

si cette collection, dont une pareille, a été achetée par le Musée Britannique, loin de l'Exposition Universelle en 1862, pourrait être agréable au Gouvernement de Sa Majesté, je serais aussi très flatté et heureux, de pouvoir l'offrir.

Barnet Lyon (19.[?].1867)

That a certain *gift economy* should be a part of the diplomatic networking is to be expected, and of course museums depend on their overseas national officials for a big part of their travels and transactions, even so, that the diplomatic liaison was to be so closely intertwined with the 'scientific' network amongst European nations is an interesting feature that needs more study and reflection. In this first letter is noted that the Portuguese consul in Suriname doesn't have a direct contact with the capital, Lisbon. And also that it is via the natural objects exchange that this connection will, in fact, be established. In the following letters, both from Barnet Lyon and his brother, Bocage carries on the exchange of several deliveries from Suriname via Barnet Lyon (in Brussels) until at least April 1869, when he receives a thank-you note from Sally Lyon, still in Paramaribo, Suriname. Sally Lyon had just received notice of his appointment for the Honorable Order of the Conception of Villa Viçosa, of which he was made an official "Cavaleiro". This may be an example of how these donated "gifts", be they specimen data or supplies, are transferred with the consent of the donor not for material or tangible profit but for social prestige, as several honours are being exchanged alongside the scientific materials. In this particular case, in the end of the day, honorific titles were «traded» off for specimen collections.

Exchange of Nature, Nature of Exchange – Closing considerations on the nature of a zoological specimen

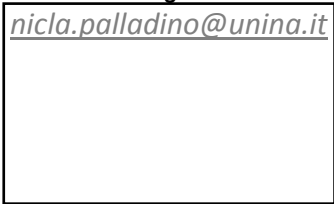
Possession of 'nature' is obtained from different procedures that engage different kinds of behaviours. There appears a specific 'gift economy', as defined by Marcel Mauss, a particular circulation of goods in societies. Even modern scientific production is known to entail some of the characteristics of this kind of shared community, when scientists publish papers and quote one another's produced knowledge in roughly the same 'detached' offering way. In the correspondence analysed there were several markings of this kind of shared knowledge. Small pieces of knowledge were traded along the network in order to fill in gaps of a larger puzzle: the systematic inventory of nature, controlled, stabilized and sanitized inside the museum walls. Scientific knowledge is exchanged openly over national borders and languages, in a tense relation between the ideal knowledge and control over nature, individual scientists and their localized institutions.

THE CORRESPONDENCES BETWEEN THE MATHEMATICIANS BRIOSCHI, CREMONA, BETTI AND GENOCCHI DURING ITALIAN UNIFICATION.

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Abstract

In the 50s of the nineteenth century, there was the necessity to organize new structures in the forming Italian State: the Unification of Italy marked a turning point not only in the political life of the Country, but also in the organization and content of university education and scientific research. A group of mathematicians helped to build the foundation for the renewal and development of Italian mathematics that took place in the following decades. This group included, among others, Francesco Brioschi (1824-1897), Enrico Betti (1823-1892), Angelo Genocchi (1817-1889), and Luigi Cremona (1830-1903).

I want to present here the epistolary correspondence between Brioschi and Cremona and Betti and Genocchi,¹ covering the period from the mid to late 19th century, provide greater insight into scientific developments and political-institutional arrangements that took place at the time of the formation of the new unified Italian state.

Mathematicians of the first magnitude, who came from different States existing in Italy in the 19th century, gave a great impulse to the formation of the Italian State and devoted themselves to give it new cultural structures. The letters between two Lombard scholars, Francesco Brioschi and Luigi Cremona (these letters were written from 1855 to 1893) and between Enrico Betti, Tuscan, and Angelo Genocchi, from Piacenza (their correspondence goes from 1862 to 1886), refer to a period in which different States of the Italian peninsula were transforming or failing and to the following unification of the Italian Kingdom.

From a chronological point of view, these letters cover almost all the second part of the 19th century, while their authors are the most important mathematicians of Risorgimento, due to their scientific capacities and their both direct and indirect political action (it is important to mention also Battaglini, Sannia, Casorati, Beltrami).

¹ [PALLADINO *et al.* 2009].

