Instituts de Recherche sur l'Enseignement des Mathématiques (France)

Application to

Emma Castelnuovo award

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IREM NETWORK (FRANCE) SUBMISSION TO EMMA CASTELNUOVO AWARD

CONTENTS

A French version of this folder may be found on : http://www.univ-irem.fr/spip.php?rubrique379

1. Nominee's programme and reasons for the nomination

The French network of IREMs (Instituts de Recherche sur l'Enseignement des Mathématiques) presents its application to the Emma Castelnuovo award. Since its creation, 45 years ago, it has contrived to be one of the most active and one of the most recognized actors in mathematics education of this country. The principles of its policy, marking its originality, were set from the beginning. These principles have been its beacons since then and granted flexibility and coherence in adapting their work to the requirements from the massive evolution during half a century: new balance in mathematical fields and their applications, revolution in the technological tools for mathematics, modifications in the social and cultural environment of education, with the following upheavals of curricula.

We will be describing these principles by indicating why they were, and still are, innovating and have contributed to the impact of the IREMs' works on mathematics instruction. The results of what is presented in this file can be observed on the website of the IREMs' network "Le Portail des IREM" ("The gateway to IREMs"): http://www.univ-irem.fr.

From the beginning, a close-by network at the service of teacher

The events surrounding the creation of the IREMs are the principal characteristics of their model. Indeed, the second half of the 20th century was marked, in France as in other countries, by the need of a renewal in teaching methods that were static, although mathematics science had greatly evolved. This need was felt in the academic circles as well as by teachers. The historic part played by the "Association des Professeurs de Mathématiques de l'Enseignement Public" (APMEP, an association of mathematics teachers from the state education) came from anticipating and following this revolution by providing gratuitous tools (textbooks and training courses) for what was at that time called the "recycling" of teachers. It was helped in its task by university professors aware of their responsibility. From this alliance came the idea of IREM adopted by the French government in 1968 when teachers from primary schools to secondary education were confused due to curricula reforms producing the "modern mathematics".

The founding principles of IREM were largely inspired by the foregoing militant work and allowed for an enthusiast approval by many teachers who came to work these institutes. The institutes provided a stimulating environment through a climate of collective arousing, away from hierarchical overview.

Still implemented, those principles are:
* a close partnership with researchers, professors and teacher educators,
* a large scattering in the country, to facilitate access to activities for all teachers ; after a couple of years the IREMs reached their actual number of 28
(see http://www.univ-irem.fr/spip.php?rubrique41),
* a partnership with universities: each IREM is linked to an university where means are provided along with creation of teaching duties, with the understanding that no teacher was to work full-time for IREM, in order to remain linked with his mathematical task.
* a bolster from the local education offices (Rectorats) by granting and allowing teachers to participate in working groups and training schemes often included in the PAF (Plans Académiques de Formation, training programs proposed by the rectorats);
* an hinging of research and training (initial or in-service) for teachers, with the aim of using it in their classes;

* a large array of methods for elaboration and dissemination of their works with massive linking between these methods: working groups uniting researchers and teachers, courses for in-service teachers (often prepared by the working groups), creation of libraries, publications of articles, brochures and, when developed, digital ways of stocking and distributing these works.

This innovative model with proven efficiency remains specific to mathematics in the French educative system. Maybe, the overly dynamic mathematics research community of France carried a stronger interest for it than those of other disciplines. Specialists from other school disciplines have vainly requested an extending of this model. However, a modest movement is starting for the creation of IRES (Instituts de Recherche sur l'Enseignement des Sciences- Research Institutes for the Teaching of Sciences) which would in some universities incorporate the IREM.

A strong synergy between IREMs

An essential coordination of IREM network different activities was instigated with the creation of ADIREM (Assembly of Directors of the IREM) also entrusted in representing the network in front of national authorities. Quickly, the need arose for thematic working components, able to gather the works of various IREMs and to unite their strengths for joint productions. Thus, were created the CIIs (Commissions Inter-IREM); the adaptability of the IREM network is clear through the evolution of their list according to needs. This is particularly true with the emerging of new fields in the teaching of mathematics. It is to their credit to have anticipated and to have given heed to these emergences. To date, we have 13 CII (each having its own page on the "Portail des IREM" (http://www.univ-irem.fr/spip.php?rubrique3)

* 6 CIIs connected to sectors of education and university: Primary school, “Collège” (i.e. the four first years of secondary education), “Lycée” (i.e the three following years of secondary education), “Lycée professionnel”, University, Teacher Education ;
* 4 CIIs specialized in several mathematics fields, their applications and educational tools: Epistemology and history of mathematics, Didactics, Statistics and theory of probability, TICE (Technologies of Information and Communication for Education);
* 2 CIIs dedicated to the dissemination of information and publication of the IREM network: publishing of the journal "Repères", managing of Publimath website.
* 1 CII dedicated to IREM network participation in mathematics popularization.

These CIIs organize workshops, conferences, publications (often collaborative work of several CII). They cooperate in activities from other organisms such APMEP. They publish their production through their dedicated page on the "Portail des IREM".

On a national scale, the "Comité Scientifique des IREM" (CS-IREMs) was implemented. It is composed of 20 members, abou half of them in-service in the IREM network and half of them external (of which 2 are not mathematicians). Its part is to observe the network activities, to view future prospects and to contribute in expressing publicly the positions of the IREMs (http://www.univ-irem.fr/spip.php?rubrique4).

Every year, a national seminar of 2 to 3 days takes place and is dedicated to a present day topic needing a deeper consideration from the national network. In 2010, it had a particular impact. It was held at the CIRM, Centre International de Recherches en Mathématiques in Marseille-Luminy, and was titled "Mathematicians and the teaching of their discipline in France". It allowed to establish an

overview of the actual state of the field and to clear prospect at the opportunity of the 40th anniversary of the creation of the first IREM and of the 20th anniversary of their journal "*Repères*" (http://www.univ-irem.fr/spip.php?article545).

Proceedings from the CII conferences and annual seminars can be found on the "Portail des IREM" on the page: http://www.univ-irem.fr/spip.php?rubrique7. The considerable amount of work of these common components of the network, and the provision of various resources from the IREMs, in the past 45 years, allowed the professional development of tens of thousands of teachers and teacher educators.

