

Preface

When we started planning the edition of the Proceedings of the International Congress of Mathematicians 2006 (ICM2006), we considered the possibility of publishing only an electronic version. However, it is pretty difficult to break traditions, particularly for an activity like the ICM with an existence of more than a hundred years. Thus, we finally decided to mimic the model that started in Berlin 98: to publish both, a printed and an electronic version of the Proceedings. However, you may notice the influence of living the Internet Era, where length of files is not really a big issue, by the number of pages, altogether almost 4400, probably a record for the history of ICMs.

These Proceedings consist of three volumes. Volume I is divided into four parts. The first one gathers the speeches at the opening ceremony including the presentation of the Fields Medals, the Rolf Nevanlinna Prize and the newly awarded Gauss Prize for Applications of Mathematics as well as the speeches at the closing ceremony. It also contains information about the organization of the Congress, the committees, sponsors and other collaborators. The second part contains the traditional laudationes for the prizes, that is, an extensive presentation of the work of the awardees. The third part is the main body of the volume and consists of the articles written by the plenary lecturers of the Congress. One of the characteristics of this ICM has been the large number of diverse activities accompanying day by day the program fixed by the IMU Scientific Program Committee. In the fourth part of the volume, you can find articles corresponding to some of them.

Volumes II and III were printed before the Congress and distributed to the participants in Madrid. They gather the articles written by the invited speakers in the different scientific sections of the Congress.

The on-line version of these volumes is accessible at the address <http://www.icm2006.org/proceedings>

We take this opportunity to express our thanks to the authors of the articles for their effort in the preparation of excellent contributions. We also would like to express our gratitude to the EMS Publishing House for the superb job in the edition of these Proceedings and all the printed material of the ICM2006.

March 2007

Marta Sanz-Solé
Javier Soria
Juan Luis Varona
Joan Verdera

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Past congresses

1897	Zurich	1958	Edinburgh
1900	Paris	1962	Stockholm
1904	Heidelberg	1966	Moscow
1908	Rome	1970	Nice
1912	Cambridge, UK	1974	Vancouver
1920	Strasbourg	1978	Helsinki
1924	Toronto	1982	Warsaw (held in 1983)
1928	Bologna	1986	Berkeley
1932	Zurich	1990	Kyoto
1936	Oslo	1994	Zurich
1950	Cambridge, USA	1998	Berlin
1954	Amsterdam	2002	Beijing



Madrid 2006

Past Fields Medalists and Rolf Nevanlinna Prize Winners

Fields Medalists

- | | | | |
|------|---|------|---|
| 1936 | Lars V. Ahlfors
Jesse Douglas | 1978 | Pierre R. Deligne
Charles F. Fefferman
Grigori A. Margulis
Daniel G. Quillen |
| 1950 | Laurent Schwartz
Atle Selberg | 1982 | Alain Connes
William P. Thurston
Shing-Tung Yau |
| 1954 | Kunihiko Kodaira
Jean-Pierre Serre | 1986 | Simon K. Donaldson
Gerd Faltings
Michael H. Freedman |
| 1958 | Klaus F. Roth
Rene Thom | 1990 | Vladimir G. Drinfeld
Vaughan F. R. Jones
Shigefumi Mori
Edward Witten |
| 1962 | Lars Hörmander
John W. Milnor | 1994 | Jean Bourgain
Pierre-Louis Lions
Jean-Christophe Yoccoz |
| 1966 | Michael F. Atiyah
Paul J. Cohen
Alexander Grothendieck
Steve Smale | 1998 | Richard E. Borcherds
William T. Gowers
Maxim Kontsevich
Curtis T. McMullen |
| 1970 | Alan Baker
Heisuke Hironaka
Sergei P. Novikov
John G. Thompson | 2002 | Laurent Lafforgue
Vladimir Voevodsky |
| 1974 | Enrico Bombieri
David B. Mumford | | |

Rolf Nevanlinna Prize Winners

- | | | | |
|------|-----------------------|------|---------------|
| 1982 | Robert E. Tarjan | 1994 | Avi Wigderson |
| 1986 | Leslie G. Valiant | 1998 | Peter W. Shor |
| 1990 | Alexander A. Razborov | 2002 | Madhu Sudan |

Organization of the Congress

Manuel de León, President of the ICM2006

In 1998, the Real Sociedad Matemática Española, the Societat Catalana de Matemàtiques, the Sociedad Española de Matemática Aplicada and the Sociedad de Estadística e Investigación Operativa got together to reorganize the Spanish Committee of Mathematics (CEMAT) representing Spain at the IMU. This Committee, which includes three other societies (the Federación Española de Sociedades de Profesores de Matemáticas, the Sociedad Española de Investigación en Educación Matemática, and the Sociedad Española de Historia de las Ciencias y de las Técnicas), put forward the Spanish candidacy to host the 25th International Congress of Mathematics in Madrid in 2006, as well as the IMU General Assembly in Santiago de Compostela.

