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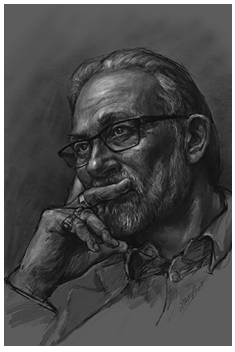
Massimo Salvatores 1941–2020



Giuseppe Palmiotti (Idaho National Laboratory)

Massimo Salvatores, one of the most recognizable names in reactor physics, and my thesis supervisor, mentor, manager, distinguished colleague, friend, and the man who was like a brother to me, passed away recently. I am delighted to be considered by his wife and children a member of their family. I would like to honor his memory with a few words about his life and his great accomplishments in the field of nuclear reactor physics.

Massimo Salvatores was born in Turin, Italy, on March 31, 1941. He was educated at the University of Turin where, in 1963, he obtained the title of doctor in theoretical physics with magna cum laude. In 1964 he joined CNEN (today ENEA), the Italian Nuclear Research Agency, and was based at the Casaccia Research Centre, near Rome.

From 1964 to 1977, he led many initiatives, mostly related to the Italian fast reactor project. He directed the Italian analysis of different integral experiments: Zero Power Plutonium Reactor (ZPPR) at Argonne National Laboratory (ANL), PECORE (simulation of the Italian PEC fast fuel test reactor at the MASURCA Facility in France), and TAPIRO (a small research fast reactor located at Casaccia) shielding experiments. Under his leadership, the first the cross-section capability and a full-scale computational code system was developed for the Italian fast reactor design. In those years, Massimo also made his seminal contributions to the field of generalized perturbation theory and to nuclear data adjustments using integral experiments.

During the same period, he had several stints outside Italy. From 1970 to 1971, he stayed for a year as a visiting scientist at ANL and became involved in the analysis and design of integral experiments carried out at both the ZPR and ZPPR facilities. He also made some developments in sensitivity theory and introduced this field to his American colleagues. In 1974 and again in 1976, he was assigned for several months as an International Atomic Energy Agency (IAEA) expert to the Institute for Nuclear Technology, Bucharest, Romania, where he helped develop the Heavy Water Reactor Development Project under the United Nations Development Program (UNDP). In 1975, he spent almost a year in the U.S. dividing his activities as visiting professor at the Georgia Institute of Technology, and as a Project Leader at Oak Ridge National Laboratory (ORNL) working in several different areas, including perturbation/sensitivity theory, shielding experiments, innovative reactors.

At the end of 1977, he moved to CEA, the French Nuclear Energy Agency, to work at the Cadarache Research Center in southern France until his retirement in 2001. During this period, he directed countless projects. From 1977 to 1983, he was first leader of the Shielding Fast Reactor Group in charge of the SUPER-PHENIX shielding design work, then he directed the experiment planning and analysis carried out at the MASURCA Facility. In particular, he focused on the RACINE experimental campaign intended for simulation of fast reactor heterogeneous cores. In parallel, Massimo did a lot of method development work related to the validation of nuclear data, high-order perturbation, and time-dependent sensitivity in the nuclide field.

In 1983 he became the head of the CEA/Cadarache Physics Studies Laboratory (LEPh). Under his leadership, LEPh became the most active center in Europe for research on advanced reactor physics. The laboratory oversaw core and shielding research and development work including:

- Critical integral experiments and neutron propagation experiments, planning and analysis: BALZAC campaign for simulation of depletion reactivity loss, heterogeneity effects for fast reactor control rods, and, in collaboration with the United Kingdom Nuclear Energy Agency UKEA, some of the JASON and ASPIS experiments at the NESTOR reactor
- Basic data evaluation and processing also related to Fuel Cycle studies
- Experimental, theoretical, and numerical method development both for neutrons and photons, including the full-scale CCRR code system for the design of French fast reactors
- SUPER-PHENIX start-up experiment planning and analysis.

In 1989 he became the head of the Reactor and Fuel Cycle Physics Service with more than 150 people under his direction, and

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with four fully-operating experimental research reactors. This service was in charge of theoretical and experimental studies in the fields of thermal and fast reactor physics, and fuel cycle studies, which supported existing reactors and innovative concepts. During this period, Massimo also worked on the CONRAD experimental campaign for simulating large-size fast reactor cores, the EPICURE experimental campaign for the simulation of Mixed Oxide (MOX) thermal reactor cores, and the development of European Reactor ANalysis Optimized code System (ERANOS), the fast reactor code system still used around the world today.