All these scholars were well-known and of great value, but Brioschi had the most complex personality. His letters, addressed to Cremona, ninety-two, are stored in "Istituto Mazziniano - Museo del Risorgimento" in Genova –*Legato Itala Cremona in Cozzolino*– while those written by Cremona are just six and they are in "Biblioteca Centrale della Facoltà di Ingegneria of Polytechnic" in Milan. Even if Brioschi was a virtuoso in computation in topics he chose², he dedicated his studies to engineering with a great didactic, institutional (thanks to unitary feeling and his institutional role as General Secretary of the Ministry of Public Education, in 1862, he organized the "Istituto Tecnico Superiore" –now *Polytechnic*, opened in November 1863– in Milan, serving as director from 1863 until his death) and entrepreneurial commitments. In his letter of 10th July 1865 to Cremona, Brioschi describes his choices: "Unfortunately, my activities at the school don't give me the possibility to dedicate more time to mathematics [...]. Moreover, I have a lot of courses because there is a lack of teaching staff; from November to May I have taught nine hours every week on theory-building and hydraulics. This explains why I work so hard but I can't publish any work: even if I reach a result, I have no time to present it".³

Brioschi held important institutional roles: General Secretary of the Ministry of Public Education, member of the Executive Council of the Ministry of Public Education, when Florence first and Rome then, were capital of Italy, president of the *Società Italiana delle Scienze*, known as *Dei XL*, president of the *Accademia Nazionale dei Lincei*, *Consigliere di Lungotenenza*⁴ and, as senator, he participated in the commission elected by the Minister of Finance to talk about the tax on flour.⁵ He also was director of *Polytechnic*, journal founded by Cattaneo in 1839 and director of the *Annali di matematica pura e applicata*.

As a matter of fact, the new Italian Kingdom needed to be built up and reorganized and Brioschi, able to examine the European situation because of his open-mindedness and with a good education (his tour with Betti and Casorati round German universities and Paris in 1858 represents an evidence⁶), strong-willed, with spirit of enterprise and never exhausted, wanted to be always present (in his opinion, "six or seven days of the month were wasted travelling"⁷) to go from Milan to Florence first and to Rome then, were good for his health, even if "this changed a lot his habits as scholar"⁸).

A man divided by the love for scientific research, which he at times practised, regretting the continuous interruptions and rejoicing at his renewals, as it is possible to understand in his letters to Genocchi, and his attraction for action, inspired by his strong self-esteem: when he accepted to be *Consigliere di Lungotenenza*, Brioschi explained his choice:

"If I hadn't been in Rome those last days and I hadn't seen what there was to do, I probably wouldn't have accepted; I convinced myself that it was necessary to deploy great activities and a wary energy, all qualities I can rely on. For this reason I will send a dispatch of acceptance right now".⁹

But Brioschi's masterpiece was the creation of the *Istituto Tecnico Superiore* (he took as model German polytechnics) and he was able to keep it alive and, with great care, grow it thanks also to a little expedient to "catch" new students: instead of forcing students to pass the preparatory two years in Mathematics at the university, where they were tempted to stay keeping on their studies, they were sent to the polytechnic of Zurich or Lausanne (where courses started a month before) and then, because of "good reasons, difficulties of languages, health...",¹⁰ they were directly transferred to three-year periods, superficially interpreting Italian law. In Milan, Brioschi also organised a "semi-official" course of one year and students were directly transferred to three-year periods.

The correspondence Brioschi-Cremona doesn't show the leading role of Cremona (in 1898, for a short period he was Minister of Public Education and then he was appointed a senator. He had a great influence on post-unitary Italian educational system) and this also because Brioschi kept few works of his pupil first and colleague later. As a matter of fact, during his years at the University of Pavia, Brioschi was Cremona's professor and patron: thanks to Brioschi, he gained

² See [CARBONE *et al.* 2006].

³ "Pur troppo le occupazioni della mia scuola mi tolgono la possibilità di lavorare come desidererei negli studj di matematica pura [...]. Oltre che il personale dell'Istituto essendo un po' ristretto devo fare molte lezioni; dal Novembre al Maggio feci nove ore di lezione per settimana sulle costruzioni e sull'idraulica. Ciò vi spieghi come lavorando come forse non mai in vita mia, pure non arrivo a pubblicare, giacché se giungo anche a qualche risultato non trovo il tempo per renderlo presentabile al pubblico"; *Part I*, [PALLADINO *et al.* 2009].

