PaNAGIC Report to IUPAP General Assembly

Cape Town, South Africa, October 26-28, 2005

The Particle and Nuclear Astrophysics and Gravitational International Committee (PaNAGIC) was established by IUPAP in 1998 as an inter-Commission committee to support the world-wide exchange of ideas and help in the convergence of the international scientific community in the large scale activity in the emerging field of particle and nuclear astrophysics and cosmology and of gravitational waves. Its purposes are:

- To promote and provide a forum for international coordination of large-scale projects in these areas of research.
- To develop a common culture in these emerging and rapidly evolving fields.
- To promote and help to organize regular world-wide meetings, workshops and schools in these areas.

These interdisciplinary sectors include:

- The study of basic constituents of matter and their interactions by non-accelerator means.
- The study of the sources, acceleration mechanism and propagation of high energy particles in the Universe.
- The study of nuclear and particle properties and processes of astrophysical and cosmological interest in the Universe.
- The study of gravity, including the detection and the astrophysical sources of gravitational waves.

PaNAGIC has the status of an IUPAP Working Group. Its mandate was extended until 2005 at the 24th IUPAP General Assembly in October 2002 in Berlin. PaNAGIC reports to C4, C11, C12 and C19 with a primary relation to C4 and a connection to AC2. The Committee has 15 members, selected primarily on the basis of intellectual leadership and representing the major components of the filed. One member is appointed by each of C4, C11, C12 and C19. One of the members acts as a link to AC2. The present and past membership is included below.

PaNAGIC also appoints or seeks advice from panels and committees for particular sub-fields when this is considered useful for carrying out its tasks. Two such sub-committees have been in existence:

- The HENAP (High Energy Neutrino Astrophysics Panel) panel was created by PaNAGIC with the specific mandate of writing a report with recommendations for the development of High Energy Neutrino Astronomy world-wide. This panel has now completed its work. The report can be found at:

http://www.lngs.infn.it/lngs_infn/contents/docs/pdf/panagic/henap2002.pdf

- The GWIC (Gravitational Wave International Committee) committee was an existing committee created by the initiative of the community of researches in gravitational waves. GWIC asked to be associated to PaNAGIC and this was favorably considered. The activities of GWIC are described below.

PaNAGIC Activities

The field of particle astrophysics and cosmology and of gravitational waves has been the subject of an intense activity in the last few years. It was described extensively in our report to IUPAP in 2000 (http://www.iupap.org/wg/panagic/report-00.html) and has continued to grow since then. What follows is a short summary of the current activities of PaNAGIC and of how they will evolve in the future should its mandate be renewed by the IUPAP General Assembly. Further information on PaNAGIC may be found at its web site hosted at the Gran Sasso National Laboratory (LNGS) of Italy
http://www.lngs.infn.it/lngs_infn/contents/lngs_en/research/panagic/

PaNAGIC has met a total of 7 times since its creation in 1998:

Atlanta, USA, March 1999 (during Centenial Meeting of the American Physical Society)
Paris, France, September 1999 (during the TAUP-1999 Conference)
Sudbury, Canada, June 2000 (during the Neutrino-2000 Conference)
Gran Sasso, Italy, September 2001 (during the TAUP-2001 Conference)
Munich, Germany, June 2002 (during the Neutrino-2002 Conference)
Seattle, USA, September 2003 (during the TAUP-2003 Conference)
Paris, France, June 2004 (during the Neutrino-2004 Conference)
Zaragoza, Spain, September 2005 (during the TAUP-2005 Conference)

The main activities of PaNAGIC are the following:

1) The regular meetings of PaNAGIC provide a much-needed forum for the discussion of its field of interest in a world-wide level, beyond the view of specific regions of the world.

