Corrado Segre and His Disciples: the Construction of an International Identity for the Italian School of Algebraic Geometry

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Abstract

It is well known that the construction of an identity for the Italian School of Algebraic Geometry directed by C. Segre was the result of a complex dynamic of scientific exchanges with the international mathematical community. In particular, Felix Klein was a reference interlocutor for Segre, Fano, Enriques and Castelnuovo, and he exerted a notable influence on mathematical studies, on the teaching of mathematics, on publishing activity, and on the organization of cultural and academic life. In this paper, in light of the correspondence that Segre

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carried on with Italian and foreign colleagues, we will illustrate the international relationships of the Italian School of Algebraic Geometry in the period of formation (1883–1891). Further, through the reconstruction of Segre's partnerships with American scholars, we will show how he took on the role of a 'Maestro a distanza' or 'distance *Maestro*', for foreign geometers up to the first years of 20th century. From these letters and other archival sources there will emerge the cosmopolite features of the research activities pursued by the Segre's team, the diffusion of Italian geometric methods and results abroad, as well as some aspects of the biography of Segre, related to his institutional, political and editorial committment.

1   The Italian Style in Algebraic Geometry

Since the beginning of the twentieth century, historiography has underlined the existence of a School of Algebraic Geometry led by Corrado Segre, a School distinguished by a precise identity, with "its own impress, an Italian one" (Fano 1924–25, 220).[1] Built up over a time span that coincided with the period of most intense scientific activity of its leader, this identity consists both in a tendecy for the development of particular areas of research: projective hyperspace geometry, geometry on an algebraic curve, geometry of the surfaces, etc., and in the adoption of distinctive methods (synthetic-hyperspace, algebraic, differential-projective), languages and ways of thinking.[2]

The existence and characteristics of the Italian School of Algebraic Geometry were specified by the members of the team and by their Italian colleagues, with singular stability in time and in various circumstances: in obituaries and commemorations of Segre, a few years after his death,[3] in lectures held in Italy and

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[1]On the Italian School of Algebraic Geometry and on the leading role played in it by C. Segre, cf. Menghini (1986), Conte (1993), Gario (1997), Brigaglia (2001), Giacardi (2001a, 2004, 2006–2007), Luciano and Roero (2012, 67–73).

[2]On the *Italian style* in research on Algebraic Geometry cf. Enriques (1920, 1924, 1928), Scorza (1932), B. Segre (1933), Severi (1950), Galuzzi (1980, 1033, 1058–1085), Boffi (1986), Bottazzini (1988), Boi (1990, 31, 38–43, 56–62, 71–73), Gray (1994), Brigaglia and Ciliberto (1995, 2004), Brigaglia (2001), Brigaglia et al. (2004), Mancosu (2009).

[3]Cf. Volterra (1924, 459), Castelnuovo (1924a, 460), Fano (1924, 460), Castelnuovo (1924b, 353, 354, 359), Berzolari (1924, 530, 531), Fano (1924–25, 220–223, 227), Terracini (1926, 209–250), Viglezio (1924, 1), Boggio (1928, 310, 313). The leadership of the Italian School of Algebraic Geometry had already been ascribed to Segre in the *Relazione sul concorso reale per la Matematica pel 1895*, Atti della R. Accademia dei Lincei, Rendiconti delle sedute solenni, I, 1892–1901, 367.

abroad,[4] in prefaces to essays and volumes,[5] in inaugural addresses and courses on Higher Geometry,[6] etc. This identity was soon recognized by foreigners. Julian L. Coolidge for instance affirmed:

> There is a pronounced rise and fall in the tide of mathematical interest in different countries and at different times. […] As for the modern birational geometry, that is almost a monopoly of *Italian mathematicians* and few others like Macaulay and Snyder, who have been strongly influenced by Italian thought (Coolidge 1927, 352).

Henry F. Baker, in the same line of thought, noticed[7]:

> He [Segre] may probably be said to be the father of that *wonderful Italian school* which has achieved so much in the birational theory of algebraic loci (Baker 1926, 269).

In the first phase of rereading of their activity, in a historical-mathematical retrospective, Italian algebraic geometers underlined not only and not so much the *national* landmark of their tradition of studies, but above all the international cultural roots and the contributions from exchanges with foreign colleagues.[8]

Recognition of a cosmopolitan dimension in geometry research was weakened, however—and eventually disappeared—during the fascist period, when some members of the School of Segre, with clear ideological intents, stressed the *Italianness* of their style of researches, to the point of distorting the evolution and identity of the School to which they belonged to make it an *emblem* of the 'Latin-Aryan genius'.[9]

Apart from this latter drift, there appears to be no doubt of the fact that Segre made a decisive contribution to the construction of an *international* identity for the *Italian* School of Algebraic Geometry, to its definition *au fil du temps* and to its affirmation at a world level. Some disciples of his rather emphasised that Segre's scientific activity had been affected—especially in quantitative terms—by the energies that he had devoted to this purpose (Castelnuovo 1924b, 369). In this connection, in the initial phase of his scientific production, between 1882 and 1884,

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[4]Cf. for example Volterra (1907, 1909, 64), Fano (1923), Castelnuovo (1929), Severi (1932), Fano n.d., conferenze del 4 e 11 maggio (1942, f. 53).

[5]Cf. for example Bertini (1907, V), Enriques and Chisini (1915–34, v. 2, 541, v. 3, 154), Severi (1926, 141–144, 240–243, 289–296), Enriques (1937, 9–12).

[6]Cf. for example Terracini (1934–35, fols. 1, 3, 5), Terracini (1957–58, fols. 1, 3, 5, 7, 9, 11), Enriques (1929, 107–109).

[7]Cf. also Fehr (1923).

[8]Cf. Castelnuovo and Enriques (1896), Enriques (1906), Segre (1905, 1921c), Enriques (1926, 129–134), Castelnuovo (1929, v. 1, 191–201), Loria (1930[4], nnp).

[9]Cf. for instance Severi (1935, 581–589, 1941, 139), Conforto (1939, v. I, 133–134). On these nationalistic and anti-Semitic tendencies in historiography regarding Segre's School cf. Israel and Nastasi (1998, 286–307), in particular 300–302 and Israel (2010, 274–287), in particular 280–282.

he had written no fewer than 16 articles, and had entertained a wide network of correspondences with mathematicians from various countries like A. Voss, F. Klein, L. Kronecker, O. Schlömilch, G. Darboux, C.F. Geiser, T.A. Hirst, K. Weierstrass, A. Cayley, T. Reye[10] and J. Rosanes[11]. However after 1887 there followed a less intense period of work. This second period could be properly defined as that of 'Segre Maestro' because of the fact that, though continuing to cultivate his personal studies and interests, he devoted a large part of his time and activity to pushing his direct and distance disciples to produce original researches,[12] which in a sense he ended up considering "as his own."[13]

In this outlook it thus becomes important to stress that phase in Segre's life which was entirely unwinded in the Short Century, a phase traditionally somewhat overshadowed by the golden period (1883–1888),[14] in order to reconstruct the strategies worked out by him to stabilize the identity of his School and 'give colour and solidity' to it. A *histoire par traces* according to Bloch springs, which, investigating some less well-known aspects of Segre's scientific biography like the epistolary relationships and conversations with foreign colleagues, the publishing activity, the attendance at international congresses of mathematicians, the intentions and actions in the period of the Great War and in the early Twenties, shows that contributions were made to the construction of this identity not only by strictly technical aspects (mathematical ideas, contents and methods), but also by a set of paradigms and socio-cultural behaviours. It was *also* the sharing of certain civic values and particular stances, proper to many intellectuals of the first generation after the Risorgimento, that helped to make the team of Italian algebraic geometers a real School, internationally recognized, endowed with an appearance and cohesion of intents that went beyond the existence of a common research project, and

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[10]For this purpose see the correspondences between Segre and foreigners in Annexes 1–16 to this article. Thanks to the discovery of new archival sources, today it is possible to reconstruct Segre's international relationships with more precise details, in regard to Terracini (1926) and B. Segre (1963–64) had done. In this connection it is significant that Segre's wife Olga and daughters Elena and Adriana made these letters available to his alumni, so that they could illustrate the international dimension of Segre's culture, at the beginning of his research on algebraic geometry.

[11]Cf. the manuscript by C. Segre *Sur les invariantes simultanés de deux formes quadratiques. Lettre à M. J. Rosanes par Corrado Segre à Turin*, 11 April 1884, described in Giacardi and Varetto (1996, 363).

[12]Cf. the correspondences by E.J. Wilczynski, C.H. Sisam, V. Snyder, E. Study and J.L. Coolidge to C. Segre, and to his wife: Annexes 28–31, 44–47 and 52–56 to this article.

[13]Cf. Segre to Pieri, 20 November 1901: Arrighi (1997, 115) and Segre to Castelnuovo, 3 April 1901: "From years and years I don't have the time to make researches that are quite substantial!" (ANL-Castelnuovo, Segre to Castelnuovo, 3 April 1901 "Sono anni ed anni che io non ho il tempo di far ricerche un po'lunghe!").

[14]It is difficult to establish the chronology of the 'golden period'in Segre's activity. Baker for example stated: "as to his work, one's judgement is dark formed by what he did before he was twenty-five years of age than by the publications of the remaining thirty-five years." (Baker 1927, 263). To us it seems nevertheless that this timeline is too narrow and that the most prolific period in Segre's research should be extended at least to 1895. For a study of Segre's youthful contributions, and particularly of the essays of the 1880s, cf. Ghione and Ottaviani (1992).

which remained strong, at least until the divergent political and cultural choices by some members, such as F. Severi, E. Bompiani and F. Conforto, during the fascist dictatorship.[15]

2 Circulation of Knowledge Between Italy and Europe

The first tiele in the construction of an international identity for this School was represented by the efficient network of circulation of texts and readings, put in place by Segre through his masterly teaching, documented by his handwritten *Notebooks* (Giacardi 2001a, 2013), and through the correspondences with some Italian and foreign colleagues.[16]

In effect, if it is true that the School of Segre identified in the writings of the Italians L. Cremona and E. D'Ovidio, and in some other renowed works by E. Bertini, G. Veronese, G. Battaglini and R. De Paolis, its *points de repère*, it is likewise undeniable that the cultural horizons of this School were much broader and took up the legacy of a wide range of influences and references to more or less famous foreign authors.

It was Segre himself that looked to international production for a profound renewal of the development of the three fields mainly cultivated by him. Regarding projective hyperspace geometry he referred, from his first works, to the results attained by F. Klein, F.G. Frobenius and K. Weierstrass (Giacardi 2001a, 141, 143–144, 148; Zappulla 2009; Luciano and Roero 2012). In particular, during the period in which he wrote his degree dissertation (spring-summer 1883) and published his first papers (Segre 1883a, b), he 'reinterpreted' some recent algebraic results obtained by Weierstrass, for the purpose of giving a geometrical and analytical pattern to projective hyperspaces, as we see from his correspondence with L. Kronecker (16 November 1883, 10 December 1883, 25 December 1883, Annexes 3, 4 and 5), with Weierstrass (28 March 1884, Annex 13) and with A. Cayley (14 May 1884, Annex 14). Aware of the difference of approach in the language adopted by the Italian and German Schools, in those circumstances Segre intensely stressed the utility of geometrically 'translating' some elements of the theory of bilinear and quadratic forms, developed by Weierstrass and by Kronecker himself (25 December 1883, Annex 5):

> Peut-être ne devrais-je pas dire «interprétation géométrique», car ces mots font penser (et vous ont fait penser à ce que je vois) à un travail qui consiste seulement dans des changements de mots […]. Mais ce n'est pas là ce que j'entendais dire dans ma dernière lettre.

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[15]On the disagreements inside the Italian School of Algebraic Geometry, due to different political and ideological choices, cf. Vesentini (1990), Israel and Nastasi (1998, 156–160, 317–327), Pompeo Faracovi (2004), Guerraggio and Nastasi (2005, 83–118, 243–268), Babbitt and Goodstein (2009), Goodstein and Babbitt (2012).

[16]For illustrating the Italian milieu we have used above all some correspondences of Segre's with Castelnuovo and with Volterra. The former has been partially published (Gario 1991; Bottazzini et al. 1996, 669–678), while the second will be edited by L. Giacardi and P. Nastasi.

Some years later he again emphasised the true coincidence between the results obtained by Italian and German geometers, in spite of the different languages used, writing to Castelnuovo:

> Certain results can perhaps already be found in the analytical works (Kronecker, Weierstrass and alumni), but, because of their style of exposition, which is completely different from ours, comparisons are difficult. (ANL-Castelnuovo, Segre to Castelnuovo, 17 May 1894: "Certe cose poi può darsi si trovino già in lavori analitici (Kronecker, Weierstrass e scolari), ma per il loro modo d'esposizione, completamente diverso dal nostro, i riscontri son difficili").

Regarding the second favourite field of studies by Segre (the geometry on curves and surfaces), it was instead above all the contacts with Max Nöther that were fundamental,[17] while for differential geometry and that of imaginary quantities Segre's letters and conversations with G. Darboux,[18] with the American E.J. Wilczynski[19] and with the Czechoslovak E. Čech were important.[20]

Besides these direct contacts with the international community, it must also be remembered that Segre, starting from the third year of his university studies, frequented Turin bookshops looking for texts by famous authors and was wont to consult in the University Library the collections of German journals like the *Mathematische Annalen*,[21] the *Journal für die reine und angewandte Mathematik*[22] and the Berlin *Monatsberichte*.[23]

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[17]On the relationships between M. Nöther and the Italian School of Algebraic Geometry cf. Segre (1921–22b, 161–163), Castelnuovo et al. (1925), Castelnuovo (1922), Berzolari (1921), and the correspondence between Nöther and Castelnuovo in the years 1889–1921 (ANL-Castelnuovo).

[18]Segre to Darboux, 11 March 1884, Annex 9.

[19]Segre to Wilczynski: 18 March 1904, Annex 29; 2 July 1904, Annex 31; 15 May 1906, Annex 48; 4 June 1906, Annex 49; 20 April 1908, Annex 56; 16 April 1916, Annex 59. Very interesting, on this subject, is the interpretation that Guido Fubini gave of the differences between the line of Italian research in projective geometry and that of E. J. Wilczynski, P. Sperry and G. M. Green (cf. EJWP, G. Fubini to E. J. Wilczynski, 27 May 1919).

[20]See below, Sect. 4.

[21]Cf. Segre to Voss, 1882, Annexes 1 and 2. Some years later he wrote to Castelnuovo: "I will certainly remain here for another month and perhaps for all the holidays. I go dipping into a few selected articles in the *Mathematische Annalen*." (ANL-Castelnuovo, Segre to Castelnuovo, 15 August 1889: "Io rimarrò qui certo per un mese ancora e forse per tutte le vacanze. Vado leggicchiando poche cose scelte nei *Mathematische Annalen*"). Hence this journal was to remain a reference beacon to perceive the most advanced and promising lines of research.

[22]Cf. Segre to Voss, 1882, Annexes 1 and 2.

[23]Cf. Segre to Kronecker, 16 November 1883 and 10 December 1883, Annexes 3 and 4.

In the first years of his scientific career, there was an evident influence on Segre of the German mathematicians, as can be inferred from his *Resoconti di Scritti letti*[24] and from examination of his correspondences with A. Voss, L. Kronecker, O. Schlömilch, C.F. Geiser and K. Weierstrass. It was in this period that Segre, showing a great entrepreneurial spirit, turned to scholars that were already prominent, expounding his research projects, asking for suggestions on how to pursue his studies on complexes of lines and on the geometry of the straight line, and asking them for offprints, essays and books. This allowed him to contextualize his results in an international perspective and thus to enter in his own right the arena of the most authoritative scholars in the discipline.

The helpfulness shown by these foreign mathematicians towards a young researcher aroused Segre's gratitude and induced him to ask those people that he was accustomed to define his "*Maestri for a moment*",[25] for hospitality for his own articles. Hence his essays on the classification of second-order and fourth-order complexes, on the Kummer surface, on linear complexes, on binary homographies, on curves and ruled algebraic surfaces appeared in the *Journal für die reine und*

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[24]Cf. UTo-ACS. *Appunti e Resoconti. Resoconti di scritti letti*, f. AP1 (F. Klein), AP3 (A. Clebsch, Salmon), AP6 (E. Malus), AP7 (J. Sylvester), AP9 (L. Schläfli), AP12 (B. Riemann), AP14 (K. Weierstrass), AP15 (L. Schläfli), AP16 (R. Sturm, M. Chasles), AP17 (G. Halphen), AP19 (R. Sturm, E. Genty), AP21 (G. Kobb), AP22 (M. Nöther), AP23 (A. Clebsch, S. Lie), AP24 (E. Study), AP25 (H. Schwarz), AP27 (E. Kummer), AP28 (G. Halphen, G. Fouret, C. Jordan), AP29 (A. Cayley), AP31 (F. von Lindemann), AP32 (M. Chasles), AP33 (M. Chasles), AP35 (D. Hilbert), AP36 (D. Hilbert), AP37 (H. Schubert), AP38 (J. Bischoff), AP39 (H. Schubert), AP40 (M. Nöther), AP41 (M. Nöther), AP42 (M. Nöther, L. Kraus), AP43 (G. Hanck), AP45 (T. Reye), AP46 (A. Hurwitz), AP47 (H.G. Zeuthen), AP48 (Harnack, Klein), AP49 (Brill), AP50 (Chasles), AP51 (Clifford), AP52 (H.G. Zeuthen), AP53 (C. Harnack, A. Ameseder, E. Weyr), AP54 (E. Weyr), AP58 (A. Voss), AP59 (F. Frobenius), AP60 (R. Sturm, T. Hirst), AP61 (H. Schröter), AP64 (E. Kummer), AP68 (J. Rosanes), AP69 (F. Frobenius); AP70 (L. Stickelberger, F. Frobenius); AP71 (C. Jordan, L. Kronecker); AP73 (L. Kronecker), AP75 (G. Halphen, E. Laguerre, C. Jordan), AP76 (G. Halphen), AP 77 (H. Picquet), AP78 (R. Sturm), AP80 (C. Stéphanos), AP81 (J. Lüroth), AP83 (F. Franklin), AP84 (K. Rohn), AP86 (A. Cayley), AP87 (H. Durrande, E. Laguerre), AP88 (G. Darboux), AP89 (T. Moutard), AP90 (E. Kummer), AP91 (E. Kummer), AP92 (E. Kummer), AP93 (F. Klein), AP94 (F. Klein), AP95 (F. Klein), AP97 (T. Reye, F. Auerbach, F. Neumann, F. Schur), AP98 (T. Weddle), AP100 (F. Schur), AP101 (A. Schumann), AP106 (A. Cayley), AP107 (G. Fouret), AP108 (F. Meyer), AP109 (H. Durège), AP111 (F. Klein, S. Lie), AP114 (M. Chasles), AP115 (G. Halphen, M. Chasles), AP116 (A. Cayley), AP117 (J. Plücker), AP119 (F. Schur), AP124 (S. Lie, F. Klein, Liouville), AP126 (R. Sturm), AP127 (L. Painvin), AP128 (J. Steiner), AP129 (F. Seydewitz), AP130 (J. Gergonne), AP131 (A. Voss). By contrast few are the reports on papers by Italian authors. Cf. UTo-ACS. *Appunti e Resoconti. Resoconti di scritti letti*, f. AP2 (L. Cremona), AP8 (L. Cremona), AP10 (P. Del Pezzo), AP26 (E. Beltrami), AP55 (F. Aschieri), AP56 (F. Aschieri), AP57 (E. Padova), AP62 (G. Battaglini), AP63 (G. Battaglini), AP65 (A. Sannia), AP66 (S. Dino); AP74 (L. Cremona), AP79 (G. Veronese), AP82 (G. Loria), AP85 (L. Cremona), AP96 (E. Bertini), AP102 (F. Ruffini, G. Battaglini), AP103 (F. Siacci), AP104 (F. Siacci), AP105 (E. D'Ovidio), AP110 (E. D'Ovidio), AP112 (F. Siacci), AP113 (G. Battaglini), AP117 (L. Cremona), AP118 (E. Caporali), AP120 (D. Boccella), AP121 (G. Veronese), AP122 (G. Veronese), AP123 (E. D'Ovidio), AP125 (G. Battaglini).

[25]Segre to Kronecker, 25 December 1883, Annex 5.

angewandte Mathematik (Segre 1884a, c, g), directed by Kronecker, and in *Mathematische Annalen* (Segre 1883a, b, 1884d, e, 1886a, 1887b, c, 1889a, 1891d), coedited by Klein.[26] By contrast did not succeed Segre's aspiration to publish a paper in the German journal *Zeitschrift für Mathematik und Physik,* edited by O. Schlömilch. He sent his article in French: "Sur les droites qui ont des moments donnés par rapport à des droites fixes", only later realising that only texts in German were accepted in that periodical. It was Schlömilch himself that forwarded Segre's paper to Klein, proposing that he publish it in *Mathematische Annalen*, but in the end it was printed in the *Journal für die reine und angewandte Mathematik* (Segre 1884c).[27]

As is well known, it was above all Klein that, starting from August 1883, assumed the role of Segre's 'distance *Maestro*' (Luciano and Roero 2012, 18–27, 81–148). Klein stimulated the young disciple to develop particular lines of research, carefully reread his first works, extended the sphere of his readings and involved him in international publishing initiatives, for instance enrolling him as a reviewer for the *Jahrbuch über die Fortschritte der Mathematik*. This proposal was immediately welcomed by Segre. In the two years 1883–1885 he wrote 35 reviews of works by Italian mathematicians (with a single exception[28]), and his comments were then translated into German by E. Lampe (Togliatti 1963, XII).

Furthermore it was Klein that widened the circle of Segre's interlocutors, putting him in contact with various European mathematicians (A. Hurwitz, F. Schur, J. Rosanes and T. Reye) that dealt with the same research themes as him,[29] and inviting Segre to vulgarize his results abroad by sending offprints to foreign colleagues. This suggestion too was attentively followed up by Segre, as is proved by

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[26]Cf. Segre to Kronecker, 10 December 1883 and 25 December 1883, Annexes 4 and 5.

[27]On the behind the scenes of this publication cf. Segre to Schlömilch, 17 January 1884 and 8 February 1884, Annexes 6 and 7; Segre to Kronecker, 18 February 1884, Annex 8, and Luciano and Roero (2012, 104–106).

[28]Cf. the review by Segre of J.S. and M.N. Vaneček, Sur la génération des surfaces et des courbes gauches par les faisceaux de surfaces, *Atti della R. Accademia dei Lincei, Rendiconti*, 4, 1 (1885): 130–133, published in *Jahrbuch über die Fortschritte der Mathematik* 17 (1885): 667–668.

[29]Cf. Luciano and Roero (2012, 24).

his promotion of his essay on metric geometries of linear complexes and the spheres (Segre 1883–84a), offered to Darboux, Cayley, Geiser, Hirst and Mittag-Leffler.[30]

The capacity of Segre's to move into the European context of research on algebraic geometry—at first as a 'distance disciple' and then as an equal partner—was greatly appreciated at the national level and put him in the condition to become, in turn, a leader for the new generation of Italian geometers. For instance, one of the aspects noticed by the examination board in the competitions for the qualification for university teaching (*libera docenza*) and for the chairs in Higher Geometry, in which Segre participated (in Turin, Catania and Naples), was precisely the fact that "the excellent young scholar" had built up relationships of scientific collaboration with illustrious foreign mathematicians and yet had an excellent reputation abroad.[31] Aware of the weight, in evaluation of his curriculum, of the flattering judgments received in the international parterre, a few years later Segre suggested to Castelnuovo that he adopt analogous strategies for himself:

> By the way sending some printed copies of Nöther's letter to the examinatory board would always be a good precaution! (ANL-Castelnuovo, Segre to Castelnuovo, 8 August 1891: "Ad ogni modo l'invio al concorso di alcune copie stampate della lettera di Nöther sarebbe sempre una buona precauzione!").

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[30]Cf. Segre to Schlömilch, 8 February 1884, Annex 7; Segre to Darboux, 11 March 1884, Annex 9; Segre to Cayley, 15 March 1884, Annex 10; Segre to Geiser, 23 March 1884, Annex 11; Segre to Hirst, 23 March 1884, Annex 12; Segre to Weierstrass, 28 March 1884, Annex 13; Segre to Cayley, 14 May 1884, Annex 14; C. Segre to G. Mittag-Leffler, 29 January 1885, IMLSA, *C. Segre n. 3*: "Monsieur le Professeur, Je vous envoi une copie d'un travail à moi, qui est paru à-présent, et qui contient des recherches géométriques et mécaniques sur lesquelles je prends la permission d'appeler votre attention. J'espère que les travaux, que je vous ai envoyés en pli chargé quelques jours après que j'avais eu le bonheur de faire votre connaissance, vous seront parvenus. Bien qu'ils versent surtout sur la géométrie à plusieurs dimensions, je pense qu'ils peuvent aussi intéresser un peu vous, qui êtes analyticien, car cette branche de la géométrie est liées très-étroitement à l'analyse. Je suis en train d'étudier le travail, dont vous m'avez fait cadeau, et je vous en suis vraiment reconnaissant. Vous me ferez aussi beaucoup de plaisir en me tenant au courant de vos découvertes futures. Votre très dévoué Corrado Segre".

[31]Cf. Relazione della Commissione pel concorso alla detta cattedra di professore straordinario, *Bollettino Ufficiale dell'Istruzione. Atti e documenti scolastici*, XIII (maggio 1887): 342.

Moreover, Castelnuovo, who had been Segre's assistant in Turin, and then became his friend and confidant, was a witness to the frequent requests for volumes, offprints[32] and lithographed polycopies of courses[33] that Segre made to his out-lander colleagues. Hence, immediately after his death, as one of the principal merits of the Piedmont algebraic geometer he stressed his having enriched "with vital nourishment the culture of the Italian geometric School" through his activity of direction of Italian research and thanks to the international opening of his teaching (Castelnuovo 1924b, 354).

As a matter of fact, the manuscript *Notebooks* of Segre's courses in Higher Geometry (1888–1924) gradually grew fuller and fuller of references to foreign scientific literature. For example, as regards his own use of the texts by M. Nöther in his university lectures, Segre wrote to Castelnuovo:

> Have you seen the *Bericht* by Brill and Noether on algebraic functions? I am enthusiastic about it; although, only having received it 2 days ago, I have not been able to examine it thoroughly yet; and although of the Italian style there is only the name (for which the A [Authors] apologise in the preface, and Nöther also apologised to me in the short letter that he sent with the volume). Apart from this lacuna and the one relating to the arithmetic approach, in this treatise there is a historical exposition and critique, minute, meticolous, detailed, of all the theory, inclusive of all the methods and all the connections. If I am not to be disanchanted during the reading (which I do not believe), here there is the true story, which I had been yearning for so long, of this field. If it had come out a few months before it would have saved me – with the chapter on singularities – a large part of the work that I have done to structure my course for this year! (ANL-Castelnuovo, Segre to Castelnuovo, 28 November 1894: "Hai visto il *Bericht* di Brill e Noether sulle funzioni algebriche? Io ne sono entusiasta; quantunque, avendolo ricevuto da soli due giorni, non abbia ancor potuto esaminarlo a fondo; e quantunque dell'indirizzo italiano non vi sia che il nome (di che gli A [Autori] si scusano nella prefazione, ed il Nöther si scusò pure con me nelle poche righe con cui accompagnò l'invio del volume). Tolta questa lacuna e quella relativa all'indirizzo aritmetico, vi è in quest'opera un'esposizione storica e critica, minuta, coscienziosa, particolareggiata, di tutta quanta la teoria, in tutti i metodi, con tutte le connessioni. Se non incontrerò delusioni nella lettura (il che non credo) vi è qui la vera storia, quale io vagheggiavo da tanto tempo, di questo campo. Se usciva qualche mese prima mi

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[32]Segre commented, for example to Castelnuovo, on the benevolence of Cayley for the gifts of his complete works (ANL-Castelnuovo, Segre to Castelnuovo, 6 January 1892) and later enthusi-astically told him: "Humbert has sent me a big parcel of his offprints." (ANL-Castelnuovo, Segre to Castelnuovo, 16 February 1893: "Humbert m'ha inviato un grosso pacco di suoi lavori").

[33]For example Segre obtained and studied lithographs of the courses of Klein, H. Weber, etc. (Luciano and Roero 2012, 43, 181) as one can see from the following excerpts from the correspondence with Castelnuovo: "I have received those Lectures by Klein, and I have found a lot of interesting elements in them, including … my name (an allusion to the *Nuovo Campo*!)." (ANL-Castelnuovo, Segre to Castelnuovo, 12 November 1891: "ho ricevuto quelle Lezioni di Klein, e vi ho trovato molte cose interessanti, fra cui … il mio nome (un'allusione al *Nuovo Campo*!)"). Segre's interest was not only limited to geometry courses. For instance in 1906 he asked Volterra for a copy of the lectures held in Stockholm (ANL-Volterra, Segre to Volterra, 24 April 1906 and 28 December 1906). The lithograph he received from his friend was much appreciated: "In the last days I completed the reading of your Stockholm conferences and I am full of admiration!" (ANL-Volterra, Segre to Volterra, 24 June 1907: "Ho finito nei giorni scorsi le tue Lezioni di Stoccolma, e ne son rimasto ammirato!").

risparmiava – col capitolo sui punti singolari – una gran parte del lavoro che ho fatto per architettare il mio corso di quest'anno!").

Similarly while preparing the 1897–98 course entitled *Lezioni sui Gruppi continui di trasformazioni* (Segre's *Notebook* 11 in Giacardi 2013) Segre confided the difficulties that he met in studying the work by S. Lie[34]:

> I only deal with studying groups, and drawing up a program for the course. […] As for the method, I sometimes find it difficult to understand Lie's reasonings and calculus; and I would like to make the treatment clearer. There are also some beautiful theorems in the last chapters of both the 1st and 3rd vols. of Lie's work. (ANL-Castelnuovo, Segre to Castelnuovo, 22 October 1897: "Non mi occupo d'altro che di studiare i gruppi, e di farmi un programma del corso. […] Quanto al metodo, trovo difficoltà qualche volta a veder chiaro nei ragionamenti e calcoli di Lie; e vorrei rendere la trattazione più luminosa. Vi sono dei bei teoremi anche negli ultimi capitoli sia del 1° che del 3° vol. dell'opera di Lie").

Indeed, in 1899 reflecting on the use of the papers by David Hilbert for his lectures on Enumerative Geometry, Segre again addressed Castelnuovo for advice:

> Tell me if you have ever studied the memoir by Hilbert *M[athematische] A[nnalen]* 36 "*Ü[ber] die Theorie d[er] alg[ebraische] Formen*" in which there is a general formula for postulation of an M_k of S_r for forms of suitable high order. I would like to expound it this year in my course: but I'm held back by the complicatedness of that part in which it is proved that the number of certain relationships is finite (and at most $= r + 1$): 3rd theorem of that Memoir. Do you have any suggestion to make me known on this subject? (ANL-Castelnuovo, Segre to Castelnuovo, 4 October 1899: "Dimmi se hai mai studiato la memoria di Hilbert M.A. 36 "U. die Theorie d. alg. Formen" in cui si trova una formula generale di postulazione di una M_k di S_r per forme di un ordine abbastanza alto. Io vorrei esporla quest'anno nel mio corso: ma mi trattiene la complicazione di quella parte in cui si dimostra che è finito (e al più $= r + 1$) il numero di certe relazioni: teorema 3° di quella Memoria. Hai tu qualche suggerimento da darmi in proposito?").

Equally numerous were the requests for purchases and exchanges of foreign offprints and volumes, personally made by Segre, and presented from 1907 to 1924 in his capacity of director of the Mathematical Library in Turin.[35] These

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[34]Regarding the use of Lie's writings in Segre's courses cf. also Segre to Castelnuovo, 26 January 1898, 17 May 1898 (ANL-Castelnuovo) and Hawkins (2000, 243–244, 251–260, 305–316).

[35]Here are some examples: "Give *me* the Note by Hilbert and Hurwitz (the Library of the Teachers Training School already has it in the *Acta Mathematica*, I think). As for the other two papers by Hilbert, the Library and I already hold them in the *Mathematische Annalen*: so you can donate them to some Roman geometer" (ANL-Castelnuovo, Segre to Castelnuovo, 12 January 1892: "Regala *a me* la Nota di Hilbert e Hurwitz (la Biblioteca di Magistero l'ha già negli *Acta mathematica*, credo). Quanto alle altre due di Hilbert, la Biblioteca ed io le abbiamo già nei *Mathematische Annalen*: sicché puoi regalarle a qualche geometra romano"); "If you didn't need Lüroth's memoir any more, at least for now, the Library of the Teachers Training School would take it back." (ANL-Castelnuovo, Segre to Castelnuovo, 7 December 1893: "Se la memoria Lüroth non ti occorresse più, almeno per ora, la Biblioteca di magistero la riprenderebbe."); "Please send us those volumes by Helmholtz and Klein, because our young scholars often need them." (ANL-Volterra, Segre to Volterra, 9 December 1900: "Favorisci inviarci quei tali volumi di Helmholtz e Klein, perché occorrono spesso ai nostri giovani."). Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 6 January 1892 and 11 December 1893 and ANL-Volterra, Segre to Volterra, 30 December 1900.

acquisitions highly contributed to increasing the scientific collections of the University of Turin (Giacardi and Roero 1999, 442–447).

The range of Segre's readings, and consequently the international dimension of the exchanges of manuscripts and printed texts, was broadened above all after 1890 when, as an authentic leader, Segre devoted himself systematically to "importing to Italy ideas that had been developing elsewhere." (Terracini 1961, 11; Fano 1924, 225). Moreover he was one of the first Italian mathematicians to be associated to the *Deutsche Mathematiker Vereinigung* in 1897,[36] and from its journal (JDMV) he got news on the scientific activities in universities of Germany and other countries.

As we deduce from examination of his *Card Index*[37] and his *Library*,[38] Segre was an attentive, untiring and meticulous reader, whose horizons, initially limited to the German area, with the passing of time were extended towards world production, not only in geometry, but also in other disciplines, like analysis, abstract algebra, set theory, foundational studies, mathematical physics and maths education.[39]

In turn, Segre repeatedly encouraged students and colleagues, in both Turin and other places in Italy, to look to international publications to enter into flourishing lines of research and to renew their university teaching. In 1886, for instance, he suggested to Castelnuovo, at the time a student, to read the articles on *n*-dimensional geometry by W.F. Meyer, W.K. Clifford and H. Schubert, published in *Mathematische Annalen* and *Acta Mathematica*,[40] and he recommended that he conveniently quote them in his works. A few years later he again urged

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[36]Cf. *Mitglieder-Verzeichnis*, JDMV 6 (1897): 20; JDMV 21 (1912): 44.