⁴ Letter of the 6th October 1870, *Part II*, [PALLADINO *et al.* 2009].

⁵ Letter 42, *Part I*, [PALLADINO *et al.* 2009].

⁶ See letter 8, *Part I*, [PALLADINO *et al.* 2009].

⁷ "Sei o sette giorni al mese sciupati in viaggio"; letter of the 23rd November 1870 to Cremona; *Part I*, [PALLADINO *et al.* 2009].

⁸ "Assai le abitudini studiose"; letter of the 23rd November 1870, *Part I*, [PALLADINO *et al.* 2009].

⁹ "Se non fossi stato a Roma gli scorsi giorni e non avessi dovuto toccare con mano quanto c'è da fare, probabilmente non avrei accettato; ma ho potuto convincermi che è necessario spiegare una grande attività, ed una prudente energia, qualità sulle quali mi pare di poter contare. Perciò manderò or ora un dispaccio di accettazione"; letter 58, *Part I*, [PALLADINO *et al.* 2009].

¹⁰ "Buone ragioni, difficoltà di lingua, salute, ecc."; letter 59, *Part I*, [PALLADINO *et al.* 2009].

permission to teach at the Ginnasio in his city and at Liceo Beccaria in Milan –before the Italian Union– and then, “well-disposed to talk to the Minister about your aptitude for teaching and the importance of your works”¹¹, Brioschi obtained that Cremona was appointed as professor at the University of Bologna.

Cremona did his best to unify Italy: the first sign is the journey around south of Italy, in 1863; it was not only an ideal continuation of his relationship with Neapolitan volunteers during the defence of Venice against the Austrian, but it seemed also a recognition to know the problems and act better.

At the end of the battles of Solferino and San Martino, in an atmosphere of militant euphoria, Cremona was risen up by Brioschi to a higher level than a pupil, as he really did at the *Istituto Tecnico Superiore* and in the *Annali*.¹²

From Genocchi’s letters (in “Archivio Betti”, stored at the library of Scuola-Normale in Pisa; Betti’s letters are at the Passerini–Landi library in Piacenza) the importance of his personality emerges. He was not a simple spectator destined to applaud others:

“I thank you for your dedications: I always read them. But I am old and I can’t see always the same words. Even if I desire to do a lot of things, my strength fails me; and I can just applaud people braver and more capable than me”.¹³

Genocchi is fifty, he is the oldest of the group, but he was the only one to dedicate his entire day to research (he confessed to Betti: “I prefer my quiet more than the interference of a chair”¹⁴); he had a lot of interests but the most important was mathematical analysis and theory of numbers. He also was a great scientific interlocutor: he read, asked for explanations, reflected and honestly commented works that his correspondents sent him; it seems that they often used him as a “tester” to verify the quality of their works. He was a sort of “scientific uncle” also ready to “spank” Giulio Ascoli.¹⁵

As every letter in which Genocchi is the correspondent, also these addressed to Betti had a high scientific density. They talked, for example, about problems of didactics of mathematics (“to force to explain Euclide”¹⁶ in Italian schools) but also other important questions: there is a long discussion on pseudo-spherical surfaces, about which the sceptical Genocchi said that, to continue discussing it is essential to “demonstrate that these surfaces exist”¹⁷; in letter 27¹⁸ there is another important discussion with Betti (in the sixties, he was dedicated to research about the theory of elasticity¹⁹) where Genocchi showed his uncritical acceptance, as it was usual at that time, of “postulate” according which “all functions have a derivative”.

Genocchi was austere and severe (he disagreed, for example, with the way that Universities, the *Consiglio Superiore* of Public Education and the Ministry overused *art. 69* of Casati Law, that is to say the direct call-up, “for good reputation”, of professors²⁰) but he was partial for professors of the University of Turin: he often conducted their defence and he was always ready to give them his recommendation, both for less good and for the best.²¹ When a good fight entered in his heart, Genocchi always dedicated to it the right consideration, as it happened for the admission of Sonja Kovalevski at the Academy of Sciences in Stockholm: in Italy he became active to support her admission.²²

During the correspondence with his Turinese interlocutor (his letters are fifty-one while Betti’s answers, always short, are twenty-four), the Tuscan scientist, who, during the formation of the Italian Kingdom, often went to Turin as deputy of Pistoia and could meet Genocchi, was involved in that issue because he was member of the *Consiglio Superiore* of the Ministry of Public Education and for his studies in physical mathematics. The letters 12, 18, 26, 31, 38, 59²³ from Betti to

¹¹ “Dispostissimo a far conoscere al Ministro la vostra attitudine all’insegnamento e l’importanza dei vostri lavori”; lettera 15, *Part I*, [PALLADINO *et al.* 2009].