A keen insertion in the world of mathematics education

The ADIREM co-operates, inside the CFEM (Commission Française pour l'Enseignement des Mathématiques), French section of ICMI (http://www.cfem.asso.fr/cfem), with scientific societies of Mathematics and of Mathematics Didactics, with teacher associations, with the Academy of Sciences, and the "Inspection Générale de Mathématiques"(an authority of the ministry for education). The present president of CFEM is Luc Trouche, previous director of the IREM of Montpellier, in charge of Mathematics for the Institut Français de l'Education (htpp://ife.ens-lyon.fr/ife).
The IREM network benefits from the interest of the mathematics section of the Académie des Sciences. It was made party to the Académie surveys on education and training. It took hand in the CREM (Commission de Reflexion sur l'Enseignement des Mathématiques) headed by the academician Jean-Pierre Kahane (previously president of the CS-IREMs) from 1999 to 2003 (http://www.cfem.asso.fr/ressources/rapports-enseignement-mathematiques/commission-kahane). Now, it is involved in the works of the organization "La main à la pâte", established by the Académie des Sciences for the promotion of innovating educational techniques in teaching sciences (htpp://www.fondation-lamap.org/).

The "Inspections de mathématiques" (general and regional) play a major role in the elaboration of the curricula and the follow-up of education in France. In view of the part played by the IREMs with mathematics teachers, it is natural that an important ratio of these inspectors had belonged to an IREM before taking up their post. The bonds so created play a major part in the dissemination of the IREM network works to the teachers. The IREMs contributed greatly to the elaboration of curricula. The reform of the elaboration process of curricula, from 2005 to 2012, has reduced this participation of the IREMs. It may evolve favourably, after the creation in 2013 of a "Conseil Supérieur des Programmes" (Higher Education Committee for Curricula), where mathematics are represented by an IREM director.

The IREM network is part of "Cap'maths", consortium created in 2012, with the backing of the French government, for developing various actions of mathematics display out-of-school and towards the general public (htpp://www.capmaths.fr). Its presence is ensured by the CII "Popularisation des mathématiques", organizing "mathematics-rallyes" aspiring to develop a cooperation spirit between pupils in regard to mathematics.

The renown of the French mathematic school in mathematics didactics is recognized. It works in close touch with the IREMs. The IREMs provide field researchers faced regularly with teaching reality and contribute to the ARDM (Association pour la Recherche en Didactique des Mathématiques) activity (htpp://www.ardm.eu/).

A structure favouring evolutions

The combining of the great autonomy of the IREMs action, whether in their working themes or in the realization of courses for in-service teachers with the coordination due to the CII, the ADIREM and the CS-IREMs, has favoured the anticipation of the mathematics education evolution and its follow-up. In the past 10 years the following problems were confronted:
* debate on teaching computation in primary school,
* debate on the place reserved to demonstration in secondary education,
* growing part granted to modelling and inter-disciplinarity,
* introduction of growing parts to probability theory and statistics,
* notable drop in the teaching of geometry,
* growing use of various technologies (computation software, geometry software …) and fast evolution of their tools (tablets, computers,…)
* introduction to algorithmic, provoking evolutions in the teaching of logic,
* bettering of the accounting of specific needs in professional high-schools, whose weight in French education has greatly improved,
* challenging of traditional ways of evaluation of students (topic submitted to to a high social pressure),
* questioning of established education methods, with introduction to inquiry based teaching, to teaching by project…

A special care was given to the difficulties encountered by students when passing from one cycle to another. Several CIIs may be mobilized simultaneously on such studies. CII "University" has specialized in the problems encountered by students starting their Licence (first 3 years in university).

One of the IREMs strength is their ability to replace studies in fruitful crossed interactions with works in didactics, epistemology, history of mathematics, to which are dedicated some of the CIIs.

The way the IREMs face these problems can be followed throughout the works of the IREMs and through the productions of the CIIs and of the Scientific Committee (“Les débats du CS”: htpp://www.univ-irem.fr/spip.php?rubrique82). There are not fit only for France; it is the IREMs network pride to be able to uphold its own part in international confrontations.

A priority given to documentation for teachers

According to the principles of the IREMs, it is one of their aims to provide teachers with pertinent documentation relating to their task. This is the role of "Publimath" (htpp://publimath.irem.univ-mrs.fr/), a large documentation data on mathematics teaching, managed with the help of APMEP.

It is also the function of journals published by the network:
* *Repères* includes articles pertaining to research carried out in the IREMs or involving them: htpp://www.irem-univ.fr/spip.php?rubrique23;
* *Grand N*, for primary school teachers (managed by the IREM of Grenoble): http://educmath.ens-lyon.fr/Educmath/ressources/lecture/repertoire-de-revues/grandn;

* *Petit x*, for high-school teachers (managed by the IREM of Grenoble): http://www-irem.ujf-grenoble.fr/spip/spip.php?rubrique24;
* *Annales de Didactique et des Sciences Cognitives* (managed by the IREM of Strasbourg): http://mathinfo.unistra.fr/irem/publications/adsc/

A critical look on teaching evolution and its rank in society

Due to its origin, challenging the archaic situation of that time, the IREMs network has always kept a tradition for a critical outlook towards answers brought by society and institutions to challenges pertaining education. It is particularly worried by the unequal character of French education enhanced by international surveys such as PISA. It questions the pertinence of such surveys and the use of their results and the means to evolve towards equality.

These last years, it has expressed its worries on the remodelling of curricula, judged prejudicial, on the decline in the offer of in-service education for teachers, on a remodelling of the training of teachers which it did not approve (happily partly abandoned since 2013), on projects of teaching computing whose impact on mathematics could enhance new drawbacks. It is also concerned by the implementing, during the first nine years of children schooling, of a "common base of knowledge, competences and culture" which drafting seems debatable as it pertains to scientific education. It is, in particular, the role of the CS-IREMs to voice these doubts: see the page "Le Comité Scientifique face à l'actualité" (http://www.univ-irem.fr/spip.php/?rubrique68).
It is in this spirit that the IREM network leads an active policy of relating to similar structures, sometimes inspired by the French model, in other countries. Cooperation seems particularly necessary with French-speaking countries through the EMF (Espace Mathématique Francophone).

A reliability founded by pursuing dynamic and solid principles

Since the beginning, the IREMs network maintained a high level of activity through highs and lows in the resources provided by local (universities, rectorats) and national (ministry) offices. Nowadays, their budget is notably lower than at the beginning. This sustained level of activity is due to the firm belief, among all those who worked in the IREMs or who support them, that mathematics teaching must regularly update. This can be achieved through values of freedom, of curiosity, of scientific rigor, of cooperation between the actors for education and research and of respect due to teachers, as well those in-service than those in pre-service position. These values were the ones of the founders and still embolden the IREM network.