This bid was initially backed by the City of Madrid, the Autonomous Community of Madrid, the Ministry of Education, Culture and Sport, the Ministry of Science and Technology and the Ministry for Foreign Affairs. His Majesty King Juan Carlos I also gave his support to the candidacy with a letter included in the dossier. In addition, backing was forthcoming from the universities in the region (the Universidad Complutense de Madrid, the Universidad Autónoma de Madrid, and the Universidad Carlos III de Madrid) with letters from their respective rectors, as well as from the president of the Consejo Superior de Investigaciones Científicas (CSIC). An association was created to promote the candidacy, which brought together the support of all the above-mentioned bodies and institutions. The candidacy was advocated by the Spanish delegation headed by José Luis Fernández at the 24th General Assembly in Shanghai, and was unanimously approved by vote. The invitation to come to Madrid was formally made on behalf of Spain by Carles Casacuberta at the ICM2002 closing ceremony in Beijing.

The association formed to present the candidacy was dissolved on its return from China, and work began on the organization of the ICM2006 in Madrid and the General Assembly in Santiago. To this end, the ICM2006 Madrid Association was set up, independently of the CEMAT and the societies but in complete co-ordination with all of them. The first president of this association was Carlos Andradas, who was replaced in 2003 by Manuel de León. At the same time, an Organizing Committee responsible for the General Assembly was set up at the Universidad de Santiago. This Committee included the three universities in the region (Santiago de Compostela, La Coruña and Vigo), and was headed by the dean of the Faculty of Mathematics, Juan Manuel Viaño. Both bodies have worked in full co-ordination with each other in recent years.

A further important point is that, although the ICM2006 was to be held in Madrid, the organization of the congress was a joint effort across the whole country. In addition to the General Assembly in Santiago, the Committee was composed of mathematicians from all over Spain, a reflection of the country's historical and cultural wealth and variety. A consultation of the web page will reveal messages of welcome not only in

English, but also Spanish, Catalan, Euskera and Galician; in other words, in all the official languages of the Spanish state.

A major congress with a scope such as that of the ICM also requires strong financial and logistic support from public administration bodies, and as such is subject to political changes. This is precisely what occurred in the city and region of Madrid. The change of government in Spain in 2004 brought about a restructuring of ministries, and with it a corresponding change in our interlocutors, who became the Ministry of Education and Science, the Ministry of Culture, and the Ministry of Foreign Affairs and Cooperation. We are bound to state that the support shown by the previous government for the organization of the ICM was taken up by its successor, both of whom were fully aware of the unique importance of the event.

With regard to financial support, the ICM2006 Executive Committee worked extremely hard to achieve the following goals: 1) To secure the backing for the event from institutions; firstly the Committee of Honour was proud to have His Majesty the King as its president, with representatives of all the public authorities: the Prime Minister, other ministers, the mayor of Madrid, the president of the Regional Government, and the rectors and president of the CSIC; 2) To ensure solid public funding, which came from the Ministry of Education and Science, the Community of Madrid, Madrid City Hall and from the CSIC, and 3) To attract funding from the private sector, which eventually fell short of initial expectations, and which except for organizations such as the Vodafone Foundation, BSCH, the Areces and Enterasys Foundations, as well as Spanish companies and those with their headquarters in Spain, are still a long way from recognizing mathematics as a driving force in research, technological development and innovation. We Spanish mathematicians have also learned that this section on the road to understanding still remains to be covered.

