educación superior en 2007.

Dr. Terttu Luukkonen is Chief Research Scientist at the Research Institute of the Finnish Economy. She has previously held positions with the Technical Research Centre of Finland (Chief Research Scientist, Director of VTT Group for Technology Studies, 1995–2001) and the Academy of Finland (1974–1995). Her expertise covers a wide range of questions in research and innovation policy. Dr. Luukkonen has evaluated and pursued research on public support to research and innovation activities. She was recently a partner in two FP7-funded projects, one on financing entrepreneurial ventures in Europe (VICO) and the other on the role of the European Research Council (ERC) in ERA and the changing European research funding landscape (EURECIA). She presents a significant list of publications and contributions to international conferences dealing with research and innovation policy questions. She has held visiting fellowships in the UK (SPRU, University of Sussex and Brunel University) and France (Ecole des Mines) and is on Editorial (Advisory) Boards of several journals in the area, including Research Policy. She has consulted and assessed science and innovation policies for national governments (Finland, Ireland, Estonia and Austria) and has been on expert boards in France, Sweden and Chile. She has consulted international organizations (European Commission, European Court of Auditors, OECD, UN ECE, and the Nordic Council of Ministers). She was on several panels of experts evaluating the impacts of EU framework Programs (5-Year Assessment Panel of the EU's Information and Communication Technologies (ICT) Program, 2004; the FP7 ICT Interim Evaluation, 2009–2010; First and Second Interim Evaluations of the ARTEMIS and ENIAC Joint Technology Initiatives, 2010, 2011–12; Evaluation of the ICT Support Program in the Competitiveness and Innovation Framework Program, 2011). She was a member of the OECD team which reviewed the Dutch higher education system in 2007.

EVALUATION OF FONDECYT, PIA/FONDAP AND FONDEF PROGRAMS

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Alan Paau
EEUU. / USA

El Dr. Alan Paau es Vicerrector y Director Ejecutivo del "Cornell Center for Technology Enterprise & Commercialization" de la Universidad de Cornell. Alan Paau es responsable de la dirección estratégica de todas las tecnologías y la propiedad intelectual que surgen de las actividades de investigación "en" y "de" la Universidad de Cornell para que sean útiles a la sociedad y para avanzar en las misiones de la universidad. Antes de enero de 2007, el Dr. Paau fue Vicerrector Asistente de Transferencia Tecnológica y Servicios de Propiedad Intelectual en la Universidad de California en San Diego durante nueve años. De 1994 a 1998 fue Director Ejecutivo de la Iowa State University Research Foundation, Inc. y Director de Propiedad Intelectual y Transferencia Tecnológica en Iowa State University. De 1992 a 1994, fue Director Asociado del Centro de Biotecnología de la Ohio State University. Mientras estuvo en Ohio State University, ocupó cargos docentes en Microbiología y Fisiología Vegetal, y en Iowa State University, los de docente en Microbiología, Inmunología y Medicina Preventiva, y en Genética y Zoolología Animal. Antes de volver al ámbito académico, el Dr. Paau pasó 12 años en la industria con la Compañía Cetus y las organizaciones de WR Grace & Co., y ocupó cargos de investigación y de gestión de responsabilidades cada vez mayores. El Dr. Paau tiene el grado de Doctor en Ciencias Biológicas, un Máster en Administración de Empresas y asistió a la escuela de leyes de Drake University. Como director de propiedad intelectual, ejecutivo de concesión de licencias, y Profesional Certificado de concesión de Licencias, ha supervisado la ejecución de más de 1.500 transacciones de licencias de tecnología y la formación de más de 140 nuevas empresas que utilizan tecnologías patentadas.

Dr. Alan Paau is Vice Provost and Executive Director, Cornell Center for Technology Enterprise & Commercialization, Cornell University. Dr. Paau is responsible for the strategic management of all technologies and intellectual property that arise from research activities at and owned by Cornell University to make them useful to society and to advance the missions of the university. Prior to January 2007, Dr. Paau for nine years was Assistant Vice Chancellor for Technology Transfer & Intellectual Property Services at the University of California San Diego. From 1994 to 1998, he was Executive Director of the Iowa State University Research Foundation, Inc. and Director of Intellectual Property & Technology Transfer at Iowa State University. From 1992 to 1994, he was Associate Director of the Biotechnology Center at the Ohio State University. He held faculty appointments in Microbiology and in Plant Physiology while at the Ohio State University and in Microbiology, Immunology & Preventive Medicine and in Zoology and Animal Genetics while at the Iowa State University. Before returning to the academic environment, Dr. Paau spent 12 years in industry with the Cetus Co. and the W.R. Grace & Co. organizations and held research and management positions of increasing responsibilities. Dr. Paau holds a Ph.D. degree in Biological Sciences, a Master of Business Administration degree, and attended Drake University School of Law. As a director of intellectual property, a licensing executive, and a Certified Licensing Professional, he has supervised the execution of over 1500 technology licensing transactions and the formation of over 140 new businesses using licensed technologies.

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3. FONDAP / PIA



Ronald Dekker
Países Bajos / The Netherlands

Ron Dekker es director de Institutos, Finanzas e Infraestructura de la Organización Holandesa para la Investigación Científica (NWO). Ron Dekker es miembro del Equipo de Dirección General en la NWO. Sus responsabilidades principales incluyen finanzas, asuntos jurídicos, TI e instalaciones; el desarrollo de políticas y la supervisión de los institutos del NWO, el Centro de e-Ciencia y otras relacionadas a infraestructura científica en TIC, la participación de la NWO en el Science Park en Amsterdam, y de "Open Access". Dekker es miembro del consejo de ESRF, del consejo de SURF, del instituto DANS, del consejo de LOFAR-NL, del Science Park de Amsterdam y de Matrix Incubator Ltda. en Amsterdam. Ha sido vice-presidente (electo) de IASSIST: Asociación Internacional de Servicios de Información en Ciencias Sociales y Tecnología (2001-2004), y vice-presidente de CESSDA, el consorcio europeo de Archivos de Datos en Ciencias Sociales (1999-2000). Él ha pertenecido 14 años a la NWO, primero como jefe de la Agencia de Estadística Científica (oficina encargada de relacionar datos estadísticos nacionales y de investigación), luego como coordinador de varios programas de financiamiento en Ciencias Sociales, a partir de 2004 como jefe del departamento de programas centrales (incluyendo grandes infraestructuras), y desde el 2006 en la gestión general. Antes de llegar a la NWO fue investigador en economía del trabajo por más de 10 años en la Universidad de Maastricht y la Universidad de Tilburg. Ron Dekker estudió econometría en la Universidad de Tilburg.

Ron Dekker is Director of Institutes, Finance and Infrastructure at The Netherlands Organisation for Scientific Research (NWO). Ron Dekker is a member of the General Management Team at the Netherlands Organisation for Scientific Research (NWO). His main responsibilities are finance, legal affairs, IT and facilities; policy development and monitoring of the NWO-institutes, the e-Science Center and other scientific ICT infrastructure, NWO-participation in Amsterdam Science Park, and Open Access. Dekker is a board member of ESRF-council, SURF-council, DANS-institute, LOFAR-NL-Council, Amsterdam Science Park, Matrix Incubator Ltd Amsterdam. He has been vice-president (elect) of IASSIST: International Association of Social Science Information Services and Technology (2001-2004), and vice-president of CESSDA, the consortium of European Social Sciences Data-archives (1999-2000). He is with NWO for 14 years, first as Head of the Scientific Statistical Agency (a data broker office between national statistics and research), next as coordinator for several granting programs at Social Sciences, as of 2004 as head of department for central programs (incl. large infrastructures) and since 2006 in general management. Before coming to NWO he was a researcher in labor economics for over 10 years at University of Maastricht and University of Tilburg. Ron Dekker studied econometrics at Tilburg University.

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Liisa Hakamies-Blomqvist Finlandia / Finland

La Dr. Liisa Hakamies-Blomqvist recibió el grado de Doctor en psicología de la Universidad de Helsinki en 1994. Desde el año 2011 es Directora de la Unidad de Investigación de Cultura y Sociedad de la Academia de Finlandia. Fue Directora de NordForsk de 2005 a 2009. Trabajó como directora científica de The Swedish National Road and Transport Research Institute entre los años 2002 y 2005. Ella es docente en Psicología en la Universidad de Helsinki. También se desempeñó como profesora de Psicología Social y Psicología en la Escuela Sueca de las Ciencias Sociales en el período 1999-2001, y como Profesora Adjunta en Estudios de Envejecimiento en la Universidad de Linköping en 2004-2005. Ella ha supervisado estudiantes de doctorado en las áreas de psicología del desarrollo, envejecimiento y transporte, estudios de la mujer y psicología de la salud. Ha ocupado diversos puestos directivos en la Universidad de Helsinki, The Swedish National Road and Transport Research Institute, y en diferentes organismos nacionales y europeos, como el EUROPSY-T (Asociación Europea de Psicología del Tráfico: Comité de Dirección), la Federación Europea de la Asociación de psicólogos profesionales (Traffic Psychology Task Force), ECTRI (Conferencia Europea de Institutos de Investigación de Transporte: Comité Ejecutivo) y la Asociación Finlandesa de Psicología (Presidente, 1999-2003). También ha estado involucrada en diferentes tareas de expertos (tanto científica como política orientada) para autoridades europeas e internacionales, tales como Transportation Research Board (EE. UU.) y VicRoads (Victoria, Australia).

Dr. Liisa Hakamies-Blomqvist received a PhD in Psychology from Helsinki University in 1994. From 2011 she is Director of the Culture and Society Research Unit of the Academy of Finland. She was Director of NordForsk from 2005 to 2009. She worked as Scientific Director of The Swedish National Road and Transport Research Institute from 2002 to 2005. She is Docent in Psychology at the University of Helsinki. She has also acted as Professor in Psychology and Social Psychology at the Swedish School of Social Science in 1999-2001, and as Adjoint Professor in Studies of Ageing and Late Life at the University of Linköping in 2004-2005. She has supervised PhD students within the areas of developmental psychology, ageing and transportation, women's studies, and health psychology. She has held a number of leading positions at the University of Helsinki, at The Swedish National Road and Transport Research Institute and in different national and European organs, such as the EUROPSY-T (European Association of Traffic Psychology: Management Committee), European Federation of Professional Psychologists' Association (Traffic Psychology Task Force), ECTRI (European Conference for Transport Research Institutes: Executive Committee) and The Finnish Psychological Association (Chair 1999-2003). She has also been engaged in a variety of expert tasks (both scientific and policy-oriented) for European and other international authorities such as Transportation Research Board (USA) and VicRoads (Victoria, Australia).

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Carmen Huber
EEUU./ USA

La Dra. Carmen Huber fue nombrada Jefa de la Oficina Europea de la NSF en París en el año 2011. La Oficina Europea representa a la National Science Foundation (NSF) en Europa y Eurasia e informa sobre asuntos de interés en todos los ámbitos de la investigación. Como Jefa de la Oficina, la Dra. Huber sirve de enlace entre las agencias europeas de financiamiento de la investigación y la NSF. La Dra. Huber se unió a NSF en 1995. Antes de asumir su cargo actual, se desempeñó en la División de Investigación de Materiales como Directora de Programa en la Oficina de Programas Especiales y como Directora Ejecutiva interina. Adquirió una amplia experiencia internacional a través del desarrollo e implementación de la Red Mundial de Materiales, un marco para el apoyo de la colaboración internacional en investigación de materiales y colaboraciones en educación en todo el mundo. En 2010 fue seleccionada como miembro científico de la Embajada de EE.UU. en Uzbekistán, donde llevó a cabo una evaluación de la ciencia y la tecnología uzbeka para el Departamento de Estado de EE.UU. También sirvió a la NSF en otros roles, incluyendo la dirección del programa de Investigación en Ciencias de los Materiales y Centros de Ingeniería, y en actividades educativas en materiales. Ella recibió el Premio Director's Superior Accomplishment de la NSF en 2010. De 1991 a 1995 la Dra. Huber se desempeñó como investigadora en física en el Centro Naval de Guerra de Superficie en White Oak, Maryland. Recibió el Premio de Investigación independiente de dicho centro en 1992. Entre 1989 y 1991 fue Miembro Científico del Instituto Radcliffe de Estudios Avanzados en Cambridge, Massachusetts, y científico visitante en el MIT. Fue profesora de física en la Universidad de Puerto Rico desde 1983 hasta 1991. Ella es autora de unas 40 publicaciones científicas y un capítulo de libro, y cuenta con tres patentes derivadas de su investigación patrocinada por la NSF, la Corporación de Investigación, la Oficina de Investigación del Ejército y la Oficina de Investigación Naval. Recibió el grado de doctor en física de la Universidad de Brown y el grado de bachiller, también en física, del Instituto Balseiro en Argentina.

Dr. Carmen Huber was appointed Head of the National Science Foundation Europe Office in Paris in 2011. The Europe Office represents NSF in Europe and Eurasia and reports on matters of interest in all fields of research. The Office Head serves as liaison between European research funding agencies and NSF. Dr. Huber joined NSF in 1995. Prior to assuming her current position, she served in the Division of Materials Research as Program Director in the Office of Special Programs and as Acting Executive Officer. She acquired extensive international experience through the development and implementation of the Materials World Network, a framework for international partnership in support of materials research and education collaborations worldwide. In 2010 she was selected as U.S. Embassy Science Fellow in Uzbekistan, where she conducted an assessment of Uzbek science and technology for the U.S. Department of State. She also served NSF in other capacities, including program director for Materials Research Science and Engineering Centers and for materials education activities. She received the NSF Director's Superior Accomplishment Award in 2010. From 1991 to 1995 Dr. Huber was a research physicist at the Naval Surface Warfare Center in White Oak, Maryland. She received that Center's Independent Research Award in 1992. In 1989-91 she was a Science Fellow at the Radcliffe Institute of Advanced Studies in Cambridge, Massachusetts, and a visiting scientist at M.I.T. She was a professor of physics at the University of Puerto Rico from 1983 to 1991. She is the author of some forty scholarly publications and one book chapter, and has three patents from her research sponsored by NSF, the Research Corporation, the Army Research Office, and the Office of Naval Research. She received a Ph.D. in physics from Brown University and a B.S., also in physics, from the Instituto Balseiro in Argentina.

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Malcolm McPherson
EE.UU./ USA

Malcolm McPherson tiene un Doctorado de la Universidad de Harvard y es miembro Senior del Ash Center para la Gobernabilidad Democrática e Innovación en Harvard Kennedy School. Entrenado como un economista del desarrollo, el trabajo actual de McPherson implica el impulso agrícola de Myanmar, la reforma macroeconómica en Ghana, la promoción de la resiliencia en estados frágiles, y la aceleración del crecimiento económico inclusivo en Indonesia.

Malcolm McPherson has a PhD from Harvard University and is a Senior Fellow, Ash Center for Democratic Governance and Innovation, Harvard Kennedy School. Trained as a development economist, McPherson's current work involves agricultural development in Myanmar, macroeconomic reform in Ghana, promoting resilience in fragile states, and accelerating inclusive economic growth in Indonesia.