2. Summary statement

Materialization of what we present in this folder for nomination at the Emma Castelnuovo award may be found on the IREM network website « Le portail des IREM »:
http://www.univ-irem.fr.

The French IREM network (Instituts de Recherche sur l'Enseignement des Mathématiques) presents its application to the Emma Castelnuovo award.
Since its creation, 45 years ago, it has contrived to be one of the most active and one of the most recognized actors in mathematics education in this country. The principles of its policy, marking its originality, were set from the beginning. The consequent characteristics features of its activity are detailed in section [1] of this folder:
- from the beginning, a close-by network at the service of teachers,
- a strong synergy between IREMs,
- a keen insertion in the world of mathematics education,
- a structure favouring evolutions,
- a priority given to documentation for teacher,
- a critical look on teaching evolution and its rank in society.

On these grounds were implemented several modes of dissemination which still structure the actions of the IREMs and are detailed in section [3] of this folder:
- dissemination through working groups, the courses and other activities involving teachers,
- dissemination through publications issued by the IREMs (three of them are attached to this folder : see section [4]),
- dissemination through research in didactics, epistemology and history of mathematics,
- dissemination through pre-service teacher education,
- dissemination through curricula elaboration,
- dissemination through popularization of mathematics,
- dissemination through international contacts (see expressions of support in section [5] of this folder).

Since the beginning, the IREM network maintained a high level of activity through highs and lows in the resources provided by local (universities, rectorats) and national (ministry) offices. Nowadays, their budget is notably lower than at the beginning. This sustained level of activity is also due to the firm belief, among all those who worked in the IREMs or who supported them, that mathematics teaching must regularly update. This can be achieved through values of freedom, curiosity, scientific rigor, and cooperation between the actors for education and research and through respect of teachers, whether they are in-service or in training. These values were the ones of the founders and still embolden the IREM network nowadays.

3. Genesis and dissemination of the nominee's work and roles of the people involved

In this section 3 of the folder, [1] refers to section 1: *Nominee's programme and reasons for the nomination.*

The diversity of the IREM network impacts was already budding in the context of their creation ([1]). Not only many mathematics teachers felt the inadequate character of the curricula they had to teach, but in addition they were isolated in their teaching task. Early in the second half of the twentieth century, the pioneering action of the APMEP (Association des Professeurs de Mathématiques de l'Enseignement Public: Association of Professors of Mathematics inside the State Schools System) aimed to attract the interest of mathematics researchers to questions about teaching of their discipline, offered training lectures for the concerned teacher (with the hope, often realized, that some of them would relay their content around them) and made accessible documentation on branches of "modern" mathematics until then unfamiliar to teachers. In France as in other countries at the same time, it essentially pertained to algebra of fundamental structures, under the influence of Bourbaki school, which itself was in phase with a wider philosophical and sociological current, namely structuralism. It was also obvious at that time that, beyond in-service teachers education that should benefit all teachers, and not only a few pioneers, there existed a strong need to rethink the pre-service education of teachers, for primary and secondary schools, and ensure for the future a way to follow the implementation of curricula and, possibly, improve them according to the evolution of science, techniques and society.

On these grounds were implemented, with the IREMs, several modes of impact which still structure their action and that we will successively detail in this section of the folder, by highlighting their present weight:
- Dissemination through working groups managed in the IREMs by "animators" and through courses, which are generally based on researches conducted in these working groups and in the CIIs (Commissions Inter-IREM: [1]).
- Dissemination through the publications developed in the IREMs
- Dissemination through research in didactics, epistemology and history of mathematics,
- Dissemination through pre-service teacher education.
- Dissemination through the development of curricula.
- Dissemination through the popularization of mathematics.
- Dissemination through international contacts.

All of these actions involve a large amount of people, academics, teachers, teacher educators, members of the inspection bodies. We will present at the end of this section their roles and some "key persons" among many other actors (by limiting their number to eight).

A. Dissemination through working groups, courses and other activities involving teachers

Research on mathematical instruction and on teacher education developed in the IREMs is carried out in working groups, whose participants include teachers (in primary or secondary schools) and researchers in mathematics, in didactics of mathematics and sometimes also in other disciplines (physics, biology, economics, French, philosophy...). They give rise to numerous local and national publications in the form of brochures and documents on line or on paper. The courses offered to teachers frequently ensue from these researches; this way of preparing courses ensures their widely acknowledged scientific and pedagogical quality, compared to other less elaborated courses within other structures. They can rely on the many publications from these working groups, as well as on the synthesis of productions from the CIIs (books, videos, conference proceedings).

In 2013-2014, the tasks of participation in working groups and of supervision of courses were insured by 1437 "animators", for the most part in addition to their teaching service: teachers in primary schools, in "collèges" (first four years in high schools), in "lycées" (next three years in high schools,

which may be “general”, “technological” or “professional”), and in universities (the union of “collèges” and “lycées” will be called in this document “high schools” or “secondary education”). About 60 to 80% among these animators were teaching in “collèges“ and “lycées”). The 28 IREMs organized the regular activity of these animators in 235 working groups. More than 3000 teachers took advantage of 207 days of such courses, recognized by the “rectorats” (regional education administrations). This figure of 3000 is to be compared with the number of mathematics teachers in secondary education, which is approximately 50 000 (see http://www.vie-publique.fr/documents-vp/enseignants-effectif.pdf). Added to these courses is the training provided through national and local conferences at the initiative of each IREM or of a CII, as well as during conferences, at a national or local level. In 2014, 6 colloquia and more than 50 lectures were so organized.

It should be reported here that the appeal from teachers, who highly appreciate IREMs' training and the framework it provides, would justify many more days of training. But the means granted by the administration for in-service teacher education have been strongly reduced. In particular only short-term courses (1 or 2 days) are often granted while their contents would require a longer period to allow a better assimilation. The IREM network campaigns for a strong improvement of the offer in education for teachers, with the help of other bodies, in particular the APMEP and the Academy of Sciences, for which this is a priority.

The involvement of mathematics teachers in the IREMs is also realized through activities of popularization of mathematics which will be detailed below in subsection F.