[37]Fano was the first to mention Segre's habit of 'gradually collecting and cataloging precious bibliographical references, over a period of 30 years' (Fano 1924–25, 222). The handwritten cards that make up his personal *Card Index*, built up and updated over time, are stored in BMP Turin (Giacardi and Varetto 1996, 367–368; Giacardi 2001b, 296).

[38]Segre's personal library was sold in 1924 to Guido Toja and bequeathed to the Mathematical Institute of Florence University (cf. Annexes 74 and 75 to this article).

[39]UTo-ACS. *Elenchi di opere, articoli e Schede bibliografiche*. The analysis of the cards devoted to the themes *Aggregates I*, *Aggregates II*, *Foundations of geometry*, *Elementary Geometry*, *Postulates*, *Foundations (S_n)* at numbered fols. 48, 49, 173, 174, 175, 176, 211, 300, 456, 461, and *Euclid and the Foundation of Arithmetic* (second part of Segre's *Card Index*, not numbered cards fols. 9, 10) is particularly interesting, both because it documents Segre's great culture, also in the realm of logical-foundational studies, and because it makes it possible to compare his point of view with that of G. Peano, who worked on the same themes with quite antithetical visions of foundational stances in respect of both research and teaching (Luciano and Roero 2012, 28–37, 66–73; Luciano 2016). From a cross exam of the *Card Index*, the *Library* and Segre's correspondence, it emerges for example that Hilbert's *Grundlagen der Geometrie*, received by Segre in 1902, were cited in his 1902–03 course on *Geometrie non-Euclidee* (Segre's *Notebook* 16 in Giacardi 2013) and in his *Lectures at the Magistero School* (Segre's *Notebook* 40 in Giacardi 2013). The book was then commented on with Castelnuovo and, through an exchange of letters between Castelnuovo, Enriques, Klein, Minkowski and Hilbert, it became known to Enriques, who referred to it in the chapter on *Foundations of Geometry* for the *Encyklopädie der mathematische Wissenschaften* (Bottazzini 2001a, 295–304; Luciano and Roero 2012, 33–37).

[40]ANL-Castelnuovo, Segre to Castelnuovo, 27 July 1886, 29 July 1886 and 30 December 1886.

Castelnuovo, who had become a colleague of his, to examine in depht into the M. Nöther's memoirs, and shared his intention to study F. Neumann's *Vorlesungen*.[41] Similarly Segre advised Loria and Castelnuovo to refer to the international literature for their courses on Higher Geometry in Genoa and Rome, respectively.[42]

Further, during all the period of his direction of the Italian School of Algebraic Geometry, Segre circulated offprints and texts by foreign geometers in Italy[43]; with his team of coworkers he commented on the most recent bibliography[44] and even

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[41]ANL-Castelnuovo, Segre to Castelnuovo, 10 October 1888 and 15 July 1889.

[42]For example Segre wrote to Castelnuovo: "Loria asked for my advice about basing his course on geometry of the straight line upon Sturm's text and a long time ago I answered him 'not', more or less explaining what you say now: but this was completely useless; later Loria wrote to me that the 2nd vol. (which has already been published, but I don't have it yet) is much more important than the 1st." (ANL-Castelnuovo, Segre to Castelnuovo, 27 December 1892: "A Loria che mi chiese consiglio sul prendere lo Sturm a testo per un corso di geometria della retta risposi tempo fa di no, adducendo all'incirca quel che dici tu: ma ciò non valse; più tardi Loria mi scrisse che il 2° vol. (già uscito, ma che io non ho ancora) è molto più importante del 1°"). Segre also recommended to Castelnuovo the texts by A. Wrigley, *Collection of Examples and Problems in Pure and Mixed Mathematics* (1865) and J. Wostenholme, *A Book of Mathematical Problems on subjects included in the Cambridge Course* (1867) for his Geometry course in Rome.

[43]In July 1900 for instance Segre sent Volterra the article by F. Klein, Riemann und seine Bedeutung für die Entwicklung der modernen Mathematik, *Amtlicher Bericht der Natur-forscherversammlung zu Wien* (26 September 1894, JDMV, 4 (1894–95): 71–87—Klein GMA 3 (1923): 482–497); cf. also ANL-Volterra, Segre to Volterra, 19 July 1900, 30 December 1900 and 7 March 1901.

[44]Segre announced for example to Castelnuovo that he had "devoured" a new volume by Lie in just 1 month (ANL-Castelnuovo, Segre to Castelnuovo, 29 August 1891). The following summer, about to prepare his famous course *Introduzione alla geometria sugli enti algebrici semplicemente infiniti*, Segre announced to Castelnuovo his intention to pivot on the Memoir by S. Kantor (ANL-Castelnuovo: Segre to Castelnuovo, 28 August 1892). In September he added: "The 1st vol. of Sturm's *Liniengeometrie in synthetischer Behandlung* has been published (I don't know if I have already told you). It is a good book; I believe you will like it. By the way, do you read Kirckhoff? I am also receiving, this very day, the 2nd vol. of Klein-Fricke." (ANL-Castelnuovo, Segre to Castelnuovo, 14 September 1892 and 18 September 1892). To structure the course on the *Teoria della singolarità delle curve e superfici algebriche*, Segre "grants a lot of time" to *Continuirliches Gruppen* by S. Lie and L. Scheffers (ANL-Castelnuovo, Segre to Castelnuovo, 13 September 1894 and 23 September 1894). By contrast, of the book by P. Appell and E. Goursat, *Théorie des fonctions algébriques et de leurs intégrales* (1895) he did not get a "very good impression, browsing through it." On Segre's comments related to international literature, and in particular on the essays of T. Reye, K. Dochlemann, E. Kötter, cf. ANL-Castelnuovo: Segre to Castelnuovo, 27 September 1892 and ANL-Volterra, Segre to Volterra, 27 October 1897.

"researches not yet published",[45] and kept him up to date the epistolary contacts of his disciples with foreign authors.[46]

Finally, to Segre's desire to afford international cultural roots for his School there are connected two publishing enterprises: the Italian translations of *Geometrie der Lage* by C. von Staudt and F. Klein's *Erlangen Program*, commissioned by him from his students M. Pieri and G. Fano (Luciano and Roero 2012, 37–45).

3 Promotion of the Italian Style Abroad

If the construction of a national identity for the School of Algebraic Geometry could not aside from the recourse to sources and comparaisons with international models, reciprocally, for Segre, it was the task of a leader to channel towards other countries the flow of the best contributions by his disciples. This was an action of diffusion of mathematical knowledge that he took on seriously and tenaciously, both in interwining a ramified network of epistolary dialogues and in working inside examining boards for attribution of prestigious prizes like the International

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[45]In this connection the question of the quotations of the unpublished works of S. Kantor was at the origin of a series of disagreements and claims of priority by the German mathematician against Castelnuovo and Segre, which induced Segre to advise Castelnuovo to use prudence in his answers to the attacks (cf. ANL-Castelnuovo, Segre to Castelnuovo, 6 October 1887, 30 September 1891, 5 March 1892, 11 March 1892, 11 March 1892, 30 March 1892, 6 April 1892, 19 April 1892, 22 April 1892, 25 April 1892, 21 October 1893, 23 November 1893, 6 January 1894). In general, Segre was always careful to draw the attention of members of his School on external contributions, recommending to quote them. For instance he wrote to Castelnuovo: "The announcement of the work by Kronecker, if I remember rightly, can be found in the *Rendiconti Lincei* of 3–6 years ago; it seems to me that he precisely proved (and, according to what he told me, it was no simple matter from the algebraic and rigorous point of view) that a surface whose section with π° [plane] tangent splits, it is ruled or it is a Steiner's surface. However, I don't know how Brioschi or Cremona in the same sitting mentioned a Roman surface of Kronecker's that would have corresponded to Steiner's. It is a vague souvenir that I have. You check there. You would do well to question Cremona (if he doesn't become a minister) on what he knows on the subject, before publishing (and you will do well to publish) your proof." (ANL-Castelnuovo, Segre to Castelnuovo, 30 November 1893: "L'annunzio del lavoro del Kronecker, se ben ricordo, si trova nei *Rendiconti Lincei* di 3 a 6 anni sono; mi pare che egli precisamente dimostrasse (e, a quanto mi diceva, non è cosa semplice dal punto di vista algebrico e rigoroso) che una superficie la cui sezione col π° [piano] tangente si spezza, è rigata o superficie di Steiner. Però non so come il Brioschi od il Cremona nella stessa seduta accennarono ad una superficie romana di Kronecker che avrebbe fatto riscontro a quella di Steiner. È un ricordo confuso che io ho. Tu riscontra colà. Faresti bene ad interrogare Cremona (se non diventa ministro) su ciò che sa in proposito, prima di pubblicare (e farai bene a pubblicare) la tua dimostrazione."). Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 23 November 1893 and 4 March 1894.

[46]For instance he wrote to Castelnuovo: "Tell me if Nöther and Rohn have supplied you interesting answers" (ANL-Castelnuovo, Segre to Castelnuovo, 31 July 1891: "Dimmi se Nöther e Rohn ti hanno fatto risposte interessanti"). "Keep me informed about the issues of curves and surfaces which you are working on with the French" (*Ibidem*, 12 March 1895: "Tienimi informato delle questioni su curve e superficie, di cui ti occupi coi francesi"). "Then tell me what Zeuthen answers you." (*Ibidem*, 29 November 1897: "Dimmi poi che cosa ti risponderà Zeuthen.").

Bressa Prize and the Guccia Medal. It was above all this last award, attributed to Severi in the IVth International Congress of Mathematicians (Rome 1908),[47] that Segre intended to 'exploit' for illustrating, at international level, the relevance and value of the researches of his School. So, since 1905 he recommended to Castelnuovo:

> If you or your brother-in-law should have an opportunity to write to Severi, you should incite him (as I have already done) to work for the Guccia medal. You know that Valentiner aspires to it. It would now have a flattering meaning for Italy and one corresponding to the leading position that Italy currently holds in Geometry, if an Italian was proclaimed the winner at the Rome congress! It would be enough for Severi to work on *the curves existing on a given algebraic surface*, profiting by his knowledge of surface geometry, to stick to the proposed theme, without straying too far away from his favourite field! (ANL-Castelnuovo, C. Segre to G. Castelnuovo, 5 November 1905: "Se tu, o tuo cognato, aveste occasione di scrivere a Severi, dovreste eccitarlo (come già feci io) a lavorare per la medaglia Guccia. Sai che vi aspira il Valentiner. Ora avrebbe un significato lusinghiero per l'Italia, e corrispondente al primato che questa ha attualmente in Geometria, il fatto che nel congresso di Roma fosse proclamato vincitore un italiano! Basterebbe che Severi lavorasse su le curve esistenti su una data superficie algebrica, approfittando della sua conoscenza della geometria sulla superficie, per essere nell'ambito del tema proposto, senza allontanarsi troppo dal suo campo preferito!")

A short time later, returning to the matter, Segre asked his friend:

> Speaking of twisted curves, after I wrote to you some time ago telling you to incite Severi to work for the Guccia prize, I wondered whether you yourself or your brother-in-law would not like to compete. Severi has written to me, also recently, that he will think about it. And you? For me it would be a great satisfaction to be able to judge that competition in favour of an Italian! Is it impossible for it to be you? (ANL-Castelnuovo, Segre to Castelnuovo, 25 December 1905: "A proposito di curve sghembe, dopo che qualche tempo fa t'avevo scritto di eccitar Severi a lavorare pel premio Guccia, mi son chiesto se tu stesso o tuo cognato non vorreste concorrere. Severi mi ha scritto, anche recentemente, che vi penserà. E voi? Sarebbe per me una grande soddisfazione il poter giudicare quel concorso in favore di un italiano! È escluso che tu possa esser quello?").

Above all it is the study of Segre's correspondence that allows us to retrace his strategy to promote abroad the Italian style in algebraic geometry and to show a clear difference in tone among the relationships he entertained with his outlander colleagues. From the letters of his youthful years (1883–1887) with F. Klein, Kronecker, Weierstrass and others, full of details on his research projects and on their links with international production, he moved on to letters and postcards, whose purpose was to announce to F. Klein, A. Hurwitz, M. Nöther (Luciano and Roero 2012, 25–27, 151–161, 164–165; ANL-Castelnuovo, Segre to Castelnuovo, 25 February 1897 and 10 March 1897), E. Picard[48] and E.J. Wilczynski[49] his own

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[47]Cf. Segre et al. (1909, 145–151). On the role played by Segre in the attribution of the Guccia Prize, cf. also Segre to O. Michelli Segre, 25 July 1904 (Annex 34), 30 July 1904 (Annex 36), 4 August 1904 (Annex 38), 5–7 April 1908 (Annexes 53 and 54).

[48]On the contacts between Picard and the Italian School of Algebraic Geometry cf. ANL-Castelnuovo, Segre to Castelnuovo, 9 May 1901 and 13 May 1901.

[49]Cf. Segre to Wilczynski, 16 April 1916, Annex 59.

important results and, subsequently, those of Castelnuovo, Enriques, Fano, B. Levi and Fubini. For instance, Segre encouraged Castelnuovo to get into epistolary contact with Picard to tell him about the recent essays on the theory of surfaces published by Italians:

> I am writing to you from the room of the same [examinations] to congratulate you on the card from Picard (at the appropriate time you will tell me about the noteworthy points in it), and to tell you … that I have nothing to tell you: the recent Italian works on the surfaces, which I would referenced, are only yours and those of Enriques … Perhaps (think about it) it will also be possible to mention the surfaces encountered by Fano in his works, which fit into our line of research. I sent my memoir to Picard some time ago. Before answering him, see in the last issue of the *Intermédiaire des mathématiciens* the question signed by Poincaré and Automne on curves with trisecant chords; and think whether it is appropriate to mention to Picard that in Italy the question … is not such. (ANL-Castelnuovo, Segre to Castelnuovo, 13 July 1894: "Ti scrivo dalla sala dei medesimi [esami] per congratularmi teco per la letterina del Picard (della quale all'occasione mi comunicherai i punti salienti), e per dirti … che non ho nulla da dirti: i lavori italiani recenti sulle superficie, ai quali io penserei, sono solo i tuoi e quelli di Enriques … Forse (pensaci) si potran nominare anche le superficie incontrate da Fano nei suoi lavori, che rientrano nel nostro indirizzo. La mia Memoria l'ho inviata a suo tempo al Picard. Prima di rispondere a questo, vedi nell'ultimo fascicolo dell'*Intermédiaire des mathématiciens* la questione firmata Poincaré e Automne sulle curve le cui corde son trisecanti; e pensa se sia opportuno accennare al Picard che in Italia la questione … non è tale").[50]

Aware of the influence of Castelnuovo and Enriques, Segre did not hide from his friends the satisfaction that he had felt reading the treatise by E. Picard and G. Simart, *Théorie des fonctions algébriques de deux variables indépendantes* (cf. ANL-Castelnuovo, Segre to Castelnuovo, 7 September 1897). On the other hand the gift of the very same volume allowed Segre to face the French colleague on the theme of the resolution of singularities:

> I had written a long letter to Picard (…). He answered me very politely recognising the difficulty "… je vous remercie bien d'avoir appelé mon attention sur l'inadvertance que j'ai commise, et que je tâcherai de réparer dans une note du second volume. En réalité, j'ai dans ma rédaction passé, je le reconnais, un peu vite sur ces théorèmes de réduction, au sujet desquels nous n'avons tous aucun dout pour le fond, et j'avais hâte d'arriver à des questions ayant pour moi plus de nouveauté. Si vous, ou vos élèves trouvaient quelque chose de tout-à-fait définitif sur ce sujet, j'en serais bien heureux." (ANL-Castelnuovo, Segre to Castelnuovo, 22 October 1897: "Avevo scritto al Picard una lunga lettera …. Mi ha risposto molto gentilmente riconoscendo la cosa …").

Besides, during the period of his leadership of the Italian School of Algebraic Geometry Segre recommended to his former students, who had become colleagues of his, that they transmitted their articles abroad[51]; informed them about the

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[50]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 8 August 1894 and 23 September 1894.

[51]ANL-Castelnuovo, Segre to Castelnuovo, 11 May 1892: "Loria charges me to tell you he believes you once sent to the *Jahrbuch* your important Memoir on the systems of curves, to be reviewed. Yes, it is always a good idea to forward one's works to the *Jahrbuch*." ("Loria m'incarica di dirti che ritiene tu abbia mandato a suo tempo al *Jahrbuch* la tua gran Memoria sui sistemi di curve, perché ne sia fatta la recensione. Già, è bene mandar sempre i propri lavori al *Jahrbuch*.").

quotations of their contributions that he was founding, in international journals[52]; enlightened about their exchanges with Brill,[53] Nöther,[54] Rohn[55] and Hurwitz[56] and was ready to put his disciples in touch with scholars like F. Macaulay[57] and the Swede A. Wiman.[58]

Moreover, on several occasions Segre made every effort to avoid clashes or controversies between Italian and foreign mathematicians. For instance, in 1903, he suggested to René Baire that he privately point out to Beppo Levi some errors that he had found in notes "Sur la résolution des points singuliers des surfaces algébriques" and "Sur la théorie des fonctions algébriques de deux variables" (*Comptes Rendus de l'Académie des Sciences de Paris*, 134, 1902, 222–225, 642–644).[59] In

[52]For example (ANL-Castelnuovo, Segre to Castelnuovo, 26 September 1892): "In Klein's lithographed lectures for the last semester (*Riem. Flächen* II, just published, your name is repeatedly and honourably mentioned. In particular he analyzed, as really instructive, the method with which you determined the number of the special series (4 pages of analysis). Remember (if it has not been done yet) to get them to purchase all those Lectures by Klein for your library as soon as possible. Do you perhaps have a manuscript copy of Nöther's Memoir on double planes (*Medic. Erlangen*)? I may need it later: and then I will ask you for it. It is for my course." ("Nelle lezioni litografate di Klein dell'ultimo semestre (*Riem. Flächen* II) uscite ora si trova ripetutamente ed onorevolmente citato il tuo nome. In particolare vi è analizzato, come particolarmente istruttivo, il metodo con cui tu hai determinato il numero delle serie speciali (4 pag. di analisi). Ricordati (se ancora non s'è fatto) di far acquistare al più presto tutte quelle Lezioni di Klein alla vostra biblioteca. Hai forse tu una copia manoscritta della Memoria di Nöther sui piani doppi (*Medic. Erlangen*)? Può darsi che mi occorra più tardi: e allora te la chiederò. Si tratta del mio corso."). Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 6 December 1892 and 29 October 1894: "Have you seen in the latest issue of Crelle [journal] a work by Kantor (extracted from the Naples one) with a mention of you?" ("Hai visto nell'ultimo fascicolo del [giornale di] Crelle un lavoro del Kantor (estratto da quello di Napoli) con citazione di te?").

[53]ANL-Castelnuovo, Segre to Castelnuovo, 28 July 1890: "Make me known Brill's answer; also tell me the praises that he will certainly bestow on you." ("Comunicami la risposta di Brill; riportami anche gli elogi che egli certo ti farà").

[54]ANL-Castelnuovo, Segre to Castelnuovo, 15 July 1891: "Then Nöther praised your latest works to me: he sees with pleasure that you have already dealt fruitfully with surface geometry, and wishes you to continue in this direction." ("Nöther poi mi ha lodato i tuoi ultimi lavori: vede con piacere che tu ti sei già occupato con qualche frutto di geometria sulla superficie, e desidera che tu continui in questo indirizzo"); 31 July 1891: "Let me known if Nöther and Rohn have given you interesting answers." ("Dimmi se Nöther e Rohn ti hanno fatto risposte interessanti"); 19 March 1896: "By the way, Enriques wrote to me some time ago that Nöther has explained to you that in his opinion the resolution of singularities of higher order in the sense that we pursue doesn't need demonstrating anymore." ("A proposito: l'Enriques mi scrisse tempo fa che il Noether t'ha scritto che a suo avviso la risoluzione delle singolarità superiori delle superficie nel senso che ci occorre non ha più bisogno di dimostrazione"). Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 13 May 1901.

[55]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 31 July 1891 and 5 September 1891.

[56]ANL-Castelnuovo, Segre to G. Castelnuovo, 23 August 1890: "I wrote to Hurwitz our proof for ∞^1 curves univocal correspondences: I will show you his answer." ("Scrissi ad Hurwitz la nostra dimostrazione per le curve ∞^1 corrispondenze univoche: te ne mostrerò la risposta.").

[57]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 19 March 1896.

[58]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 4 June 1901.

[59]Cf. Baire to Borel, 12 November 1903 (in Dugac 1990, 65).

1906 Segre again acted as an intermediary between H. Lebesgue and B. Levi, trying to abstain from a controversy that would have damaged the international reputation of his School:

> Mes théorèmes invoqués par Fatou sont mis en doute actuellement par Beppo Levi dans les *Rendiconti dei Lincei*. Beppo Levi n'a pas su rétablir quelques raisonnements intermédiaires simples et il s'est cassé le nez sur une faute de rédaction grave que Montel m'a jadis signalée et qu'il est facile de réparer. Naturellement j'ai commencé par rédiger une note où je l'attrapais comme du poisson pourri puis, sur une lettre de Segre, et parce que ce n'est pas le moyen d'acquérir une réputation mondiale que d'attraper ceux qui s'occupent de mes histoires, j'ai été moins dur. (H. Lebesgue to E. Borel, 1 June 1906, in Bru and Dugac 2004, 148–149).[60]

In the context of the international promotion of the Italian geometric style an essential role was also played by Segre's project, several times postponed and finally abandoned, to publish a volume of *Lectures on Algebraic Geometry*. It was E. Bertini that suggested that initiative to him, as an ideal way to increase the prestige of the Italian School and to convey knowledge of the production of its members to other countries. Aware of the advantages of similar publishing entreprises, in the summer of 1890 Segre wrote to Castelnuovo:

> It is really necessary to thinking about writing treatises, lithographing lectures, extensively popularizing our ideas (I refer to yours and mine, we being perhaps the only ones in Italy, in all modesty, and without offending Peano, that have the right views on the subject). We will resort to Fano, who has already written me a long letter telling me to greet you, and with news on his readings and his researches (on cubic varieties), which always show his activity is prodigious. (ANL-Castelnuovo, Segre to Castelnuovo, 6 July 1890: "Bisogna proprio pensare a far trattati, a litografare lezioni, a divulgare con estensione le nostre idee (parlo di quelle di te e di me, che forse forse siamo i soli in Italia, modestia a parte, e senza offender Peano, che la pensiamo rettamente in proposito). Ricorreremo a Fano, che m'ha già scritto una lunga lettera coll'incarico di salutarti, e con notizie sulle sue letture e sue ricerche (sulle varietà cubiche), che lo mostrano sempre di un'attività prodigiosa.").

Segre therefore entrusted to his young student the task of compiling the *Summaries* of the lectures in Higher Geometry in the 1890–91 academic year. It was the famous course devoted to the *Introduzione alla geometria sopra un ente algebrico semplicemente infinito* (Segre's *Notebook* 3, in Giacardi 2013). Nevertheless,

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[60]The dialogue between Segre and Lebesgue continued until 1910, as we see from the letter of Lebesgue to Borel, 20 May 1910 (Bru and Dugac 2004, 238): "La recherche des transformations ponctuelles transformant tout plan en plan a été ramenée par M. Segre, grâce à un résultat de M. Darboux, à la résolution des équations fonctionnelles $f(x_1 + x_2) = f(x_1) + f(x_2), f(x_1 x_2) = f(x_1)f(x_2)$. M. Segre m'a demandé mon avis sur ce problème analytique. J'ai montré que si l'on raisonne comme M. Zermelo on doit admettre l'existence d'une infinité de solutions autres que les solutions connues, mais que nommer effectivement une telle transformation revient à nommer une fonction échappant à tout mode de représentation analytique. Autant dire qu'il n'y a pas d'autres solutions".

starting from the first revision, Segre was not satisfied of the notes by Fano since they were "very careless"[61] and predicted that they would have required months of patient work, before he could send them to be printed.[62]

For their part, the colleagues Castelnuovo and Bertini urged the time to be shortened, and they offered Segre their help in the work of correction,[63] with the purpose not to procrastinate the appearance of these *Summaries*. Reluctant to delegate to others the responsibility of the revision, in the autumn of 1896 Segre went back to the project of editing his *Lectures*. Fundamental changes were made to the previous plan, for the aim of arriving at a more ambitious publication that would constitute a true treatise, and not only a volume of *Summaries*. The text should have organically recapitulated his most important and most appreciated monographic courses so as to reach a broad readership. Therefore Segre abandoned the idea of lithography to turn, instead, to well-known and 'powerful' publishing houses like Gauthier-Villars or Teubner. Segre also changed the nature of the *authorat* of these *Lectures* and the intention to circulate the summaries of a specific university course gave way to a project for a collective publication, that of a 'master work', 'harmonious and original', the expression of a School, realized thanks to collaboration among Segre, Castelnuovo and Enriques. The project so began to set up in its structure and organization:

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[61]ANL-Castelnuovo, Segre to Castelnuovo, 8 August 1891: "Two days ago I started the revision of Fano's summaries of my lectures. And I find them very careless! So I don't know if I will have the patience to spend about 3 months on them (which will be necessary if the rest corresponds to the beginning) to make them suitable for lithographing! Yet Bertini insists on lithographing!" ("Da due giorni ho cominciato la revisione dei sunti di Fano delle mie lezioni. E li trovo molto trascurati! Sì che non so se avrò la pazienza di perdervi tre mesi attorno (come ci vogliono se il seguito corrisponde al principio) per renderli litografabili! Eppure Bertini insiste per la litografazione!"); 29 August 1891: "This month (…) I have corrected 1/9 of Fano's summaries (really not at all accurate!, and I have now left them aside to return to that work on hyper-algebraic entities that I suspended in January because of the paper for the *Rivista*." ("In questo mese ho corretto 1/9 dei sunti di Fano (poco accurati davvero!, ed ora li ho piantati per riprendere quel tal lavoro sugli enti iperalgebrici che in Gennaio avevo sospeso per causa del lavoro della *Rivista*."). cf. also Segre to Amodeo, 16 August 1891 (Palladino and Palladino 2006, 179–180).

[62]In any case, Segre was not favourable to the practice of *Summaries*. While many of his colleagues every year released notes on courses, both preparatory and advanced, it is actually curious that a single volume of *Summaries* of his lectures appeared, the one relating to the course on *Projective Geometry* for the academic year 1885–86, no less than 989 pages (Segre C. *Geometria proiettiva*, Torino: Litografia dell'Università, 1886).

[63]ANL-Castelnuovo, Segre to Castelnuovo, 30 September 1891: "I thank you for the very kind offer to help me with the lithographs of my lectures: but it would be difficult, and besides I would be sorry to involve you in very boring jobs. Besides, I have not in the least given up the idea of dealing myself, perhaps in November, with this lithographing." ("Ti ringrazio dell'offerta gentilissima di aiutarmi per le litografie delle mie lezioni: ma sarebbe cosa difficile, e d'altronde avrei rimorso di occuparti in cose molto nojose. Non ho punto rinunziato, del resto, ad occuparmi io stesso, in Novembre forse, di questa litografazione."). Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 18 and 23 September 1892, 9 October 1892, 9 July 1893, 20 July 1893, 17 August 1893, 30 November 1893, 25 December 1893, 25 February 1894, 17 April 1894.

Let's now speak of the grand treatise on Higher Geometry. Castelnuovo will remember that here in Turin we have sometimes spoken about it together as of a work that we would gladly have done *together later*. Now that a new member, an active one, moves in, the initiative becomes much easier. Besides, I must point out that precisely for Enriques it would be better to defer the enterprise a few more years: because, for good or bad it is, the regulation requires him to prepare titles for his promotion to full professor; so for some time it is better for him to devote his scientific industriousness only to original researches. Then there is the usual difficulty about the publisher: if it were possible to turn to Gauthier-Villars or Teubner, it would be all right! For the rest, I completely approve of the idea, and I believe that among us three it would be possible to write a good treatise, harmonious, original. Whatever the form of collaboration to assume, I already have a sure way to take part in the work: and that is with the summaries (by me) of various courses of mine: that is to say of some general courses on curves, algebraic surfaces, etc. and of special courses on higher singularities, on geometry on a curve, on rational surfaces and linear systems of plane curves, etc. If the undertaking is delayed a few years, I will do some new courses which can also be useful. I must also prepare for the German Encyclopaedia the article on hyperspaces (algebraic varieties), and this can also serve for the respective chapters of the treatise (likewise for the article on algebraic surfaces promised by Guido [Castelnuovo] for the Encyclopaedia). Then I fully approve of a treatise being done by us three and no others: because we three share the same ideas; and others would perhaps upset the harmony of the work. I will be pleased if you write something more to me on this matter. (ANL-Castelnuovo, Segre to Castelnuovo and Enriques, 30 December 1896: "Parliamo ora del grande trattato di Geometria Superiore. Castelnuovo ricorderà che qui a Torino ne abbiam parlato insieme qualche volta come di un lavoro che avremmo fatto volentieri insieme *più tardi*. Ora che un nuovo elemento, energico, s'introduce, la cosa diventa molto più facile. Per altro fo notare che appunto per Enriques converrebbe differire ancora di qualche anno l'impresa: perché, buono o cattivo che sia, il regolamento vuole che egli si prepari titoli per la sua promozione ad ordinario; sicché per qualche tempo è meglio che egli dedichi la sua operosità scientifica solo a ricerche originali. Vi è poi la solita difficoltà dell'editore: se fosse possibile ricorrere a Gauthier-Villars oppure a Teubner, andrebbe bene! Del resto io approvo completamente l'idea, e credo che fra noi tre si potrebbe fare un buon trattato, armonico, originale. Qualunque sia la forma di collaborazione da adottare, io ho già un modo sicuro di prender parte all'opera: e cioè coi sunti (da me fatti) di vari miei corsi: cioè di qualche corso generale sulle curve, superficie ecc. algebriche, e di corsi speciali sulle singolarità superiori, sulla geometria sopra una curva, sulle superficie razionali e sistemi lineari di curve piane, ecc. Se l'impresa verrà ritardata di qualche anno, qualche nuovo corso farò che potrà pur servire. Inoltre io debbo preparare per l'Enciclopedia tedesca l'articolo sugl'iperspazi (varietà algebriche), e ciò potrà pur servire per capitoli corrispondenti del trattato (analogamente per l'articolo sulle superficie algebriche promesso da Guido [Castelnuovo] all'Enciclopedia). Approvo poi pienamente che il trattato sia di noi tre e non d'altri: perché noi tre siamo in piena uniformità d'idee; ed altri forse turberebbe l'armonia dell'opera. Avrò piacere se mi scriverete altro su questo argomento.").

Nevertheless, this second project too was postponed, both because of Segre's recurring hesitations, and because of the fear of damaging Enriques, busy preparing his dossier in view of the competition for the Bologna chair.[64] In April 1898,

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[64]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 26 January 1897: "As Ghigo [Federigo Enriques] will have written to you, following your letter I decided to propose to him that we postpone the grand project of our Treatise to later. However, it is right to have spoken of it: perhaps the idea will be realized!" ("Come t'avrà scritto Ghigo, in seguito alla tua lettera io mi son deciso a proporgli di rimandare a più tardi il grandioso progetto del nostro Trattato. Però è bene che ne abbiamo parlato: forse l'idea avrà seguito!").

however, the project seemed to be becoming concrete and Segre committed himself with Teubner to bring out the treatise in his name, in German:

> I am working on that blessed article for the *Encyclopaedia*. As if this were not enough, I am negotiating with Teubner for the publication of my *Vorlesungen* on higher geometry, based on some courses that I have already delivered, but enriched, etc. It is another enterprise that will then occupy me for several years, and I hesitated a lot before deciding. (ANL-Volterra, Segre to Volterra, 23 April 1898: "Lavoro attorno a quel benedetto articolo per l'*Enciclopedia*. Come se questo non bastasse, sto trattando col Teubner per la pubblicazione di mie *Vorlesungen* di geometria superiore, tolte da alcuni corsi che ho già fatto, ma arricchite, ecc. È un'altra impresa che mi occuperà poi per vari anni, ed ho esitato molto prima di decidermi.").

The outline of the text, the distribution of the contents and the financial aspects were illustrated and discussed with Castelnuovo and Enriques between 1899 and 1900.[65] Segre's *Vorlesungen* would have chained the classical texts by Salmon-Fiedler (1874) and Clebsch (1876) to the volume on algebraic surfaces, commissioned by Teubner from Castelnuovo and Enriques. The *Vorlesungen* were intended to offer a balanced overview, extensive but not encyclopaedic, of recent researches on algebraic geometry conducted by Italians.

Against the quite advanced schedule of this 'collective publication', it is strange that after 1900 no traces of the manuscript of these *Vorlesungen* have been spotted, except for a mention of their imminent publication in the *Bulletin of the American Mathematical Society*[66] and the advertising announcement which appeared "for several years in the Catalogues of the Teubner publishing house" (see Fig. 2.1; Loria 1924, 13; Terracini 1961, 12).

It is quite possible that other commitments distracted Segre's attention from this task, above all the one connected to his collaboration, direct and indirect, on the *Encyklopädie der mathematische Wissenschaften*, a collaboration that can be ascribed to the same strategy of international diffusion of the results attained by the Italian School of Algebraic Geometry that he had put in place.[67] As far as concerns

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[65]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 9 August 1899 and 13 February 1900, Annexes 26 and 27 to this article.

[66]Notes, *Bulletin of the AMS*, 6 (1900): 305–312.

[67]The *Encyklopädie der mathematischen Wissenschaften,* printed by Teubner in Leipzig, published the followings essays by members of the School of Segre: F. Enriques, Prinzipien der Geometrie, Bd. III.1, W.F. Weber and H. Mohrmann (eds., 1907: 1–129); G. Fano, Gegensatz von synthetischer und analytischer Geometrie in seiner historischen Entwicklung im XIX Jahrhundert, *Ibidem*: 221–288; G. Fano, Kontinuierliche geometrische Gruppen. Die Gruppentheorie als geometrisches Einleitungsprinzip, *Ibidem*: 289–388; Segre (1921c); G. Castelnuovo and F. Enriques, 6a Grundeigenschaften der algebraischen Flächen, Bd. III.2, W.F. Weber and H. Mohrmann (eds., 1915: 635–673, chapter sent in 1908); G. Castelnuovo and F. Enriques, 6b Die algebraischen Flächen vom Gesichtspunkte der birationalen Transformationen aus, *Ibidem*: 675–767, chapter sent in 1908; G. Loria, Spezielle ebene algebraischen Kurven von einer Ordnung hoher als den vierten, *Ibidem*: 571–634.

