

# Creating an Olympiad Tradition in Colombia: What Went Right (Plenary session at the WFNMC Conference)

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*At the invitation of the WFNMC Conference (July 26, Cambridge 2006) organizers, we attempt to analyze the strategies and choices, the plans, projects and outcomes, that have enabled Colombia (and several of its neighbors) to create and sustain a tradition of enrichment and competitions that have impacted the educational and mathematical communities and the development of mathematics in Colombia and the region.*

## 1 Presentation

When asked by Tony Gardiner about a year ago to give a plenary talk at this conference trying to explain the Math Olympiad movement in Colombia, the performance of Colombian students and teams at the IMO and other international problem-solving competitions, and what lies behind it, I immediately accepted although I was not so sure of what I would have to say or of what value it might be for this highly qualified audience. In 2006 we are commemorating the twenty-fifth anniversary of the Colombian Mathematics Olympiads and this opportunity to speak at the WFNMC Conference is one of the ways to celebrate.

I suspect that I was interested in finding out for myself what arguments might be presented to support an explanation, and at the same time felt highly complimented that the organization of this conference saw something special in the gains made by Colombian students and the Colombian Math Olympiads.

What follows is then a first, tentative, laying out of the contribution of people, policies and strategies to the Colombian participation in problem solving competitions with special attention paid to the international level. This will inevitably lead us to Olympiads in all the Iberoamerican

countries, for this highly supportive community is one of the keys to understanding all of our activities.

In preparing for this talk we were fortunate to attend a National Congress of Mathematics in August, 2005 that featured many ex-Olympians as speakers and we were fortunate in hosting, in September 2005, the XX Olimpiada Iberoamericana de Matemáticas, an event that brought together as organizers and coordinators, many ex team members and ex leaders and deputy leaders, both from the IMO and from the Iberoamerican and Central American Olympiads. This enabled us to appreciate firsthand the careers that many of our students have followed, and to see the impact on both the students themselves and those who have followed in their footsteps, and on the mathematics community as a whole.

## 2 Getting Started

When one begins an entirely new activity, as was the case of the Math Olympiads in Colombia, one makes many plans and choices without expertise or guidance, so that intuition and general good judgment play a part in the ensuing failure or success. In other words, we consider that we were lucky or that we made many “happy” decisions.

### **Getting Started: Looking For and Sticking to International Standards and Being Lucky**

For several years during the 1970’s Professor Ricardo Losada had to no avail written a series of projects to get financing from the appropriate Colombian sources to organize a national math olympiad. These sources were a governmental organization devoted to educational testing, the Colombian Ministry of Education and COLCIENCIAS, the Colombian, very junior, counterpart to NSF. Then ICME was to be held in Berkeley in 1980 providing an opportunity to speak directly with the organizers of the 1981 IMO to take place in Washington. A plan was hatched to look for the IMO organizers at ICME and solicit directly an invitation to the 1981 IMO. This was to be the mechanism for jump-starting olympiad activity in Colombia—and it worked! If we were unable to begin with a national olympiad, we would begin with international competition.

Preparation got underway. We began by forming an interinstitutional group, Universidad Nacional de Colombia (National University) represented by the chairman of its Mathematics Department, Colombian Math Society and Universidad Antonio Nariño, each represented by its President. The effort was led by Rafael Mariño who would be the team leader and myself who would become the first deputy, but a large portion of the math department of the National University got involved. This was the first stroke of luck or happy coincidence. There was a base of people willing to learn about the IMO. We began by publishing the problems of former IMOs and asking professors to contribute solutions. We worked hard on them ourselves, without referring to the official solutions, trying to get a real sense of the level of the competition. None of us was particularly good at it at the beginning, we had not come up through the ranks as olympiad competitors ourselves, we had to learn about problem solving on the IMO level, and we succeeded, at least partially. We went about this during the “year” between ICME-4 and IMO Washington. It was an important choice that would enable us to train a Colombian team for the competition.

