Introduction

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Chile has entered a new developmental phase in polar science. We now have a robust Antarctic science program (called PROCIENT for its acronym in Spanish: Programa Nacional de Ciencia Antártica) with five areas of research tied to global trends, featuring strong international cooperation: 50 percent of the PROCIENT projects include non-Chilean researchers in their working groups.

We have also diversified and broadened the financing bases of the several Chilean Antarctic calls for proposals in such a way as to offer opportunities for the entire Antarctic scientific community, ranging from undergraduate students to interdisciplinary research groups who may be facing complex problems dealing with the changing state of nature in the far south.

The contests for such support are open, transparent, and competitive. Of the peer-reviewers, only 28 percent are Chileans, with the rest being recognized researchers from 18 countries, among them the United States (14 percent), the United Kingdom (8 percent), Australia (7 percent), Canada (7 percent), and Spain (7 percent). About one out of every three proposals receives funding, which reflects the interest of the Chilean scientific community in applying to these calls as well as the need to increase the funds available as the competition becomes more rigorous. Still, the above shows that we have been able to fund a respectable number of innovative and high-caliber projects.

A horizon growing southward

Research in the last several years has made available a great deal of valuable data. Considerable pieces of evidence have been presented concerning the linkage between mainland Chile and several parts of the Antarctic peninsula during past geological periods. We have discovered enzymes capable of decomposing peptides and proteins, giving rise to applications in the food industry, along with biocompounds with antioxidant properties which can be used in cosmetic sunscreens. In addition, a microorganism (Deinococcus sp) has been discovered that is able to resist high levels of gamma radiation, similar to those emitted during nuclear events, which are particularly damaging to living organisms. These bacteria have the ability to repair their DNA, an effective system for protecting their protein, and a very compact genome. We have learned about amazing underwater algae forests, and organisms that can live in extreme environments – up to 95 degrees C (203 degrees F) – as well as ticks that are threatening the health of penguins, mosses colonizing areas uncovered by retreating ice, and fossils which are revealing the greener past that existed on the Last Continent.

Another related aspect is the growth of laboratories at all the Chilean Antarctic stations, especially at the Escudero Station belonging to the Chilean Antarctic Institute (INACH), which is helping to promote international cooperation and the development of human capital. To this we add the recently inaugurated Ambassador Jorge Berguño Barnes Antarctic Laboratories Building, as a new science facility created in Punta Arenas to increase the degree of cooperation and assistance currently offered by Chile. This building provides laboratories for paleobiology studies of Antarctica and Patagonia, as well as facilities for microbiology, molecular biology, and biochemistry, along with a paleontology collection, and rooms for gels, microscopy, for meetings, and an area for postgraduate thesis students. In the same way, this was a year for improvements at the Escudero and Prat Stations, greatly increasing their capacity for supporting scientific research.
I. Relationships between South America and Antarctica

Walking on the submerged Gondwana bridge

These projects attempt to characterize the strong interrelationships that exist between Chile and Antarctica, using modern analysis techniques applied to species of trees that grow today in the forests of the south of the country, which once cast shadows across Antarctica. Likewise the mosses, molluscs, penguins, and fish of various parts of South America and the White Continent have woven an interesting evolutionary plot through millions and millions of years. This history is even earlier than the separation of these two continental land masses, which we are studying from both geological and paleontological points of view.

Evolution and origins of the Southern biota

Throughout the chapters of natural history, contact between the South America and Antarctica has provided a bridge for many terrestrial species which today inhabit the sub-Antarctic forests of continental Chile, but which gradually disappeared from Antarctica.

In one example of the juncture between science and tourism, we have a project for the study of the Ichthyosaurs – marine reptiles similar to dolphins, from the age of the dinosaurs. Today they are found as fossils in the rocks of a marine basin that is common to both mainland southern Chile and the Antarctic peninsula. We believe that this will add an exciting new dimension to special-interest tourism. As a result, one of the largest concentrations of Ichthyosaurs in the world will serve for not only scientific study but also for both cultural and economic development within a previously unexplored portion of Torres del Paine National Park, bringing with it a world of unsuspected potential resulting from the ancient retreat of the glaciers.

