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Remembering Andrea Bacciotti

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Abstract: Andrea Bacciotti passed away in his home in Turin on August 2, 2022 at the age of 74. I had the fortuitouse oportunity to know him closely a long time ago. Therefore I can write here a few, indeliblepersonal memories.

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I met Andrea in October 1962, at the beginning of school: we were both first-year students – enrolled in the "1 L" section – of the Leonardo da Vinci Scientific High School in Florence.

Those were years in which scholastic education (and cultural education in general) was a completely individual matter in a period in which, with the "Cold War" dominating, strong social positions opposed each other. At the time, in Florence there was only one scientific high school compared to three "classical" high schools : nowadays there are still three classical high schools (with names diluted in classical art or music high schools) while there are now six scientific high schools (also with names ranging from Mathematical High School to Human Sciences High School). At the beginning of the 1960's, class distinctions were very clear even if the well-known "social elevator" could be said to be functioning. In the 1 L (first year, section L) of the scientific high school there were 32 students and, even if some of them could attend the high school with dignity, they were nevertheless careful not to frequent, for instance, tennis courts or ski fields due to the families' lack of economic possibilities.

In the first two years of the 1 L I vividly remember the mathematics teacher (named Amelia), the Liverani-Fortini mathematics text, the three quarterly written tests in which I often "battled" with Andrea, by far the brightest in mathematics. As mentioned, the written tests in mathematics (and Latin) destroyed the hopes of many students of being able to pass the semester exams: I can remember a written test (in the 2 L) in which the teacher, at the time of returning it, said: if not had Anichini and Bacciotti been satisfactory, I would have had to cancel the test as you all made a lot of mistakes. It is useless to describe here the looks of "sympathy" of the other boys towards us.

After two years, Andrea and I were separated: the 3 L section could not be born as the students who "survived" (based on the results of the written tests in Mathematics and Latin) were only 13 (or perhaps 12) and it was necessary to emigrate to other sections: therefore, I and six other classmates were placed in section D (in which the German language was taught although we continued with French). The others, including Andrea, the second in alphabetical order in the old section, were assigned to section G, a section in which the French language was already taught. From these two years it is also worth remembering an excellent professor: Mario Gozzini, who was a writer, politician and journalist, an assiduous collaborator of various magazines and newspapers. He also became famous for the approval of a law inspired by him, which introduced a particular regime of prison confinement, in certain cases of emergency and/or necessity. He was clearly a professor of above average caliber and from him we could only learn not only literature and history but above all civic education.

Two other engaging memories of Andrea are the following. One day when school was closed we found ourselves, together with $7-8$ other classmates, sunbathing in the Cascine, a large park in Florence. On that occasion we had the privilege of hearing Andrea playing the guitar: his favorite pieces were Fabrizio de Andrè's songs. Personally, it was the first time I heard about the Beatles. Finally, since we were both readers of Settimana Enigmistica, the first site in Italy for crosswords, puzzles, interactive games, quizzes, intelligence tests, and more. In 1964, a problem involving determining the weight of 12 apparently identical balls except for one kept us arguing (mathematically) for a couple of weeks (until the magazine published the solution).

Over the next three years, after the class split, we saw each other only occasionally. In June 1967, eight months after the terrible flooding of the city by the Arno River, we faced (and passed) the high school leaving exams (now State exams) which, at that time, consisted of five written tests (Italian language, Foreign language, Mathematics, Latin and History of Art, including a drawing "from life") and eight oral tests. The tests concerned the entire final year program with "references" to topics from the other four previous years. A few words on the mathematics topic we had to face: the problem - for which six hours were foreseen - consisted of the study of a bundle of parabolas, preparatory to a study of functions with symmetry properties. The final question involved calculating the area of a region bounded by two of the parabolas of the parabola bundle. I remember a "tip" that was at the bottom of the text of the problem. It said: *The candidate can choose an algebraic-analytical or geometric-synthetic procedure.* Only the most mathematically gifted students - not very many - chose the second procedure, certainly more elegant but certainly more difficult. Obviously, Andrea was among them.

Then at the University. In those years there was no limited number to access university studies. The difference could be made by the school of origin: from the classical high school you could access any degree course, from the scientific high school you could not, for example, enroll in Literature and History. So, of the 25 students in my 5 D, 13 are now (Medicine) doctors, 2 physicists, 3 graduates in mathematics, other biologists, agronomists, engineers (which in Florence only had the two-year preparatory course and not the entire five-year Faculty). Andrea and I found ourselves together in the mathematics degree course, thus challenging the prejudices of our friends who saw this choice only as an educational opportunity .

In 1967 there were approximately one hundred mathematics students; Physics students were also present at the lessons, again around 100. Compared to the high school period, the circle of classmates naturally expanded with new study companions, with new acquaintances. Those who were within the indicated time to graduate on time took the exams in the same "calls", deserving the same grades. However, with Andrea I never found myself preparing in detail for the same exam in the same period. Although, we met together to prepare the degree thesis. The thesis, for those who had a "high" average (i.e., not far from 30), was of an "original" or research type (as opposed to the so-called "compilation" thesis). The substantial difference was to include, in the research thesis, at least one original result, a possible future seed of a scientific publication (as happened later for a joint article between Andrea and me). Andrea, who probably had clearer ideas than me, asked Roberto Conti as the professor for the thesis. In fact, after the third year of the course, the writer had a craving for Probability Calculus and was intending to ask for a thesis in this discipline. Unfortunately, external personal events of the eventual speaker prevented me from satisfying such a request. The fact is that, after some attempts (to two other teachers) which failed for academic reasons, I too turned to the prof. Conti. Roberto, who for the rest of my life I considered like a second father, welcomed me one morning together with Andrea and proposed a thesis on the emerging mathematical Theory of controls. With Andrea, in those months, we read several articles together - some of which were written in Cyrillic - on the topic that had been proposed to us. Thus, we worked together until Roberto told us that the theses necessarily had to be diversified: the "linear" topic of control processes was intended for me, the "non-linear" part went to Andrea. In retrospect, an indication has never been more guessed. Andrea had always been fascinated by the most challenging topics and "non-linearity" certainly did not lack uncomfortable obstacles. We graduated on the same day in March 1972 and then our paths temporarily diverged due to, for me, a military service obligation.

A few years later Andrea was a lecturer at the University of Siena, in 1980-81 he won the competition for Full Professor of Mathematical Analysis and moved

away from Florence (first to Cosenza and then to the Polytechnic of Turin). In the following years we only saw each other sporadically at scientific conferences, more often in collaborative activities with the Italian Mathematical Union. Andrea was elected Coordinator President of the UMI Commission for the research and teaching of mathematics in the Faculties of Engineering: as an "engineer" (at that time in Modena) I participated in the work of that commission, and I could admire the demanding, precise, oriented, and profound work that Andrea dedicated to this activity. In other pages of this issue you will find information on his important scientific production mainly in control theory and stabilization, on the valuable books he wrote, on his brilliant academic career: here I want to conclude by recalling only how that day at the beginning of August was one of the saddest days of my life for me: only twenty days before his death I had heard Andrea, by then retired from the teaching, speaking, with his usual brilliant calmness, to some kids from the last years of high school in the province of Pistoia, about how accounts were done before the advent of (small) calculators and computers: I remember two hours of beautiful mathematics, of passionate speaking by a scientist of great importance.

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