

Report of the INdAM Evaluation Committee

April 2009

This is the report of the *Comitato di Valutazione Interna* of the *Istituto Nazionale di Alta Matematica Francesco Severi* (INdAM), located in the *Città Universitaria*, Rome.

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I. Introduction

The Evaluation Committee was first established in 2001. Its mandate is to assess the state of INdAM's activities, and to advise both INdAM itself and the competent authorities on its future orientations. Its membership (as of March 1, 2005) is as follows:

- Enrico Bombieri, Institute for Advanced Study (chairman)
- Francis Clarke, Université de Lyon I
- Gianluigi Galeotti, Università di Roma La Sapienza
- Francesco Guerra, Università di Roma La Sapienza
- Victor Kac, Massachusetts Institute of Technology

II. Missions and structure of INdAM

II.1 Missions.

We recall briefly INdAM's organizational structure. The Istituto Nazionale di Alta Matematica is an autonomous state institution created by Italian law. It receives financial support from the Italian government and other sources. Its stated goals are:

- To promote the training of researchers in Mathematics, at the national, international and community level, in particular to complement the training potential of the Italian universities.
- To develop research in pure and applied mathematics, especially in the developing branches, and to favor the transfer of knowledge to technological applications.
- To promote close and sustained contact between Italian and international mathematical research, in particular by participating in programs within the framework of the European Union.

II.2 Administrative structure.

The *Managing Committee*: It has ten members besides INdAM's president, six of whom are elected for four-year terms from the community of university mathematicians, together with the four directors of the national research groups. Members can serve at most two consecutive terms. The current managing committee has the following membership as of June 2007:

- Angelo Alvino
- Vincenzo Ancona

- Alfredo Bellen
- Italo Capuzzo Dolcetta
- Vittorio Coti Zelati
- Nicola Fusco
- Giorgio Patrizio
- Mario Pulvirenti
- Tommaso Ruggeri
- Elisabetta Strickland
- Sandro Verra

The *President* (and the two *Vice-Presidents*) are chosen by the Managing Committee from among the elected members. The president is Prof. Vincenzo Ancona. The *vicepresidente vicario* is Prof. Angelo Alvino, the other vice-president is Prof.ssa Elisabetta Strickland.

The *Board*: the managing team along with experts and administrative people from the Ministries.

II.3 Sections and National Groups.

INdAM has more than fifteen sections, in particular in Milano, Napoli, and Firenze, where is located the secretary of the National Research Groups. Their purpose is to organize activities on a local level (administration, international relations).

The four National Research Groups, and their approximate membership levels are as follows:

- GNAMPA: Mathematical analysis, Probability and its applications. Membership: 918
- GNFM: Mathematical physics. Membership: 554
- GNCS: Computer science (with two principal applications: medical engineering and technology for the knowledge society). Membership: 461
- GNSAGA: Algebraic, geometric structures and their applications (pure mathematics except analysis). Membership: 672

There are therefore almost two thousand members of the university community who currently adhere to one of the groups.

The groups carry out the following activities:

1. Invitations of foreign scientists to develop research, and for consultation and high-level training.

2. Payment of missions abroads for their members.
3. Organization of (and participation in) meetings prepared by their members.
4. Financing of travels abroad, for research or meetings, of doctorates and research fellows.
5. Research projects. A common project, *Models and methods of optimization*, has been initiated in 2000 by the four groups; it involves three hundred participants.

The previous status of the four research groups (inherited from the CNR) ended in December 2000, and now they are fully integrated inside INdAM.

Each group is governed by a Scientific Committee composed of four elected members and three members named by INdAM. The Director of each group is chosen by INdAM itself among the four elected ones. They report to INdAM on a yearly basis their expenditures and activities; INdAM has given (mandatory) guidelines (*Disciplinari*) on a number of issues (visiting professors, sabbatical years, etc.). Each group is subdivided into a number of thematic sections and composed of Research Units at the level of the various universities.

III. Activities in education

University bursaries

These bursaries are awarded to students at the ‘laurea’ level of study: (Licence (L) or Master (M) in the new LMD System). There are some 40 at the (L) level (renewable for two years) and 15 at the (M) level (renewable once), and the amount of the bursary in each case is EUR 4000 per year.

Summer school

INdAM participates in the Mathematics Summer Schools of Perugia and Cortona organized by the SMI. The former runs for five weeks, and targets Masters students intending to prepare a doctorate in Italy or abroad; the latter is intended for a higher pre- or postdoctoral level of students. Since 2004, INdAM has formed a consortium with the Scuola Normale, SISSA (Trieste), and the University of Perugia which has become the center for educational activities at the undergraduate level, and in particular for the two SMI Summer Schools.

