



They enjoy science and challenges

Brazil's progress in the science Olympiads motivates secondary school students and helps train new researchers

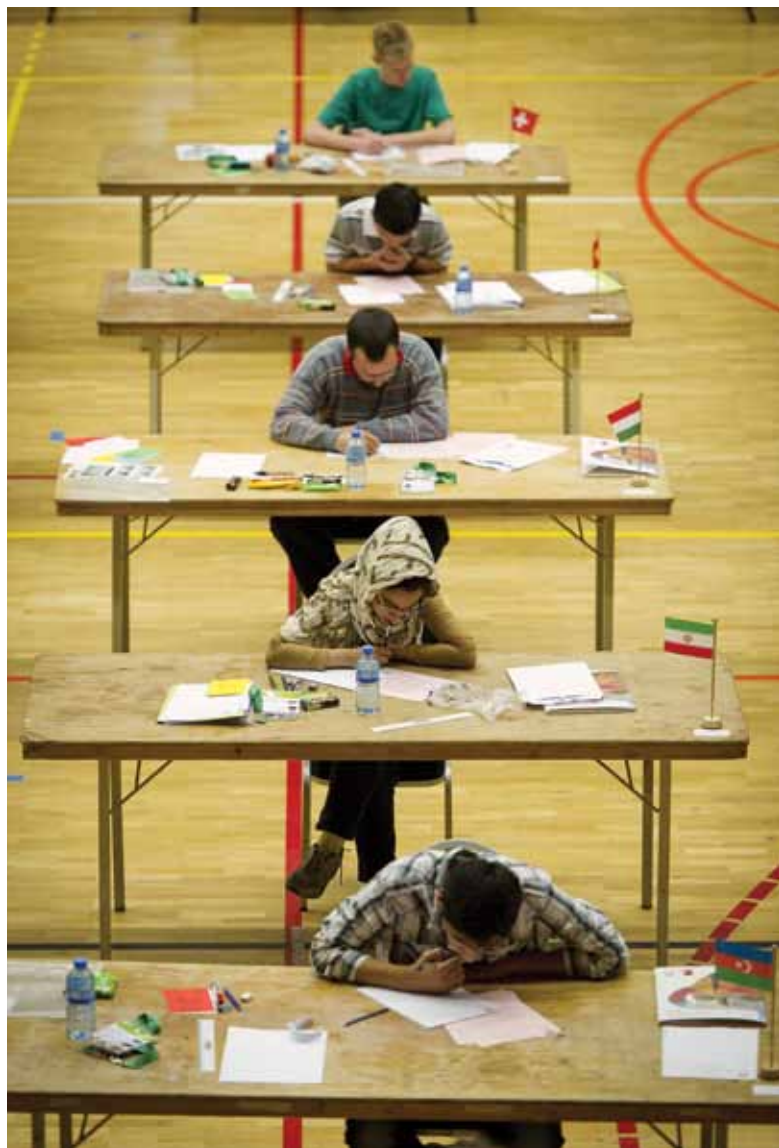
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As the first Brazilian to win a medal at the International Physics Olympiad, with a bronze in 2002 in Indonesia, Ronaldo Pelá, now 27, says that the experience of participating in science tournaments as a teenager had a major impact on his decision to become a researcher. Pelá is a professor in the Physics Department of the Aviation Technology Institute (ITA) in São José dos Campos. « The tournaments were decisive in helping me find my calling, » says Pelá, who completed his doctorate in 2011 with a grant from FAPESP. Participation in Olympiads during secondary school, he says, was a major incentive behind his quest for advanced knowledge and his growing enjoyment of intellectual challenges. Through the tournaments, he acquired valuable skills in many areas; in particular, he acquired skills that contributed to his science career. « The unrelenting routine of testing means that, at some point, you completely lose the fear of taking tests, » he recalls. Last year, Pelá received the Best Paper Award for Young Scientists at the International Conference on the Physics of Semiconductors held at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland. He is currently one of the leaders of the Semiconductor Materials and Nanotechnology Group (GMSN) at the ITA and is working on a simulation of magnetic semiconductor materials.