B. Dissemination through publications issued by the IREMs

From their inception in the seventies, the IREMs had an active policy of publishing. It was then uncommon for teachers to be encouraged to participate in redaction of essays relating to their task. This was one of the IREMs founding originalities to get them involved in working groups, flanked by animators used to the requirements of scientific writing, aiming at publishing brochures or articles from these works, to be used by their colleagues. The mass of works thus gathered in the IREMs is extensive. They have a formative role at the time of their publication and consequently remain a documentary source of great interest. It is estimated that on average, since their creation, each IREM has published about 80 brochures.

IREMs' publications cater primarily to mathematics teachers at all levels of education (elementary schools, secondary education (general, technological or professional), universities and other “post-baccalauréat” institutions), as well as to teacher educators and to researchers in didactics, history or epistemology of mathematics. They may be used by students as part of their training or for their initiation to research. More widely, they are also of interest to anyone who is interested in teaching or research in education. The themes addressed by the publications are very varied and reflect the wide diversity of the IREMs’ missions on mathematical instruction, from kindergarten to university: reports on activities in class rooms, history of mathematics, popularization of mathematics, connections between mathematics and other disciplines …

A large majority of these works is referenced by the APMEP-IREM *Publimath,* Commission which establishes for each production a note that records on the editorial references and the document content. It is essential to note that *Publimath* publishes notes not only on the IREMs work but as well about all publications reported as of use for teaching of mathematics in the francophone world. Out of 18000 productions recorded in *Publimath*, about 6500, come from IREMs' productions, among which about 3000 are freely at disposition on the website “Le Portail des IREM”: about 500 for elementary education, more than thousand for “collège” and also more than thousand for “lycée”. They include 2500 brochures or books, about 100 videos and also chapters in proceedings of symposia, articles in journals and various papers set down online on the IREMs' sites.

Here is a classification of the productions of the IREM according to their aim, together with information on their number from 2012 to 2014:

-"Brochures" (about 60 from 2012 to 2014) of length about hundred pages; this type of production is typically used to publish the results of a working group in an IREM, relating a didactic experiment carried out jointly by teachers from the university and from the elementary schools or high schools;
-"Books" (about 15 from 2012 to 2014); this type of production is typically used to publish the thematic work of a CII or to publish colloquia proceedings;
-"Articles" typically published in (see below) the network journals *Grand N* (14 from 2012 to 2014), *petit x* (40 from 2012 to 2014), *Repères IREM Annales de didactique et de sciences cognitives* (16 from 2012 to 2014*)*; this type of production is often used to synthetically publish the achievement in all or part of their work by a working group or some of its members.
- hundreds of "work documents" frequently in the form of online version on an IREM website; their contents bear witness to the evolution of a study within a group of animators; they come as training in writing and stand often as a form of pre-publication.
In addition to these publications there exist also PhD dissertations (3 in 2014), video resources (6 in 2014) and software (1 in 2014).

The publications of the IREM network evolve with technology of communication. They are now either presented in paper version, or freely available online on the website "Le portail des IREM" (http://www.univ-irem.fr/) or from each IREM website. At the ADIREM instigation, the IREMs are engaged since 2013 in a retro-digitalization for their documents previously published only in paper version.

Four journals of the IREM network have received national recognition from the AERES (“Agency of Evaluation of Research and Higher Education”, renamed in 2013 “High Council fort he Evaluation of Research and Higher Education”: http://www.aeres-evaluation.fr/), which has classified them either in its category "Interfaces" (the first three below), or, for the last one, in its category "Research journals".

All papers in these journals are digitalized and freely available on their website with a delay of about two to three years after they have been published:
http://www.univ-irem.fr/spip.php?rubrique24 for *Repères-IREM,*
http://www-IREM.ujf grenoble.fr/spip/spip.php?rubrique25 for *petit x*,
grenoble.fr/spip/spip.php?rubrique13 for *Grand N,*
http://mathinfo.unistra.fr/IREM/publications/ADSC/#c62294 for *Les annales de didactique et de sciences cognitives*

Repères-IREM (97 issues, 622 papers published since its creation in 1990) serves as an interface between the research community, especially in didactics, epistemology and history of mathematics or, more generally, in sciences of education, and the educators and teachers, both at national and international level in French-speaking countries. *Repères-IREM* is designed to inform all stakeholders of mathematical education, but also of neighbouring disciplines, on the work and the refections conducted in common between practitioners and researchers, in classes or in teacher education, both from primary and secondary shools. It focuses on current issues that concern the teaching communities such as inquiry based teaching in mathematics, interdisciplinarity, educational account of disability, skills assessment… It pays attention as well to major debates as to realizations on the terrain. Through its publications, the journal is not only a tool for in–service teachers education, regardless of the level of education, but also a support for education of students in Masters' degrees in Teaching, Education and Training (MEEF), inside the ESPE (Superior Schools for Reaching and Education) as well as for in-service training teachers.
(contact: yves.ducel@univ-fcomte.fr).

Petit x (95 issues, 538 papers published since its creation in 1983) is published by the IREM of Grenoble and sponsored by ARDM (Association for Research in Didactics of Mathematics) and ADIREM (Assembly of the Directors of the IREMs), *petit x* is a journal for didactics of mathematics and for analysis of teaching practices at the secondary education level. *Petit x* promotes the dissemination of research, of analyses and of records of works and activities carried out in classes of

secondary education. *Petit x* is also interested in the transition problems between elementary school and "collège", between "collège" and "lycée", and between "lycée" and post-baccalauréat education. Due to its editorial line, the journal reflects the latest advances in research in didactics of mathematics. Articles published in *petit x* contribute to swapping between researches and teaching practices. This orientation makes *petit x* a valuable tool for the initial and in-service education of teachers and trainers in mathematics. *Petit x* also follows international exchanges in the francophone world in the field of didactics of mathematics, with the help of foreign members of its editorial board. Young francophone researchers publish articles in significant numbers.
(contact: denise.grenier@ujf-grenoble.fr).