28 Mathematik, techn. u. Naturwissenschaften. [Mitteilungen

F. Dingeldey, Kegelschnitte und Kegelschnittsysteme.
F. Dingeldey, Sammlung von Aufgaben zur Anwendung der Differential-
und Integralrechnung.
F. Enriques, Prinzipien der Geometrie.
J. Harkness, elliptische Funktionen.
G. Kohn, rationale Kurven.
A. Krazer, Handbuch der Lehre von den Thetafunktionen.
R. v. Lilienthal, Differentialgeometrie.
G. Loria, spezielle, algebraische und transcendente Kurven der Ebene.
Theorie und Geschichte.
R. Mehmke, über graphisches Rechnen und über Rechenmaschinen, sowie
über numerisches Rechnen.
E. Netto, Kombinatorik.
E. Pascal, Determinanten. Theorie und Anwendungen. [Unter der Presse.]
S. Pincherle, Funktional-Gleichungen und -Operationen.
A. Pringsheim, Vorlesungen über Zahlen- und Funktionenlehre. (Elemen-
tare Theorie der unendlichen Algorithmen und der analytischen
Funktionen einer komplexen Veränderlichen.) Bd. I. Zahlenlehre.
Bd. II. Funktionenlehre.
C. Segre, Vorlesungen über Algebraische Geometrie mit besonderer
Berücksichtigung der mehrdimensionalen Räume. *[der algebraischen Gebilden,]*
D. Seliwanoff, Differenzenrechnung.
M. Simon, Elementargeometrie.
P. Stäckel, Differentialgeometrie höherer Mannigfaltigkeiten.
O. Staude, Flächen und Flächensysteme zweiter Ordnung.
O. Stolz und J. A. Gmeiner, theoretische Arithmetik.
R. Sturm, Theorie der geometrischen Verwandtschaften.
R. Sturm, die kubische Raumkurve.
K. Th. Vahlen, Geschichte des Fundamentalsatzes der Algebra.
K. Th. Vahlen, Geschichte des Sturmschen Satzes.
A. Voss, Abbildung und Abwicklung der krummen Flächen.
E. v. Weber, Vorlesungen über das Pfaffsche Problem u. die Theorie der
partiellen Differentialgleichungen 1. O. [Erscheint Ende März 1900.]
A. Wiman, endliche Gruppen linearer Transformationen.
H. G. Zeuthen, die abzählenden Methoden der Geometrie.
       In Aussicht genommen:
W. Wirtinger, algebraische Funktionen und ihre Integrale.
W. Wirtinger, partielle Differentialgleichungen.
       ☞ Mitteilungen über weitere Bände werden baldigst folgen.

Mitteilungen der Mathematischen Gesellschaft in Hamburg.
Band III, Heft 10. Ausgegeben im Februar 1900. Redigiert
von REPSOLD, SCHRÖDER und BUSCHE. [19 S.] gr. 8. geh.
n. ℳ —.80.
   Inhalt: Michael Stifels handschriftlicher Nachlaſs. Von *Edmund Hoppe.* —
Über Reduktion linearer Modulsysteme. Von *Otto Pund.* — Verzeichnis der Abhand-
lungen des 1890 verstorbenen Mitgliedes der Mathematischen Gesellschaft Wilhelm
Lazarus. Nach *Orthmann* und nach dem Katalog der Mathem. Gesellschaft. — Bericht
über das Gesellschaftsjahr 1899/1900. Zusammengestellt vom Adjunkten Dr. *J. Schröder.*

———— ———— ———— Band III. 1891—1900. [IV u. 429 S.]
gr. 8. geh. n. ℳ 10.60.

Fig. 2.1 Teubner's announcement of Segre's *Vorlesungen* with autograph corrections by Segre
(UTo-ACS)

this aspect, we may remind that the first Italian mathematicians to be asked by F. Klein and F. Meyer to join the authors of the third volume of the *Encyklopädie* were Castelnuovo, Enriques and Fano, in September 1895.[68] Segre indeed supervised the progress of the work, from the very beginning, readily advising these 'disciples' on the structure to give their own essays, suggesting the suitable content extension of their chapters, and offering to revise himself their manuscripts:

> I am pleased that your *Bericht* is going ahead. Regarding what Meyer has asked Fano for, it seems to me that the latter would do well to agree: of course, provided that the theme is specified better than it is by the *Jahrbuch*: that is to say "algebraic transformations of algebraic entities in 2 and higher dimensions." For my part, while I could not myself accept such an assignment, I will willingly help, for what I am capable, whoever does it. As you say, it cannot be a heavy labour! (ANL-Castelnuovo, Segre to Castelnuovo, 23 September 1895: "Ho piacere che il vostro *Bericht* vada avanti. Quanto a quello che il Meyer domanda al Fano, mi pare che questi farebbe bene ad accettare: s'intende, purché il tema fosse meglio precisato di quel che non sia dal *Jahrbuc*h: vale a dire "trasformazioni algebriche degli enti algebrici a 2 e più dimensioni". Per parte mia, mentre non potrei accettare io stesso un tal lavoro, ajuterò volontieri, per quel che valgo, chi lo farà. Come tu dici, non dev'essere poi una gran fatica!").

Taken up with numerous teaching and institutional responsibilities, at last Segre reluctantly forewent the revision of the first article by Castelnuovo and Enriques (ANL-Castelnuovo, Segre to Castelnuovo, 7 January 1896) and, in actual fact, until the first months of 1896 he limited himself to marginally contributing to the *Encyklopädie*. In May, however, he was entrusted with writing the article on hyperspace geometry. As he announced to Castelnuovo, it was:

> about 2 sextodecimos; deadline for presentation 1st of 1899. It seems to me that the general programme of the work is very solid: and I have decided to accept. (ANL-Castelnuovo, Segre to Castelnuovo, 14 May 1896: "circa 2 fogli di stampa; termine per la presentazione 1° del 1899. Mi è parso che il programma complessivo dell'opera sia molto serio: e mi son deciso ad accettare.").[69]

From that moment on, Segre became in actual fact the Italian 'delegate' for the third volume of the *Encyklopädie*.[70] In addition to collecting sources for his chapter, to the writing of which he devoted himself for years, with immense

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[68]On the *Encyklopädie der mathematischen Wissenschaften* and on the partnership that were established between the German and Italian mathematical communities cf. von Dyck (1909), Gispert (2001), Luciano and Roero (2012, 32–37, 51–53, 64, 185, 199–200, 204, 213), Luciano and Roero (2017).

[69]Segre is mentioned as being in the team of the *Encyklopädie* in Notes, *Bulletin of the AMS*, 5 (1898): 150–157; 6 (1900): 213–219.

[70]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 14 May 1896 and 11 June 1896: "You are very right to accept the theme of algebraic surfaces for the *Encyclopaedia*. Indeed, I would probably have written about it myself if Meyer hadn't preceded me." ("Fai benissimo ad accettare per l'*Enciclopedia* il tema delle superficie algebriche. Anzi, probabilmente te ne avrei scritto io stesso se il Meyer non mi preveniva.").

zeal,[71] he was charged by Klein to make contact with other contributors, coordinated the work of the members of his School and, in order to avoid overlaps and omissions, discussed with Fano, Castelnuovo and Enriques the distribution of the contents among the essays on projective hyperspace geometry, on linear differential equations, and on the theory of algebraic surfaces:

> For a while I have been collecting sources for my article in the *Encyclopaedia*. Now I am concerned to specify my task clearly; and, among other things, to have from you and Enriques the assurance that in your article IIIC8 "Algebraische Transformationen und Correspondenzen" which comes *after* mine, you will also deal with the algebraic transformations of S_n (excluding projective ones), that is to say that you, not me, will do what Noether expounded in the *M[athematische] A[nnalen] II* on such transformations, etc., and Del Pezzo and S. Kantor in some recent works, etc. It seems appropriate to me that that article of yours, as it encompasses together transformations of the plane and space, should also contain those of hyperspaces: and this (I repeat) also because, otherwise, I should speak of hyperspace transformations before those of the plane and of S_3 are explained. I will also have to find out whether Zeuthen in IIIC10 will present the numerative geometry of S_n in addition to that of S_3. (ANL-Castelnuovo, Segre to Castelnuovo, 19 February 1898: "Da qualche tempo raccolgo materiali pel mio articolo dell'Enciclopedia. Ora m'importa precisare bene il mio compito; e fra l'altro, avere da te e da Enriques l'assicurazione che nel vostro articolo IIIC8 "Algebraische Transformationen und Correspondenzen" il quale vien *dopo* del mio, tratterete anche le trasformazioni algebriche di S_n (escluse le projettive) cioè farete voi, e non io, quel tanto che su tali trasformazioni dà Noether nei M. A. II, ecc., Del Pezzo e S. Kantor in alcuni recenti lavori, ecc. Mi pare opportuno che quel vostro art[icolo], come abbraccia insieme le trasformazioni del piano e dello spazio, così contenga anche quelle degl'iperspazi: e ciò (ripeto) anche perché, in caso contrario, io dovrei parlare di

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[71]Way back the summer of 1897 Segre announced to Castelnuovo that he was dealing "exclusively with the future lectures and the article on hyperspaces for the *Encyclopaedia*." (ANL-Castelnuovo, Segre to Castelnuovo, 7 September 1897: "esclusivamente delle future lezioni e dell'articolo sugl'iperspazi per l'*Enciclopedia*"). Writing this essay induced Segre to return to his youthful studies, and to consult a broad collection of articles and volumes, so much so that he confessed to Castelnuovo as long ago as 4 October 1899: "I'm sending you the papers I wrote many years ago on that subject. I remember that I stopped that research because I didn't have sufficient knowledge of the theory of algebraic numbers. … Reading the article by Hilbert and seeing cleverly exploited in it the properties of fields of algebraic numbers confirmed to me my old idea that this was my weak point. I'm going on working for the article for the *Encyclopaedia* but now I despair of finishing it for the end of the year!" (ANL-Castelnuovo: "T'invio le carte che avevo scritto tanti anni fa su quell'argomento. Mi ricordo che mi ero fermato nella ricerca perché non avevo sufficiente cognizione della teoria dei numeri algebrici. … Leggendo l'articolo di Hilbert e vedendovi sfruttate abilmente le proprietà dei corpi di numeri algebrici, mi confermavo nella mia idea antica che lì era il mio punto debole. Continuo a lavorare per l'articolo dell'*Enciclopedia*: ma ormai dispero di condurlo a termine per la fine dell'anno!"). The chapter, completed in 1912, was only published after the end of the Great War (Segre 1921c). On this overview of hyperspatial geometry different judgments were expressed: "The longest, and by far the most important of these was his article in the *Mathematical Encyclopedia* on the geometry of *n*-space. The thought that he must one day complete this, depressed his spirits at times for a good many years, for he was one who took his responsibilities seriously, and he felt in honor bound to put the thing through. Complete it he finally did, thus earning the gratitude of geometers for many years to come." (Coolidge 1927, 355). By contrast (Baker 1926, 271): "For completeness of detail, breadth of view, and generous recognition of the work of a host of other writers, this must remain for many years a monument of the comprehensiveness of the man." Among the alumni in the School of Segre, many stigmatized the 'injustice'of Coolidge's comment (Terracini 1961, 12; Togliatti 1963, XI).

trasformazioni iperspaziali prima che sian state trattate quelle del piano e di S_3. Dovrò anche informarmi se Zeuthen in IIIC10 darà la geometria numerativa di S_n oltre a quella di S_3").[72]

4 Study Trips and Sojourns

In the activity of a mathematical School an important component is the oral tradition, that is to say the habit of verbal exchanges, which contribute in a decisive way to the collective construction, the sharing and transmission of knowledge between the *Maestro* and the disciples. From this point of view we can state that the Italian team of algebraic geometers was an authentic School, linked to a very precise local milieu, constituted by the University of Turin and some 'satellite' contexts like the Academy of Sciences, in whose meetings Segre assiduously participated, cultural cafes like *Giaccardi*, *Bergia* and the *American Bar*, where the so-called *Pitareide* met,[73] and Segre's house. In his 'little studio' various disciples and colleagues were entertained, both Italians and foreigners, cf. (Terracini 1968, 9, 13 and Annexes 29, 30, 31, 49, 57, 58, 71 and 72).

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[72]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 28 August 1898: "I have continued to accumulate material for my article on hyperspaces. In extracting from a Note of yours presented at the Accademia dei Lincei the number of secant spaces of a curve in certain cases, I thought about asking you if you don't have the number (when it is finite) of the secant spaces of a curve in all cases, and if you couldn't immediately publish it, so that I can give it in my article. We also need to agree on *surfaces*, to separate clearly what is given by me and what comes from your and Enriques'article on surfaces. For reasons of uniformity it seems appropriate to me to leave all the properties of geometry on the surface, even if obtained by means of hyperspaces; I would limit myself in general, regarding the surfaces of hyperspaces, to projective properties. In this way I will reproduce your results on surfaces with elliptic sections, hyper-elliptic, of type 3, etc.: not those on canonical curves, on the bigeneric (on surfaces considered in the work on the rationality of plane involutions, etc.) or, if I need to, I will only mention them. Tell me if you approve, and if Enriques approves." ("Ho continuato ad accumulare materiali pel mio articolo degli iperspazi. Nell'estrarre da una tua Nota lincea il numero degli spazi secanti di una curva in certi casi, ho pensato di domandarti se tu non possiedi il numero (quand'è finito) degli spazi secanti di una curva in tutti i casi, e se non potresti pubblicarlo subito, affinché io lo possa dare nel mio articolo. Occorre anche che ci accordiamo riguardo alle *superficie*, per separare bene quel che spetta a me e quel che spetta all'articolo tuo e di Enriques sulle superficie. Per ragioni di uniformità mi pare conveniente di lasciare a voi tutte quante le proprietà di geometria sulla superficie, anche se ottenute col mezzo degl'iperspazi; io mi limiterei in generale, quanto alle superficie degl'iperspazi, alle proprietà projettive. Così io riprodurrò i risultati tuoi sulle superficie a sezioni ellittiche, iperellittiche, di genere 3, ecc.: non quelli su curve canoniche, sul bigenere (sulle superficie considerate nel lavoro sulla razionalità delle involuzioni piane, ecc.; od, occorrendomi, li citerò soltanto. Dimmi se approvi tu, e se approva Enriques.").

[73]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 28 November 1891; Segre to Amodeo, 24 November 1891 and Castelnuovo to Amodeo, 30 November 1891 (Palladino and Palladino 2006, 186, 282–283). The group of young mathematicians that met in these Turin cafes, at least until 1891, colloquially called the *Pitareide*, included members of both Peano's and Segre's Schools. Castelnuovo, Fano, B. Levi, Pieri, Amodeo, A. Tanturri and P. Predella were used to frequent the *Pitareide*. On the events that led to the break-up of the initial group cf. Giacardi (2001a, 147) and Roero (2004, 139).

That algebraic geometry on the curve was born of dialogues between Segre and Castelnuovo under the porticos of Via Po is not an hyperbole (Conte 1993, 438). The Piedmont geometer, in effect, assigned great importance to conversation, and generally to all those vectors of scientific sociability (private teaching, seminars, reunions, working lunches, etc.) that were set alongside institutional education and, allowing greater freedom of expression and debate between the interlocutors, proved particularly useful in the creative phase of research activity.

Significant in this connection is the role of study trips and sojourns by Italian geometers abroad, and, reciprocally, those of foreigners in Italy. Heir to the tradition of the *Grand Tour* of the Baroque age and the Enlightenment, the practice of going abroad for a period of master-class is certainly not a prerogative of the School of Algebraic Geometry. Back in the Risorgimento period, mathematicians like C.I. Giulio, L.F. Menabrea, L. Cremona and Q. Sella had grasped the advantage of offering international training to their best alumni. Therefore they had sent them to complete their studies in French and German *Ecoles*, or in the most dynamic environments from the cultural, industrial, manufacturing, agricultural, mining and technological points of view. In turn, these scholars had known how to exploit to the best the meetings with outstanding scholars visiting our country for work, amusement or health, and had derived fruitful stimuli from conversations with promising scientists.[74]

Having trained in contact with *Maestri* like F. Faà di Bruno, E. D'Ovidio, F. Siacci and A. Genocchi, who had been capable of treasuring international inter-plays, Segre entertained the idea of a trip to Germany since 1884. He chose as his privileged destination the University of Göttingen, an emblem, at a world level, of the culture of orality, toward which he would then oriented many of his alumni (Luciano and Roero 2012, 47–49).

In the summer of 1891, accompanied by Gino Loria, Segre stayed in Göttingen a few days (29–30 June and 11 July). However, for the rest of his life, he was to preserve an indelible memory of the 'School of Klein', and above all of the 'luminous conversations' with the German *Maestro*. In their itinerary the two Italians touched on Frankfurt am Main (25 June), Berlin (4–8 July), Dresden, Leipzig, Nuremberg (15 July) and finally Munich (16–17 July), before returning homeland on 18 July.[75]

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[74]Cf. Dröscher (1992), Bottazzini (1994), Gouzévithc (1993), Gouzévitch and Gouzévitch (2002), Becvárová and Becvár (2006), Gouzévitch (2006), Brianta (2007), Lacaita (2009), Dhondt (2008), Luciano and Roero (2012, 45–55), Pepe (2012), Ferraresi and Signori (2012), Roero (2013, 383–388, 414–439, 485–507, 514–543), Israel (2016).

[75]ANL-Castelnuovo, Segre to Castelnuovo, 20 July 1891: "In Munich before leaving I received your postcard of 16th, and now I've got yesterday's. I came here yesterday afternoon and found on my table such a massive amount of works to read, matters to sort out, that I already foresee that I won't find the time to write to Veronese." ("Ebbi a Monaco prima di partire la tua cartolina del 16, ed ora ricevo quella di ieri. Io sono giunto qui ieri nel pomeriggio e mi son trovato sul tavolo una tal mole di cose da leggere, di faccende da sbrigare, che vedo già che non troverò il tempo di scrivere a Veronese.").

Although partially spoiled by the controversy between G. Peano and G. Veronese, which in the meantime had broken out in the pages of the *Rivista di Matematica*, the experience of the 'German journey' was fully exploited by Segre. He visited libraries and scientific institutes; he assisted, on an invitation from Kronecker and Weierstrass, at a meeting of the Berlin Academy; he attended the *Mathematische Verein* in Göttingen; he promoted the output of the Italian geometers, and above all that of Castelnuovo, publicizing it to Klein, Nöther and Rohn; and he strengthened the friendship and the scientific collaborations that he had already opened with Reye and Sturm (Boggio 1928, 305). The notes he took in Germany, the cutting-edge literature consulted in the Göttingen Library and the 'impressions' of his 1891 trip spangled the letters to Castelnuovo and F. Amodeo, even months after Segres's return to Turin.[76]

The journey by Segre and Loria on one side consolidated the tradition of the study sojourns in Germany, inaugurated by A. Tonelli (1874–75) and continued by A. Abetti (1876), E. Caporali (1877–78), C. Romaniello (1877–78), S. Pincherle (1878), G. Ricci Curbastro (1878–79), L. Bianchi (1879–80), A. Capelli (1879–80), G. Veronese (1880–81), F. Gerbaldi (1882–83), G. Morera (1883–84), E. Pascal (1888) and R. Marcolongo (1888–89). On the other side it launched the trend of scientific 'pilgrimages' to Göttingen. In the ensuing years, numerous Italian mathematicians, went to the 'School of Klein': V. Volterra (1891, 1904, 1914), G. Vailati (1899, 1906), Castelnuovo (1903), Enriques (1903), Severi (6–8 January 1937) and E. Bompiani (summer semester 1913). In his conversations with Klein and Hilbert in Göttingen, Enriques, for example, several times dealt with the issues regarding mathematics education and the new developments in algebraic geometry. Klein and Enriques also planned some joint publishing ventures, seeking to establish an agreement between the Teubner and Zanichelli companies, in view of special sale prices of volumes, treatises, textbooks and journals.

In addition to geometers that spent study sojourns in foreign countries on their own accord, there were disciples of Segre's that—urged by the *Maestro*—sojourned in Germany and France with ministerial scholarships. Segre for instance carefully monitored the works of the Junta of the Higher Council that assigned posts for master-class abroad. In particular he attended its meetings in the academic year

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[76]ANL-Castelnuovo, Segre to Castelnuovo, 8 August 1891: "You have more things to tell me than I have you … if you except the various impressions of the trip to Germany that I intend to recount you, illustrating them with the photos of Reye, Sturm, Nöther, etc. etc. (…) Poor Simplicio [Amodeo]! Speaking with him, I indeed had immediately to delve in all possible details on my German trip … He even wanted me to describe what Klein's house was like, how his studio was set out, how many chairs there were, etc. etc.: in which I was not able to satisfy him." ("Tu hai più cose da raccontarmi che non ne abbia io per te … Se eccettui le varie impressioni del viaggio in Germania che mi riservo di esporti a voce, illustrandole con le fotografie di Reye, Sturm, Nöther, ecc. ecc. (…) Povero Simplicio [Amodeo]! A lui sì che ho dovuto dare subito tutti i dettagli possibili sul mio viaggio germanico … Voleva persino che io gli descrivessi com'era fatta la casa di Klein, come era disposto il suo studio, quante sedie vi erano, ecc. ecc.: nel che non l'ho potuto soddisfare.").

1893–94, when G. Fano was given a grant to spend the winter semester in Göttingen, and then at the time of his return to Italy.[77]

Moreover the summer holiday periods by members of the School of Segre in famous places in the Alps, frequented by foreign colleagues like Hurwitz, Hilbert and Klein, afforded unexpected opportunities to establish scientific and personal bonds and opened up new scenarios for international promotion of the team.[78]

The relevance of oral exchanges, in the framework of the activity of a mathematical School and for its success on a supranational scale, was fully acknowledged by Segre's disciples: the homes of the Enriques and Castelnuovo families, in Bologna and Rome, in turn became known for being a 'cosmopolite theatre of debates' among the most eminent scholars of the period (Enriques 1983; Parikh 1991; De Benedetti 2001; Linguerri and Simili 2008). And likewise, the charm and brilliant conversations of Fano, Severi, Terracini and B. Levi were to be important in promoting knowledge of Italian algebraic geometry abroad, not only in Great Britain (1923), Japan (1936) and Switzerland (1940), but also in peripheral or developing countries, like Argentina (Luciano 2016).

If many members of Segre's School crossed the borders to go to foreign countries, no less numerous were the outlanders that chose to stay in Turin to attend Segre's lectures, or to get acquainted with him in Rome, Ancona, Naples, and Engadina. We can for instance mention C. Hermite in 1892,[79] F. Mouton in 1895,[80] F. Lindemann in 1897,[81] G. Mittag-Leffler in 1899, H.G. Zeuthen in June 1900,[82]

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[77]ANL-Castelnuovo, Segre to Castelnuovo, 3 October 1893: "Fano wrote to me that between the position as assistant offered again to him and the opportunity to complete his training in Göttingen he opted for the latter." ("Fano mi scrisse che fra l'assistentato ripropostogli e il perfezionamento a Gottinga s'è deciso per quest'ultimo."). 30 May 1894: "In the Easter holidays Fano visited me, and he told me that after this stay in Germany he greatly desires to return to the Italian Universities, and that is to say to Turin or Rome." ("Nelle ferie pasquali il Fano mi venne a trovare, e mi disse che dopo questo soggiorno in Germania desidera vivamente rientrare nelle Università italiane, e cioè a Torino od a Roma."). 22 August 1894; "If Fano will choose to go to Paris it will be *faute de mieux*: from what he told me and wrote to me, his ambition seemed to be to come to study under your direction." ("Se il Fano andrà a Parigi sarà *faute de mieux*: da quanto mi disse e scrisse, il suo ideale pareva che fosse di recarsi presso di te"). In Göttingen Fano was particularly appreciated by Klein, so much so that Klein offered him an opportunity to be appointed there as professor in 1899 (Luciano and Roero 2012, 49–50).

[78]ANL-Castelnuovo, Segre to Castelnuovo, 29 August 1891: "A pity you didn't advise me you were travelling to Pontresina. Precisely in this period (about the 20th and afterwards) I learnt from Hurwitz that he would spend 2 weeks there and I could have organized an encounter between you there!" ("Peccato che non m'hai avvertito che andavi a Pontresina. Appunto in questo periodo (verso il 20 e seguenti) sapevo da Hurwitz che egli ci sarebbe stato per passarvi 14 giorni ed avrei potuto farvi incontrare colà!").

[79]ANL-Castelnuovo, Segre to Castelnuovo, 6 January 1892: "I congratulate you on the visit from Hermite. It was a serious lacuna not knowing him!" ("Mi congratulo teco per la visita ricevuta dall'Hermite. Era una grave lacuna il non conoscerlo!"); cf. also *ibidem*, 5 March 1892.

[80]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 2 October 1895 and 11 October 1895.

[81]Cf. ANL-Volterra, Segre to Volterra, 11 August 1899.

[82]Cf. ANL-Volterra, Segre to Volterra, (s.d.) and Segre to Volterra, 13 June 1900.

C. Stéphanos, E. Study and J. Coolidge in 1903,[83] E.J. Wilczynski in 1904 and 1906,[84] L.W. Dowling in 1907,[85] V. Snyder in 1922[86] and E. Čech in 1921–22, alongside with F. Klein, who travelled round Italy several times: in the summer of 1874, in the 1878 Easter holidays, again in March 1899 and in the spring of 1900.[87]

Further, among the professors at the University of Turin, Segre was one of the few that could boast of an international audience of students in his classrooms. As alumni, colleagues and family members recalled, starting from the end of the 19th century:

> the fame of his skill as a *Maestro* went far beyond the borders of our nation, and more or less every year scholars from other countries flocked to listen to his lectures, especially ones from England and North America, who from what they learnt in Italy often drew the inspiration for fine publications (Berzolari 1924, 532).[88]

The first to sojourn in Turin to take Segre's courses and to carry out studies on higher geometry, under his direction, were Grace Chisholm (1868–1944) and his husband William Henry Young (1863–1942) (Grattan-Guinness 1972, 105–185; Conte and Giacardi in this volume). Having arrived in Turin in October 1898, they stayed until March of 1899 and attended the Higher Geometry course devoted to the *Curve algebriche dei vari spazî* (Segre's *Notebook* in 12 Giacardi 2013). Showing great friendliness, Segre not only integrated his university teaching with private lessons and domestic lectures imparted to them, but on 30 April 1899 presented to the Academy of Sciences two notes, respectively by Chisholm, "Sulla varietà

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[83]Cf. Study to O. Michelli Segre, 6 August 1924 and Coolidge to O. Michelli Segre, 20 September 1924, Annexes 71 and 72.

[84]Cf. Segre to Wilczynski, 18 March 1904, 27 April 1904 and 4 June 1906, Annexes 29, 30, 49. On the influence of Segre's results on Wilczynski cf. Wilczynski (1911): 3, 7.

[85]Cf. Sisam to Wilczynski, 12 December 1908, Annex 57.

[86]Cf. Snyder to Segre, 21 November 1922 and 19 February 1923, Annexes 61 and 65.

[87]On the verge of designing volumes 4 and 5 of the *Encyklopädie der Mathematische Wissenschaften*, related to applied mathematics, Klein scheduled a sojourn in Turin from 21 to 23 March 1899 and asked Volterra to help to contact potential collaborators for this enterprise. It was Volterra himself that organized Klein's stay, planning his meetings at the Academy of Sciences with the members of the various Schools: that of Electrotechnics founded by Galileo Ferraris (L. Lombardi, R. Arnò, L. Ferraris, G. Grassi, F. Lori), that of Geodesy and Practical Geometry directed by N. Jadanza (V. Baggi, C. Aimonetti), that of Statics (C. Guidi, E. Ovazza), and that of Applied Mechanics (G. Bertoldo, S. Cappa). As far as the mathematical community concerns, Volterra drafted the detailed programme of Klein's rendezvous with E. D'Ovidio, N. Jadanza, C. Segre, G. Peano, L. Berzolari, F. Porro, A. Garbasso, O. Zanotti Bianco, M. Pieri, R. Bettazzi and B. Levi, as well as those with the Youngs, at that time in Turin (ANL-Volterra, Klein to Volterra, 27 January 1899; Volterra to Klein, 29 January 1899, 10 March 1899, 11–13 March 1899; Klein to Volterra, 14 March 1899). Klein returned to Turin in March 1900, during the Easter holidays, to continue to discuss with Volterra and Tedone the agenda of the *Encyklopädie* (ANL-Volterra, Klein to Volterra, 30 December 1899, 12 February 1900, 1 March 1900, 15 March 1900; Volterra to Klein, 23 March 1900). The correspondence between F. Klein and V. Volterra in the 1892–1912 period is being edited: Luciano and Roero (2017).

[88]Cf. also Fano (1924–25, 225), Viglezio (1924, 2), Boggio (1928, 319), B. Segre (1963–64, 18), Fuà Segre (1952, 125).

razionale normale di M_3^4 di S_6 rappresentante della trigonometria sferica", and by Young, "Sulle sizigie che legano le relazioni quadratiche fra le coordinate di retta in S_4".[89] Furthermore Segre put the Youngs in contact with Castelnuovo:

> Until 18 November we won't start our lectures. In my audience I will have the Youngs, whom I believe know you. Yesterday I had a visit from the husband, who gave me a brief Note of his, quite good. If you can then send him some offprints of yours (especially on M^3, geometry of the straight line in S_4, numerative geometry) it will be a good thing. (ANL-Castelnuovo, Segre to Castelnuovo, 23 October 1898: "Fino al 18 Novembre non cominceranno le nostre lezioni. Avrò fra i miei uditori i coniugi Young, che credo ti conoscano. Ieri ho avuto la visita del marito, che mi ha dato una sua breve Nota, abbastanza buonina. Se potrai inviargli poi qualcosa di tuo (specialmente su M^3, geometria della retta in S_4, questioni numeriche) farai bene").[90]

Chisholm and Young preserved a good memory of their Turin stay, together with deep gratitude for the generosity of the *Maestro* to them (cf. Chisholm Young to O. Michelli Segre, 19 June 1924, Annex 68).

From the United States there then came Julian Lowell Coolidge (1873–1954) to complete his training under Segre's guidance. Engaged in a tour of European universities between 1902 and 1904, the American geometer, together with his wife Theresa Reynolds, spent in Turin the winter semester from October 1903 to the spring of 1904. In this period he published the first part of the essay "Les congruences isotropes qui servent à répresenter les fonctions d'une variable complexe" in the *Atti* of the Academy of Sciences, under the presentation by Segre in the meeting of 20 December 1903 (Struik 1955, 671–672; Hammond et al. 1955; Dauben 1999).[91] Coolidge's experience 'at Segre's School' was shortly afterwards described as follows in the article "The Opportunities for Mathematical Study in Italy":

> At the same time such headings as Higher Analysis, Higher Geometry are so comprehensive as to leave to the teacher the greatest discretion in the choice of material. Some fortunate professors give a new course each year, others run through a cycle including a greater or less number of subjects. Americans are sure to find lectures on subjects that will interest them, and they will have the French, rather than the German standard of clearness and elegance. They will also be struck by the eclecticism of the instructor, for Italian mathematicians read widely. I remember being impressed at the beginning of one course of lectures by the fact that the professor put down, as principal works of reference, books in four different languages, and remarked that those of his hearers who could not read English,

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[89]Chisholm (1899), Young (1899). Cf. Segre to Chisholm, 11 March 1899, Conte and Giacardi 2017. Some years later, in the sitting of 18 November 1905, Segre presented to the Turin academy the article by Young and Chisholm (1907), *Note on Bertini's transformation of a curve into one possessing only nodes.*

[90]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 9 November 1898: "When you want to send some papers to the Youngs, address it to me, because they have not found a lodging to their satisfaction yet." ("Quando vuoi inviare qualcosa ai signori Young, dirigi a me, perché essi non hanno ancora trovato un alloggio di loro soddisfazione.").

[91]Coolidge (1904a). The second part Coolidge (1905) was presented by Segre in the sitting of 8 January 1905. Regarding the influence of Segre on the American scholar see Brigaglia's paper in this volume.

French and German, must certainly make up the deficiency in the course of the year (Coolidge 1904b, 13).

In fact, that year Segre began his lectures on *Applicazioni degli integrali abeliani alla Geometria*, giving references to writings by 23 foreign authors, among them W.F. Osgood, W. Wirtinger, A. von Brill and M. Nöther, B. Riemann, K. Weierstrass, A. Clebsch and P. Gordan, F. Neumann, E. Picard, C. Jordan, A. Forsyth, C.A. Briot and C. Bouquet, F. Klein, P. Appell and E. Goursat, H.F. Baker, K. Hensel, G. Landsberg, N. Abel and A. Hurwitz, and only quoting three Italian authors: L. Bianchi, F. Casorati and S. Pincherle (Segre's *Notebook* 17: 3–6, in Giacardi 2013).

The synergy between Coolidge and Segre was not interrupted at the end of the Turin sojourn. Although there were no further opportunities for encounters, the two mathematicians continued to correspond,[92] and in 1924, on Segre's death, Coolidge evoked his scientific and ethic stature in a long obituary (Coolidge 1927) and with these heartfelt words sent to Segre's wife:

> Je ne me flatte pas que vous vous souviendrez d'un Américain errant qui est arrivé à // Turin avec sa petite famille au moins d'Octobre 1903, pour suivre les cours de l'université, et surtout pour profiter de l'enseignement de votre illustre mari. Pour lui, pourtant, ça a été un évènement d'importance capitale. Non seulement a-t-il trouvé une impulsion scientifique dont il n'a cessé de profiter énormément depuis, mais, chose beaucoup plus précieuse, il a eu le privilège de nouer de liens d'amitié avec son maitre, que chaque année depuis n'a que rendu plus forts. Je ne saurais vous exprimer, madame, ni l'estime que je ressentis pour votre mari comme savant, ni l'affection qui me lié à lui. Toujours je serai fier d'avoir été à la fois de ses élèves et de ses amis (J. Coolidge to O. Michelli Segre, Annex 72).

Very effective in attracting disciples from America was the fact that between 1904 and 1920 Segre sent the outlines of his courses on Higher Geometry to be published in the *Bulletin of the American Mathematical Society*.[93] As a consequence from the United States in 1908 two other students of Segre's: Charles Herschel Sisam (1879–1964) and Clarence Lemuel Elisha Moore (1876–1931) hastened to Turin to hear his lectures.

An alumnus of V. Snyder, Sisam completed his Ph.D. in 1905 at Cornell University with the thesis *Classification of Scrolls of Order Seven Having a Rectilinear Directrix*. He then decided to refine his studies in Europe, with post-doc fellowship in Göttingen and Turin, before returning home, to Colorado College, where the rest of his brilliant career was played out. Having reached Piedmont at the

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[92]Cf. Coolidge (1947[2], 219, 223–227, 247, 272–277, 390–391, 401).