But where were we to get a team? We invited schools from Bogotá to take part in a local olympiad-type competition. One hundred ten students from thirty-three schools did so. This was a second stroke of luck or circumstance, there were many very good (mostly private) schools in Bogotá willing to take the risk of allowing their students to be challenged in mathematics. Not having a broad base, we decided on a long series of weekly “tests” to choose our team. After about four months of working twice weekly with students on problems and solutions, as well as having them take tests, we chose a team of eight. Three from the Colegio San Carlos, which has produced one or more of our team members for the IMO just about every year since 1981, including our present team leader, Federico Ardila. Two from the Liceo Francés Louis Pasteur (one a girl), one from the Colegio Hebreo, one from the Colegio Antonio Nariño and one from the Colegio Santo Tomás de Aquino. This long process was another good decision (although completely untried). We really did have an excellent team assembled. Nevertheless, there were to be no medals at the Washington IMO, a team score of 93 and an average of 12 points was disappointing, but not discouraging, and whet our appetite for continuing to compete at the IMO.

Other lucky coincidences were to appear. The Colombian Minister of Education at the time was a lawyer, but more pertinently a frustrated mathematician whose father did not allow him to study mathematics. He put the Ministry of Education behind this first effort and financed the students' travel. He became directly involved with our project of creating a Colombian Math Olympiad, and supervised its approval when presented the following year. The Ministry of Education was subsequently behind the Colombian Olympiad for its first twelve years of existence.

### **Going Directly to the Students**

Meanwhile, another excellent decision was made. We sought, and obtained, newspaper space to take the problems to the people. The director of one of the Bogotá dailies, *El Espectador*, was another aficionado of math problems and was willing to take the risk. Thus began eight years of a Sunday column of problems with readers' solutions published, and with a short introductory essay on one or more fun topics in math. Popularization was linked directly to the Colombian Math Olympiad and taken to the students themselves without having to go through the teachers and the schools, which would have drawn out the process for several more years, and maybe have prevented many students from hearing about the Olympiad or getting involved.

### **Receiving the Help and Following the Lead of Outstanding International Figures**

Undoubtedly one of the most important ingredients in starting out on the right track and on firm footing, was the friendship with Sam Greitzer that began with the meeting in Berkeley, was nourished by the IMO experience in Washington, and that flourished in the following years as Sam made a series of trips to Colombia to accompany, advise and encourage us over the following years. He went there to train students, and we learned a lot about training, and to talk to us at length about the way he envisioned olympiads and teaching gifted students. This partnership, with the Colombia olympiad organizers still as very junior partners, was to lead to the founding of the Iberoamerican Olympiad, a step that was important for Colombia and crucial to the development of math Olympiad activities in all of Iberoamerica.

It was Sam Greitzer who introduced us to Walter Mientka that same summer of 1981 in Pittsburgh. It was to be a good friendship and a fruitful professional relationship through the next twenty years.

Not only were individuals to work together with us. Our early, and wise, decision was that the first round of our competitions would remain demanding with regard to international standards. Due to the relationship with Walter Mientka and later Titu Andreescu, as well as Peter O'Halloran and Peter Taylor, we have taken part in the American Math Competition, the American Elementary School Olympiad, and the Australian Math Competition as a policy and as part of our philosophy. We have always believed that our students can be as good as students from any other country in the world (a truism), but we must both find them and challenge our schools to improve constantly. So we have always taken part in international challenges.

### **3 Going Forward**

#### **Building a Team of Doers with Young People Willing to Learn**

The first Colombian Math Olympiad in 1982 attracted 1000 students and the second 2500, during the past few years the figure has stabilized around 75000–80000, a lull in growth that has us rather worried, given the surge in Olympiad participation especially in Brazil (twelve million) and Peru (two and a half million). But there are important choices that have been made and that have strengthened the Colombian hand. One of these has been building a team of organizers and trainers composed of a constantly-changing group of young ex-Olympians.

Perhaps the international trend in this direction that can be perceived is due to Colombia. Many other countries followed suit. Others have not renewed their Olympiad teams, or have done so only under extreme circumstances.

#### **Problem Posers**

One of the most fruitful and correct decisions we made was to begin to work on forming a team of problem posers. We encouraged our young students to become problem posers, and began by offering a \$1000 prize

for the first problem selected for use in the IMO and proposed on behalf of Colombia. This was another high international goal we set ourselves and our students from the beginning. Our first problem short-listed was in 1981 and our first problem selected came more than twenty years later, created by Federico Ardila.