Other projects will attempt to better explain the means of adaptation for mosses and penguins in South America and Antarctica over time, and to understand the corresponding relationships involved in comparable episodes of previous and contemporary climate change.
Geological evolution of Southern landmasses

One project funded by CONICYT and INACH puts forth as its main hypothesis that the Antarctic peninsula was attached to the western edge of Patagonia until the Early Mesozoic period (about 200 million years ago) and that it later migrated to its present position, initially as a result of the forces leading up to the opening of the Weddell Sea and the subsequent expansion of the floor of the Scotia Sea. Very ancient rocks, up to 540 million years old – and others that appear to have been formed during the Permian – (about 250 million years ago) have provided clear evidence for establishing the geological connection. The rocks from the Permian age went through a metamorphasis, presenting proof that Patagonia and Antarctica were most likely joined prior to the Permian. A new project that has grown out of this is called “Geological and paleontological evolution of the Magallanes and Larsen basins during the Mesozoic and Cenozoic.” This effort will compare the geological and paleontological evolution of the retroarc basins Magallanes and Larsen, located in Patagonia and the Antarctic peninsula, respectively.

Within this subcategory are other projects. One will attempt to confirm the influences resulting from the subduction of ocean ridges on changes in magnetism in the Antarctic peninsula, and compare the corresponding tectonic changes with those in Patagonia. Another project will assess the effects of soil degradation on ecosystems in Antarctica.

Phylogenetic studies of marine invertebrates

A group of biologists has suggested using organisms as a sort of living registry for the past and present, with ultimately an eye on the DNA in these evolutionary processes. Thanks to these studies, it has been possible to determine complex evolutionary relationships between the fauna of Antarctica and that of such distant locations as the sub-Antarctic ocean regions of Australia, South Africa, and Chile.
Evolution and origins of the Southern biota

1. Ichthyosaurs of late Jurassic/early Cretaceous age in the Torres del Paine National Park, southernmost Chile (2008-2012)
   Contact: Wolfgang STINNESBECK and Marcelo LEPPE
   mleppe@inach.cl

2. Invertebrates and paleoflora of the early Cretaceous ichthyosaurs site at Torres del Paine National Park, southernmost Chile (2011-2012)
   Contact: Marcelo LEPPE and Wolfgang STINNESBECK
   mleppe@inach.cl

   Contact: Wolfgang STINNESBECK and Marcelo LEPPE
   mleppe@inach.cl

4. Genetic structure and ancestral niche modeling approach of Sanionia uncinata (Hedw.) Loeske as support for studies on conservation (2009-2012)
   Contact: Ingrid HEBEL
   ingrid.hebel@umag.cl

5. Assessment of historical and recent climatic change over Antarctic penguin adaptation (2011-2013)
   Contact: Juliana VIANNA
   jvianna@uc.cl

Geological evolution of Southern landmasses

6. Geological and paleontological evolution of the Magallanes and Larsen basins during the Mesozoic and Cenozoic: Source areas and possible similarities (2010-2013)
   Contact: Teresa TORRES
   ttorres@uchile.cl

7. Petrographic and geochemical studies of the Antarctic peninsula batholith, northern Antarctic peninsula: Petrogenetic and tectonic implications (2010-2011)
   Contact: Hernán BOBADILLA
   hbobadi1@ing.uchile.cl

8. Studies leading to control of land degradation in the high Andes region (2011-2012)
   Contact: Paulina SCHULLER
   pschulle@uach.cl

Phylogenetic studies of marine invertebrates

9. Comparative genomic sequencing in marine patellogastropods species (Nacella, Schumacher, 1817) inhabiting rocky shores from central Chile to Antarctic Peninsula (2010-2013)
   Contact: Leyla CÁRDENAS
   leylacardenas1@gmail.com

    Contact: Claudio GONZÁLEZ
    omeuno01@hotmail.com

11. Phylogeography and molecular divergence between species of the genus Harpagifer (Richardson, 1844) from Antarctica and Patagonia (2011-2012)
    Contact: Mathias HÜNE
    mathiashune@gmail.com

1. The project called “Geological and Paleontological Evolution of the Magallanes and Larsen Basins during the Mesozoic and Cenozoic” has uncovered fossils of extinct penguins, conifers, ammonites, shark teeth, remains of a mosasaur skull, and the vertebrae from plesiosaurs (gigantic marine reptiles). In the photo, researcher Andrés Hevia with an ammonite in his hands.

