OMAPA

ORGANIZACIÓN MULTIDISCIPLINARIA
DE APOYO A PROFESORES Y ALUMNOS

PROGRAM OF SCIENTIFIC INITIATION WITH EMPHASIS IN
MATHEMATICS FOR YOUNG TALENTS

DECEMBER, 2013

Mathematics, computer literacy and three spoons of curiosity are the essential ingredients for success.

Bill Gates

PROGRAM OF SCIENTIFIC INITIATION WITH EMPHASIS IN MATHEMATICS FOR YOUNG TALENTS

SUMMARY

The program of Scientific Initiation with Emphasis in Mathematics for Young Talents developed by OMAPA aims to empower the young talents who are, with no doubts, the most valuable resource of our country.

It is the first and only program with these features in the country, has a national scope and proven international effectiveness and has been conducted continuously since 1989.

It consists of three main steps: 1st) Detection and motivation through National Mathematical Olympiads; 2nd) Academic and Scientific Training; and 3rd) Incentive to Excellence.

The long-term impact intended with the program, besides of the one that every student can achieve by his own, is the continuous training of Paraguayan professionals in science and technology, which will be the engine for the social and economic development of Paraguay.

In 2013, about 350.000 students from throughout the country participated in the first stages of detection and motivation. 359 outstanding students participated in the stages of Academic and Scientific Training.

In the last three years this program has had an important growing thanks to the sponsorship of national organisms through cooperation agreements that assured financial resources until 2013.

OMAPA intends to continue this work by finding new sources of funding to collaborate actively in the realization of the aims of the program and therefore strongly bets to the support of individuals and companies who want to help with their donations through GlobalGiving.

DESCRIPTIONS OF PROGRAM ACTIVITIES

The achievement of the objectives requires a work in different stages: one of detection and selection, other of specific teaching and training, according to the needs of each student, and the last, the stage of international competition, where the advances of this program are evaluated based on the results.

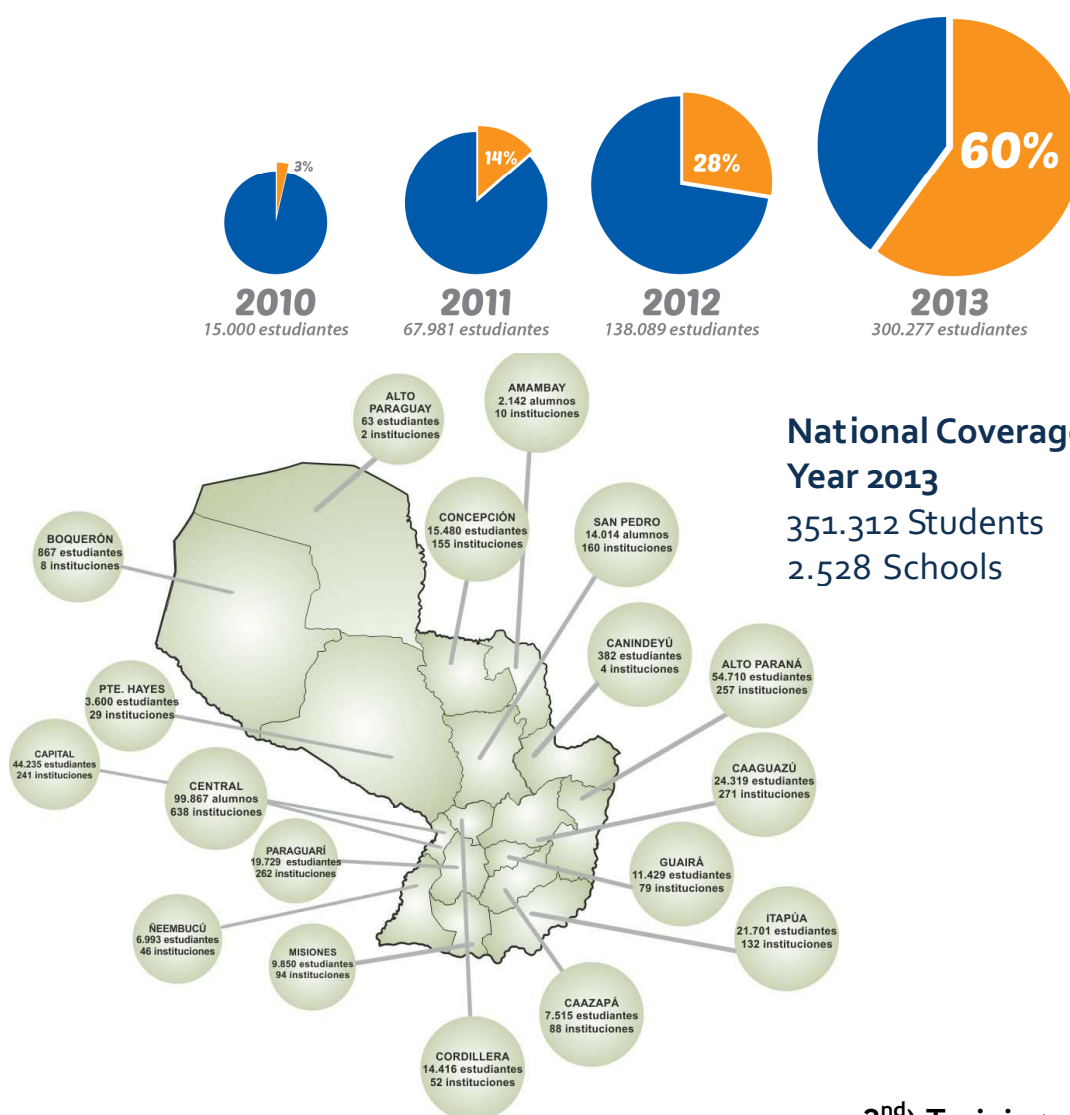### 1st) Detection and selection through the National Mathematical Olympiads