In the meantime our young ex-Olympians, working in the organization of the Colombian National Olympiad and the training of gifted young students in January and June of each year, began posing new problems that were accepted for the Iberoamerican Math Olympiad, the Asian-Pacific Math Olympiad, and more recently for the Math Olympiad of Central America and the Caribbean. Although at first we adapted good problems from around the world, we soon began to formulate our own problems for the Colombian Olympiad, starting with short answer problems, then moving on to two levels each of problems requiring complete solutions for children of three different grade levels.

Posing original problems truly enabled our young ex-Olympians (still at university) to become great trainers of younger students, not only because it required them to get to know the problems that were being posed in other competitions, but also because they were able to exercise their own creativity and special problem talents and imprint a specially Colombian flavor on their problems. The team of young ex-Olympians gradually turned into a school. What are the particular advantages? Renewal is a positive word indicating a positive step. One of the strong points to mathematical problem solving is the originality of the problems and the creativity they elicit from students.

Why has this been important? Novel ideas continually crop up. Different people get interested in different areas of mathematics and different areas of problem solving. This creates a constant evolution, a good variety in the training sessions and types of problems posed on the olympiad tests. The entire organization becomes richer and a student who spends three or four, or more, years of his life participating in the olympiad or related activities constantly encounters new material and challenges, keeping his interest honed and rounding-out his mathematical “repertoire”.

## **Growing and Diversifying**

### **Math Olympiad for Primary Schools**

It soon became apparent that it would be necessary and important to serve other groups of young students. Our first initiative then was to establish a competition for primary school students, grades 3 to 5.

This was seen as important to encourage students to love mathematics and develop their mathematical interests, creativity and talents in problem solving from the time they had learned to read. So the first primary school olympiad was held in 1984 and has continued ever since with wonderful results year after year.

Here are photos of one of the early winners of the competition for third graders in the figure.



Figure 1: Federico Ardila and María de Losada



Figure 2: Federico Ardila. First place among third graders. Colombian Math Olympiad for Primary School.



Figure 3: Another first place finish in the primary school Olympiad.

### **Math Olympiad for University Students**

Although it was also apparent that those students who had taken part in the Math Olympiad in secondary school sometimes felt let down not





Figure 4: María de Losada and Federico Ardila in the organization with Angelica Osorno, Candidate. PhD. in mathematics, MIT. Deputy leader, Colombian team, Centroamerican and Caribbean Math Olympiad 2003–2005.

to find the same challenging atmosphere at university, it was to be several more years, not until 1997, that the University Olympiad was first organized. We quickly moved to founding the Iberoamerican Math Olympiad for University Students, as a correspondence type competition in 1998 and shortly thereafter were able to begin taking part in the International Math Competition for University Students in 2002. This move to internationalize is fundamental in creating and maintaining the interest of students and universities.

### Future Olympians

Looking for ways to draw ever more students into challenging mathematics, we were not afraid to innovate, looking to alternative forms of representation of problems as an avenue of access for those intimidated or stymied by verbal and symbolic presentation of mathematics and mathematics problems, but still very able to develop and exercise mathematical

thinking. The Future Olympians competition ever since has attempted to reach these students and encourage them to do mathematics.

### **Building International Groups on the Regional Level**

One of the most important projects proposed early on was the organization, by Colombia, of an olympiad on the regional level. After several options were discussed, between Latin American, Pan American and Iberoamerican, this third alternative was chosen, and it also proved to be an excellent choice.

Several currents of thought coincided in 1984 leading to the founding of the OIM. There was the hope of the Colombian Ministry of Education to find constructive means of renewing and making more relevant the OEI (Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura) over which Colombia was then presiding. There was the idea of Samuel Greitzer, founder of the USA Mathematical Olympiad, to found a similar event on the Panamerican scene. And there was the dynamism of the Colombian Mathematical Olympiads (OCM), that had recently obtained the first medals for Colombia at the International Mathematical Olympiad (IMO), dynamism that was looking for a way to spill over and encourage and help to prepare other Iberoamerican countries to take part at the international level, by getting their first experiences on the regional level of competition.