In 1992 he was named research director at CEA and was a program manager for the Fuel Cycle Programs at the CEA Nuclear Reactor directorate. He launched the CAPRA program for investigating plutonium burning and provided support to the PHENIX and SUPER-PHENIX reactors. At that time, Massimo was already one of the major world players in both reviewing and/or proposing new concepts (including molten fuels) and scenarios for the deployment of nuclear energy. He worked on the theoretical principles of the Accelerator Driven System (ADS), on the double-strata fuel cycle concept and innovative radioactive waste management strategies. He conceived and launched the first international neutronics experiment to validate the ADS concept, the MUSE experimental campaigns at the Cadarache MASURCA Facility.

In 1995 Massimo became a member of the Scientific Advisory Board of the Energy Department of the Paul Scherrer Institute PSI (Switzerland). In 1996 he was co-director of the Research Coordinate Project (CEA, CNRS, EdF, FRAMATOME) on new options for waste management (GEDEON Research Project). In 1997 he was named a Member of the Scientific Advisory Board of the Institute for Reference Materials and Measurements (IRMM) in Geel, Belgium. In 1997 he was chairman of the National French Committee for Nuclear Data (CFDN), and in 1998 he became a member of the Scientific Council of CEA.

Retirement was just a pleonastic word for Massimo, with no practical implications for his work except he was free to multitask for several different activities. He immediately joined for a year, from 2001 to 2002, ANL as a visiting scientist working on nuclear fuel cycle strategies and nuclear data. Then he held several consulting positions at different organizations. From 1999 to 2003, he was the project leader of the international experiment MEGAPIE (1MW spallation target Pilot Experiment) at PSI (successfully completed in 2006). From 2001 to 2014, he was scientific advisor to the director of CEA Nuclear Energy for reactor physics and innovative fuel cycle issues. From 2002 to 2009, he was scientific advisor at ANL. He was scientific advisor from 2002 to 2013 for the NUKLEAR program at the Karlsruhe Institute of Technology. During this stint, he was leader of the Partitioning and Transmutation (P&T) studies in the framework of the European projects (EUROTRANS and PATEROS), which proposed a new and original "regional" approach to the fuel cycle.

From 2002 to 2010, he was scientific advisor at ENEA and, during this period, the TRIGA Accelerator Driven Experiment (TRADE) experimental campaign was conceived together with Nobel Prize recipient, Carlo Rubbia. The campaign was planned to be carried out at the TRIGA reactor at the Casaccia Research Centre. TRADE was the first simulation of an ADS system, with feedback from heating in a power reactor. From 2007 to 2009, he was policy director for the Generation-IV International Forum.

From 2006 to 2019, he was scientific advisor at Idaho National Laboratory (INL) for several initiatives. Among them, the Measurement of Actinide Neutron Transmutation Rates at ATR (MANTRA) experimental program was devoted to irradiation of actinide samples at the INL Advanced Test Reactor (ATR) in order to infer actinide-capture cross sections. This campaign produced the first integral evaluation for many isotopes down the decay chain including, ^{244}Pu, ^{245}Cm, ^{246}Cm, ^{248}Cm, ^{249}Bk, ^{250}Cf, and ^{251}Cf. In 2010 Massimo was advisor for a project that-received funding from the U.S. Department of Energy (DOE) Office of Science. The project in collaboration with Brookhaven National Laboratory (BNL) was based on the consistent data assimilation (adjustment of nuclear parameters instead of cross sections), which he had originally proposed together with Augusto Gandini in the early 1970s.

Massimo was instrumental in the proposal of the ATR and NRAD Complementary Experiments of Spectral Indices, Transmutation rates, and Oscillations of Reactivity (ANCESTOR) experimental program. The ANCESTOR program included the second phase of the MANTRA campaign and the Measurements in Adapted Spectra of Spectral Indices and Material Oscillations (MASSIMO) campaign, which I named for him. This experimental program will measure oscillating samples and spectral fission indices in different types of spectra at NRAD, the TRIGA Neutron Radiography Reactor at INL.

Finally, there was the Versatile Test Reactor (VTR), the current flagship nuclear reactor program of the U.S. DOE. Massimo chose the catchy and clever "versatile," which, in the end, helped sell the concept to DOE. He proposed the initial design with the innovative flexible coupled (fast/thermal) reactor configuration that, subsequently, was reverted to a more conventional fast reactor core.