2. Dr Marcelo Leppe looking for fossils at Byers Point on Livingston Island during the 48th Antarctic Scientific Expedition, organized by the Chilean Antarctic Institute.

3. Dr Ingrid Hebel at Lyons Ramp on King George Island, studying mosses that are colonizing the areas uncovered during glacial retreat. Her project provides background concerning the genetic structure of the moss Sanionia uncinata as part of increasing knowledge about the genetic variation, colonization, and adaptation of moss populations in Tierra del Fuego and Antarctica.
II. Adaptation mechanisms of Antarctic organisms

In the last six years, Chilean Antarctic research has experienced a strong movement towards the study of this particular form of biodiversity, which deals with the characteristics of adaptation to extreme environments in ways that are not found on other continents.

Given the stimulus of our being close to the Antarctic peninsula and the availability of related access and support, this issue of PROCIEN covers a worldwide scientific trend that is reflected in the increasing number of proposals for the study of bacteria, yeasts, fungi, lichens, and marine plants and invertebrates, some with an eye on possible new sources of biocompounds. We wonder whether science will find Antarctic substances which provide the same impacts as aspirin or penicillin - which also came from plants or microorganisms.

Dr Aurelio San Martín (first on the left) and Dr Inmaculada Vaca (center of photo) have collected numerous macroinvertebrates on King George Island, which were then processed to obtain possible fungus species inhabiting them. Up until now, they have obtained about 30 pure cultures of various filamentous fungi, which lead us to believe that Antarctic marine macroinvertebrates are a promising source for new species and possibly new compounds with interesting pharmacological properties.

What are the characteristics of Antarctic organisms that allow them to tolerate the cold, the darkness, the salinity, the ultraviolet radiation, and hydric stress? Can these characteristics be of some use to humanity? These are some of the questions that the following projects hope to answer.
1. Fungus colonies isolated from marine macroorganisms taken from the depths of Fildes Bay at King George Island.

2. Dr (c) Patricio Muñoz is studying the enzymatic mechanisms of organisms which survive under harsh conditions, such as those of microorganisms living around Deception Island. The one in the picture belongs to genus Geobacillus, and lives in environments of up to 70 degrees Celsius (158 degrees F). This microorganism is capable of producing lipase (an enzyme that degrades fats) and thus may have potential for useful applications.

Adaptation and functionality

Several of the projects in this section study physiological adaptations of marine invertebrates, algae, and plants to low temperature.

The general goals of these projects are:
• Create a platform to facilitate the study of Antarctic organisms.
• Discover the effects of freezing, UV radiation, hydric stress and wind over vascular plants and the expression and modulation of biomolecules in situ.
• Study how biologically relevant chemical components, that grow on Antarctic lichens and mosses, interact with and affect cell membrane structures.
• Isolate psychrophilic microorganisms (bacteria and fungi) associated with vascular plants, to cultivate them in-vitro.

1. New psychrophilic biofertilizers (2010-2013)
Contact: Manuel GIDEKEL manuel.gidekel@uai.cl

2. Studies on the structural effects induced by inorganic compounds, therapeutic drugs and native plant extracts on cell membranes (2009-2012)
Contact: Mario SUWALSKY msuwalsk@udec.cl

3. Bioactive compounds obtained from new fungi isolated from Antarctic marine sponges (2009-2013)
Contact: Inmaculada VACA inmavaca@uchile.cl

