in is possible to trace the history of competitive solving of mathematical problems at least to the early 16th century — well remembered in the colourful story of the solution of the cubic is the contest between Antonio del Fiore and 19th centuries, significant mathematical discoveries were often made in prize competitions arranged by academies and learned societies on themes considered to be important. Among the participants of such competitions we find several giants of science, including Gauss.

There are widely divergent opinions on the moral issues involved in competition in education. However, it is a fact that competition in school has always existed. In particular, competition in solving problems in school mathematics has often been an essential part in tests for admission to universities. The Concours Générale in France, originally dating from the 18th century, is probably the oldest independent mathematical school competition. However, the present-day voluntary competitions for high school students with the expressed aim of promoting mathematical talent and arousing interest in mathematics can be regarded to be descendants of a competition in Hungary.

The mathematical competitions in Hungary were started in 1894, to commemorate the fact that the chairman of the Hungarian mathematical society, Baron Lorraz Eötvös, was promoted to Minister of Education of Hungary. The Eötvös competition, later renamed after József Kürschak, played an important role in the mathematical life of Hungary — a good testimony for this is the list of winners from the early years which includes famous names such as G. Szegő, E. and M. Riesz, T. Radó, L. Kalmár, L. Fejér, A. Haar, T. Kárný, E. König, L. Rédei, T. Gallai etc. (It is claimed that Jôba von Neumann, probably the most famous Hungarian mathematician of the century, was always somewhat bothered by the absence of his name from the list, and was eager to explain the reason for this, namely that he had been abroad at the time of the competition the year he was eligible to participate, but on receiving the problems in a letter from a friend, he had solved the problems in half an hour.)
Linking mathematical competitions with sports — and, incidentally, also with classical Greek, the birthplace of the science of mathematics — in the name mathematical olympiad was first done in the Soviet Union. In 1934 and 1935 local olympiads in high school mathematics were organized in Leningrad and Moscow, respectively, by the State Universities in these cities. Various kinds of mathematical competitions have been organized in different countries in the first half of this century, but the development which led to the International Mathematical Olympiads started around 1950, when several countries in Eastern Europe developed a rather uniform "pyramid-shaped" system of national competitions in several rounds on school, local, district, and national levels, with the winners in each round qualifying for the next round. From this system, it was a small and natural step to add one more round, the international one.

The initiative was taken in 1956 by the Romanians, in particular by professor Tiberiu Rusan. In July 1959 the first IMO was organized in Brașov, with eight member teams from Bulgaria, Czechoslovakia, Hungary, Poland and Romania and a four-member team from the Soviet Union, in fact Moscow. In the next few years, there were no additions to the list of competing countries, but in 1965 and 1964 two countries, Yugoslavia and Mongolia, joined in, to be followed by Finland in 1965 and by France, Great Britain, Italy and Sweden in 1967. Since then, the number of participants has slowly but steadily increased: there were 15 teams in 1971, 21 in 1977, 27 in 1981, and 34 in 1984. For various reasons, many countries have not been able to participate without interruptions. Only Romania, Czechoslovakia and Bulgaria have participate in each of the 25 IMOs. On the other hand, only a few countries have dropped out after a try; in the 25 IMO’s organized the far altogether 38 countries have sent their teams. The total number of participapant students is 2799, but since it is not uncommon for a bright student to participate in several consecutive IMOs, the actual number of young people who have actually directly benefited from the IMO is probably around 2500.

The first two IMOs were held in Romania, the third in Hungary, the fourth in Czechoslovakia etc. Eventually, an ordering was established among the original IMO countries according to which each country in turn was responsible for organizing the event. The expenses with the numerous new countries entering the competition, the burden of organizing could no longer rest on a few countries. The first "non-standard" organizer was Austria in 1976, to be followed by Great Britain in 1979. At this stage, the lack of an international coordinating organ became manifest: in 1980,
no IMO was arranged. In the same year, the International Commission of Mathematical Instruction created the IMO Site Committee with the sole task of providing assistance in finding an IMO organizer for each year. Since 1981, the IMO tradition has continued unbroken, and by all indications seems to continue in the future, too.

Basically, the way the IMO is run can be read from the IMO rules elsewhere in this program. The rules and conventions of the IMO have remained remarkably stable over the years, in spite of the increase in the number of participants and the diversification in their cultural and political backgrounds. This is even more surprising when viewed against the fact that the rules are not fixed by any international authority. Some changes have inevitably taken place. For a long time, the maximal team size was eight students. In 1982, the teams were reduced to four students and from 1983 the size has stabilized to six. The number of problems has fluctuated between six and seven and the time allotted for the two written tests between three five hours each.