Also, during all these years, he was involved and led several expert groups at the Organization for Economic Cooperation and Development's Nuclear Energy Agency (OECD-NEA). He was leader of several P&T OECD-NEA Task Forces (P&T Impact study, Heterogeneous vs. Homogeneous Actinide Recycling). From 2006 to 2009, Massimo chaired the NEA's Working Party on International Nuclear Data Evaluation Cooperation (WPEC), Subgroup 26, on "Uncertainty and Target Accuracy Assessment for Innovative Systems Using Recent Covariance Data Evaluations." The seminal activity of this subgroup up to the present has been the justification for countless initiatives, measurements, and evaluations in the nuclear data field. Three other subgroups for the NEA-WPEC were co-chaired by Massimo: SG33 (2009–2013) on "Methods and Issues for the Combined Use of Integral Experiments and Covariance Data," SG39 (2013–2018) on "Methods and Approaches to Provide Feedback from Nuclear and Covariance Data Adjustment for Improvement of Nuclear Data Files," and SG46 (2018–present) on "Efficient and Effective Use of Integral Experiments for Nuclear Data Validation." All of these subgroups had incredible successes, with more than 30 participants from all over the world, including the U.S., Europe, Japan, and China. Now, a new generation of young scientists are being initiated to the use of uncertainty, sensitivity, and cross-section adjustment techniques using integral experiments for nuclear data validation.

I will end his achievements with a list for his teaching activities, international collaborations, and awards.

Teaching activities:

- 1982–2000. Reactor Physics and Shielding Courses at the National Institute for Nuclear Science and Technology (Grade: Full Professor).
- 1991–2000. Responsible for the Advanced Study Degree (DEA) Course on Reactor Physics at the University of AIX-MARSEILLE I.
- 1995–present. Founder, director, and former director emeritus for the International Summer School F. Joliot in Reactor Physics (Today: Frédéric Joliot/Otto Hahn International Summer School).
- Nominated "*Nuclear Engineering Distinguished Technical Lecturer*" at North Carolina State University for 2008.
- Member of the Executive Committee for the International Summer School, "MeV: Modelization, Experiments and Validation," sponsored by INL, ANL, Idaho State University and ORNL. He was one of the founding members of this school.

International Collaborations:

- 1981–1991, French representative at the OECD Nuclear Energy Agency Committee for Reactor Physics (NEACRP). Chairman, 1984–1985.
- 1991–1995. Named French representative at the committee for Nuclear Science (NSC) of the OECD-NEA.
- 1985–1994. Chairman of Joint Evaluated File (JEF) project of OECD-NEA (European Basic Nuclear Data File).
- 1996–2000. Chairman of the OECD-NEA Nuclear Science Committee.

Awards:

- 1985. *Fellow* of the American Nuclear Society
- 1997. *Knight* of the National French Order "Palmes Académiques"
- 2001. *Nuclear Technology Award* of the American Nuclear Society
- 2002. *Grand Prix Ampère* of the French Academy of Sciences
- 2005. *Eugene P. Wigner Reactor Physicist Award* of the American Nuclear Society.

Photo taken in the occasion of Massimo Salvatores receiving the *Eugene P. Wigner Reactor Physicist Award* (with Jack Ohanian, 2005; courtesy of the American Nuclear Society).

In the following, I will tell more personal, anecdotal stories about his life. Massimo either told these stories to me, or I witnessed the events personally.

In his youth, Massimo went to Rome to talk with Prof. Ugo Farinelli about his possible thesis, which was about one of the first attempts to adjust multigroup cross sections. Being still fresh from a class where he deepened his knowledge in abstract algebra on the mathematical "group theory," he proudly replied to Farinelli that he was very aware of the concept, not having any idea of what neutron group cross sections were. He later was embarrassed about what happened, but we used to have a good laugh every time he told this story.

After he obtained his doctorate, Massimo was down to two job offers: one from CNEN to work at the Casaccia Research Centre, and the other from the UK to be part of the team for the international DRAGON nuclear reactor, designed to test fuel and materials for the European High Temperature Reactor program. He told me that he decided to go abroad, but then a "Sliding Doors" movie-type event happened. The organization sent him a notification with the date and a time for a taxi that would pick him up to go to the airport and fly him to London to discuss the last details of his contract. The taxi never showed up. Newly married, and in need of money, he quickly accepted the CNEN offer and went to work in the group lead by Prof. Augusto Gandini. I have always wondered at the alternate-universe idea of how different the UK nuclear program would look today if that taxi had arrived. The UK's loss was an enormous gain for the Italian and French nuclear programs, and for me. Otherwise, I would never have had him as my thesis supervisor.

