In Honor of Guido Castelnuovo

Palazzo Loredan Venezia 15-16 May, 2015

Istituto Veneto di Scienze Lettere ed Arti, PRIN Research Project "Geometry of Algebraic Varieties" Under the auspices of the "Unione Comunità Ebraiche Italiane" Acknowledgements: It is a pleasure to thank the organizers of this conference for inviting me. It is a pleasure as well to thank Lucilla Cannizzaro, Carla Degli Espositi and Nicoletta Lanciano for showing me Emma Castelnuovo's models, preserved at the Liceo "C. Darwin" in Rome, Claudio Fontanari for pointing out to me Segre's beautiful letter to Castelnuovo, and Alessandra Dini for helping me with the English translation of the Italian text of this talk. This talk will not be only about Castelnuovo, because his life is inextricably interwoven with the lives of other mathematicians such as Volterra, Enriques, and Levi Civita; because at its core lies the story of Italian Algebraic Geometry; because it will span the history of my country in the century between the nineteenth and the twentieth centuries; and in particular it will involve Rome, my city, as well as personal memories such as the teachings of Emma Castelnuovo.

A common trait to this group of Italian Jews, and to the great majority of Italian Jews in general, was the enthusiastic and wholehearted adherence to the movement called Risorgimento, which sought to create the country of Italy out of the patchwork of kingdoms and foreign-occupied provinces that the peninsula had become since the fall of the Roman Empire. In the ideas that characterized the Risorgimento, they saw redemption from the marginalization and discrimination they had suffered, and immediately they felt part of a society which, even amid poverty, ignorance and inequality, was nevertheless growing. Central to their thoughts was the school system, teaching, and a public education accessible to all.

Their enthusiasm is an exact counterpoint to the melancholy that characterized the educated Jewish world of central Europe which, in odd asymmetry, saw in the collapse of the Hapsburg empire and consequent birth of nation states the demise of their space of free cultural exchange, and the dawning on the horizon of a dark menace (and they were right). I am thinking in particular of Joseph Roth, Stephan Zweig, and Walter Benjamin.

The Italian Jews were, if I may say so, even more Italian than the Italians. This optimistic and complete adherence to the new ideals determined their assimilation, the gradual loss of their original cultural traditions, and their laic and positivistic view of the society they were contributing to build.

I would also like to give you an idea of the Italy and the Italians that accompanied Castelnuovo's life.

But let's follow the tradition and start with the grandmother on the mother's side.

The Grandmother

Adele Levi della Vida

She was the daughter of Samuele della Vida and Regina Pincherle, she married Mosé Levi.

She participated in the defense of Venice in 1849.

She founded, first in Venice in 1869, in the Santi Apostoli neighborhood, and then in Verona and Padova in 1874, gardens for children, the "giardini di infanzia", where children learned by playing, and which were later inspiration for Maria Montessori.

These two facts are already sufficient to illustrate to what extent this remarkable person was permeated by the social consciousness and ideals of Rirsorgimento.

I think that she embodies the family spirit. But let's go to Guido's parents.

The parents





Emma Levi, his mother, marries her cousin Enrico (1839-1915)

Guido was born on August 14, 1865.

Guido's sister Bice took care of Guido after their mother's early death. She was a painter: Enrico Castelnuovo (1839-1915)



Through Italy

Enrico was a patriot and a novelist. He wrote a fairly well known novel "I Monclavo". He was also the director of the *Scuola Superiore di Commercio* in Venice.

Enrico was born in Florence and went to Venice when he was very young. Guido went from Venice to Padua, from Padua to Torino and from Torino to Rome.



The family's cities: Florence Venice Padua Turin Rome In Venice, Guido attended the beautiful Liceo Foscarini and had an excellent teacher: Aureliano Faifofer, who was later the teacher of another great venitian mathematician: Guido Fubini.

