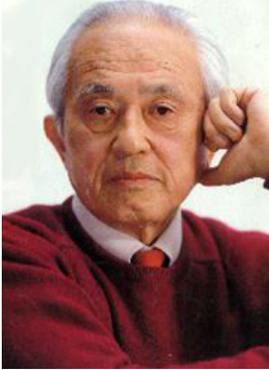




## Minoru Oda



Sapporo, Japan, 24 Feb. 1923 – Tokyo, Japan, 1 Mar. 2001

**Title** Professor of Astrophysics, Tokyo University of Information Sciences, Japan

**Field** Astrophysics

**Nomination** 18 Sep. 1992

### Most important awards, prizes and academies

**Awards:** Japan Academy Award-Emperor's Award (1975); Ziorkovsky Medal-USSR (1987); Von Karman Awards-IAA (1987); 6th Marcel Grossmann Award (1991); The Order of Cultural Merit-Japan (1993); COSPAR Award (1996). **Memberships:** The Japan Academy (1988); Academia Europaea (1994); Indian Academy of Sciences (1994).

### Summary of scientific research

The main contributions of Prof. Minoru Oda are in the study of X-ray astronomy since 1963 when he joined Prof. Bruno Rossi of MIT who is one of the founders of the X-ray astronomy, after years of his contributions in solar radio astronomy and cosmic ray physics. Some details of his activities are briefed in the following.

1-1): The location of the first-discovered and the brightest X-ray sources Sco X-1 was precisely determined by means of the modulation collimator invented by himself on board sounding rockets in collaboration with his colleagues at MIT in early 1960. The references include: Oda, M. *et al.*, *Nature*, 205, 55 (1965); Clark, G. *et al.*, *Nature*, 207, 58 (1965); Gursky, H. *et al.*, *Astrophysical J.*, 146, 3 (1966).

1-2): The X-ray source Sco-X-1 was identified with an optical object by an international collaboration of X-ray and optical group in US and Japan; i.e., Oda and his colleagues at MIT and at American Science and Engineering on the one hand and Palomar Observatory and Tokyo Astronomical Observatory (TAO) on the other. See, e.g., Sandage, A. *et al.*, *Ap. J.*, 146 (1966); Oda, M., *Space Science Revs*, 8, 507 (1968).

1-3): The location of an X-ray source in Cygnus Constellation was precisely determined by using the modulation collimators on board balloons, sounding rockets and satellites. The collaboration on this object, Cyg X-1, led optical and radio astronomers to conclude that it is a very likely candidate of the black hole. See, e.g., Miyamoto, S. *et al.*, *Ap. J.L.*, 168, 211 (1971); Oda, M., *Space Science Revs*, 20, 757 (1977).

1-4): The X-ray study of the structure of Crab Nebula was performed by means of modulation collimators on board a sounding rocket under the same collaborations 1-1). See Oda, M. *et al.*, *Ap. J.*, 148, L5 (1967). Also a series of balloon experiments with modulation collimators were carried out under collaborations of ISAS and UCSD. See Pelling, M. *et al.*, *Ap. J.*, 319, 419 (1987). The evolution of X-ray astronomy since 1960s is reviewed in Oda, M., «Genome» Records in the History of X-ray astronomy; *New Horizon of X-ray Astronomy* (Universal Academy Press, Tokyo) ed. Makiko, Oshashi 1994, P3.

2-1): The Solar astronomy satellites, Hinotori and Yohkoh, were launched by ISAS and produced X-ray images and X-ray movies of the Sun under the collaboration of ISAS and TAO with US laboratories, Lockheed, Naval Research Laboratory and others, as well as with those in UK, RAL and MSSL. Oda as the Director general of ISAS then was instrumental in coordination of this international undertaking. See Oda, M., *Physics of Solar and Stellar Coronae*, ed. Linsky and Serio, pp. 59-68, Kluwer Academic Publishers (1993).

2-2): Oda promoted an international collaboration between Japan and India on the study of multi-band observation of Sco X-1. Namely ISAS and TAO worked with Tata Institute of fundamental Research on the simultaneous observations of the object in X-rays, visible, infrared and radio on a number of occasions. See Matsuoka, M., *Nature*, 236, 53 (1972).

2-3): Ora promoted an international collaboration between ISAS/TAO in Japan and MIT/ASE/Palomar Observatory in US together with some of the ground-based observatories in both the countries on the simultaneous observations on X-ray bursts. See Pedersen, H. *et al.*, *Ap. J.*, 263, 325 (1982); Lawrence, A. *et al.*, *Ap. J.*, 267, 301 (1982).

2-4): Oda played an important role in coordinating the study of Solar Terrestrial Physics by means of the satellite GEOTAIL launched by ISAS and NASA in 1996. This experiment explored far in the wake of the solar wind behind the moon.

**Commemoration** – Minoru Oda was born in 1923 in Sapporo. He studied physics in Osaka, where he graduated in 1944. After a few years spent in the construction of Japan's first radio telescope, he moved to MIT, where he started a long collaboration and friendship with Bruno Rossi, working first in the field of cosmic ray showers and, starting from 1962, in the study of extra solar X-ray sources with the help of satellites. Minoru Oda made important contributions to the study of X-ray sources, and in 1965 devised an original method for the localization of these sources through the invention of the modulation collimator. These collimators played a crucial role in the optical identification of the first X-ray source, Sco X-1. X-ray astronomy and space science became the lifelong mission of Minoru Oda. In Japan he became a professor in the newly founded Institute for Space and Aeronautical Sciences (ISAS) at the University of Tokyo, an institute that he directed from 1984 until his retirement in 1988. Under Oda's direction ISAS had an enviable record of successful missions, probably unequalled by other agencies, among which Hakucho and Tenma, as well as the Japanese-British satellite Ginga. After retiring from ISAS, Oda was appointed president of RIKEN, an important Japanese research institute. When he died last year he was still very active as president of the Tokyo University of Information Sciences. Many scientists in Italy and elsewhere will remember Oda's friendship and generosity, especially to young people. Many of us will remember Minoru through his delightful watercolours of flowers collected in different parts of the world.

Nicola Cabibbo