[93]*Notes*, in *Bulletin of the AMS* 10 (1904): 321–324; 13 (1906): 87–94; 13 (1907): 522–530; 14 (1908): 504–508; 16 (1909): 40–48; 17 (1910): 47–55; 18 (1911): 34–42; 19 (1912): 33–43; 21 (1914): 43–50; 22 (1915): 41–47; 23 (1916): 46–54; 25 (1918): 39–45; 26 (1919): 87–93; 27 (1920): 39–46.

beginning of September 1908, Sisam attended Segre's course *Rassegna di concetti e metodi della Geometria moderna* (Segre's *Notebook* 22, in Giacardi 2013) and was a guest of the professor for private lessons, which proved very stimulating for him, as he confided to Wilczynski:

> In his lectures he speaks very distinctly and I have had no difficulty whatever in following them. In his lectures this year he is covering, in a general way, the entire field of Geometry. In our private conferences at his home he is very approachable, makes me feel entirely at liberty to come where I want to, and is very stimulating. I am working on some properties of triply infinite varieties in five dimensions, with references to line geometry. I am very much pleased with the results I have obtained thus far (Sisam to Wilczynski, 12 December 1908, Annex 57).[94]

During the months he spent in Turin, Sisam developed his researches under the guidance of Segre, who presented them at the Academy of Sciences, in the sitting of 5 March 1911.[95] Between Segre and Sisam a relationship *inter pares* was maintained, despite the professional, cultural and age difference between the two. On one side, thanks to Segre, Sisam corrected a significant mistake which he, and before him Wilczynski, had made:

> In a paper, published in the *Bulletin* for June, 1904, page 440, Mr. C. H. Sisam gives a proof for a theorem previously enunciated and proved by me in the *Mathematische Annalen*, volume 58, page 256. Unfortunately, however, he follows me in giving an inexact formulation of the theorem in question. I have used the word self-dual in a more restricted sense than is usual, without having properly called attention to the fact. As others may be misled also, a few words of explanation seem to be in order. A dualistic transformation may have the property of converting a ruled surface into itself without interchanging its generators, so that every generator of the surface is transformed into itself. It is merely of scrolls, for which such a transformation exists, that I wish to assert the theorem that they belong to a non-special linear complex. It is only to this case that Mr. Sisam's demonstration applies. There actually exist ruled surfaces, self-dual in the general sense, which do not belong to a linear complex. The following example of such surfaces is due to Professor Corrado Segre, who first called my attention to the fact that my theorem was badly formulated (Wilczynski 1904, 8).

At his turn, Segre was prompted by the sodality with Sisam to develop some studies of his own, and expressly thanked the American disciple in the article "Aggiunta alla memoria: Preliminari di una teoria delle varietà luoghi di spazi":

> Mr. C.H. Sisam, of the University of Illinois, has kindly pointed out to me that there are exceptions to the theorem (no. 21) enounced in the middle of p. 107 [here at pp. 96–97]. As far as the content of that no. 21 concerns, I also want to emphasize that, since the beginning of last year (1909), Dr. Sisam, who at that time was studying with me in Turin, presented a work of his to me on the V_3 varieties that satisfy four or more homogeneous linear partial differential equations of order 2. I hope that that research is published soon (Segre 1910b, 346).

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[94]Cf. also Sisam to Wilczynski, 29 March 1909, Annex 58 and Sisam to O. Michelli, 14 July 1924, Annex 70.

[95]C.H. Sisam, On Algebraic Hyperconical Connexes in Space of *r* Dimensions, *Atti R. Acc. Scienze di Torino* 46 (1911): 481–487.

In Sisam's case too, Segre's role as a *Maestro* was not limited to the Turin period[96] but went on until the twenties. Though having a single opportunity to return to Italy in 1928, as invited lecturer in Bologna, at the VIII International Congress of Mathematicians, Sisam kept in touch with Segre by letter.

By contrast, the recollection by Terracini, that the American Ellis Bagley Stouffer (1884–1965) also spent a study sojourn in Turin as a disciple of Segre's, is unfounded (Terracini 1968, 13). An alumnus of Wilczynski's, Stouffer took his Ph. D. in 1911, defending the thesis *Invariants of Linear Differential Equations, with Applications to Ruled Surfaces in Five-Dimensional Space.* Having become an Instructor in Mathematics at Drake University and the University of Illinois, he pursued most of his career at the University of Kansas, where he was an Assistant Professor (1914–1917), and Associate Professor (1917–1921), and finally a Full Professor and Dean of the Graduate School (1921–1955). An eminent and prolific scholar, Stouffer obtained a fellowship of the John Simon Guggenheim Memorial Foundation in 1926, for Mathematics, reserved for American and Canadian citizens. The grant was to finance a study sojourn of 10 months, beginning from 1 August 1926, to conduct comparative studies on the three general methods of projective differential geometry. Went in company with his wife Anna Lucile Shepard and their children, Stouffer spent most of his time in Italy, where he attended the courses of E. Bompiani at the University of Bologna (Fitch 1928, 331; Ciliberto and Sallent 2012, 156). He also sojourned in Turin, and returned to Italy in 1928, on the occasion of the International Congress of Mathematicians in Bologna, during which he strengthened his contacts with B. Segre, Fano and Severi, but not with Corrado Segre, who passed away four years before.

Quite the contrary, although till now it has not been noticed, the pool of Segre's American disciples included Clarence Lemuel Elisha Moore (1876–1931). An expert in algebraic and Riemannian geometry, he obtained a Ph.D. at Cornell University, with a thesis on the classification of the surfaces with singularities of the quadratic spherical complex, with Virgil Snyder as advisor. Moore improved his geometric culture by going to study in Göttingen, in Turin with C. Segre, and in Bonn with E. Study. In 1904 he entered the Department of Mathematics of MIT, at first as an instructor, then as an assistant, an associate professor and finally a full professor (Franklin 1933). Reaching Turin in March 1908, Moore attended Segre's course devoted to *Capitoli vari di Geometria della retta* (Segre's *Notebook* 21 in Giacardi 2013) and entered in friendly relations with the Italian geometer.[97] For example, Segre advised him and helped him in drafting the report of the IV International Congress of Mathematicians,[98] which Moore had been entrusted with for the *Bulletin of the American Mathematical Society* (C.L.E. Moore 1908).

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[96]Both Baker (1926, 263) and Coolidge (1927, 357) remember the care and promptness with which Segre maintained his correspondence with young English and American scholars.

[97]Cf. C.L.E. Moore (1911, 350, 355–356).

[98]Cf. DESPC: C.L.E. Moore to D.E. Smith, n.d. (1908) and C.L.E. Moore to D.E. Smith, 31 March 1908.

To complete the panorama of Segre's international disciples, it is also necessary to mention those outlanders that, like René Baire, sojourned in Turin to specialize in other domains of mathematics, and nevertheless assisted to some lectures on Higher Geometry. Among Segre's other foreign alumni, we can mention David Cytron (1887–1982), a Jew from Bialystok, afterwards naturalized, who came to study in Italy because he was forbidden to do so in his homeland. In the years 1908–1910 he attended two courses of Segre's (Segre's *Notebooks* 22 and 23 in Giacardi 2013) and his lectures at the Teacher Training School (Segre's *Notebook* 40 in Giacardi 2013), with good profit. After the degree examination, on 2 July 1910, at which he was given the maximum vote, Cytron became an assistant of B. Levi at the University of Cagliari. Appreciated by Segre for his mathematical talent and diligence, Cytron then devoted himself to finance and trading. Interned with his wife Ida Tyktin, in the province of Chieti, he was detained at Pizzoferrato on 15 October 1940 and subsequently at Villa Santa Maria (10 November 1940–1942) and, after the liberation, returned to Turin.[99]

Finally, from analysis of some notebooks preserved at the Special Library of the Turin Department of Mathematics, in which the alumni were registered that took examinations with Segre in Projective, Descriptive and Higher Geometry, many other names of foreigners have emerged, for whom it is difficult to retrieve information, since often they did not take up a university career.

5 Annali di Matematica: A Journal for the Italian School of Algebraic Geometry?

In the years 1850–1880, many Italian geometers, among them F. Brioschi, L. Cremona, G. Battaglini, E. Beltrami, E. D'Ovidio, E. Bertini, R. De Paolis, L. Bianchi and G. Veronese published essays and articles in foreign journals, first of all *Mathematische Annalen*, but also *Bulletin des Sciences Mathématiques* and *Journal für die reine und angewandte Mathematik,* to reach a broader and more specialized readership, both quantitatively and qualitatively, compared to that afforded by the national context.[100]

This strategy of self-promotion of his own results on an international scale was soon appropriated by Segre, ever since the years of his university studies, thanks, as already mentioned, to the example of D'Ovidio, Faà di Bruno and Genocchi. It was soon effective: it is sufficient to consider the reviews and quotations of Segre's

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[99]Cf. ASUT, *Registri di carriera scolastica n. 31, 1906–07*, p. 13; Fonti H40, *Nominativi di ebrei internati in provincia di Chieti e di Pescara, tratti dall'Archivio Arcivescovile di Chieti, Carteggio dell'arcivescovo Giuseppe Venturi (1931–1947)*; MCT-Mary Cytron Treves H123-*Notizie relative a singoli internati o elenchi di internati*, in Ministero dell'Interno, Divisione Generale di Pubblica Sicurezza, Affari Generali e Riservati, A4bis (Stranieri internati, b. 85); Terracini 1968, 11.

[100]Brioschi (1855a, b, c, 1856, 1857a, b, 1858, 1861, 1864, 1869, 1870, 1871, 1877a, b, 1878, 1879a, b); Cremona (1861, 1862a, b, 1864a, b, 1865, 1868, 1871a, b, 1876, 1878); Battaglini (1868); Beltrami (1869, 1877); D'Ovidio (1877); Bertini (1877, 1878); De Paolis (1878); Bianchi (1880a, b); Veronese (1881, 1882).

works, dotted around, from 1883 on, in repertoires like *Revue Semestrielle*[101] and *Jahrbuch über die Fortschritte der Mathematik*,[102] or the reports of conferences and activities in mathematical societies.[103]

However, as the identity of the Italian School of Algebraic Geometry was consolidated, it became important to have a journal that could confirm, at a national and international level, the 'command position' attained by this School. Thus increasing weight was taken on by Segre's active presence in the editorial board of the *Annali di Matematica pura ed applicata*[104]—alongside with L. Bianchi, G. Jung and U. Dini—from 1904 onwards.[105]

Publishing activity—to which Segre devoted himself with fervour and with a scrupulousness that was universally appreciated and sometimes feared (Segre to Wilczynski, 16 April 1916 and 2 March 1917, Annexes 59 and 60)[106]—was rather

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[101]Cf. RS I.1 (1893): 86; III.1 (1895): 98; III.2 (1895): 115, 125; IV.1 (1896): 105, 115-116; IV.2 (1896): 104-105; V.1 (1896): 115; V.2 (1897): 98; VI.1 (1898): 56, 97-98, 107; VI.2 (1898): 135-136; VII.2 (1899): 113; VIII.1 (1900): 112, 118, 132, 134; IX.2 (1901): 70, 115; X.1 (1902): 114, 115, 117; X.2 (1902): 127.

[102]Cf. JFM 16.0716.02 (rev. Lampe); JFM 16.0716.01 (rev. Aachen); JFM 16.0703.02 (rev. August); JFM 16.0596.01 (rev. August); JFM 16.0096.01 (rev. F. Meyer); JFM 17.0784.01 (rev. W. Stahl); JFM 17.0773.01 (rev. August); JFM 18.0795.01 (rev. G. Loria); JFM 18.0523.01 (rev. G. Loria); JFM 19.0682.01 (rev. Krazer); JFM 19.0676.02 (rev. G. Loria); JFM 19.0676.01 (rev. G. Loria); JFM 24.0640.01 (rev. G. Loria).

[103]Cf. for example Meyer (1894: 279, 283) translated into Italian by G. Vivanti, see F. Meyer, Rapporto sullo stato presente della teoria degli invarianti, *Giornale di Matematiche* 33 (1895): 261, 36 (1898): 313; E. Study, Ein neuer Zweig der Geometrie, Hamburg 23 September 1901, JDMV 11 (1902): 97–123, in particular 122; JDMV 14 (1905): 81, 287; JDM 15 (1906): 467; JDMV 18 (1909): 159; JDMV 21 (1912): 44; JDMV 25 (1917): 113 (Mathematische Gesellschaft in Wien, 15 December 1916 Gustav Kohn, *Über einige Arbeiten von Segre*); JDMV 30 (1921): 69; JDMV 31 (1922): 79, 93.

[104]Segre critically monitored the publishing policies of the *Annali*, long before becoming a member of their editorial committee. For instance, he wrote to Castelnuovo in the winter of 1894 (ANL-Castelnuovo, Segre to Castelnuovo, 8 February 1894): "Regarding the *Annali*, nowadays they have been given new stimuli: but they still leave something to be desired … Perhaps, if (as seems likely) the journal soon has to change its editorial board, it will fulfill that role which is now performed by the periodicals published by our bosom friend [Guccia] and the porcupine [Peano]: if the editing fell into good hands …" ("Riguardo agli Annali, in questi ultimi tempi hanno ricevuto un po' di spinta: ma ancora lasciano qualcosa a desiderare … Forse, se (come sembra probabile) il Giornale dovrà fra non molto cambiar direzione, potrebbe esso venir ad adempire a quegli uffici a cui servono ora i periodici pubblicati dall'amicone [Guccia] e dall'istrice [Peano]: se la direzione cadesse in buone mani …").

[105]On the history of the *Annali di Matematica* during Brioschi's direction cf. Bottazzini (2000, 71–84), Martini (2003, 171–198) and Lacaita (2012); on the period 1880–1930, Roero (2015).

[106]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 29 July 1886, 16 May 1893, 27 May 1893, 7 June 1893, 18 June 1893, 28 November 1894, 9 May 1901; ANL-Levi-Civita, Segre to Levi-Civita, 11 May 1905, 9 April 1923; Enriques to U. Amaldi, (1901) and Segre to Amaldi, 20 April 1905, (Nastasi and Rogora 2007, 12–13, 53). Segre's severity as a reviewer was proverbial, in both the Italian and the international mathematical sphere. Before accepting a work for publication, presented by a young beginner or an eminent colleague like S. Kantor, he checked the manuscript in every detail, appraised its contents and form and even the spelling. If his "conscience" was not fully satisfied, he did not hesitate to refuse it for publication, or to ask for it to be completely rewritten.

onerous. It was not by chance that in 1922 he declined the invitation to become a member of the editorial board of the *Bollettino dell'Unione Matematica Italiana*, giving as quite a reason the desire to dedicate himself entirely to *Annali* (S. Pincherle to C. Segre, 27 January 1923, Annex 64).

As co-editor in chief of this illustrious journal, Segre participated in the rapid changes taking place in the twentieth-century world of mathematics publishing, in the decline of many academic collections and in the resulting process of special-ization and internationalization, undertaken by the most successful journals, in Italy above all *Rendiconti del Circolo Matematico di Palermo* by G.B. Guccia (Brigaglia 2014, 165–178).

Though he continued to choose to publish most of his works in the series of the *Atti* and *Memorie* of the Turin Academy of Sciences, or in the *Rendiconti* of the Lincei Academy, Segre's attitude regarding the most effective tactic to be adopted for promoting Italian algebraic geometry gradually varied, adapting to the new scientific demands and practices. The letters to F. Klein of the 1880s, where the young Segre and his colleagues and disciples (Veronese, Loria, Amodeo, Fano, Pieri, etc.) asked for hospitality in *Mathematische Annalen*, certain that this journal could truly afford an international showcase for their production, gave way, in the 1890s, to the correspondences of Segre 'Maestro', careful to acquire for *Annali di Matematica pura ed applicata* the best essays by Castelnuovo, Enriques, Fano, B. Levi, Severi, etc.:

> If you are still in time, I would beg you to consider whether, out of national respect, you might say, if you think it is better not to give your important work to the *Mathematische Annalen*, but instead to *Annali di Matematica* (or another Italian journal). I am sorry not to have thought about it before, but I believe that you are still in time. For when your discovery has to be quoted why should a foreign periodical be named? Foreigners must get used to reading our collections. About other works, for instance the one that Klein asked you for, I will not say anything. But precisely for this one I would prefer *Annali di Matematica,* in which it seems that at the moment there is not too much material; so perhaps the delay would not be great. (ANL-Castelnuovo, Segre to Castelnuovo, 26 September 1893: "Se ne sei ancora in tempo, ti pregerei di considerare se, per un riguardo, dirò, nazionale, non ti paja meglio di non dare ai *Mathematische Annalen*, ma bensì agli *Annali di matematica* (od altra raccolta italiana) il tuo importante lavoro. Mi rincresce di non averci pensato prima, ma credo che tu sia in tempo ancora. Poiché quando si dovrà citare la tua scoperta si dovrebbe nominare un periodico estero? Gli stranieri s'abituino a leggere le nostre raccolte. Per altre cose, ad esempio per quella che ti chiese il Klein, non dico. Ma per questa proprio preferirei gli *Annali di matematica*, nei quali pare che ora non vi sia troppa materia; sicché il ritardo forse non sarebbe grande").[107]

This action was not devoid of effects: after 1891 Segre published no other works in *Mathematische Annalen*. By contrast, in *Annali di Matematica* seven articles of his appeared, four papers by Castelnuovo (against two edited in *Mathematische*

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[107]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 3 October 1893, 12 October 1893 and 16 November 1893.

Annalen), three essays by Enriques (against five appeared in *Mathematische Annalen*), and five memoirs by Fano (who only addressed one work to *Mathematische Annalen*).

Nonetheless, despite Segre's intentions, the publishing activity continued to be the weakest and most marginal element of his leadership of the Italian School of Algebraic Geometry. On one side we have to recognize, as has often been done (Brigaglia and Ciliberto 1995, 14–16), that the volume XXII of *Annali,* containing the two famous essays by Bertini "La geometria delle serie lineari sopra una curva piana secondo il metodo algebrico" (Bertini 1894) and by Segre "Introduzione alla geometria sopra un ente algebrico semplicemente infinito" (Segre 1894a), perfectly reflected the interplay in national research on algebraic geometry and the *Italian style* that characterized it. On the other hand it should not be denied that *Annali di Matematica* never became the 'journal of a School', with a role analogous to this taken on by the *Rivista di Matematica*, edited by Peano, for the promotion of studies on logic and foundations of mathematics (Roero 2015).

The task of retrieving and coordinating the articles to publish in *Annali* was undertaken by Segre in a fragmentary and occasional way. In actual fact, he limited himself to examining the works that through various vectors were submitted to him for publication, without pursuing any specific cultural line. In his role of leader of a School, Segre did not clearly show he had a preference for *Annali*. Indeed, he sometimes advised Castelnuovo, Enriques and Fano—for most disparate reasons, not all of a scientific nature—to use the *Rendiconti* of the Accademia dei Lincei, *Memorie di Matematica e di Fisica della Società Italiana delle Scienze detta dei XL*, the *Giornale di Matematiche ad uso degli studenti delle Università Italiane*,[108] etc. Equally inconsistent it was the strategy pursued by Segre to place his own publications, so much so that it was only in one circumstance, when he thought he was about to complete the essay "Sulla scomposizione dei punti singolari delle superficie algebriche" (Segre 1897a), that he requested Castelnuovo and Enriques to "get the place reserved for him" in *Annali*, "because he would have been very pleased to appear in their company. In this way, precisely, their School in its entirety would have been represented!" (ANL-Castelnuovo, Segre to Castelnuovo,

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[108]Cf. ANL-Castelnuovo, Segre to Castelnuovo, 24 September 1891: "Publication in that journal [*Giornale di Matematiche*] would remove any idea of hostility to Amodeo's work edited in the *Atti* of Turin Academy of Sciences. I would like your opinion." ("La stampa in quel giornale [*Giornale di Matematiche*] toglierebbe ogni idea di ostilità contro il lavoro di Amodeo pubblicato negli Atti di Torino. Desidero il tuo parere.") Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 13 September 1891.

9 February 1895: "perché avrei molto piacere di uscire in vostra compagnia. Così appunto sarebbe stata tutta la nostra scuola rappresentata!").[109]

Besides, continuing to be anchored to 'old-style' publishing practices, Segre constantly asked disciples and colleagues to 'donate' works to the Turin Academy of Sciences, especially in the periods in which "in our series it seemed that the geometers were silent." (ANL-Castelnuovo, Segre to Castelnuovo, 21 March 1893 and 25 December 1893). On manifold occasions he 'reproached' Castelnuovo in a friendly way for "always turning to the Accademia dei Lincei and not the Turin Academy" for the publication of his most interesting results (ANL-Castelnuovo, Segre to Castelnuovo, 17 April 1894), and reminded him that—as a member of this latter Society—he was 'morally' bound to ensure effective collaboration to its periodicals:

> I will be pleased to present Enriques' work, because I like our Academy to publish the important geometric researches that you two are doing. Therefore I need not repeat to you that this year too you must give our Academy some works of yours. (ANL-Castelnuovo, Segre to Castelnuovo, 25 December 1893: "sarò lieto di presentarlo [il lavoro di F. Enriques], perché mi piace che la nostra Accademia pubblichi le importanti ricerche geometriche che si vanno facendo da voi. Non occorre quindi ch'io ti ripeta che anche quest'anno tu devi dare alla nostra Accademia qualche tuo lavoro").

However, though naive and heterogeneous, Segre's commitment within the editorial board of *Annali di Matematica* appears to have been marked by two aspects: the defence, in a Risorgimento and patriotic key, of the Italian language as one of the international languages of mathematics, equal in dignity and breadth of use to French, German and English; and the battle for those journals that, so to speak, had 'made the history' of Italian scientific culture. It is therefore not surprising that, though having a full expertise in both French and German, after 1906

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[109]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 16 January 1895, 9 March 1895, 12 March 1895 and 18 March 1895: "I believe that the prize will be awarded, and it will be well deserved! Naturally, if for this the President deems it necessary that your works should be published by the XLs there is no doubt that you have to accept. Then you and Enriques judge whether the filiation between your works is such as to make it more useful to publish them together in a learned collection that is not very widespread, rather than using *Annali* (for Enriques) and so to spread your ideas more widely (through two journals). Concerning my Note, I happened, near the end of the final version, to notice a mistake of some gravity that I had committed! I hope to correct it: but, being occupied with my course, I cannot do it very soon. So you two mustn't wait any longer for me! Before you correct your proofs you will know whether and how to quote my paper. Probably between the *Memorie dei XL* and *Annali* I would prefer the latter: but for now I don't have to decide anything on the matter." ("Ritengo che la premiazione avrà luogo, e sarà ben meritata! Naturalmente, se per questo il Presidente ritiene necessario che i tuoi lavori sian pubblicati dai XL, non v'è dubbio che tu devi accettare. Tu e l'Enriques giudicate poi se il legame fra i vostri lavori sia tale da rendere più utile il pubblicarli insieme in una raccolta poco diffusa, anzi che valersi anche degli *Annali* (per l'Enriques) e così diffondere maggiormente (per mezzo di due raccolte) le vostre idee. Riguardo alla mia Nota, m'è accaduto, pressoché al termine della redazione definitiva, di accorgermi di una svista di una certa gravità che avevo commessa! Spero di ripararla: ma, con le occupazioni del corso, non potrò farlo tanto presto. Sicché non aspettatemi più voi due! Prima che correggiate le vostre bozze saprete se e come citarmi. Probabilmente tra le *Memorie dei XL* e gli *Annali* preferirei questi ultimi: ma per ora non occorre che io decida nulla in proposito").

Segre did not submit any more work in a foreign language and that as long ago as 1890 he informed Castelnuovo, with a vein of satisfaction, of the possibility of also using Italian for publications abroad:

> The problem on the $g_2^{(1)}$ of particular curves that you wrote to me saying you had solved already seems to me very general and important; and you will do well to publish it. If you decide on *Mathematische Annalen* I must warn you that the editorial board of the latter is really determined also to accept works in Italian (also in the competition of the Berlin Academy for the Steiner prize they now also admit papers in our language). (ANL-Castelnuovo, Segre to Castelnuovo, 13 August 1890: "Il problema sulle $g_2^{(1)}$ di curve particolari che tu mi scrivi di aver risolto mi par già molto generale ed importante; e farai bene a pubblicarlo. Se ti decidi pei *Mathematische Annalen* t'avverto che la redazione di questi è proprio decisa ad accogliere anche lavori in italiano (anche nel concorso dell'Acc [ademia] di Berlino pel premio Steiner adesso accolgono anche i lavori scritti nella nostra lingua)").

However, defence of the use of Italian was typical of the period. One need only think that in an other prestigious context too, that of the Accademia dei Lincei Prizes for Mathematics, candidates could only compete with essays written in Italian and Latin. Segre himself, who won the prize in 1898, together with Volterra, was forced to devote the 1895 Christmas holidays to the "very boring occupation" of "summarizing, in Italian" some works of his published in French (ANL-Castelnuovo, Segre to Castelnuovo, 7 January 1896).

In the same line of thought and action was the campaign of international mobilization for the survival of *Annali di Matematica*, in which Segre was involved in the years after World War One. Though sorry to have to turn to foreigners, which "it is always regrettable to have to ask for money",[110] in that circumstance he was willing to sacrifice patriotic pride, whilst it should be guaranteed the life of the journal that, since 1857, had represented the 'voice' of Italian mathematical community. To face the serious economic crisis of *Annali*, Segre asked the Americans for help, expressing his worry over the destiny of the journal to Snyder, at the time in Turin for a study sojourn.[111] Through the *Bulletin of the American Mathematical Society* Snyder released an invitation to his American colleagues,[112] which was echoed by 'distance disciples' of Segre's like C.L. Moore, as well as by many estimators of the Italian geometer (E.B. Stouffer, S. Lefschetz, S. Lipka, etc.).[113] The excellent results of this subscriptions campaign, an "effect of Segre's work",[114] succeeded in avoiding the 'death' of *Annali* and indeed projected the journal—with the opening of the fourth series, edited by L. Bianchi, C. Segre, S. Pincherle and T.

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[110]ANL-Volterra, Segre to Volterra, 5 July 1912: "L'estendere la sottoscrizione agli stranieri va bene sotto un aspetto. D'altro lato rincresce sempre chieder denari, noi italiani agli stranieri." Cf. also Segre to Volterra, 9 July 1912 and 27 December 1912.

[111]Cf. Snyder to Segre, 21 November 1922, Annex 61.

[112]Cf. Notes, *Bulletin of the AMS*, 28 (1922): 370; Notes, *Bulletin of the AMS*, 29 (1923): 41.

[113]Cf. Snyder to Segre, 21 November 1922, 8 December 1922, 5 January 1923 and 19 February 1923, Annexes 61, 61.1 and 61.2, 62, 63 and 65.

[114]Pincherle to Segre, 27 January 1923, Annex 64.

Levi-Civita—towards a "new season of Italian mathematics" (Pincherle to Segre, 27 January and 3 November 1923, Annexes 64 and 67).

6 Segre's School at International Congresses of Mathematicians

For Mathematical Schools in the 19th and 20th centuries international congresses constituted very propitious occasions to promote their research *style*. At the same time, they favoured exchanges and interactions among the participants, creating the premises for new collaborations among scholars in different geographical areas or renovating ancient relationships (Albers et al. 1986; Lehto 1998; Curbera 2009).

Segre, probably influenced by Klein, soon appeared aware of the importance of that form of sociability for spreading and vulgarizing his results and projects. In this connection, since 1893, on the occasion of the Evanston Colloquium (28 August–9 September 1893), he commented to Castelnuovo on the usefulness of participating in international conferences:

> They write to me from Chicago that I should promote a report from my Italian friends at that congress, especially with "brief critical review of the development during the last 20–25 years of the definite small subdivisions of the science." Would you like to make such a brief account on geometry *of hyperspaces* (algebr[aic] entities; proj[ective] geom[etry], etc.) in Italy? I believe that it would cost you little work (it being a matter of *briefly* characterizing the progress due to the various main contributions, which you already know) and it would be a useful survey. The congress is being held *from 21 to 28 August*. Let me know if you accept this task. If the answer is affirmative you could then send *me* your text, authorizing me to retouch it. (ANL-Castelnuovo, Segre to Castelnuovo, 28 June 1893: "Mi scrivono da Chicago di promuovere un resoconto dai miei amici italiani a quel congresso, specialmente con "brief critical reviews of the development during the last 20–25 years of the definite small subdivisions of the science." Avresti tu voglia di fare un breve rapporto sulla geometria *degl'iperspazi* (enti algebr.; geom. proj. ecc.) in Italia? Credo che ti costerebbe poca fatica (trattandosi di caratterizzare *brevemente* i progressi dovuti ai vari principali lavori, che tu già conosci) e sarebbe una cosa utile. Il congresso si tiene *dal 21 al 28 d'Agosto*. Avvertimi se accetti quest'incarico. In caso affermativo potresti poi inviare *a me* il tuo scritto con facoltà di ritoccarlo.").[115]

However, the first opportunity to present themselves collectively, as a true School, came to the Italian geometers from the International Congress of Mathematicians in Zurich (9–11 August 1897). The previous summer, Segre had already told his closest friends of his intention of attending it:

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[115]Cf. also ANL-Castelnuovo, Segre to Castelnuovo, 9 July 1893: "To Chicago I will send some works by others; nothing of mine probably. I am sorry that you cannot draft the little paper I proposed to you. Do you have some other small paper?" ("A Chicago manderò lavori altrui; nulla di mio probabilmente. Mi rincresce che tu non possa fare il lavoretto che io ti proponevo. Hai qualche altra cosetta?"). On the outcomes of the Chicago congress cf. ANL-Castelnuovo, Segre to Castelnuovo, 3 March 1894, 8 August 1894 and 22 August 1894.

Your letter gave me great pleasure because of the hope that it gives me that you yourself will decide to come to Zurich. […] I believe that if I could not go there, later I would regret it, like an opportunity missed to meet scholars of high value and to attend at special meetings […]. I would devote Saturday evening and part of Sunday to the mathematicians that are already in Zurich. At Göschenen Fano will join me; it seems, instead, that Enriques will come later. (ANL-Volterra, Segre to Volterra, 31 July 1897: "Molto piacere m'ha fatto la tua lettera per la speranza che mi dà che tu ti decida a venire a Zurigo. […] Io credo che se non potessi andarci, dopo ne proverei rammarico, come di un'occasione perduta di vedere uomini di valore, e riunioni singolari […]. La sera di sabato e parte della domenica li dedicherei ai matematici che già si trovano a Zurigo. A Göschenen si unirà a me il Fano; Enriques, invece, pare che verrà più tardi.").

Regarding personal contacts, the Zurich Congress proved profitable for Segre, who exploited his time there to establish a dense network of partnerships, which he was to preserve for the rest of his life. Besides being acquainted with E. Borel, T. Reye, H. Zeuthen and the American C.A. Scott,[116] Segre met F. Kraft, who after the end of the Congress went to Italy.[117] On an invitation from Klein, moreover, Segre was appointed vice-president of the *Geometry* section, directed by Reye, in which appreciated talks were given by F. Gerbaldi, C. Burali-Forti and G. Fano; Enriques spoke in the *Arithmetic and Algebra* session; Loria in the *Mechanics and Mathematical Physics* one, but on a historical theme.[118] Although C. F. Geiser pressed him to submit a paper, Segre firmly declined the invitation, fearing the judgment of mathematicians of the standing of M. Nöther and F. Klein:

Alongside these there will be, it is true, others for whom my words might perhaps have been of some utility. But meanwhile wouldn't the former have branded me superficial, wouldn't they have said that I was expounding ideas that were already known, and partly already developed by me in that article of mine in *Rivista di Matematica* …? (ANL-Castelnuovo, Segre to Castelnuovo, 12 June 1897: "Accanto a questi vi saranno, è vero, altri pei quali le mie parole potevan essere forse di qualche utilità. Ma intanto quei primi non m'avrebbero tacciato di superficiale, non avrebbero detto che io esponevo cose già note, ed in parte già svolte da me in quel tale mio articolo della *Rivista di matematica* …?").

Despite some important defections like those of Castelnuovo, Guccia and P. Del Pezzo,[119] the Italian delegation in Zurich was quite large, with about twenty participants, including, in addition to the speakers mentioned above, Volterra, F.

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[116]Cf. Segre to O. Michelli Segre, 8 August, 8–9 August and 10 August 1897, Annexes 21, 22 and 23.

[117]ANL-Volterra, Segre to Volterra, 19 August 1897.

[118]Cf. Gerbaldi (1898), Sul gruppo semplice di 360 collineazioni piane, *Verhandlungen des Ersten Internationalen Mathematiker-Kongresses in Zürich vom 9 bis 11 August 1897*, F. Rudio (ed.), Leipzig: Teubner, 1898: 242–246; Burali-Forti (1898), Postulats pour la géométrie d'Euclide et de Lobatschewsky, *Ibidem*, 247–250; Fano 1898, Über Gruppen, insbesondere continuierliche Gruppen von Cremona Transformationen der Ebene und des Raumes, *Ibidem*, 254–255; Enriques (1898), Sur les problèmes qui se rapportent à la résolution des équations algébriques renfermant plusieurs inconnues, *Ibidem*, 145–146; Loria (1898), Aperçu sur le développement historique de la théorie des courbes plane, *Ibidem*, 289–298; cf. also Segre to O. Michelli Segre, 10 August 1897, Annex 23.

[119]Cf. Annex 22 and ANL-Castelnuovo, Segre to Castelnuovo, 7 September 1897: "In Zurich there was great regret over your absence … Ghigo [F. Enriques] will have told you!" ("A Zurigo s'è rammaricata tanto la tua assenza … Ghigo te l'avrà detto!").

Brioschi, S. Pincherle, G. Ricci Curbastro, G. Veronese and T. Levi-Civita. In particular, one of the four plenary lectures was delivered by G. Peano, who illustrated to the world scholarly community the second edition of his *Formulaire de Mathématiques*, showing how this ambitious encyclopaedia had been achieved thanks to the creation of a specific logical-ideographic language (Peano 1898, 299). Segre confided to Volterra the fear that the choice of such a theme might have harmed the image of Italian mathematics abroad:

> I want to believe that nothing disagreeable for us will happen there: something *comical* perhaps, but if there will be cause for laughter, it won't be such a bad thing! (ANL-Volterra, Segre to Volterra, 31 July 1897: "Io voglio credere che nulla abbia da accadere là di spiacevole per noi: di *comico* forse sì, ma se vi sarà da ridere, non sarà un gran male!").

The following October, Segre 'found on his desk' a report of the Congress, published by Borel in *Revue générale des Sciences pures et appliquées* (Borel 1897, 783–789) and regretfully ascertained that the French colleague too had not appreciated Peano's plenary lecture.[120]

A sort of 'rivalry' between the two Turin Mathematical Schools, and consequently between their leaders Segre and Peano, was perceived in a more evident way in Paris at the International Congresses of Philosophy (1–5 August) and of Mathematicians (6–12 August), which opened the Short Century. Segre did not go to Paris but asked Volterra to convey him his impressions, without "waiting to tell him all of them face to face" on his return to Italy, and reminding him:

> At present there is a philosophy congress there, with the active participation of the Peanians with their leader: Peano will be speaking of mathematical logic in general, Padoa and Pieri of its applications to arithmetic and geometry. I am warning you about it, so that you can attend this event if you are still in time! (ANL-Volterra, Segre to Volterra, 3 August 1900: "In questi giorni si fa costì un congresso di filosofia, al quale prendon parte attiva i peaniani col loro duce: questi parlando di logica matematica in genere, Padoa e Pieri delle sue applicazioni all'aritmetica e alla geometria. Te ne avverto, affinché tu possa andare se ne sei ancora in tempo!").