Venice: the Liceo Marco Foscarini



Castelnuovo joined the school of mathematics in Padua in 1882 when he was seventeen. There he was the student of Giuseppe Veronese. Veronese was the student of Luigi Cremona. Another student of Cremona's was Eugenio Bertini. Padua 1882





Eugenio Bertini

Giuseppe Veronese

Luigi Cremona (1830-1903): Castelnuovo's mathematical grandfather



A towering figure, a patriot and a fighter:



At 18 he left Pavia to join a group of neapolitans who rushed to the defence of the Repubblica di San Marco Luigi's brother Tranquillo, was a famous painter.



Luigi Cremona was a close friend of Benedetto Cairoli, the sole surviver of seven brothers who died fighting for independence. Benedetto became prime minister. Luigi Cremona was master in a masonic lodge, he was appointed senator and became Minister of Education. One of the task Cremona was given in 1873 was to organise and direct, for the young nation, the new School of Engineering in Rome.

But let's go back to Guido. He graduated at twenty-one, in 1886, in Padua and went to Rome for one year as a post-doc: Cremona wanted to meet this young prodigy.

Yet another master wanted young Guido. That was Corrado Segre. He was in Torino. He was only twenty-four and he had graduated five years earlier and he already had the status to influence academic appointments.

That was a young Italy lead by very young italians.

Corrado Segre (1863-1924)



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Corrado Segre was a real school leader.
Here are some of his students Gino Fano (1871-1952)
Beppo Levi (1875-1961)
Francesco Severi (1879-1961)
Beniamino Segre (1903-1977)
post-doc:
Federigo Enriques (1871-1946)
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Federigo Enriques

Beppo Levi



Francesco Severi



Beniamino Segre

Via Po (1887-1891): Turin's four years

Corrado Segre and Guido Castelnuovo became close friends. Their friendship is both mathematical and personal, it's very intense and full of mutual admiration. They both get to know and admire Riemann's work. Castelnuovo said, "one of the major mathematical geniuses of the past century, Bernardo Riemann, whose immense stature grows more imposing the farther away we get from the time he lived."

In parallel to Brill and Noether, Castelnuovo and Segre gave projective form to the theory of linear series on algebraic curves, strolling under the porticos of via Pò. Castelnuovo loved to stroll while doing math.



¹La geometria algebrica e la scuola italiana. Congresso internazionale dei Matematici Bologna 1928.

Algebraic Curves

Ricerche di Geometria sulle curve algebriche, 1888: The maximum genus of a smooth projective curve of given degree d embedded embedded in \mathbb{P}^r :

$$C \subset \mathbb{P}^r$$
, $\deg C = d$

$$g(\mathcal{C}) \leq rac{m(m-1)}{2}(r-1) + m\epsilon$$
, $m = \left[rac{d-1}{r-1}
ight]$, $d-1 = m(r-1) + \epsilon$



Ricerche generali sopra i sistemi lineari di curve piane, 1890

Here Castelnuovo tackles, maybe for the first time, the problem of the characteristic linear series which would become a tormented conquest of the italian school.



Guido Castelnuovo

Rome, 1891

In 1891 Castelnuovo is appointed Professor in Rome at the School of Engineering in Sant'Ivo alla Sapienza. There he finds an architectural environment very dear to him.



His task is twofold

- To develop algebraic geometry in Rome,
- The education of engineers for his young country, and he assigns himself a third one:

- The establishment of an extensive mathematical library: one of his great passions.

Two very dear friends

Corrado Segre would have liked very much if Castelnuovo had stayed in Torino.

These are excerpts from a long and moving letter that Corrado Segre writes to his friend Guido in December 1891, when Guido has been in Rome for only a few days.