EVALUACIÓN DE LOS PROGRAMAS FONDECYT, PIA/FONDAP Y FONDEF

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Anthony James (Tony) Press
Australia

El Dr. Tony Press es Director General del Centro Cooperativo de Investigación del Clima y el Ecosistema Antártico (CRC ACE) con sede en Hobart, Australia, posición que ha ocupado desde el año 2009. El ACE CRC es una de las instituciones científicas líderes de Australia en cambio climático. Con base en la Universidad de Tasmania, ACE reúne a científicos de la División Antártica Australiana, CSIRO, la Universidad de Tasmania, el Departamento de Gobierno Australiano de Cambio Climático y Eficiencia Energética, y 17 otras instituciones nacionales e internacionales para estudiar el papel que la Antártida y el océano sur juegan en el cambio climático y sus impactos a nivel regional y mundial. Durante los últimos 20 años, los científicos de la ACE han ayudado a trazar el rumbo del cambio climático y evaluar su potencial impacto, no sólo en la Antártida, sino también en todo el mundo. Científicos de la ACE han jugado un papel destacado en la elaboración de los informes de evaluación del Grupo Intergubernamental de Expertos sobre el Cambio Climático. Tony es también un miembro del Comité Nacional de Integridad e Igualdad del Gobierno Australiano (DOIC). El DOIC es un comité de expertos independiente que apoya la integridad ambiental de los bonos de carbono generados en el marco de la Iniciativa de Agricultura de Carbono. Su función consiste en evaluar las propuestas metodológicas y asesorar al Ministro de Cambio Climático y Eficiencia Energética, quién decide sobre la aprobación de las propuestas. De 1998 a 2008, Tony fue el Director de la División Antártica Australiana. Tony presidió el Comité del Tratado Antártico para la Protección del Medio Ambiente (CEP) de 2002 a 2006. Fue representante de Australia a la CEP y un representante de alto nivel en las Reuniones de Asesoría del Tratado Antártico desde 1999 hasta 2008 y Comisionado de Australia en la Comisión para la Conservación de los Recursos Antárticos Marinos Vivos desde 1998 hasta 2008. Antes de mudarse a Tasmania en 1998, Tony fue miembro ejecutivo principal del Departamento de Medio Ambiente del Gobierno Australiano de 1996 a 1998, Director General de los Parques Nacionales Australianos y Servicio de Vida Silvestre (Darwin) de 1990 - 1996, y ecologista en el Parque Nacional de Kakadu desde 1984 hasta 1989.

Dr. Tony Press is the CEO of the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC) based in Hobart, Australia. He has held this position since 2009. The ACE CRC is one of Australia's leading climate change science institutions. Based at the University of Tasmania, ACE brings together scientists from the Australian Antarctic Division, CSIRO, the University of Tasmania, the Australian Government's Department of Climate Change and Energy Efficiency, and 17 other national and international institutions to study the role that Antarctica and the Southern Ocean play in climate change, and its impacts regionally and globally. Over the past 20 years ACE scientists have helped chart the course of climate change and assess what its impacts are likely to be, not only in the Antarctic, but also around the globe. ACE scientists have played a leading role in the development of the assessment reports of the Intergovernmental Panel on Climate Change. Tony is also a Member of the Australian Government's Domestic Offsets Integrity Committee (DOIC). The DOIC is an independent expert committee supporting the environmental integrity of carbon offsets generated under the Carbon Farming Initiative. Its role is to assess methodology proposals for use under the scheme and advise the Minister for Climate Change and Energy Efficiency, who makes a decision whether to approve methodology proposals. From 1998 to 2008 Tony was the Director of the Australian Antarctic Division. Tony chaired the Antarctic Treaty's Committee for Environmental Protection (CEP) from 2002 to 2006. He was Australia's representative to the CEP and a senior Representative to Antarctic Treaty Consultative Meetings from 1999 to 2008; and Australia's Commissioner in the Commission for the Conservation of Antarctic Marine Living Resources from 1998 to 2008. Before moving to Tasmania in 1998, Tony was a Senior Executive Service member in the Australian Government's Department of the Environment from 1996 - 1998; the General Manager of the Australian National Parks and Wildlife Service (Darwin) from 1990 - 1996; and an ecologist in Kakadu National Park from 1984 - 1989.

EVALUATION OF FONDECYT, PIA/FONDAP AND FONDEF PROGRAMS

Report of International Review Panels



Claudine Schmidt-Lainé
Francia / France

La Dra. Claudine Schmidt-Lainé fue Directora del Instituto de Ciencias de la Ingeniería y Sistemas del CNRS, cargo que ocupó desde septiembre de 2011. Nacida en Rouen en 1955, Claudine Schmidt-Lainé es Directora de Investigación de clase excepcional en el CNRS desde 1981. Desde enero de 2010 fue Delegada Regional de la circunscripción Rhône-Auvergne. Anteriormente ocupó el cargo de Directora Científica en Cemagref, al cual se unió en 1998. Durante su carrera en la CNRS, se desempeñó como directora adjunta del Departamento de Física y Matemáticas e inició grupos interdisciplinarios de investigación como el programa de "Modelación y Simulación Numérica del Organismo". Claudine Schmidt-Lainé tiene un diploma de ingeniero en Artes y Manufacturas de la Escuela Central de París (1977). Después de un DEA realizado en Lyon, defiende su tesis de doctorado en ingeniería en 1980 y una tesis en matemáticas aplicadas en 1985. Claudine Schmidt-Lainé es miembro de numerosos comités editoriales y científicos de la Academia de Ciencias, y experta para la Comisión Europea. También es miembro de la Academia de Tecnologías desde 2007, es autora de un centenar de publicaciones sobre análisis no lineal y modelación de la turbulencia y la combustión. Claudine Schmidt-Lainé fue nombrada rectora de la Academia de Rouen en el Consejo de Ministros del 3 de enero 2013. Ella es chevalier de l'ordre national du mérite y chevalier de la Légion d'honneur.

Dr. Claudine Schmidt-Laine was Director of the Institute of Systems and Engineering Sciences of CNRS, position that she held since September, 2011. Born in Rouen in 1955, Claudine Schmidt-Lainé is Research Director of exceptional class at CNRS since 1981. Since January 2010 she was Regional Delegate of Rhône-Auvergne constituency. Previously, she served as Chief Scientist at Cemagref since 1998. During her career at the CNRS, she served as deputy director of the Department of Physics and Mathematics and initiated interdisciplinary research groups such as the program "Modeling and Numerical Simulation of the Organism". Claudine Schmidt-Lainé has an engineering degree in Arts and Manufactures of the Ecole Centrale de Paris (1977). After a DEA held in Lyon, she defended her PhD thesis in engineering in 1980 and a thesis in applied mathematics in 1985. Claudine Schmidt-Lainé is member of numerous editorial and scientific boards of the Academy of Sciences, and an expert for the European Commission. She is also member of the Academy of Technology since 2007, is author of hundreds of publications on nonlinear analysis and modeling of turbulence and combustion. Claudine Schmidt-Lainé was appointed rector of the Academy of Rouen in the Council of Ministers of January 3, 2013. She is chevalier de l'ordre national du mérite and chevalier de la Légion d'honneur.



Jean-François Stéphan
Francia / France

Jean-François Stéphan, de 63 años, es Director del Instituto Nacional de Ciencias del Universo, uno de los 10 institutos de CNRS, desde julio de 2010. Fue alumno de la Ecole Normale Supérieure de Saint-Cloud (69-73), es agregado ("agrégé") en biología y ciencias de la tierra (1972) y Doctor de Estado (1982) de la Universidad Pierre et Marie Curie en París. Es profesor de Categoría Sobresaliente de Geología Tectónica y Geodinámica de la Universidad de Nice-Sophia Antipolis y desde 1989 ha sido investigador del CNRS en los laboratorios asociados a esta organización, primero en la Universidad Pierre et Marie Curie (77-81) y luego en la Universidad de Western Bretaña [Brest] (1981-1989). Su campo de investigación es el estudio de la arquitectura y los mecanismos de génesis de las cadenas montañosas y las estructuras submarinas en el contexto de la convergencia (subducción y colisión). Su investigación se ha centrado en los Alpes de Venecia, los Andes y la cadena del Caribe Sur de Venezuela (tesis y trabajo posterior), la placa del Caribe, los sistemas montañosos de Taiwán y las Filipinas, el sur de Sicilia, el sur de los Alpes franceses, Siberia (Lago Baikal). Su obra se ha traducido en más de 150 publicaciones, entre ellas unos 60 artículos en revistas de circulación internacional y más de 70 en congresos nacionales e internacionales. En la Universidad de Nice-Sophia Antipolis, dirigió el laboratorio del "Instituto de Geodinámica", y la DEA (Máster 2) de Greater South East France, "Dinámica de la litosfera" (1989-1995). En el Ministerio de Educación Superior e Investigación ha sido sucesivamente Director Científico del Departamento de "Ciencias de la Tierra, Astrofísica e Investigación Espacial" dentro de la Misión Científica y Técnica Pedagógica (2003-2006), luego fue director del departamento estratégico "Medio ambiente, planeta, universo, espacio" en la Dirección General de Investigación e Innovación (2006-2010). Fue galardonado con la medalla de bronce del CNRS (1985), el Premio James Hall (1990) y Léon Lutaud (2010) de la Academia Francesa de Ciencias.

Jean-François Stéphan, 63, is, since July 2010, Director of the National Institute of Sciences of the Universe one of the ten institutes of CNRS. Former student of the Ecole Normale Supérieure de Saint-Cloud (69-73), he is aggregated ("agrégé") in Biology and earth sciences (1972) and Doctor of State (1982) from the University Pierre et Marie Curie in Paris. Outstanding Class professor of Geology Tectonics and Geodynamics at the University of Nice-Sophia Antipolis, since 1989 he has been a CNRS researcher in laboratories associated with this organization, first at the University Pierre et Marie Curie (77-81) then at the University of Western Brittany [Brest] (81-89). His field of research is the study of the architecture and mechanisms of genesis of mountain chains and submarine structures in the context of convergence (subduction and collision). His research has focused on the Venetian Alps, the Andes and the South Caribbean chain of Venezuela (state thesis and subsequent work), the Caribbean plate, mountain systems of Taiwan and the Philippines, southern Sicily, southern French Alps, Siberia (Lake Baikal). His work has resulted in over 150 publications, including approximately 60 articles in journals of international circulation and more than 70 papers in national and international conferences. At the University of Nice-Sophia Antipolis he directed the "Institute of Geodynamics" laboratory, and the Federated DEA (Master 2) of Greater South East France "Dynamics of the Lithosphere" (1989-1995). At the Ministry of Higher Education and Research he has been successively Scientific Director of the Department "Earth Sciences, Astrophysics and Space research" within the Mission Scientifique Technique et Pédagogique (2003-2006), then director of the "Environment, Planet, Universe, Space" strategic department at the Directorate General for Research and Innovation (2006-2010). He was awarded the Bronze Medal of the CNRS (1985) and James Hall Prize (1990) and Léon Lutaud (2010) of the French Academy of Sciences.

IV. RESULTS OF THE EVALUATION: ORIGINAL REPORTS



Reporte de Evaluación Programa FONDECYT

IV. RESULTS OF THE EVALUATION:
ORIGINAL REPORTS

1. FONDECYT Program Evaluation Report

1.1. Introduction

FONDECYT, the oldest and largest research funding instrument of CONICYT, has been consistently shaping the science base in Chile for the last 30 years; this includes the development and continuous improvement of research capacity as (a) human capital; (b) research competencies; and (c) bodies of knowledge. During this relatively brief period substantial and very impressive strides towards developing and stabilizing a national research system have been made; there is also evidence of a focused internationalization strategy for this system by training PhD graduates abroad and enabling some national knowledge communities to become an integral part of the world-wide scientific community.

We would like to emphasize from the outset, that as members of the expert evaluation panel assessing the objectives, operational principles and practices, and impact of FONDECYT, we find the history of this research funding program to be one of great achievements. The fact that this history is relatively short makes these achievements even more impressive.

At the same time we believe that CONICYT, and to some degree FONDECYT, have outgrown their initial missions, namely the developmental mission related only to human capital and the initial conditions for research (see Figure 1). Chile already has human capital that would enable it to make a step change in its science base and research capacity. Hence, the time has come to develop a strategy for and plan the conditions for the next step in building the research capacity of the country. This step is likely to involve (and demand) a wide range of changes including: (a) revising the notions regarding science and its role in society and

economy; (b) changes in the ways in which science organizations (universities and institutes) are funded; (c) how much funding is dedicated to science and innovation; and (d) structural change at the level of the national innovation/research system and the universities and research institutes.

While being mindful of the charge to this expert evaluation panel, namely to evaluate the FONDECYT Program of CONICYT, we did find this somewhat problematic without referring to the broader structure and conditions that provide the framework(s) for the operation of this specific research instrument. Hence, our report is structured in three further sections. Section 2 sets out our observations about, and understanding of, the national and organizational background and context. In Section 3 we discuss our findings and conclusions about FONDECYT, linking these to CONICYT where appropriate and possible. Last but not least, in Section 4 of this report we outline 12 recommendations following directly from our work and agreed to by the members of the expert evaluation panel.

The findings and conclusions included in this report draw on the following information: (a) background documents provided by CONICYT; (b) meetings with officials at six universities in Chile; (c) exploratory interviews with Chilean researchers in these universities who are recipients of FONDECYT grants (all three schemes); (d) representatives of the FONDECYT Superior Council; and (e) discussions with the Director and the staff members of FONDECYT.

We would like to specifically recognize the effort of the CONICYT staff members who organized this expert evaluation and provided the background material for it. Their professionalism, competence and dedication are exemplary. Given that there appears to be little experience with evaluation of research funding schemes in Chile, this effort is impressive. We would also hope that the process of the expert evaluation itself will contribute to developing further the evaluation competence in Chile and to furthering a culture of openness, debate and reflectiveness.

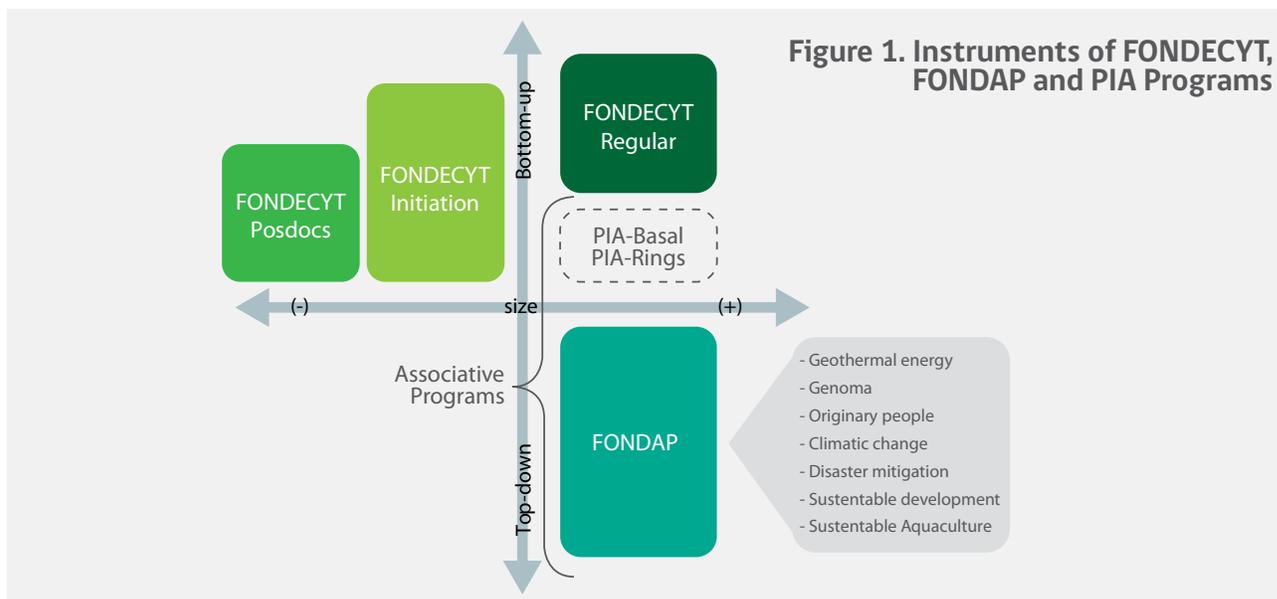


Figure 1. Instruments of FONDECYT, FONDAP and PIA Programs

1.2. Background and Context

In this part of the report we discuss our impressions, observations and understanding of the research funding background and context at the level of the national innovation/research system and the research performing organizations (universities).

A. National Innovation/Research system

During the last three decades or so, CONICYT and FONDECYT have been actively supporting and continuously building the science base in Chile. This is evidenced by the longevity and stability of the FONDECYT program, its ability to incorporate new funding instruments (e.g. the Post-doctoral funding and the Initiation into Research schemes) and the fact that its budget has increased two-fold over the last six years representing over 15% of the current public funding for science and innovation in Chile.

While the efforts of CONICYT and FONDECYT in this respect are commendable, and highly appreciated by the research community of Chile, we believe that the national innovation/research system needs further consideration along three major lines, namely national strategy and policy for science, funding issues and organization.

a) National strategy and policy for science

Currently Chile does not appear to have a developed, overarching national vision and strategy for science and innovation or adequate and workable policy frameworks. This message was confirmed by our discussions with key stakeholders in the system, CONICYT employees, university leaders and individual researchers. Without developing and agreeing upon a national vision and strategy for science, research and innovation, and supporting these with appropriate policy and implementation frameworks, the future development of the national innovation/research system of the country may be impeded.