Volterra did not fail to send Segre, from Paris, a letter containing detailed accounts of the two congresses together with an abstract of the famous talk by Hilbert "Mathematische Probleme" (ANL-Volterra, Segre a Volterra, 11 September 1900).

In Paris, the Italian School of Algebraic Geometry was certainly not well represented. Only two of Segre's alumni presented talks: F. Amodeo, who traced a "Coup d'oeil sur les courbes algébriques au point de vue de la gonalité" (Amodeo 1902), and A. Padoa, who, though having had Segre as the advisor of his degree dissertation, cannot be properly considered a disciple of Segre. Padoa presented two papers, the first one on the theme "Un nouveau système irréductible de postulats pour l'Algèbre" and the second one on a hypothetical-deductive system for

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[120]ANL-Volterra, Segre to Volterra, 27 October 1897: "Borel's article [is] equal to the spirit that he shows in talking: there are also some barbs … which I liked a great deal." ["L'articolo di Borel [è] pari allo spirito che questi dimostra nel discorrere: vi è anche qualche stoccata … che m'è piaciuta assai"). For an analysis of the reception of Peano's logic by Borel and his coworkers R. Baire, H. Lebesgue, cf. Luciano (2016).

Euclidean geometry (Padoa 1902a, b).[121] To the absences of Segre, Castelnuovo and Enriques, there should be added the circumstance that Veronese spoke in the section devoted to *Teaching and methods* and that Fano did not present any paper.

The plenary lecture by Volterra himself (Volterra 1902), which Segre had hoped "would have been very beautiful and would have doubly honoured the name of Italy both for the value of the eminent scholars mentioned and for the expertise and the competence of the speaker" (ANL-Volterra, Segre to Volterra, 3 August 1900) proved a little disappointing for him. In fact Volterra concentrated on the study traditions opened up by E. Betti, F. Brioschi and F. Casorati and only marginally hinted at the evolution of Italian geometry.

While the congresses in Paris, and above all that of Philosophy, for Peano's 'phalanx' represented the key moment of its affirmation, for the Italian algebraic geometers the apex of internationalism was reached in 1904. During the third Congress, which was held in Heidelberg from 8 to 13 August of that year, Segre, together with F. Morley, chaired the *Geometry* session (10 August), with talks by F. S. Macaulay, C. Guichard, E. Study, F. Meyer, K. Rohn and G. Scheffers and he took part, together with L. Automne, in the relevant debates. He was also entrusted with one of the four plenary lectures, on an indication by F. Klein. The topic chosen, "La Geometria d'oggidì e i suoi legami coll'Analisi", gave Segre an excellent opportunity to recap the progress of the researches of the Italian School and to highlight the *style* that marked them:

> A whole Italian *school* of geometers recognizes its starting point in the Memoir by Brill and Noether! Those concepts became even more fertile when, thanks precisely to this *school*, they took on a more abstract and more general character, being referred to algebraic curves, especially with the methodical introduction of the important notion of the sum of two linear series (corresponding to that of product in the field of rationality defined by an algebraic irrational). With these tools Castelnuovo obtained major new results on algebraic curves, for example regarding the issue of postulation, which I have already mentioned. More important still is the way in which it has been possible to apply that theory, or to extend it, by analogy, to surface geometry! (Segre 1905, 115).

Preparing the lecture, which Segre held in Italian on Saturday 13 August, for him was a source of some worry and constant commitment, during the summer stay in the Swiss Alps. From Airolo, where some colleagues joined him (Guccia and G. Morera), he updated his wife on the revisions that he was broughting to the text, on the decision not to have it printed before the Congress and on the programme of the events in which he would participate in Heidelberg (cf. Segre to O. Michelli Segre, letters from 17 July to 8 August 1904, Annexes 32–39). His presence at the Congress, together with Castelnuovo, Loria and Fano, certainly allowed the team of algebraic geometers to broaden the horizon of their scientific links. We nevertheless notice the unusual fact that, against the large number of members of this School (four out of eleven Italians that attended the Congress), only Segre gave a plenary

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[121]These are two very important works from the logical-foundational point of view. For in-depth examinations of these essays the reader is referred to Borga (2005, 3–24), (2011, 89–114), Borga et al. (2009, 233–254), Lolli (2010, 47–66), Pasini (2010, 327–367), Luciano (2012, 49–52).

lecture and only Loria a talk, not on a geometrical theme but on a historical one, as he had already done in Zurich in 1897.

From correspondences and other testimonies we infer that in Heidelberg Segre made conversations with Klein, M. Nöther, G. Mittag-Leffler, E. von Weber, H. Zeuthen, A. von Brill, P. Stäckel, S. Dickstein, E. Study and E. Wilczynski.[122] Further, to his wife he confided:

> This is the great pleasure of conferences: to entertain with so many people that one only knew through their works, and to talk together of so many topics (8 August 1904, Annex 39).

1904 was also a year of very great importance for Segre from the point of view of the internationality of publications. In this connection, in June the *Bulletin of the AMS* published the English translation, by John Wesley Young (1879–1932), of the article "Sulle investigazioni geometriche, Osservazioni dirette ai miei studenti", which, as is well known, had been at the origin of a bitter controversy with Peano in *Rivista di Matematica* (Segre 1891a). The English version "On Some Tendencies in Geometrical Investigations" of his 'old' text[123]—whose salient points were taken up in the Heidelberg plenary lecture—gave Segre an opportunity to illustrate at an international arena how he conceived the role of *Maestro*, giving details of the modalities with which he structured the higher teachings and with which he trained young scholars towards original production. The fundamental convictions on the balance between intuition and rigor, on the alternation of methods and on the distinction between elementary mathematics, higher mathematics and elementary mathematics from an advanced standpoint, expressed by Segre in the 1904 article, and strongly permeated by the ideas of Klein, echoed the assumptions that he had defended since long time in his lectures at the university and at the Teacher Training School.[124] Filtered by the network of exchanges intertwined by Segre and

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[122]Cf. C. Segre to O. Michelli Segre, 9 August 1904, 10 August 1904, 12 August 1904, 13 August 1904 and 15 August 1904, Annexes 40, 41, 43, 44, 45. For Segre's meetings with Study and Wilczynski, in Heidelberg, we also have the testimonies of Coolidge (1927, 354–355). He wrote: "he [Segre] thereby established contact with Study, whom he subsequently met at the Heidelberg Congress in 1904, and with whom he retained cordial relations for many years." On Wilczynski, instead, Coolidge erroneously affirmed that Segre had met him in Heidelberg, while actually the two had met in Turin, for the first time, in the spring of 1904 (cf. C. Segre to E. Wilczynski, 18 March 1904, Annex 29, and 27 April 1904, Annex 30).

[123]Re-examining the drafts of the translation in the spring of 1904, Segre made some additions and changes to it, above all regarding bibliography (Segre 1891a, 442, 443, 446, 447, 448, 449, 450, 452, 455, 458, 459, 461, 462, 463, 465 and 467). For example, he pointed out that in 1888 F. Schütte translated the essay by G. Loria *The past and the present of the main geometric theories*; he added some references to the recent works by R. Ball, S. Lie, R. K. Fricke, F. Klein, A. R. Forsyth, E. Kötter, E. Picard, G. Simart and W. Killing, to the translations into Italian of the *Erlangen Program*, edited by G. Fano in 1890, and in English, edited by W. Haskell in 1892, and to his own publications and those of his disciples, which appeared in *Annali di Matematica* in 1890, 1893, 1895 and 1897.

[124]Cf. UTo-ACS. *Quaderni e Documenti relativi all'attività didattica*: *Lezioni di Geometria non euclidea (1902–03)*, Segre's *Notebook* 16: 1–22; *Vedute superiori sulla Geometria elementare (1916–17)*, Segre's *Notebook* 30: 7–27 and *Lezioni per la Scuola di Magistero*, Segre's *Notebook* 40, in Giacardi 2013.

his disciples with D. E. Smith and others American scholars, sensitive to mathematical instruction and education, these instances achieved an international resonance even before the publication of Segre's *Notes for the lectures at the Teacher Training School* (Tricomi 1940). This led foreign mathematicians to perceive Segre's School as a team that not only shared a particular research project but also precise assumptions and convictions regarding teaching and methodology.

Further the opportunity to publish the article "On Some Tendencies in Geometrical Investigations" (Segre 1904) in the United States was grasped by Segre to illustrate the changes—compared to 1891—in the conditions of research on and teaching of higher geometry in Italy, and to maintain that, precisely thanks to the more recent studies on the foundations of mathematics, it was now possible to consider as universally accepted the abstract and logical-deductive character of geometry:

> Since the appearance of the present paper multi-dimensional geometry has spread more and more, so that now (among mathematicians!) its opponents have become rare, who at one time were so common. […] In regard to the foundations of geometry, the books by Pasch and by Peano, and since the publication of this article the book by Veronese and the papers of Pieri, Hilbert, and others have led mathematicians in recent years more and more to consider geometry from an abstract, purely logical or deductive point of view, detaching it entirely from every physical consideration. […] Following this method the points of a space of 4, or 5, … dimensions are treated as above stated in the same way as those of S3, the system of postulates being slightly modified (Segre 1904, 459, 462, 463).

If for Segre the Heidelberg Congress marked the acme of his international prestige, the next symposium, held in Rome in April 1908[125] had as its protagonists above all his disciples. Castelnuovo was the General Secretary and Fano the deputy-secretary; Enriques, B. Levi and Severi delivered plenary lectures and talks (Enriques 1909; Levi 1909; Severi 1909). With the exception of Severi, nevertheless, none of the members of Segre's School spoke about algebraic geometry or higher geometry themes.

Entrusted, with L. Bianchi, with organizing and introducing the *Geometry* session, Segre proposed sending a best wishes telegram to his friend and colleague Reye, who had not been able to come to Rome for family reasons, and suggested that the meetings of 7 and 10 April should be chaired, respectively, by two 'great *Maestri*' from abroad: the Danish Hieronymus Georg Zeuthen and the German Issai Schur. However, the *Geometry* session was almost entirely animated by foreigners. There were talks by the French J. Andrade, the Croatian V. Varićak, the Dane Zeuthen, the Romanian G. Tzitzeika and the Ukrainian G. F. Pfeiffer; the only Italian to lecture was D. Montesano.

In Rome Segre's School saw its importance fully recognized, in the international arena, in relation to three main aspects: the awarding to Severi of the Guccia Medal, the praise of the contributions of this team to the *Encyklopädie der mathematischen Wissenshaften* and the recognition of the Italian tradition in algebraic geometry by Volterra in his plenary lecture "Le matematiche in Italia nella seconda metà del secolo XIX" (Volterra 1909).

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[125]On the history of the International Congress of Mathematicians in Rome cf. Guerraggio and Nastasi (2008).

Regarding the first aspect, Segre, who had been charged with delivering the final report for the attribution of the Guccia Medal, succeeded in "capturing the attention of the immense public" present,[126] particularly underlining the connections between Severi's researches on geometry on algebraic surfaces, the algebraic-geometrical methods of Enriques and Castelnuovo and the transcendent ones of Picard (Segre 1909, 212). He also listened with satisfaction to the presentation of the *Encyklopädie der mathematischen Wissenshaften* by W. von Dyck, who, speaking of the third volume, emphasised the input by Italian geometers as follows:

> I would like to particularly single out another field, that of algebraic curves and surfaces and their integrals, in connection with the *Analysis situs*. The latter first arose in Germany, and then in Italy, through the problems promoted by the life work of Cremona, recently the rivalry of French and Italian geometers has operated successfully and – I refer to the latest presentation by Mr Segre about the Guccia Prize – produced new studies, rich in surprising results. We owe to this intense interest in geometric researches if the volume of the *Encyclopaedia* devoted to geometry benefited from the excellent collaboration of our Italian colleagues (von Dyck 1909, 128).

Lastly, the Italian *style* in geometrical research was "honourably" mentioned (Segre to his wife, 6–7 April 1908, Annex 54) by Volterra, who, referring to his friend Segre, in his *lectio magistralis* affirmed:

> The further development of these studies in Italy and the new direction that they have taken is mainly to the credit of Segre with the first line of his researches, and to him there should be added Del Pezzo, Fano and others. Then, in the second phase of his scientific career, in which he drawn on the great essay of Noether, Segre was responsible for the beginning of that patrimony of works with which Castelnuovo, Enriques, Severi and De Franchis achieved their important results on the theory of the surfaces, the most recent of which are connected to the discoveries of Picard on algebraic functions and hence are in the framework of the theory of functions (Volterra 1909, 63–64).

The Rome Congress was also very fruitful from the point of view of conversations and exchanges with foreign colleagues. In addition to seeing Borel, Nöther and Mittag-Leffler again, Segre on that occasion got to know Henri Poincaré and met the young mathematician Emmy Nöther, Max Nöther's daughter.[127] By contrast, he regretfully noticed the absence of many American correspondents of his, including Coolidge, Wilczynski, Sisam and Stouffer.

In the ensuing years the participation of Segre's School in International Congresses of Mathematicians became increasingly episodic. The team continued to be represented by a remarkable group of members at the Cambridge Congress (22–28 August 1912). The new ranks of scholars like F. Severi, E. Bompiani and A. Terracini were present alongside the algebraic geometers of the first generation: Castelnuovo and Enriques. Fano and Segre, although enrolled, did not attend the conference. However, in Cambridge the themes of the talks reflected the new interests, not of a geometric type, cultivated by some members of Segre's équipe.

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[126]Cf. Segre to O. Michelli Segre, 6–7 April 1908, Annex 54.

[127]Cf. Segre to O. Michelli Segre, 5 April 1908 and 5–6 April 1908, Annexes 52 and 53.

Enriques, for instance, presented a talk "Sul significato della critica dei principii nello sviluppo delle Matematiche" (Enriques 1913, 67–79) and Castelnuovo—as one of the Italian delegates of ICMI—limited his activity to the session on mathematics education (Giacardi and Furinghetti 2008). The first *Geometry* meeting (23 August), chaired by H.F. Baker, elected Bompiani as Assistant Secretary, together with W. Blaschke. As had already happened in Rome, the session was dominated by foreigners: L. E. J. Brouwer, F. Morley, L.P. Eisenhart, E. Neville, M. Brückner, C. Stéphanos and A. Martin. The only Italian speaker was Bompiani, who dealt with a topic in line with the favourite research interests of Segre, like projective hyperspace geometry:

> In a series of works published from 1906 to 1910 Prof. Segre resumed this branch of hyperspace geometry and took it to a high degree of perfection. The contribution made to it, under Segre's impulse, by young geometers in Italy and abroad, can therefore be characterized as truly Italian (Bompiani 1913, 23).

At the following session too (24 August), chaired by Severi, there were interventions by W. Esson, M. Grassmann, P.H. Schoute, E. Kasner and G. Tzitzeica, while there were no Italian lecturers.

The presence of Segre's School, seen as a community at International Congresses of Mathematicians was further reduced after the Great War. Indeed, Segre refused to take part in the Strasburg conference (22–30 September 1920), an event that was only deemed international 'in name', seeing the exclusion of German, Austrian, Hungarian and Bulgarian mathematicians. Agreeing with Segre's stance, the School of Algebraic Geometry deserted the conference *en masse*, submitting no paper (cf. Klein to Enriques, 13 August 1920 and Enriques to Klein, 18 January 1921, in Luciano and Roero 2012, 214–217).

After Segre's death, in a context that was radically changed from both the cultural and the political points of view, it was Severi and Castelnuovo that at the International Congresses in Toronto (11–16 August 1924), Bologna (3–10 September 1928) and Zurich (5–12 September 1932) represented the Italian School and inherited that directional role that Segre[128] had maintained for thirty years:

> Nous devons cet esprit à nos maitres italiens Cremona, Betti, Bertini, Veronese, Segre, aux savants allemands Riemann, Clebsch, Klein, Brill et Noether, au danois Zeuthen, aux anglais Cayley, Sylvester et Salmon, et aux travaux, si profondément géométriques dans leur esprit, des analystes français, de Galois à Poincaré, à Picard, à Painlevé, à Humbert. Comme le peu que j'ai pu faire dans la science est le fruit de l'enseignement savant et passionné de mon maitre direct, Corrado Segre, que la mort nous a prématurément ravi, le 18 mai dernier, qu'il me soit permis d'envoyer à son souvenir les hommages du disciple affectionné et reconnaissant et ceux, bien plus hauts, du Congrès (Severi 1929, 154).
>
> A current of thought that was different from Cremona's and, through Klein, spread in our country between 1880 and 1990, led projective geometry to be extended to hyperspaces. Giuseppe Veronese and Corrado Segre were the greatest representatives of this trend. Segre in particular, an eclectic spirit, an insuperable *Maestro*, prematurely taken away from our affection and our admiration, foresaw the applications that could be made of hyperspace geometry to the theory of algebraic curves (Castelnuovo 1929, 192).

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[128]Severi (1932, 216): "Pour l'espace projectif on a ainsi une variété remarquable, qui a été découverte par Corrado Segre, mon regretté et éminent maître.".

In the light of this overview, it seems pertinent to affirm that Segre's School only partially succeeded in exploiting (and to a lesser extent with respect to the 'rival' School of Peano) Mathematical Congresses as showcases to build and validate its own identity at an international level, and to give resonance to the Italian *style* in algebraic geometry. It was mainly two elements that prevented the maximum profit from being derived from this strategy: in the first place, the decision of several members of Segre's School not to present papers, or to devote their talks to themes that were not strictly mathematical, but rather historical, philosophical or methodological; in the second place, the fact that Segre himself was not able, and/or did not choose to coordinate the involvement of his disciples in the various Congresses, and often was not informed on the intentions of Castelnuovo, Enriques and Fano.[129] Very effective, by contrast, was the policy of exchanges developed by the Italian geometers within these symposia, a policy that led them to build up a network of long-lasting relationships destined to be maintained until the First World War.

7 Interventionism and Pacifism: Segre's School and the First World War

The web of supranational partnerships shaped by Segre's School underwent an abrupt, though temporary, interruption following the outbreak of the First World War. Even in the months around the Sarajevo assassination, the letters from Castelnuovo and Enriques to their German colleagues document a rich agenda of commitments, regarding both research and teaching. Castelnuovo and Klein, for example, planned to send out a questionnaire of the International Commission on Mathematical Instruction devoted to the training of secondary school teachers; the final report was to be presented by Loria, the Italian delegate, at the 1916 Stockholm International Congress of Mathematicians (Castelnuovo to Klein, 3 March 1914, in Luciano and Roero 2012, 208–209). At the same time, several members of Segre's School, like Castelnuovo, Enriques, Loria and Segre himself, were dealing with the translation and correction of the proofs of their chapters for the *Encyklopädie der mathematische Wissenshaften*, while Klein was already thinking about recruiting yet another Italian, Berzolari, for the essay on transformations and correspondences (Klein to Castelnuovo, 4 March 1915 and Castelnuovo to Klein, 10 March 1915 (Luciano and Roero 2012, 209–213).

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[129]For example (ANL-Castelnuovo, Segre to Castelnuovo, 23 May 1897): "Please *immediately* write to me if you intend to take part in the congress in Zurich (9, 10, 11 August). I intend to. I have received a letter today from Geiser inviting me to give a talk in the Geometry session. I had not thought about it. Before thinking about it I would like to know who is coming of the young Italian geometers: you, Enriques, Fano, … and also if coming you are going to give talks and what on. If you agree, talk to Fano about it, and tell him to write to me immediately." ("Ti prego di scrivermi *subito* se tu hai intenzione di prender parte al congresso di Zurigo (9, 10, 11 Agosto). Io ne avrei intenzione. Ho ricevuto oggi una lettera del Geiser che m'invita a fare qualche comunicazione nella sezione di Geometria. Non avevo ancora pensato a ciò. Prima di pensarvi vorrei sapere chi viene dei giovani geometri italiani: tu, Enriques, Fano, … ed anche se venendo avete comunicazioni da fare e su che cosa. Se credi, parlane a Fano, e digli che mi scriva subito.").

However, even before Italy entered the war, the contacts became increasingly difficult: a part of the Italian mathematical community—and first of all Volterra—took up interventionist stances, while postal censorship hindered the circulation of letters and books. Klein signed the *Aufruf an die Kulturwelt,* denying the war crimes committed by German army in Belgium, and this alienated him from many of his 'distance disciples'.[130]

In this situation, Segre put in place a series of concrete initiatives, to limit the effects of ostracism towards colleagues from the central powers. The pacifist beliefs of the Turin algebraic geometer—which dated back to his youth, though never paraded—led him to keep in touch with his friends Zeuthen and Reye, for example painfully assisting at the epilogue of the life of Reye, who died shortly after, having repaired to Würzburg at his daughter's home:

> On the eve of our entry into war, I received a postcard, dated "Strassburg Els., 18-5-15", approved by the German censorship, which said: *Lieber Freund und College, Bewahren Sie mir Ihre freundschaftlichen Gesinnungen, wie ich die meinigen Ihnen bewahren werde, auch wenn Italien, wie ich fürchte, in den Weltkrieg hineingerissen wird. Herzlich grüsst Sie Ihr. Th. Reye.* This kind act, which touched me and shows the delicacy of feeling of our dear departed colleague, came to my mind when, some days ago, from the President of the Academy I received an invitation to commemorate Theodor Reye (…) whom I began to admire when I was a student, reading his classic *Geometrie der Lage*; and with whom I did not wait for enter into a scientific relationship, and also a personal one. I was able to appreciate not only his value as a mathematician, but also the real goodness of the man: a true gentleman! […] Strasburg being occupied by the French, Reye and his wife in March 1919 were expelled from that city, in which they had lived no less than 47 years, without any respect for their advanced age (Segre 1922, 492–493).

Further, in his quality of national member of the Turin Academy of Sciences, Segre made every possible effort to send the volumes of the academic collections to hostile or neutral countries, as to the Sweden through Mittag-Leffler.[131] Moreover, as the dean of the Turin Faculty of Sciences, in the war years he actively worked for students who were enlisted to help them in catching up on their examinations. He also interceded so that lecturers engaged at the front in research activity of military engineering, meteorology or ballistics would receive the instruments and books necessary for their studies (ANL-Volterra, Segre to Volterra, 13 January 1917). As far as this latter aspect is concerned, Segre insisted that the Special Library of Mathematics should go on receiving German publications, as they were "essential for scientific institutes", despite the customs block on commodities coming from the Central Empires (Giacardi and Roero 1999, 444). Finally, in relation to an extraordinary Agenda, concerning participation in chairs by foreign scholars, voted

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[130]Cf. Klein to Enriques, 13 August 1920 and Enriques to Klein, 18 January 1921 in Luciano and Roero (2012, 214–217).

[131]C. Segre to G. Mittag-Leffler, 27 February 1920, IMLSA, C. Segre n. 8: "Seulement aujourd'hui j'ai pû avoir une réponse à votre question. On m'a dit que le tome 64 des *Memorie* vous a été envoyé en juillet 1914, et le tome 65 en juillet 1916: tous les deux au moyen des échanges internationaux. Maintenant on m'a promis de vous en envoyer un nouvel exemplaire. Après la 1ère Partie du t. 66 nous n'avons plus pû publier les *Memorie*, mais seulement les *Atti*.".

by the Faculties of Letters and Sciences in Rome and by that of Letters and Philosophy in Turin, Segre affirmed, in one of the last meetings held while he was dean:

> Personally [I] do not feel to wholly adhere to the votes formulated in the said Agenda. They are delicate matters, which it is necessary to deal with and decide on serenely, and ones which should not be subjected to deliberations taken irrationally, moved by feeling alone, as happens in some manifestations occasioned by the present war.[132] ("[Segre] personalmente, non si sente di aderire in tutto e per tutto ai voti formulati in detti Ordini del Giorno. Sono questioni gravi, che occorre trattare e decidere con serenità, e alle quali non convengono deliberazioni prese affannosamente, mosse dal solo sentimento, come avviene in talune manifestazioni occasionate dalla guerra presente.").

The ensuing discussion saw many colleagues in the Faculty align with Segre's opinion. In particular, D'Ovidio declared he was "favourable to admitting full Professors of those countries which granted full reciprocity of treatment."[133]

These various actions caused Segre to be branded filo-German, and to be criticised by some foreign and Italian scholars (Mazliak and Tazzioli 2009, 23; Aubin and Goldstein 2014, 189–192).

Actually, his conduct in the war years cannot be easily liquidated, since it took on distinct tones according to the role that he was playing. In this connection, if on one side Segre—as a private citizen—contributed to charity initiatives for ex-combatants and disabled war veterans,[134] on the other side—as a functionary—deemed it right to applaud the heroism of students and colleagues fighting on the battlegrounds.[135] As a scientist, he did not betray the ideals of brotherhood and cosmopolitism, which he had believed in since his youth, when he read the volumes by A. Thiers on the history of the French Revolution,[136] or when he attended the free course on Criticism of socialistic doctrines held by Salvatore Cognetti de Martiis. As a man, Segre always respected the deeds of those co-workers that, faithful to the ideals of the Risorgimento, 'made the nation illustrious with their mind and arms' (Luciano 2013, 307–309, 335–345). Therefore it is not surprising that to his friend Volterra he freely manifested patriotic enthusiasms, even ending letters with the exclamation: "Long live Italy!" (ANL-Volterra, Segre to Volterra, 27 May 1915). Nor does it appear contradictory that Segre acted in favour of A. Terracini and M. Picone[137] so that the young mathematicians could receive the authorizations, the books and the sources

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[132]ASUT, *Verbali del Consiglio della Facoltà di Scienze*, 13 May 1916.

[133]*Ibidem*: "favorevole ad ammettere nelle nostre Università Insegnanti di quelle Nazioni le quali accordino piena reciprocità di trattamento."

[134]Cf. the newspaper *La Stampa*, Turin 1st June 1915: 6; 5 June 1915: 5; 24 July 1915: 5; 7 November 1915: 5; 19 April 1916: 4.

[135]Cf. the praise written by Segre for F. Vercelli, a lecturer at the University of Turin and an officer of the 3rd Army on the Carso, for his *Analisi armonica dei barogrammi e previsione della pressione barometrica*. In that case "collaboration between meteorology and war was really effective, especially in the most serious and decisive impasses." (Segre 1919–20, 20).

[136]Cf. UTo-ACS. *Appunti e Resoconti. Zibaldone di appunti*, fols. 1r–5r, incipit: "È cosa ammessa da tutti che l'umanità progredisce …" and *La Rivoluzione Francese*.

[137]This intervention was entirely spontaneous and not prompted by G. Fubini, or by Picone himself, or by Segre's cousin Roberto, a general in the 5th Artillery Corps.

indispensable to lead their studies on mountain artillery, "to the advantage of our war, which is at the core of our thoughts".[138]

Segre's international relationships and those of his disciples took on a new impulse after the end of the war. He revived his links with Hilbert and Klein, expressing regret at not having been able to participate in their jubilees (Segre to Hilbert, 20 October 1919 and Segre to Klein, 24 February 1921, Luciano and Roero 2012, 213, 218). Further, in the inaugural lecture for the 1919–20 academic year[139] he expressed his feelings with these words full of *pathos*:

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[138]Cf. ANL-Volterra, Segre to Volterra, 13 January 1917: "Dr Picone, as you will read in a sheet that I enclose, resuming the good results that his calculations gave last summer in the raids against the *Alpe di Cosmagnon* and against the *Dente di Pasubio*, was charged with compiling, here, in the winter, new tables for firing in mountains with medium and big calibres, using the facilities that are found in the nearby shooting range at Cirié. This appointment was given with all possible formalities: Supreme Command, Ministry of War, etc. And the work must be completed within the end of March. So at the Cirié shooting range, after many flatteries, Picone: 1st) was warned that for the experiences of rectification and control of the calculations he would have, *for every shot*, to wait for a special ministerial authorization; 2nd) he was even forbidden to consult the old experiences, without a new permit by the Ministry; 3rd) he could not even have books, except with the indirect intervention, in Turin, by General Arlorio. I will say nothing about the fact that he was not even given a draftsman or a calculator! Fubini took an interest in Picone's problems, and also indicated to him some modifications of his method. By the way he found a formula for adjusting the fire, valid in general, to replace the usual correction coefficients, not efficient in firing with large differences in height. (…) Colonel Bianchi from here (a professor of Ballistics, on whom it seems everything that concerns artillery depends) objected to him that this formula was too complicated, and that there was nothing better than a coefficient like Parodi's! (…) In a few words, your work, that of Fubini, etc. is going to sleep. Obstructionism at Cirié, obstructionism in Turin with Colonel Bianchi. They don't want help from those who could give it! And it is our Italy!" ("Il Dr Picone, come leggerai in un foglio che qui ti unisco, in seguito agli ottimi risultati che i suoi calcoli avevano dato l'estate scorsa nelle azioni contro l'*Alpe di Cosmagnon* e contro il Dente del Pasubio, ebbe l'incarico di compilare, qui, nell'inverno, nuove tavole di tiro per il tiro in montagna dei medii e dei grossi calibri, valendosi dei mezzi che si trovano nel vicino poligono di esperienze d'artiglieria di Cirié. Questo incarico è dato con tutte le formalità possibili: Comando supremo, Ministero della Guerra, ecc. E il lavoro deve essere ultimato entro la fine di marzo. Orbene al poligono di Cirié, dopo molti complimenti, il Picone: (1°) fu avvertito che per le esperienze di rettifica e di controllo dei calcoli avrebbe dovuto, *per ogni colpo*, attendere di avere un'apposita autorizzazione ministeriale; (2°) ebbe persino il divieto di consultare le vecchie esperienze, senza una nuova corrispondenza col Ministero; (3°) nemmeno libri poté avere, se non quando ricorse all'intervento indiretto, a Torino, del generale Arlorio. Non parlo poi del fatto che non gli si diede nemmeno un disegnatore o un calcolatore! Fubini s'interessò ai problemi del Picone, e gl'indicò anche qualche modificazione nel metodo. Trovò, fra l'altro, una formola per l'aggiustamento dei tiri, valida in generale, da sostituire ai soliti coefficienti di correzione non validi nei tiri con forti dislivelli. (…) Il colonnello Bianchi di qui (prof. di Balistica, da cui pare dipenda tutto ciò che riguarda l'Artiglieria …) gli obbiettò che era cosa troppo complicata, e che non c'era niente di meglio di un coefficiente come quello del Parodi! (…) In poche parole la cosa tua, quella di Fubini, … tutto si mette a dormire. Ostruzionismo a Cirié, ostruzionismo a Torino col colonnello Bianchi. Non vogliono aiuti da chi potrebbe darli! E si tratta della nostra Italia!"). On Segre's role in this matter cf. also Terracini (1968, 84–88).

[139]Segre devoted particular care to writing this *lectio inauguralis*. After some hesitations on the theme, he several times corrected the manuscript. In this case too the literature quoted was almost all international. Alongside classical texts like *Conférences scientifiques et allocutions* by W. Thomson (Lord Kelvin 1893) and *La valeur de la Science* by H. Poincaré (1905), Segre referred to essays on astronomy by J. Sageret (1913), on meteorology by Moreux (1910) and A. Angot (1916), and on atomic physics, radiochemistry and cosmology by B. Brunhes (1908), S. Arrhenius (1909), F. Soddy (1912), A. Berget (1912) and E. S. Grew (1914).

More than twenty years ago, a work dedicated to the subject of the war that caused a great stir, by the Russian De Bloch, contained these prophetic words: "It is impossible to guarantee that the emperor Wilhelm II, in one of those fits of passion, vibrant with partiality, that he is wont to have, may not be capable of violating a treaty and taking on himself the responsibility … of provoking a war, whose consequences are impossible to predict." Others too foresaw the huge tragedy that was to break out. But humanity has not been able to prevent it. There is a great difference between 'foresee' and 'prevent'! […] And yet, through uncertainties and corrections, Science progresses; it becomes more and more capable of foreseeing; and to its practitioners it appears more and more beautiful. O young people, about to take up new studies, acquire new knowledge, or competences that will serve you in life; and you, who are distant, and to whom our thought always went out in these years, full of love and gratitude, students that have fought gloriously for our great mission, and have won! There, the day has come when humanity, freed of the arrogant, can start works of peace again with greater safety than it ever had. And we will be able in these rooms, without that shadow of remorse that during the war we seemed to feel, to resume all together to cultivate Science: not only that which is applied to bringing material wellbeing to men, but also that other kind of Science whose only aim is the satisfaction of our spirit. And Science will give you—allow me, in concluding, this prevision—the highest, the purest joys! (Segre 1918–19, 11, 24).

It was, however, above all in the context of learned Societies, that Segre continued to be the messenger of convictions and actions of authentic supranational landmark. He did this, for instance, when in 1922 he told Pincherle that he would resign from UMI if ostracism persisted towards mathematicians from Central Empires.[140] Segre's internationalism also shines through the penetrating commemorations of Reye (22 April 1922), Zeuthen,[141] Schwarz and Nöther, who were "glories not only of Germany, but of the whole civilized world".[142] In these he charmingly illustrated to what extent their works had conditioned the evolution of Italian algebraic geometry. Lastly, we shall remember, what Segre wrote to Klein, following the publication of his *Gesammelte Mathematische Abhandlungen*, which he presented at the Accademia dei Lincei together with Castelnuovo and Enriques:

After so many vicissitudes, after so many sorrows, I have always preserved for you the affection and the veneration that I started to profess when I was a university student, when I grew excited reading your geometric works. What a deep influence those readings had on

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[140]Cf. Segre to Pincherle, 19 May 1922, in Nastasi and Tazzioli (2013, 387–390).

[141]Cf. Segre (1919–20, 327–328): "Because of the affection that linked me to him for many years, because of the gratitude that I felt for him because of everything that I have learned from him, I feel the duty to draw your attention, though briefly, to our great loss … Very much devoted to Italian geometers, he was wont to express very flattering judgments on our geometry, also publicly. And he loved Italy: to which (particularly in Turin) he had repeatedly come. It is not one month since he wrote to me saying this; and he joined me in deploring the recent loss of two other illustrious geometers who were his contemporaries: T. Reye and R. Sturm.".