At the time Corrado was twenty-eight and Guido twenty-six:

Corrado and Guido

Torino, 12 XI 91

My Dearest,

I am in receipt of your affectionate letter and I thank you for it. Ever since Monday I miss you, and I feel this void very deeply. You mention the bit of benefit that you might have been able to gain from the past four years in my company. If that is indeed true, it is also true that it was a completely even exchange, and that your acute insight, as well as the goodness of your heart, have continuously made the many hours I spent with you useful and pleasant (...) You did me good, I repeat, not only intellectually, but also morally. And now that you are missing, I really feel a void which cannot be filled by anyone. (...) Keep me forever in your affection. (...) And once again, a very big hug, from

Your affectionate C. Segre

Rome 1891-1913

- -The scandal of the Bank of Rome 1893
- End of the ill fated Eritrean war 1897, that was initiated 10 years before.
- Ernesto Nathan

One of the central figures in Rome in those years was Mayor Ernesto Nathan: English, Jewish, Republican, Mazzini follower, laic and anticlerical, and later- Gran Master of the Masonic order. He was an enemy of speculators and in essence the first mayor not on the side of the landowners. Quick-witted and intelligent, he was an impeccable and efficient administrator. Romans remember him for a saying that we still use today quite often. The saying came about thanks to the meticulous examination to which Nathan subjected public accounting. Noticing a huge sum of money allotted to tripe, he asked a clerk about this particular line-item. The clerk reminded him of the huge rat problem plaguing Rome at the time, and of the necessity to feed an appropriate number of cats to chase them. To which Nathan answered: let the cats feed themselves with the rats! And he crossed out the line-item for tripe.

Nun c'è trippa pe' gatti!

No tripe for the cats! (it sounds much better in Roman...)

Imagine this laic, anticlerical Rome ebullient in its development, even right next to a rancorous and close-minded Holy See, still reeling from being thrown out of its own home. It was a world that was full of hope, and in which the best minds thought with great foresight of the future of the country.

Rome 1891-1913



Solido la spitica di removemente interdorte del portener Giuden, andre Rover i investore de tregortezetti novico. Nel 1997 vana eletto oridani il programma Eranani Vantani (sulta foni), Soziharate la Capada arti in endorchi putto oridanistica.

Ernesto Nathan Mayor of Rome '07 -'13 Nun c'è trippa pe' gatti!



(The Synagoge 1901-1904) Let us go back to Guido.In 1896 he marries Elbina Enriques' sister. Then, in symmetrical sequence, his sons and daughters:Mario (1897), Maria (1899), Gino (1903), Gina (1908) and Emma (1913).Twenty years later "Uncle Ghigo" will be Emma's thesis advisor.

The Roman School

As I mentioned, Castelnuovo won a professorship in Rome in 1891. Cremona had already been there for eighteen years and made sure to get him at the school of engineering.

Vito Volterra was given a professorship in Rome in 1900.

- Cremona died in 1903.

The school was then in the hands of Castelnuovo (thirty-eight) and Volterra (forty-three). So the responsibility and the merit to appoint

Levi-Civita in 1918

Severi in 1921

Enriques in 1922 was in ther hands.

Strolling in Rome

In 1892 Federigo Enriques was in Rome for one year as a post-doc (Enriques was twenty, Castelnuovo twenty-eight). Castelnuovo writes:

"That was the time when, in the streets of Rome, we started the long strolls during which Algebraic Geometry was the favorite topic of our conversations. Having absorbed in short order the conquests of the Italian school in the field of algebraic curves, Enriques boldly set out to conceive the geometry on an algebraic surface. He kept me informed on the progress of his research on a daily basisprogress that I subjected to a strict criticism. It's not an exaggeration to state that the Italian approach to the theory of algebraic surfaces was built during those conversations."



There is a long tradition of productive strolling in Rome: Goethe, Stendahl, Castelnuovo and Enriques...

1893-1894

A very remarkable achievement: The rationality criterion:

An algebraic surface S is rational if and only if $P_a(S) = P(S) = 0$ Corrado Segre, in Turin, is completely enthusiastic about it.

1904-1906 The irregularity and the Picard variety.