Thus was conceived a joint project to organize the first Iberoamerican mathematical Olympiad in Colombia. The project was approved by the Assembly of Ministers of Education of the Iberoamerican Countries, meeting in Bogotá in the spring of 1985, and the first version of this regional olympiad took place in December of the same year with the participation of the ten founding countries mentioned above.

In 1984 when the project began only four Iberoamerican Nations had taken part in the IMO on a regular basis; Cuba, starting in 1972, Brazil (1979), Colombia (1981) and Spain (1983). The success of the original objective of leading a greater number of Iberoamerican countries toward international participation in an event such as the IMO of such high prestige and great import is also clear today. 13 Iberoamerican countries take part in the IMO on a regular basis, while others (notably Chile) have participated sporadically.

We wanted to show a path that would transcend the limitation of our mathematical schooling and lead to the conquest of a respectable international level in mathematics education consequent with the demands of a citizen of our times. The Iberoamerican Math Olympiad would also serve as the culmination of a vibrant activity of problem solving and development of mathematical thought beginning with the earliest stages of primary education and continuing on to the university level in each participating country. This indeed has been the case in the majority of the Iberoamerican countries; olympiad activity on the regional or international level is the culmination of events with popular participation on all school levels, events that challenge a large number of students to think creatively in mathematics and give them and their teachers orientation that enables them to enrich their mathematical education and attain higher personal levels of development of problem-solving ability and consequential mathematical thought.

### **Regional Integration Leads to Competitiveness on the International Level**

With this project the countries of the Iberoamerican region have shown leadership, in mathematics and mathematics education, with respect to tendencies that have since been proven to be of transcendental importance: they have achieved regional unity and cooperation as a prelude to becoming globally competitive. Thus the story of the Iberoamerican Mathematics Olympiad (Olimpiada Ibero-americana de Matemáticas—OIM) is the history of the insertion of students from Latin America and the Iberian Peninsula into the international arena of mathematics competitions.

Looking at the results of IMO 2004 held in Athens with the participation of some 85 countries, we find facts that may be surprising to many. Iberoamerican students have become and remained highly competitive on the international level.

The IMO distinguishes individual students and does not officially rank countries; furthermore results vary from year to year. However, the unofficial team scores of 2004 do provide perspective. To illustrate we extract only some of the scores of European and Latin American countries. The highest team score was China with 220 points, followed by the USA with 212.

United Kingdom	134
Brazil	132
Germany	130
Colombia	122
México	96
France	94
Argentina	92
Italy	69
Spain	57
Netherlands	53
Perú	49
Ireland	48
Uruguay	47

These results clearly show that Iberoamerican teams not only take part in the IMO, they have reached a respectable international standard of excellence.

IMO results vary from year to year, and among the Iberoamerican countries it is still possible to perceive a rather wide variation. The results of 2006 might be said to be similar, but the names of the countries occupying these positions has changed. I believe that in good measure these wide variations are the consequence of an Olympiad tradition that is still relatively immature when judged by the standards of many other countries.

### **Impact on Students, Math Educators and the Mathematical Community**

There are many aspects in which these olympiads impact the Iberoamerican educational and mathematical communities.

The math olympiad experience, starting from the elementary level, allows many students to develop their mathematical thought and problem-solving ability, striving to reach personal bests. It allows teachers to see how carefully planned problems with many different avenues of approach and solution can appeal to their students' imagination and enrich their understanding of mathematical concepts and relationships.

By making mathematics both challenging and fun, it becomes an attractive career choice, and also allows students to build a much stronger foundation for higher studies in other related areas such as physics, engineering or economics. The mathematical communities have been renewed by a greater number of talented young people entering the profession after having taken part in olympiads and having developed many of the skills required to do successful research in mathematics, such as a broad and deep grasp of fundamental mathematics, creative and flexible ways of thinking mathematically, ability to relate different areas of mathematics in new ways, and extraordinary capability for solving challenging and original problems.

Additionally, teachers have learned that many of their students are capable of mapping out their own strategies and thought patterns in mathematics when their desire to solve a particularly attractive new problem leads them to concentrate their mathematical strength and energy, laying a foundation for more ambitious school curricula.