¹² See letter of the 26th June 1859, *Part I*, [PALLADINO *et al.* 2009].

¹³ “Vi ringrazio delle vostre importanti Memorie che mi favorite e che io leggo sempre con interesse e con mio profitto. Ma io sono vecchio e ormai non posso uscire da cose trite e ritrite, benché non mi manchi la voglia di far meglio: le forze mi mancano; e solo mi è dato di applaudire ai più arditi e valenti di me”; letter 16, *Part II*, [PALLADINO *et al.* 2009].

¹⁴ “Ho sempre preferita e preferisco la mia quiete alla vanità di avere un’ingerenza qualunque nel conferimento delle cattedre”; lettera 42, *Part II*, [PALLADINO *et al.* 2009].

¹⁵ Letter 58, *Part II* of [PALLADINO *et al.* 2009].

¹⁶ “Sull’obbligo imposto di spiegar Euclide”; letters 17, 18, *Part II*, [PALLADINO *et al.* 2009].

¹⁷ “Dimostrare che tali superficie esistano”; letter 44, *Part II*, [PALLADINO *et al.* 2009].

¹⁸ *Part II*, [PALLADINO *et al.* 2009].

¹⁹ See [CAPECCHI *et al.* 2006].

²⁰ Letter 52, *Part II*, [PALLADINO *et al.* 2009].

²¹ See the letter 49, *Part II*, [PALLADINO *et al.* 2009].

²² Letters 75, 76, 77, *Part II*, [PALLADINO *et al.* 2009].

²³ In *Part II*, [PALLADINO *et al.* 2009].

Genocchi are very important: those letters present some consideration about non-Euclidean geometry and Helmholtz's physiological optics.

The documents here collected until now represent the most important cards of a patchwork setting up the time when a country, Italy, that, even if varied, was joined together after so many centuries under the same entity of State and it tried to build a stronger political, civil and scientific future: that historical period required the presence of great national states and the Italian ambition was that of conquering an outstanding place in the European nations "concert" or, at least, the honor of a first line place in the "haute culture" under the great "Italians" flag that until the 17th century had lived up to the whole peninsula. This is the direction where Genocchi, for example seems to look at when corresponding with Betti; he praised the scientific activity carried out by the latter:

"You also work a lot and with your and Italy's honor. I cannot play any other role than the spectator and I am delighted in clapping the talented actors".²⁴

The epistolary exchanges published in this volume, fitting together one in another, realize images evoking a heroic period lived by the Italian people or, at least, from a coat, much as thin, of it. These are images representing rush actions, gone along with a considerable sense of dignity. We can also compare the publishing of these epistolary exchanges, still, to the act which gives voice to some poets; they take part in a choir which can bank on a large number of qualified voices.

The new structures and the new rules building up in this time, will impress on a territory wider and wider since, at first, the Kingdom of Sardinia with the united Lombardy (a sort of "Regno dell'Italia Superiore" as Brioschi writes²⁵), and they will find themselves being broadened, a month later or so, to the Italian Kingdom with Turin as its capital at first, from 1861, and then Florence from 1865 to 1871, to pass afterwards to Rome. An important example, from this point of view, is given by the passing of the *Casati Law*. It concerned the whole public education, of every order and rank, and it approved a part of the law project presented, in 1854, from Cibrario, Minister of the Public Education of the Kingdom of Sardinia. The *Casati Law*, thought for the "Superior Italian Kingdom", will be expanded gradually, with some modifications and integrations, to the whole Italian Kingdom: it was elaborated according to a politic view and it assigned to the highest level of education a constitutional organism function which had to ensure the birth and growth of a national science, the formation of the class heading the country not submitted to the clergy influence, the validity of the educational qualifications, the access to the freelances, the grounding of new grammar school professors and so on. Consequently to the listed reasons, the *Casati Law* calculated to give to the State the entire control and the financial burden of the superior Education, cutting out any private or clerical participation.²⁶