It was Castelnuovo who built the bridge between Picard integrals of the first kind and the irregularity of the italian school, and he was him who called the Picard variety by this name. André Weil, in 1950, writes: *Ce que nous appelons à présent la variété de Picard d'une variété V fu entroduite par Castelnuovo en 1905 sous le nom de "variété de Picard attachée à V" … Historiquement parlant, il eût juste de lui donner le nom de Castelnuovo, mais il s'agissait de toucher le moins possible aux usages reçus plutôt que de rendre à ce maître un hommage mérité.*

In 1905 Castelnuovo understands perfectly the importance of Emile Picard's work, exactly as he will understand the importance of Solomon Lefschetz's work some twenty years later.

Italian Algebraic Geometry

Castelnuovo left algebraic geometry when he was forty, in 1906, during one of the highest peaks reached by the Italian school.

This school ended in the 40's not because of the lack of ideas but because of the lack of adequate mathematical instruments. This inadequacy of tools brought the school to curl into itself

Algebraic geometry rose again (1940-1965) with:

Weil

Zariski

Leray

Serre

Hodge

Kodaira

Grothendieck

The French school took up the baton and in the 50's built a beautiful edifice with very solid foundations.

However, reading now Castelnuovo, having internalized the French point of view, we see modernity in his thinking ad we have the sense of a fulminant intuition.

31/68

Looking back (1928)

In 1928 Castelnuovo looks back at his work with Enriques. These are his words:

"We had built, in an abstract sense, of course, a large number of models of surfaces in our space, or in higher dimensional spaces; we had so to speak- distributed these models in two cabinets. One contained the regular surfaces for which everything happened in the best possible way; this analogy allowed us to transport to those surfaces the most important properties of plane curves. But when we tried to apply these properties to the surfaces in the other cabinet, the irregular ones, trouble ensued, and we were faced with all kinds of exceptions. In the end, the diligent study of our models led us to discover a number of properties that hold, with the appropriate modifications, to the surfaces of both cabinets; we then tested these properties against the construction of new models. If they passed the test, then, as a last step, we looked for a logical justification."

André Weil loved Italian algebraic geometry. In 1948 he writes:

¹ Ce n'est pas le lieu de revenir ici sur l'insuffisance, maintes fois signalée, des démonstrations des géomètres italiens; j'espère au contraire montrer par l'example qu'il est possible de donner à leurs méthodes toute la rigeur nécessaire sans leur rien faire perdre en puissance ni en fécondité.

¹Sur les Courbes Algébriques et les Variétés qui s'en déduisent, Strasbourg

Castelnuovo's interests after 1906:

- Probability theory (1913-1919),
- Education,
- Special and general relativity,
- History of Mathematics.

- In 1908, together with Volterra, he organizes the 4th ICM, of which is nominated general secretary.

- He is vice-president of the Commission internationale de

l'enseignement mathématique under the presidency of Felix Klein.

- In 1911, he is President of Mathesis, the Society of school teachers in mathematics.

- He gives a decisive contribution to the drafting for high school curriculum in mathematics

- Here is vision of mathematical teaching:

¹ - In the end, no school is truly effective unless it is able to engage an average intelligence, unless it is able to form an educated democracy, which is the base of every modern Nation. To study the means by which education can be spread, even at the expense of some depth: this is the problem that we are all called to solve! ² - It is often preferable to proceed by successive approximations, where each step is evaluated in relation to actual facts, in order to separate bit by bit true from false, rather than to rely on impeccable logic sealed off from the exterior world. The way mathematics is taught nowadays in schools shuns, wrongly, that first approach and therefore gives up on the only way of thinking that is common to most people. The emphasis on demonstrating through logic what is already evident intuitively causes a double damage in that it undermines reasoning, which has a different function, and intuition, by not acknowledging its immense value.

