



**FRENCH MINISTRY OF  
FOREIGN AFFAIRS**

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## **ARCTIC ENVIRONMENT MINISTERS MEETING, 5-6 FEBRUARY 2013**

### ***The French Arctic scientific research***

The French scientific research has been active in the Arctic since the 18<sup>th</sup> century and gained international recognition thanks to famous researchers and explorers as Joseph-René Bellot, Paul-Emile Victor, Jean-Baptiste Charcot, Jean Corbel, Jean Malaurie, Jean-Louis Etienne etc.

This Arctic research has been enhanced by the French **experience gained in Antarctica** and, above all, by the **support of the *Institut polaire Paul-Emile Victor* (IPEV)** and a **growing interest for the Arctic within the French scientific and academic community**. This community is also becoming more and more structured within the French research institutions, which enables France to be a **scientific contributor and data provider in several international organizations** dealing with the Arctic or that have a part of their enforcement area in this region.

The **wide scope of disciplines** involved in the French Arctic research and the **level of expertise** they reached in many sectors (glaciology, ecosystem studies, climatology, social sciences...) could represent an **important input for the work of the Arctic Council and its working groups**, especially for contributions to monitoring programs or to the establishment of models.

With this information document France intends to present the existing situation and scope of its Arctic scientific research to the Arctic Council. Thanks to its scientific institutions France could bring input in many disciplines involved in Arctic Council Working Groups' programs. In that prospect, **this document is designed to stir up dialogue with Arctic Council Members, Permanent Participants, Working Groups and Observers, in order to initiate cooperation in research sectors that would be considered useful to the work of the Arctic Council.**

## **The IPEV and the French scientific and academic institutions active in the Arctic**

### **1) The Institut Polaire français - Paul-Emile Victor (IPEV)**

The French polar institute, the *Institut Polaire français - Paul-Emile Victor* (IPEV) is the **government resources agency for Polar research**, both in the Arctic and in Antarctica, in charge of bringing financial, administrative and logistical support to polar research programs.

The IPEV dedicates **23% of its annual resources to the Arctic research**, an amount close to 6.3 millions euros. It operates two stations in the international scientific village of Ny-Ålesund in Spitsbergen: the *Charles Rabot* and *Jean Corbel* stations. These structures constitute, with the German station, the *French-German Spitsbergen Station of Ny-Ålesund* (the AWIPEV). This station has a capacity of more than 20 researchers. In all the Arctic, 111 personnel work for the IPEV or thanks to it – most of which are in Spitsbergen and northern Norway – as employees (administrative and technical support) and as researchers.

The IPEV currently **supports 26 Arctic research programs** in a wide range of disciplines (anthropology, ethnology, ethno-biology, astronomy, biology, chemistry, climatology, glaciology, paleontology, ornithology, fluids physics, sociology, volcanology etc.) and in a large number of Arctic regions (Arctic Ocean, Alaska, northern Canada, Greenland, Iceland, Nunavik, Nunavut, northern Russia, eastern Siberia Spitsbergen, northern Sweden, Yakutia etc.). Six of these programs are conducted at the AWIPEV in Spitsbergen.

## **2) The French research and academic institutions involved in the Arctic**

Many **more research programs are carried out independently from the IPEV** by the numerous French universities and research centers interested in the Arctic (cf. **Annex**, page 6). Some of them are developing specialized courses on the Arctic and sometimes academic degrees such as the “Masters of Arctic Studies” proposed by the University of Versailles Saint-Quentin.

## **3) The initiatives to create synergies in the French Arctic research efforts**

French Arctic research is progressively being structured and organized thanks to multidisciplinary initiatives such as the recently created the “*Chantier Arctique*” (“Arctic Project”). This project, initiated by the French scientific institutions aims at promoting Arctic research and coordinating the efforts across all disciplines. This initiative will lead to a vast **prospective exercise** in spring 2013 that will culminate in the organization of an **Arctic Science meeting** at the “*Collège de France*” (Paris) in June 2013. This meeting will enable to draft a global vision of the French Arctic scientific research.

**International initiatives are also undertaken**, such as the “*Journées de l’Arctique / Arctic Days*” organized by the French research institutions on 14-16 November 2012 in Brest. This international workshop on Arctic marine ecosystems was designed to realize an assessment of the achievements of the disciplines involved in Arctic research and to strengthen international exchanges between scientists in order to build new cooperation initiatives.