We believe the articulation of such strategy and policy (implementation) frameworks is necessary if Chile is to:

- Increase the efficiency of its innovation and research system; Enable the coordination of different funding streams and mechanisms;
- Ensure closer, organic and productive relationship between science, the economy and society; and
- Provide a vehicle for further investment in science, technology and innovation.

We would like to elaborate on the last bullet point. Our impression from discussions with different participants in the research system is that the budget for science in Chile is still, at least in part, viewed as an 'expenditure'. Science, innovation and ultimately the Chilean economy and society will benefit greatly were this to be seen as a valuable investment in the future of the country.

b) Organization of the national innovation/research system

The emergence of national level strategy and policy frameworks for science and innovation is conditional on the existence of a policy actor in the system that has the competence and influence necessary to carry out these tasks. The organization of the Chilean national innovation/research system appears somewhat fragmented with the various research performers and implementing agencies reporting through three different ministries and coordinated loosely by an inter-ministerial committee. In the judgment of this review panel, this coordination is not currently as effective as it could or should be. A governmental body is needed to lead the negotiation of a national vision and strategy for science and innovation, and to enact national level policy frameworks, and CONICYT appears to be best suited to be this governmental body. However, whilst CONICYT has the competence and legitimacy to carry out these tasks, it thus far has no ministerial authority that will allow it to do so.

CONICYT could be strengthened as the National Research Council by reinstating the Presidential council that intercedes with the President for CONICYT.

c) Funding issues

Here we would like to draw attention to three issues, namely: the level of funding for research and innovation in Chile; the sources of funding; and the modalities of public funding.

Although significant funding progress has been made in the last several years, the proportion of GDP used to invest in science and technology remains very low at 0.42% of GDP. A significant increase in this budget would align Chile further with the scientifically and technologically advanced countries around the world. Moreover, an increase in the proportion of the GDP devoted to science, research and innovation would enable the science system to make a qualitative jump thus being able to offer more value to the economy and society. Here, thinking of funding for science and technology as investments may be the key.

An overwhelming proportion of the funding for science and research is public and comes from governmental sources (about 90%). This may create imbalances in the innovation system whereby science and technology research versus industry and innovation develop on separate and unconnected trajectories. This in turn can restrict the transition to a sustainable knowledge-based society whereby research and industry develop in an integrated and mutually beneficial fashion.

Regarding modalities, Chile is fairly unique in that almost all public funding for research is competitive and project based. In most countries, particularly the ones with well balanced, developed and successful innovation/research systems, research

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funding is allocated in two modalities: competitive projects and selective block grants to universities and/or research institutes. **We would like to emphasize that introducing block research grants is important but it can be done only if the research budget of the nation is substantially increased.** Such block research grants enable sustainable research centers of excellence, national institutes, and national laboratories. Again, in well-developed and successful innovation/research systems, these types of entities are common.

B. Universities

Because of the funding structures at national level – the funding for research is mostly project based – the universities have fairly limited capacity for strategic action and they experience a very high level of funding and budgetary uncertainty. One area that is particularly vulnerable and uncertain is the maintenance of research equipment and facilities. Our meetings with university leaders and researchers alike, highlighted considerable challenges with maintaining research equipment and developing research facilities. Universities ought to have adequate means of creating and maintaining research infrastructure consistent with the goals and aspirations of the country.

C. Other issues

Thousands of PhDs are being trained in Chile and abroad, who represent a valuable investment in human capital necessary to accomplish future goals in research and innovation. However, there are insufficient job opportunities for PhDs in both the public and private sector; Chile will have great difficulty in placing these new PhD-holders in the future if changes are not implemented. Greater coordination of the overall research and development environment and economic development is needed to ensure these persons are well placed in society.

Regional policies are being established in Chile. FONDECYT should articulate appropriate regional policies without decreasing the level of excellence.

1.3. Observations and Conclusions about FONDECYT and CONICYT

A. Objectives and Design of FONDECYT and Its Funding Instruments (Regular, Initiation, and Postdoctoral Programs)

This section describes our observations and conclusions about the objectives and design of FONDECYT programs and, where appropriate, their relationship to CONICYT overall structure, design, and objectives. It should be stated at the outset that the FONDECYT programs are essential for the overall research health of Chile and for the productivity and livelihood of individual Chilean

researchers. FONDECYT has, in very large part, accomplished its foundational goal of promoting the development of basic research in all fields in science and technology, as well as in humanities, social sciences, and other fields, in the country. It is the jewel in the Chilean research system. Without continued strong and growing FONDECYT funding, there will be no research of any substance in Chile. FONDECYT programs undergird all other research programs funded by CONICYT, CORFO, and other sources of funding. Our comments and observations should therefore be taken within this context and understood to intend to constructively enhance and strengthen an already very successful set of programs.

a) Success Rates of Applications

One concern that arose among the international review panel with regards to FONDECYT programs was the high success rate of proposals. The success rate of the Regular grant awards is approaching 50% (47% in 2011) and this is unusually high relative to international standards. While such elevated success rates are understandable when building capacity, the administrators of the FONDECYT program must be mindful that this will likely limit the excellence of the awarded grants. To ensure that excellence is also promoted and maintained, it may be prudent to take some actions to ensure that some FONDECYT funds are directed primarily to those researchers who will perform at the very highest levels.

b) Design of FONDECYT

• Governance Issues

The governing council of FONDECYT and the administrative staff who manage the programs in FONDECYT appear to be unnecessarily disconnected. The administration of the various programs within CONICYT appears to be fragmented and uncoordinated. It is the panel's understanding that this is by design in order to separate policy and budget decisions from programmatic administration, but this leads to lack of coordination within both FONDECYT and other CONICYT programs. There should be a closer working relationship between the policy and budget making bodies and the administrators of both CONICYT and FONDECYT. While it is understandable that CONICYT should have no ability to decide its own budget nor policy, it should have some vehicles for communicating improvements in policy and it should have the ability to request and defend suggested budget limits.

• FONDECYT Issues

Without in any way diluting the value of the three existing programs, FONDECYT should consider diversifying its funding instruments in two new possible ways. Firstly, a new program should be considered for exceptional researchers: those with

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proven track records of outstanding research accomplishment and with many years of continuous FONDECYT funding. These researchers should be offered a streamlined pathway for continued FONDECYT funding which possibly relies solely on external reviews and a short expedited evaluation. A second new program should be considered for exploratory, high risk research, similar perhaps to the EAGER program from the NSF in the USA. This program would offer again a very short turnaround time, a possible decision taken solely based on internal review by the study groups, and a shorter funding duration with smaller award sizes than a Regular FONDECYT grant. These two instruments could reduce the amount of administrative burden associated with extensive review and evaluation, thus liberating valuable FONDECYT staff time for other pressing issues. These new programs could also ease the way for both established and very successful researchers, as well as those researchers pursuing new research avenues, to obtain funding.

From interviews with individual researchers, research administrators, and research center groups, it is clear that FONDECYT funding remains the core basal funding for the Chilean research community. However, many researchers commented that while the FONDECYT Regular and Initiation grants are incredibly helpful, they must often be supplemented by PhD Fellowships, Postdoctoral Research awards, equipment funding, and related funding in order to create the needed funds to execute a substantial research project. It is therefore advisable that CONICYT finds ways to make it easy and simple for qualified researchers to coordinate grant awards from different funding instruments (e.g. FONDECYT Regular, FONDECYT Initiation, FONDECYT Postdoc, BECAS Chile PhD Fellowships, and FONDEQUIP awards) with regards to both source of funding and timing. For example, qualified researchers who receive a Regular FONDECYT grant award should have the ability to receive a fast track PhD fellowship grant, a FONDECYT Postdoctoral research grant, and/or a FONDEQUIP grant award. Another possible means of addressing the funding needs of extremely highly qualified researchers is to increase the size of the Regular FONDECYT grant awards and reduce the success rate of proposals.

The success rates of the Postdoctoral and Initiation grant awards are also very high by international standards, well in excess of 50% in 2012. Again, this is understandable as the nation builds research capacity but it is also important to ensure excellence. The grant monies could be put to better use by reducing the success rate somewhat and using those funds to increase the duration of the Initiation grant awards to five or six years. Initiation grant award recipients should also be allowed to use grant funds to travel within Chile in order to establish fruitful collaborations with other Chilean researchers so as to build up multi- and interdisciplinary teams that can compete for larger center funding. Also, as mentioned above, to empower those highly qualified

researchers in the Regular grant award program, some of the Postdoctoral research awards might be reserved as fast track options for those Regular grant award recipients judged to be at the highest level.

There is a perception that the disciplinary areas in which FONDECYT makes grant awards may be too rigidly defined to accommodate new and emerging fields. A specific portion (perhaps on the order of 5-10%) should be reserved each year to accommodate both the quality of the proposals and the needs for developing new funding streams. Also, emerging interdisciplinary and multidisciplinary fields, such as computational biology and neuroscience or bio-nanotechnology, may require either new funding instruments or flexible funding each year for the existing funding instruments.

c) FONDECYT Grant Administration

In interviewing researchers receiving FONDECYT grant awards, sentiments were expressed that researchers may spend too much time either administering their grants or complying with the regulations associated with funds expenditures. While it is certainly appropriate to carefully administer federal grant monies and to exercise prudence in expending funds, it is also important that faculty researchers be given the time and freedom to perform their research creatively and at a very high level. Accordingly, FONDECYT might consider increasing the indirect cost rate paid to Universities to enable them to hire more research support staff, such as grant budget administrators and purchasing agents. Also, FONDECYT might examine carefully the budget limits for expenditures that require quotations from multiple vendors and/or in-depth justification for purchase. International standards have pushed these limits to several thousand dollars to ensure that researchers are not unnecessarily burdened with fiscal constraints. Finally, funds administration directly to PIs is unusual by international standards. Addressing this in the future by encouraging Universities to establish grant funds administration offices will enable Chilean Universities to scale their research programs.

d) International Collaboration

As the Chilean research ecosystem continues to grow and mature, excellence will be built and maintained through frequent collaboration with the very best international Universities and research organizations. Promoting and enabling joint projects with international collaborators in which CONICYT and FONDECYT funds serve as matching monies to comparable international funding instruments is necessary to enable such deep productive collaborations. Currently, all of the CONICYT and FONDECYT funding instruments for international collaboration do not appear to accommodate this but establishing bilateral funding arrangements with, for example, NSF, ANR, and the DFG

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will enable Chilean researchers to build powerful international collaborations and teams that will enhance an ever stronger research community here in Chile.

e) Communication

Finally, the international expert review panel perceived many misconceptions by Chilean researchers and others about FONDECYT and CONICYT. One area of endeavor which can always be improved is the clear and frequent communication of CONICYT and FONDECYT goals, methods, and procedures. For example, it is always important to communicate the amount of funding and the anticipated number of awards in every funding instrument call. As Chile continues to build its research excellence, the importance of communicating the goals of its research programs, and the value of the results from the research to the public, cannot be overstated.

B. Processes, Applications, Evaluations, Follow-up and Report Approval

In this section, the review panel derived from the written documents and from the interviews with the FONDECYT staff and Council members, the FONDECYT program director, and the University representatives, results and recommendations concerning the procedures for application, evaluation, follow-up, and report approval.

a) Application Processes

Generally, the procedures for the annual calls for the three funding instruments are clearly defined and scheduled, and the guidelines describe each step and each requirement for the applicant in a very detailed form. The online application process is 'user-friendly' for PIs and efficient. However, the limitation in the numbers of pages to describe the methodology in the proposal guidelines is too strict. Generally, it is helpful to have limitations in pages, but for certain disciplines that are very methodology-intensive, a refinement of this limitation should be considered.

Concerning the proposal application frequency, one application deadline per year creates a situation in which all of the proposers and reviewers nationwide participate in the application and review process in a short period of time. This results in a large amount of work in a short period of time. Thus, FONDECYT should consider ways of distributing the proposal and administrative burden evenly throughout the year, without increasing the administrative load on FONDECYT staff and the study groups.

Currently, any individual researcher is only permitted to be a PI on one Regular grant at any time. This should be reconsidered

as many PIs have great capability and can easily manage more than one project at a time. In the words of Alan Paau, one of the panelist for FONDEF, "don't be afraid of success".

b) Evaluation Processes

With respect to the evaluation process, the review panel has confirmed in the interviews with the researchers at the universities that the research community is largely supportive of the evaluation process made by the FONDECYT council and the study groups. However, we find the evaluation process to be elaborate and labor intensive, in particular for the CV evaluation. The criteria for CV evaluation are overly prescriptive, e.g. for journals and authorships in the different areas, which is not a common practice internationally. Applying these procedures, a bias in the evaluation cannot be excluded. Therefore, our recommendation is that CV evaluation should be left to the discretion of the study groups and the external reviewers within more general guidelines. A proposed alternative way to evaluate the publications of the individual researchers is to ask them to list only their five most important publications. A skilled reviewer will have no difficulty judging accomplishments in this way.

It has become clear from the interview with the members of the FONDECYT council and study group members that difficulties exist with the selection of external reviewers. Up to now, the selection of reviewers has been performed by the study group members, some of whom are asked to select reviewers outside their own disciplines. This may be problematic as they may not have sufficient knowledge of international experts in the specific areas for which they are responsible. This can lead to an inappropriate selection of external reviewers. The fact that there is only one application per year increases the probability of a conflict of interest between study group members and proposers. Therefore, we recommend the creation of a large database of reviewers, which should be continuously updated. Coordinators of the study groups should select the reviewers based on this list. Such databases already exist and could be easily available from other international research agencies.

Currently, FONDECYT appears to use a combination of a rating and ranking system for evaluation and funding of proposals. An alternative approach to proposal evaluation entails developing an absolute rating system, in which standards for absolute quality are developed and become the criteria against which proposals are rated. This would seem more appropriate with regards to international standards.

c) Follow-up and Monitoring

The annual reports required of the PIs appear to be unnecessarily detailed. We recommend simplifying the reporting by limiting the number of pages and the information provided in the report.

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FONDECYT should consider limiting the report to publications, patents, students graduated, and any other very significant results. These measures will reduce the reporting burden placed on the researchers and the evaluative burden on FONDECYT staff.

A certain number of ISI-publications is required in the final reports. On the one hand this is a positive measure to stimulate peer reviewed publications in important scientific journals. However, many disciplines have varying measures of productivity other than simply ISI publications and this should be left to the judgment of the study groups.

Internationally, programs like FONDECYT should undergo self-evaluation on a regular basis. This will not only contribute to benchmarking the funding instruments but also allow periodic judging of the effectiveness of such programs.

d) Management and Administration

Professional management of research programs in funding agencies requires an adequate number of academic staff and directors as well as administrative personnel. The percentage of FONDECYT's total budget allocated for administration has become insufficient for the professional management of projects. This can be remedied by either allocating increased funding to administration and/or through a streamlining of the administrative processes as mentioned above. Along these lines, it is positive that FONDECYT procedures follow ISO certification. However, caution should be exercised to ensure that these procedures are not unnecessarily rigid, thereby adding inappropriate administrative burden.