The organization of an ICM requires an important logistical underpinning that cannot be left to voluntary contributions. For that reason we chose a congress agency with great experience in organizing major events, and one with enough flexibility to adapt to our needs. This agency was Unicongress. With their team headed by Paloma Herrero we worked hand in hand as though the ICM2006 were indeed a joint venture, and together we shared the achievements and setbacks which, like all those who have been involved in previous ICMs, we know are part of and parcel of this difficult task. I am happy to say that our choice was the right one, and that the outcome was satisfactory for all concerned. We also believe that for Unicongress, too, this was a new experience, since any ICM amounts to much more than a conventional congress.

The ICM congress logo is something that remains in the mind for years to come. It is not easy to devise a logo that embodies at once the essence of a country and mathematics itself. After many attempts we settled on the one that has since become familiar, and is inspired in the sunflower. On the one hand, the sunflower symbolizes the Spain of sun and light already known to many; on the other, the number of its spirals to right and left are elements of the Fibonacci sequence. The artistic creativity of its devisers led to an image that resembles both a sunflower and the fractal nature of a Romanesco cauliflower. This has given rise to different mathematical interpretations,

and even to different reproductions of the original. The colours of the logo can be fully appreciated on the congress website, where in the logo structure the different themes are associated with the different colours.

The logo formed the basis for one of the official posters designed to promote the ICM2006, together with four others based on well-known pieces of Spanish architecture with a mathematical content. These five posters were sent to mathematical departments the world over and have been very well received internationally.

The target for the ICM2006 budget was 2 500 000 euros, including the attendance fees and specific help from the IMU. The fees could not be set too high, otherwise it would have prevented mathematicians from countries with economic difficulties from attending the congress. Thus following the custom of previous ICMs, it was set at 260 euros, which scarcely covered the expenses generated by each participant in terms of proceedings, coffee, congress bag, materials, etc... As mentioned before, most of the budget was provided by public sources and the fees. On-going work with the General Secretariat of Scientific and Technological Policy enabled us to meet all budget requirements without any final deficit. I would like to mention the outstanding work carried out by the Treasurer, Alberto Ibort, and the vice-Treasurer, Miguel Ángel Rodríguez, thanks to whom the accounts for the ICM2006 remained always on an even keel.

Every ICM is special in some respect, and ours was no exception. The Committee wanted to emphasize three main branches or axes peculiar to the geo-strategic situation of Spain in history and in the world, in particular in relation to Europe.

- The European axis, as a reflection of Spain's position in Europe, symbolized by holding the General Assembly in Santiago de Compostela, the destination of pilgrims along the Road to Santiago, which acted as a channel for culture and science in the Middle Ages.
- The Latin American axis, highlighting the existence of a cultural community by means of which Spain wishes to further its links, including those concerned with mathematics; and
- The Mediterranean axis, with Spain as a bridge between Africa, the Near East and Europe, with the intention of increasing mathematical co-operation in this sphere.

The venue for the congress deserves a section on its own. For a congress such as the ICM, eminently scientific in character, but also with its relevance in social and media terms, with the presentation of the most prestigious prizes awarded in mathematics, an appropriate venue is a crucial factor. The Palacio Municipal de Congresos (PMC) in Madrid is a striking building designed by Ricardo Bofill, one of the most highly recognized Spanish architects on the international scene. This majestic building, equipped with all the latest modern technology, provided everything we could have wished for. But this did not come cheaply, and in fact accounted for a considerable part of the budget. However, thanks to our collaboration with the Convention Bureau

of Madrid, Madrid City Hall, and those in charge at the PMC itself, we were able to secure the building as the venue for the congress. In retrospect, I believe our decision to have been the correct one, and it is true to say that the ICM2006 would not have been the same without these premises.

The opening ceremony is another vital part of any ICM. For several months, we debated with the IMU Executive Committee, and in particular with its president, Sir John Ball, about how the ceremony would be structured. The presence of His Majesty the King at this opening ceremony on August 22nd was decisive for attaining the impact desired, and we are grateful for the extraordinary co-operation extended by the Royal Household from the very beginning. In spite of difficulties with the agenda, to say nothing of the security measures required, everything was in place on time for the event. Not only is financial support from public institutions necessary for a congress of this nature, but also the physical presence of their representatives. In this case, we the organizers would like to express our thanks to the Royal Household, to Madrid City Hall, to the Community of Madrid and the Ministry of Education and Science for all their support in both these respects. The opening ceremony was divided into two parts; the first part consisted of a video produced by the organizers showing the relation of mathematics with art and culture through the ICM2006 official posters. There was also a musical performance by the Ara Malikian Trio that enjoyed great success. The second part consisted of the official speeches and the presentation of the prizes by His Majesty the King. We believe this was an emotive and attractive event befitting the importance of the awards and the prize-winners themselves. Finally, His Majesty the King delivered a speech pointing out the vital role played by mathematics in education, knowledge and development. After his address, the King declared the Madrid ICM2006 officially open. His Majesty also attended the cocktail reception held after the opening ceremony, and delighted everyone with his cordiality and friendly approachability.