Contact: Aurelio SAN MARTÍN aurelio@uchile.cl

Contact: Marcelo BAEZA mbaeza@uchile.cl

6. Isolation of Antarctic microorganisms able to synthesize highly fluorescent semiconductor nanoparticles (quantum dots) for biotechnological applications (2010-2014)
Contact: José PEREZ jpererez@gmail.com

7. Screening for enzymatic activities with biotechnological potential, in filamentous fungi and yeasts isolated from marine sponges from the Antarctic sea surrounding Fildes Bay (King George Island) (2010-2012)
Contact: Renato CHÁVEZ renato.chavez@usach.cl

8. Thermophilic lipases of Antarctic origin: Effect of ionic liquids (2010-2012)
Contact: Patricio MUÑOZ pmunoz@bioscience.cl

9. Purification and characterization of a thermostable nitrilase from hyperthermophile or thermophilic Antarctic microorganisms (2011-2013)
Contact: Geraldine DENNETT g.dennett@gmail.com

10. Molecular characterization of Xanthophyllomyces dendrorhous likely strains isolated from the Chilean Antarctica and metabolite with biotechnological potential production analysis (2011-2012)
Contact: Gabriela CONTRERAS gicontrerasa@gmail.com

11. Antarctic bacteria that produce extracellular substances capable of inhibit biofilm formation of Flavobacterium psychrophilum (2011-2012)
Contact: Arely LEYTON arely.leyton@gmail.com

12. Production of new biomolecules from Antarctic extremophiles microorganisms for diagnostic and precursors of biopharma (2011-2012)
Contact: Rodrigo LÓPEZ rlopez@inach.cl

Contact: Sergio MARSHALL and Marcelo GONZÁLEZ smarshal@ucv.cl

14. Screening of lactase activity at low temperature obtained from extracts of Antarctic microorganisms (2011-2012)
Contact: Rodrigo LÓPEZ rlopez@inach.cl

15. Effect of extract of lichens in the formation of biofilms of Vibrio anguillarum pathogen of fish (2011-2012)
Contact: Claudia TORRES ctrorresb@udec.cl
Biochemical response to stress-induced conditions

Several projects have focused their studies on biochemical responses of organisms to stresses suffered in adverse environments, particularly under high UV radiation.

Microorganism diversity and ecological roles

Organisms in Antarctica have evolved unique biota that is found nowhere else in the world. On land we find microorganisms that live in the ice at low temperatures as well as others living at nearly the temperature of boiling water, in the calderas of active volcanoes on Deception Island. These are the “extremophiles” whose specific category names are related to the extreme environments in which they live: there are acidophiles (acid environments), alkaliphiles (alkaline environments), halophiles (highly salty environments), thermophiles (living in temperatures between 65 and 85 degrees C, or between 150 and 185 degrees F), and hyperthermophiles (over 85 degrees C or 185 degrees F). Understanding these adaptations will result in enormous interest in the area of possible effects of climate change on this type of organism, along with insights into their ability to respond to such changes.

16. Surface spectral UV radiation and UV-linked effects on endemic species (2010-2013)
   Contact: Raúl CORDERO raul.cordero@usach.cl

17. Relationship between sucrose accumulation and Sucrose Phosphate Synthase (SPS) activity in cold acclimated Colobanthus quitensis under SPS isoform expression: modulation of daylight duration and light quality, with differentiation among several natural populations (2009-2012)
   Contact: Marely CUBA mcubaster@gmail.com

18. Effect of radiation (PAR and UV-B) and temperature in the expression of genes involved in the fructans biosynthesis in Deschampsia antarctica desv. (2010-2012)
   Contact: Ariel PARDO ariel.pardo.ramirez@gmail.com

19. Role of fungal endophytes on the ecophysiological performance of Antarctic vascular plants under a global climate change scenario (2011-2013)
   Contact: Rómulo OSES romulo.oses@inia.cl
III. Abundance and diversity of Antarctic organisms

The splendor of Antarctic life

The recent Census of Antarctic Marine Life showed more than 16,500 taxa, including hundreds of newly discovered species. We see that some populations, such as whales and the Antarctic fur seal, are recovering, in spite of variations in several key factors that affect their survival. The set of studies in this area of research shows us that the face of life in Antarctica is changing in two senses. On the one hand, we are deepening our knowledge of the species that inhabit the waters, ice, air, and ground. On the other, we are witnessing dramatic changes in populations and in ecological relationships in an environment in which impacts of global warming are greater than in any other region.