C. Results and Impact

In this part of the report we turn our attention to the third set of criteria that frame the evaluation of FONDECYT, namely the results from and the impact of the program.

a) Significance and Results of FONDECYT

In terms of the results of FONDECYT, the evidence leaves no doubt of their significance:

- i. Over the last three decades, Chile has developed a solid foundation for its science base and national innovation/research system by supporting, developing and introducing highly competent researchers. This can be attributed, in large part, to the operation of the FONDECYT program and its funding schemes.
- ii. FONDECYT is THE research funding program in Chile: it provides the foundation for the establishment and success of any other funding program and/or policy instrument.

iii. FONDECYT is structured in a way (through its funding schemes) that provides a relatively 'smooth' funding transition throughout a research career.

iv. According to bibliometric analysis, the FONDECYT program has substantially contributed to Chile's impressive performance in scientific production, showing an average increase of 13% growth per year. A further cumulative increase can be expected in following years in other indicators, because of the delayed effects of investments.

b) Challenges with FONDECYT

Despite these very positive outcomes, there are some concerns and challenges:

i. Little information is available on other key outcomes from FONDECYT grants, such as patents and technology transfer to third parties. This is probably because IPRs and links with industry are not used as incentives by FONDECYT (judging by the criteria for selection and evaluation of final reports) and information about these is not systematically collected (through the reporting practices). While this is understandable given the basic nature of the research supported by FONDECYT, moving towards these additional measures as the nation's research ecosystem matures is advisable.

ii. It is possible that some of the rules for selection of proposals and evaluation of final reports are formulated in a way which encourages the increase in quantity of publications but does not signal a requirement for increasing quality. This may be an interesting 'shortcut' to consider: policy mechanisms and incentives that aim to increase the overall quality of research output thus placing Chilean science firmly 'at the table' of elite, international scientific communities.

c) Impact of FONDECYT

Where the impact of FONDECYT is concerned this is also impressive and difficult to dispute: in the case of Chile there are no issues of attribution of effects since FONDECYT is THE basic research funding program in the country. Furthermore, researchers in Chile see FONDECYT as 'an unique funding program in that it is active year after year; that it is stable and we know that it will be there next year and we could apply at a specified time'.

i. Probably the biggest achievement and the most notable impact of FONDECYT is that it has contributed greatly, and is continuing to contribute to building, developing and maintaining the science base and technically oriented human capital in Chile.

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ii. Researchers unanimously recognize FONDECYT as the most valuable and transparent instrument for funding basic research. Fixed and regular schedules and well-known evaluation rules are the most remarkable positive features.

iii. FONDECYT schemes for young researchers (post-doctoral and initiation) are perceived as having an increasingly significant impact, and as a way new research groups are initiated.

iv. FONDECYT has an enormously positive effect on the research standing of the universities in Chile. We repeatedly heard that without FONDECYT funding the universities, even the more prosperous and well positioned among them, would not be able to carry out any research whatsoever.

v. FONDECYT has an enormous effect on the academic careers of individual researchers in Chile, being crucial for success in this research environment. Moreover, this program is the only source of funding for conducting research and Universities rely heavily on criteria related to research performance, e.g. grants, publications etc., for appointment to academic positions and for promotion.

vi. FONDECYT has implemented policies encouraging women to lead research projects and this has enabled women to engage more actively in science and building the science base in Chile, and to advance their academic careers.

d) Challenges

We did identify a couple of challenges, however:

i. One clear challenge is the state of research infrastructure (equipment, facilities) and research support in Chile. There is a need for funds for both creating and maintaining research equipment and facilities, particularly for major research instrumentation.

ii. Currently, Chile is training a relatively large number of new PhD students, many of whom are liable to have difficulty in being placed in the Chilean economy and research environment. This is due in no small part to the lack of employment of PhDs in private industry. Moving forward, Chile needs a robust employment environment for its knowledge workers to ensure that PhDs can be well placed in the growing and expanding Chilean economy.

Another point we would like to make in this section is that the effort that FONDECYT puts in science dissemination and popularization activities is far too small for the achievements of the program. Showcasing the most important scientific

results achieved by research projects funded by FONDECYT is important for the 'enchantment' of both members of society and influential political figures. Clear and frequent communication of outstanding achievements in science is necessary.

1.4. Recommendations about FONDECYT and CONICYT

In view of our observations and conclusions discussed above and considering the context in Chile, the international expert review panel is pleased to make the following recommendations:

i. FONDECYT should be vigorously protected and expanded as it is the most successful research funding program in Chile. The FONDECYT process should be considered as an exemplar for other CONICYT programs.

ii. FONDECYT should attempt to minimize any unnecessary and/or redundant evaluative and reporting regulations that are unhelpful in executing research, that exacerbate administrative burdens, and that are potentially onerous with regards to fiscal accountability.

iii. FONDECYT should increase the funding amounts of its grants and allow a PI to lead more than one Regular grant at a time.

iv. FONDECYT should increase the length of the Initiation grants to 5-6 years and increase correspondingly the award amount.

v. In FONDECYT Regular contests, the evaluation should proceed in a single step by simplifying the evaluation of CVs possibly moving to a mode in which only the top 5 publications of the PI and co-PIs are considered.

vi. FONDECYT should consider a 4th category of funding instrument related to awarding grants to researchers based on exceptional accomplishment and productivity that minimizes the effort required to receive the funding. FONDECYT should consider an additional category of funding instrument related to short term, exploratory research grants for seed funding.

vii. CONICYT should consider **increasing the % of indirect overhead** charged to grant funding.

viii. CONICYT should provide funding instruments that can increase significantly the amount of research equipment available, the size of **research equipment** and facilities (Major Research Instrumentation), and the **maintenance of research equipment** to enable the Chilean research community to build up its research infrastructure and capabilities.

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ix. CONICYT should make it easy and straightforward to qualified researchers to **coordinate grants** from different funding instruments, with regards to both source of funding and timing. For example, researchers who receive a Regular or Initiation FONDECYT grant should have the ability to receive a fast track PhD fellowship grant, postdoc FONDECYT grant, and a FONDEQUIP grant.

x. CONICYT should hold **an annual Chilean research days**, open to public, at which it showcases the very best research funded that year, and any other manifestation to promote highlights of science.

xi. CONICYT and the Government should consider establishing **National Laboratories** and Institutes in a few selected areas, linked with particular associated Universities.

xii. CONICYT should develop a **short and long term strategic plan** that attempts to coordinate and integrate the various funding instruments and that aligns with a **national strategic plan** for developing the appropriate knowledge based economy of Chile.



Foto: "Procesos de mezcla vertical y estudio de masas de aguas en fiordos y canales de la Patagonia Chilena", gentileza del investigador FONDECYT, Iván Pérez (Universidad de Concepción).
Photo: "Vertical mixing processes and study of water masses in the fjords of Chilean Patagonia", courtesy of Iván Pérez, FONDECYT Researcher (Universidad de Concepción).

Foto: "Arqueología, Arte Rupestre", gentileza del investigador FONDECYT, Francisco Gallardo.
Photo: "Archaeology, Rupestrian Art", courtesy of Francisco Gallardo, FONDECYT Researcher.

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2. FONDEF Program Evaluation Report

2.1 Executive Summary

FONDEF, the Fund for the Promotion of Scientific and Technological Development, aims to increase the competitiveness of the Chilean national economy and improve the Chilean people's quality of life by increasing links between research institutions, companies, and other entities, enhancing the number of applied R&D projects, and increasing the amount of technology transfer performed in Chile.

The President of CONICYT asked the International Expert Panel to review the strategy, design, operations, impacts, and results of FONDEF in light of international experience in similar programs. The Panel reports here with regard to FONDEF as a whole as well as three of its individual programs: IDeA (Research and Development into Action), VIU (Valorization of Research in the University), and the Thematic Programs. We had insufficient information to evaluate the performance of the Regional FONDEF Program.

FONDEF operates on an interface that is crucial to the economic performance of a knowledge economy. University research should be a key source of new ideas and innovations for industry, government, and society. Applied research and development and knowledge and technology transfer are essential to achieving that benefit. But universities in many countries do not undertake these activities spontaneously; government encouragement is usually required. FONDEF programs are similar to some of the approaches used in other countries to link universities to industry and society.

We found FONDEF to be a useful program that has delivered value to Chile. Our findings suggest that the program should be maintained, but improvement in a number of areas will add to its impact. The recommendations provide suggestions as to where the improvement could be sought.

Key findings and recommendations follow:

- FONDEF is an important program, but needs stronger focus on the specific needs of industry and society for the development of a knowledge based economy.
 - » Recommendation: The program should do its own strategic plan, including missions that differentiate it from other organizations and programs with specific objectives that allow measurement of progress. The program should choose instruments and allocate resources in relation to its objectives.
- The program could be building skills and attitudes among researchers that are needed in Chilean industry, but is not consciously promoting this goal.
 - » Recommendation: The program should include skill building and attitude change as explicit goals.

- Enhancing the connectivity between academic researchers and industry is an achievement of FONDEF.
 - » Recommendation: FONDEF should promote and extend this mission component by facilitating the development of extensive networks among academic researchers, industry and public interest partners.
- The recent redesign of the R&D program to IDeA is seen as being more flexible but the first stage grants are too small and too short, with risk of interruption.
 - » Recommendation: The IDeA program should alter its grant conditions to allow continuity between the two stages of the grants.
 - » Recommendation: FONDEF should undertake renewed communication about the rationale for the redesign of the program and the continued opportunities for infrastructure development for long term university industry partnerships.
- The core of the program idea in VIU appears to be encouraging and training early career researchers in the possibilities of application, commercialization, and entrepreneurship based on science and technology.
 - » Recommendation: The program should allow a broader range of participants, use a wider range of mentors, and set realistic goals for learning and translational science rather than focusing exclusively on company formation.
- Many important issues are missing from the Thematic Programs. The areas are narrow, and there is over representation of certain disciplines.
 - » Recommendation: The Thematic Programs should be aligned to strategic objectives promoting economic and social development and there should be synergy within the project portfolios. The rationale for the alignment should be articulated clearly to the researchers and projects receiving funds from the program.
- Both evaluation process and program management in FONDEF are sometimes seen as less than transparent; reviews are occasionally not technically competent. Reporting is seen as burdensome.
 - » Recommendation: Evaluation processes should include competitor conflict of interest rules, more reviews from those with specific technical competence that matches the project, and international reviewing.
 - » Recommendation: Technical and financial reports should be minimal, for example, at the midterm and end of the project.
- Limited information is available on the most important potential outcomes of FONDEF programs.
 - » Recommendation: The program should develop better indicators and measurements of its impacts, including a broader set of outcomes and longer term results that are broadly accessible to the public and stakeholders.

2.2. Introduction

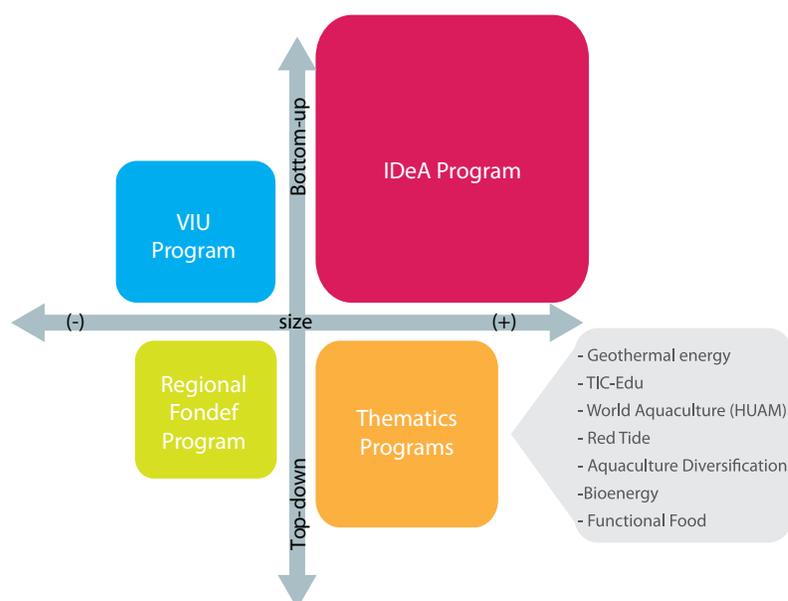
Forging partnerships between knowledge producing and problem solving institutions is a key element of an innovation system in a knowledge society. University research should be a key source of new ideas and innovations for industry, government, and society. Applied research and development and knowledge and technology transfer are essential to achieving that benefit. But universities in many countries do not undertake these activities spontaneously; government encouragement is usually required. In Chile, the Fund for the Promotion of Scientific and Technological Development (FONDEF) serves that role.

2.3. The Missions of FONDEF

FONDEF has been in existence for over twenty years. Its major missions are to increase the competitiveness of the Chilean economy and to improve the quality of life of the Chileans. FONDEF plays an important part in the implementation of the national innovation strategy the first version of which was accepted in 2007 and the second in 2008.

The major tools of FONDEF aim to promote applied R&D projects performed in Chile and to promote links between research institutions, companies, and other entities. It thus is related to most of the pillars of the national strategy, not just R&D, but also to technology transfer, entrepreneurship and commercialization, and, upon the observations of the evaluation panel, to the promotion of (entrepreneurial) culture and building human capital in the areas under the program (though these aspects are not explicitly mentioned in FONDEF's goals).

Figure 2. Instruments in current FONDEF Program



FONDEF has recently modified and reformed its programs. Its current program set up is given in Figure 2. The largest program in Figure 2 is the IDeA Program (Research and Development into Action), which had its first contest in 2012 and will replace the Annual Contest of R&D Projects in the future. This latter program was in operation for 19 years and had its last call in 2012. The VIU Program (Valorization of Research in the University) started in 2011. The Thematic Programs and Regional FONDEF Program have been running several years. The specific goals and methods of each program will be elaborated in the sections reporting on the findings concerning them. FONDEF project funding is awarded to universities or other non profit organizations, not to individual researchers.

The panel was given a mandate to evaluate the strategy, design, and operation of FONDEF, as well as its impacts and the achievements, in light of international best practices. Given that there have recently been significant changes in the programs, the panel has limited its attention to considering impacts relating to the older schemes - the Annual R&D Contest of R&D Projects and Thematic Programs - and to judging the overall objectives and design of FONDEF's new instruments along with the efficiency and effectiveness of their projected processes.

A. Goals and targets of programs

a) Goals and targets of the program as a whole

FONDEF's goals are commendable. As we have described above, linking knowledge producing institutions to industry, government, and civil society organizations is a crucial process in a knowledge based society. This process should in the long run improve the economic competitiveness of firms that produce jobs in a national society and contribute to quality of life through both commercial and non commercial routes. FONDEF focuses on bringing universities into these knowledge transfer processes. This is an appropriate function for CONICYT, which is already a key institution providing a broad range of support to university researchers. FONDEF's work complements programs undertaken by InnovaChile to encourage industry to engage in seeking knowledge partners among universities.

- While FONDEF thus occupies an important space, the reasons for the particular programs it operates were not well articulated in the materials the panel examined or in our conversations with program staff. It was not clear why the four programs were the right ones to accomplish the long-term goals. The design for the programs appeared to assume that university researchers would know what industry and society partners wanted from them, without help in establishing linkages. FONDEF does not currently provide help with learning about industry's needs, a step that international experience suggests is quite important. The major program focus seems to be on bottom up areas and project initiatives. We therefore recommend that the program develop its own strategic plan to translate its broad missions into measurable objectives that more clearly define

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its niche in the Chilean innovation system. Finding: FONDEF is an important program, but needs stronger focus on the specific needs of industry, society, and the development of a knowledge based economy.

- » Recommendation: The program should do its own strategic plan, including missions that differentiate it from other organizations and programs with specific objectives that allow measurement of progress. The program should choose instruments and allocate resources in relation to its objectives.

Over the long run, an innovation system supports competitiveness and quality of life by creating a culture of cooperation and collaboration between universities and their industry and societal partners. FONDEF programs appeared to us to be contributing to such a culture, but the program documents did not stress its importance and the performance measures reported did not take the culture changing aspects of program activities into account. The learning outcomes of applied research and linkage to external partners appeared to be undervalued in the design of the programs.

- Finding: The programs could be building skills and attitudes among researchers that are needed in Chilean industry, but is not consciously promoting this goal.
 - » Recommendation: The program should include skill building and attitude change as explicit goals.

The importance of university industry linkages in an innovation system were recognized in the 1970s in many OECD countries. Many early programs encouraged these linkages through individual projects. Later, centers and larger networks became a more common funding mechanism for promoting these connections, since they allowed strategic input from industry and spread industry experience more widely among both faculty and students. FONDEF's programs have been effective in encouraging linkages at the level of individual projects, but do not explicitly help to build the more complex set of lasting relationships that characterize the most innovative interfaces between universities and their industry and society partners.

- Finding: Enhancing the connectivity between academic researchers and industry is an achievement of FONDEF.
 - » Recommendation: FONDEF should promote and extend this mission component by facilitating the development of extensive networks among academic researchers, industry and public interest partners.