2) PaNAGIC co-organizes the very successful TAUP conference, the main conference in the field of particle astrophysics. TAUP was started by physicists involved in underground experiments on beta-decay and dark matter searches, notably Alessandro Bottino and Angel Morales. TAUP has now become the principal international conference in astroparticle physics, covering all the subfields of the sector, and is held every two years in different regions of the world. As such TAUP gets IUPAP support and sponsorship as a “class B” conference.
The last three editions of TAUP took place at the Gran Sasso Laboratory in Italy (September 2001), at the University of Washington in Seattle, USA (September 2003)

and at the University of Zaragoza, Spain (September 2005). They were attended by 225, 270 and 270 people respectively. The Proceedings of these conferences are published or will be published.

A major activity of PaNAGIC in the future will consist on helping to organize this conference and strengthen its international character, with the help of IUPAP.

3) PaNAGIC maintains a web page (at present hosted at the Gran Sasso National Laboratory (LNGS) of Italy
http://www.lngs.infn.it/lngs_infn/contents/lngs_en/research/panagic/
with information and links to an extensive number of experiments in its fields of interest.

Two actions are foreseen for the immediate future:

- To bring up to date the links to the different laboratories and experiments.
- To provide an explanation of the main fields of research in particle astrophysics and cosmology and on gravitational waves. This task was carried out initially by PaNAGIC in the form of an "electronic book", but it needs to be updated, as the field is continually changing and expanding.

4) The field of gravitational waves (both on the ground and in space) has continued to be successfully auto-organized by the GWIC committee (http://gwic.gravity.psu.edu). PaNAGIC provides a link between to IUPAP of the gravitational-wave projects, some of which involving large-scale installations of an international character.

GWIC recommended that the existing Edoardo Amaldi Conference series became the main forum for gravitational waves research, something that is now happening. This biannual Amaldi Conference has IUPAP support and sponsorship as “class B” conference and its location rotates internationally. Additional annual meetings under GWIC oversight are the gravitational waves data analysis workshop, GWDAW, and the Aspen meeting on advanced gravitational wave detectors. The latter has been held outside Aspen in 2005. The TAUP conference includes some talks on gravitational waves as well, and will continue doing so in the future.

GWIC helps coordinating activities toward a possibly global network of detectors, which would make use of GRID distributed computing for data analysis. Initial results from “bar” and “interferometer” networks are already in the literature. GWIC issues assessments about proposals concerning new gravitational wave instruments, analysis methods and theory needs.

PaNAGIC is the natural, and perhaps unique, forum where "multi-messenger" astrophysical observations, in which GWIC is highly interested, can be shared. A possible action for PaNAGIC would be to try to facilitate a timely and organized sharing of results and findings as well as to plan a coordinated effort between observatories with different messengers, much in the way as GWIC is trying to do internally between gravitational-wave detectors.

5) The HENAP (High Energy Neutrino Astrophysics Panel) panel has produced a report with recommendations for the development of High Energy Neutrino Astronomy world-wide. Specifically the report addressed the scientific interest of this field, the required detector size, the importance of more than one experiment site in the world, the coordination with other observations and guidelines for collaborations:

http://www.lngs.infn.it/lngs_infn/contents/docs/pdf/panagic/henap2002.pdf

The report was presented at several conferences and at the OECD Global Science Forum in January of 2003. One of the recommendations of HENAP, the joining of the different European efforts towards the construction in the Mediterranean of a kilometer-cube neutrino detector, is now being realized. More specifically, the European Union has recently approved and funded, under Program FP6, a joint proposal of ANTARES, NEMO and NESTOR, co-ordinated by ApPEC (Astroparticle Physics European Coordination Committee) for a Design Study for a Kilometer-cube Neutrino Telescope (KM3NeT) to be completed in three years. The funding for construction, if approved, should be part of the FP7, now in preparation. HENAP will not continue in the future, as its work is now concluded. PaNAGIC may organize a world-wide workshop on the subject of Neutrino Astronomy with the help of the major experiments involved.

6) Another action that was originally envisaged by PaNAGIC was the establishment of a high- level comprehensive school (or schools) in the field of particle astrophysics as this was considered to be of major importance to help in the development of a common culture in this field. After circumstantial delays there are now advanced plans to foster international schools on particle astrophysics. PaNAGIC will explore ways to help in the organization, execution, the maintenance of high level of scientific standards and the procurement of financial help of such events.