The following projects attempt to understand the spatial and temporal differences in the species that have colonized Antarctica. These initiatives include the identification of new species and communities that exhibit great diversity and abundance in numbers, along with determining the factors behind their distribution, in hope of predicting future changes in their ecosystems. Antarctica is a continent with vast unexplored areas. Recent PROCIEN researchers have discovered extraordinary abundance and diversity in the waters of Fildes Bay, just a short distance from Villa Las Estrellas, which rival the richness of coral reef ecosystems.
Ecological studies at a community level

Ecological studies of communities have several areas of focus. One of those is the characterization, distribution, and degree of activity of the diazotrophic cyanobacteria present in thermal sites distributed along the length of the Chilean Andes as well as in Antarctica (between 19° S and 42° to 62° S latitude). In addition, these studies hope to produce a better understanding of the role of the marine diazotrophic organisms in the polar regions as part of an effort to identify new species and genes which may have ecological significance.

In another area, research is underway to learn about the potential origins and prevalence of the wide range of marine flora in the Chilean region that includes Magallanes and the Chilean Antarctic, to merge this knowledge with the results of previous research which describes the biogeographic history of this region, thus providing tools for conservation and sustainable practices, as well as for use in future studies involving basic ecology and evolution.

One novel project involved georeferencing studies for underwater areas of Antarctica using GPS comparisons with other regions of Chile, to determine the extent and diversity of the flora and fauna through the analyses of images and qualitative sampling.

1. Humpback whales, along with penguins, are certainly one of the most representative animals of Antarctic wildlife. Jorge Acevedo’s project is developing a system to integrate large amounts of photographs in a database, combining the various catalogs of photoidentification of humpback whales in the southeastern Pacific region.

2. During the last Antarctic Scientific Expedition, Dr Daniel González discovered a large number of tick colonies among the gentoo penguins in the area of Paradise Bay, near the Antarctic Circle. This project hopes to gather information about these parasites which are associated with diseases that could drastically affect penguin populations in a climate change scenario.

3. One example of the marvels of biodiversity in the Antarctic seas: a sea worm (Polychaeta) feeding through its very fine white or transparent filtration structure.
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Ecological studies at a population level

Studies in the fluctuations in marine vertebrate populations are keys to clarifying the potential impacts of human activities that are global (e.g., climate change) and local (such as commercial fishing) in nature. The population of humpback whales that feed in waters adjacent to the Antarctic peninsula has been returning little by little during the past ten years in spite of the reduction in their principal food (krill) during the same time. The best explanation for this natural phenomenon may be different feeding behaviors of the humpback when compared to other Antarctic rorqual whales (order Balaenopteridae).

One project in this area will study the specific nature, availability, and selectivity factors in the symbiotic relationship of a cyanolichen in Tierra del Fuego and Antarctica. There will also be efforts to confirm the presence or absence of a reproductive season and mating patterns for the sea urchin (*A. agassizi*) found in the waters of the Antarctic peninsula.

- **5.** Factors involved in a cyano-lichen association: Availability, specificity and selectivity (2010-2013)
  Contact: Julieta ORLANDO orlandojulieta@yahoo.com.ar

- **6.** The common seabird tick *Ixodes uriae* (White, 1852) as a vector of pathogenic virus, bacteria and protozoa to penguins of the Antarctic environment (2010-2013)
  Contact: Daniel GONZÁLEZ danigonz@udec.cl

- **7.** Winter migratory connections of *Megaptera novaeangliae* feeding in Antarctic and continental Chilean waters as revealed by photo-identification analyses (2010-2012)
  Contact: Jorge ACEVEDO jorge.acevedo@cequa.cl