## **4) The developing international cooperation of the French Arctic research institutions**

An international scientific and academic cooperation is developing between French research institutions and their counterparts in Arctic States. France is committed to strengthen this academic and research cooperation which is currently based, for examples, on the partnership with Quebec (May 2011) for students and researchers exchanges in several disciplines including Arctic-related ones, the partnership between the *Pierre et Marie Curie University* and the *University of Akureyri* (Iceland ; March 2012), the partnership between some French universities (*Université de Bretagne occidentale, Université Aix-Marseille III*) and the Canadian *ArcticNet* initiative, a French chair at the *University of Nuuk* (Greenland) since 2008, an exchange program that grant French students access to courses at the *University College of Finnmark* (Norway), the Canadian excellence research chair granted to the Joint International Unit on the Arctic created by the *Laval University* and the *CNRS* (2011), etc.

# **The French scientific contributions within the international organizations involved in the Arctic**

## **1) The Northern Dimension of the European Union**

France is involved in the Northern Dimension of the European Union, especially in **cooperation programs on nuclear safety** in the north thanks to its recognized nuclear expertise. France is also a major contributor to the Northern Dimension Environmental Partnership (**NDEP**) and to the **NDEP Fund**. For example, France’s contribution to Northern Dimension nuclear cleanup programs in 2003-2004 and 2007-2008 amounted to a total of 46 millions euros.

## 2) Regional Fisheries Management Organizations

France brings scientific data on the state of fish stocks to the two regional fisheries management organizations (RFMOs) which have a part of their enforcement area in the Arctic.

- France is a member of the **Northwest Atlantic Fisheries Organization** (NAFO), that covers the sea of Davis, and contributes each year to its funding (82 000 Canadian dollars).
- Through the European Union, France brings scientific data and contributes to the funding of the **North East Atlantic Fisheries Commission** (NEAFC) that covers the sea of Greenland, the sea of Barents and a small fraction of the Arctic Ocean up to the North Pole.

## 3) The OSPAR Commission

France has been active in the OSPAR Commission since its creation in 1972. Region I of the organization covers the seas of Greenland, Norway and Barents as well as a small fraction of the Arctic Ocean up to the North Pole. **France provides each year scientific data** to the OSPAR Commission, especially on the chlor-alkali industry, monitoring of the atmosphere, radioactive substances and waste disposal in the Commission Area. France also prepared **background documents** on chemical pollutants such as clotrimazole (2005) and dibutylphthalate and diethylhexylphthalate (2006), and updates them periodically. France is an important contributor to the establishment of the OSPAR **marine protected areas beyond national jurisdiction** in the Northern Atlantic.

## Examples of the content and results of French Arctic researches as possible contributions to Arctic Council Working Groups' programs

### 1) The French ecological research in the Arctic

French ecological research in the Arctic **addresses the impact of climate change and pollution on both terrestrial and aquatic ecosystems**, notably through research programmes funded by the IPEV. These programmes take into account nearly all the Arctic with a focus on the North Atlantic sector and the international research facilities of Ny-Ålesund. These researches mostly deal with marine organisms and ecosystems but also address terrestrial ecological processes.

**In the terrestrial realm**, French Arctic researchers are working to understand the impact of global environmental change (notably climate warming) on multi-trophic interactions and food web dynamics which will ultimately shape polar biodiversity. These investigations are based upon fieldwork conducted in east Greenland, in collaboration with Danish researchers.

**In the marine realm** the impact of climate warming is tested on a variety of organisms and biota. For instance, French researchers working in Spitsbergen investigate how climate-induced changes in biotic (food resources) and abiotic (temperature, pH, salinity) environmental conditions impact Arctic benthic organisms and communities. This will enhance the understanding of present Arctic coastal ecosystem functioning and will enable to predict possible feedback scenarios of the ecosystem in a less ice-rich Arctic due to climate warming.

**In the pelagic ecosystem**, a similar programme also assesses the physiological consequences of a possible temperature increase linked to global warming in Euphausiids from Arctic Ocean. The latter constitute an important food source that conditions the functioning of pelagic food webs, in particular marine top-predator biomass.

Further up the food chain, **French researchers also work on seabirds**. Four research programmes investigate the behaviour, physiology, evolution and population dynamics of seabirds from Arctic areas. Arctic seabird research is currently the most powerful branch of French Arctic ecological research, with fieldwork and data collection across the Arctic basin (Alaska, Greenland, Svalbard and Norway), a vast network of collaborations with researchers from all Arctic States and an international visibility.

Specifically, French seabird ecologists examine the **responses of populations of these marine top predators to environmental variability** at different spatial and temporal scales, including the impacts of climatic forcing but also of other forcing factors such as parasites. This is possible because seabirds can be easily marked individually and their populations subjected to long-term monitoring. Seabirds are therefore the visible ‘tip-of-the-iceberg’ in Arctic marine ecosystems, which can be studied to gain insights over all underlying ecological processes. Seabirds are being used by French researchers as biosamplers of marine pollutants (DDT, DDD, DDE, HCB, PCBs, PBDEs and heavy metals), which they tend to concentrate because of their apical position within the food chain.