The scientific leadership of the competition reas in the hands of the International Jury which consists of all the leaders of the teams. The Jury selects the traditional six problems from the proposals sent in by the participating countries. Much effort in Jury is devoted to the formulation of the problems in a manner which should not favor any participant. In the beginning, the problems were chosen from those parts of school mathematics which were common to all the participating countries. Nowadays, this common part is difficult to find owing to the curriculum reforms and other variations in the many participating countries. The problems represent rather a special kind of mathematics, which could even be called olympiad mathematics. It is a narrow field which never has been formally defined, but it contains certain parts of the so-called pre-calculus mathematics. The difficulty of the problems does not lie in the amount of information needed to understand and solve them but in the ingenuity and mathematical insight needed. Olympiad mathematics may not be school mathematics in the strict sense of the word, but in the selection of topics one could perhaps find implicit statements on the directions of school mathematics preferred by the Jury. So, for instance, problems of geometric character appear frequently in spite of the sharp decline of geometry teaching in recent years.

An important role in the IMO is played by the coordinators, who read, assisted by the team leaders, all the answers and are responsible for maintaining a uniform standard of marking. In practice, the coordinators are decisive in the evaluation of the competitors' answers: although the
final responsibility in deciding on the prizes belongs to the Jury, in practice only the coordinators who specialize on one problem each, have time enough to become sufficiently familiar with the answers. The marking of the answers and selection of the winners has always been performed in a humane fashion. Although one could say that in mathematics, a proof either is correct or then it is not, credit is usually awarded for partial solutions. In most IMO's the relative difficulty of the problem has been taken into account in deciding the maximum number of points for each problem; for some problems the maximum has been as low as 4 while in some cases a correct solution has given 9 points. The students will not learn the maximum numbers until after the tests. In recent years, it has been increasingly difficult for the Jury to predict which problems will in fact be more difficult, and a more uniform marking scale has been adopted. In contrast to its namesake in sports, the IMO is by no means seeking to find out "the best young mathematician in the world" but rather trying to encourage gifted young people on a wider front, the number of prizes is large. In the first IMO, 3 first, 3 second and 5 third prizes were awarded for the total of 52 participants, and from the 4th IMO on, the number of students receiving prizes has been approximately one half of the total number of participants. The percentage of prize-winners has varied between 21 and 67. Nowadays, it is a stated objective in the rules that the ratio of the number of first, second and third prizes should be approximately 1 : 2 : 3. The application of this rule has been flexible: since one expects that for a first prize an almost flawless performance is sufficient and necessary, a predetermined ratio is sometimes hard to achieve. In fact, ratios as wide apart as 1 : 1.05; 0.83 and 1 : 6.67 : 7 have appeared, but if the total number of prizes during the whole history of the IMO is counted, on obtains the ratio 1 : 1.95 : 5.03, and 49.98% of participants have won a prize. It is also possible to award a special prize for a particularly elegant or mathematically interesting solution of a single problem. In recent years, the Jury seems to have become increasingly critical in judging special solutions. And the number of special prizes has remained very small.

In principle, the IMO is not a team competition. All participants work independently, and only individual work is recognized by prizes. On the other hand, the uniform size of the teams inevitably leads to summing the individual points and making international comparisons: when the results of the IMO are published in various mathematical or educational journals, one is likely to find not the names of the winners but a list of countries. The first name in this list has been the Soviet Union in 11 years, Hungary in six, Romania, United States and German Federal Republic twice and
Czechoslovakia and German Democratic Republic once each. The total number of points achieved thus far is larger for Hungary (5482), trailed by Soviet Union (5224) and Romania (4651). - Of course there is no real basis for comparisons like this since different countries have been able to participate a different number of times, the team sizes and theoretical maximal numbers of points have varied etc.

The IMO is not a novel phenomenon any more, and one should be able to trace its effects if there are any. One question to ask is the relationship of the competition to the education of future mathematicians. It has been pointed out that successful work in, say, research mathematics requires skills totally different from those needed in problem solving in a competition. The author does not know of any systematic follow-up study of the IMO participants; such a study would be useful. On the basis of a rather superficial inspection of the standard mathematical reference journals one is lead to believe that many successful IMO participants indeed engage themselves in mathematics. Take the year 1965 for instance. All the eight first prize winners of that year have published referenced work in mathematics as well as at least seven of the twelve second prize winners and eight out of the 17 third prize winners. Among the invited speakers of the International Congresses of Mathematics, one finds at least eight IMO prize winners, and one has even received the coveted Fields Medal for mathematics equivalent of the Nobel Prize.

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