There were two little-known projects on which Massimo was involved in late 1960s and the beginning of the 1970s that show how eclectic he was. He collaborated with a classmate involved in astronomy, first inventing a new uranium enrichment process that would exploit the magnetic spin differences between ^{238}U and ^{235}U. The original idea was from his classmate, but he did all the calculations for demonstrating that the process was feasible, and I believe the concept was patented. The second project was to measure the moon's distance from Earth using a laser beam reflected by a mirror that was left for this purpose on the moon by U.S. astronauts. Again, while his classmate was the one in charge of the measurements, he did the calculations for deriving the Earth-moon distance. This project was in line with his passion for astronomy.

In 1972 Prof. Ugo Farinelli, my applied nuclear physics professor at the University of Rome, introduced me to Massimo who had recently returned from his stint at ANL. Massimo had several thesis subjects to propose and I was looking for a subject that included computational and experimental aspects. His original subject was purely computational—the treatment of neutrons slowing down in fast reactor multigroup cross-section processing codes—but he quickly added the experimental side by proposing the analysis of propagation experiments carried out at the TAPIRO reactor for testing the different algorithms. I was sold on it and that was the start of our long-standing fellowship. I have lost count of how many papers, including journal articles, conference papers, and external and internal reports, we have coauthored, but I would not be surprised if that number is around 200. Massimo was a forge of ideas, and I was the executional branch for materializing them. It is strange that in all these years, he has been my manager/boss for only a limited time. That was mostly because, even though we were at the same locations, I usually reported to a different organization.

The 1980s were exciting years to work at the Cadarache Research Center. There were two operational fast power reactors, RAPSODIE and PHENIX, for which we had to solve any problems that arose during operation of, and one new large-sized fast prototype reactor, SUPER-PHENIX, for which we had to make the neutronic design, then develop the strategy and follow up its start-up. Moreover, there were two fast flux zero power facilities, MASURCA (core configurations) and HARMONIE (propagation) were experiments were conceived and carried out. We also developed new methods and code systems and investigated new nuclear fuel cycles strategies. The personnel were extremely heterogeneous. Following the 1974 oil crisis, the European agreement for developing the fast reactor program brought to Cadarache Italian researchers, followed by German and Belgian researchers, and finally, British researchers. Those were hectic times with hard and fruitful technical discussions. Massimo was the fulcrum of them all. Multitasking was the norm in going from designing reactors, to designing integral experiences, to carrying them out and analyzing the results, then developing new methods and implementing them in new codes.

Among the successes I am proud to share with Massimo and other colleagues of the time, was the prediction of the SUPER-PHENIX critical mass (~4 tons of plutonium) within only three external assemblies. This was possible thanks to the use of cross sections adjusted on several hundreds of integral experiments. Another success was the secondary sodium activation dose, measured at SUPER-PHENIX. We had calculated this value using the crude computational tools of the time in connection with the calculational/

measurements discrepancies observed in neutron propagation experiments, 5 years in advance of the SUPER-PHENIX start-up and rise to power. When the measurement came, we were off only by 30%, well within the attached uncertainty of a factor 2.

However, there were also setbacks. The start-up control rod measurements were, luckily, just at the lower boundary (the dangerous one) of the announced 13% uncertainty. The safety authority threatened to stop reactor operations. After first blaming, with no substantiated reasoning, the computed beta effective, we found the problem was mostly coming from the fact that the core design team was using diffusion theory for their calculations, with crude corrective factors for transport and heterogeneity effects for the control rods. Massimo immediately diverted the BALZAC experimental campaign, devoted to the investigation of the reactivity loss by depletion, to the study of the transport and heterogeneity effects attached to control rods. In just a few weeks, several configurations with many different heterogeneity arrangements were carried out, measured, and analyzed with new methodologies to show the capability to correctly calculate these effects. This would be unthinkable to do today in such a short amount of time.