Grand N (93 issues, 395 papers published since its creation in 1973) is published by the IREM of Grenoble, with editorial participation of the CII COPIRELEM (Commission Permanente des IREM sur l'Enseignement Elémentaire), *Grand N* was initially dedicated to the teaching of mathematics in primary school. It was enriched in 1990 by intake from other scientific disciplines: physics, earth sciences and technology. *Grand N* is currently the only French journal dedicated to mathematics, science and technology in elementary education. Its editorial board is composed of academics teaching in schools for teachers, of "district advisers", of elementary school teachers taking part in the education of their future colleagues. This journal is at the interface between the research field and the professional practices, which is essential for the education and training domains. Its editorial policies aims at making it a tool for teachers and educators: with its help, teachers from elementary schools can widen their class situations. Teachers in high schools can find in the journal studies for elementary school to high school transition, along with situations transposable to "collège". Teachers' educators use *Grand N* articles for pre-service and in-service education, mainly in didactics of scientific disciplines. *Grand N* also applies to researchers in didactics.
(contact: cecile.ouvrier-buffet@univ-reims.fr)

Les Annales de Didactique et de Sciences Cognitives (18 issues, 186 papers published since its creation in 1988) is published once a year by the IREM of Strasbourg. It publishes articles of research aimed at enhancing reflection on mathematics teaching at all levels. Research presentations about pre-service and in-service education of teachers and works on education in various socio-cultural contexts are welcome. Articles can be of a theoretical nature in close relationship with an experiment in education. They can be the description of a teaching experience based on explicit theoretical framework reports and can as well present a synthesis of research in a particular field of mathematics didactics. The theoretical fields of references are from the didactics of mathematics. When they fit into a mathematics education problem, articles may also rely on cognitive psychology and linguistics.
(contact: kuzniak@math.jussieu.fr or francois.pluvinage@math.unistra.fr)).

Among other journals edited under the reponsability of some IREMs and which are accessible from their page on the "portail des IREM" (http://www.univ-irem.fr/spip.php?rubrique41), let us mention:
- *Feuilles de vigne* (IREM of Dijon, 130 issues, about 400 papers),
- *Le Clairon* (IREM of Nantes),
- *Le miroir des maths* (IREM of Caen, 13 issues, 34 papers),
- *L'Ouvert* (IREM of Strasbourg, until 2010, 118 issues, 606 papers),
- *Feuille@problèmes* (IREM of Lyon, since 2005, 13 issues),
- *Mnémosyne* (M.A.T.H. group at the IREM of Paris-Diderot, 19 issues, 50 papers).

The IREM network production also appears in journals (on paper or online) of others associations:
- *MathemaTICE*, edited by Sésamath: http://revue.sesamath.net/ ,
- *Recherches en Didactique des Mathématiques*, published by the ARDM: http://rdm.penseesauvage.com/ ,
- *Le Bulletin Vert*, edited by the APMEP: http://www.apmep.fr/-Le-Bulletin-Vert-
- *PLOT,* edited by the APMEP: http://www.apmep.fr/-PLOT, 13

- *Educmath*, published by the French Institute of Education: http://educmath.ens-lyon.fr/Educmath

Besides, many text books make their profit, with or without an adaptation, of activities elaborated in the IREMs

C. Dissemination through research in didactics, epistemology and history of mathematics

Research in didactics of mathematics has emerged in France in the IREM, which have profoundly influenced its development. Let us quote some examples with an international fame. The work that Guy Brousseau led for several decades in the COREM, created at his initiative by the IREM of Bordeaux, is a particularly emblematic illustration; it has fed the development of the theory of didactic situations. Similarly the works by Régine Douady at the IREM of Paris focused on the development of the tool-object dialectic and framework games, those of Yves Chevallard, at the IREM of Marseille, on the development of the theory of didactical transposition, those of Raymond Duval at the IREM de Strasbourg, on the development of his semiotic theory and those, led in partnership by Michèle Artigue at the IREM of Paris, Jean-Baptiste Lagrange at the IREM of Rennes and Luc Trouche at the IREM of Montpellier, on the development of the instrumental approach of technological integration.

Through their modes of operation and their values, the IREMs enabled specialists to keep a close contact with the whole mathematical community and fed the epistemological sensitivity recognized for this research. They also allowed specialists to keep in touch with the educational field, that is the classroom, and that ability was reflected in their problematic, their theoretical constructs, as well as in the methodological emphasis put very early on didactic engineering.

The IREMs also brought a vision of collaborative, non-hierarchical work between teachers and researchers. So, when a better acknowledgement for educational research led to the creation of specific laboratories, outside the IREMs' structure, in some universities, these laboratories kept close ties with the IREMs. And when the creation in 1990 of the “University Institutes for Teacher Training” (IUFM, converted into the ESPE in 2013: Superior Schools for Teaching and Education) shifted many researchers in didactics to these new institutions, the ties with the IREMs remained strong. A testimony for these connections may be found in the work of the two CIIs (“Commissions Inter-IREM) specially dedicated to the initial training of teachers, the COPIRELEM and the CORFEM. More generally, the national seminar of didactics, the CII "Didactics of Mathematics" and all researchers gathering around the ARDM (Association for Research in Didactics of Mathematics: http://www.ardm.eu/) have always worked very close together.

In addition, the existence of the IREMs undoubtedly helped a diffusion of research in didactics of mathematics within the profession which probably has no equivalent in other disciplines in France. The involvement of the IREMs in teacher in-service education was obviously essential in this diffusion, as well as the work on applied research and the transposition of results from more fundamental research. They were carried out by IREM working groups and the CIIs, and spread through the courses proposed by the IREMs.

Of course, other institutions such as the Institut National de Recherche Pédagogique (INPR, transformed in 2010 into the IFE: Institut Français de l'Education) and other researchers that those in the IREMs contributed in the development of research on didactics of mathematics in France. But the richness of this structure, this successful association between researchers and practitioners, this momentum to find new ways of teaching for all, that make the specificity of the IREMs network have marked and continue to mark the didactical research conducted in France.

From their inception, the IREMs also took into account the need, experienced by mathematics teachers, that they acquire a broader culture on the history of their discipline and that they complete this culture with tools and resources, in order to allow their students to take advantage of it. Specific working groups on these topics have thus emerged very early in many IREMs. Let us quote the one in the IREM of Paris with the mathematician and historian Jean-Luc Verley who, as soon as the eighties, has selected and proposed to his students and to teachers original mathematical texts. Let us also cite the group created at the IREM of Nantes with Jean Dhombres (who was director of this IREM),

who was concerned in supporting, through historical work, multidisciplinary approaches and an epistemological thinking.