The GMSN, not coincidentally, has two undergraduate science students who have won a number of medals in science Olympiads. Pelá has always had an interest in meeting other

ITA Professor Ronaldo Pelá (*front*) and two of his students, Ivan Guilhon (*seated*) and Cássio Sousa (*standing*): these students have won medals in Olympiads and enjoy research



Students from over 100 countries participate in tests at the International Mathematical Olympiad in Amsterdam in 2011. The Brazilian medalists become physicians, engineers and researchers

medalists who study at the ITA, and a few years ago, he became one of the founders of a study group that assists the undergraduate students who are taking part in an annual tournament for young physicists at the Institute for Theoretical Physics (IFT) of the Universidade Estadual Paulista (Unesp). Last year, engineering student Ivan Guilhon Mitoso Rocha, 21, won first place in the IFT tournament, and he says that he is leaning toward an academic career. « I want to do a masters degree in physics. Recently I completed an internship in information technology at a financial institution and concluded that it is not what I want to do in the future, » says Ivan, who is conducting undergraduate scientific research on the link among three materials: graphene, silicene and germanene. Originally from Fortaleza in the state of Ceará, Ivan's collection of medals includes one silver from the International Physics Olympiad in Mexico in 2009, one gold from the the Brazilian Physics Olympiad and

one bronze medal from the Brazilian Chemistry and Mathematical Olympiads. Cassio dos Santos Sousa, 19, a Brazilian from the state of São Paulo, is striking a balance between an academic career and private initiative. He believes that it is still too early to decide between these options. « Taking part in Olympiads gives you quite a head start, » says Cassio, who won a silver medal at the International Junior Science Olympiad in South Korea in 2008, a bronze at the International Physics Olympiad in Croatia in 2010 and a gold at the Brazilian Physics and Robotics Olympiad, to mention just a few. Cassio's undergraduate science research is on graphane, a variant of graphene. « One common characteristic of the medalists is that they enjoy science and challenges. This kindles their desire to teach themselves and learn on their own, » says Lara Kühn Teles, a professor at ITA and one of the leaders, along with ITA Professor Marcelo Marques, of a research team that she established in 2007 under the Young Investigators in Emerging Institutions Program at FAPESP.

The ITA example shows how popular and important science Olympiads have become in Brazil. These regional Olympiads and the preparation of students for international tournaments, most often with support from universities, are boosting Brazil's performance in terms of winning medals, which contrasts the country's poor performance in international rankings for learning (see *Pesquisa FAPESP* No. 153). Professor Euclides Marega Júnior from the São Carlos Institute of Physics at USP has helped organize the Brazilian Physics Olympiad for 14 years and prepares the national team for the international Olympiad in this subject area. The professor says, «We learn from experience and strengthen training for students. The performance of Brazilian students has improved significantly since Brazilian Ronaldo Pelá took the bronze medal in 2002. In the last two years we have won gold and silver medals. » » This performance has been repeated in other tournaments. In the International Mathematical Olympiad last year, Brazil took one gold medal, one silver and three bronze medals, which is an improvement over its performances in 2010 and 2011, when the country failed to win a single gold medal. In the 2012 International Chemistry Olympiad, Brazilians won one silver and three bronze medals.

Another example of Brazil's increasingly professional approach to preparing competitors is found in a team of young engineers, mostly graduates of the Polytechnical School at USP, who founded a company to train the Brazilian teams for the International Junior Science Olympiad (IJSO) and the International Young Physicists

« Medalists like challenges and strive to learn on their own, » says Lara Kühl Teles of the ITA

Tournament (IYPT). The B8 Educational Projects, the organization founded by the young engineers, build upon the experience of several of their members who competed in these Olympiads when they were in secondary school. « Stimulation and challenge is lacking for the brightest students, so we are helping to mitigate this problem, » says one of the members, electrical engineer Márcio Martino; Martino won a gold medal for Brazil at the IYPT as well as silver and bronze medals at the Brazilian Physics Olympiad. In 2007, the company established a national event at the IJSO to select the team for the international tournament, held in Iran last year. Brazil won one gold, three silver and two bronze medals, as well as its very first gold in the experimental tournament. In 2011, the B8 Educational Projects group also began to organize the Brazilian IYPT event, with a new, nontraditional tournament format. In an auditorium in São Paulo, 20 teams from various cities in Brazil took practical tests in which one team tries to solve a problem, the second team questions the solution and a third questions and evaluates the performance of the first two, all under the supervision of a panel of judges. Each of the five best teams sends one representative to the International Tournament.