The overall size of the FONDEF budget is small compared with CONICYT total budget. Given that we cannot perceive a clear strategy underlying the choice of these support forms, we find it hard to judge the adequacy of the size of the budget. Nevertheless, it is clear that a program of less than USD 40 million cannot have much impact if it aims to create structural and cultural changes in the economy.

b) Goals and targets: Annual Contest of R&D Projects and IDeA Program

The Annual Contest of R&D Projects had two kinds of projects. The first is precompetitive projects aiming to generate innovations in products, processes or services with impacts on the markets. These projects have to involve companies or other types of institutions; at a minimum, two of those were required to have been operating in Chile. The projects could also have been in the "public interest" category, where innovations in products, processes or services will benefit the Chilean society. These projects were required to involve a Chilean non profit public or private organization. These projects can have an execution period of 36 months at most, and their maximum funding was \$830 000 USD. Both beneficiary institutions and participating enterprises and institutions had to contribute at least 15% of the costs of the project.

The new IDeA program has a somewhat different structure. Its general aim is similar to that in the Annual Contest of R&D projects, but it has two instruments: Applied Science Annual Contest (AS) and Annual Technological Research Contest (TR). The first contest in the former is ongoing and the first in the latter will be launched next year. In addition, the projects proposed may be "pre competitive" (which we took to mean oriented over the long run to commercial goals) or "public interest" (which we took to mean oriented to producing non commercial public benefits).

The Applied Science Annual Contest is addressed to projects which aim to verify a scientific hypothesis or validate a proof of concept in order to demonstrate its potential for application. The project recipients will again be Chilean non profit organizations (mainly universities), but by contrast to Annual Contest of R&D projects, the applicants do not need to involve companies at this stage other than obtain their expressions of interest (at least one Chilean enterprise or other associate institution). The Annual Technological Research Contest is open to successful projects in Applied Science Annual Contest, as well as to other potential projects that have not had AS funding. The purpose is to continue research on topics with a small scale result or validated proof of concept to develop ideas that are closer to productive application or implementation in the social sphere. In AS, the maximum grant period is 24 months, in TR 36 months. The maximum funding in AS is expected to be USD 250,000.

The panel was able to interview several researchers who were recipients of the old Annual Contest of R&D Projects and a few who had applied for the new IDeA grant. In addition, researchers were aware of the new scheme and its differences as compared with the older scheme. The benefits of the old Annual Contest of R&D Projects included an opportunity for researchers to pursue applied research projects based on their earlier, often though not exclusively FONDECYT supported projects and to engage with industrial or public sector partners who are potential users of the

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outcomes. Project funding was more generous than in FONDECYT program and enabled the creation of substantial research groups to pursue a topic. Such projects have in some cases involved foreign subcontracting and services. Project results have also in some cases led to the utilization of the results.

It was evident that the old Annual Contest of R&D Projects had some clear successes among the projects. To some extent this is due to the size and length of project funding. The agreements with businesses and other partners, however, were not always easy and in some cases took quite some time to conclude. Overall, the researchers who received funding appreciated it. Further, the funding form was appropriate R&D support for researchers in areas with potential applications in low R&D intensive industries such as forestry, construction, and food. The panel notes that moving towards a knowledge based society and economy requires increasing knowledge intensity in low or middle R&D intensive industries; this movement is important in parallel with the promotion of high R&D intensive industries. In the new IDeA program, the division of the program into two parts, Applied Science Annual Contest (AS) and Annual Technological Research Contest (TR), has both positive and negative aspects. The AS has lowered the entry barrier to the instrument, since it does not require deep involvement by enterprises at the start of the work. The letter of expression of interest is easier to obtain than the commitment of resources on the part of the partner. The lower level of expectations at the first stage also avoids having to negotiate with the firms or partners about IP.

The panel found, however, that the aims and structure of the new IDeA projects were not clear to all potential proposers. The division of the program into two contest types, which correspond to different stages in the R&D process with potential applications, has the potential to create a break in the R&D process. The break will certainly occur if investigators wait to apply for TR project support until their AS project is over. During this break, the research team may dissolve. Researchers may also forgo the TR stage and move on to applying for a yet another AS project, which is easier to prepare.

The funding size and shorter duration of the projects, especially AS, were problematic in the eyes of several researchers we talked to. The small size is not attractive, and the two year length is not long enough to build relationships with industry. Life science projects may not be able to produce results in this period. In addition, some R&D Projects had been able to establish a substantial infrastructure of equipment and test beds, which facilitated long term relationships with industry. Investigators fear that the structure of IDeA funding may be an obstacle to this kind of capacity building.

The limitation of the program for projects with a Chilean business partner is understandable from a point of view of wishing to further the national economy. However, there are examples of projects and research areas where appropriate

Chilean business partners are not available, but where one could find appropriate business partners abroad. This raises a more general question of various national strategies to support job-creation in knowledge based and more highly paid tasks. Even with international partners, skills and competencies in R&D activities can be used to create a service sector which in the first stage brings in revenues; in a later stage this development can be an attractor for foreign enterprises to establish R&D related activities in the country, and also support potential indigenous business developments. Thus, the strict requirement that the business partner be a Chilean business enterprise may not be beneficial in the long run. Ultimately it does not matter whether the partner firm is Chilean or not as long as the trajectory of the project is generating jobs and wealth in Chile.

The bottom up nature of the IDeA scheme is reflected in the fact that we found many projects where global competition is very high. Even though public funding is expected to support ventures which can fail – and the high risk of failure being one of the arguments for public support – nevertheless, it may necessarily not be in the public interest to support ventures with very small chances of developing into commercial applications. In such a program, niches need to be carefully selected and the pathways to impact need to be mapped carefully in such areas. The technologies can be productively developed to a certain point in the value chain, even if they are handed over later, as long as the projects generate local economic activities.

- Finding: The recent redesign of the R&D program to IDeA is seen as being more flexible but the first stage grants are too small and too short, with risk of interruption.
 - » Recommendation: The IDeA program should alter its grant conditions to allow continuity between the two stages of the grants.
 - » Recommendation: FONDEF should undertake renewed communication about the rationale for the redesign of the program and the continued opportunities for infrastructure development for long term university industry partnerships.

c) *Goals and Targets: Program for the Valorization of Research in the University (VIU)*

The instrument's stated objectives are to:

- i. Support students using the results of their research to develop products and services in commerce via the formation of new companies;
- ii. Encourage students to value science and technology by transforming their research results into products and services in commerce;

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- iii. Help foster associative linkages among students, mentoring professors and the sponsoring universities; and
- iv. Entice sponsoring universities to develop effective support systems for such entrepreneurial activities with the overall goals to capture and realize the commercial value of research performed by students and to promote entrepreneurship that may result in the development of new industries to help diversify and strengthen the economy of the Chile.

The design of the program, however, appears to be overly restrictive and limiting and offers little flexibility to allow it to reach its goals. The rationale for limiting the program to students is not clear, nor is the 18 month time limit for student applications. Limitation of mentors to FONDECYT investigators leaves out opportunities for more junior researchers or industry mentors. The funding levels are minimal (in the first stage, USD 4,000 for the elaboration of a business plan, a work plan for the activities, and an IP agreement; in the second stage, a maximum of USD 48,000 for the launch of entrepreneurship), with the second phase in particular not set at a realistic level for successful proof of concept in most products and services. The administrative overhead of 10% is too small to encourage universities to establish the supporting structures for entrepreneurship. Finally, the emphasis on new company formation may be unnecessarily discouraging, since few licensed technologies are used as the basis of company formation, and most of all new companies fail. Young researchers may be discouraged from further efforts at commercialization rather than invigorated by low success rates.

- Finding: The core of the VIU program idea appears to be encouraging and training early career researchers in the possibilities of application, commercialization, and entrepreneurship based on science and technology.
 - » Recommendation: The program should allow a broader range of participants, use a wider range of mentors, and set realistic goals for learning the translation of research results into practical uses rather than focusing exclusively on company formation.

d) Goals and Targets: Thematic Programs

The thematic programs were created in 2001, first as the Chile Genome Initiative; later, other initiatives were added, and some have been dropped. The main aim is to help develop economic sectors of national importance and where the country can have competitive advantage through the supply of natural resources. The Thematic Program has seven thematic areas, most of them, because of the natural resource emphasis, in biological fields. The program has similar goals and principles as the Annual Contest of R&D Projects, with the difference that funding is directed to predefined areas of application. FONDEF also administers a Regional Program in thematic areas selected by the regions and funded by central government money. The panel did not obtain information on these and we will not comment on them in particular.

The calls are not annual. The number of approved projects per call range from 4 to 11 in the different thematic programs. The total number of approved projects is 49. On average thematic program projects have been sizeable varying from \$700,000 - \$1,200,000 USD per project (2008 - 2009). It seems, however, that the annual allocation for these programs is decreasing.

We consider that thematic programs are one way of setting up a strategic priority system in FONDEF, where the others programs are entirely bottom up. Each thematic priority is continued for a number of years and the program has potential to contribute to the development of industries in their chosen fields. Nevertheless, the degree to which the thematic programs have promoted their specific objectives is not clear to the panel since we obtained very little information about them and hardly met researchers or institutes obtaining funds through them. We did not see evidence of interaction among different research projects within a thematic program or across thematic programs. This led the panel to question whether the potential for building up a research community and critical mass within each area was realized, both through thematic alignment of projects and promotion of networking and interaction among the communities in each research areas. Furthermore, the process of selection of the thematic areas was not transparent and evident to the panel.



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- Finding: Many important issues are missing from the Thematic Programs. The areas are narrow, and there is over representation of certain disciplines.

- » Recommendation: The Thematic Programs should be aligned to strategic objectives promoting economic and social development and there should be synergy within the project portfolios. The rationale for the alignment should be articulated clearly to the researchers and projects receiving funds from the program.

B. Infrastructure and co-funding from business sector

Infrastructure for applied research projects can take several forms. On the one hand, laboratories need equipment that is enough like what is used in industry to allow partnerships in the research. In addition, in some industry collaborations, specialized testing environments are needed, to simulate conditions in industrial production or the use of products. On the other hand, applied research projects need administrative infrastructure, including specialized staff who can help with reporting requirements and technology transfer offices to facilitate commercialization of products.

In visiting with universities, we found that even when FONDEF projects allowed for the acquisition of instruments, universities were often unable to provide appropriate environments for their operation. The very limited overhead payments currently being paid are not high enough to renovate or build space for instruments, and maintenance funds were lacking. Likewise, the administrative structure to support research projects appeared to be generally lacking; we heard repeated reports of investigators filling out financial reports themselves, for example. As to technology transfer offices, the largest universities were starting in this endeavor, but it had certainly not spread to smaller institutions. We were informed about the recent initiative by CORFO trying to address this gap. It was not evident that researchers and their institutions were aware of this initiative.

With respect to co funding from either business or public interest organizations, a significant amount of the contributions we heard about were of an in kind nature. Some researchers felt that this was indicative of a lack of genuine interest on the part of the other organizations. The provision of an “expression of interest” by firms for an IDeA project was thought by many to not represent a true commitment to the project. Some companies were attempting to use ill defined in kind contributions as leverage to claim portions of project IP. At least one university requested clear guidelines from FONDEF to make this aspect easier to navigate.

C. FONDEF Program Overhead

The panel received very different accounts regarding the overhead rates allowed under the various programs and even within the same program. It appears there is a lack of clear articulation to the participants under the various programs (i) the process and rationale how the overhead rate of each program is determined; (ii) what the administration overhead will cover and therefore services provided to the program participants; and (iii) in general, what purposes the administration overhead serves. The lack of clear articulation and transparency breeds distrust among the participants. In general, the panel also believes the overall administration overhead rate is too low to enable the sponsoring institutions to establish the necessary infrastructure to provide sufficient support to the program participants and to allow them to focus on what they do best (i.e. research and development) and not be distracted to perform the various reporting and accounting chores. The panel recommends FONDEF to take a more pragmatic, and facts based approach to determine the administration overhead by reviewing with the various sponsoring institutions their actual costs for providing specific supportive functions. After such a determination, the rationale and process for the finally determined administration overhead rate for each program should be articulated to all program participants in a transparent manner so that they are aware where their program fund goes for what support they may receive.



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D. Incentive payments

The system in Chile under which researchers get part of their project grant as an additional payment on top of their normal salary is justified locally as being an incentive for researchers to engage in research. Furthermore, another local justification is related to the overall low salary levels of university staff. We acknowledge these needs, but point out that we have not come across a similar system elsewhere. Normally, research grants are used to employ additional staff for the project or to pay part of or all of the normal salary of the principal investigator, depending on her employment contract, thus releasing institutional funds for other purposes.

CONICYT has established top bonus rates and we find that a positive fact. However, there are no rules for top salary bonuses if a researcher has research money from several agencies or organizations. This has an effect that the system is not very transparent. We think that there should be a clear and reasonable limit on the total across projects. The panel suggests that CONICYT should review the use of incentive payments employing a comparison of international best practice in this area of researcher compensation.

2.4. Processes

We encountered few issues with the call and application processes in FONDEF, although a few potential grantees noted that the deadlines for FONDEF programs were not as predictable as those for other CONICYT programs, and they sometimes had to scramble to put together their responses. The unpredictability may come from the many small competitions that FONDEF manages on top of the main IDeA programs. In some cases in the old R&D projects, decisions on the grant took too long, but the program has apparently addressed these issues by separating the AS and TR stages in IDeA.

We heard about many more problems with the evaluation criteria and evaluation process, however, and it does not compare well with the processes we are familiar with in similar programs internationally. Based on international comparisons, we find the use of a quality threshold to be appropriate, and therefore the use of the two step process. The criteria for final evaluation seem too finely subdivided, allowing little flexibility for reviewers to use their best judgment in weighting what is important in a particular case. Using scores for just the three main elements would fit better with our experience with expert reviewer evaluation.

We had several concerns about the composition of the evaluation committees. First, there does not appear to be any control for competitor conflict of interest; that is, someone from a firm

that competes with a partner firm on a proposal could be sitting on the committee when the proposal is reviewed. The CONICYT conflict of interest rules are written for research situations and are probably not strong enough for evaluation processes that involve industry. Second, the committees are apparently heavily Santiago based, because of the intensive work they do with projects, from selection to receiving reports. All of the learning benefits of review thus go to people from Santiago, when the general direction of policy is to distribute capabilities more broadly around the country. The job of the committees should be defined in a way that allows participation from all areas of the country. Finally, we had reports of technically incompetent reviews. The program should be using at least three reviewers per proposal, and avoiding technical judgments from reviewers not in the research area. A rejoinder process could be considered.

Based on our experiences with other funding systems, we find the reporting requirements of the program to be much too heavy. Many of those we talked to in universities agreed. The investigators on the projects often have to fill out the financial forms themselves, and find that feedback on them is too late to be useful in managing project funds. FONDEF should not be playing the role of project manager for each project, and should instead be building capability at the universities. FONDEF projects, although applied, are still research and need appropriate flexibility. We recommend limiting reports to mid term and end of project. Deadlines should be staggered so that staff can respond in a reasonable time frame.

We were asked to comment on the quality of final report and deliverables but did not have any information on which to comment.

- » Finding: Both evaluation process and program management in FONDEF are sometimes seen as less than transparent; reviews are occasionally not technically competent. Reporting is seen as burdensome.
- » Recommendation: Evaluation processes should include competitor conflict of interest rules, more reviews from those with specific technical competence that matches the project, and international reviewing.
- » Recommendation: Technical and financial reports should be minimal, for example, at the mid term and end of the project.

2.5. Impacts and Results

Over the history of the FONDEF program, over 900 projects have been supported. In its self assessment, the program reports modest levels of publications and patents as well as the involvement of many students. A list of qualitative achievements is also included. Without doing a detailed assessment of economic or social impacts, we cannot ascertain the impact these achievements had on Chile and the world.

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The program notes that systematic follow up of long term results has not been done. This task should be undertaken through prospective tracking systems and intensive follow up studies. Practical approaches to the task will take time and energy to develop. The assessment should be aggregated at the portfolio level, since one would expect the results of a program of this sort to be characterized by many dead ends along with a few outstanding successes.

In our view, however, the actual applications of the research are not the central form of achievement of the program. The most important objectives of the program should be building appropriate skills and attitudes among university researchers for cooperation with industry and public interest partners; fostering communication and networking that facilitates moving knowledge into practice; and increasing the capacity of universities to undertake collaborations with such external partners.