Further, seabirds are **ideal organisms to investigate the impact of climate change** especially when they feed at a low trophic level – such as **planktivorous little auks** (*Alle alle*). Indeed, climate models predict a multi-degree warming of the North Atlantic in the 21<sup>st</sup> century. A research priority is to understand the effect of such changes upon marine organisms. With 40 to 80 million individuals, planktivorous little auks are an essential component of pelagic food webs in this region that is potentially highly sensitive to climatic effects. Using an integrative study of their behaviour, physiology and fitness at 3 study sites, researchers evaluated the effect of ocean warming on little auks across the Greenland Sea in 2005 to 2007. Contrary to hypothesis, the birds responded to various sea surface temperatures via plasticity of their foraging behaviour, allowing them to maintain their fitness levels. Predicted effects of climate change are significantly attenuated by such plasticity, confounding attempts to forecast future effects of climate change using envelope models.

## **2) The French Arctic research in the sciences of the universe**

The French research is also active on the sciences of the universe. **Glaciology** has become a sector of excellence of the French polar research. Ice experts study the impact of climate change on the cryosphere and especially on glaciers and permafrost dynamics, intra-glacial and sub-glacial runoff etc. French specialists gather measures in the Arctic to develop models of the evolutions of icecaps and to enhance knowledge of the radiative forcing by aerosols on ice sheets. They study the interaction between volcanic areas/ocean-rifts and icecaps, and the exchanges of heat and fresh water in the interfaces between ice, ocean and atmosphere, to understand better the withdrawal of Arctic sea-ice. France is also an active participant to the international ice-drilling project IPICS-NEEM in Greenland.

**Climatology** is another strong point of the French Arctic science. The current researches focus on the assessment of the Arctic carbon budget of the atmosphere, ocean and atmospheric water steam through the establishment in southern Greenland of the first water vapour isotopic content monitoring instrument. Current studies extend these efforts to the monitoring of other gases like methane. Studies are also undertaken on sediments to assess the past evolutions of climate change on a large timeframe. Chemical studies focus on the content and dynamics of the Arctic stratosphere and try to assess the isotopic profile of the Arctic atmospheric helium thanks to the development of a new tracer.

Projects are conducted in **paleontology** in Spitsbergen to study the association of animal fossils and flora remains in the successive fossiliferous geologic levels. These researches enabled the French experts to discover plants fossils damaged by insects and a succession of marine and continental levels of fossils that reveals synsedimentary tectonic movements.

### **3) The French Arctic research in social sciences**

The French Arctic research in social sciences focuses mostly on the Arctic indigenous people in Canada (Nunavut and Quebec) and Russia (eastern Siberia and Yakoutia). These studies aim at accumulating oral, visual and written data on the **indigenous people's cultural and educational practices as well as on their relation to nature**. The research thus try to understand the processes that led to owning nature, the link between the environment and the methods of children education and the possible ways for these populations to adapt themselves to a changing environment.

Other researches focus on **social changes and political processes that appeared recently among the Arctic populations**, such as the transformation of authority practice in the 20<sup>th</sup> century, the progressive institutionalization of the Canadian Arctic or the ways Arctic political leaders became professional both on the national and international scenes. These researches on current evolutions also **include the impact of new economic phenomenon**, such as tourism and mining, on the management and conservation of fauna and flora resources and on the Arctic lifestyle. They try to imagine alternative options to the developing economic model currently developing, basing the effort on the preoccupations of the Arctic communities.

Historical studies are also carried out, especially on the **history of human settlement in the Arctic**. For example, the HUMAD-MAFO program, led by the *Laboratoire d'Anthropologie Moléculaire et d'Imagerie de Synthèse* (Molecular Anthropology and Synthesis Imaging Laboratory, supervised by the CNRS) studies the different ways coexisting communities of hunter-gather populations, cow and horse breeders and European settlers adapted themselves to extreme Arctic conditions. The gathering of data relies on DNA from tombs excavations and on samples from contemporary populations. The comparison of these two sources of information will enable to understand better the human genomic evolution in response to environmental, climatic and epidemiologic constraints.

## ANNEX

### The French research institutions, universities and laboratories that have activities in the Arctic

This annex provides a list of French scientific institutions, universities and laboratories that have research in the Arctic activities. This document is not exhaustive as it does not take into account the institutions, universities and laboratories that had punctual activities in the Arctic.

#### 1) Research institutions involved in the Arctic scientific research

- *Centre National pour la Recherche Scientifique (CNRS)* – National Center for Scientific Research: <http://www.cnrs.fr/>
- *Commissariat à l'énergie atomique (CEA)* – Atomic Energy Commissariat: <http://www.cea.fr/>
- *École des hautes études en sciences sociales (EHESS)* – School for Upper Studies in Social Sciences: <http://www.ehess.fr/fr/>
- *Institut Pierre Simon Laplace (IPSL)*: <http://www.ipsl.fr/>
- *Museum national d'histoire naturelle (MNHN)* – National Museum of Natural History: <http://www.mnhn.fr/le-museum/>
- Etc.