Of course, it is not just the academic environment that benefits from these talents. « We have

Matheus Camacho, who won Brazil's very first gold medal at the International Junior Science Olympiad in Iran, complains that the elementary school content is repetitive

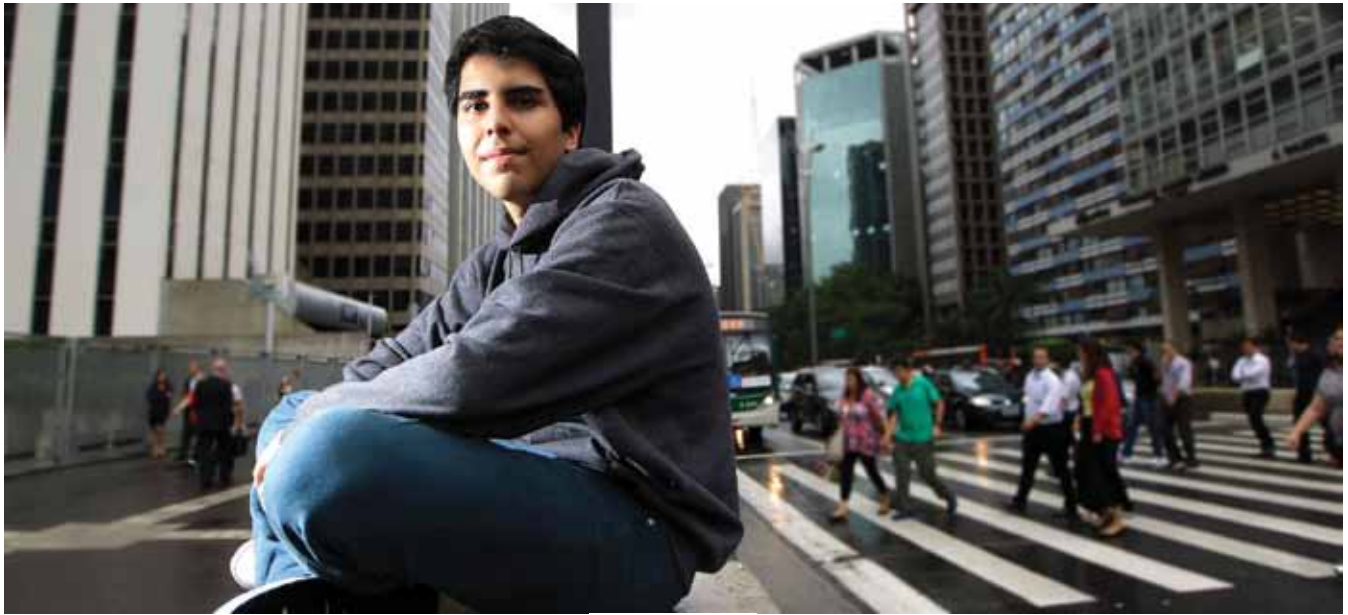
medalists who have become physicians, engineers, educators, and then there are those who have pursued an academic career, » says Nelly Carvajal, Secretary of the Brazilian Mathematical Olympiad (OBM), organized by the Institute for Pure and Applied Mathematics (IMPA). IMPA itself has profited from these talents. The coordinator of the OBM, Carlos Gustavo Moreira, age 40, won the gold medal in China in 1990 and the bronze in Germany in 1989 in the International Mathematical Olympiad. Mathematician Artur Ávila, who divides his time between IMPA and the Jussieu Mathematics Institute in Paris, won the gold in the tournament in Canada in 1995. Ávila has been mentioned as a candidate for the Fields Medal, the highest award for mathematicians under 40 years old.