After the opening ceremony, the congress unfolded according to plan. The quality of the lectures was a concern of both the Programme Committee and the Local Programme Committee, not only for their content, which was beyond all doubt, but also for the presentations. Noga Alon's work on behalf of the PC, and Marta Sanz-Solé's on behalf of the LPC, were both admirable, and I am sure I am not mistaken when I say that the ICM2006 fully emulated previous ICMs in this respect. There is no doubt that the technological facilities at the Palacio Municipal de Congresos did much to ensure the quality of both invited talks and plenary lectures.

The scientific programme consisted of 20 plenary lectures and 169 invited talks distributed over 20 sections, the same amount as at the ICM2002. With regard to the open programme, the presentation of posters was encouraged by a competition with prizes for the best entries, a measure whose purpose was to make the programme more agreeable and digestible.

Steps are taken at every ICM to encourage the participation of mathematicians from the more disadvantaged countries. Indeed, co-operation in development is a priority of the IMU, as explicitly stated in the resolutions approved at the 25th General

Assembly. On this occasion, the IMU and the ICM2006 established the following five categories for financial support:

1. Young mathematicians from developing and economically disadvantaged countries.
2. Senior mathematicians from developing and economically disadvantaged countries.
3. Senior mathematicians from Latin America.
4. Senior mathematicians from Mediterranean developing countries.
5. Young Spanish mathematicians.

The IMU subsidized the travel expenses of 143 mathematicians selected for Programmes 1 and 2: 80 on Programme 1 and a further 63 on Programme 2, while the Local Organizing Committee covered the registration fee, board and lodging in Madrid for 131 of these 143 participants.

In accordance with the three axes previously described, the ICM2006 Organizing Committee also managed to include Programmes 3, 4 and 5, covering the registration fee, board and lodging in Madrid for 178 mathematicians (Programme 3: 76; Programme 4: 70; Programme 5: 32) and 43 airline tickets (Programme 3: 25; Programme 4: 18). These five programmes were co-ordinated by C. Herbert Clemens, Linda Geraci and Sharon Laurenti (IMU), and also by Marisa Fernández (ICM2006). This task was possible thanks to their efforts and dedication.

The specific funding was provided by the IMU Special Development Fund, the Spanish Agency for International Cooperation (Ministry of Foreign Affairs and Cooperation), the Departments of Mathematics and Deans of the Faculties of Mathematics of the Spanish Universities, and the Carolina Foundation, as well as by a large number of Spanish and non-Spanish mathematical societies.

As regards co-operation, one of the activities undertaken prior to the ICM2006 was the “Mathematics for Peace and Development” School. During the week July 17th-23rd, young mathematicians from Arab countries (including Palestine), Latin America, Europe and Israel attended eight courses given at the Universidad de Córdoba by prestigious mathematicians from different countries. The aim of the School was to draw attention to mathematics as an effective means of contributing to the progress of peoples, as well as its use as a universal language for mutual understanding among different cultures. The choice of Córdoba as the venue was the role of this city as a symbol of the “Spain of the Three Cultures”, where Christians, Jews and Muslims lived side by side in an example of tolerance and co-operation.

The Madrid ICM2006 was also complemented by 64 satellite conferences – a record. 36 of them were held in Spain and constituted a demonstration of the organizational powers of Spanish mathematicians and their many international relations. There was no specialized branch of mathematics that was not addressed in any of the satellite conferences. Although at times these satellite conferences can draw

attendance away from the ICM itself, in this case the number and quality of such conferences more than made up for any shortfall and proved to be an excellent scientific accompaniment.