¹Sui lavori per la Commissione Internazionale pel Congresso di Cambridge. ²*II Valore didattico della Matematica e della Fisica*

Castelnuovo writes numerous brief biographies and obituaries: Pieri Guccia Veronese Torelli Tonelli Max Noether Corrado Segre Klein Cremona Abel Riemann Poncelet Volterra Galileo Enriques Cauchy Severi

A few years before the war: Messina's earthquake and tsunami (1908)



Death toll: 70.000. This immense catastrophe made many Italians aware of the fact that southern Italy existed.



The Great War starts, and with it Europe begins its long suicide.

Apparently, Castelnuovo stayed away from it.

Volterra and Levi Civita adopted opposite approaches.

Volterra was an ardent interventionist, to the point that he volunteered his scientific and organizational abilities to the war effort.

Tullio Levi Civita, on the other hand, was a convinced pacifist who, after the war, firmly opposed anyone who wanted to boycott German scientists.







Tullio Levi-Civita

Several Italian mathematicians died in World War I.

Ruggiero Torelli died in 1915 at thirty-one. Ruggiero's father, Gabriele, founded the Torelli Prize won in 1920 by thirty-one year old Giacomo Albanese.

In the same war, Eugenio Elia Levi died at the age of thirty-four (Levi decomposition, pseudo-convexity...). He was Beppo Levi's brother.

Emma was born in 1913.



Ruggiero Torelli (1884-1915) and his family before the war. Giacomo Albanese in 1920 was the first reciepient of Torelli's prize.

Eugenio Elia Levi (1883-1917)

À propos d'Albanese:

André Weil, in 1948 writes:

....Ce qu'on appelle à présent la "variété d'Albanese" est alors le quotient du groupes des cycles de degré 0 par cette relation. C'est là ce qui me suggéra de donner le nom d'Albanese à cette variété; par la suite Severi s'en plaignit amèrement...

Between the two wars

Rome after WWI continues to be a very lively cultural center. Castelnuovo devotes himself wholeheartedly to the formation of a great school of Mathematics. As I said, he was the one who, together with Volterra, orchestrated the appointments of Levi Civita, Enriques, and Severi. He was also the one who, for many years, took care of the mathematics library in San Pietro in Vincoli.

He never shies away from his teaching responsibilities, which he in fact enjoys very deeply and it's very clear that he keeps up to date with the developments in Algebraic Geometry.

He follows many students, in particular: Asher Zaritsky

Between the two wars

In Rome Asher Zaritsky

becomes

Oscar Zariski. Zariski gets his degree in 1924, with Castelnuovo as advisor. In Rome. Oscar met and married Yole, Corrado Cagli' s sister, and becomes part of the circle of the Roman painters Afro and Mirko Basaldella (who marries another Cagli's sister). This is the other "Scuola Romana".



The episode of Zariski's entrance exam to the University in Rome is well known.

It took place during a long walk home, during which Castelnuovo's questions grew more and more complex, while Zariski, completely unaware, kept answering until he was almost out of breath. Once they got to Castelnuovo' s doorstep, Castelnuovo said: you are admitted to the third year, come to my class tomorrow!

André Weil also spent a period in Rome.

André and Simone in Rome

In 1925-26, André Weil spent six months in Rome, where he got to know Italian Algebraic Geometry, and where he establishes a strong bond with Vito Volterra. About ten years later Simone, André' s sister, during a trip to Assisi, which was an important stop on her path towards Christian mysticism, stopped in Rome to meet Vito Volterra and the other Italian mathematicians, certainly following her brother's suggestions.





I'd rather not (1931)" I swear allegiance to the King and to his Royal successors, and to the Fascist Regime, to follow loyally the Statute and the other laws of the State, to exercise the teaching profession and fulfill all my academic duties with the purpose of shaping hard-working, honest citizens who are dedicated to the Motherland and to the Fascist Regime. I swear that I do not belong, nor will I ever belong, to associations or parties whose activities do not reconcile with the duties of my office." Among 1200 university professors only 11 said: I'd rather not...