#### 2) Universities that have at least one research structure involved in the Arctic scientific research

- Université de Caen: <http://www.unicaen.fr/>
- Université de Franche-Comté: <http://www.univ-fcomte.fr/>
- Université de Nantes: <http://www.univ-nantes.fr/>
- Université de Paris Sud: <http://www.u-psud.fr/fr/index.html>
- Université de Savoie: <http://www.univ-savoie.fr/>
- Université de Versailles Saint-Quentin en Yvelines (UVSQ): <http://www.uvsq.fr/>
- Université Joseph Fourier: <http://www.ujf-grenoble.fr/>
- Université Pierre et Marie Curie (UPMC): <http://www.upmc.fr/>
- Etc.

#### 3) Laboratories supervised by the above-mentioned institutions and universities that have activities in the Arctic

- *Centre d'écologie fonctionnelle et évolutive (CEFE)* / Center for Functional and Evolutionary Ecology (supervised by CNRS): <http://www.cefe.cnrs.fr/>
- *Centre d'études arctiques* / Center for Arctic Studies (supervised by EHESS);

- *Centre d'études biologiques de Chizé (CEBC)* / Center for Biological Studies of Chizé (supervised by CNRS): <http://www.cebc.cnrs.fr/>
- *Centre de Recherches Historiques (CRH)* / Center for Historical Research (supervised by EHESS and CNRS): <http://crh.ehess.fr/>
- *Centre de spectrométrie nucléaire et de spectrométrie de masse (CSNSM)* / Centre for Nuclear Spectrometry and Mass Spectrometry (supervised by CNRS and *Université de Paris Sud*): <http://www.csnsm.in2p3.fr/>
- *Environnements, Dynamique et Territoires en Montagne (EDYTEM)* / Environments, Dynamics and Territories in the Mountains (supervised by *Université de Savoie*): <http://edytem.univ-savoie.fr/>
- *GLACCIOS* (supervised by CNRS and CEA within LSCE): [http://www.lsce.ipsl.fr/Phocea/Vie\\_des\\_labos/Ast/ast\\_groupe.php?id\\_groupe=33](http://www.lsce.ipsl.fr/Phocea/Vie_des_labos/Ast/ast_groupe.php?id_groupe=33)
- *Groupe société et religions* / Society and Religion Group (supervised by CNRS): <http://www.gsrl.cnrs.fr/>
- *Institut de Planétologie et d'Astrophysique de Grenoble (IPAG)*; supervised by CNRS and *Université Joseph Fourier* – Institute of Planetology and Astrophysics of Grenoble: <http://ipag.osug.fr/science-pour-tous/faits-marquants/article/perdue-dans-l-espace-une-planete>
- *Institut français de recherches et d'études arctiques – Centre Européen Arctique (IFREA-CEARC)* / French Institute for Arctic Research and Studies – Arctic European Center (supervised by UVSQ) : <http://www.developpement-durable.uvsq.fr/le-developpement-durable-a-l-universite/langue-fr/notre-recherche/nos-laboratoires/centre-europeen-arctique-cearc--63241.kjsp?RH=1326709864001>
- *Laboratoire Ampère* (supervised by CNRS): <http://www.ampere-lab.fr/>
- *Laboratoire Biogéosciences* / Bio-Geosciences Laboratory (supervised by CNRS): <http://biogeosciences.u-bourgogne.fr/>
- *Laboratoire d'Anthropologie Sociale (LAS)* / Social Anthropology Laboratory (supervised by EHESS): <http://las.ehess.fr/>
- *Laboratoire d'océanographie de Villefranche* (supervised by UPMC and CNRS): <http://www.obs-vlfr.fr/>
- *Laboratoire de glaciologie et géophysique de l'environnement (LGGE)* / Laboratory of Glaciology and Environmental Geophysics (supervised by CNRS and *Université Joseph Fourier*): <http://lgge.osug.fr/>
- *Laboratoire des sciences du climat et de l'environnement (LSCE)* / Laboratory of Climate and Environment Sciences (supervised by CNRS, UVSQ and CEA): <http://www.lsce.ipsl.fr/>
- *Laboratoire Morphodynamique Continentale et Côtière* / Laboratory of Continental and Coastal Morphodynamics (supervised by *Université de Caen*): <http://www.unicaen.fr/recherche/m2c/spip.php?rubrique124>
- *Théma* (supervised by *Université de Franche-Comté*): <http://thema.univ-fcomte.fr/>
- Etc.