Math educators can point to their research concerning the way in which the school math experience gradually drains many students' confidence in their own capacity to think consequentially about a problem, leading them by adolescence to strike haphazardly at a problem by attempting to apply pre-established formulas and methods drilled in school, results which necessarily imply a rethinking of the school mathematics experience.

The Iberoamerican Math Olympiad, and the enormous amount of mathematical activity it has unleashed or given direction to, has changed the face of school, university and professional mathematics in Iberoamerica and has contributed significantly to the development of mathematics in the region.

Having only two mutually comprehensible languages made this competition, though potentially large, quite an easy one to handle from the logistics standpoint. No need for specialists in many languages among the coordinators, every leader able to express himself in his own language in jury meetings and before coordinators. A mutually supportive group of people with several similarities in their cultural backgrounds, who have even read the literature and seen the films produced in each of

the other participating countries, gives grounds for understanding, eases the possibility of exchanges, and just opens up the future for all taking part. Colombia, among other things, has been able to shine in the Iberoamerican group whenever it has brought a strong team with the intention of standing out (there are times when it is deemed more important for younger students to get some experience at the OIM before tackling the IMO, and so a less-experienced team with less than shining results may be taken to the OIM).

The Iberoamerican Math Olympiad celebrated its twentieth version in 2005 in Cartagena, Colombia; for the second consecutive year teams from all 22 Iberoamerican countries took part. As a prelude to the Olympiad, a three-day Problem-solving Seminar was held for all participating teams and local students, featuring such luminaries as Andy Liu, Titu Andreescu and Patricia Fauring. The strength of the Seminar is both motivational and academic on the one hand, and far more importantly strikes a chord of cooperation and harmony in the task of giving students what they need to face the challenge of the competition successfully.

The Iberoamerican community is there. We built it ourselves, and have no unhealthy rivalries, only healthy competition. We can find support among our group when we need it. Olympiad organizers from one country, among them many Colombians, will often take part in the organization of the Iberoamerican or Centroamerican Olympiad when it takes place in another country, as coordinators, members of the problem selection committee, or as speaker in the pre-Olympiad seminar.

Our students train each year with some students from other countries. Students from Costa Rica, Ecuador, Honduras, Panamá, Perú and Venezuela (and, yes, even Switzerland) have trained with the Colombian team. When a murmur of protest has arisen in Colombia that we are training our rivals in competition, we are quick to point out to our students that they will have to prove themselves best, on their own merits, not because they were privileged, perhaps, to get better training. This has set us straight as to the nature of an Olympiad competition. Our students finally realize that they are competing against the problems (and perhaps with themselves).

### **Olimpiada de Mayo y Centroamericana**

The Iberoamerican group has been the cradle for other subregional competitions, or competitions for students of different age groups. Colombia takes part in two of these. The Olimpiada de Mayo is a competition run by Argentina (though founded by the entire Iberoamerican group) for students in two age groups, up to age 13 and up to age 15, that challenges our young students on the regional level without leaving their home towns, and gives them a glimpse of problems conceived with the Argentine twist. The Olimpiada de Matemáticas de Centro-América y el Caribe is for students up to 16 years of age and who, for Colombia, Cuba, Mexico and Venezuela have not yet had experience at the OIM or IMO. Organized in a similar way to other international olympiads, it is an excellent place to start international competition.

### **Reengineering Competitions, Training and Leaders**

Perhaps most importantly, the OCM have evolved, filled out, added events, changed their training schemes, tried untried deputies, nurtured new leaders, shared responsibilities. The OCM has not been dominated by a single team leader or deputy at the IMO. Many different people have had the experience, especially of being a deputy leader. Then the deputies have had the opportunity to be leader, if not at the IMO, then at the OIM or OCC. This renewal is also positive in every sense of the term.

The Colombian leader at the IMO has always been a person fluent in English and able to take an active role in problem selection and the other duties of the jury, as well as speak confidently with coordinators and be able to get his or her point across. This is a far more important ingredient than many may think. It is to take part on equal footing with colleagues from around the world, not to accept a secondary role. This attitude helps our students, who are naturally quite reticent about their place on the international scene, to have more confidence in themselves, although they seem never to have quite enough.