Unfortunately, none of these objectives is measured well by the standard indicators the program is currently using. The attention given to ISI publications is probably counter productive to the overall goals of the program. New performance concepts and new performance measures should be developed as part of the strategic planning process we recommended at the start of our report. Network concepts and measures are likely to be needed, and we note that much progress has been made in other countries on automated ways to collect network information in this kind of assessment.

One simple way to track a subset of impacts is to keep track of the students involved in the projects and where they go afterwards. We were easily able to gather information from the investigators we talked to about their students' careers in industry and graduate study in prestigious overseas institutions. These data speak strongly to the long term value of the connections made in the projects, and would be easy to gather.

- » Finding: Limited information is available on the most important potential outcomes of FONDEF programs.
- » Recommendation: The program should develop better indicators and measurements of its impacts, including a broader set of outcomes and longer term results.

2.6. Appendix: Information Sources

A. Documents:

- Introduction to CONICYT - Expert Panel Evaluation, October, 2012
- Self Assessment Report of FONDEF Program- Expert Panel Evaluation, November, 2012

- VIU Program 2012 Guidelines
- IDeA 2012 Call Guidelines
- The FONDEF Evaluation - from 1994 until December 2008 by Victor Manríquez, FONDEF, July 2009
- Study for the Qualitative Assessment of Results of the Regular FONDEF, CONICYT - Final Report by Asesorías para el Desarrollo S.A. May 2012
- Start Up Chile - Technical and Administrative Requirements InnovaChile
- Universidad de Chile - A Brief Overview, November 2012 (PowerPoint Printout)

B. Presentations:

- Science and Technology Research in Chile by Jose Miguel Aguilera R., President CONICYT, November 2012
- FONDEF / CONICYT: Programs, Instruments - by Gonzalo Herrera J., November 2012
- Associative Research Program: An Introduction for the Review Panel - by Maria Elena Boisier, November 2012
- National Policy on Innovation - by Innovation Division, Ministry of Economy

C. Interviews in Chile:

- Vice Rectors of research, program and center directors, and researchers from the following university institutions:
 - » Universidad de Chile
 - » Pontificia Universidad Católica de Chile
 - » Pontificia Universidad Católica de Valparaíso
 - » Universidad Técnica Federico Santa María
 - » Universidad del Bío-Bío
 - » Universidad de Concepción
- Representatives from the following organizations or funding programs:

- » SOFOFA
- » MINECON
- » InnovaChile de CORFO

Reportes de Evaluación Programas FONDAP y PIA

3. FONDAP and PIA Programs Evaluation Reports

3.1. Preface

We express our profound gratitude to the President of CONICYT and his staff for their hospitality and support during our visit to Chile. We especially appreciate the assistance provided by Maria Carolina Moreno for her dedicated and efficient assistance, as well as that of the CONICYT team who assisted us during the evaluation process.

The Government of Chile and CONICYT have much to be proud of both in terms of value of the support provided for science and technology in Chile and their willingness to modify the modalities through which that support is offered as circumstances require. Given the amount of funds invested, the achievements of Chilean scientists in terms of research, training of human capacity to the highest standards, and outreach to the economy and society has been extraordinary. Notwithstanding this progress, the Government and its funding agencies have a considerable way to go before they succeed in building the "...essential conditions for Chile to become a knowledge economy...[thereby]...positioning the country as a world leader in competitiveness⁵".

The following two reports, the first on FONDAP (Fund for Advanced Research in Priority Areas) and the second on PIA (Associative Research Program) provide the panel's assessment of the current contributions of these programs to the development of excellent S&T in Chile and offer suggestions by which those contributions can be enhanced to the benefit of Chile's economy and society as a whole.

3.2. FONDAP Evaluation Report

A. Executive Summary

CONICYT organized an international review of four of its most important research programs. Seventeen international researchers and research council directors were invited to join three panels to evaluate the FONDECYT, FONDEF and FONDAP/PIA programs. They received self-assessment reports and extensive background information on organization, procedures, research centers and projects.

Each panel member submitted a preliminary review report early November. Two weeks later the panels met for a week in Santiago for meetings with CONICYT staff and stakeholders. They also had a closed session with the President of CONICYT and an interview session during dinner with the Minister of Education. Two days were spent on site visits at universities and centers in Santiago, Concepcion and Valparaíso.

The main questions for this evaluation were 1) the objectives and design of the programs; 2) the process, and 3) results and impact. Each part examined whether the instruments a) are appropriate, b) meet international standards, c) can be improved, and d) can include a self-assessment. The panel also paid attention to relations between the programs under evaluation and also other programs/initiatives within CONICYT and the overall science & innovation system in Chile.

a) Program design

FONDAP is a good step forward in the research system. It aims at increasing the quality of fundamental research and at cooperation between researchers. It is a stable, well designed instrument that allows applicants to have a clear view for periods up to 10 years.

Given the limited capacity (both quantitative and qualitative) within the Chilean research system and the target that research must be of benefit to Chile, it is appropriate to focus on priority areas. However, it is unclear how the priority areas were identified. There should be a clear pathway between national research priorities and the themes of the FONDAP calls.

This process must be transparent and with participation of the whole research community and other stakeholders. Such a process could raise public support to set up a robust national research strategy, which seems to be lacking (or not in operation).

b) Processes

As a general principle, the processes used to elicit, evaluate, approve, award, and monitor research grants should be open, clear, transparent, simple, and time-constrained. These criteria help reduce the costs of compliance to applicants and the costs of administration for the funding agencies without exposing the use of public funds to unwarranted risks.

Chile has achieved significant economies by following international practices in elicitation, evaluation and follow-up. There is still room for improvement. FONDAP processes are unnecessarily rigid, too mechanical, and too reliant on measures which tend to bias application and monitoring to quantitative criteria. This places the human and social sciences at a disadvantage in competitions for research funds.

The panel offers several recommendations for improvements aimed at reducing application and compliance costs and enhancing the chances that research environments besides those in the Santiago region will have an equal opportunity to compete for and benefit from the limited supply of research resources.

5 Introduction to CONICYT Expert Panel Evaluation October, 2012" Section 2.1.1.1, page 4.

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c) Results and Impact

The review panel was generally impressed with the results and impacts of the FONDAP program especially in the building of human capital (particularly the training of PhD students). The formation of research groupings assists in attracting PhD students and high performing scientists, and the funding period (5+5 years) provides an appropriate timeline for both building and demonstrating the success of the collaborations and providing value for the investment of the research funds.

There were convincing examples of FONDAP centers building collaborative research partnerships, and the metrics provided demonstrate that the FONDAP centers are increasing the quality of research outputs. The panel believes, however, that qualitative indicators will also be important in measuring the effectiveness of FONDAP, especially to adequately assess knowledge transfer and impact and to distinguish public from private goods.

The basic research activities performed in the FONDAP centers provide an indispensable basis for the long-term development of Chilean science and a creative environment to train future leading-edge scientists.

B. FONDAP Program Design

The mission of the FONDAP Program is clear:

- to encourage the development of scientific Research Centers of Excellence in Chile, and,
- to have a high impact in priority areas that address a problem of national interest.

The FONDAP program goals are to promote associated research, develop research of excellence, advance human resource formation, disseminate results broadly and contribute to the overall development of the country.

FONDAP program goals are consistent with its mission and are reflected into the project evaluation criteria. We agree with the 2008/09 external evaluation that the FONDAP Program has achieved substantial progress towards achievement of the stated goals.

FONDAP is a funding instrument that provides investigators with sustained support for a project over a 5-10 year period. The program complements FONDECYT: whereas FONDECYT focuses on bottom-up, basic research by individual investigators, FONDAP emphasizes top-down, collaborative research by groups of investigators.

The 5+5 year support scheme has proven constructive in establishing new centers. The mid-term project evaluation gives effective feedback both to the investigators and to CONICYT. It is appropriate that if progress has not been satisfactory after 5

years, the center has one year to wrap-up its activities. On the weak side, it is not clear how successful centers which have a long-term strategy and/or costly infrastructure, can continue after 10 years, except for switching to another program or substantially redirecting their research activities.

Some program rules and regulations are flexible, although it is a disadvantage to restrict principal investigators from applying for FONDECYT or other grants concurrently. There is also some rigidity with respect to re-allocating funding between groups at participating institutions.

Unfortunately, the program has had some discontinuity - no new calls from 2001 to 2009. The 2009 call had a very low funding rate of 8% (cf. 20-25% in other years), which implies a large effort of the research community with little payoff.

The process for determining the priority areas for each call for proposals (how the priorities emerged, what were the considerations involved, how were the decisions arrived at) is unclear. In the first three calls priority areas roughly followed disciplinary lines; in the next calls priority areas were identified as 'national' priorities, although there seems to be an absence of an overall national research policy/strategy. There should be a clear pathway between national research priorities and the themes of the FONDAP calls. This process should be transparent and with participation of the whole research community, with clarity on who makes the final decision on the priorities.

In spite of some weaknesses as noted above, the overall conclusion is that the design of the FONDAP program fulfils its goals.

Recommendations:

- To continue FONDAP on a regular basis as the program is well-suited for promoting emergence of centers of excellence.
- There should be a clear pathway between national research priorities and the priority areas in the calls for proposals. The process for identifying priority areas for the FONDAP calls should be transparent and with participation of the broad research community. It could be done through a top-down combined with a bottom-up process to be conducted well in advance of the call for proposals.
- CONICYT should consider setting up an instrument in support of bottom-up, basic research centers, to complement the top-down FONDAP approach.
- The latest calls of FONDAP refer to priority areas that contain scientific and economic relevance. Therefore, CONICYT should facilitate links between researchers in the FONDAP program and the business/industrial sector.

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C. FONDAP Program Processes

As a general principle, the processes used to elicit, evaluate, approve, award, and monitor research grants should be open, clear, transparent, simple, and time-constrained. That is, the program should be openly advertised in a regular fashion so that all potential applicants can be appropriately informed about them through public channels. The conditions such as eligibility, intended goals, performance requirements, and documentation should be clearly stated. The processes for evaluation (such as internal and external reviews, weighting schemes, and time involved) should be known to applicants. The submission requirements should be as simple and convenient as possible (format, possibility of submission by email, and so on) thereby enabling all eligible applicants to comply. Finally, the times allowed for responding to the call, conducting the reviews, deciding the outcomes and awarding the grants should be as short as practicable. All of these improvements are designed to reduce both the costs of administration to the funding agency (in the current case CONICYT) and for the applicants. Given that Chile devotes such a small share of its national resources to funding of S&T, it is essential to ensure that these compliance and administrative costs are low and remain that way. This will enable more resources to finance research, training and outreach thereby providing the biggest possible boost to Chile's productivity and competitiveness.

As will be noted below, some of the processes used in Chile do not meet these criteria and some significant costs are being incurred by ponderous regulations and convoluted procedures. Improvements could readily be made, especially in areas that do not rely on re-negotiation of basic regulations imposed by the Government of

Chile. One such improvement could be the offer of assistance by CONICYT to regional centers and researchers in the application process. They do not have the same skills and competences to write an application and do not have as easy access to support as the universities in Santiago. An active outreach by CONICYT should precede every call to ensure the regional research entities have the required competence.

The use of external and internal evaluations is consistent with the best international practice and should be continued. Some reassessment of the selection criteria, especially the weighting scheme⁶ should be reconsidered. The criterion related to the "scientific and training competences of the Center Director and Principal Researchers proposed for the Center" should be played down. It reinforces the current pattern of inequity that exists within the system by systematically excluding young researchers or those whose regional location have isolated them from the science funding that has been traditionally available to researchers in Santiago. The criteria "association" and "collaboration" are essentially the same and should be combined. In evaluating the combined criterion, it should be specifically related to the intent of the science. The other criteria such as "training" and "outreach" should be judged on the basis of pass/fail.

At the Stage 2 evaluation, the Superior Councils of the FONDECYT should generally accept the recommendations of the evaluators. However, when funds are limited and there are several proposals judged to be equally excellent with respect to the promotion of associative scientific research, the Superior Councils should not use the current rigid weighting scheme⁷ to rank them. In the panel's assessment, the Council should use its judgment regarding

6 Evaluator's weighting scheme:

- Scientific Proposal: Quality, importance and relevance of the proposal in terms of the problem of national interest; the multidisciplinary strategy proposed; the advantages of its associative action; and the feasibility of the Center to become an international benchmark (35%);
- Scientific and Training Competences of the Center Director and the Principal Researcher(s) Proposed for the Center: considering their scientific productivity, the impact of their publications and the number of students who have completed doctorates under their leadership (20%).
- Association: Quality, relevance and feasibility of the interaction of national and international researcher(s), postdoctoral fellows, incorporated scientist(s) and visiting researchers, to generate research of higher quality and impact (10%);
- Collaboration: Quality, relevance and effective integration of the national and international collaboration strategy (10%);
- Training: Quality and quantity of the training of high-level researcher(s) in the priority area being addressed (15%);
- Outreach: Coverage and innovation of the proposed strategy (10%).

7 Superior Council's weighting scheme:

- Relevance and importance of the proposal within the priority area it seeks to address, and contribution to the knowledge of the problem of national interest (25%);
- Relevance and importance of the proposal for the development of science and/or technology in the country (25%);
- Potential impact on training and/or consolidation of research teams that would allow the country to produce top-level knowledge (20%);
- Level of international association: Quality, importance and effective integration of the national and international collaboration strategy (10%);
- Level of exploitation of the country's comparative advantages (10%);
- Institutional commitment of the Sponsoring and Associate Institutions to establish, maintain and expand the Center (5%);
- Additional funding commitments by the sponsoring and associated institutions, private sector or other funding sources (for example, international cooperation) to achieve the Center's objectives (5%).

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each proposal's expected contribution to national priority areas, support of regionally diversified research, and exploitation of the comparative advantage.

Some respondents informed the panel that the application form was "too positivistic," i.e., it was too highly structured so that it excluded the opportunity for applicants to provide a more nuanced explanation of their objectives and intentions. It was also biased against the human and social sciences.

Applicants informed the panel that they were impressed with and learned a lot from the feedback provided by the international review panels. The external feedback on the annual reports was especially appreciated. In several instances, it led Centers to reorient and reorganize their activities.

The time taken to complete the process from the issuing of the call to the completion of the awards⁸ particularly in view of the low acceptance rates⁹, is unacceptable given FONDAP's goal of creating collaborative research groups. The costs involved in the application process, the difficulties of holding the interest and commitment of a coherent group for an extended period, and the uncertainty generated by the limited funding involved give an automatic advantage to established groups within existing well-funded institutions (such as the Santiago-based traditional universities). This biases the process against new entrants, potentially undercutting the vitality of the overall S&T system in Chile.

The one-year grace period provided for FONDAP centers if they are not renewed after five years is appropriate. It avoids major disruption in the careers of researchers and their students and enables the activities to be wound down in a cost effective manner.

As a final point, panel members encountered examples where the adherence to numerical indicators for evaluation purposes (e.g., annual increment in ISI publications) has given Centers an

incentive to promote "safe" research. This is detrimental to the Government of Chile's overall goal of using S&T as a foundation for innovation and enhanced competitiveness. To be relevant, cutting edge research runs the risk of failure, sometimes monumentally so. Yet, it is primarily through failure and the generation of anomalous results that learning and knowledge creation occurs.

Recommendations:

- The Panel recommends that the metrics and indicators used to assess applications in selection rounds should be flexible in order to provide for new entrants into CONICYT funding programs, thus avoiding a widening gap between the general research community and the program-funded research community.
- CONICYT should modify its procedures to reduce the compliance costs to applicants and its own administrative costs. There are numerous international standards as a guide.
- CONICYT should offer application support to regional universities.
- In response to the increasing funding volumes, the administrative apparatus of CONICYT needs to be strengthened. This will directly enhance the efficiency of research and research management in Chile.
- The pre-set weights of selection criteria should be omitted to avoid overly mechanistic evaluation of proposals. Scientific excellence and collaboration should be fundamental. The previous merits of the applicants should not be over-emphasized to avoid exclusion of promising younger researchers as PIs.
- The application form should be modified to accommodate the diversity of the scientific disciplines.