Foreign doctoral fellowships

These fellowships are destined for:

- a) foreign students (*borse di studio per cittadini stranieri*) to prepare an Italian doctorate; EUR 12,000 per year renewable no more than three times.
- b) Italian doctoral students, to help finance visits to foreign universities.

Laureati doctoral fellowships, Senior study grants

For Italian *laureati* doing graduate work abroad (*borse di studio per l'estero*), these are given on what appears to be an *ad hoc* basis, for variable durations.

School for the Applications of Mathematics in Industry

Typically these incorporate 12 to 15 courses of thirty hours each, and include seminars by people from industry. The School is now cofinanced by the bank Cariplo, and is run in collaboration with the Università di Milano Bicocca. Ten bursaries at the laureati level are awarded currently.

Visiting professors for doctorate courses

The visiting professors stay at least two months and teach twenty-four to sixty hours. The aim is the internationalization of scientific research. In current years there have typically been six such professorships, each of two to four months duration, in five different universities.

IV. Activities in research

Postdoctoral support

There have traditionally been a number of relatively small postdoctoral grants awarded by INdAM each year. In 2004, however, a new program of prestigious ‘Francesco Severi postdoctoral fellowships’ was launched, the aim being to be competitive with the Marie Curie fellowships. They involved a yearly stipend of up to EUR 40,000. Two such awards were made in 2005. In 2006, an experiment was carried out in which two such fellowships were co-financed (with Rome 3 and Trento).

These fellowships are difficult to fund in any quantity, given the budget. A new approach is being developed, involving a mechanism for co-financing with the EU (this is discussed later in the report).

Meetings

a) The tradition (since 2004) of organizing an INdAM Day, with high-level expository lectures, continues. The venues change each year: in 2008, the event took place in Padova, and in 2009 it will take place in Torino.

b) The workshop program continues. Each workshop is organized by two directors (Italian or otherwise) and consists of lectures and short lecture series on clearly defined topics. The duration is 4 to 5 days and involves 20 to 25 invited participants: established specialists and promising young researchers. Typically, three or four such workshops per year are held on average, at a typical cost of EUR 10,000 each.

c) INdAM organizes periods (one to several weeks) of study and of intensive research (*incontri*) on a specific topic with the participation, for the whole period, of about twenty invited researchers, at least 10 of them from abroad. Other researchers may be admitted on request, in particular young researchers and Italian professors during a sabbatical year. During these periods there are cycles of conferences, mainly by invited people, but also presentation of results of other participants; seminars and workshops are organized and possibly a meeting (*convegno*) at the end. The Proceedings may be published in special issues of *Rendiconti di Matematica* (Università La Sapienza, Roma), though this appears to happen very rarely.

These meetings have traditionally taken place in Cortona, but were organized in Levico and Beltinoro in 2008 and 2009. A new agreement (in partnership with the Scuola Normale di Pisa) has now been negotiated to hold them in Cortona (at the Palazzone) for at least 2010-2012.

INdAM Research Grants

In 2005 INdAM launched a new program of Strategic Research Grants. A feature of this program was the definition of three interdisciplinary areas to which priority would be assigned. The call for proposals resulted in a large number of applications (68). The budget of 250.000 EUR for these grants was divided among the nine proposals that were accepted for funding, after an extensive peer review process. These grants have received their second and last year of funding. It has been decided to discontinue the program, for the reason that the budget allows only a few grants, while there are a great many excellent applications.

Research Units in the Universities

In recent years, INdAM has entered into conventions with most Italian Universities to constitute Research Units of the Institute inside these Universities. The Units are coordinated by the Institute and receive financial support from it.

The National Research Groups

The groups are the following:

GNAMPA (918 members)

- Differential equations and dynamical systems
- Calculus of variations, control theory and optimization
- Real analysis, measure and probability theory
- Functional and harmonic analysis

GNSAGA (672 members)

1. Differential geometry
2. Complex geometry and topology
3. Algebraic geometry and commutative algebra
4. Algebraic structures and combinatorial geometry
5. Mathematical logic and applications

GNFM (554 members)

1. Mechanics of discrete systems (122 members)
2. Mechanics of continuous fluids (98)
3. Mechanics of continuous solids (120)
4. Diffusion and transport problems (97)
5. Relativity and field theory (52)

GNCS (461 members)

1. Numerical analysis
2. Foundations of information systems

The activity reports of the Groups are available on the INdAM website: <http://www.altamatematica.it/>

VI. General Remarks of the Committee

INdAM is unusual among research centers in regard to the variety of roles that it assumes. It supports the entire Italian mathematical community, both pure and applied, extended to Computer Science and Theoretical Physics, and relations with industry. Thus INdAM is the union of several organisms which are completely distinct in other countries. As coordinator for the funding of the four national research groups (*Gruppo nazionale*) that constitute to a great extent the mathematical research effort of Italy, it even acts in part much like a granting agency. At the same time, its educational component is very important, at both the predoctoral and postdoctoral level.