- 1. Ernesto Buonaiuti (History of Christianity)
- 2. Mario Carrara (Criminal anthropology)
- 3. Gaetano De Sanctis (Ancient Hitory)
- 4. Giorgio Errera (Chemistry)
- 5. Giorgio Levi Della Vida (Semitic Languages)
- 6. Piero Martinetti (Philosophy)
- 7. Fabio Luzzatto (Civil Law)
- 8. Francesco Ruffini (Ecclesiastical Law)
- 9. Edoardo Ruffini Avondo (History of Law)
- 10. Lionello Venturi (History of Art)
- 11. Vito Volterra (Mathematical Physics)

Ambitious public projects

During those years the fascist regime built an important part of Italy's infrastructure. One example of this is the new site for the University of Rome Sapienza (1932-1935)

Castelnuovo retired in 1935, therefore he worked in the new building for the School of Mathematics for only one year. But he participated actively in its design, often advising Giò Ponti, the architect. When Ponti showed him his first version of the library, Castelnuovo told him: double it! And that's what he did. The result was one of the most beautiful spaces of our university, in a pure Modernist style, essential and elegant. It is a pleasure to study and work there. We can see in the interest that Castelnuovo had for the new building the same optimism that characterized the Risorgimento, as well as his unwavering desire for an educated democracy.



Giò Ponti



Guido, Giò and the library: double it!



Then came the anti-semitic laws (1938)

Volterra dies in 1940

Levi-Civita dies 1941

Beppo Levi emigrates to Argentina in 1939

A law of the Italian State



On September 5th, 1938, by executive order, the Italian Government banned Jewish students from all schools.

It conceded, however, permission to establish segregated Jewish high schools under an Aryan supervisor selected by the Ministry of Public Education. In Rome, they thus set up a Classics High School. Guido Castelnuovo and Guido Coen were the principal promoters of this initiative. Emma, Guido's daughter, became one of the teachers in these new schools.

It was however absolutely forbidden to establish university courses for Jewish students.

Guido Coen discovered that Guido Bonzanigo head of the Institut Technique Supérieur in Fribourg, Switzerland, was willing to allow jewish students in Rome access to a university degree from his institute.

The University of the 3 Guidos

Guido Castelnuovo, Guido Coen, Guido Bonzanigo create in 1941 a completely

Underground University under the discreet name of *"Supplementary Courses* of Mathematical Education" (Rome-Fribourg)

Among its teachers, were Giulio Bisoncini, Raffaele Lucaroni, Bernardo Cacciapuoti, Castelnuovo and Enriques.

Then came the real danger.



Castelnuovo nel giardino della sede dell'Università clandestina: alla sua destra, Giulio Bisconcini, alla sinistra Raffaele Lucaroni

Guido with Giulio Bisoncini and Raffaele Lucaroni

The nightmare: September 8, '43 - June 4, '44



October 16, 1943: the rounding up of jews in Rome's ghetto

The nightmare: September 8, '43 - June 4, '44

During the Nazi occupation of Rome, many Jews took refuge in convents, or in the mountains of the Abruzzo region. Some were already under house arrest, as antifascists, in remote areas. Some joined the clandestine movement and fought.

Enriques hid in S. Giovanni in Laterano.

Guido and his family were saved by the timely intervention of a police officer. Guido took the name of Guido Cafiero.

Then came the massacre of the Fosse Ardeatine (May 24, 1944)

Nobody could believe what was actually happening to our country.

Liberation



June 4-5, 1944: General Mark W.Clark and the Fifth Army in Rome.

The years after the war

This is a short period, because Guido Castelnuovo died on April 27, 1952. Here we see Castelnuovo having a good laugh with Enrico Fermi and Giuseppe Cardinali (the Rector of Sapienza), at the Accademia dei Lincei. Castelnuovo was, at the time (1949), the President of the Accademia.