## IMO—AB

We have been fortunate in recent years to have such a fine young mathematician as Federico Ardila as our leader, a person who has not lost his keen appreciation for the Olympiad and the way it allows young students to flourish and shine. He has been fortunate to have the opportunity to be part of the IMO-AB and to give voice to the perspectives of participants from the Iberoamerican and other developing countries there.

### Olympiad and the Math Society

There is no doubt that the Colombian Math Olympiads have renewed the Colombian mathematics community, forming an entire new generation of mathematicians who have revitalized university math departments, schools and the Math Society itself.

The Colombian Math Society has (almost) always supported the Olympiad program and initiative in Colombia. That is especially true with the current president of the Society, Carlos Montenegro, who has stated:

*There does not exist another activity that has produced more benefit to mathematics in Colombia than the Mathematical Olympiads.*

*It is a program carried out with limited resources and with the conviction that is required to overcome common obstacles that have stopped other initiatives; it already has more than 25 years and has expanded to include university Olympiads.*

*The impact of the Olympiads is the creation of an entire generation of mathematicians that form a young community that possesses a sense of identity and a network of contacts and affinity given that they belong to this exclusive group of young people with great talent and motivation.*

*The number of mathematicians who have graduated in Colombia in the past 15 years has increased considerably and the process of selection and motivation is due in great measure to the Olympiads.*

*The generation renewal in Colombia can count on a great resource and this is the generation of young mathematicians who have come out of the*



*Olympiads. These are presently in all the different stages of formation as researchers (competing in school, in the university, studying in doctoral programs, young professors and postdoctoral students). The challenge we have is to create a milieu in Colombia so they can fully develop their profession here, and return after completing their studies abroad.*

*We hope that in a few years they will be the ones who will be found in our national universities researching and leading a vibrant mathematical community. They will have gotten their start in the Olympiads.*

His support has consolidated the academic status of the Olympiad; there is no doubt of the importance of Olympiads to the mathematics community in Colombia.

### **Olympiads and the International Mathematical Union**

The same is true of IMU, and one of the reasons that Nicolai Dobilin, Petar Kenderov and myself were elected by the IMU general assembly as members-at-large of the ICMI Executive Committee. Competitions are seen by IMU as an important means of promoting meaningful and challenging mathematics in the schools, replenishing aspirants to follow a career in mathematics at university and renewing the world-wide community of mathematicians.

*The core agenda of IMU (through its Commission on Development and Exchanges) is to foster and nurture pockets or centers of excellence in mathematics research in developing countries. While this is distinct from the development of quality programs in mathematics education, the two goals have natural links, and there is a possibility of synergy between the two efforts that would give added leverage to both. One area of intersection of capacity building in both mathematics and mathematics education is the International Mathematical Olympiad movement. An example of dramatic progress in this domain is the growth through dedicated regional organization, of the participation of Ibero-American countries from four, in 1985, to virtually all twenty-two of them at present.*

[From the Report and Recommendations of the Ad Hoc Sub-committee of the Executive Committee of the International Mathematical Union on Supporting Mathematics in Developing Countries, September 2003]

There is in IMU a group called the Developing Countries Strategic Group which has further focused its attention on developing countries, with some altruism, but with a stated goal of attracting talented young people from developing countries into mathematics, given that talented students from the developed world may choose other more lucrative or technology based alternatives.

*Mathematics is in a period of rapid change, as are the educational systems that provide much of the human capital essential to the health and advancement of the profession. In many countries of the world, especially those with developed or flourishing economic systems, young people are perhaps less drawn to mathematics or basic science than in generations past. In part this is because of increasingly market-driven educational systems, and in part because of an increasing variety of lucrative career alternatives.*

*In strife-torn and economically underdeveloped countries, the academy in general and mathematics in particular has another face. There, academic pursuits, in general, and the study of mathematics, in particular, are often a refuge of comity and order in an otherwise disordered world. And too, academic distinction is also among the few avenues to social advancement and relative academic prosperity. All societies are fertile sources of the raw material of human intelligence and ingenuity, in roughly comparable measures. But, given the increased intensity of the appeal of mathematics to the intelligent young people in such environments, and the lesser costs of education there, one can at least plausibly argue that the marginal return on investment may actually be greater in the developing world than elsewhere. Such a plausibility argument leads to the conclusion that, if for no other reason than its own future health and growth, the mathematics profession has a vital stake in advancing the mathematical sciences in the developing world.*

[From the same source.]