- **8.** Reproductive seasonality and mating system in the Antarctic brooding echinoid, *Abatus agassizi* (Mortensen, 1910) (2010-2012)
  Contact: Claudia MATURANA cmaturana.ciencias@gmail.com
Interactions with the physical dimension

Some projects in this area will focus on the study of relationships that certain organisms have with their physical environment. For example, it has been shown that the movement of icebergs and their erosive action upon the sea floor has an impact on bottom-dwelling sea life. There will be investigation into the role of the biological crust made up of various communities of lichens, mosses, liverwort plants, and algae in the processes of forming the soil, such as the accumulation of nitrogen, phosphorous, and organic material in non-avifauna communities, also known nitrophobous conditions. Yet another project involves determination of the abundance and taxonomic nature as well as function of eukaryotic phytoplankton in Antarctic coastal waters, along with variations between winter and summer. A project from the University of Los Lagos will characterize nematodes and tardigrades associated with Antarctic intertidal micro-habitats, applying morphological and molecular techniques, and comparing the results with those found in the Magallanes region of South America.

- **9.** High latitude meiofaunal macroecology and diversity assessed using both morphological and molecular techniques (2011-2014)
  Contact: Matthew LEE matthew.lee@ulagos.cl

- **10.** Diversity and ecology of communities of photosynthetic planktonic eukaryotes in Antarctic coastal waters: A comparison between austral summer and winter (2010-2013)
  Contact: Rodrigo DE LA IGLESIA rdelaiglesia@bio.puc.cl

- **11.** The role of soil biological crusts as sources of nitrogen in non-ornithogenic soils of South Shetland Islands, Antarctic peninsula (2011-2014)
  Contact: Cecilia PÉREZ cperez@bio.puc.cl

- **12.** Inverse Bergmann’s and Cope’s rules and the evolutionary dwarfism in Antarctic and Magellanic molluscs (2011-2013)
  Contact: Marcelo RIVADENEIRA marcelo.rivadeneira@ceaza.cl
IV. Global warming and climate evolution

The warm zone in Antarctica

At first glance it’s just a long tube of ice, but to the eyes of science it’s a tremendous store of information about the earth’s climate thousands of years ago. This medium depth ice core is what Chilean, Brazilian, and US scientists expect to obtain soon in an area that is warming at rate four times the global average. Along with this are projects for the study of glaciers, penguins, zooplankton, and macrofauna from the depths of the ocean, all seeking to decipher the signs of climate change in one of the most important natural laboratories on the planet.

Since the beginning of time, climate changes have molded the landscape and influenced the evolution of all types of life. Nevertheless, with today’s better measurement tools, there is world-wide concern, with the debate over evolving and warming climate, and the impacts of human activities on the global environment.

The scientific evidence has been enormous and categorical. The latest reports from the Intergovernmental Panel on Climate Change suggest that during the period between 1906 and 2006, the planet warmed 0.74 degrees Celsius, adding that the greatest part of the increase is probably due to growing concentrations of greenhouse gases from anthropogenic origins. Three regions on earth are growing at a rate above the global average and one of them is just a step away from mainland Chile, in the Antarctic peninsula. In this region in just 50 years the average surface air temperature has increased nearly 3 degrees C. This trend is above four times the global average and has taken place in just half the time. Another factor that will affect the marine organisms is the acidification of the Southern Ocean, where the pH of the seawater shows a trend downward, or increasing acidity, which could directly affect invertebrates with calcium-based skeletons, or indirectly through other links in the food chain.

The main objective of the CASA project is to produce an integrated climate interpretation from 1000 to 2000 years ago, using ice cores from the interior of Antarctica (about 85 degrees South) and in the more northerly location (at 63 degrees South). In the photo, Dr. Ricardo Jaña is at the Detroit Plateau where the first medium depth ice core (130 meters) was taken.
Two projects are studying the mass balance, thickness, dynamics, internal structure and evolution of the glaciers and ice shelves on the Antarctic peninsula. Another one is making an integrated interpretation of time series obtained indirectly from several Antarctic ice-cores (from latitudes 63 and 85º S), covering the past 1,000 to 2,000 years.