It is conducted along the months of March and October every year, in five rounds, with contestants coming from public and private schools throughout the country. Until 2010, the number of participants on this stage was around 33.000 students, and in 2013 it has been reached the record of 350.000 students participating.

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The students with the best scores of this event (which was 452 in 2013) are invited to the courses of mathematics of the Program of Scientific Initiation with Emphasis in Mathematics for Young Talents.

✚ NATIONAL MATHEMATICAL OLYMPIAD

300.277 students from public schools participated in the National Mathematical Olympiad 2013

499.071 is the number of students of public school throughout the country *

(*) Según datos MEC 2011

2010	2011	2012	2013
3%	14%	28%	60%
15.000 estudiantes	67.981 estudiantes	138.089 estudiantes	300.277 estudiantes

ALTO PARAGUAY
63 estudiantes
2 instituciones

AMAMBAY
2.142 alumnos
10 instituciones

CONCEPCIÓN
15.480 estudiantes
155 instituciones

SAN PEDRO
14.014 alumnos
160 instituciones

BOQUERÓN
867 estudiantes
8 instituciones

CANINDEYÚ
382 estudiantes
4 instituciones

ALTO PARANÁ
54.710 estudiantes
257 instituciones

PTE. HAYES
3.600 estudiantes
29 instituciones

CAAGUAZÚ
24.319 estudiantes
271 instituciones

CAPITAL
44.235 estudiantes
241 instituciones

CENTRAL
99.867 alumnos
638 instituciones

PARAGUARÍ
19.729 estudiantes
262 instituciones

GUAIRÁ
11.429 estudiantes
79 instituciones

ÑEEMBUCÚ
6.993 estudiantes
46 instituciones

ITAPÚA
21.701 estudiantes
132 instituciones

MISIONES
9.850 estudiantes
94 instituciones

CAAZAPÁ
7.515 estudiantes
88 instituciones

CORDILLERA
14.416 estudiantes
52 instituciones

National Coverage Year 2013
351.312 Students
2.528 Schools

2nd) Training

Courses of Scientific Initiation with Emphasis in Mathematics: these courses are especially designed to empower the talent for problem solving in young with skills in this discipline. Thus, students reach high levels of training which enable them to achieve a higher level of mathematics to that achieved in formal education in our country, and also enable them to successfully compete in international high level competitions.
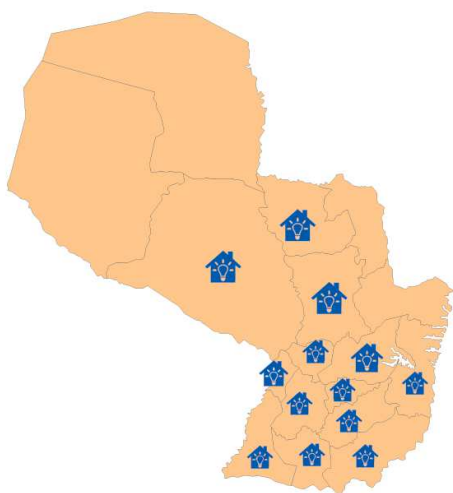
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✚ CENTERS FOR YOUNG TALENTS - 2011 to 2013

Department	2011	2012	2013
Asunción/ Central	✓	✓	✓
Alto Paraná	✓	✓	✓
Caaguazú	✓	✓	✓
Concepción	✓	✓	✓
Guairá	✓	✓	✓
Itapúa	✓	✓	✓
Misiones		✓	✓
Ñeembucú		✓	✓
Paraguarí		✓	✓
Caazapá			✓
Cordillera			✓
Pdte. Hayes			✓
San Pedro			✓

Until 2010, courses were held exclusively in Asunción. Since 2011 activities started also in the Center of the countryside. OMAPA conducts these courses in three ways:

- Summer intensive course: two workshops of 40 hours each, one in December and one in February, in three levels: Beginning, Intermediate and Advance.