Cultural and dissemination activities were other facets of the ICM that were accorded fundamental importance. In consequence, an ambitious programme was drawn up to cover two fronts: on the one hand, society in general, and on the other the congress participants. Our aim was to draw attention to the role played by mathematics throughout the length and breadth of geography and history and in the culture of humankind, as well as showing how mathematics is an essential part of life. Judging by the results, and by the reactions to these cultural activities, which were praised in King Juan Carlos' opening speech and in the closing speech by the IMU president, they were one of the outstanding successes of the congress. The responsibility for this task fell to a team led by Antonio J. Durán, in collaboration with Raúl Ibáñez, Guillermo Curbera and Antonio Pérez-Sanz.

In relation with the ICM2006 in particular, and in the effort to bring mathematics closer to society at large, the exhibition "The Life of Numbers" was expressly prepared for the occasion, and was organized and financed by the Ministry of Culture and the Spanish National Library. The exhibition was held in Madrid at the Spanish National Library from June 7th to September 10th, and provided an account of the relation of human beings with numbers from the first marks left by human hands in Palaeolithic cave paintings to the Renaissance, a journey through Mesopotamia, Egypt, Greece, Mesoamerica, Rome, India and the Middle Ages. On display at the exhibition were Babylonian tablets, Roman coins, pre-Roman and Mayan manuscripts, an impressive collection of Renaissance mercantile arithmetics, engravings by Leonardo da Vinci and Durer, maps of the Earth and the Stars, all the exhibits coming from different Spanish institutions: the Museum of America and the National Archaeological Museum, the Library of the Monasterio de El Escorial, the Capitular & Colombina Library in Sevilla, the Universidad Complutense de Madrid Library, from Catalonia, and of course from the Spanish National Library itself. The pièce de résistance was the Codex Vigilanus, a manuscript composed in 976 at the Monasterio de San Martín de Albelda (La Rioja), currently conserved at the Monasterio de El Escorial. This manuscript is the oldest written record of its kind in history and includes the Hindu-Arabic numerals which are still the basis of our numbers today. A beautifully illustrated edition of the book "The Life of Numbers" was published for the exhibition with texts by Alberto Manguel, Georges Ifrah and Antonio J. Durán (who was also the curator of the exhibition).

Also with the general public in mind, three exhibitions were organized at the Centro Cultural Conde Duque in Madrid, financed by the Ministry of Education and Science and the Spanish Foundation for Science and Technology. Firstly, the already well-known "Experiencing Mathematics", an exhibition originating at the French Centre des Sciences in Orleáns and sponsored by UNESCO. This exhibition was presented under the Spanish title of "¿Por qué las Matemáticas?" ("Why Mathematics?") and was open at the Conde Duque Cultural Centre from August 17th to

October 20th (the curators being Raúl Ibáñez and Antonio Pérez Sanz). The second exhibition, organized expressly for the occasion, concerned fractal art and went under the title of “Fractal art: Beauty and Mathematics”. On display were works by the twenty-eight finalists in an international competition expressly organized for the ICM2006 in Madrid, with a jury of panellists headed by Benoit Mandelbrot. Professor Mandelbrot gave a talk on “The Nature of Roughness in Mathematics, Science, and Art” at the main congress venue, where a replicated version of this exhibition could also be seen. Highly visual catalogues were published for both exhibitions (the first included a notebook of activities for students). The third exhibition was “Desmocene: Mathematics in Movement”, held in parallel at the Centro Cultural Conde Duque and the congress venue, and consisted of a selection of computer-aided animated films with live commentary by some of their creators. Desmocene is a powerful source of mathematical algorithms for the creation of graphic and visual effects, whose special digital effects are currently used in feature films and video games.

The success of all these exhibitions, whose purpose was to stimulate interest about mathematics in society at large, together with the celebration of the ICM2006 in itself, can be measured by their repercussion in the media and by the large number of people who came to visit them, to the extent that they frequently had to queue to enter. Those in charge at the Spanish National Library and the Centro Cultural Conde Duque were frankly surprised by the number of visitors, given the subject-matter of the respective exhibitions.

The ICM2006 Executive Committee also mounted an extensive programme of activities for the Congress participants themselves.