[142]Segre (1921–22b, 161). Speaking of scientific exchanges between the Italian School of Algebraic Geometry and Nöther, Segre annotated (1921–22b, 162, 163): "Nöther's works were then the starting points for Enriques, Castelnuovo and the other geometers, particularly Italian and French, that so brilliantly erected the edifice of present-day Geometry on algebraic surfaces. (…) Nöther's work, as I have already mentioned, had a great influence on the modern development of algebraic geometry in Italy. He admired this development; and he was pleased about his personal relationships with the Italian geometers.".

my ideas at that time! Now, cutting out the pages of this volume, and seeing those papers again, I seem to feel once again the freshness and the limpidity of those impressions. You were my *Maestro*, though we were so distant from one another! (Segre to Klein, 24 February 1921, in Luciano and Roero 2012, 218).[143]

8 Conclusion

Speaking of the flourishing School of Luigi Cremona, in 1930 Castelnuovo stated:

> Now since the School goes beyond the value of the man and the importance of a given discipline, to affect all scientific activity, it is worth saying a few words on the subject. All of you know what difficulties we meet in our Latin countries, which are prevalently individualist, in constituting a scientific School, that is to say a reunion or I would almost say a family of people collaborating in developing and pursuing a well defined project of research. But you also understand what advantages the School brings with itself. In scientific respects it offers the means accelerating and deepening the exploration of a given field, penetrating every facet of it, illuminating it from various perspectives. But the School also brings advantages as regards individuals, since it makes it possible to exploit in the most effective way the various aptitudes, and also to treasure the work of mediocre scholars, who, if guided, can perform useful services, while if they are abandoned to their own devices they tend to encumber science with contributions of little or no value. Now, to create a School the worth of the *Maestro* is not sufficient, nor is it sufficient that he knows how to trace out such a vast plan of researches as to go beyond his own working capacity. It is also necessary that he succeed in communicating his passion and his faith to his disciples and in demanding and directing their collaboration (Castelnuovo 1930, 615).

This description of what it means the membership to a mathematical School, of what advantages and detriments it introduces in the collective work, but above all of what the prerogatives are that a *Maestro* has to have for creating and directing it, is well suited to the case of the team of Italian algebraic geometers.

The question of the pertinence and effectiveness of the interpretative category of 'School' in relation to the group that Segre gathered around himself has already been discussed (Luciano and Roero 2012). However, it was still necessary to explore more closely the extent and the nature of the exchanges that involved the members of Segre's School, according to the recent literature on the topic 'internationality and science' in the *Belle époque*.[144] In light of new archival sources it appears clear that Segre contributed in an essential way to the construction of a specific identity for his School and to the promotion of its image abroad, not only with writings and lectures, but also through other forms of sociability.

The various aspects of twentieth-century internationalism were not, of course, equally present in his scientific activity. If the breadth of Segre's cultural horizons really was supranational, also thanks to his training in a context like the Turinese

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[143]Cf. also Segre to Klein, 2 June 1923, in Luciano and Roero (2012, 219).

[144]Cf. for example Ausejo and Hormigòn (1993), Rasmussen (1995), Bottazzini and Dahan Dalmedico (2001), Dhombres (2004, 81–114), Goldstein et al. (1996), Parshall and Rowe (2002).

one, permeated from the time of the Risorgimento by influences of French and German science, his international vocation was weaker from the publishing point of view. In this sphere his patriotic feelings sometimes ran over, above all in the 20th century, into a policy of almost nationalistic promotion of Italian journals.

Likewise, if it is true that Segre did not reproduce the stereotype of the 'Jew with a suitcase in his hands' (Heims 1980),[145] nonetheless he was capable of developing a strategy of internationalism that was very effective for his School, even in the short term, fully exploiting the dimension of orality, and in particular conversations with his 'distance *Maestri*' and then with his 'distance disciples', during trips, study sojourns and international congresses.

The Short Century may have seen Segre less prolific on the research front. On the other hand, it marked the moment of his greatest commitment to crystallizing the identity of his School, not only in the milieu of Old Europe, but also in that of developing countries, from Americas to Scandinavia and Poland.[146]

From 1890 on, and even more from 1904, Segre would have devoted his best energies and much of his time to drive abroad the Italian *style* in algebraic geometry, recognizing—in the evolution of his School—a shining example of the law of rapprochement highlighted by Klein, according to which:

> The development of mathematical Schools, subject to alternations of progress and decadence in the limits of a nation, is revivified passing from one nation to another, almost making the spirit of the world participate more amply in the common work (Frajese, but Enriques 1938, 181).

Annexes.

1. Corrado Segre to Aurel Voss,[147] [Turin November] 1882
UTo-ACS. *Carteggi, Lettere di Segre* (Gario L3, N. 192, R. 219), f. 1r-v.

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[145]From this point of view Segre was more 'sedentary', compared to both his collaborators Castelnuovo, Enriques and Severi, and colleagues like Peano, Volterra and Levi-Civita.

[146]To have a concrete image of the size of the network of international contacts cultivated by Segre, see his *Address Book* (UTo-ACS. *Documenti di famiglia. Indirizzario*, fols. 13–27) where there are listed the addresses of mathematicians from all over the world.

[147]Aurel E. Voss (1845–1931).

A M^r le Dr A. Voss, professeur de mathématiques Darmstadt.

Monsieur,

Veuillez m'excuser si j'ose vous écrire sans vous être connu, pour vous faire une demande que vous trouverez peut-être indiscrète. Cependant ce n'est pas sans avoir fait tout mon possible pour éviter de vous incommoder que je me résous à vous écrire. J'étudie avec passion cette belle science que vous illustrez, la Géométrie[148]; spécialement les complexes de droites forment aujourd'hui l'objet de mes études. Il me serait donc indispensable non seulement de lire, mais d'approfondir vos mémoires, qui contiennent la résolution de tant de questions importantes et générales de cette théorie si jeune et si belle. Je nomme[149] particulièrement les mémoires publiés dans les tomes VIII, IX et X des «Mathematische Annalen»[150] et[151] spécialement celui du tome IX «Über Complexe und Congruenzen» qui a tant d'importance et qu'en aucune manière je n'ai pu me procurer chez les libraires. Si vous vouliez, Monsieur, m'expédier ces mémoires[152] en m'avertissant de leur prix, ou bien m'écrire par quels moyens je pourrais les acquérir je vous en serais infiniment obligé. Excusez-moi, encore une fois, de mon indiscrétion, mais comme elle est causée par l'amour de la // science, j'espère que vous me compatirez.[153] Quelle que puisse être votre réponse, je vous en remercie auparavant[154] Votre humble serviteur Corrado Segre.

2. Corrado Segre to Aurel Voss, [Turin] 1882

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L4, N. 193, R. 220), fols. 1r-2r.

Monsieur,

J'ai reçu[155] vos mémoires sur la géométrie des espaces de droites[156] en même temps que votre lettre, et je vous en remercie vivement. Vous ne pouvez vous figurer le plaisir qu'elles m'ont fait.[157] Outre la joie[158] d'avoir enfin dans mes mains ces mémoires que j'avais tant désiré, recevoir encore d'un géomètre distingué comme vous une lettre si obligeante comme vous avez écrit, à moi qui ne suis

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[148]In the manuscript Segre erased: "et je me trouve à près présentement j'..".

[149]Here Segre erased: "spécialement".

[150]A. Voss, Zur Theorie der windschiefen Flächen, *Mathematische Annalen* 8 (1875a): 54–135; Über Complexe und Congruenzen, *Mathematische Annalen* 9 (1875b): 55–162; Die Liniengeometrie in ihrer Anwendung auf die Flächen zweiten Grades, *Mathematische Annalen* 10 (1876): 143–188.

[151]Here Segre erased: "particulièrement".

[152]Here Segre erased: "et m'avertir".

[153]Segre erased: "Agreez, monsieur, mes remerciments, qu'elle que puisse être votre réponse".

[154]Segre erased: "en vous saluant".

[155]Segre erased: "vos quatre de".

[156]Cf. Voss (1875a, 1875b, 1876) cit.

[157]Segre erased: "; vous le comprendrez peut-être mieux quand vous serez que je n'ai même pas encore le titre de".

[158]Segre erased: "plaisir".

même pas encore docteur (je[159] suis étudiant de la troisième année à cette université) c'était beaucoup plus que je ne méritais.

Je vous remercie aussi de vos conseils. Dans l'étude que[160] je fais avec passion de la géométrie de la droite, après l'ouvrage[161] de Plücker[162] et les mémoires de Battaglini,[163] de Pasch,[164] etc. je suis passé aux recherches de Mr Klein, en tâchant de bien posséder la méthode de coordonnées si féconde qu'il a développée particulièrement dans les mémoires du tome II des Mathematische Annalen «Über die Theorie der Complexe I und II Grades».[165] Seulement alors j'ai pu[166] commencer à lire vos beaux mémoires sur les complexes d'un degré quelconque. Je vous assure que je tâcherai d'en tirer tout les profits possibles, ne fût-ce que pour gratitude envers vous. Du reste comme pour moi l'étude des mathématiques, et particulièrement de la géométrie, est un grand plaisir et non pas une chose ennuyeuse, je n'y aurai pas beaucoup de mérite.

Vous avez déjà eu tant de bonté que peut-être me permettrez-vous de vous entretenir encore un moment sur une question étrange relative à la théorie des complexes. Monsieur Klein dans le mémoire[167] cité donnait une interprétation géométriques de ses cordonnées de la droite fondée sur les théorèmes qu'il énonçait ainsi: «si dans l'équation (en coordonnées plückeriennes p_{ik}) d'un complexe linéaire l'on substitue[168] les coordonnées d'une droite donnée, on aura une expression qui sera proportionnelle au[169] moment de la droite donnée et de la droite qui lui correspond relativement aux complexe linéaire».[170] Mais[171] en tâchant de prouver ce théorème que j'ai avais aussi trouvé dans la II édition allemande de la géométrie

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[159]Segre erased: "n'étant qu'un".

[160]Segre erased: "j'ai fait, non seulement à l'école mais pour moi-même sur".

[161]Segre erased: "l'etude de".

[162]Julius Plücker (1801–1868). J. Plücker, Théorie générale des surfaces réglées, leur classification et leur construction, *Annali di Matematica* (2) 1 1867, 160–169; *Neue Geometrie des Raumes,* Leipzig: Teubner 1868.

[163]Giuseppe Battaglini (1826–1894). G. Battaglini, Intorno ai sistemi di rette di primo grado, *Giornale di Matematiche* 6 (1868): 24–37; Intorno ai sistemi di rette di secondo grado, *Giornale di Matematiche* 6 (1868): 239–259; 7 (1869): 55.

[164]Moritz Pasch (1843–1930). M. Pasch, Zur Theorie der linearen Complexe, *Journal für reine und angewandte Mathematik* 75 (1873): 106–152.

[165]Felix Klein (1849–1925). F. Klein, Zur Theorie der Liniencomplexe des ersten und zweiten Grades, *Mathematische Annalen* 2 (1870): 198–226, Die allgemeine lineare Transformation der Liniencoordinaten, *Mathematische Annalen* 2 (1870): 366–370.

[166]Segre erased: "lire".

[167]Segre erased: "que j'ai déjà".

[168]Segre erased: "à la place".

[169]Segre erased: "la racine carrée du".

[170]Klein (1870, 366–370) cit. Segre erased: "Ce théorème a été reproduit dans la géométrie de l'espace de Salmon traduite … Fiedler (version allemande)".

[171]Segre erased: "cette année en faisant le calcul, d'ailleurs très simple, pour le vérifier, je".

de l'espace de Salmon-Fiedler[172] il me semblait qu'au lieu de dire «proportionnelle au moment etc.» il fallait dire «proportionnelle *à la racine carrée*[173] du moment etc.»,[174] lorsque dans la III édition de cette géométrie j'eus le plaisir d'y trouver dans une «errata» précisément cette correction[175]: on y dit qu'elle est due à M. Sturm (Crelle's Journal, Bd 86, pag. 138).[176] Cependant après y avoir encore réfléchi et avoir lu ce que dit M. Sturm dans le lieux cité je suis venu à la conclusion que le théorème même ainsi modifié est faux et je vous prie d'écouter mes raisons. Le soupçon de cette fausseté m'était venu en raisonnant ainsi: soit $(cp) = c_{12}p_{34} + \ldots = 0$ un complexe linéaire; le théorème (modifié) dit que (cp) est proportionnel à la racine carrée du moment des droites $p \cdot p$' // qui se correspondent relativement au complexe donné. Mais supposons[177] que $(c \cdot c) = 0$, c'est-à-dire que le complexe soit spécial, alors on sait positivement que (cp) est proportionnel au moment (et non à sa racine carrée) des droites $p \cdot p$' (p' étant en ce cas la droite c) il y aurait donc une exception très singulière au théorème pour ce cas-ci. Mais en examinant un peu la démonstration donnée par M. Sturm, et que moi aussi j'avais cru un moment acceptable, il me parait évident qu'elle est insuffisante. M. Sturm dit ainsi (je ne fais que changer légèrement ses notations): l'on a, comme on sait:

$$p'_{ik} = -\frac{1}{2}(cc)p_{ik} + (cp)c_{ik}.$$

De là on tire par une proposition que j'ai déjà citée, que le moment des deux droites $p \cdot p$' sera proportionnelle à $(pp') = (cp)^2$ d'où l'on conclut le théorème en question. Mais si M. Sturm au lieu d'écrire

$$p'_{ik} = -\frac{1}{2}$$

avait écrit, comme c'est plus juste:

$$pp'_{ik} = -\frac{1}{2}(cc)p_{ik} + c_{ik}(cp),$$

peut-être se serait-il aperçu que ce raisonnement est insuffisante. Car le facteur p qui[178] reste à la fin du calcul, car l'on obtient $p(pp') = (cp)^2$ peut très bien être

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[172]George Salmon (1819–1904, Otto Wilhelm Fiedler (1832–1912). G. Salmon and W. Fiedler, *Analytische Geometrie des Raumes*, 2 Bände, 2 Teil, 2 Aufl., Leipzig: Teubner 1865².

[173]Segre underlined "à la racine carrée".

[174]Segre erased: "Peu de temps après étant"; "Etant pour la dernière édition de la géométrie de Salmon–Fiedler".

[175]G. Salmon and W. Fiedler, *Analytische Geometrie des Raumes*, 3 Aufl., Leipzig: Teubner 1874³.

[176]F.O. Rudolf Sturm (1841–1919). R. Sturm, Darstellung binärer Formen auf der cubischen Raumcurve, *Journal für die reine und angewandte Mathematik* 86 (1879): 116–145.

[177]Segre erased: "pour un moment".

[178]Segre erased: "l'on obtiendra à la fin".

une fonction non seulement des coordonnées c du complexe, mais encore des coordonnées p_{ik} de la droite, pourvu qu'elle soit symétrique en celles-ci. Dès lors, on ne peut plus rien conclure sur le théorème en question.

J'ai même tâché de prouver qu'il est vraiment faux et voici comment. J'ai pris pour coordonnées, non homogènes, d'une droite les rapports p_{ik} des[179] volumes des tétraèdres déterminés par deux sommets i, k du tétraèdre fondamental et deux points de la droite dont la distance soit = 1, au volume V du tétraèdre fondamentale. Alors entre les 6 coordonnées d'une droite passent les *deux* relations caractéristiques:

$$(p \cdot p) = 0, \quad \sum a_{mn,rs} p_{mn} p_{rs} = 1$$

où m, n, et r, s sont des combinaisons binaires de 1234, et où $a_{mn,rs}$ sont des quantités constantes qui dépendent seulement de la forme du tétraèdre fondamental. Cela posé l'on trouve facilement (de la même manière que pour les coordonnées projectives) que la droite p' que coorrespond à p relativement au complexe $(c \cdot p) = 0$ a des coordonnées p'_{ik} telles que:

$$pp'_{ik} = (cc)p_{ik} - 2(cp)c_{ik}$$

où

$$p^2 = 4(cp)^2 \sum a_{mn,rs} c_{mn} c_{rs} - 4(cc)(cp) \sum a_{mn,rs} c_{mn} p_{rs} + (cc)^2.$$

On voit bien ainsi ce qu'est le facteur p. Maintenant comme dans ces cordonnées-ci le moment de deux droites p, p' est précisément égal à $6V(pp')$ l'on aura:

$$\text{mom } (pp') = -12V \frac{(cp)^2}{p}$$

d'où l'on voit que ce moment n'est pas du tout proportionnel à $(cp)^2$, car p est une fonction des c et des p. Lorsque c est un complexe spécial $(cc) = 0$,[180] alors p^2 devient égal à moins d'un facteur indépendant de p (c'est-à-dire $4 \sum a_{mn,rs} c_{mn} c_{rs}$) à $(cp)^2$ et la formule précédente donne que le // moment de p et p' est proportionnelle à (cp), comme cela devrait être. Il parait ainsi qu'en général lorsqu'on fait usage de coordonnées homogènes il serait mieux de préciser un peut plus le sens de la parole «proportionnel».

Pardonnez-moi, Monsieur, cette longue lettre, mais c'était une belle occasion pour moi pour soumettre mes doutes à un savant. Je vous répète encore une fois mes remerciements pour votre bonté et en même temps je vous prie[181] de m'écrire

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[179]Segre erased: "au volume du te".

[180]Segre erased: "c'est-à-dire une droite".

[181]Segre erased: "encore".

encore pour me dire[182] ce que je vous dois pour les mémoires que vous m'avez envoyé,[183] car je désire beaucoup le savoir. Vous avez déjà été trop courtois de me les envoyer sans me connaitre et je[184] ne voudrais absolument pas que vous y perdiez. Même après vous avoir expédié leur prix, ce sera toujours moi qui aurai gagné au charge. Vous me ferez aussi infiniment plaisir en me disant un mot sur ces doutes que je vous ai soumis. Votre très-dévoué Corrado Segre.

3. Corrado Segre to Leopold Kronecker,[185] Turin 16 November 1883

UTo-ACS, *Carteggi, Lettere di Segre* (Gario L16, N. 206, R. 233), fols. 1r-2r

Herr Prof. Leopold Kronecker, Professor der Mathematik an der Universität zu Berlin

Turin, le 16 Novembre 1883

Monsieur,

Sans avoir le plaisir de vous être connu, je prends la permission de vous écrire pour vous demander quelques renseignements sur la théorie des formes bilinéaires, théorie dont je m'occupe depuis quelque temps, spécialement en vue de ses applications géométriques.[186] J'ai tant de confiance dans votre courtoisie que,[187] malgré mon hardiesse, je suis sûr que vous me donnerez ces renseignements.

En 1868 votre savant ami, M. Weierstrass,[188] a donné dans un mémoire des *Monatsberichte* de Berlin un théorème fondamental sur la théorie des formes bilinéaires et quadratiques, c'est-à-dire il a démontré que la condition nécessaire et suffisante pour que deux séries (*Schaaren*, suivant votre expression) de formes quadratiques

$$u\Phi + v\psi, u\Phi' + v\psi'$$

puissent se transformer linéairement l'une dans l'autre, est que les déterminants de

$$u\Phi + v\psi, u\Phi' + v\psi'$$

aient les mêmes diviseurs élémentaires (*Elementartheiler*).[189] Mais M. Weierstrass avait exclu les cas dans lequel ces déterminants sont nuls identiquement. Or dans

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[182]Segre erased: "ce qui vous pensez de mes doutes et pour le prix".

[183]Segre erased: "Il ne serait pas juste que je ne satis".

[184]Segre erased: "je vous en serai reconnaissant même".

[185]Leopold Kronecker (1823–1891).

[186]Segre erased: "Je suis sûr que bien que je soi pour".

[187]Segre erased: "bien que".

[188]Karl Weierstrass (1815–1897).

[189]K. Weierstrass, Zur Theorie der bilinearen und quadratischen Formen, *Monatsberichte der königlichen Preussischen Akademie der Wissenschaften zu Berlin* 18 Mai 1868 (1869): 310–338, in particular 326–326. Cf. also Segre (1883b), (1883–84c).

les remarques que vous, Monsieur, avez fait suivre à ce mémoire,[190] vous considérez précisément les séries pour lesquelles se présente ce fait, et vous avez démontré l'importante proposition qu'une telle série peut toujours être représentée par

$$u\left(f_1 x'_{m+1} + f_2 x'_{m+2} + \cdots + f_m x'_{2m} + F\right) + v\left(\varphi_1 x'_{m+1} + \varphi_2 x'_{m+2} + \cdots + \varphi_m x'_{2m} + \Phi\right)$$

où F et Φ sont des formes quadratiques de

$$x'_{2m+1}, x'_{2m+2}, \ldots x'_{n-1}$$

et de f_i, φ_i sont des formes linéaires de toutes les n variables $x'_0, x'_1, \ldots x'_{n-1}$. Mais ce que je ne trouve pas dans // votre note c'est la condition nécessaire et suffisante pour que deux séries de formes quadratiques de cette espèce particulière puissent se transformer linéairement l'une dans l'autre, c'est-à-dire qu'elles soient *équivalentes*. Il me semble que cette condition doit être la suivante: que la série $uF + v\Phi$ et son analogue (qui sont deux séries pour lesquelles les déterminants ne sont pas nuls identiquement)[191] soient elles-mêmes équivalentes; de manière qu'en appliquant le théorème de M. Weierstrass à ces dernières séries à un nombre moindre de variables on aura précisément la condition cherchée. En d'autres termes on aurait ainsi ce qu'il m'importerait beaucoup d'avoir, c'est-à-dire tous les cas que peut présenter du point de vue de l'algèbre des transformations linéaires une série de formes quadratiques dont le déterminant soit identiquement nul, et par conséquent aussi tous les invariants absolus d'une telle série des formes. Mais comme ce n'est là qu'un résultat que ne suis pas encore réussi à prouver rigoureusement pour tous les cas, je désire vivement de savoir si vous vous êtes déjà occupé de cette question et quels sont les résultats que vous avez obtenus. Peut-être dans le cas contraire pourrez-vous la résoudre avec peu de mots[192] et m'éclairer sur une chose qui m'intéresse beaucoup.[193]

Permettez-moi encore une autre question. Dans un autre mémoire très-importante et très-connu des *Monatsberichte*, *Über die Congruenten Transformationen der bilinearen Formen*[194] vous avez démontrez, Monsieur, que si f et f' sont deux formes bilinéaires conjuguées, dans le déterminant de $uf + vf'$ aura les

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[190]L. Kronecker, Zur Theorie der bilinearen und quadratischen Forme: Bemerkungen (Weierstrass 1868) *Monatsberichte der königlichen Preussischen Akademie der Wissenschaften zu Berlin* 1868 (1869): 339–346.

[191]Segre erased: "puissent se transformer linéairement l'une dans l'autre (c'est-à-dire soient *équivalentes*)".

[192]Segre erased: "cette question qui".

[193]Segre erased hereafter: "mais qui en même temps me présente quelque difficulté".

[194]L. Kronecker, Über die Congruenten Transformationen der bilinearen Formen, *Monatsberichte der königlichen Preussischen Akademie der Wissenschaften zu Berlin* 23 April 1874 (1875): 302, 397–447.

diviseurs élémentaires satisfaisant à la condition d'être deux-à-deux du même degré et correspondants à des valeurs réciproques // de $u : v$, exceptés ceux de la forme $(u + v)^{2x+1}$ et $(u - v)^{2x}$. Or il m'importerait beaucoup, pour mes recherches, de savoir si celles-ci sont les seules conditions auxquelles satisfassent les diviseurs élémentaires du déterminant de $uf + vf'$, c'est-à-dire si réciproquement, étant donné un système de diviseurs élémentaires satisfaisant à ces conditions, on peut trouver deux formes conjuguées f, f' telles que le déterminant de $uf + vf'$ ait précisément ces diviseurs élémentaires.

J'aurais quelques raisons pour en douter, mais je ne suis pas encore assez fort analyste pour trouver les autres conditions, s'il y en a. En conséquence je vous prie,[195] Monsieur, de me dire si vous avez étudié cette autre question, qui me semble très-intéressante, et quels sont les résultats auxquels vous êtes parvenu. Et s'il arrive que vous ne vous en soyez pas encore occupé et que ma lettre vous y fasse penser, je serai doublement content de l'avoir écrite, car non seulement moi, mais aussi la science y aura gagné.

En vous demandant encore excuse pour la liberté que je me suis prise, et en attendant avec impatience votre réponse pour laquelle je vous remercie déjà, je me déclare, Monsieur, avec la plus grande estime Votre très-dévoué Dr Corrado Segre (presso la R. Università di Torino, Italia).

4. Corrado Segre to Leopold Kronecker, Turin 10 December 1883

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L17, N. 207, R. 234), fols. 1r-2v.

Herr Professor Dr. L. Kronecker, Berlin W. Bellevuestrasse 13

Turin, le 10 Décembre 1883

Monsieur,

Je vous remercie vivement soit pour les explications que vous avez bien voulu me donner sur les deux questions que je vous avais faites, soit pour le cadeau, que vous avez eu la bonté de me faire de votre mémoire *Über die congruenten Transformationen der bilinearen Formen*,[196] que je conserverai précieusement. J'ai retardé à vous écrire pour étudier vos mémoires de Janvier, Février et Mars 1874,[197] mémoires que je ne connaissais pas encore, et qui, avec les nouveaux détails contenus dans votre lettre et dans votre carte postale, m'ont parfaitement éclairé sur la question fondamentale des conditions pour l'équivalence de deux faisceaux quelconques de formes quadratiques. J'étais arrivé par mes propres recherches à un système d'invariants d'un tel faisceau, mais je n'avais pas encore vu l'importance de cet autre système d'invariants que vous avez introduit: les degrés des équations

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[195]Segre erased: "encore".

[196]Kronecker (1874) cit. The letter by Kronecker to Segre is lost.

[197]L. Kronecker, Über Schaaren von quadratischen Formen, *Monatsberichte der königlichen Preussischen Akademie der Wissenschaften zu Berlin* 19 Januar 1874 (1875): 59–76, 16 Februar 1874 (1875): 149–156, 16 Marz 1874 (1875): 206–232.

qui lient les dérivées partielles de[198] la forme[199] générale du faisceau. Je préfère, à vous dire le vrai,[200] cette dernière méthode que vous avez adoptée pour exprimer l'équivalence de deux faisceaux, ou le système complet des invariants d'un faisceau donné (c'est-à-dire la méthode dont vous avez fait usage, à ce que vous me dites, dans votre cours de l'été 1882), à celle qui faisait usage de // la considération des faisceaux élémentaires. Je sais bien qu'au fond les résultats sont les mêmes, mais j'aime à éviter l'usage des formes particulières[201] c'est-à-dire des formes *canoniques* pour l'étude de formes générales. Si parfois on ne possède pas une analyse si puissante qu'on puisse éviter tout-à-fait ces[202] formes canoniques dans une[203] recherche, il faut du moins qu'elles ne paraissent plus dans les résultats. En me rappelant ce que vous avez écrit à propos des recherches sur les formes bilinéaires de M. Jordan,[204] je crois que vous pensez aussi comme moi.

Et à ce propos je ne sais si vous avez remarqué[205] que la plus grande partie des écrivains paraissent au contraire s'occuper plutôt des[206] formes canoniques que de la condition générale d'équivalence établie par le moyen du système complet des invariants. Dans ma thèse pour le doctorat (qui paraîtra bientôt dans les mémoires de l'Académie de Turin)[207] je me suis occupé précisément, entre autres choses, de l'interprétation géométrique du théorème de M. Weierstrass sur le système des invariants d'un faisceau des formes quadratiques dont le déterminant ne soit pas identiquement nul (le cas d'un faisceau de formes bilinéaires est traité dans un mémoire présenté à la R. Académie des Lincei),[208] et j'ai remarqué précisément que plusieurs géomètres ayant voulu appliquer ces recherches à différents sujets de géométrie (et on peut en faire effectivement des applications géométriques très-s-importantes) avaient toujours fait usage, non pas de ces théorèmes mêmes, mais des équations canoniques dont M. Weierstrass[209] s'était servi pour établir son théorème, mais qui n'ont certainement pas l'importance (ni analytique ni géométrique) de[210] celui-ci: de cette manière on était contraint à changer la forme des équations quadratiques pour chaque système de degrés des diviseurs élémentaires! Maintenant, // à la suite de votre lettre je m'occupe de l'interprétation géométrique

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[198]Segre erased: "une".

[199]Segre erased: "quelconque".

[200]Segre erased: "la mani…".

[201]Segre erased: "d'équations".

[202]Segre erased: "équations".

[203]Segre erased: "démonstration".

[204]Camille Jordan (1838–1922). C. Jordan, Mémoire sur les substitutions *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences Paris* 22 Décembre 1873, 66 (1873): 952–954; Kronecker (1874) cit.: 71–76.

[205]Segre erased: "que la majorité".

[206]Segre erased: "équations".

[207]Segre (1883–84d).

[208]Segre (1883–84c).

[209]Segre erased: "avait cherché".

[210]Segre erased: "qui est bien étrange".

de vos résultats sur les faisceaux dont le déterminant est nul (avec les subdeterminants d'un certain ordre). La considération d'un espace (*Mannigfaltigkeit*) linéaire à $n - 1$ dimensions permet de représenter par un point chaque système de valeurs de n variables x_i, de sorte qu'un faisceau de formes quadratiques $u\Phi + v\Psi$ est représenté par un faisceau de surfaces du 2e ordre. Si le déterminant de toutes ces formes est nul, ces surfaces sont toutes des cônes. Quel est le lieu des sommets de ces cônes? Supposons qu'entre les dérivées partielles de $u\Phi + v\Psi$ passe une seule équation linéaire, dont le degré par rapport à u, v soit m, alors le lieu des sommets des cônes du faisceau est une courbe (*Normalcurve*) de l'ordre m, qui est contenue dans un espace linéaire à m dimensions. C'est ainsi que dans l'espace ordinaire à 3 dimensions il y a deux espèces des faisceaux de cônes; les faisceaux de cônes ayant le même sommet ($m = 0$) et les faisceaux dans lesquels les sommets ont pour lieu une droite ($m = 1$); dans l'espace à 4 dimensions il y a encore, outre ces deux espèces de faisceaux une espèce composée de faisceaux dont les sommets des cônes forment une conique ($m = 2$), etc., etc.. Cette interprétation géométrique du degré m de la relation, qui lie les dérivées de $u\Phi + v\Psi$ me parait remarquable. S'il y a plusieurs relations entre ces dérivées, c'est-à-dire si les surfaces du 2e ordre du faisceau ont, non pas seulement un point, mais une droite, un plan, etc. … double, alors les degrés en u, v de ces relations dépendent des degrés des lieux géométriques de ces espaces doubles; mais je n'ai pas encore fini ces recherches. Lorsqu'je l'aurai finies et complétées j'en ferai une note *Sur les faisceaux de cônes quadriques*, que je vous demanderai la permission de vous envoyer, pour qu'il // soit publié dans votre *Journal für Mathematik*.[211]

En attendant, je vous remercie encore, Monsieur, de votre courtoisie envers moi, et vous envoie mes salutations les plus respectueuses. Votre très-dévoué Corrado Segre.

5. Corrado Segre to Leopold Kronecker, Turin 25 December 1883

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L18, N. 208, R. 235), fols. 1r-2v

Herr Prof. D^r. L. Kronecker, Berlin W. Bellevuestrasse 13

Turin, le 25 Décembre 1883

Monsieur

Vous me ferez beaucoup de plaisir en continuant à m'écrire dans votre langue maternelle, que je comprends parfaitement. Mais permettez-moi de ne pas vous écrire en italien, car comme cette langue vous est probablement moins familière que

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[211]This paper was published in Segre (1883–84d). In the manuscript of this letter Segre erased here: "Quant à la deuxième demande que je vous avais faite, j'attendrai impatiemment que vous poussiez vous en occuper. Il me semble que la question si les particularités que vous avez trouvées pour le système des invariants d'un système de deux formes conjuguées (*f*, *f*') sont les seules qu' il présente, c'est-à-dire si étant donné un tel système l'invariant on puisse trouver les formes correspondantes *f*, *f*', ne peut-être résolue qu'avec difficulté en composant additivement ces formes par l'addition des formes élémentaires qui correspondent à ces invariants.".

la langue française, mes lettres pourraient vous fatiguer et je crains qu'elles ne vous ennuient déjà que trop.[212] A peine avais-je fini d'écrire ma dernière lettre,[213] je pensai que[214] peut-être j'avais fait confusion en considérant vos faisceaux élémentaires de formes quadratiques comme n'ayant autre importance que celle des formes canoniques et votre lettre[215] m'a montré qu' effectivement il n'y a pas de relation nécessaire entre l'une chose et l'autre, c'est-à-dire que l'on peut, il est vrai, donner aux faisceaux élémentaires des représentations[216] simples ou *canoniques*, mais que[217] l'idée des faisceaux est indépendante de ces représentations particulières.

J'ai vu aussi par votre lettre que je ne m'étais pas expliqué clairement à propos de l'interprétation géométrique de vos recherches et de celles de M. Weierstrass sur la théorie des formes bilinéaires et quadratiques. Peut-être ne devrais-je pas dire «interprétation géométrique», car[218] ces mots font penser (et vous ont fait penser à ce que je vois) à un travail qui consiste[219] seulement dans des changements de mots[220] or je considérais comme // ridicule un savant qui ne s'occupât que de changer les mots analytiques en mots géométriques dans des résultats analytiques déjà connus. Mais ce n'est pas là ce que j'entendais dire dans ma dernière lettre.[221] Pour m'expliquer avec plus de clarté, prenons les théorèmes[222] sur les conditions afin que deux formes quadratiques puissent se transformer dans deux autres formes quadratiques. En mettant des mots géométriques, on peut dire que ces théorèmes donnent les conditions pour que deux couples de surfaces du 2e degré (dans un espace à n dimensions) soient identiques du point de vue de la géométrie projective. Mais ces conditions restent analytiques, car il y entre des diviseurs élémentaires, etc.; quelle est donc, par exemple, la signification géométrique des diviseurs élémentaires? Si à un couple des surfaces de 2e degré correspond une racine double, triple, etc. du déterminant de leur faisceau,[223] ces deux surfaces se toucheront mutuellement en un ou plusieurs points, mais quelle différence y aurait-il entre ces contacts suivant les divers degrés des diviseurs élémentaires, c'est-à-dire quelles *singularités* aura l'intersection de ces deux surfaces pour un système donné de diviseurs élémentaires? Voilà l'une des questions que j'ai tâché de résoudre et qui n'a pas laissé de me présenter au premier abord des difficultés. C'est ainsi que j'ai pu établir une *classification* géométrique des intersections de deux surfaces du 2^e

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[212]Segre erased: "mais comme je n'ose … Il n'y a que quelques mois que j'ai cessé d'être étudiant pour devenir professeur, mais je sens encore".

[213]Segre to Kronecker, 10 December 1883, Annex 4.

[214]Segre erased: "probablement".

[215]Segre erased: "me confirme dans cette". This letter by Kronecker to Segre is lost.

[216]Segre erased: "plus".

[217]Segre erased: "la concept".

[218]Segre erased: "cela".

[219]Segre erased: "uniquement".

[220]Segre erased: ", qui d".

[221]Segre refers to his letter to Kronecker, Annex 4. Then Segre erased: "Pour m'expliq".

[222]Segre erased: "de M. Weierstrass et de vous".

[223]Segre erased: "on sait".

degré. De même les résultats analytiques sur les formes bilinéaires m'ont donné par une étude géométrique la classification des *homographies* ou *collinéations* dans un espace linéaire quelconque.