- Annual course: developed on Saturdays from March to September. Initial and Intermediate levels, 120 hours. Advanced Level, 240 hours. It covers subjects such as Number Theory, Algebra, Geometry (demonstrations, constructions), Combinatory (logic, games and strategy), always focused in problems solving.

- Online tutoring to outstanding young. Training materials are sent by email and then the solved problems are handed the same way, with a final feedback given by the teacher. During 2013, a former Olympian currently making his Doctorate in Applied Mathematics in the Massachusetts Institute of Technology (MIT) was in charge of the monitoring of 4 students of advanced level, on this way.

![OMAPA logo]

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+ SCIENTIFIC INITIATION FOR YOUNG TALENTS

79 — 2010	**211** — 2011	**258** — 2012	**359** — 2013

+ 13 Centers spread throughout the country
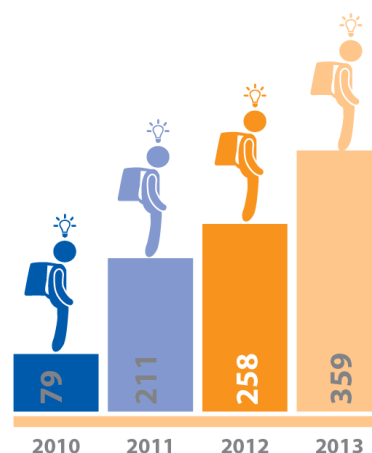
+ 525 young talents participated since 2011

Since 2011 and all along 2012 it was held, with great success, lectures of scientific initiation aimed to students of the program, in the cycle called **"Scientific Paraguay"**.

These lectures are issued by young Paraguayan researchers who had studied abroad, and thus bring closer to the students their experiences in the scientific world; they were held one Saturday a month, from 13:30 to 15:30 hours, in the postgrad classrooms of the Rectorate of National University of Asunción, and were followed online in the other 5 centers of scientific initiation that were working in countryside in 2012.

In total, 3 lectures were issued by young Paraguayan researchers in 2011 and 6 lectures in 2012.

+ CYCLE OF LECTURES SCIENTIFIC PARAGUAY

Lecturer	Subject	Date
Ing. Carlos Sauer, MSc.	Mathematics for the country's development	08/06/2011
Ing. Jorge Rodas, MSc.	Applications in Communications of the Signal Processing	09/17/2011
Ing. Hugo Checo, MSc.	Finite elements applied to the resolution of problems of dynamic of fluids	12/17/2011

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Ing. José Colbes, MSc.	The algorithms and their applications to problems of combinatory optimization and game theory	02/06/2012
Econ. Liz Barrios	Love's economy	02/06/2012
Econ. Guillermo Cabral, MSc.	Game theory: experiments of reactions under incentives	04/28/2012
Ing. Alberto Samaniego, MSc.	Evolutionary Algorithms applied to the game Mastergoal	05/19/2012
Ing. Inocencio Ortiz, MSc.	Matrix and facial recognition	07/07/2012
Ing. Hyun Ho Shin, MSc.	Turbulence: encounter between probabilistic and deterministic	08/18/2012

3rd) Incentive to Excellence

The best ones among the best students represent to Paraguay in the international competitions (of Mathematics and Astronomy), in both onsite and by correspondence.

On this way, students can compare their performances with the highest standards not only locally but in a world level; by spreading their achievements, the goals and self-esteem of the Paraguayan youth and all the educative community are raised.

The students of this program coming from public and private schools participate equally, competing to qualify for the Paraguayan teams that represent the country in international Olympiads. In case they are qualified (after hard exams of selection about problems with the subjects and own style for each Olympiad), they receive intensive and specific training for each competition.