To be sure, recognition in an international Olympiad has become a powerful credential that can lead to scholarships at excellent secondary schools and job offers after graduation. « Olympiads have proven to be an excellent way to select the best candidates, and major companies and research institutions worldwide recognize this, » says Ricardo Anido, professor at the Unicamp Institute of Computing. Anido helps organize the Brazilian Computer Society's Informatics Olympiad and university informatics marathons; he also helps prepare the Brazilian team for the International Olympiad in Informatics. Anido observes that jobs in conglomerates such as Google and Facebook are the most attractive to medalists. « Companies compete for talented professionals and some act in a manner that I consider unethical. Until recently, a large company customarily invited all the finalists from the Brazilian Programming Marathon to internships, even though a competitor sponsored the marathon. They've now stopped doing it, » says Anido.

Gabriel Dalalio, 21, is in his final year of computer engineering at the ITA and is currently spending three months in California on an internship with Facebook. « I plan to work as a programmer and am evaluating the experience in the United States to decide whether to stay here or work in Brazil, » says Gabriel, who has won bronze medals in two editions of the International Olympiad in Informatics. « I put it on my resume and indicated that I would take part in the global marathon in July, in Russia. My supervisor at Facebook said that he too would be going to the marathon. They focus on people who do well in computer studies. They know exactly what a bronze medal is, » says Gabriel.

One common trait seen in many medalists is their willingness to help the younger students who are new to Olympiad tournaments. Ricardo





Anido says that he usually invites prize-winning students to help prepare the questions for the tests, and they are always ready and willing. « I recently spent four days in a small city poring over questions for the Brazilian Informatics Olympiad. In the end, they were the ones who were thanking me, » Anido says. Regis Prado Barbosa, a 22-year-old student from Ceará studying computer engineering at the ITA discovered his vocation as a math teacher while helping to prepare secondary school students for the International Mathematical Olympiad. Barbosa participated in several editions of the tournament, taking two silver medals—in Vietnam in 2007 and in Spain in 2008—along with a bronze medal in Slovenia in 2006. « I was impressed with this experience. I enjoy creating difficult problems and find it even more rewarding when I see a student who comes up with a solution that is better than mine. I chose computer engineering to broaden my horizons, but

Gustavo Haddad Braga has seven international medals; he left the School of Medicine at USP when he was accepted at MIT

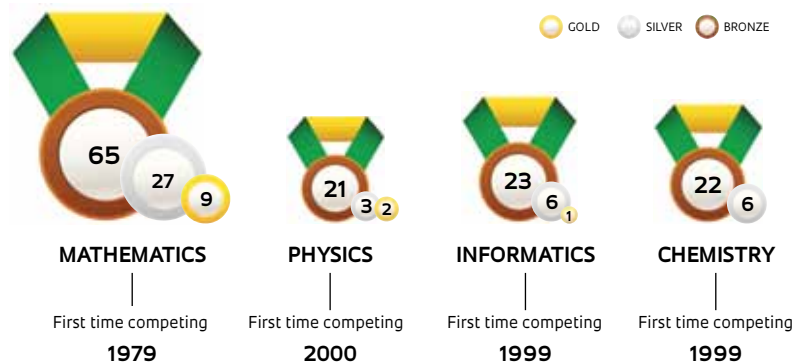
I discovered that I really like teaching, » he says.

However, the organizers of the Brazilian Olympiad have one major concern: the medalists tend to leave Brazil once they graduate. « We're losing talent, » says Euclides Marega Júnior. « We organize the Olympiads, help identify talented people early on, and then they go and apply to foreign universities such as Harvard and MIT, and they are accepted, » he complains. « It's relatively easy for medalists to get scholarships to the École Polytechnique and go study in France, and they get a grant of €1,000 a month. They take our talented students for €1,000! We need to figure out how to keep them in Brazil. They need incentives to stay. It's not only about scholarships: they also need to be offered challenges that they can delve into, in addition to good tutors, » he says. Ricardo Anido believes that medalists should be permitted to enter Brazilian universities without being required to take the college entrance exam. « It would be an incentive for them to stay. Foreign universities admit them based solely on a review of their résumés, » he says.