So was developed within the IREMs a specific research aiming at supporting the introduction of a historical perspective in mathematics teaching at “collège”, “lycée” and university. As early as 1975, the Commission Inter-IREMs “Epistemology and Mathematics history”, under the responsability of Evelyne Barbin, coordinated this work, and so become quickly, and is still now, one of the network most important committees. This CII contrives to make the IREMs historical and epistemology work known to mathematics teachers, but also to physic sciences and philosophy teachers, as well as to a wider audience of students and general public interested in these topics. This is achieved through conferences that it organizes every two years on a specific theme. The summer universities initiated in 1984, and which were recognized by the french ministry of education, were at the origin of the European Summer University which alternate with the symposia of the study group affiliated to ICMI “History and Pedagogy of Mathematics” (HPM).

The work of the commission and, more widely, of the IREMs network in this field gave rise to numerous local and national publications (more than 600 references in Publimath): monographs on topics about mathematics teaching or group experiments of insertion of mathematics history in education, collections of commented ancient texts.This CII itself is the author of thirty books, edited by the IREMs, by the Institut National de Recherche Pédagogique, by some "Presses universitaires" or by private publishers. Its works are internationally recognized, thanks to the active participation of members from the commission of European Summer Universities and symposia HPM. Evelyne Barbin co-organized with Jean-Luc Dorier in 1998 in Marseilles the conference linked to the ICMI study entitled “The Role of the History of Mathematics in the Teaching and Learning of Mathematics” and chaired the international group HPM from 2008 to 2012.

D. Dissemination through teacher education

Teacher education was the first mission of the IREMs (see section A here above). The IREMs were also rapidly involved in the pre-service education for future teachers in elementary and secondary education. When in 1990 this training was restructured in the IUFMs (Instituts Universitaires de Formation des Maîtres), it was considered to integrate the IREMs in the IUFMs as research laboratories. The IREM network did not wish this insertion in the IUFMs, because it seemed to them essential to remain as internal structures in universities, in close vicinity to mathematics departments, in order to maintain this close alliance with mathematical research which was one of their founding principles. Indeed, numbers of active teachers in the IREMs participated in IUFM courses, throughout their existence, and could thus mark the students' education; some students came then in turn, once in office, to work in an IREM as animators. The symbiosis was facilitated when, in 2006, the IUFMs lost their status as autonomous institutions to be integrated in universities. Finally since, in 2013, the IUFMs gave way to the ESPEs (Ecoles Supérieure du Professorat et de l'Education), a great care is taken to the sustainability of the involvement of the IREMs in this new organization of the studies for future teachers; the ADIREM works on it with the "National Network of the ESPE".

Research, inventory analysis, experimentation and critical reflection on education of teacher educators at all levels are provided in the IREM network by two specific CIIs, already quoted in this document: the COPIRELEM created in 1975 for elementary schools, and the CORFEM established in 1993 for high schools, following the renovation of teachers training resulting from the creation of the IUFMs.

A key role of the IREMs for future teachers is to show them the importance of a deepening of their culture and their task practice throughout their careers. They encourage them in this way by facilitating their access to documentary resources (websites, libraries, etc.), by instructing them in how to use these resources and more generally by offering them a framewofk convenient to combine research and professional action.

E. Dissemination through curriculum elaboration

Since their inception, the IREMs have been associated with numerous curriculum reforms that have successively been carried out. This association has taken various and complementary forms including:
- the regular participation of IREM animators of secondary and higher education to groups of experts in charge of drafting mathematics curricula, sometimes including the heading of these expert groups,
- the opinion systematically transmitted by the network on the formulated projects,
- a privileged interaction of the administration for national education with some CIIs, such as the COPIRELEM for elementary school curricula, or the CII "Lycée technique" (which melted a few years ago with the CII “Lycée” and must not be confused with the autonomous CII “Lycée professionnel”) for curricula for the technological ways inside the “Lycées”,
- some experimentations on drafts of curricula entrusted to the IREM, as in the “collège“ curriculum reform of the 1980s which gave rise to the "*Suivis Scientifiques*" series for the four years of “collège”, available to teachers as soon as this reform was implemented (1985-1989),
- the systematic implementation of training courses to support curricular developments, associated with the production of resources for teachers (see for example the productions of the CIIs ”Collège”, '”Lycée”and “Statistics and probability theory”),
- a keen attention to the evaluation of the consequences of curricula and of teaching environment, inluding a support to EVAPM, a strucutre of evaluation created by APMEP.

Not only did the IREMs participate in the curriculum evolution and accompanied it, but their pioneering work often directly influenced it. A former but particularly evident example was a reform of mathematics instruction at the “Lycée” where the deep development of teaching of calculus was carried by the work of the CII “Analyse” (French word for”calculus”) at that time. But it is also more generally the case for the introduction of historical perspectives in mathematics teaching, as well as for the technological integration with the development of many softwares dedicated to mathematics (or with the particpation of the IREMs in such developments). In order to quote a few examples, let us mention softwares of dynamic geometry as Cabri-geometer, Geoplan and Geospace, and more recently Dgpad running on tablets, or the free software for formal computation Xcas, now implemented in the latest version of Geogebra. We must also mention various experimental and research works around computer and digital technologies, since their emergence, coordinated nationally by the CII "TICE".

To this should be added the leading role of the IREMs in the creation of national committees which, since the 1980s, had successively taken charge of planning long term mathematics education and its evolution: the COPREM (Commission Permanente de Réflexion sur l'Enseignement des Mathématiques), the GREM (Groupe de Réflexion sur l'Enseignement des Mathématiques), and the CREM (Commission de Réflexion sur l'Enseignement des Mathématiques, known as the "Kahane Commission" by the name of its chairman, the member of the Academy of Sciences Jean-Pierre Kahane, former president of ICMI and chairman of the scientific committee of the IREM from 1997 to 1999). Researchers and active teachers in the IREMs played an influential role in these commissions and in the preparation of the documents resulting from their studies (see the CREM reports: http://smf4.emath.fr/en/Enseignement/CommissionKahane/).

F. Dissemination through popularization of mathematics

In addition to their main activity of teacher educatioin, the IREMs have gradually developed activities for students, in order to improve their vision of mathematics and also to give them a look at what the academics in this discipline can be.

In this respect, the most popular involvement of mathematics teachers in the IREMs is accomplished through regional mathematical rallies (19 in 2013-2014), mobilizing thousands of classes and tens of thousands of students. In France, each year some 30 mathematical rallies are credited directly or indirectly to the IREM. Some even exceed our borders, like the Transalpin Mathematical Rally, which involved in 2014 more than 4000 classes, from level 3 (3rd year elementary) to level 10 (high-school),

in Italy, French-speaking Switzerland, Belgium, and Luxembourg. Meetings of teachers during these rallies are also an opportunity to develop themes for the in-service education of mathematics teachers: didactics elements, analysis of situations in classes, review of obstacles encountered by pupils during their researches...