8 Timing of award process.

Timing of award process (calendar days)	Year of competition	
	2009	2011
Submission	68	133
Evaluation and Awarding	306	98
Signing of the "agreement"	94	in progress

9 Acceptance rates an their evolution:

	Year of competition			
	1998	2001	2009	2011
Applications	10	8	25	27
Awarded	2	4	2	6
Award Rate	20%	50%	8%	22%

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D. Results and Impact of FONDAP

- a) *Building and strengthening the national scientific and technological base*

The review panel was generally impressed with the results of the FONDAP programs especially in building of human capital (such as the training of PhDs), particularly in the framework of collaborative research. The formation of research groupings assists in attracting PhDs and high performing scientists. There were excellent examples of FONDAP building collaborative research partnerships.

For the FONDAP program the 5-year plus 5-year funding timelines provided stability to encourage the development of strategic focus on research and training, and sustained collaboration.

While it is difficult to measure precisely the added value of the FONDAP programs, the information provided to the panel and the panel's own interactions with both FONDAP projects demonstrates that the program has increased overall the level of formal scientific output.

The scale of FONDAP funding allows important and significant investment to be made in scientific infrastructure.

There were good examples of FONDAP-funded programs which attracted visiting international scientists and formal and informal international collaborations.

It is apparent that high performing collaborations funded under FONDAP are important contributors to national capacity building.

- b) *Quality of the science and progress beyond the state-of-the-art*

All the measures provided show that FONDAP funding was encouraging progress against international benchmarks and providing impetus for the future. The panel had some concerns that reliance on pure academic metrics in selection rounds might discriminate against new entrants into these programs. Such metrics also favors natural sciences over human and social sciences.

It is obvious from the metrics provided that overall the centers funded under FONDAP are lifting the scientific productivity of Chile.

It will be important to ensure that those currently outside the funding programs are able to compete in the future as new entrants. Failure to allow a steady stream of new entrants into research funding streams will result with in a widening gap between the 'general' research community and the program-funded research community.

- c) *Contribution to solving problems of national interest or in specific areas of knowledge*

The panel saw some excellent examples of how FONDAP funds were being applied to important regional or national issues. An overarching roadmap for science in Chile, one that would be well understood in both the research community and research funders, would provide a framework for future investment and planning in research. Such a framework is currently lacking.

- d) *Added impact above individual projects of researchers participating in each of the projects funded by FONDAP*

There was evidence that the FONDAP program was providing a clear impact against the metrics provided.

- e) *Dissemination and exploitation of the results the project*

There were many examples where research results generated by FONDAP programs are being disseminated. On balance, the evidence from the self-assessment and the Panel's interviews was that commercial exploitation of outputs was generally difficult - there were few apparent incentives to promote the commercial uptake of research and impediments within the Chilean system worked against consistent uptake of scientific research.

- f) *The most impressive (scientific) achievements of the FONDAP projects reviewed*

- Effectiveness and quality of the collaborations and networks they have built.
- The attractiveness of the centers to other researchers both nationally and internationally.
- The effectiveness of the training of PhDs and research capacity building.

- g) *Overall benchmarking of the results and impacts by international standards*

The FONDAP program is helping to raise the level of Chilean science against international standards. Continued and sustained investment in science and in programs like FONDAP will be an important component of the development of the Chilean economy and society.

Results under some metrics, such as the production of patents and direct measures of commercialisation, are below international

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standards, but the important point is that the FONDAP program is helping produce the essential researchers of the future and building the overall capacity of the Chilean research sector. Assisting the science and research sectors to build links with the commercial and policy sectors is an important challenge for the future.

Recommendations:

- Qualitative indicators (as well as quantitative metrics) should be developed to assess the results and impacts of the FONDAP program, especially regarding knowledge transfer and benefits to society.
- CONICYT should implement a system to comprehensively review the results and impacts of FONDAP funded centers at the end of their funding period. This would provide a fuller view of the overall impact of FONDAP funding.
- Across all programs, CONICYT should look for ways to strengthen uptake of research outputs and to increase the capacity of researchers and research centers to transfer knowledge to policy makers, businesses and the wider society. It would be most efficient to do this across all funding programs at the government level.



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3.3. PIA Evaluation Report

A. Executive Summary

CONICYT organized an international review of four of its most important research programs. Seventeen international researchers and research council directors were invited to join three panels to evaluate the FONDECYT, FONDEF and FONDAP/PIA programs. They received self-assessment reports and extensive background information on organization, procedures, research centers and projects.

Each panel member submitted a preliminary review report early November. Two weeks later the panels met for a week in Santiago for meetings with CONICYT staff and stakeholders. They also had a closed session with the President of CONICYT and an interview session during dinner with the Minister of Education. Two days were spent on site visits at universities and centers in Santiago, Concepcion and Valparaíso.

The main questions for this evaluation were:

- 1) The objectives and design of the programs.
- 2) The process.
- 3) Results and impact.

Each part examined whether the instruments:

- a) Are appropriate.
- b) Meet international standards.
- c) Can be improved.
- d) Can include a self-assessment.

The panel also paid attention to relations between the programs under evaluation and also other programs/initiatives within CONICYT and the overall science & innovation system in Chile.

Within PIA the panel evaluated two instruments:

- Team Research projects (RINGS)
- Scientific and Technological Centers of Excellence with Basal Funds (BASAL)

a) Program Design

PIA BASAL is a large bottom-up program aiming at bridging the gap between science and the industrial or public policies domains. It promotes collaborative research in an open way: there are no predefined priority areas. Hence, it is a flexible program with a strong emphasis on knowledge transfer. Like FONDAP, it is appropriate to have a long (5+5 year) time frame.

However, the program emphasis to develop applications and technology implies a risk of overshooting on patents and other

marketable results, and hence on inducing safe research lines instead of creative, high-risk innovative research. Moreover, technology transfer is a separate domain which requires specialized expertise and entrepreneurs to bring products and services to the market.

PIA RINGS are a productive means of inducing cooperation that wouldn't have started without them. However, the amount of money awarded does not provide an adequate financial incentive relative to separate individual (FONDECYT) awards.

There is currently a risk of obstructing creativity and of discontinuity of successful projects because of administrative rules, i.e., there is rigidity on continuation of RINGS projects.

b) Processes

With respect to the processes used to elicit, evaluate, approve, award and monitor research grants, CONICYT should pay close attention to the compliance costs incurred by applicants and their own administration costs.

Many of the procedures used by CONICYT for the Basal Centers and Team Groups are consistent with international better practices and, as such, help to reduce these two sets of costs. Significant improvements could be made. Though now well-established, Basal Center procedures are unnecessarily detailed and lack flexibility. They have had adverse (unintended) consequences on the efficient collaboration among researchers.

The Team Grants, while generally welcome by the research community and constructive in their goals, have also been too inflexibly applied.

The panel has offered several suggestions for improvements. These could reduce the costs of administering research grants thereby enhancing the efficiency of research activity in Chile.

c) Results and Impact

The review panel was generally impressed with the results of the PIA programs especially in the training of human capital of excellence. There were several examples of PIA centers building collaborative research successful partnerships and attracting PhD students and high performing scientists.

For the PIA Basal program the 5-year plus 5-year funding timelines provided stability which encourages the development of strategic focus on research and training, and the level of funding allowed for important investment in research infrastructure.

PIA Basal centers were able to attract important international collaborations leading in some cases to the establishment of additional formal international collaborations and networks.

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PIA Basal programs provided some good examples of research, technology and innovation which promote the development of products, licenses services and patents with commercial outcomes that have the potential to create significant regional and national benefits. But the performance against this criterion is not uniformly high and there are institutional and systemic impediments to commercialization and public policy transfer of research results.

The panel believes that qualitative indicators should also be used to assess the impacts of PIA programs, especially in the areas of knowledge transfer to the government, businesses and society.

B. PIA Program Design

The mission of the PIA Program is clear: to promote the articulation and association of researchers, along with their connection to other national and /or international actors, by encouraging the creation and consolidation of scientific and technological groups and centers.

The panel evaluated two instruments within PIA:

- Team Research projects (Rings)
- Scientific and Technological Centers of Excellence with Basal Funds.

a) PIA Basal Funds

PIA BASAL is a large, bottom-up program aiming at bridging the gap between science and the industrial or public policy domains. The program promotes collaborative research in an open way: there are no pre-defined priority areas. The requirement of additional funding sources reinforces the goal of knowledge transfer.

The program has a 5+5 year funding period. The mid-term evaluation after 2.5 years gives constructive feedback to the investigators and to CONICYT.

Within PIA BASAL, principal investigators are permitted to have FONDECYT funding. This is flexible and positive.

On the weak side, there is too much emphasis on these centers to develop applications and/or technology/knowledge transfer to industrial or public policy domains. This implies the risk of overshooting on patents and other marketable results (this doesn't necessarily fit company demands as they generally prefer a package of patents or applicable technologies), and hence on inducing safe research lines instead of creative and high risk research. Moreover, technology transfer is a separate domain which often requires specialised expertise that is currently not well-developed at the centers or at the universities.

The Centers have to secure additional support in the form of contracts at the application stage. This may not always be feasible

as complementary support is likely to be contingent upon an award from the PIA BASAL program.

In spite of the technology/knowledge-transfer emphasis of the PIA BASAL program, there are no interactions with the industry-oriented FONDEF program.

b) PIA Rings

PIA RINGS are a productive means of inducing cooperation that wouldn't have started without them. However, the amount of money awarded does not provide an adequate financial incentive relative to separate individual (FONDECYT) awards.

There is currently a high risk of obstructing creative efforts and of disrupting successful projects because of administrative rules regarding eligibility of ongoing RING projects. This relates to the requirement that the ongoing RING project be formally and administratively concluded before the deadline for applications for the new call.

Recommendations:

- Continue PIA BASAL and PIA RINGS, both on a regular basis.
- Interaction between PIA BASAL and FONDEF would be beneficial given the technology/knowledge transfer nature of the PIA BASAL program.
- Reduce the excessive administrative requirements, especially with respect to detailed specifications of long-term deliverables.
- Decrease rigidity in administrative procedures and increase flexibility in order to include new approaches, objectives, methods and new lines/orientation during the course of the project.

PIA Basal Funds

- Interaction between PIA BASAL and FONDEF programs would be beneficial to the PIA BASAL program because of the applied research conducted in FONDEF.
- Attention should be paid to coherence between the research lines within a PIA BASAL center.

PIA Rings

- Enhance the financial incentives for RINGS compared to individual (FONDECYT) proposals in order to encourage cooperation.
- Establish mechanisms for fruitful continuation of RINGS by allowing re-competition before the administrative end of the project.

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C. PIA Program Processes

As a general principle, the processes used to elicit, evaluate, approve, award, and monitor research grants should be open, clear, transparent, simple, and time-constrained. That is, the program should be openly advertised in a regular fashion so that all potential applicants can be appropriately informed about them through public channels. The conditions such as eligibility, intended goals, performance requirements, and documentation should be clearly stated. The processes for evaluation (such as internal and external reviews, weighting schemes, and time involved) should be known to applicants. The submission requirements should be as simple and convenient as possible (format, possibility of submission by email, and so on) thereby enabling all eligible applicants to comply. Finally, the times allowed for responding to the call, conducting the reviews, deciding the outcomes and awarding the grants should be as short as practicable. All of these improvements are designed to reduce both the costs of administration to the funding agency (in the current case CONICYT) and for the applicants. Given that Chile devotes such a small share of its national resources to funding of S&T, it is essential to ensure that these compliance and administrative costs are low and remain that way. This will enable more resources to finance research, training and outreach thereby providing the biggest possible boost to Chile's productivity and competitiveness.

As will be noted below, some of the processes used in Chile do not meet these criteria and some significant costs are being incurred by ponderous regulations and convoluted procedures. Improvements could readily be made, especially in areas that do not rely on re-negotiation of basic regulations imposed by the Government of Chile. One such improvement could be the offer of assistance by CONICYT to regional centers and researchers in the application process. They do not have the same skills and competences to write an application and do not have as easy access to support as the universities in Santiago. An active outreach by CONICYT should precede every call to ensure the regional research entities have the required competence.

a) PIA Basal Funds

With two rounds and several mid-project reviews completed the Basal program is well-established. Many of the Centers, however, find that the reporting requirements are excessive (especially the quarterly financial reports). As one respondent noted, the reports required by CONICYT "steal from our research" by diverting program funds to accountants managers and others who are hired simply to compile repetitive and detailed reports. CONICYT's procedures have become so prescriptive and time-intensive that some centers are organized in ways that meet the reporting requirements of CONICYT rather than the research requirements of the Centers.

Respondents also complained about the lack of flexibility in the program, especially with respect to the modification of objectives and the reallocation of the budget. The panel recommends that the Centers, in consultation with CONICYT, should be allowed to follow the most promising scientific avenues to reach their overall goals even if it requires shifts in specific objectives. Such modification in objectives should be supported by complementary flexibility in the allocation of funds. Accordingly, when appropriately motivated, the Centers after consulting CONICYT should be permitted to reallocate funds within their agreed budget. The inability to reallocate or reclassify expenditures has been especially detrimental with respect to travel. We were informed that Centers can fund the travel of designated PIs but not students. The effectiveness of both research and training would be enhanced if Centers had discretion in allocating their travel funds.

Respondents also indicated that changes in rules by CONICYT had been especially counterproductive. CATA noted that the development of a computer center at PUC had been derailed by a change in rules requiring the lead institution (Universidad de Chile) to host the equipment. This has wasted resources and created difficulties among the cooperating partners. It seems to be an unreasonable requirement in a research area such as astrophysics in which no single Chilean entity has the ability to handle a national research program on its own. In this endeavor, cooperation is essential. The rule allowing only the host university to receive equipment funds has undesirable consequences. The recent unexpected change in rules led to the discontinuation of the funding of a unique computer at PUC and the initial CONICYT investment was wasted. If rules have to be changed, it should only occur in dialogue with performing Centers so that no unintended negative outcomes occur.

There were several cases where questions raised by CONICYT about financial reporting hold up the disbursement of funds. The panel recommends that if an amount is in dispute, CONICYT should ensure sufficient handling time to deal with disagreements. Otherwise, the disputed amount should be set aside for negotiation and the undisputed amount disbursed without delay.

b) PIA Rings

Most of the above comments also apply to administration of the Team Grants.

A particularly disruptive feature of the Rings is the rule by which the current PI cannot apply for a continuation while the current ring is being implemented. This forces a time gap which disrupts the research teams and undermines the quality of the collaborative research. The panel recommends that the restriction be about having two activities operating concurrently.

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That is, a PI could apply while one ring was in process but would not be funded until the other one finishes.

As a means of avoiding systematic biases against human and social sciences, the evaluation criteria (which currently favor the natural and exact sciences) need to be more nuanced. There are numerous international guides for this purpose.

There were some indications that CONICYT staff members were unresponsive to requests for assistance or clarification regarding the rules that apply to Team Grants. In the panel's assessment this reflects the fact that CONICYT staff is overwhelmed rather than intentionally unresponsive. It is apparent to the panel that CONICYT's administration has not expanded adequately to accommodate the growth of funding activities.

Recommendations:

- The Panel recommends that the metrics and indicators used to assess applications in selection rounds should be flexible in order to provide for new entrants into CONICYT funding programs, thus avoiding a widening gap between the general research community and the program-funded research community.
- CONICYT should modify its procedures to reduce the compliance costs to applicants and its own administrative costs. There are numerous international standards as a guide.
- CONICYT should offer application support to regional universities.
- In response to the increasing funding volumes, the administrative apparatus of CONICYT needs to be strengthened. This will directly enhance the efficiency of research and research management in Chile.
- The pre-set weights of selection criteria should be modified to avoid overly mechanistic evaluation of proposals. Scientific excellence, collaboration and contribution to the economy should be fundamental. The previous merits of the applicants should not be over-emphasized to avoid exclusion of promising younger researchers as PIs.
- CONICYT should allow more flexibility in the judicious reorientation of projects objectives and the budget to enhance the effectiveness of the research, training, collaboration, and outreach.
- To avoid undesirable outcomes, CONICYT should only change their rules after broad consultation with the grantees and relevant members of the research community.

D. PIA Program Results and Impact

a) Building and strengthening the national scientific and technological base

The review panel was generally impressed with the results of the PIA programs especially in the creation of human capital, particularly the training of PhDs, and the promotion of collaborative research. The formation of research groupings assists in attracting PhD students and high performing scientists. There were concrete examples of PIA centers building collaborative research partnerships.