A progressive, considerable documentation is collected supporting the statement according to which, once the Italian Unity reached, it produced a renewed involvement for research, an increase in the chances offered to the experts. In particular, the mathematics enthusiasts –that had previously already found the way, on the occasion of the invitations to the yearly *conferences* of the *Italian scientists* which went over from 1839 to 1847,²⁷ of giving themselves some "solemn occasions" of meeting and, subsequently, they continued actively to look for each other– could take more advantages of the new politic affair. With a remarkable enterprise, they made a good use of the motivating forces that came from the natural intensifying of their relations. Having an edge, in living this occasion of growth, from the fact that their need of scientific equipment and teaching aids were not, as the usual procedure of that time, very strong and so to compromise, in the absence, their capacity of realizing their potentials.

The starting limits outlined a picture of backwardness –less evident in the Grand Duchy of Tuscany, though of little size entity (but where they were well decided, after the risings of 1848, to close the two Universities existing at that time, Pisa and Siena, which were later re-opened by the provisional Government of Tuscany in 1858-59)– in some districts in Emilia and Romagna and in Piedmont, that could count, looking to the grass roots, on a quite strict and common ethical behaviour but, especially, it could have a controlled State deployment; and where also the capital before the Italian unification, Turin, was enriched in some measure by the people who came from the different states of the peninsula, taking refuge there. It is known that during the so-called "preparation decade" for the Unity, many exiles, leading figures of the future Italian governing class, were received in Turin University (but not always with full acceptance by their colleagues). However, the state apparatus of the Piedmont monarchy, despite the presence of a Parliament (the Kingdom of Sardinia was the only Italian state having a Parliament), got to wield forms of control, over its own governed people, even too extreme; more or less in the way of a Bourbon government, as it seems to be from Genocchi's uneasiness confided to Brioschi.²⁸

²⁴ "Voi pure lavorate molto e con onore vostro e dell'Italia. Io non potendo oramai sostener altra parte che di spettatore godo di batter le mani ai valenti attori"; letter of the 7th June 1868, *Part II*, [PALLADINO *et al.* 2009].

²⁵ "Italy's Superior Kingdom"; letter of the 22th July 1859, *Part I*, [PALLADINO *et al.* 2009].

²⁶ See [MORETTI *et al.* 2001], [POLENGHI 1993], [PORCIANI 1994], [PORCIANI 2001].

²⁷ The places of the *meetings* were: Pisa, Turin, Florence, Padua, Lucca, Milan, Naples, Genoa, Venice. See [PANCALDI 1989], [BARTOCCINI *et al.* 1952].

²⁸ Letter of the 29 August 1858, in [CARBONE *et al.* 2006], p. 381.

The south part of the peninsula, the south which Cremona knew personally and a little bit better both for thrusting to the far provinces²⁹ and for staying in Naples for many, long times –it was in this city that his daughter Itala lived as wife of the Neapolitan doctor Vincenzo Cozzolino–, was a definitely a different world.

It already was, anyway, a cause of wonder if the Kingdom of Naples along with Sicily (the largest and most populated of the reigns before unification, and the second for richness production after the Lombardo-Veneto), preserved itself, in broad cultural, civil and religious terms, clung to the European continent. It was a piece of Italy that was felt as far away. But, even if in its irregular way of life in the crowded capital, which naturally represented its core, the Kingdom of Naples could be proud, if nothing else in the Italian area, of some supremacy³⁰ and could count upon the presence, often very active in the capital and somewhere else, of all those institutions, including the cultural expressions, which connoted a country as civil while, provided with a large hard-working youth, and studious,³¹ mainly centered in the capital itself, it had its intellectuals' view addressed to the central and northern –more advanced– part of Europe with which they actively interacted.

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²⁹ See also the letter from Cremona to Genocchi of the 18th January 1863, edited in [CARBONE *et al.* 2001], pp. 73-74.

³⁰ See [PALLADINO *et al.* 2009], pp. XIII-XIV.

³¹ See [PALLADINO 1999 b], pp. 236-237.