The years after the war

Castelnuovo's celebration of Francesco Severi as a mathematician is an example of honesty and intellectual generosity. Severi did not behave well during the antisemitic period.

A profound sadness comes across in Castelnuovo's words:

The two World Wars, with the dark and restless period that separated them, the uncertainties of the present, and the worries about the future have provoked in our youth a sense of instability that, coupled with material difficulties, is not conducive to scientific research. There is also another cause, inherent in our science, for the lesser achievement in todays research in the field of Mathematics. We who were born in the second half of the last century have received a great legacy, a whole patrimony that had been accumulated by the great masters who preceded us, from Gauss to Riemann. But that patrimony has perhaps already borne its best fruits: the soil that has been overworked is giving signs of becoming fallow.

But let me finish by talking about Castelnuovo's youngest daughter Emma.

It's certainly true that Emma followed in her father's footsteps, but -I don't know if consciously or unconsciously she is Adele Levi della Vida's true heir.

Emma Castelnuovo: December 12, 1913- April 13, 2014

- Emma Castelnuovo gets her mathematics degree in 1936 with a thesis in algebraic geometry.
- From 1939 to 1943 she teaches at the israelite middle school in Rome
- She teaches at the Tasso middle school from 1945 to 1979
- She revolutionizes the teaching of mathematics in high schools.



Emma

I remember her lessons full of history, discussing symmetry in Art, transportation systems, train schedules, mail systems, electricity, telephones, sports, agriculture, even the Mont Blanc tunnel!

Those lessons were the foundation of two masterpieces of the teaching of Mathematics: Geometry, and Numbers. These texts are perhaps the most important contribution to the teaching of Mathematics in the last century. And perhaps we have not even begun to understand fully what a treasure Italian culture has in her.

Emma

Those few weekly hours of Mathematics are unforgettable. Emma was unstoppable: she commanded enormous awe, just through her understatement and irony. Once she had reached us in this way, we would start the journey with her, following together our intuition, marveling with her, and walking together on the path of creative process, analogic method, or even modeling- all part of mathematical thought. Her method was never axiomatic, or deductive-logical, which are tools that are useful to professional mathematicians only in the final phase of their research. And even logic does not necessarily stem from deductive reasoning, but rather from the constant search for a counter-example. Emma followed Guido and Ghigo's philosophical thought. But not only did she follow their philosophy, she was also capable of feeling with us, each time anew, the thrill and joy of mathematical discovery, which are so transparent in the works by her father and her uncle.

Let me quote Guido in 1908

One can always say that intuition can lead to mistakes; maybe. But intuition also provides the principal, if not the only path to the discovery of truth. Should we really give up the truth for fear of making mistakes? (...) If we'll be willing to follow her various suggestions, if we'll be willing to strip elementary geometry of a whole series of mental gymnastics which serve no purpose, we might be able, I think, to reach two goals which, at first glance, might seem incompatible. We will be able to raise the pedagogical value of Mathematics, educating simultaneously several mental abilities, instead of sacrificing everything to just one. And on the other hand, we will make Mathematics enjoyable and accessible to everyone, finally defeating the prejudice that the very elements of this subject are only suitable to a few select minds.

But this is Emma!

Two masterpieces

emma castelnuovo LA VIA DELLA MATEMATICA LA GEOMETRIA la nuova italia



emma castelnuovo LA VIA DELLA MATEMATICA INUMERI la nuova italia

These are the books I was referring to. And this is an example of Emma's tools

It is enough to look!





and then you see: Projectivities Degenerations Monodromy

At a certain point amid our excitement she would close the courtains and, in the almost complete darkness, shine a beam of light through that slit, dissecting the cone, or the hyperboloid, and show how conics degenerate into one another, without saying a single word other than: isn't that strange?

I leave you with two photographs of Guido and Emma while they are deep in thought, something they were able to do quite well. I only regret not finding a portrait of Adele, grandmother and great-grandmother of these two extraordinary Italians.