Et votre théorème que "la condition afin qu'une forme bilinéaire *f* puisse être transformée dans une autre f par une substitution congruente est que les deux formes conjuguées *f*, *f'* puissent se transformer dans les deux autres formes conjuguées // *f*, *f'*" me donnerai la classification des *corrélations* ou *correspondances dualistiques*. Mais je vous le répète et j'espère vous en convaincre à peine mes travaux seront imprimés, ce n'est pas un simple changement de mots qui donne ces résultats géométriques mais bien une suite de raisonnements plus ou moins difficiles.

J'ai vu avec plaisir soit par votre lettre soit par quelques travaux où vous parlez de géométrie à *n* dimensions, que vous n'êtes pas de ces savants (et il y en a beaucoup) qui n'attachent d'importance à cette science qu'on ce qu'elle peut s'appliquer à l'espace ordinaire: la géométrie à *n* dimensions (comme toutes les branches des mathématiques, si abstraites qu'elles soient) a le droit d'être étudiée en dehors de ses applications. Cependant lorsqu'on peut en faire des applications à l'espace ordinaire il est bon de les faire: or[224] on ne peut se figurer combien d'applications on peut faire de la classification géométrique de l'intersection de deux surfaces du 2e degré à plusieurs dimensions. Toute la classification des complexes de droites du 2e degré et celle des congruences du 2e degré (et en conséquence aussi des surfaces de Kummer[225] à 16 nœuds) en découlent immédiatement; la classification des surfaces du 3e ordre, celle des surfaces du 4e ordre à conique double,[226] puis aussi (comme je m'en suis aperçu seulement[227] il j a deux ou trois jours) la classification des surfaces du 4e ordre ayant au moins deux points doubles et un point uniplanaire ou bien une droite double. Cette méthode donne lieu à des rapprochements curieux entre ces différentes surfaces, qui viennent à être représentées les unes sur les autres d'une manière fort intéressante.

Est-ce-que vous, Monsieur, n'avez jamais abordé le problème sur la condition pour l'équivalence de deux systèmes de plus que deux formes quadratiques de 3, de 4, de *r* formes quadratiques? Vous me faisiez plaisir en faisant aussi la même demande à M. Weierstrass: il me semble improbable que ni vous ni votre amis n'y ayez pas pensé et ne l'ayez pas résolue. Probablement // c'est encore la con- sidération du déterminant de

$$\lambda\varphi + \mu\psi + \nu\chi + \cdots$$

et des[228] diviseurs communs à ses subdéterminants qui donnera tous les invariants du système des formes φ, ψ, χ, … Et est-ce-que vous n'avez pas pensé à étendre cette même méthode au cas de plusieurs formes d'un même degré quelconque en

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[224]Segre erased: "vous ne pouvez vous".

[225]Segre erased: "du 4e ordre".

[226]Segre erased: "et des surfaces du 3e ordre".

[227]Segre erased: "hier".

[228]Segre erased: "plus".

considérant encore le *discriminant* de leur série et les invariants ou covariants qui en s'annulant indiquent que la forme a plusieurs points singuliers? Je suis bien indiscret en vous faisant toutes ces demandes, mais vous avez répondu si obligeamment aux premières que je vous ai faites que je me sens entrainé à vous en faire des autres. Le système des invariants de deux formes quadratiques est établi d'une manière satisfaisante par les recherches de M. Weierstrass et de vous, qu'il me semble très-désirable d'étendre la même méthode à des cas plus généraux.

Quant à la note dont je vous avais parlé sur les faisceaux de surfaces du 2e degré à points singuliers (ou cônes) je ne l'ai pas encore écrite,[229] et si mes recherches ne me conduiront pas à en faire travail assez bon je ne vous l'enverrai certainement pas, car je connais trop bien le respect que l'on doit à votre journal, à l'ancien *Journal de Crelle*. Cependant, même dans ce cas, je vous remercie de l'avoir acceptée.[230] Et je vous remercie aussi de la bonté avec laquelle vous voulez bien répondre à mes lettres. Je suis jeun, et j'ai beaucoup de besoin et d'envie d'apprendre: je suis donc bien reconnaissant aux savants qui veulent pour quelques moments être mes maîtres.

Croyez-moi Votre très-dévoué Corrado Segre.

6. Corrado Segre to Oscar Schlömilch,[231] Turin 17 January 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L14, N. 204, R. 231), f. 1r-v.

Herr Prof. Dr Oscar Schlömilch, professor der Mathematik Kgl. Sächs. Geh. Schulrath Leipzig

Turin, le 17 Janvier 1884

Monsieur,

je vous envoie avec cette lettre en un pli chargé une note *Sur les droites qui ont des moments donnés par rapport à des droites fixes*, que je vous prie de publier dans votre *Zeitschrift für Mathematik und Physik*.[232] Dans cette note je m'occupe surtout du complexe des droites qui ont un moment donné par rapport à une droite fixe, complexe quadratique très-remarquable dont la surface singulière se décompose en un cylindre droit et dans le cercle imaginaire à l'infini. Dans la 1e partie[233] j'étudie élémentairement et par voie synthétique ce complexe; dans la 2e je me sers des coordonnées pour en trouver d'autres propriétés, qui regardent surtout la *série homofocale* de ce complexe, série qui se compose de complexes quadratiques

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[229]He is referring to the paper mentioned in his letter to Kronecker, 10 December 1883, Annex 4.

[230]Segre erased: "sans reserves".

[231]Oscar Schlömilch (1823–1901).

[232]This article by Segre was published in the *Journal für die reine und angewandte Mathematik* 97 (1884): 95–110. Segre (1884c).

[233]Segre erased: " de ma note".

généraux de la classe [(22)11] de M. Weiler,[234] et de ces complexes je trouve ainsi une définition géométrique remarquable. Enfin dans la 3e partie je m'occupe brièvement de la congruence, de la surface réglée et du groupe de droites qui ont des moments donnés par rapport resp. à 2, 3, 4, droites fixes.

Dans un mémoire qui va paraitre dans le 2ième cahier du nouveau volume des *Mathematische Annalen*, je me suis occupé (avec mon ami Dr Loria) // de trouver tous les complexes quadratiques qui peuvent s'obtenir comme complexes des droites coupant harmoniquement des surfaces du second ordre.[235] Le complexe des droites qui ont moment donné par rapport à une droite fixe appartient aussi à cette catégorie: je l'ai simplement affirmé dans ce mémoire, et je le prouve dans la note que je vous envoie. C'est pour cela que je désirais que celle-ci fut publiée le plus tôt possible. Vous m'obligeriez infiniment en lui donnant un peu de place dans le prochain cahier de votre *Zeitschrift*. Mais si cela ne vous est pas possible, je ne vous serai pas moins reconnaissant pour la publication. Agréez, Monsieur le Professeur, mes salutations les plus respectueuses. Votre Dr Corrado Segre.

7. Corrado Segre to Oscar Schlömilch, Turin 8 February 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L15, N. 205, R. 232) postcard.

Turin, le 8 Février 1884

Monsieur le Professeur

Je reçois votre lettre,[236] dont je vous remercie: j'espère que vous serez tout-à-fait guéri de votre maladie. Lorsque j'avais écrit ma note en français, plutôt qu'en italien, je n'avais pas réfléchi à ce que vous me faites justement remarquer, c'est-à-dire que dans votre *Zeitschrift* n'ont jamais paru que des travaux écrits en allemand. Aussi je regret de vous avoir incommodé en vous envoyant mon manuscrit: le faire traduire en allemand vous coûterait aussi plus de peine que le mémoire ne vaille. J'accepte donc volontiers l'offre que vous me faites de le renvoyer aux *Mathematische Annalen*, et je vous remercie de la bonté que vous avez de vous charger vous-même de cet envoi.[237] J'écris tout-de-suite à M. Klein, avec lequel j'ai aussi le plaisir d'être en relation, pour l'en aviser.[238]

En attendant recevez encore, Monsieur, mes remercîments et mes salutations les plus cordiales et respectueuses. Votre très-dévoué Dr Corrado Segre.

PS. Je prends la permission de vous envoyer une copie d'un travail qu'est paru il y a quelques jours dans le *Giornale*.[239]

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[234]Adolf Weiler (1851–1916).

[235]Segre (1883a).

[236]This letter is lost.

[237]Segre (1884c) was published in *Journal für die reine und angewandte Mathematik*.

[238]Cf. Segre to F. Klein, 8 February 1884, in Luciano and Roero (2012, 104–105).

[239]Segre (1883d).

8. Corrado Segre to Leopold Kronecker, Turin 18 February 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L19, N. 209, R. 236), postcard.

Herr Prof. L. Kronecker, Berlin W. Bellevuestr. 13

Turin, le 18 Février 1884

Monsieur,

Je prends la permission de vous envoyer en un pli chargé un manuscrit d'une note que je désirerais voir imprimée dans votre *Journal für Mathematik*. Cette note regarde la géométrie de la droite: j'y étudie d'une façon assez élémentaire quelques complexes quadratiques dont les propriétés me semblent assez remarquables pour mériter d'être étudiées à part.[240] Bien que ce travail puisse se rattacher à un autre imprimé dans les *Mathematische Annalen*[241] (dont[242] j'espère que vous aurez reçu une copie), cependant j'ai fait en manière[243] qu'il se suffit à lui-même de sorte qu'il n'est pas besoin d'avoir lu l'autre pour le comprendre.

Je vous remercie en avance de la publication et en attendant votre réponse[244] (dans laquelle j'espère trouver les explications sur la théorie des formes bilinéaires que je vous avais demandées dans ma dernière lettre,[245] et que sans doute vos occupations vous[246] ont empêché jusqu'à-présent de me donner), croyez-moi Votre très-dévoué Dr Corrado Segre.

9. Corrado Segre to Gaston Darboux,[247] Turin 11 March 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L12, N. 202, R. 229), f. 1r.

A M. le prof. G. Darboux—Paris

Turin, le 11 Mars 1884

Monsieur,

Je vous envoie deux copies d'une note sur les géométries métriques des complexes linéaires et des sphères[248] qui, j'espère, ne vous déplaira pas tout-à-fait, car elle se lie à des recherches que vous avez fait autrefois, et elle montre (du moins si je dois croire ce que m'en écrit ce juge si compétent qu'est M. Klein) des analogies

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[240]Segre (1884c).

[241]Segre (1884b).

[242]Segre erased: "j'espère vous aurez … me suis empressé à vous faire hommage d'une copie".

[243]Segre erased: "que ce petit travail".

[244]Segre erased: "j'attends encore avec impatience".

[245]Segre to Kronecker, 25 December 1883, Annex 5.

[246]Segre erased: "empêchent de me donner. En vous remerciant par anticipation des deux faveurs croyez-moi".

[247]Gaston Darboux (1842–1917).

[248]Segre (1883–84a).

très-intéressantes entre ces deux géométries métriques. Comme M. G. Koenigs,[249] qui a été votre élève, s'est aussi occupé de ces analogies, et comme je ne connais pas son adresse, je vous prie de vouloir lui faire parvenir une de ces deux copies de ma note, si cela ne vous incommode pas trop. Excusez-moi mon hardiesse et recevez mes remercîments et mes respects. Votre Dr C. Segre.

10. Corrado Segre to Arthur Cayley,[250] Turin 15 March 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L11, N. 200, R. 227), f. 1r.

Mr. Arthur Cayley, F. R. S., Sadlerian Professor of Mathematics in the University of Cambridge

Turin, le 15 Mars 1884

Monsieur,

je vous envoie une copie d'une note sur les géométries métriques des complexes linéaires et des sphères,[251] en souhaitant que vous vous daigniez-y jeter un regard, car les analogies que j'y découvre entre ces deux géométries métriques (par des méthodes qui vous sont dues en partie) me paraissent fort remarquables. Agréez mes salutations les plus respectueuses Dr Corrado Segre.

11. Corrado Segre to Carl Friedrich Geiser,[252] Turin 23 March 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L9, N. 198, R. 225), f. 1r

Herr Dr C.F. Geiser. Docent am Polytechnikum Zürich

Turin, le 23 Mars 1884

Monsieur,

Je vous envoie une copie d'un travail sur les géométries métriques des complexes linéaires et des sphères, qui j'ai fait paraitre en ces jours-ci.[253] Si vous pourrez y jeter un regard, vous me ferez plaisir en m'en faisant la critique.

Je vous demanderai encore un autre plaisir: en lisant votre mémoire *Über die Flächen vierten Grades, welche eine Doppelcurve zweiten Grades haben* (Crelle 70)[254] je y vois cité une note *Über eine geometrische Verwandtschaft des zweiten*

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[249]Gabriel Koenigs (1858–1931).

[250]Arthur Cayley (1821–1895).

[251]Segre (1883–84a).

[252]Carl Friedrich Geiser (1843–1934).

[253]Segre (1883–84a).

[254]C. Geiser, Über die Flächen vierten Grades, welche eine Doppelcurve zweiten Grades haben, *Journal für die reine und angewandte Mathematik* 70 (1869): 249–257.

Grades (*Mittheil. der Berner naturforsch. Gesellsch.* 1865),[255] qui traite de l'inversion de l'espace par rapport à une quadrique. Serais-je indiscret en vous priant de m'envoyer une copie de cette dernière note, ou bien de me donner des détails sur ce qu'elle contient? Je dois envoyer dans quelques semaines aux *Mathematische Annalen* un travail sur les surfaces du 4e ordre à conique double ou cuspidale dans lequel je fais usage de ces inversions[256] (et de plusieurs de leurs cas particuliers) et j'aurais besoin de connaitre tout ce qui a été écrit là-dessus.

Excusez-moi mon hardiesse et agréez mes remercîments et mes salutations Dr Corrado Segre.

12. Corrado Segre to Thomas a. Hirst,[257] Turin 23 March 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L8, N. 197, R. 224), f. 1r.

Prof. Thomas Archer Hirst, F. R. S. Professor of Mathematics in the University of London

Turin, le 23 Mars 1884

Monsieur,

Dans un très long travail que j'écris en ce jours-ci pour les *Mathematische Annalen* j'ai besoin[258] d'appliquer la théorie des inversions de l'espace par rapport à une quadrique (générale ou décomposée en un cône ou en un couple de plans).[259] Permettez que je vous demande si vous avez développé cette théorie quelque part car dans ce cas je pourrais me borner à une citation sans développer moi-même cet argument. Je connais seulement votre mémoire sur les inversions du plan par rapport à une conique (*Proceedings*, Mars 1865),[260] mais il me semble probable que vous vous soyez aussi occupé de l'inversion dans l'espace, laquelle présente encore plus d'intérêt. M. Geiser[261] s'en est occupé en 1865 et je lui écris en ce moment-même pour lui demander des détails sur ses résultats.[262]

Permettez encore que je profite de cette occasion pour rappeler votre attention sur[263] le contenu de quelques travaux que j'ai eu l'honneur de vous envoyer dernièrement et surtout sur l'un d'eux qui montre les liens étroits qu'il y a entre la

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[255]C. Geiser, Über eine geometrische Verwandtschaft des zweiten Grades, *Mittheilungen der Berner naturforschenden Gesellschaft* 22 April 1865, Nr. 592 (1866): 97–107.

[256]Segre (1884e).

[257]Thomas Archer Hirst (1830–1892).

[258]Segre erased: "de considérer".

[259]Segre (1884e).

[260]T.A. Hirst, On the Quadric Inversion of Plane Curves, *Proceedings of the Royal Society of London* 14 (1865): 91–106.

[261]Segre erased: "en a dit quelques mots dans un mémoire du".

[262]Segre to Geiser, 23 March 1884, Annex 11.

[263]Segre erased: "quelques".

géométrie métrique des complexes linéaires et celle des sphères, liens qui n'avaient pas encore été aperçus.[264]

Agréez,[265] Monsieur le Professeur, mes remercîments anticipés et mes salutations les plus respectueuses. Dr Corrado Segre.

13. Corrado Segre to Karl Weierstrass, Turin 28 March 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L10, N. 199, R. 226), f. 1r-v.

Herr Prof. Weierstrass Berlin

Turin, le 28 Mars 1884

Monsieur,

J'ai l'honneur de vous envoyer une copie d'un mémoire, dont une partie au moins vous est due,[266] car elle contient des recherches sur la signification géométrique d'un théorème analytique sur la théorie des formes bilinéaires qui est à vous.[267] Je parle du théorème fondamental pour cette théorie: «la condition nécessaire et suffisante pour que deux couples de formes bilinéaires puissent se transformer linéairement l'une dans l'autre est que les déterminants de leurs faisceaux aient les mêmes diviseurs élémentaires».[268] A vrai dire dans ce mémoire et dans un autre qui le suivra bientôt je n'ai appliqué à la géométrie que la partie de ce théorème qui regarde les formes quadratiques,[269] mais dans un mémoire que j'ai envoyé à l'Académie des Lincei j'ai aussi étudié le cas de formes bilinéaires quelconques.[270] Est-ce que vous n'avez jamais pensé à étendre votre méthode et votre théorème[271] en considérant, au lieu de deux, plusieurs formes quadratiques,[272] ou même en considérant au lieu de deux formes quadratiques[273] plusieurs formes de degrés quelconques (auquel cas on pourrait substituer au déterminant et à ses subdéterminants le *discriminant* et certaines autres fonctions[274] qui en s'annulant indiquent que la forme a plusieurs points singuliers)? On résoudrait avec cela[275] les principaux problèmes de la théorie des invariants des formes: et je comprends que par cette raison même l'extension dont je parle doit présenter des difficultés;

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[264]Segre (1883–84a).

[265]Segre erased: "recevez".

[266]Segre (1883b).

[267]Segre erased: "vous est dû".

[268]Segre (1883b, 59; *Opere* 3, 29).

[269]Segre (1883c).

[270]The mentioned reference is Segre (1883–84c). In the manuscript Segre erased: "je vous prie de saluer M. Kronecker".

[271]Segre erased: "soit".

[272]Segre erased: "soit".

[273]Segre erased: "deux".

[274]Segre erased: "des coefficients".

[275]Segre erased: "tous".

cependant[276] s'il est possible de résoudre ces problèmes généraux par quelque méthode, il me semble que ce doit être par la vôtre convenablement étendue. // M. Kronecker,[277] avec lequel je suis entré en relation précisément à propos de la théorie des formes bilinéaires, mais j'ignore s'il vous en a parlé. Agréez, Monsieur, mes salutations respectueuses Votre dévoué Dr Corrado Segre.

14. Corrado Segre to Arthur Cayley, Turin 14 May 1884

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L13, N. 203, R. 230), f. 1r-v.

Mr Arthur Cayley Cambridge

Turin, le 14 Mai 1884

Monsieur,

en feuilletant le tome 50 du *Journal de Crelle* j'y trouve avec surprise à la pag. 317 dans votre note de 1854 *Recherches sur les Matrices dont les termes sont des fonctions linéaires d'une indéterminée* (pag. 313–317) une idée importante et[278] dont je ne pensais pas qu'elle fût connue depuis si longtemps: c'est-à-dire,[279] que toute la théorie et la classification des homographies[280] se rattachent aux propriétés d'une[281] matrice, ou,[282] comme l'on dit d'après Weierstrass, aux *diviseurs élémentaires* d'un certain déterminant.[283] Vous comprendrez tout l'intérêt que je porte à cette matière lorsque je vous dirai que j'ai justement étudié (dans l'automne passé) cette théorie et cette classification des homographies (dans un espace à n dimensions) par la méthode que vous indiquez dans un mémoire qui paraitra dans les Atti de la R. Académie des Lincei[284] et dont vous pourrez voir dans les derniers *Transunti* de cette Académie le résumé contenu dans la relation[285] qu'en a fait M. Cremona.$^{(1)}$

Dans la[286] page, dont je vous parlais je vois clairement que vous aviez déjà il y a trente années une idée[287] complète de cette théorie (il faudrait seulement corriger en disant que dans votre symbolique on a pour l'homologie[288] le symbole 2   1 et non

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[276]Segre erased: "le caractère de votre méthode".

[277]Segre to Kronecker, 16 November 1883, 10 December 1883, 25 December 1883, Annexes 3–5.

[278]Segre erased: "que".

[279]Segre erased: "l'idée".

[280]Segre erased: "dépenden".

[281]Segre erased: "des diviseurs".

[282]Segre erased: "c'est-à-dire".

[283]A. Cayley, Recherches sur les Matrices dont les termes sont des fonctions linéaires d'une seule indéterminée, *Journal für die reine und angewandte Mathematik* 50 (1855): 313–317.

[284]Segre (1883–84c).

[285]L. Cremona and F. Siacci, Relazione sulla Memoria di C. Segre, Sulla teoria e sulla classificazione delle omografie in uno spazio lineare ad un numero qualunque di dimensioni, *Atti della R. Accademia Nazionale dei Lincei Transunti* (3) 281 1883–84 (1884): 212–214.

[286]Segre erased: "dernie".

[287]Segre erased: "tout-à-fait".

[288]Segre erased: "on a, dans votre symbo".

pas $\frac{2}{1}$); mais vous ne la développez pas. Cepen-//dant comme vous finissez votre note en disant que vous reviendrez à cette théorie dans une autre occasion, je voudrais vous prier de me dire si (et dans quel travail) vous y êtes réellement revenu; soit par le vif intérêt que je prends à cela, soit aussi parce-que, ayant encore à corriger les épreuves du mémoire dont je vous parlais je tiendrais beaucoup à[289] avertir[290] avec plus de détails que je puisse que vous m'avez précédé. Je vous envoi quelques travaux que j'ai publiés dernièrement. Veuillez m'excuser si je vous dérange et recevez[291] mes salutations et mes remercîments anticipés. Dr Corrado Segre.

   $^{(1)}$ Voyez aussi un mémoire sur le même argument de mon ami le Dr Gino Loria, dans le dernier cahier du *Giornale di matematiche*.[292]

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15. Draft of Corrado Segre to Theodor Reye,[293] Turin 15 October 1884[294]

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L6, N. 195, R. 222), f. 1r-v.

   Dimostrazione sintetica di un teorema del Reye sulle curve assintotiche della superficie di Kummer.

   Il teorema consiste in questo che ogni piano tangente della superficie di Kummer considerata la tocca nel centro di uno dei due fasci di rette di un determinato Q dei complessi quadratici di cui quella superficie è singolare, quando il piano stesso è pure tangente alla superficie singolare di quel complesso quadratico che contiene la congruenza singolare di Q ed è infinitamente vicino a Q. Da esso si trae poi, per una proposizione di Klein, il risultato del Reye che una curva delle tangenti principali della superficie di Kummer è base di un fascio di superficie del 4° ordine.[295]

   Per dimostrare quel teorema si consideri un piano singolare π di Q: siano A, B i centri dei due fasci di rette di π contenute in Q e sia P quel punto della retta singolare A, B in cui π tocca la superficie singolare di Q, e P' il punto coniugato armonico di P rispetto ad A, B. La congruenza singolare di Q è base di un fascio di

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[289]Segre erased: "ne pas".

[290]Segre erased: "que avec des".

[291]Segre erased: "par anticipation".

[292]G. Loria, Sulle corrispondenze proiettive fra due piani e fra due spazi, *Giornale di Matematiche* 22 (1883): 1–16.

[293]Theodor Reye (1838–1919).

[294]This draft is the first part of the letter sent by C. Segre to T. Reye on 24 October 1884 which was published in French, Segre (1884g), with the title: Sur les courbes de tangentes principales des surfaces de Kummer, Extrait d'une lettre adressée à M. Th. Reye par M. Corrado Segre, *Journal für die reine und angewandte Mathematik* 98 (1885): 301–302 (*Opere* 3, 545–546). The second part is edited in Annex 16.

[295]T. Reye, Über die Singularitätenflächen quadratischer Strahlencomplexe und ihre Haupttangentencurven, *Journal für die reine und angewandte Mathematik* 97 (1884): 242–260.

complessi quadratici (tra cui è Q) le cui coniche poste su π formano una schiera di coniche tangenti tutte alla retta A B in P' (per un teorema generale di Pasch): in questa schiera una conica degenera nella coppia di punti A, B appartenente a Q ed esiste solo più una conica degenerata nel punto P' ed in un altro punto, conica appartenente ad un certo complesso Q' del fascio rispetto a cui π è piano singolare. Ora quando Q' è infinitamente vicino // a Q, e solo allora, accadrà che la seconda conica degenere dovendo essere infinitamente vicina alla prima, il punto P' dovrà venire a coincidere con A (o con B), e quindi anche P coinciderà con A. Il teorema è dunque dimostrato.

Torino, 15 Ottobre 1884.

16. Draft of Corrado Segre to Theodor Reye, Turin 24 October 1884[296]

UTo-ACS. *Carteggi, Lettere di Segre* (Gario L7, N. 196, R. 223), f. 1r-v.

Nuove conseguenze del detto teorema del Reye.

Si ha immediatamente, coi metodi esposti nella mia memoria *Sulla geometria della retta e delle sue serie quadratiche*,[297] la proposizione seguente:

I complessi quadratici passanti per la congruenza delle rette singolari di un complesso quadratico hanno tutti la stessa caratteristica e gli stessi complessi lineari fondamentali (ed in particolare le stesse rette doppie) di questo.

Siccome d'altra parte il teorema di Reye vale per ogni specie particolare di superficie di Kummer, così applicando anche quella proposizione avremo:

Le linee asintotiche della superficie [21111], cioè della *Complexfläche* generale sono (intersezioni di essa con superficie quartiche aventi la stessa // retta doppia, cioè) curve d'ordine e classe 12 aventi 4 punti singolari sulla retta doppia della superficie (e non appartenenti a superficie cubiche).

Le linee asintotiche della superficie [2211], cioè della superficie a due rette doppie secantisi e 4 punti doppi, le curve asintotiche sono d'ordine e classe 8 ed appartengono a superficie cubiche passanti per le due rette doppie (ma non a quadriche).

Le linee asintotiche della superficie cubica a 4 punti doppi (reciproca di quella di 4° ordine di Steiner) sono intersezioni di essa con superficie cubiche contenenti le stesse 3 rette (non passanti per punti doppi) e sono per conseguenza curve del 6° ordine intersezioni della superficie con delle quadriche (e di 4ᵃ classe).

Le linee asintotiche della superficie di Steiner di 4° ordine a 3 rette doppie sono intersezioni di essa con altre superficie di Steiner aventi le stesse rette doppie: ne segue tosto che esse sono linee razionali di 4° ordine (2ᵃ specie) e 6ᵃ classe aventi

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[296]This draft is the second part (see footnote 294) of the paper Segre (1884g), published in *Journal für die reine und angewandte Mathematik*, 98 (1885): 302–303 (*Opere* 3, 546–547).

[297]Segre (1883c, 36, *Opere* 3, 127).

quelle 3 rette per corde e le cui sviluppabili osculatrici inviluppano quadriche. Ecc. ecc. Le superficie singolari rigate non danno risultati interessanti su questa via.

Torino,[298] 24 Ottobre 1884.

17. Extract of Corrado Segre to Guido Castelnuovo,[299] Frankfurt am Main 25 June 1891

ANL-Castelnuovo, postcard.

Spero di trovare tuoi scritti a Göttingen (*poste restante*), ove saremo lunedì 29 e martedì 30; e poi a Berlino ove saremo nei primi giorni di luglio. Ho visto ed imparato un'infinità di cose. Ti farò poi leggere i pochi appunti che ho preso e che prenderò ancora. Intanto ti posso dare la buona notizia che Reye (gentilissima persona che ci fece accoglienze cordialissime) sta pubblicando la nuova ediz. della 2^a parte della G.d.L. [*Geometrie der Lage*]: la quale viceversa, per le copiose aggiunte fattevi (come pentaedro ed esaedri della F^3; calcolo simbolico con le omografie ecc., si comporrà ora di una 2^a e di una 3 parte.[300] M. Cantor[301] poi (altra persona gentilissima!) ha compiuto a stampa il $2°$ vol.^{e} della sua Storia della matematica[302] (dillo a D'O [D'Ovidio]).[303] Salutami Porro[304] e digli che, seguendo il suo consiglio, siamo andati (con Reye) a visitare minutamente l'Osservatorio di Strassburgo, guidati colla massima cortesia dall'astronomo Becker.[305] È un osservatorio splendido!

18. Extract of Corrado Segre to Guido Castelnuovo, Göttingen 30 June 1891

ANL-Castelnuovo, postcard.

Chi non è stato qui non può imaginare che razza d'uomo è Klein e che specie di organizzazione egli ha saputo, con un'abilità che nessun altro può avere, imporre agli studi matematici in quest'Università. È una cosa che m'ha fatto un'impressione straordinaria. E sì che di impressioni vivissime da parte degli scienziati ne ho già avute parecchie in questo viaggio! Ho trovato qui la tua lettera di cui ti ringrazio tanto tanto. Ti prego di ringraziare e salutare, anche a nome di Loria, il prof. D'O.

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[298]Segre erased: "23".

[299]Guido Castelnuovo (1865–1962).

[300]T. Reye, *Die Geometrie der Lage*, 3 vols., Leipzig: Baumgärtner 1886–1893.

[301]Moritz Cantor (1829–1920).

[302]M. Cantor, *Vorlesungen über Geschichte der Mathematik*, Band II, Leipzig: Teubner 1892.

[303]Enrico D'Ovidio (1843–1933).

[304]Francesco Porro de' Somenzi (1861–1937), astronomer at the Turin university.

[305]Ernst Becker (1843–1912) astronomer.

[D'Ovidio] per la sua gentilissima. Queste lettere che si ricevono dagli amici quando si è in paese straniero fanno un grandissimo piacere. Ti sarò quindi grato se mi scriverai ancora a Berlino ove saremo sabato 4 Luglio e ci tratteremo fino all'8 almeno. Con Klein s'è parlato oggi di te e delle tue ricerche: m'incarica di ripeterti che avrà molto caro che tu gli dia quel tal lavoro. Vorrebbe pure che si risolvesse la questione: quali g_n^r, $g_n^{r'}$, ... eccezionali son possibili in enti (particolari) di genere p.

19. Extract of Corrado Segre to Guido Castelnuovo, Göttingen 11 July 1891

ANL-Castelnuovo, postcard.

Mio ottimo Castelnuovo,

Non ho parole per ringraziarti di quanto hai fatto per me nei giorni scorsi. Debbo limitarmi a dirti un semplice "grazie"! Ma tu mi conosci e capisci i miei sentimenti se anche non li manifesti. Ieri ho ricevuto insieme la tua cartolina e la tua lettera dell'8, unitamente ad un telegramma di mio fratello che mi diceva di telegrafare subito al Rettore che presentasse la mia domanda alla Facoltà ecc. [...] Che la mia faccenda scorra liscia mi par molto difficile ... Solo stamane ho letto in questo Seminario matem[atico] le parole del Direttore.[306] È roba da cani! Non trovo altro modo di qualificarla. È peggio, od almeno mi fece peggior impressione ancora che quella prima redazione che P. [Peano][307] m'aveva fatto vedere! Cosa mostruosa! [...] Il 15 sarò a Nürnberg; il 16, 17 a München.

20. Extract of Corrado Segre to Guido Castelnuovo, Nürnberg 15 July 1891

ANL-Castelnuovo, postcard.

Trovo qui la tua car[issi]ma cartolina. Ti raccomando di calmare Veronese.[308] Che non si prolunghino i pettegolezzi in Italia, per carità! Dico ciò, per quanto io sia sempre indignatissimo contro P. [Peano], e per quanto, ora che io taccio assolutamente, potrebbe soddisfarmi il vedere altri a bastonare quell'... animale! Ma è meglio che lascino stare: non c'è nulla da guadagnare, mentre ci si può sempre perdere qualche cosa ... Mi è accaduto ripetutamente in questo viaggio, non solo di fare, ma anche di sentir altri a fare i tuoi elogi: puoi figurarti con quanto piacere per me! A Dresda il Rohn[309] mi disse che in ricerche che sta facendo sulle curve

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[306]Segre is referring to the polemic note by Peano, Giuseppe, Osservazioni del Direttore sull'articolo precedente, *Rivista di Matematica* 1 (1891: 66–69, published at the end of Segre's paper: Su alcuni indirizzi nelle investigazioni geometriche. Osservazioni dirette ai miei studenti (Segre 1891a).

[307]Giuseppe Peano (1858–1932).

[308]Giuseppe Veronese (1854–1917).

[309]Karl F. Rohn (1855–1920).

sghembe e sulle rigate ebbe occasione di vedere qualche tuo lavoro, specialm[ente] le *Ricerche di geom[etria] sulle curve algebriche*,[310] che pare siano state indicate dal Brill.[311] Faresti bene ad inviargli subito (all'indirizzo: Prof. K. Rohn, Dresden, Werderstrasse 7) quelli fra i tuoi lavori di cui hai ancora copie e che tu più stimi. Il Rohn m'ha pur detto che l'ultima formola delle tue *Ricerche* gli gioverebbe assai, se fosse completata in guisa da dare per ogni caso il vero limite *raggiunto*. Non son però sicuro d'averlo ben capito: se credi, potresti scrivergli domandandogli precisamente qual è il suo desiderio. Nöther[312] poi m'ha lodato i tuoi ultimi lavori: vede con piacere che tu ti sia già occupato con qualche frutto di geom. sulla superficie e desidera che tu continui in questo indirizzo. Mi domandò se tu conoscevi *tutti* i sistemi piani iperellittici (egli si occupò altra volta senza frutto di determinarli): anche quelli li vedrebbe con piacere. È lieto che tu sia riuscito a dimostrare completam[ente] la rappresentabilità delle involuzioni piane (di coppie di punti): crede che sian rappresentabili anche le involuzioni di *n*-ple di punti (di qualche spazio). […] Stassera sarò a Monaco, e la mattina del 18 ne ripartirò per l'Italia. Il 19 sarò a Torino.[313]

21. Extract of Corrado Segre to O. Michelli Segre, Zürich 8 August 1897

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 10710, fols. 1r-v, 2r-v.

Il viaggio da Milano a qui fu ottimo. Nel treno mi sono incontrato col Prof. Ricci[314] di Padova, altro congressista. Poi a Göschenen si unì a me il Fano[315]; e intanto nei cinque minuti di fermata in quella stazione mi son trattenuto coi genitori di Fano. […] Qui alla stazione ero atteso da Volterra[316] e da Lombardi,[317] che è un mio antico discepolo, ora assistente al Politecnico di Zurigo. Venimmo a questo Hotel Central, ove mi era stata assegnata una bella camera, di cui sono pienamente // soddisfatto. Intanto che mi lavavo Volterra mi si *lagnava*, perché tutto gli fa prevedere il fiasco del congresso, perché non verranno alcuni illustri francesi che avevan detto di venire, perché verranno invece tante nullità; e così via. In realtà invece io credo che sarò

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[310]Castelnuovo, Guido, Ricerche di geometria sulle curve algebriche, *Atti R. Accademia delle Scienze di Torino* 24 (1889): 346–373.

[311]Alexander von Brill (1842–1935).