The most ambitious of these events was the exhibition entitled “The ICM through History”, based on the history of the 25 ICMs held to date, from the first held in Zurich in 1897 to the Madrid congress in 2006. The aim of the exhibition was to provide a visual chronicle of all the ICMs, emphasizing their significance in terms of human endeavour and using the activities of mathematicians at the ICMs as a mirror in which history, culture, technology, fashion and changing attitudes were reflected. Some 500 written and photographic documents provided a twin portrait of the ICMs; on the one hand, a chronological review of the history of the ICM, and on the other a transversal view through the social life of the congresses, the graphic design for the congresses and the buildings where they have been held. The physical and conceptual heart of the exhibition resided in the display of medals, original reproductions of the Fields, Nevanlinna and Gauss awards provided by the Royal Canadian Mint, the University of Helsinki and the Deutsche Mathematiker-Vereinigung. Guillermo Curbera, the curator of the exhibition, was helped in his task by many universities, libraries, archives, museums, mathematical societies and individuals, enabling him to assemble an extraordinary collection of photographs and documents, many of them never available to the public before. The exhibition was entirely financed by the ICM2006 Executive Committee and has remained as an asset of the Spanish mathematical societies.

Another cultural activity that aroused much public and media attention was the Japanese sculptor Keizo Ushio's live sculpting of a square block of black granite weighing various tonnes. From this he fashioned a torus which he split into two curved sections to form a sculpture resembling the symbol for infinity. Ushio began work in early August on the campus of the Consejo Superior de Investigaciones Científicas, from where he moved to the Congress venue on August 22nd. It was there he completed the work in full view of congress participants and passers-by, producing a sculpture that has attracted much attention, especially in Spain and Japan.

This programme of activities was complemented by others which, although not organized directly by the Committee, were included in the general programme. One of the most noteworthy was the exhibition based on classical mathematical texts under the title of the "History of Mathematical Knowledge", which was held at the "Marqués de Valdecilla" Historical Library of the Universidad Complutense de Madrid between June 28th and October 27th (with Ricardo Moreno as curator). Another was the replicated version of the exhibition organized by the University of Vienna, with Karl Sigmund and John Dawson as curators. This exhibition commemorated the centenary of Kurt Gödel and took place at the Botanical Garden of the Universidad Complutense de Madrid from August 22nd to September 8th (with Capi Corrales Rodríguez as local co-ordinator). Further exhibitions were: "Singularities", mounted at the Congress venue by professor Herwig Hauser (including a film show); a tribute to the musician Francisco Guerrero (including a concert held at the venue), and the mathematical visit to the Monasterio de El Escorial and its library (tickets for this event were sold out six months before the Congress began).

Pride of place among the cultural events was the official gift presented to all plenary lecturers and invited speakers by the Executive Committee in recognition for their contribution to the Congress. This consisted of a facsimile edition of the works of Archimedes, "On the Sphere and the Cylinder", "On the Measurement of the Circle" and "The Quadrature of the Parabola" (published jointly with the Real Sociedad Matemática Española), in an annotated Spanish translation. This is a luxury edition comprising two volumes presented in a box-set (333 × 230 mm). The first volume is a facsimile book of a 16th century manuscript from the Library of El Monasterio de El Escorial, a manuscript copied in Venice at the expense of Diego Hurtado de Mendoza (Charles V's ambassador at Venice from 1527 to 1547) from the manuscript CCCV extant in the Marciana Library. The second volume contains the annotated Spanish translation of those Archimedean works, and the following four studies: (1) *Greek Science: Towards a Critical Knowledge* by Carlos García Gual; (2) *Archimedes and His Manuscripts* by Antonio J. Durán (who was also in charge of co-ordination of the edition); (3) *Archimedes: A Legend of Wisdom*, and (4) *The Mathematical Works of Archimedes*, both by Pedro M. González Urbaneja.

Many other special activities were organized, a list of which would be too long to include in this introduction, although we may mention the scientific part of the Emmy Noether Talk, given by Ivonne Choquet-Bruhat, the special talk on Poincaré's Conjecture by John Morgan, and the talk given by Benoît Mandelbrot. A joint scien-

tific activity organized by the London Mathematical Society and the Real Sociedad Matemática Española was also held.

Several round table discussions were also held, among which were those organized by the European Mathematical Society on August 23rd, “Should Mathematicians Care about Communicating to Broad Audiences? Theory and Practice”, chaired by Jean Pierre Bourguignon and with the participation of Björn Engquist, Marcus du Sautoy, Alexei Sossinsky, François Tisseyre and Philippe Tondeur, and the ICM2006 Closing Round Table on August 29th, “Are Pure and Applied Mathematics Drifting Apart?”, chaired by John Ball and with the participation of Lennart Carleson, Ronald Coifman, Yuri Manin, Helmut Neunzert and Peter Sarnak.