### **Ex-participants in Schools and Universities**

The olympiad has helped to replenish mathematics education in many schools and universities. We often find that a math teacher who is especially good at motivating his or her students to participate

successfully in the Olympiad is someone who fondly remembers his own experience in olympiad competition.

At the university level, one of the reasons for the incipient success of the Colombian Math Olympiad for University Students and the respectable results of the Colombian team in the IMC is rooted in the ex-Olympians who man the math departments.

### **Working Hard**

There is no substitute for working hard; for taking stock, assessing results, redesigning, innovating, learning constantly from others. It has always been my idea that true “development” has its roots in being inclusive (not excluding any person, school or initiative) and exercising leadership. We believe this has been an important idea for the Colombian math olympiads.

### **Recapitulating**

I believe that in any case that we were lucky. We were lucky in the schools that began taking part in the Olympiad, although there was no tradition along these lines, We were lucky in the personalities of our first successful students, who were always willing to share what they had learned and the expertise only they could share (exam strategies, how to handle the stress, how to relate to kids from other teams). We were lucky in the people who became interested in working with us: Sam Greitzer, Walter Mientka, Peter O’Halloran, Peter Taylor, Andy Liu, Titu Andreescu, in the support of our Iberoamerican colleagues: Patricia Fauring, Angelo Barone, María Gaspar, Ceferino Ruíz, Carlos Bosch, Uldarico Malespina, Rafael Sánchez. We were lucky in the first Minister of Education who set the tone for over ten years of Ministry support.

We have been lucky in finding echo in the Iberoamerican community, in creating lasting friendships among those dedicated to math Olympiads in the different countries, in having the continued and inspired collaboration of fine young mathematicians and problem solvers, in being able to rely on the continued support of the Colombian Math Society and above all that of the Universidad Antonio Nariño as the principal institutional organizer of Olympiads (math, physics, informatics) in Colombia.

## 4 Looking Forward

Two keys to the spirit of the times, twenty-five years later:

- Continue to question, assess and revitalize what we are doing, year after year.
- Continue to see the appearance of young people of great genius, enough of them with true modesty, truly thankful for the opportunities they've had, willing to give some of their time and thought and creativity to the new generations.

Some new groups of people discover the Olympiad, year after year, become enthusiastic, respect the students and the organizers, “defend” and “sell” the olympiad to others.

### Challenges

I am deeply impressed by the work being done in other Latin American countries that certainly is not a threat, but will just as certainly prove to be an enormous challenge for Colombia and other countries to keep pace.

In 2005 Brazil began the Brazilian Olympiad for Public Schools that had, as we mentioned, just under 12 million participants. The idea is positively brilliant. Each school is responsible for the inscription of its students in the Olympiad and is encouraged to have all its pupils take part. It is a one hour 10 question multiple choice and short answer exam, with some questions that require more analysis than creativity and others that require less routine ways of thinking spatially or in other mathematical terms.

The exam is corrected by the teachers of each school and the names and papers of the first 5% of its students is sent to the organizers for a second round of questions requiring full solution. This meant that 600,000 students took part in the second round which was held in regional centers and corrected by professors from the math departments of the public universities all over Brazil.

There were medals and prizes for the best students, the prize being having earned the right to take part in a summer math school for talented

students. There were prizes for the teachers of the best students; the prize was the right to attend an in-service course preparing them to teach more challenging mathematics to their students.

There were prizes for schools, according to the number of students from that school earning prizes; the prizes were laptop computers and math books for their school libraries.

There were prizes for the towns with the best schools, trophies and equipment.

The Brazilian Math Olympiad devised the problem sets.

This is an excellent model, and one which we will try to follow in the coming years, for if we do not evolve into challenging all of our students in all of our schools the positive results which we have been able to show, though modest on an international level, will no longer shine on the Iberoamerican scene.

## **5 Conclusion**

This teaches us all that we'll simply have to learn to do better.

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