In addition, fifteen IREMs took part in various actions aimed to give to students an alternative vision of mathematical activity:
- *Le Kangourou des mathématiques* (http://www.mathkang.org/default.html),
- *Math-en-Jeans* (http://www.mathenjeans.fr/),
- *MathC2+* (http://eduscol.education.fr/pid23341-cid54958/mathc2.html),
- *Hippocampe* (http://www.irem.univ-mrs.fr/Hippocampe).

Each year, they also attend the "Fête de la science" (a national action involving all sciences) and the "Week of Mathematics" (under the aegis of the Ministry of education, with activities in class and out-of-class).

The IREMs network also elaborates exhibitions attracting teachers with their students and the general public; among the five exhibitions which have been created, let us quote the one developed by the IREM in Marseilles, *Glances on mathematics Mediterranean routes,* travelling through France.
A different kind of actions by the IREMs is to welcome students in mathematical laboratories, for traineeships of one to three days. For example, Hippocampe internships accommodate a class of high school students for three consecutive days at the university, for an introduction to research. Supervised by researchers, students reflect on mathematics problems, they ask questions and develop hypotheses, and then they experiment, discuss, debate and communicate, as researchers do daily in their activity. Finally, they present their work to other researchers at a poster meeting. Initiated by researchers in biology, Hippocampe courses format has been adapted to mathematics since 2005 by the IREM of Aix-Marseille (fifteen Hippocampe-Math courses are held every year in Marseille) and this action broadcasts through the IREM network.

The IREM network also participates in collective actions of dissemination of mathematics and their applications. Thus, in 2013, "International year of mathematics for the planet earth", the IREMs set up some notes on documents to to be used in class around this theme (http://www.univ-irem.fr/spip.php?rubrique290).

In the universities to which they belong, the IREMs are active partners in the operations linking “lycées” and universities, in order to attract students towards scientific studies.

G. Dissemination through international contacts.

As soon as the 1970s the IREMs established collaborations with other universities around the world developing teacher education, possibly interested in promoting structures with some similarity with the one of the IREMs.

Notably, it is in French-speaking Africa that these exchanges were first developed, favouring the birth of an IREM at Dakar, Senegal, which later became IREMPT (Mathematics, Physics, and Technology) and at Niamey, Niger. Currently, some IREM style structures tend to open, like the IREM/UPC at the National University for Education (UPN) of Kinshasa in the Democratic Republic of Congo that was created in August 2014, with the support of the GREMA group from the Paris' IREM. Other IREMs were developed in Latin America. The IREM of Lima at the Pontificia Católica University of Peru is particularly active. It maintains exchanges with the IREM of Caen and held in February 2014 its 7th international symposium on mathematics teaching.

Relations of resources exchanges, or even of educators, between the IREMs and similar structures abroad favoured mathematics popularization in these countries. For example, the IREM of Reims and the IREM in Niamey, Niger, have jointly developed the "Champagne-Ardennes-Niger Mathematical

Rally" for students in both countries. The IREM of Aix-Marseille, which in France initiated the Hippocampe mathematics internships, currently promotes their development within the international "Unité Mixte IMPA-CNRS"in Rio de Janeiro in Brazil.

H. Roles of people involved in the IREM network activity

The functioning of the IREM network is highly decentralized. The President of the ADIREM (Assembly of IREM Directors), currently Fabrice Vandebrouck, director of the IREM of the University Paris-Diderot (Paris 7), and the chair of the Scientific Committee, currently Michèle Artigue, have an important function of management, of coordination, of dialogue with the authorities (administration of the schools system at the national or regional levels, universities) and of representation of the network. But the network draws its strength from the multiplicity and the diversity of persons sharing responsibilities in its actions. They have very different statuses: teachers, teacher educators, scholars. Their responsibilities can be at various scales, within the IREMs or within the CIIs. They can take various forms: managing of working groups, coaching for courses, responsability in the edition of books or proceedings, coordination of digital information, organization of symposia and seminars, presence in the editorial boards of journals, membership in boards (boards of the IREMs, Scientific Committee)...

We can estimate at several hundreds the number of people who are currently involved in the visibility which is the one of the IREMs in the world of mathematics and of their teaching in France. This translates to several thousands since their creation. It is remarkable that, despite their workload, often in addition to their teaching activities or research, and despite the difficulties that have accumulated in recent years (reduction of public subsidies, restriction of the means conferred by universities, decrease in the possibilities offered by the local authorities' offices for the teachers in-service training courses...), it has never been difficult to find volunteers willing to suggest themes for further work or to set up courses, such is strong the belief in the necessity of IREMs actions and the certainty that these activities are conducted in the context of a great freedom.

It was difficult under these conditions to select "key persons" to be included in this folder. Rather than to retain academic recognition criteria (authors of many publications, holders of PhDs or of "habilitations" ("Habilitations à diriger des recherches") obtained on the basis of studies in connection with the activity of the IREMs) it was decided to choose eight people representative of the IREMs' diversity in the long term, and still having an undeniable influence in different areas of interest in the network.

Here is their list, with a short presentation for each of them; complementary information may be obtained from Fabrice Vandebrouck or Jean-Pierre Raoult (see section 6)

Michèle ARTIGUE. Emeritus professor at university Paris Diderot (Paris 7) and president of the scientific committee of the IREM network since 2011. Has been involved in the activities of the IREM network since the beginning of her academic career, in the early 70', until now, involved in a diversity of IREM activities from elementary school to university, which have deeply impacted her vision of research and practice in mathematics education, and her scientific production. Has been director of the IREM of Paris from 1985 to 1988 and then from 1999 to 2005, and in charge of regional and national IREM projects, especially on technological issues. Has also contributed to the international visibility of the IREMs and to the engagement of the IREM network in international collaborative activities, especially with developing and emerging countries.

Evelyne BARBIN. Full professor of epistemology and history of sciences at the University of Nantes. Her research concerns mainly three fields: history of mathematic, history of mathematics teachings and relations between history and teaching of mathematics. As convenor of the "Commission Inter-IREM Epistemologie et Histoire des Mathématiques", she organized thirty colloquia and interdisciplinary summer universities. Since 1980, she is a member of the ICMI HPM Group ("History and Pedagogy of Mathematics") and chair from 2008 to 2012. Recent papers: History of Teaching Geometry (with Menghini M.), *Handbook on History of the Teaching of Mathematics*, Karp, A.,

Schubring G. (eds.). New York ; Springer, 2014, 473-492; History of mathematics and Education (with Tzanakis C.), *Encyclopedia of Mathematics education*, S. Lerman (ed.), Springer, 2014, 255-260.