Gustavo Haddad Braga, an 18-year-old student, has one of the largest collections of medals in the country. He holds 50 Brazilian and seven international medals, including a gold medal from the International Physics Olympiad held in Thailand in 2011. He recently left Brazil to study at the undergraduate level at the Massachusetts Institute of Technology. Raised in São José dos Campos, he spent six months studying medicine at USP while he waited to see whether he would be accepted at MIT. He was accepted and received a scholarship from the National Council for Scientific and Technological Development (CNPq) to study in the United States at the undergraduate level. He was very much looking forward to studying abroad

Brazilian medalists

Brazil's achievements in the international science Olympiads



even before his performance in the Olympiad in secondary school. « The first time I ever heard of MIT was in the seventh grade when I met the father of a student who had been accepted at MIT. I thought to myself: MIT must be a great place, » he recalls. He still does not know if he will study computers or electrical engineering at MIT; he will not decide until after his first year there. However, he plans to return to Brazil after graduating. With entrepreneurial enthusiasm, he and some classmates helped establish three promising business ventures: one is a site with tips on how to apply to universities in the United States; another is a service that connects students with strong skills to companies interested in sponsoring them to study abroad—in exchange, these companies take on the students as interns once they complete their studies; and the third is an application that discreetly connects Facebook friends who are seeking a boyfriend or girlfriend. The idea for this service emerged last year, when Braga competed in a programming and entrepreneurship tournament in Miami, where he won a \$50,000 prize that he invested in the business.

The personal experiences of a medalist in a science Olympiad are unusual. Gustavo Haddad Braga, for example, has been to countries that very few people his age have visited. Among the places where he has participated in Olympiads are countries such as South Korea, Azerbaijan, China, Croatia, Poland and Thailand. The study routine is arduous and requires both time and interest to master content that is generally explored only in higher education. The youngest star among the Brazilian medalists attracts attention precisely because he manages advanced knowledge so easily. Matheus

A medalists' study routine is arduous and requires both time and interest to master content

Camacho, 14, won a gold medal at the International Junior Science Olympiad, held in Iran in December. He answered all of the questions correctly for the practical test on a DNA electrophoresis experiment (a technique for separating molecules) including physics, chemistry and biology. He also won silver in the individual general category, in which a student's performance is evaluated using three tests: objective, discursive theory and experimental.

This feat is impressive because Camacho is a student who just began his ninth year in middle school (the other two members of his team were secondary school students). His first contact with chemistry and biology content was just last year, but he was already familiar with physics from studying on his own. Matheus, of course, likes to study, but his relationship with school is ambiguous. In the morning, he attends ninth grade classes at Colégio Objetivo in São Paulo, but he finds them very repetitive, especially physics, chemistry and biology. He feels that the only class in which he is learning new things is Portuguese, which, he admits, is not his favorite subject. He spends part of his afternoons as well as his Saturdays attending advanced preparatory classes for Olympiads at the same school. His subjects include differential calculus, which he considers to be challenging. At night, he studies for an hour or two, but it is important for him to stay in touch with the friends from the elementary school where he started. He also exercises daily and has been a fan of the Beatles since childhood. Simone, his mother, says, « He complained that he was not interested in school because he considered it repetitive. » His father, Carlos Henrique, a colonel in the Army, says, « We try to give him the support he needs. If he asks for a book, I buy it. When he told me confidently that he was going to Iran, even before he was chosen for the last national team, I admired his conviction and I knew that I had to encourage him, for sure. Deep down, I think he already knew he would meet his goal. » « I have met people from all over the world, and it has been a very interesting experience, » says Matheus. He does not yet know what he wants to study, but he does enjoy surfing the Harvard and MIT web sites and keeps both institutions on his radar screen. ■



ITA student Gabriel Dalalio in San Francisco. The bronze medal that he won at the Informatics Olympiad was his passport to a three-month internship with Facebook