7) Fields where large scale international projects may emerge in the future are MEGATON-size water Cherencov detectors for proton-decay and neutrino observations and ground based Very High Energy Gamma-Ray Astronomy. Panagic will continue to encourage and facilitate international and inter-regional cooperation on projects such as these, where the scale of the activities are likely to exceed the capabilities of individual agencies.

Membership of PaNAGIC

Since the last Report to the General Assembly in 2002, the membership of PaNAGIC has changed considerably, as detailed below. At the meeting in Paris on June 2004, a nomination committee was formed inside PaNAGIC to find a new chair, as the term of Alessandro Bettini as chair was coming to an end. The nomination committee, after consulting with the PaNAGIC members, proposed the name of Enrique Fernandez as the new chair. The nomination was endorsed by the C-4 Commission in its meeting in Pune, in August 2005.

The present membership in PaNAGIC is the following

PaNAGIC current members

Name	Start Date
Alessandro Bettini (Italy) Chair	1998
Johannes Blümer (Germany)	2003
Massimo Cerdonio (Italy) [AC-2]	1998
Enrique Fernadez (Spain) Chair elect	2000
Victoria Fonseca (Spain)	2004
Joshua Frieman (USA)	2003
Masa-Katsu Fujimoto (Japan)	2004
Rohini Godbole (India) [C-11]	2004
Takaaki Kajita (Japan)	2003
Stavros Katsanevas (France)	2004
Paolo Lipari (Italy) [C-4]	2004
Victor Matveev (Russia)	1998
Angela Olinto (USA)	2004
David Sinclair (Canada)	2004
Steve Ritz (US) [C-19]	2003
Michael Wiescher (USA) [C-12]	2004

General email address (reflector for all members): panagic@lngs.infn.it

PaNAGIC past members:

Barry C. Barish (1998 - 2004), Thomas Gaisser (1998 - 2004), Isabelle Grenier (1998 - 2003), Wick Haxton (1998 - 2004), Eckart Lorenz (1998 - 2004), Karl Mannheim (2000 - 2003), Arthur McDonald (1998 - 2004), John Peoples (1998 - 2004), Martin Rees (1998 - 2000), Bernard Sadoulet (1998 - 2000), Michel Spiro (1998 - 2004), Yoij Totsuka (1998 - 2003), Alan Watson (1998 - 2003)

Membership of GWIC

Massimo Cerdonio (AURIGA) (Italy) (Chair)
Eugenio Coccia (EXPLORER/NAUTILUS) (Italy)
Barry Barish (LIGO) (U. S.)
Benoit Mours (VIRGO) (France)
Karsten Danzmann (GEO600) (Germany)
Lee Samuel Finn (U. S.) (Executive Secretary)
Giorgio Frossati (MiniGRAIL) (Germany)
Masa-Katsu Fujimoto (TAMA) (Japan)
Adalberto Giazzotto (VIRGO) (Italy)
William O. Hamilton (U. S.)
James Hough (GEO600) (U. K.)
David McClelland (ACIGA) (Australia)
Thomas Prince (LISA) (U. S.)
Peter Saulson (LSC)(U. S.)
Bernard Schutz (LISA) (Germany)
Robin Stebbins (LISA) (U. S.)
Kimio Tsubono (TAMA) (Japan)
Stefano Vitale (LISA) (Italy)
Clifford Will (Theory) (U. S.)

Membership of HENAP

Enrique FERNANDEZ (Spain) Chair
Steve BARWICK (US)
John CARR (France)
Charles DERMER (US)
Friedrich DYDAK (CERN)
Grigorii DOMAGATSKY (Russia)
Emilio MIGNECO (Italy)
Rene ONG (US)
John PEOPLES (US)
Leonidas RESVANIS (Greece)
Yoji TOTSUKA (Japan)
Eli WAXMAN (Israel)

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