One of the most long-standing traditions in the history of the ICM is the edition of a special commemorative stamp. On this occasion, the design for the stamp included the congress logo and the first known written record of the Hindu-Arabic numbers from the Codex Vigilanus, published in Spain in the 10th century, which is currently conserved at the Library of the Monasterio de El Escorial on the outskirts of Madrid.

The volunteers are a collective who deserve a special mention. We also wanted this group to be composed of representatives from all over Spain, and indeed volunteers came forward from all the Spanish universities. Some 700 pre-graduate and pre-doctoral grant students responded to our call, from which a total of 350 were selected. These volunteers worked hard and enjoyed the experience to such an extent that they were sad to see the ICM2006 come to a close, which in itself stands as a testimony to the success of their efforts. We on the Organizing Committee are indebted to all of them. They worked tirelessly for long hours without complaint, and I hope that many of them will be able to participate in the ICM2010 as fully-fledged mathematicians.

Every ICM at its conclusion is obliged to present statistics providing an account in numbers of all that took place. The final figure of participants reached 3,600, with 400 accompanying persons. The number of countries from which participants came set an all-time record of 108. The number of exhibitors rose to 45. In the scientific part of the congress there were 20 plenary lectures, 169 invited talks and some 1,000 short communications and posters.

There is no doubt that the most outstanding feature of this congress was the extraordinary attention it received from the media. In this regard, some have attributed this interest to the conspicuous absence of Grigory Perelman and his refusal to receive the Fields Medal, but it must be said that one year before the start of the congress the Organizing Committee set up a press office with the “Divulga” agency. Over the 20 weeks immediately prior to August 22nd, a weekly news bulletin providing information about the contents of the coming ICM was published. At the same time, the ICM public presentations and the most important parallel activities were programmed. Our press team headed by Ignacio F. Bayo and Mónica Salomone also collaborated with the IMU Executive Committee at an international level. Indeed, we sent letters to the leading communications media in Spain and abroad inviting their representatives to the opening ceremony. The combination of all these circumstances made the event a media success. For ten days during the summer in Spain the ICM2006 was headline

news, and international repercussion was likewise unprecedented. The lesson to be learned from this is that we mathematicians must work hand in hand with journalists and the media if we wish to emerge from the information ghetto.

Press work culminated in the publication of 7 issues of the “Daily News”, often produced against the clock and in spite of permanent pressure on the press office arising from the continuous avalanche of requests for information from the media and its representatives. In addition, press conferences were organized on a daily basis, which sometimes attracted audiences hitherto unconceivable in the world of mathematics.

With regard to diffusion, it is also necessary to mention the series of programmes produced by the UNED Educational Television and provided for the Organizing Committee. These programmes constitute documents of great educational value.

The Closing Ceremony was held on August 30th and featured the expressions of gratitude and acknowledgement from the IMU president to the different committees, my own to the committees who worked on the organization in Spain, the address by the elected president of the IMU, László Lovász, and the invitation from the Indian representative, Rajat Tandon, to attend the ICM2010 to be held in his country, in the city of Hyderabad.

After every ICM there still remains work to be done. In addition to the thick Volumes II and III forming part of the Proceedings, there is the first that the reader now holds in his or her hands. The Publishing House of the European Mathematical Society was charged with the publication of these proceedings, and the result has certainly been impressive. This first volume is accompanied by a DVD with recordings of the opening and closing ceremonies, as well as all the plenary lectures. We believe that it provides an excellent complement to the text and an unforgettable record for all those who shared with us those wonderful ten days in Madrid in August 2006.

This ICM2006 will have a long-lasting effect on Spanish mathematics. It has been a collective effort that has brought us closer together and made us aware of belonging to a national and international community. On a domestic level, it has also led to a self-examination that has given rise to initiatives that are already under way to improve research in the discipline. Furthermore, it has brought mathematics more to the social forefront to an extent never before witnessed in Spain. This is a situation that we must make the most of in the years to come. Moreover, the eyes of the international mathematical collective were fixed on Spain this summer, a fact that will undoubtedly further greater collaboration.

We hope to have fulfilled all the expectations placed in us by the IMU, and leave the mathematical doors of our country open to the future.

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