One other quality Massimo had was the ability to give good names to his different projects. I remember the experimental programs BALZAC and CONRAD were related to the writers Massimo was passionately reading at the time the campaigns were conceived. Another interesting name was ERANOS, the European code system I was leading at the time. As mentioned, the European collaboration included many international partners who all contributed with different codes which, together, became the modules of the system. Massimo decided the name would be ERANOS because, in ancient Greek, *eranos* means a banquet to which the guests bring contributions of food. Afterward, I had to find the definition of the acronym—European Reactor ANalysis Optimized code System.

Massimo enjoyed and was very passionate about teaching. Being the source of so many ideas, he supervised countless students' thesis work. I remember talking not long ago with one of his former students who believed that Massimo had supervised more than 100 theses. Because of his passion, he launched the F. Joliot Summer School in 1995. Many organizations were impressed by its success and offered to sponsor it. Later, the Germans joined, and the school name became the F. Joliot/O. Han Summer School. The program is still up and very successfully running today. When he became an advisor for INL, he proposed the idea for a similar school in U.S., and the MeV school, run by INL, ANL, and ORNL, was born.

After I moved to the U.S. at the beginning of the 1990s, we lost touch for the most part, though we still met up at different conferences. Finally, after he retired, he joined ANL in 2001 and we reunited for a year, at last. If you asked him, his preferred U.S. lab was ANL. Soon, I challenged him on the future of reactor physics, especially in the U.S. The improved deterministic solutions of the neutron transport equation were less and less competitive because of the advent of Monte Carlo codes. Because of the cost attached to them, the integral experiments lacked funding and facilities were shut down. The only major problem remaining were the nuclear data. Therefore, we started to try to awaken the field.

In fact, the nuclear data evaluators had stopped to provide covariance data, with the exception of the Japanese JENDL. Without a covariance matrix, it was not practically feasible to attach uncertainties to the nominal values of an integral parameter of the neutronic reactor design. Massimo came up with a brilliant idea. He said we as reactor physicists should create one covariance matrix by ourselves using just physical judgment. He was sure that this would provoke an immediate reaction by the nuclear data evaluator community. In less than a week, we came up with a multigroup covariance matrix for about 30 isotopes (the most important ones for a reactor design) and Massimo suggested, correctly, that we could define full correlations for specific reactions based on physical considerations (i.e., separate the energy domain in bands limited by the discrete and continuous ranges of inelastic reaction, the unresolved and resolved resonance regions, and epithermal and thermal regions). We began to use this ANL covariance matrix for uncertainty quantifications. Later, we also extended the energy domain up to 150 MeV in order to compute uncertainties for ADS with a spallation source.

This became a major point of interest for nuclear data evaluations. Then, with the launch of the NEA WPC Subgroup 26, the subject became very popular and justified a myriad of projects on nuclear data with so many people involved around the world. The evaluated nuclear data started to have a renaissance in the nuclear reactor world. To my great surprise, I have seen other people begin using the ANL covariance matrix, and a Russian evaluator even considered it quite reliable for comparison against seriously evaluated data.

When Massimo spent that year at ANL, he received the news of winning the "Grand Prix Ampere," a prestigious prize granted by the French Academy of Sciences to one or more French scientists for outstanding research work in mathematics or physics. He was very pleased with the award, but there was a problem. In order to receive it, he had to appear in front of the French Academy of Sciences dressed appropriately. That means that he had to find one of those old Napoleonic uniforms, and, even more complicated, he had to carry a specific little sword. I remember him spending a fortune in calls from the U.S. to France in order to get these two things. In the end, with a lot of effort, he found the required items and could go to receive the award.

After he became scientific advisor at INL (where I moved in 2007), we began reviving the integral experiments for reactor physics, which were dormant after the last ones performed at ZPPR in 1989. There was no chance to reopen or have a new zero power facility due to increased costs and lack of funding. When at ANL, Massimo had been impressed at the capability of the Argonne Tandem Linac Accelerator System (ATLAS) to perform spectrometry measurements down to 10^{-12} relative sensitivities. He came up with the idea to measure transmutation rates, mostly for actinides, after irradiation.

Thanks to the support of Phillip Finck, who was at that time the Associate Lab Director for nuclear energy at INL, we were able to have access to the INL ATR reactor with a Nuclear Science User Facilities (NSUF) grant and the MANTRA program was born. The irradiations were performed, and measurements also came for a series of higher actinides down the depletion chain. These had never been measured before in integral experiments. The activity on integral experiments continued afterward, and the INL NRAD reactor was proposed to be used for carrying out reactivity sample oscillation measurements in different types of spectra. Things continued in this field and, before he passed away, Massimo was participating at the new proposed (by Wes Hines) zero power facility at the University of Tennessee, Knoxville, the Neutron Fast Source, which is an ADS with thermal and fast coupled regions.

