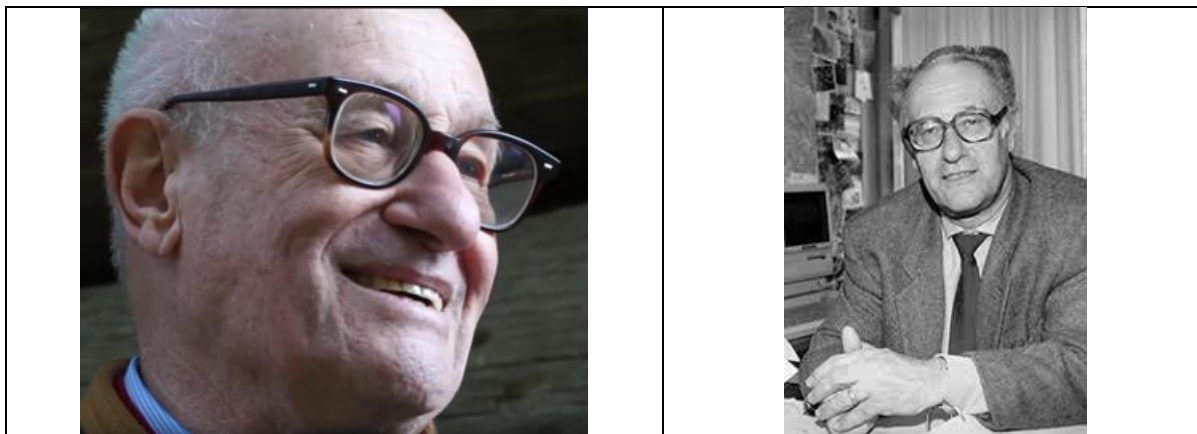


## THE DOYENS OF MEDICAL PHYSICS: PROFESSOR LUCIANO BERTOCCHI – THE MAN WHO MADE ICTP A GLOBAL HOME FOR MEDICAL PHYSICISTS FROM LMI COUNTRIES

By Prof. Slavik Tabakov, Emeritus President IUPESM, President IOMP (2015-2018)



Prof. Luciano Bertocchi – a relatively recent photo and a photo from 1990s as ICTP Acting Director

There is hardly a medical physicist from the Low and Middle Income (LMI) countries, who has not been aware of the tremendous role, which ICTP has in spreading medical physics activities in all corners of the world. The International Centre for Theoretical Physics (ICTP) at Trieste, Italy has been opened in 1964 in Trieste by the Nobel Laureate in physics Prof. Abdus Salam (1926-1996). After Prof. Salam's death ICTP has been named Abdus Salam International Centre for Theoretical Physics. This unique institution, operating under the aegis of UNESCO, IAEA and the Italian Government, has always been an international hub for research, education and training.

Prof. Luciano Bertocchi has worked with Prof. Abdus Salam from the establishment of the ICTP. He and his colleague Giorgio Alberi initiated activities in the field of medical physics in 1982 when ICTP hosted an International Conference on the Applications of Physics to Medicine and Biology. This was followed by a second such conference in 1983 with 259 international delegates. Soon after this Conference Giorgio Alberi passed away and these activities were continued by Prof. Bertocchi. Thus the first workshop on Medical Physics with colleagues from LMI countries was organized in the same year, 1983. The success of these conferences, and the need of developing Medical Physics also in Third World countries, convinced ICTP that it was the right time to expand its training activities in the field of medical physics. Two more Workshops on Quality Control in Medical Physics X-Ray Diagnostic Equipment followed in 1985 and 1986, organized by Prof. Bertocchi and Dr Anna Benini (at that time IAEA Expert). This led to the opening of the College on Medical Physics in 1988 - a four week activity, which from its first run attracted 68 scientists from LMI countries. This extremely useful activity continues to this day and Prof. Bertocchi was its Local Co-Director until his 90th anniversary. Currently over 1500 scientists from 82 LMI countries have attended this regular (now biannual) ICTP College. Many of them have started medical physics activities in their own countries. This way the global impact of the College on Medical Physics has reached now a very significant part of the medical physicists in LMI countries, who are directly or indirectly related with ICTP.

In 2014 Prof. Luciano Bertocchi arranged the establishment of the unique Master programme in Advanced Medical Physics, which he inaugurated together with Prof. Renato Padovani and Prof. Renata Longo. This activity was based on a cooperation between ICTP and the University of Trieste with the strong support of the Italian Association of Medical Physics, and the IAEA. Thus the students from this Master programme not only attend full set of Master-level education modules, but also pass clinical training. So far over 200 students from LMI countries have graduated this Master programme.



Prof. Luciano Bertocchi (right) with students from the 3<sup>rd</sup> MSc cohort and ICTP and University of Trieste officials, 2017



Prof. Luciano Bertocchi (middle) with faculty and students from ICTP College on Medical Physics, 2024

Prof. Luciano Bertocchi was born in 1933 in a small village in the Alps - at the triple corner between Italy, Austria and Slovenia. The 500 inhabitants of the village speak 4 languages: Italian, German, Slovene and Friulano.