The Olympiads in which Paraguay participates are:

- Mayo Ibero-American Olympiad, by correspondence (23 countries)
- Cono Sur Olympiad, for students up to 16 years old (8 countries)
- Ibero-American Olympiad, for students up to 18 years old (23 countries)
- International Olympiad, up to 20 years old (more than 100 countries)
- Rioplatense Mathematical Olympiad, for students until the last year of High School (8 countries)
- Latin-American Astronomy and Astronautics Olympiad, for students until last year of High school (8 countries)

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✚ PARAGUAYAN AWARDS IN THE INTERNATIONAL MATHEMATICAL OLYMPIADS

Olympiad	Gold	Silver	Bronze	Honorable Mention	Puerto Rico Cup
IMO		1	3	11	
Ibero-American		3	13	15	2
Cono Sur			12	19	
Mayo	3	12	43	41	
Rioplatense			2		
OLAA		3	8	4	

✚ FORMER OLYMPIADS ¿WHERE ARE THEY NOW?

Even though it cannot be attributed the personal achievements of the students of the program exclusively to it, we are convinced that the vision, the skills and the goals achieved by the students during their stay in the program have contributed to these outstanding students to reach the places where they are now. As an example a list of some of them and their studies abroad are presented.

Nilda Chamorro
Civil Engineer by the National University of Asunción (Paraguay) with a minor in Environmental Engineering in the Palermo University (Italy).

Diego Segovia
Bachelor in Sociology by the Pontifical Gregorian University in Rome (Italy). He was the former Director of public policies and strategies at the Public TV of Paraguay.

Carlos Alberto Jara
Civil Engineer by the National University of Asunción (Paraguay), he is currently studying a Master's degree in sanitary engineering in Polytechnic University in Valencia (Spain).

Carlos Sauer
Electronic Engineer by the National University of Asunción (Paraguay) with a master's degree in Computer Science by the IMPA (Brazil), currently studying a PhD in applied Mathematics at the MIT (Massachusetts, USA) with a scholarship MIT – Fulbright – Itaipú.

Joel Prieto
Electronic Engineer by the Catholic University of Asunción (Paraguay) with a master's degree in engines from Sevilla University (Spain). He is currently studying a PhD in engines in Sevilla University (Spain).

Guillermo Cabral
Economist by the Catholic University of Asunción (Paraguay). Master in Economy by Torcuato di Tella University (Buenos Aires, Argentina).

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Carlos Jara de Marco
Economist by the Catholic University of Asunción (Paraguay), Master in International Political Economy and Development by Fordham University

Mattias Hiebert
Food Processing student at University of British Columbia (Canada)

Andrés Codas
Automation and Control Engineer and M.Sc. in Optimization applied to the oil industry in the Federal University of Santa Catarina. He is currently a researcher at the Norwegian University of Science and Technology (Norway).

Maurizio Caló
Master in Computer Science and Applied Mathematics student at Stanford University, California (USA) with a Stanford scholarship

Michael Chan
Aeronautical Engineering student at the University of Cordoba (Argentina)

Ezequiel Gamarra
Electromechanical Engineering student at the University of La Plata (Argentina)

Mauricio Maluff
Physics and Mathematics student at Northwestern University, Illinois (USA)

Marcos Martínez Sugastti
Mathematics and Economy student at Columbia University, New York (USA), with a scholarship of his University

Ariel Schvartzman
Computer Science student at the MIT (USA), with a scholarship of MIT

Enrique Díaz
Engineering student at Cornell University, New York (USA) with scholarship of Cornell University

Edgar Elizeche
Mathematics student at the University of New Delhi (India) with a scholarship of his University

Also, it is good to know that every year the students who participate in this program generally obtain the first positions in the admission tests in the different schools of the national universities of Paraguay, especially in the engineering school, where they study their careers successfully.

This is a good indicator of the valuable contribution that this program gives to their participants, since it shows the break in the gap that exists in Paraguay, between the levels of education of high schools and the demanded by the universities for the access and beginning of the academic activities in them.

✛ CURRÍCULUM YOUNG TALENTS (UPDATED TO DECEMBER 2013)

Beginning Level

- **Demonstration Techniques**
- **Algebra I**
- **Introduction to Number Theory**
- **Geometry I**

Intermediate Level

- **Combinatory I**
- **Games and Boards**
- **Algebra II**
- **Number Theory I**
- **Geometry II**

Advanced Level

- **Number Theory II**
- **Inequalities**
- **Geometry III**
- **Introduction to Mathematical Analysis in $\mathbb{R}^1$ (OBS.: Mini Course Year\ 2013, it is not repeated each year)**
- **Linear Algebra (OBS.: Mini Course Summer 2012, it is no repeated each year)**
- **Polynomials**
- **Functions and Functional Equations**