Investigator Cristina Carrasco is determining the role of the Antarctic Intermediate Water (AAIW) in gas transportation and other physical properties to the eastern South Pacific Ocean, discerning between the biogeochemical and physical processes that transform these properties.

The interaction between climate change and physical and biological systems offers us ample opportunities to test hypotheses and to document the processes and mechanisms involved, yielding vital knowledge for understanding the phenomenon on this part of the globe, and helping in evaluating the present consequences as well as predicting future impacts on a global scale.

The world is seeking answers to these and other questions. Our scientists are developing new knowledge while contributing to the better understanding of our destiny as human species.
V. ENVIRONMENT AND OTHER INITIATIVES

In addition to projects in the four previous lines, there are those that touch upon other areas of polar research, for which INACH provides support, with several of these being related to the Antarctic environment.

Organic compounds and environmental monitoring

Several projects are focused on the effects of human-generated contaminants in Antarctica, identifying key parameters, persistent organic compounds, and their potential risk to the Antarctic environment.

1. Construction of atmospheric corrosiveness maps to metals and alloys of major technological interest for Chile (2009-2012)
Contact: Rosa VERA rvera@ucv.cl

Contact: Ricardo BARRA ricbarra@udec.cl

3. Biological weathering in a soil chronosequence of the glacier retreat in the Antarctica Fildes Peninsula (2011-2014)
Contact: Roberto GODOY rgodoy@uach.cl

4. Environmental Antarctic Center (2011-2012)
Contact: Claudio GÓMEZ claudio.gomez@umag.cl

Space and Atmospheric Monitoring

Antarctica provides a privileged location for atmospheric and space studies, due to the particular characteristics related to isolation, to areas without precipitation (the “desert of ice”) and the unique condition of being a polar location.

5. Turbulence in space plasmas and its impact on the magnetospheric dynamics and space weather (2011-2015)
Contact: Marina STEPANOVA marina.stepanova@usach.cl

6. On climate change-related effects on surface UV radiation in Antarctica: development of a ground-based UV reconstruction model (2010-2013)
Contact: Alessandro DAMIANI adamiani024@gmail.com

7. First steps towards a new site-testing at West Antarctica: The search for the best astronomical observations site in our planet (2011-2013)
Contact: Patricio ROJO projo@oan.cl

8. Neutron monitor MN-64 for the Antarctic territory (1985-2012)
Contact: Enrique CORDARO ecordaro@dfi.uchile.cl

9. Meteorological records in Fildes peninsula (permanent)
Contact: Jorge CARRASCO jorge.carrasco@meteochile.cl

The project directed by researcher Rosa Vera is constructing maps, both national and regional in scope, covering atmospheric corrosivity. This will allow better selection of materials for use in metallic structures in various locations. In the photo, a corrosivity test sample station at INACH’s Escudero Base on King George Island.
Improving the infrastructure for Antarctic science

The development of science requires increasingly better infrastructure, both for the conduct of the scientific activities themselves and for housing the scientists doing that work. For that reason, since 2007, INACH has undertaken a modernization effort at the Chilean Antarctic stations. From the incorporation of a laboratory at O’Higgins Station to the readying of the Antarctic bio-resources laboratory at Escudero Station, this season we are adding a marine biology laboratory at Prat Station. Likewise, Escudero Station was renovated during the 2011-2012 summer, with the addition of 250 square meters finished. In 2011 was the inauguration of the Antarctic Laboratories Building named after Ambassador Jorge Berguño Barnes. 500 square meters are being added in this first stage, with Antarctic and Patagonian paleobiology laboratories, and facilities for microbiology, molecular biology, biochemistry, a paleontology collection, and various rooms for slides, microscopy, for meetings, and for graduate students.