For the PIA Basal program the 5-year plus 5-year funding timelines provided stability encouraging the development of strategic focus on research and training.

PIA Basal centers are attracting important international collaborations. In some cases this has resulted in the establishment of additional formal international collaborations and networks. This is because of the funding available and the formation of a critical mass of researchers in the relevant fields plus the ability to invest in significant scientific infrastructure to underpin the research. The panel observed that the formal quantitative metrics used may undervalue the benefits of these collaborations and the networks they help establish.

While it is difficult to measure precisely the added value of the PIA programs, the information provided to the panel and the panel's own interactions with PIA projects demonstrate that the program has increased overall the level of formal scientific output.

The scale of PIA Basal funding allows for important and significant investment to be made in scientific infrastructure.

There were several examples of PIA-funded programs which were attractive for visiting international scientists and led to formal international collaborations (CMM, CARE and UDT for example). It is apparent that high-performing collaborations funded under PIA are important contributors to national capacity building.

b) Quality of the science and progress beyond the state-of-the-art

All the measures provided show that PIA funding was encouraging progress against international benchmarks which is likely to continue. The panel is concerned that reliance purely on academic metrics in the selection process discriminates against new entrants into these programs.

PIA programs are lifting the scientific productivity of Chile. It will be important to ensure that those currently outside the funding programs are able to compete in the future as new entrants. Failure to allow a steady stream of new entrants into research

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funding streams will result in a widening gap between the broad research community and those with program funding.

c) Added impact above individual projects of researchers participating in BC and TG

There was evidence that the PIA programs were providing significant impact against these metrics.

d) Fostering links between applied research at Universities and the business sector (BC)

The PIA metrics provided show, with a few fine exceptions, a general weakness in the interactions between the research and business/industrial communities. In more than one case the panel was informed that both a lack of funds and lack of skills were impediments to producing patents from IP. Some centers requested that CONICYT provide some additional assistance for this effort.

Some centers were concerned that they did not have the skills to take the knowledge developed in the centers and transfer this to the commercial/industrial sector. There was also a general view that the commercial sector in Chile was not used to interacting with the scientific community and did not have the confidence or trust to do so. The UDT center, though, provided a good model for how a technical and scientific center can build a pathway from research and development to innovation and commercialization.

The panel saw good examples of knowledge transfer between researchers and public offices but these were fragile and susceptible to changes in Government policy. Building stronger links between government, officials and the research community is an important factor for the longer term development of society.

e) Contributions in terms of patents, new or improved products, services or process development and the formation of spin offs

There were some good examples of research, technology and innovation leading to the development of products, licenses services and patents. The UDT center demonstrated very clearly that the funds provided were able to produce clear commercial outcomes that have the potential to produce significant regional and national benefits. But the performance against this criterion is not uniformly high and there are (as discussed earlier) institutional and cultural barriers to commercialization of research in Chile.

The emphasis on patents as a metric of knowledge transfer does not provide a true picture of strengths and weaknesses in scientific and commercial /industrial relationships. In our interactions with centers there were other examples of knowledge transfer such as commercial contracts for the provision of scientific and technical services, and public policy development that were not captured by the current metrics.

f) Dissemination and exploitation of the results the projects

There were several examples in PIA of dissemination of scientific and research results (see for example UDT and the ISCI -Complex Engineering Systems Institute). On balance the evidence from the self-assessment and the Panel's interviews, though was that commercial exploitation of outputs was generally difficult - there were few apparent incentives to promote the commercial uptake of research and the cultural aspects mentioned above worked against persistent uptake of scientific research.

g) The most impressive (scientific) achievements of the FONDAP projects reviewed

- Effectiveness and quality of the collaborations and networks they have built.
- The attractiveness of the centers to outside researchers both nationally and internationally.
- The effectiveness of the training of PhDs and research capacity building.

h) Overall benchmarking of the results and impacts by international standards

The PIA program is producing science of international standing and in doing raising the standards of Chilean science against international standards. Continued and sustained investment in science and in programs like PIA will be an important component of the sustained development of the Chilean economy and society.

Results under some metrics, such as the production of patents, are direct measures of commercialization that may well be below international standards, but the important point is that the PIA program is helping produce the essential researchers of the future and building the overall capacity of the Chilean research sector. Assisting the science and research sectors to build links

with the commercial and policy sectors is an important challenge for the future.

Recommendations:

- Qualitative indicators (as well as quantitative metrics) should be developed to measure the results and impacts of PIA programs, especially to assess interactions with the business community and for knowledge transfer and benefits to society.
- CONICYT should implement a system to comprehensively review the results and impacts of PIA-funded centers at the end of their funding period. This would provide a fuller view of the overall impact of PIA funding.
- Across all programs, CONICYT should look for ways to strengthen uptake of research outputs and to increase the capacity of researchers and research centers to transfer knowledge to policy makers, businesses and the wider society. It would be most efficient to do this across all funding programs at the government level.

3.4. Other Overarching Issues

A. Overhead

The question of overhead came up in most interviews. There is a broad consensus that public research funding bodies should pay overhead. There are several reasons for this. The researchers emphasise prioritising their use of time. When the universities do not get overhead, or where contributions are small (3% of project costs except salaries), they cannot afford to hire administrative support for the projects. It follows that the PIs have to do the administrative work themselves, which is time-consuming and thus leaves less time for their most important task, research. Paying overhead would increase the quality of research by liberating researcher resources.

The panel would like to point out a few additional advantages. On a system level, having an overhead makes competitive funding on the whole more attractive, which also has a quality effect since competitive funding in general leads to high-quality research. In addition, it increases the status of grantees within the university, since they bring money to the university that others also can benefit from, at least indirectly.

The panel recommends that CONICYT decide the level of overhead to be paid and apply the same amount to all recipients, so that competition based on overhead levels between the research environments cannot arise. If it is believed that having an overhead decreases the universities' interest in cooperation, other measures should be taken to make cooperation more attractive.

B. Monetary Incentives for Researchers

These should be continued if they serve to promote and facilitate research at universities and if done within appropriate, normative guidelines.

C. Equal Opportunities

Building up research capacity in a country is a national endeavour. A small country such as Chile should try to profit from its potential talent pool as comprehensively as possible, independently of, e.g., gender or regional background.

The background materials show an alarming gender imbalance among the beneficiaries of research funding. This is also reflected in the different CONICYT bodies participating in the decision process regarding the grants. In discussions with the leaders of the universities the panel also noticed a lack of awareness and concern regarding this issue. CONICYT therefore should have an explicit policy for equal opportunities for men and women in science and also see to it that both are equally represented in its decision-making bodies. Since most European science funding bodies have such a policy, ample benchmarking materials are easily accessible.

Another source of inequity that may hamper the national research capacity building project is regional. With the current policies and practices, investment in research is heavily concentrated in the Santiago area. This trend will not change without direct measures to counteract it, and in the long run its consequences will be detrimental to the economic growth and social sustainability of the Chilean society. The awarding rates of the FONDECYT grants are high in the leading universities in Santiago, creating a self-reinforcing process of growing inequity, since previous grants give additional points in the following funding rounds. Measures to counteract this development can be taken on different levels, beginning with an active outreach preceding the calls, through incentivising inclusion of regional partners in projects, etc.

The FONDECYT practice of expecting that universities pay for the travel costs of researchers to attend study group meetings in Santiago reinforces inequity.

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D. Sustaining Career Paths in Research

In designing their set of funding schemes/ instruments, national (and European) research funding bodies try to ensure that suitable instruments are available throughout the research career so that promising or already established and well performing academics are not lost to the national research community due to, e.g., gaps in funding opportunities. CONICYT follows this pattern to some extent: FONDECYT grants give a good start for promising young researchers and help them mature and become independent while advancing from one type of grant to the next one. The most promising ones will advance further and eventually become center leaders.

The panel identified a few problems. First, many interviewees expressed concern with the rules of eligibility and the time schedules of CONICYT. For instance, a RING PI cannot apply for a new RING while the previous RING is still running. The panel was presented with several cases where the yearly RING call deadline was closed shortly before somebody's previous RING ended, thus forcing them into a long time gap before being able to apply again. It would be better to apply the limitation to running two RINGS at the same time, not to the eligibility to apply. In that way, a RING leader could apply for a new one so that the next RING could connect seamlessly to the previous one. Even during funding gaps, obviously, young researchers need support, and there is a risk for national brain drain if such gaps appear during the maturing years when the accumulation of formal merits should be continuous.

Towards the other end of the researcher career, the panel considered those researchers who have an exclusively basic research orientation. While they lead a FONDAP center, researchers will contribute to the development of scientific knowledge within areas of national interest and their results will sooner or later come into value chains, even if they themselves only do what they are good at, i.e., basic research. The most successful ones will lead a FONDAP center for 10 years. After this however, the centers should apply for a BASAL center if they wish to continue as a center through CONICYT funding. In so doing they would have to adopt a more innovation-oriented approach which may not suit their research tradition, or their talents. This would be especially difficult for those research fields whose intended application areas are not oriented towards private goods but public goods, e.g., policy advice within the social sector. If no suitable funding scheme is available after a successful FONDAP, there is an obvious risk that excellent basic researchers will find attractive opportunities outside Chile. The panel recommends that CONICYT take this threat seriously and try to prevent it by offering attractive options for high-level research groups with a basic-science orientation after the termination of their successful FONDAP. One option could be the possibility of continuing a FONDAP center, subject to success in a new competitive call.

E. Program Self-Assessment Reports ¹⁰

While both self-assessments could be better organized and more clearly written, e.g., FONDAP reports could provide some commentary on the tables and the lessons learned TG section of the PIA report could be expanded, the following comments focus on content and not style.

a) FONDAP

This report summarizes some dimensions of the program. Section 1 discusses background and mission of the program; identifies the centers funded by FONDAP; states the program's objectives, and gives data on the budget. This helps set the program in context. Section 2 lists the areas which have been designated as priorities in various calls and outlines in detail both the selection criteria and process by which centers of excellence were identified, chosen, and how follow-up was organized. Section 3 has data intended to measure the outcomes and impact of the research effort.

The usefulness of the assessment could have been enhanced in three ways. First, readers would have benefited from some explanation of why the particular processes were adopted and followed. Were the procedures determined by Government of Chile regulations, or adapted from methods used abroad, or designed from scratch by CONICYT staff? That explanation would enable readers to understand the rationale for differences in the weighting schemes used for external and in-situ valuation. It would also have provided some insight into the criteria for selecting priority areas and for the switch from disciplines to thematic areas in the fourth call. Perhaps more important, it would enable readers to better assess whether the research teams created and consolidated in the centers in fact had a "...high impact on priority areas that address a problem of national interest". Second, further explanation would have indicated why the selection rate was so low (Table 4) and why the time taken to complete the competition (Table 5) was so long. Both of these elements have major impacts on the costs incurred by centers submitting proposals.

Third, the data are not strictly comparable across centers and over disciplines. Some centers had more researchers; some research areas have longer gestation periods than others; some centers were more engaged in creating public goods than others; some had higher prospects of raising additional funds from private sources; and some centers had a higher degree of international collaboration.

¹⁰ Self-Assessment Report of the Fondap Program Expert Panel Evaluation November 2012. Available in www.conicyt.cl

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b) PIA

Section 1 of the PIA self-assessment offers a concise overview of the background, rationale, goals, beneficiaries, and budget of the Basal program and the four activities that comprise the TG (team grants) component. Section 2, which is exceedingly detailed, explores the background, conditions, awards, funding and other aspects of the Basal Funding for Scientific and Technological Centers of Excellence. Section 2.10 constructively rounds out the overview with a number of lessons learned. Section 3 discusses the Team Grants for Research. The discussion is detailed providing readers with ample information to assess the design, processes used, and results achieved. The annexed material rounds out the discussion.

Overall, the approach used in the self-assessment of the PIA program is constructive, informative, and offers readers with more than enough detail to structure their reviews of the two programs. Two suggestions seem appropriate. One, the report leaves a number of issues partially answered and some points unaddressed (e.g., why there were such long delays in the evaluation and approval process). As a standalone study, this would create problems. But, as an input into the review process, the ambiguities and lack of clarity proved useful in directing

attention of reviewers in their subsequent discussions with CONICYT staff and the beneficiaries of the programs. A second point is that working definitions should have been provided for key terms used - "knowledge-based economy", "innovation", "productivity", "competitiveness", "critical mass". These would have enabled reviewers to understand what was intended.

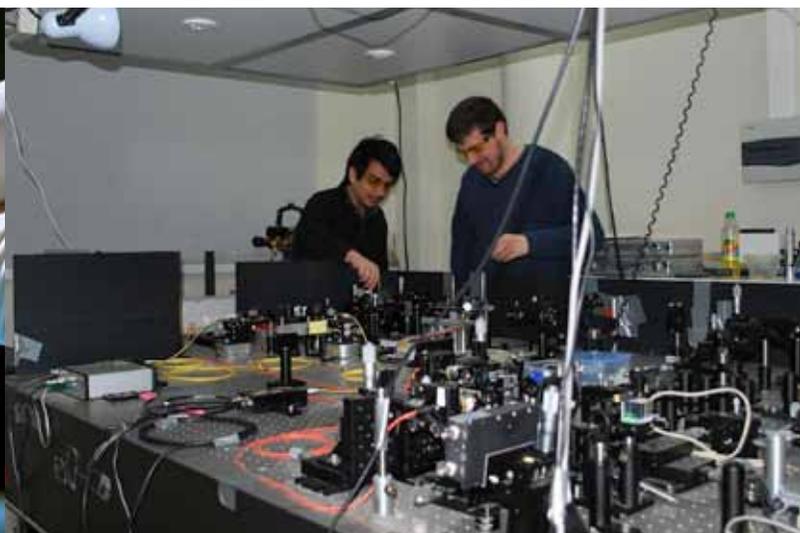
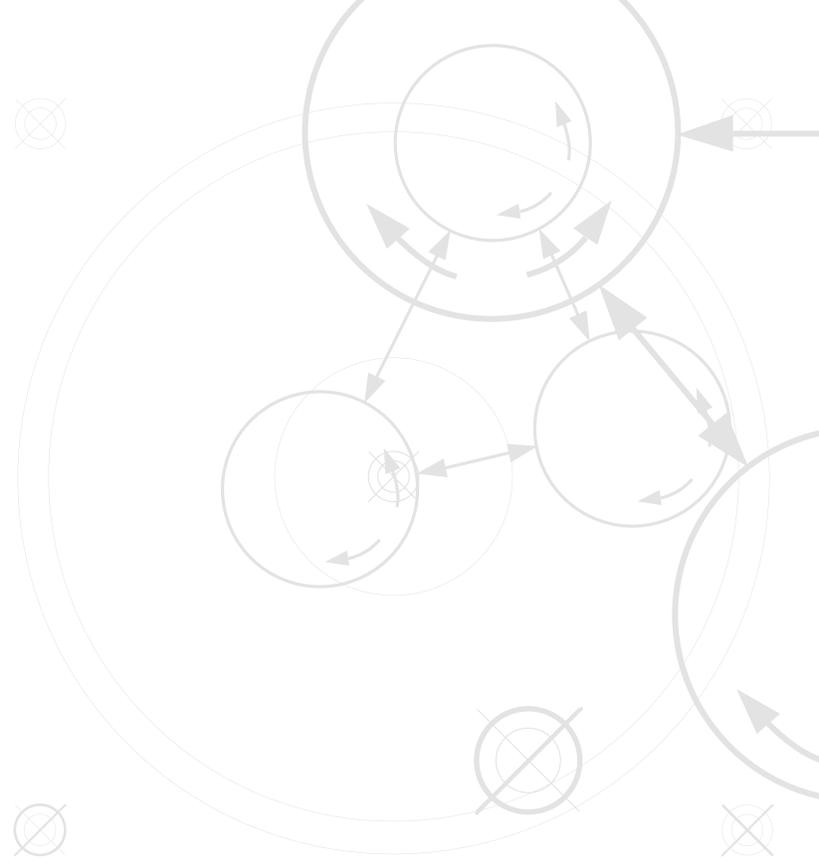


Foto: Gentileza de Centro de Óptica y Fotónica, CEFOP (Universidad de Concepción), Centro Basal financiado por PIA.
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