After the High School in Udine, Prof. Bertocchi graduated Physics in Bologna with a thesis in Dispersion Relations under the guidance of Giampiero Puppi. During his military service in Padova he was able to go to the Padova Physics Department, where he started his scientific cooperation with Sergio Fubini - a cooperation which marked his scientific career. In the Fubini group he achieved important scientific results: one was the relativistic Regge Poles derivation from the ladder Feynman Diagrams; another was the detailed phase behaviour of the scattering amplitude at the classical turning points. Luciano remembers that many years after this, somewhere in the 1980s he met Dr Michael Berry, known for the "Berry Phase". When he was introduced to him, Dr Berry commented: "Are you the Bertocchi, of the Bertocchi, Fubini and Furlan Paper? This is the paper where I found the inspiration for the phase, known as the "Berry Phase".

Prof. Bertocchi worked in Torino, where Fubini was Professor, and afterwards for two more years at CERN as a Research Fellow. In CERN he started a new phase in his scientific research: the multiple scattering of hadrons with nuclei – cooperating with Roy Glauber. In this area an experimental group from Trieste, directed by Giuseppe Fidecaro, was working at CERN on the high energy scattering experiment on deuterium (to check the interference between single and double scattering). Prof. Bertocchi and his late cooperator Giorgio Alberi developed the relativistic single and double relativistic scattering theory. The collaboration with the Fidecaro group was one of the reasons for Luciano's moving to the Trieste University after his CERN Fellowship. Another reason for this move was the scientific collaboration with Giuseppe Furlan. Also another reason was the fact that he would work in a city close to his native village. But the most important reason was the foundation in Trieste of the ICTP - the International Centre for Theoretical Physics (where he is associated to this day). Initially he was scientific consultant in ICTP, after this was for many years Deputy Director to Prof. Abdus Salam, and finally he was Acting ICTP Director (during the illness of Prof. Salam).

In Italy, a scientific career is always accompanied by teaching. Thus Prof. Bertocchi was lecturing courses in classical electrodynamics, in quantum mechanics, in the structure of matter. In 1972 he was appointed as Full Professor in Theoretical Physics. After this he was lecturing also Theoretical Nuclear Physics at the Trieste University. During this period, Prof. Edoardo Castelli was starting a group on experimental Medical Physics in Trieste. He convinced Prof. Bertocchi to include in the Nuclear Physics course a section on Imaging Methods in Medical Physics. This later evolved in a full course on Imaging Methods in Medical Physics. This in fact started

his interest in Medical Physics. Initially he started with a series of workshops in ICTP, and later in the form of two much bigger events. The first was the College in Medical Physics, established in 1988 and held every two years since this time. During the College in Medical Physics Prof. Luciano Bertocchi collaborated with the other Co-Directors over the years: Dr Anna Benini, Prof. John Cameron, Prof. De Guerrini, Prof. Mascarenhas, Prof. Perry Sprawls, Prof. Slavik Tabakov, Prof. Donald G Grey, Prof. Franco Milano, Prof. Renato Padovani and others.

Prof. Luciano Bertocchi's interest in medical physics education continued in the EU project EMERALD, where from 1995 he represented ICTP. This project created the first e-learning in medical physics and received the EU Award for vocational education – the Leonardo da Vinci Award in 2004. Later Prof. Bertocchi took part in the medical physics Conferences in ICTP (associated with EMERALD and its subsequent projects) - in 1998, 2003 and 2008. Recently (in his late 80s) Luciano became one of the authors of the book "Introduction to Medical Physics".

One of the most important contributions to the profession, led by Prof. Bertocchi, was the creation of the unique Master in Advanced Medical Physics – a cooperation between ICTP and the University of Trieste, supported by the IAEA. Starting in 2014 this Master programme, orientated to colleagues from LMI countries, runs every year. During the Master programme Prof. Luciano Bertocchi was for 10 years one of the main leaders, together with Prof. Renato Padovani, Prof. Renata Longo and others.

Alongside physics and medical physics Prof. Bertocchi was sportsman of international calibre in cross-country skiing. He was for 15 years member of the Italian University National Cross-Country Skiing team, taking part in 4 University Winter Olympic Games, where his team won twice the relay competition. He is also an expert in long ski running (cross-country ski marathon). He has made twice the enormous 90 Km ski races (in Norway and Germany), as well as 43 times the Italian 70 km ski race "MARCIALONGA". Prof. Luciano Bertocchi is indeed one of the 10 Lifelong Senators ("SENATORI A VITA") of the Marcialonga.

Prof. Luciano Bertocchi has always been close to his family - his late wife Liliana and his children, Elena and Bruno. Until his 90<sup>th</sup> anniversary he continued to lecture at the MSc in Medical Physics and to support the College on Medical Physics in ICTP. Part of his many awards is the inaugural Spirit of Salam Award of ICTP.



Prof. Luciano Bertocchi competes at the 70km Marcialonga cross-country ski competition (in his 80s) and part of his ski trophies