Funding for Chilean Antarctic science

After several years of nearly constant investment in logistics, the year 2011 shows a significant increase of 43 percent. The increase is mainly associated with the construction of the marine biology laboratory at Prat Station, with 80 square meters destined for scientific activities, and increasing the housing facilities from the previous space for two, to new housing to allow ten researchers. The readiness of the new laboratory, primarily for marine studies, comes with investment in equipment, thanks to support from the regional government (FNDR 2011). INACH has formed alliances with other institutions and programs, such as FONDECYT, the Program for Associative Research affiliated with CONICYT and CORFO-INNOVA, thanks to the steady motivation of the national Antarctic community to participate in competition for the various available funding sources.
Evolution of PROCIEN

Over nine years, from 2003 through 2011, the number of PROCIEN projects has grown from 11 to 61, thanks to a strategy for broadening the funding sources as well as improvements in spreading out among the Chilean centers for research, and universities. Our method for organizing this scientific program has become a regional level reference point, with transparency and competitiveness that stimulates international cooperation. Only 28 percent of the regular competition proposals at INACH are reviewed by Chilean peers. The rest are done by recognised researchers from 18 countries, including the United States (14 percent), the United Kingdom (8 percent), Australia (7 percent), Canada (7 percent), and Spain (7 percent). About one of every three proposals receives funding from INACH.

Chilean ISI publications related to Antarctic science

Prolific Chilean Antarctic scientific activity, as measured by the number of ISI (Institute for Scientific Information) publications, has continued to grow in recent years and this trend is expected to continue. One recent publication by J. Dudeney and D. Walton (“Leadership in politics and science within the Antarctic Treaty”, Polar Research, 2012) reflects these efforts, as well as the importance Chile gives to its participation in the Antarctic Treaty Consultative Meetings, reflected in the number of Working Papers presented to this forum.
Chile has stations at several points throughout the Antarctic peninsula and the South Shetland Islands archipelago. The following presents research-related information covering five Chilean stations. These descriptions are small windows into an increasingly captivating world, full of opportunities, with many answers for the enigmas that have intrigued the contemporary science community.
Profesor Julio Escudero / Frei Station

Location: Fildes peninsula, King George Island, South Shetland archipelago.

Includes capacity for 36 persons. Operates primarily during summer but can accommodate researchers during winter. Includes wet and dry laboratories, completely equipped: spectrometer, Memmert oven, autoclaves, analytical balance, freezer, laminar flow hood, trinocular stereo-microscope. Includes multiple means of communication (HF and VHF radio, telephone, internet) and transportation to study zones (boats, small all-terrain vehicles, pickup trucks, etc). Can be reached by sea or air.

Guillermo Mann Station

Location: Cape Shirreff, Livingston Island, South Shetland archipelago.

Capacity for 6 persons. Operates only in summer. Provides one laboratory with basic instrumentation. Can be reached by sea or helicopter. Communications via HF and VHF radio and satellite telephone. Located nearby is a base run by the National Oceanic and Atmospheric Administration (NOAA).

Opportunities for polar research

Arturo Prat Station

Location: Chile Bay, Greenwich Island, South Shetland archipelago.

Capacity for 8 researchers. Operates all year. In the 2012 season it will be fitted with dry and wet laboratories. Multiple means of communications: HF and VHF radio, telephone, and internet. Transportation belonging to the Chilean Navy can provide transportation to study sites. Can be reached by sea or by helicopter. Coordination is possible through the neighboring Pedro Vicente Maldonado station (Ecuador) which also features laboratories.

Bernardo O’Higgins Station

Location: Cape Legoupil, Antarctic peninsula. Located close to the German GARS-O’Higgins satellite station.

Capacity for 8 researchers. Operates all year. Features a laboratory with drying oven, precision scale, freezer, autoclave, laminar flow hood, etc. Multiple communications systems including HF and VHF radio, telephone, and internet. Transportation to study sites provide by Chilean Army. Can be reached by sea or air (Twin Otter).

Gabriel González Videla Station

Location: Paradise Bay, Antarctic peninsula.

Capacity for 4 researchers. Operates only in summer. No laboratory. Multiple means of communication (HF and VHF communication, telephone, internet). Transportation by Chilean Navy zodiac boat. Can be reached by sea or via helicopter.
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