Michèle BECHLER. Mathematics professor in high school and project leader to the Academic Delegation for Digital Education (DANE) of the Academy of Nancy-Metz. Since 1980, animator in the IREM de Lorraine, Member of the CII "Mathématiques et Informatique" and of the CII "Manuels scolaires" which became the joint CII and APMEP Commission Publimath, present chair of this commission. Member of the CFEM (Commission Française pour l'Enseignement des Mathématiques). Former President (from 1992 to 1994) of the Lorraine section of the APMEP. Former member of the INRP (National Institute for Pedagogical Research) group *"Didactique banque de ressources documentaires en mathématiques."*

Yves DUCEL. Mathematics lecturer at the University of Franche-Comté (Besançon). Animator at the IREM of Franche-Comté since 1991, director of this IREM from 1992 to 2000. Editor of *Repères IREM* since 2002. Deputy-Director, then Director (from 2002 to 2012) of the Presses Universitaires de Franche-Comté. Author of many papers and books on teaching of mathematics and on history of mathematics. In 2011 took part in the work, under the aegis of the Inspection Générale de Mathématiques, for production of resources on theory of probability and statistics for the form of "Première" (second year in the "Lycée").

Michel HENRY. Retired associated professor (University of Franche-Comté). Animator at the IREM of Franche-Comté in 1969-70 and from 1982 to 2014, Director of this IREM from 1985 to 1992, member of the CII "Statistique et probabilités" since its inception in 1990, President of the scientific committee of the IREMs from 1992 (year of its creation) to 1995. Creator and Director of the joint service of teachers training of the University of Franche-Comté from 1984 to 1997. He had contributed to several international conferences: ICME (1969, 1973, 1992, 1996), PME (1995, 1997), ISI (2003), ICOTS (2006), CERME (2003, 2011) and to publications as *Exploring Probability in School, Challenges for Teaching and learning,* Graham Jones ed., Springer, 2005.

François MOUSSAVOU. Mathematics and physics professor in a professional high school in Marseille and animator at the IREM of Aix-Marseille since 2004, member of the CII "Lycée professionnel" since september 2008 and chair of this commission from 2014, member of the scientific committee of the IREMs since 2014. Took part in the action of various working group in the academy of Aix-Marseille; to the redaction of official pedagogical documents ant to courses for in-service teachers of mathematics and physical sciences in the "Lycée professionnel" and in "Collèges" since 2005. In 2014, took part in the work, under the aegis of the Inspection Générale de Mathématiques, for production of resources on "general disciplines connected to professional disciplines" for the "Baccalauréat professionnel".

Vincent PAILLET. Mathematics professor in high school and trainer in the Academy of Orléans-Tours, animator in the IREM of Orléans since 2002, member of the CII "Collège" since 2004 and co-chairman of this commission from 2006 to 2014, member since 2014 of the editorial committee for "*Repères*". In charge, every year since 2003 and up to now, of courses for in-service teachers in "Collège". Author of numerous publications relative to teaching in "Collège".

Catherine TAVEAU. Professor at the ESPE (Ecole Supérieure du Professorat et de l'Education, former Institut Universitaire de Formation des Maîtres, of Aquitaine, University of Bordeaux), teacher trainer since 1994 in mathematics teaching, co-author of many resources for elementary school teachers and for teachers of mathematics in secondary education, co-chairwoman of the CII COPIRELEM for 6 years (2001-2005 and 2011-2013) and member of the IREM scientific committee for 8 years (2004-2012).

4. Three publications that reflect the nominee's work related to the practice of mathematics education

It was not easy to select three publications among the IREM network realizations, due to the abundance of their production.

It was decided to focus on the two last years (2013 and 2014) and to emphasize the diversity of the IREM network works, as well in the form (collective book, colloquium proceedings, special issue of journal *Repères)* as in the themes (History of mathematics, Probability theory, Inquiry based teaching).

Electronic copies of these three publictions are attached to this folder.

A. Les ouvrages de mathématiques dans l'histoire : entre recherche, enseignement et culture

Collective work edited by Evelyne Barbin (Nantes IREM chairwoman of the Commission Inter-IREM « Epistémologie et histoire des mathématiques ») and Marc Moyon (Limoges IREM, member of the Commission Inter-IREM « Epistémologie et histoire des mathématiques »)

Collection « Savoirs scientifiques et pratiques d'enseignement », Presses de l'Université de Limoges, 2013

B. Probabilités au collège : ne pas laisser l'enseignement des probabilités au hasard

Colloquium proceedings edited by Fabienne Lanata and Vincent Paillet (co-chairpersons of the Commisson Inter-IREM » Collège ») and Brigitte Chaput (chairwoman of the Commisson Inter-IREM « Statistique et Probabilités »))

Published by APMEP (Association des Professeurs de Mathématiques de l'Enseignement Public, Brochure 198, 2013

C. Repères-IREM, Numéro spécial sur la démarche d'investigation

Issue number 96 of Repères-IREM, july 2014

5. Three letters of support (see attachments to this folder)

Authors of the letters of support:

A. EDIMaths network (French speaking countries of Africa)

Letter signed by Kalifa Traoré (Burkina Faso), Patricia Nebout Arkhurst (Côte d'Ivoire), Moustappha Sokhna (Sénégal), Morou Amidou (Niger), Sidi Bekaye Sokona (Mali), Mohamadou Sangharé (Sénégal), Alexandre Mpondi Bendeko Mbumbu (République démocratique du Congo) , Fernand Malonga (Congo-Brazzaville), Mamadou Suleymane Sangaré (Mali)

B. Tania Maria Mendoça Campos, Director of IREM-Brazil and Uldaric Malapina, Director of IREM-Perù

C. Luis Radford, Professor, Laurentian University, Ontario, Canada

6. Two persons who could provide further information

Fabrice VANDEBROUCK, Chairman of Paris IREM, President of the ADIREM (Assemblée des Directeurs d'IREM), vandebro@univ-paris-diderot.fr

Jean-Pierre RAOULT, Former President (2004-2011) of the IREM Scientific Committee, jpraoult@orange.fr