In the last few years, INdAM has succeeded in placing itself at the forefront of research, with a new programme of activities that is highly coherent. The team of people who were in place up to June 2007 had done an excellent job in this respect, and the new team has built upon this progress in impressive fashion, at each of the levels at which it operates: nationally, internationally, locally.

We note in particular the following significant advances at the international level in the past year:

- INdAM has joined the consortium supporting the Mathematical Sciences Research Institute (MSRI) at Berkeley. Among the benefits of this is the possibility of sending several graduate students to the MSRI summer programs. A joint event INdAM-MSRI will take place in 2010.
- A GDRE (Gruppo di ricerca europeo) with the CNRS (France) in partial differential equations now joins the existing one; its acronym is CONEDIP.
- INdAM has become the official representative of Italy for the International Mathematics Union.
- Prof. E. Strickland, vice-president of INdAM, has been elected Delegate for Italy to the European Mathematical Society.
- INdAM has applied to MAE (Ministero degli Affari Esteri) for support for a bilateral research program with the NNSFC (National Natural Science Foundation of China) on the topic *Computational and Applied Mathematics. Mathematical Models in Life Sciences: Theory and Simulation*.

Among the developments at the national level are the following:

- An agreement has been signed with CIRM (Centro Internazionale per la Ricerca Matematica) in Trento to organize joint workshops; four are already arranged for 2009.
- A similar agreement has been formulated with Centro de Giorgi (Pisa), beginning in 2010.
- A new agreement has been reached with the Scuola Normale di Pisa regarding the *incontri*, which will be held at their traditional setting, the Palazzone in Cortona, for the period 2010-2012.

It appears that the committee's earlier recommendation that due credit and visibility be given to INdAM in such joint projects has been taken into account.

As regards progress at the local level, we note the following:

- The proposal by INdAM to obtain some living space in a new building at Tor Vergata appears to have received initial support from the regional government; an official announcement by the latter had just appeared at the time of the committee meeting. An official decision, however, which necessarily involves the Minister, is still to come.
- INdAM has recovered the use of what was formerly its *Severi library* contiguous to its present location, and intends to restore the collection to this venue.
- An application has been submitted to the FP7 Programme 'ERC Advanced Grants'. If successful, INdAM would receive substantial overhead funding in the context of a five-year research appointment for Prof. C. Procesi in the area of algebra, combinatorics and numerical analysis.
- A celebration of the 70th anniversary of INdAM has taken place in Arezzo, the birthplace of Francesco Severi.
- INdAM has signed an agreement with the *Casa dell'Aviatore* in Rome which allows visitors and workshop participants to make use of its lodging and restaurant facilities. Given the proximity to INdAM and the reasonable cost, this is a very positive initiative.

All the developments above testify to the increased visibility of INdAM both in Italy and abroad, and demonstrate the ever-greater coherence and scope of its varied activities.

As regards the budget, one observes a certain stability. The funding of the groups has been restored to essentially its 2005 level, following the decrease in 2006 due to the budget squeeze. The quest to find adequate postdoctoral funding remains a challenging one, since the amounts involved are large for the current revenue to cover (especially in view of the multi-year nature of such fellowships). No new fellowships could be awarded in 2008, but a new effort is underway to secure European funding. One such new proposal would apply to relatively experienced researchers, and would fund both ingoing and outgoing fellows (with incoming recipients who are not necessarily Italian). The Sao Paulo group has funded for INdAM two fellowships in certain applied areas, and it is hoped that this practice will continue.

The committee notes that INdAM has been unable to proceed on new postdoctoral fellowships for 2009, for the reason that the MIUR has been slow in appointing a new Board for INdAM (as it must).

VII. Recommendations

- R1 That INdAM build upon its programme of activities, and continue structuring itself nationally and internationally, as it has been doing impressively in recent years.
- R2 That the creation of truly permanent positions (held by a given person) be avoided. However, the creation of a permanent position held by different people on a rotating basis (for a two or three year term, for example) would be of undeniable interest. In this vein, it would be most useful to design a ‘detachment’ mechanism, in analogy with that of the Academy Lincei. Perhaps a research grant could form part of such a mechanism.
- R3 That INdAM, both for its own visibility and that of Italian mathematics, develop a mechanism (possibly in collaboration with commercial publishers, as is done elsewhere) to prepare and publish research results on a regular basis: informal lecture notes, conference proceedings, specialized monographs.