I would conclude with the memories attached to technical subjects by mentioning the last big project in which Massimo was involved: the VTR. Today this project is the flagship of the DOE Nuclear Energy Office. When the idea was born for a test reactor to be built at INL, Massimo was immediately brought in to provide his wisdom. At the time, it was not clear who would be the major customer and both thermal and fast systems were considered. He, of course, came up with the idea of a coupled system (central fast region, transition zone, and outside thermal region), a concept originally proposed by R. Avery, and of which Massimo had worked in his youth. He also provided the "versatile" name, knowing this was the best attribute to attach to a test reactor. He often jokingly

mentioned that he should have copyrighted the name. Later on, the interest of the thermal reactor community for a test reactor faded away, and the VTR design took a more conventional approach, fully dedicated to fast-spectrum applications.

Massimo was passionate about the sky and the stars. I remember us spending so many August summer clear nights together at his beloved retreat in Muzzano in the high hills of North Piedmont at the feet of the Alps, lying on a lounge chair, staring at the sky, watching the Perseids meteor showers. He had an uncanny ability in distinguishing, with naked eye, the different constellations and major stars and planets. In his honor, a star has been named after him and its coordinates can be found at this website: https://stars.osr.org/massimo-salvatores. Besides visualizing in 3-D the stars' positions in the Milky Way, on this website people can leave messages honoring him, share memories, and upload photos.

Massimo was an avid reader, an art aficionado, a man of immense and variate culture, a real Renaissance man, with a great love for traveling. He made many travels, especially to Asia, and I remember his eyes shining when he told me the wonders of the silk road after he recently went to retrace like a modern Marco Polo. However, his major passion was India, and I lost count of the many trips he made there. On what would be his last trip to India, in February 2020, while he was attentively looking at a statue, he fell and hit a stone with his head. He continued for 4 days without complaining until he felt the need for a headache pill. He took it, closed his eyes and fell into a coma. Even though he received immediate surgery, he never recovered from the consequences of what was an internal brain hemorrhage. He died, peacefully, on March 26, 2020 in Aix-en-Provence.

Requiescas in pace, Massimo. You had a magnificent and, as once you said to me, full life that touched and enlightened so many other people.

A reminiscence of Massimo Salvatores

Augusto Gandini (Università di Roma "La Sapienza")

After his master degree at Turin University, in the early 60's, Massimo was associated to the Fast Reactor Group which I was leading at ENEA Casaccia Center. During this time we closely collaborated and wrote together a number of papers. Since we were particularly interested in sensitivity analysis methods, knowing that publications on this subject were written by L.N. Usachev on the Russian Atomnaya Energiya journal (at that time not yet available in an English translation), in order to read them we both followed, together with others, a course of scientific Russian language organized at Casaccia.

Our collaboration continued until Massimo was proposed, with my advice, for a long term stage at the Argonne National Laboratory, at that time an international school in reactor physics and engineering for young physicists of all continents (I myself had been associated to it at an earlier time). On his return, after a period spent at Casaccia, he started his brilliant career at CEA Cadarache.

We have always maintained a close and collaborative contact. I will always remember him as a wonderful person and a dearest friend.

To testify of his sensible spirit, I like to write his words in a greetings mail he wrote to me last December with an invitation to spend a few days at his home at Muzzano village:

"Sperando di vederci da qualche parte nel mondo nell'anno prossimo, o magari se aveste voglia di venire qualche giorno da noi nella nostra casa di Muzzano fra il 10 Luglio e il 25 Agosto: ci farebbe un grandissimo piacere... Il posto a 600-700 metri è l'ideale per qualche giorno di relax al fresco, fra Sacri Monti e ricordi di Fra' Dolcino....Fammi sapere. Massimo"

"Hoping to meet somewhere in the world in the next year, or maybe if you would like to come to our house at Muzzano for a few days between 10 July and 25 August: it would be for us a great pleasure... The place at 600-700 meters is ideal for a few days of relax, between the Sacri Monti[1] and memories of Fra Dolcino[2] .... Let me know. Massimo"

[1] A chain of mountain sanctuaries in the region.

[2] Inspirer of the Dulcinians, a heretical sect of the 13th century.