[312]Max Nöether (1844–1921).

[313]Cf. also ANL–Castelnuovo, Segre to Castelnuovo, München 17 July 1891, 31 July 1891, 5 September 1891.

[314]Gregorio Ricci Curbastro (1853–1925).

[315]Gino Fano (1871–1952).

[316]Vito Volterra (1860–1940).

[317]Luigi Lombardi (1867–1936). After taking a degree in Civil Engineering in Turin in 1890, he was a lecturer at the Zurich Polytechnic in 1895, graduated in Philosophy at the University of Zurich and in 1897 returned to Turin as a lecturer in Technical Physics.

contento del congresso; perché dall'elenco che ho visto dei congressisti mi pare che, con molte nullità, vi siano pure moltissimi uomini di valore …: ho detto male, dicendo solo uomini; vi sarà anche la signorina Scott,[318] americana, con la quale io sono in relazione scientifica, ma che ancora non conosco personalmente … Intanto che io mi lavavo e che Volterra si sfogava // bussano: era un professore francese, M.ʳ Borel,[319] che abita pure in quest'albergo, ed avendo sentito che io ero arrivato, voleva complimentarmi. Volterra fece le mie veci finché io fui in grado di riceverlo. Poi siamo stati quasi sempre insieme, anche la sera. […] // ₂ᵥ […] Ora andrò alla stazione, ove stanno in permanenza i matematici svizzeri per ricevere i congressisti che arriveranno oggi. Dall'Italia, oltre a quelli che già sapevo, arriveranno Veronese, Levi-Civita,[320] Amodeo,[321] ecc.

22. Extract of Corrado Segre to Olga Michelli Segre, Zürich 8–9 August 1897

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 10720, fols. 1r, 2v.

T'avevo scritto stamattina, prima di mettermi in moto. Dopo d'allora quanta gente ho veduta! Alla stazione, dal lato da cui arrivano i treni, era aperta una sala, a cui invitavano molti cartelloni con la scritta "congrès des mathématiciens". E là mi sono trattenuto delle ore, con qualche matematico svizzero e coi numerosi stranieri che arrivavano alla spicciolata, // coi diversi treni, da tutte le parti. Ogni momento era una nuova presentazione, o fatta da intermediari, o fatta direttamente tra me ed il congressista. Tedeschi, russi, francesi, inglesi, polacchi, americani, italiani: di tutte le nazioni. Con alcuni, simpaticissimi, s'entrava subito in intimità. Tanto che si fissò lì per lì un convegno per la colazione: ove ci trovammo poi ad una tavola in parecchi. Stassera poi sarà una cosa più grandiosa: perché è già fissato nella nostra "Festkarte" una riunione di *tutti* i congressisti per la cena. Stamane, prima di colazione, andammo Volterra, Fano ed io a far visita a Brioschi,[322] che era arrivato poco prima. Nel pomeriggio poi visita, con Fano, al tedesco Reye ed al danese Zeuthen.[323] Sapendo poi che nell'albergo dov'era quest'ultimo alloggiava pure la professoressa americana miss Scott, di cui già ti scrissi, abbiamo fatto visita anche a lei! […] son contento di averle usato questo riguardo, perché ho potuto capire che è tanto una buona donna, ed ho visto che era molto lusingata della nostra visita. […] Ho anche visto oggi Peano, Gerbaldi,[324] Burali-Forti,[325] ecc.; ed ho stretto la mano a tutti quanti, discorrendo con loro solo per

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[318]Charlotte Angas Scott (1858–1931).

[319]Émile Borel (1871–1956).

[320]Tullio Levi–Civita (1873–1941).

[321]Federico Amodeo (1859–1946).

[322]Francesco Brioschi (1824–1897).

[323]Hieronymus Georg Zeuthen (1839–1920).

[324]Francesco Gerbaldi (1858–1934).

[325]Cesare Burali-Forti (861–1931).

pochi minuti. Pare che né Del Pezzo,[326] né Guccia[327] non verranno. In complesso sono già arrivati o stanno per arrivare un grande numero di scienziati di vero valore. Sicché per questo lato possiamo essere soddisfattissimi del congresso. […] Ho contato adesso nella lista dei congressisti: siamo poco meno che duecento. D'italiani quasi una ventina.

23. Extract of Corrado Segre to Olga Michelli Segre, Zürich 10 August 1897

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 10730, postcard.

Sono sempre più contento di questo congresso, che a detta di tutti … i non lagnosi è riuscito egregiamente. Ieri mattina lunga seduta con due interessanti letture, e altre cose. A 1 ora pom[eridiana] grande pranzo, elegante, abbondante, allietato dalla musica. Poi lunga gita su questo bel lago, ritornando a Zurigo verso le 9½ tra i fuochi artificiali e la musica. Ma quel che di più interessante, per me e per molti vi era in questa gita, era nella opportunità di discorrere un po' con l'uno un po' con l'altro scienziato: ed io ne ho approfittato largamente, trattenendomi specialmente con quelli verso cui ho più ammirazione. Vi è molta cordialità in tutti, ed io sono contento del modo come vengo accolto. Oggi sarà una giornata di molto lavoro, perché cominciamo le sedute scientifiche alle 8 e proseguiremo forse per tutto il giorno.

24. Extract of Corrado Segre to Olga Michelli Segre, Zürich 10 August 1897

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 10740, postcard.

Carissima, Questa è in aggiunta ad altra cartolina che ho impostato stamane. Ed è per dirti che m'han fatto l'onore di nominarmi vice-presidente per la sezione di geometria. Presidente è il Prof. Reye; poco fa, in sua assenza, ho dovuto presiedere io. La nomina m'ha fatto piacere, perché, oltre al Reye, vi sarebbero stati tanti altri geometri più anziani di me da nominare. Ho un gran da fare, e quindi ti lascio.

25. Corrado Segre to Olga Michelli Segre, Rome 23 April 1899

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 10850, f. 1r-v.

Ti scrivo avendo da un lato un accademico, dall'altro un altro: mi converrà dunque esser prudente, perché non mi vedano a baciarti! Siamo nella gran sala dei Lincei, e un accademico sta esponendo a voce tonante le sue scoperte. È seduta

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[326]Pasquale Del Pezzo (1859–1936).

[327]Giovan Battista Guccia (1855–1914).

della classe di scienze storiche ecc., ma siam venuti anche noi matematici per render onore a Lord Kelvin.[328] È venuto il gran Lord insieme colla moglie e colla figlia. È un bel vecchio, dallo sguardo acuto. Il Presidente Beltrami[329] ha aperto la seduta con un bel discorsetto in cui ha parlato della grandezza di quest'uomo, le cui prime pubblicazioni datano dal 1840! Lord Kelvin ha risposto con poche parole in inglese, che nessuno ha capito. Ora mi toccherà rimanere qui chissà per quanto tempo, perché l'oratore attuale non accenna a finire, e dopo di lui chi sa quanti altri parleranno!

26. Corrado Segre to Guido Castelnuovo, Ancona 9 August 1899

ANL-Castelnuovo, fols. 1r-2v.

Carissimo,

Ho ricevuto la tua cartolina del 3, mentre tu forse ricevevi la mia. Ho molto piacere delle buone notizie della tua Signora e dei due bimbi. Oggi ti riscrivo riguardo al libro che intenderei scrivere per Teubner: avendo ricevuto ora la lettera di accettazione di questo. Premetto che nello scrivere al Teubner io avevo indicato come argomenti che ora avrei in mente (fra quelli trattati nelle mie lezioni e da mettersi nel libro) i seguenti:

"Iperspazi. Varietà algebriche più notevoli che si presentano negl'iperspazi. Geometria sopra una curva (serie lineari di gruppi di punti, ecc.) e sue applicazioni alle curve sghembe e iperspaziali. Superficie razionali dei vari spazi, in relazione coi sistemi lineari di curve piane; riduzione di questi sistemi lineari a tipi, ecc. A queste teorie mi riserverei di aggiungerne qualche altra, se mi paresse opportuno, per rendere più armonica o // più completa l'opera. Lo svolgimento dovrebbe farsi secondo i punti di vista più moderni, ed in modo che il mio libro, insieme coi classici trattati di Geometria analitica di Salmon e Clebsch,[330] e con quello che scriveranno Castelnuovo ed Enriques sulle superficie algebriche[331] contribuisca a dare un'idea abbastanza completa dello stato attuale della geometria algebrica. Come titolo si potrebbe dire, all'incirca *Vorlesungen über höhere algebraische*

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[328]William Thompson, Lord Kelvin (1824–1907).

[329]Eugenio Beltrami (1835–1900).

[330]Salmon, Georg, *A Treatise on the Higher Plane Curves*, Dublin: Hodges, Foster and Figgis 1852, 3rd ed. 1879; *Traité de Géométrie analytique (Courbes planes*, suivi de *Étude sur les points singuliers)*, éd. G. Halphen, Paris: Gauthier-Villars 1884. Clebsch, Alfred, *Vorlesungen über Geometrie*, Leipzig: Teubner 1876.

[331]Castelnuovo, Guido and Enriques, Federigo *Sur quelques récents résultats dans la théorie des surfaces algébriques*, Lepzig: Teubner 1896.

Geometrie oppure *Vorlesungen über algebraischen Curven und höhere Räumen*, ecc.". Tutto questo io dicevo nella mia lettera del 28 luglio a Teubner.[(*)] Questi mi risponde in data 7 corrente così:

"Für das mir untern 28 v. Mts. freundlichst von Ihnen gemachte Verlagsaner-bieten spreche ich Ihnen meinen verbindlichsten Dank aus und erkläre mich gern bereit die von Ihnen geplanten *Vorlesungen über höhere algebraische Geometrie* in Verlag zu nehmen und zwar in einer Reihe // von Handbüchern über die ver-schiedenen Gebiete der mathematischen Wissenschaften, die ich im Anschluss an die Encyklopädie zu veröffentlichen beabsichtige. Es würde sich wohl empfehlen, wenn Sie sich über die Abgrenzung des von Ihnen zu behandelnden Gebietes mit den Herren Castelnuovo und Enriques in Verbindung setzten. Mit der Fertigstellung würde ich selbstverständlich in keiner Weise drängen. Was die Bedingungen anlangt, so würde ich Ihnen wie den anderen Herren bei einer Ausstattung wie der des beiliegen Blattes die Zahlung eines Honorars von M. 50 pro Bogen bei einer Auflage von 1000 Exemplaren, die sich bei jeder Auflage wiederholen würde und sich bei stärkerer Auflage entsprechend erhöhte, vorschlagen können, wovon frei-lich noch ein Teil des aufzuwendenden Übersetzungshonorars abgezogen werden müsste. Dasselbe würde voraussichtlich M. 24 pro Bogen betragen, hiervon würde ich bereit sein—womit ich freilich schon den deutschen Mitarbeitern gegenüber Ihnen ein besonderes // Entgegenkommen bewiese—1/3 meinerseits zu überneh-men, während der Rest von Ihnen getragen werden müsste."[332]

Ora io ti prego:

1° di scrivermi subito se queste condizioni, specialmente riguardo alle spese di traduzione, coincidono con quelle fatte a te ed Enriques; e se voi le avete accettate o in qualche modo modificate,

2° di scrivermi, ora e poi, quali argomenti vorresti aggiunti a quelli indicati più sopra pel mio libro, acciocché meglio aiuti il vostro, e qualunque altra cosa ti venga in mente riguardo al *Abgrenzung* dei nostri *Gebiete*, di cui parla il Teubner.

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[332]*Tr.* "For the proposal that you kindly sent me on 28th of last month I express my most heartfelt thanks and declare my willingness to print your *Vorlesungen über höhere algebraische Geometrie* (*Lectures in Higher Algebraic Geometry*) and in a series of textbooks on the different spheres of the mathematical sciences that I intend to publish after the Encyclopaedia. It would be very useful for you to get in touch with Messrs Castelnuovo and Enriques for delimitation of the subjects to be dealt with. Regarding the deadlines, naturally I do not intend in any way hurry you. As regards the conditions it is possible to propose to you, as to other authors, a contract like the one enclosed, which contemplates the payment of a fee of 50 Marks per sheet for an edition of 1000 copies, which could be repeated for each edition and with an increase for subsequent reprints, from which however a part would have to be deduced for the translation expenses. Concerning this the expected expense is 24 Marks per sheet and I would be prepared to give you, compared to the German collaborators, a special concession that consists of taking on myself the onus of 1/3 of the costs, while the rest should be met by you.".

Avverti che io vorrei fare un'opera, ampia sì ma non troppo, un'opera armonica, non un'enciclopedia. Poi fammi il favore d'inviare questa mia lettera ad Enriques, al quale è pure diretta. Anche da lui aspetto che mi esprima *tutti i suoi desideri* riguardo alla mia opera, in relazione colla vostra, come considerata da sé, e *tutti i consigli* che gli posson venire in mente.

Ringraziamenti e saluti affettuosi ad entrambi Vostro C. Segre.

[*] Dicevo poi che mi ci vorrebbero alcuni anni per compier tutta l'opera; e che nemmeno potrei cominciare subito, dovendo prima finire l'articolo per l'Enciclopedia.[333]

27. Extract of Corrado Segre to Guido Castelnuovo, Turin 13 February 1900

ANL-Castelnuovo, fols. 1r-1v.

Carissimo,

ti prego di riflettere subito e di scrivermi subito il tuo parere intorno al titolo del mio molto futuro libro. Tempo fa io avevo scritto al Teubner che il titolo poteva essere all'incirca *Vorles*[*ungen*] *ü*[*ber*] *höhere algebraische Geometrie, mit besonderer Berücksichtigung der mehrdimensionalen Räume* (la 2ª parte del titolo l'ho aggiunta perché il T[eubner] ci teneva ai *mehrdim*[*ensionalen*] *Räume* nel titolo). Ora nella bozza che anche tu avrai ricevuto trovo soppresso il *höhere*. E son dubbioso fra metterlo o no. Tu che sai all'incirca gli argomenti principali che saranno esposti (argomenti di corsi di geometria *superiore*) mi sapresti consigliare? Io temo che a sopprimere quell'aggettivo // rimanga un titolo troppo indeterminato.

28. Corrado Segre to Ernest J. Wilczynski,[334] Turin 8 February 1904

EJWP, B2 F2, fols. 1r-2r.

Torino 8 II 04

Pregiatissimo Signore,

nell'ultimo fascicolo dei *Math. Annalen* a pag. 256 trovo un teorema di una Sua Nota che mi stupisce: "If a ruled surface is self-dual, it must belong to a linear complex".[335]

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[333]Segre was preparing the essay *Mehrdimensionale Raume* (Segre 1921c) which would be published in *Encyklopädie der Mathematischen Wissenschaften*, III.2A.7, Leipzig: Teubner 1921: 769–972.

[334]Ernest Julius Wilczynski (1876–1932).

[335]E.J. Wilczynski, A fundamental theorem in the theory of ruled surfaces, *Mathematische Annalen* 58 (1904): 249–256, in particular 256.

O io capisco male il significato, oppure la proposizione non è esatta. Infatti se noi abbiamo una reciprocità R, e prendiamo una retta g con tutte le sue trasformate $g_1, g_2, \ldots$ per mezzo di $R, R^2 \ldots$, possiamo far muovere g in modo che essa con g_1, $g_2, \ldots$ descrivano una stessa rigata: e questa sarà trasformata in sé da R, sarà *self-dual*, senza giacere necessa-//riamente in un complesso lineare.

Per esempio, prendiamo le coordinate di retta (di Klein) $x_1 \ldots x_6$ tali che

$$\sum_1^6 x_i^2 = 0.$$

Tre equazioni del tipo

$$\sum_1^3 a_{ik} x_i x_k + \sum_4^6 b_{lm} x_l x_m = 0$$

determinano una rigata che è trasformata in sé dalla reciprocità (polarità rispetto a una quadrica) che muta $(x_1 \ldots x_6)$ in $(-x_1, -x_2, -x_3, x_4, x_5, x_6)$. Profittando dei coefficienti liberi si può fare in modo che quella rigata non stia in un complesso lineare. Oppure in coordinate plückeriane p_{ik} consideriamo tre equazioni quadratiche fra queste 6 coordinate, ognuna delle quali sia simmetrica rispetto a p_{12}, p_{34}. Le tre equazioni rappresenteranno una rigata, che non sta in generale in nessun // complesso lineare, ma corrisponde a se stessa nel *Nulsystem* definito dal complesso lineare $p_{12} - p_{34} = 0$.

Anche la proposizione seguente di quella citata, cioè "If however this complexe is special, ecc.", mi lascia dei dubbi analoghi. Se i miei dubbi non hanno ragione, voglia scusarmi e spiegarmene il perché.[336] Cordiali saluti Suo Corrado Segre.

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29. Corrado Segre to Ernest J. Wilczynski, Turin 18 March 1904

EJWP, B2 F2, f. 1r-v.
   Turin, le 18 III 04
   Monsieur et honoré Collègue,

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[336]After this letter Wilczynski wrote on the same journal the following addition (Bemerkung zum Aufsatz von E.J. Wilczynski, *Mathematische Annalen* 58 (1904): 584): "The theorem on page 256 is liable to misinterpretation, as Mr. Corrado Segre has kindly pointed out to me. The self-dual surfaces mentioned in the theorem are such, that a dualistic transformation exists which transforms every one of the generators of such a surface into *itself*. There exist ruled surfaces, not belonging to a linear complex, invariant under a dualistic transformation, which does not however have the individual generators unchanged.".

Je Vous remercie pour Votre aimable réponse.[337] Maintenant je suis parfaitement d'accord avec Vous sur le théorème dont je Vous avais écrit.[338] Il est une conséquence de ce fait: que les droites *autoréciproques* d'une réciprocité de l'espace, si elles sont en nombre infini, ne peuvent présenter que les cas suivants: ou bien elles forment deux faisceaux de droites; ou bien elles forment une ou deux *Regelschaaren*, ou enfin elles sont les droites directrices d'un *Nulsystem*, qui définit la réciprocité. Je serai très-heureux de faire Votre // connaissance personnelle. Je serai à Turin presque certainement vers le 5 ou 6 Avril; mais si par hasard je devais éloigner d'ici en ces jours, je Vous en avertirais en Vous écrivant à Florence. Aujourd'hui, après avoir reçu Votre lettre, je n'ai pas vu M. Fano: mais, connaissant ses habitudes, je crois pouvoir supposer qu'il ne sera pas à Turin pendant les vacances de Pâques, mais qu'il reviendra ici pour le 7 Avril. Lui aussi, j'en suis sûr, sera très-heureux de Vous connaître. Agréez mes salutations cordiales. Votre C. Segre.

30. Corrado Segre to Ernest J. Wilczynski, Turin 27 April 1904

EJWP, B2 F2, f. 1r.

Torino, 27 aprile 04

Preg.mo Signore,

La ringrazio vivamente per il gentile invio dei Suoi *Studies in the gen. theory of ruled surfaces.*[339] Non mancherò di ricambiarla alla prima occasione con qualche mio lavoro! Ho avuto molto piacere di averla conosciuta personalmente, quantunque solo per pochi istanti. Spero che ci rivedremo altre volte, e che allora potrò godere di più la Sua simpatica conversazione. Tanti cordiali saluti Suo C. Segre.

31. Corrado Segre to Ernest Wilczynski, Turin 2 July 1904

EJWP, B2 F2, f. 1r.

Torino 2 VII 04

Egregio Collega,

La ringrazio per la Sua lettera. Ella è stata molto gentile a voler citare il mio nome per quella piccola osservazione.[340] Avrò molto piacere di rivederla a Heidelberg,[341] e poi anche (spero più a lungo!) quest'inverno in Italia. Suo C. Segre.

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[337]This letter seems to be lost.

[338]Segre to Wilczynski, 8 February 1904, Annex 28.

[339]Wilczynski, Ernest J., Studies in the General Theory of Ruled Surfaces, *Transactions of the AMS*, 5 (1904): 226–252.

[340]Cf. Annex 28 and footnote 336 above.

[341]He is referring to the International Congress of Mathematicians which was held in Heidelberg from 8 August to 13 August 1904.

32. Extract of Corrado Segre to Olga Michelli Segre, Airolo 17 July 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11320, f. 1r-v.

Ho ricevuto una lettera del Prof. Krazer[342] (del comitato organizzatore del congresso di Heidelberg) in cui è detto: "Gestatten Sie mir // die Benachrichtigung, dass Sie als einer der 4 Vortragenden in den allgemeinen Sitzungen des Kongresses beim Bankett Ihren Platz am Tische Seiner Königlichen Hoheit des Erbgroßherzogs werden angewiesen erhalten, und dass mit Rücksicht darauf Frack und weiße Binde als Toilette notwendig sein dürfte."[343]

33. Extract of Corrado Segre to Olga Michelli Segre, Airolo 20 July 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11340, fols. 1v-2r.

… Il mio discorso![344] È attorno ad esso che lavoro un'ora o due ogni giorno. Per forza: bisogna pur finirlo! Anzi: in quella tal lettera di cui ti riferii l'altro giorno un brano, il sig. Krazer mi avverte pure che gli altri 3 conferenzieri (non solo l'inglese, ma anche il tedesco ed il francese)[345] fanno stampare e distribuire le loro conferenze a Heidelberg, prima di darne lettura; sicché mi eccita a non tardare l'invio del mio manoscritto per la stampa. Gli ho risposto // che sono stato poco bene, e che il mio discorso non sarà redatto in modo definitivo che quando sarò in procinto di partire per Heidelberg: sicché non si potrà stamparlo prima della lettura!

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[342]Adolf Krazer (1858–1926).

[343]*Tr.* "Allow me to inform you that as you are one of the four speakers in the general sessions of the Congress you will be a guest in the banquet at the table of His Royal Highness the Grand Duke and therefore should wear a tailcoat and a white tie.".

[344]Segre is referring here to his lecture in Heidelberg, *La Geometria d'oggidì e i suoi legami coll'analisi* (Segre 1905).

[345]The four guest speakers were Gaston Darboux from Paris, who was replaced by Paul Painlevé: *Le problème moderne de l'intégration des équations différentielles*, Alfred G. Greenhill from London: *The mathematical Theory of the Top considered historically*, Corrado Segre from Turin: *La Geometria d'oggidì e i suoi legami coll'Analisi* and Wilhelm Wirtinger from Wien: *Riemanns Vorlesungen über die hypergeometrische Reihe und ihre Bedeutung*. Cf. *Jahresbericht der Deutschen Mathematiker Vereinigung* 13 (1904): 299–303, 382 and *Verhandlungen des dritten Internationalen Mathematiker-Kongresses in Heidelberg vom 8 bis 13 August 1904*, hrsg. Adolf Krazer, Leipzig: Teubner 1905.

34. Extract of Corrado Segre to Olga Michelli Segre, Airolo 25 July 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11380, postcard.

Guccia m'ha scritto che vuol aprire un concorso internazionale per un premio di 3000 £ sulle curve algebriche (sai bene che cosa sono!), e che la commissione giudicatrice sia composta di me, Noether[346] e Poincaré.[347] Dopo qualche riflessione, ieri ho risposto che ho già tanto lavoro da fare pei miei corsi e pei manoscritti dei miei discepoli che non posso accettare un ufficio che mi obbligherebbe ad esaminare altri manoscritti. Scelga un altro geometra italiano!

35. Extract of Corrado Segre to Olga Michelli Segre, Airolo 25–26 July 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11390, f. 1v.

Ricevo, rinviatomi da Torino, un elegante invito litografato ad un pranzo che darà il Prof. Weber,[348] presidente della Società matematica tedesca, la sera del 13 agosto. Sotto sta scritto da un lato: "Bitte im Rock", dall'altro che si prega d'inviare subito la risposta. Quel "Rock" suppongo sia il frac. Domanderò oggi stesso a qualche tedesco di qui.

36. Extract of Corrado Segre to Olga Michelli Segre, Airolo 30 July 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11400, f. 1v.

Guccia mi ha riscritto insistendo perché io accetti di entrare in quella sua Commissione, ché se no egli manda tutto a monte, che io devo fare questo sacrifizio per la scienza e per amor suo (!), ecc. ecc. ecc. Andrà a Heidelberg e passerà di qui probabilmente mercoledì, fermandosi due ore per stare con me. Gli ho risposto che è inteso che farà qui colazione con me, ma ho insistito nel mio rifiuto, ripetendogli che è facilissimo sostituirmi con un altro italiano. // Quanto ai miei progetti di viaggio, eccoli. Domenica 7 agosto conterei partire per Heidelberg ove arriverei la sera stessa. Viaggerei coll'amico Loria. Là resterei fin verso il 15. Poi tornerei qua per restarvi ancora una diecina di giorni circa, a rinforzare maggiormente la mia salute.

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[346]Max Noether (1844–1921).

[347]Henri Poincaré (1854–1912).

[348]Heinrich Weber (1842–1913).

37. Extract of Corrado Segre to Olga Michelli Segre, Airolo 3 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11420, f. 2r.

Ho finito finalmente di ritoccare e di mettere in buona copia il mio discorso di Heidelberg. Se lo finivo due giorni prima, facevo ancora in tempo a farlo stampare prima della seduta in cui dovrò leggerlo. Cioè sabato 13. Ma, come già dicemmo insieme, per quelli che ne capiranno qualcosa è meglio se la lettura sarà una novità. D'altronde, per ragione di prudenza (e sapienza …!) non ho voluto affannarmi. Ora me lo rileggerò alcune volte, per vedere di poterlo poi dire alla seduta fissando spesso l'uditorio senza aver bisogno sempre di guardare le carte!

38. Extract of Corrado Segre to Olga Michelli Segre, Airolo 4 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11430, fols. 1 r-2v.

Annunziato con due lettere da Palermo, con un telegramma da Roma ed altro telegramma da Milano, giunse qui stamane alle 11½ Guccia, per restare venti-quattr'ore a discorrere con me sul famoso premio di 3000 Lire! Che seccatura! E il guaio è che la cosa continuerà anche ad Heidelberg, ove ci troveremo con Noether, altro commissario. Eppure, con tutte le insistenze che m'ha fatto, non mi pareva di poter continuare a rifiutarmi. Aggiungi che col Noether sono in ottime relazioni; e col Poincaré (che è, secondo l'opinione gene//rale, il più grande matematico vivente) sono lieto di entrare ora in relazione, grazie a questo premio.

39. Extract of Corrado Segre to Olga Michelli Segre, Heidelberg 8 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11450, fols. 1 r-2v.

Ieri mattina alle 11½, salutato alla stazione da varie signore dell'albergo con cui avevo stretto intima (!) amicizia, salii nel treno coll'amico Morera.[349] E subito vedo Volterra, che era lì colla Sig^a, provenienti direttamente da Roma. Viaggiammo insieme fin qui. Insieme più o meno, perché loro erano in 1^a cl., Morera ed io in 2^a: ma vi era comunicazione, e spesso ci parlavamo. Il viaggio fu abbastanza nojoso e caldo; // Morera e i Volterra non ne potevan più dalla stufezza. […] Poi, ritornato all'albergo, vidi arrivare, e ci unimmo insieme, l'un dopo l'altro, vari scienziati tedeschi, di cui qualcuno conoscevo già e vari altri desideravo conoscere. Questo è il grande piacere dei congressi: trovarsi con tante persone, che si conoscevan solo per i lavori, e discorrere insieme di tante cose. Loria arriverà oggi. Castelnuovo non

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[349]Giacinto Morera (1856–1909).

c'è ancora, e non so quando verrà. In quest'albergo il solo italiano son io, perché scrissi molto tempo prima, per fissare la camera; i miei amici italiani che scrissero più tardi non poterono più esser alloggiati qui, perché era già pieno. Oggi, per tutto il giorno, non si farà altro che un cercarsi a vicenda fra // i vari congressisti. Stassera riunione generale al Municipio, dove siamo invitati. E da domandi comincieranno le sedute!

40. Extract of Corrado Segre to Olga Michelli Segre, Heidelberg 9 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11460, postcard.

Ieri fu una giornata piacevolissima. Dal mattino alla sera sempre nuove conoscenze o rinnovazione di antiche: tanti sommi matematici, e tanti "scienziati in erba"! Con parecchi ho parlato, ai quali avevo da tempo desiderio di conferire su l'una o l'altra cosa! Giunsero ieri Loria, Castelnuovo, Capelli,[350] Levi-Civita, Vailati[351] e due o tre altri italiani, oltre quelli che già sai. Dopo questo congresso Volterra e Sig.ᵃ andranno a quello di Cambridge,[352] a cui anch'io ero invitato.

41. Corrado Segre to Olga Michelli Segre, Heidelberg 10 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11470, fols. 1r-2v.

Ieri mattina apertura ufficiale del Congresso, con S.A.R. il granduca ereditario, e una quantità di lunghi discorsi, dopo alcuni dei quali io sono scappato via con altri colleghi, alla spicciolata. Nel pomeriggio si son costituite le 6 sezioni: geometria, analisi, ecc. ecc. Io sono andato alla sezione di geometria e lì si è dato principio alle conferenze. Io sono stato messo dentro al comitato generale del Congresso. Di più m'hanno pregato di essere oggi presidente della sezione di geometria. Ieri per un'ora e mezza // presiedette Zeuthen (che tu hai conosciuto a Torino, colla moglie). […] Verso le 8½ dovrò trovarmi al mio posto per presiedere; e ne avrò per più ore! Più tardi, verso le 16½, partiremo per Schwetzingen (a ½ ora di ferrovia da qui), ov'è il castello con ampio parco del granduca: siamo invitati colà da S.A.R. ad una *garden-party* o qualcosa di simile. Ritorneremo qui con altro treno speciale verso le 9 di sera. Ieri, dopo la seduta, son venuto all'albergo a mettermi // frac, gibus e compagnia bella pel gran pranzo. Giunto il granduca ereditario, vi furono anzitutto alcune presentazioni, fra cui la mia. Il granduca è un ufficiale sui 25 o 30

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[350]Alfredo Capelli (1855–1910).

[351]Giovanni Vailati (1863–1909).

[352]On 17 August 1904 there would be a meeting of the British Association for the Advancement of Science.

anni, alto, biondo, simpatico, molto affabile, sorridente con tutti. Mi disse che rammaricava di non conoscere Torino; mi chiese se ero già stato in Germania, e a Heidelberg in particolare, se da molti anni son professore, ecc.; mi espresse la sua soddisfazione perché il bel tempo di questi giorni presentava Heidelberg sotto la miglior luce; e concluse: "conto di vederla domani" (cioè al // castello dove siamo invitati). Mi parlò sempre in francese. Poco dopo prendemmo posto alle tavole. Io (solo fra gl'italiani) alla tavola del granduca cogli altri del comitato, il rettore, il sindaco, qualche ufficiale d'ordinanza ecc. Mi trovavo fra 2 scienziati, Brill[353] e Stäckel,[354] con cui sono in relazione intima: sicché abbiam discorso tutta la sera. Il pranzo, ottimo, durò 3 ore! Come qui si usa, i brindisi cominciarono fin dalla 1ᵃ portata, e furono quasi una dozzina! Vi fu molta allegria, a cui prese parte anche S. A.R. Poco dopo le 10 questi uscì, e io pure: ma la maggior parte rimase ancora a lungo!

42. Extract of Corrado Segre to Olga Michelli Segre, Heidelberg 11 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11480, postcard.

Ieri dalle 17 alle 20 splendido ricevimento (*garden-party*) del granduca eredi-tario. Trattamento suntuoso, abbondantissimo. Bellissimo giardino. Compagnia piacevolissima. Ho persino trovato che una sigᵃ (di un prof. di Berlino), colla quale ho passeggiato a lungo, è parente di miei parenti (dei Montel)! Sono più che mai soddisfatto del congresso … è vero che finora non ho detto la mia conferenza! Quella è il punto oscuro …: vi sarà qualcuno che la capisca? Piacerà? Stamane vi furon le prime due conferenze generali: quella francese e quella inglese. Ma dopo la 1ᵃ moltissimi vennero via. Andranno via tutti anche prima della mia?

43. Extract of Corrado Segre to Olga Michelli Segre, Heidelberg 12 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11490, fols. 1r-2v.

I congressisti sono circa 400. Ve n'è di tutte le nazioni, compreso il Giappone. Sono tanti // quelli che mi si vengono a presentare, e tanti quelli che io stesso cerco di conoscere, che finisco per fare confusioni e non sapere più chi è l'uno e chi è l'altro … Del resto ciò succede a tutti! In ogni modo alcune conoscenze più importanti per me mi si sono bene impresse. E ho potuto avere parecchi colloqui interessanti con vari colleghi. A questo fine giovano molto le festicciuole che abbiamo ogni giorno, come pure il trovarsi insieme nei Restaurants, ecc. Ieri al

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[353]Alexander von Brill (1842–1935).

[354]Paul Stäckel (1862–1919).

tocco Guccia offrì un pranzo squisito a me, ai Volterra, ai coniugi Noether, a //
Castelnuovo e Mittag-Leffler.[355] Tutto molto chic, da gran signore. Iersera alle 6
tutti i congressisti ebbero il divertimento di una scampagnata nei dintorni. Partenza
in ferrovia. Ritorno in battello sul fiume Neckar. Giunti davanti al castello di
Heidelberg (che hai visto nelle cartoline), questo si illuminò improvvisamente col
bengala: spettacolo interessante. Poi fuochi d'artifizio sul fiume, pure bellissimi;
serenata, barche illuminate, ecc. Del resto in questi giorni del congresso la città
sembra sempre in festa. Dovunque si vedono bandiere, di tutti i colori. È //
una città graziosissima; tutte le case sono belle, pulite, da signori! Pare che non debba esservi
qui gente povera! […] Stassera altro divertimento, con musica!

44. Extract of Corrado Segre to Olga Michelli Segre, Heidelberg 13 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11500, fols. 1r-2v.

Due righe in gran fretta, perché alle 17 ho il pranzo dal prof. Weber, e prima
vorrei preparare un po' di bagaglio perché partirò domattina alle 8½, arrivando la
sera stessa alle 19 ad Airolo (accompagnato di nuovo da Morera). Ti ho telegrafato
che la mia conferenza ebbe ottimo successo, e credo di non esagerare. In questi
giorni vi era tutti i momenti qualche scienziato straniero che mi domandava se la
mia conferenza sarebbe stata distribuita stampata prima della lettura, come s'è //
fatto per le altre. E rispondendo io che non avevo fatto in tempo a farla stampare,
tutti mi esprimevano il rammarico di non poterla capire, o mi raccomandavano di
dirla molto lentamente. E io l'ho detta con grande lentezza, ad alta voce, pronun-
ciando con molta chiarezza le parole, dando colorito alla cosa, come se avessi
improvvisato. La lentezza del parlare mi permetteva (dopo un'occhiata al mano-
scritto, di tanto in tanto) di tenere per lo più gli occhi fissi sull'uditorio. Questo era
molto numeroso, e stette attento dalla prima parola all'ultima, // per 40 minuti, fissi
gli sguardi su di me, anzi che sulle copie stampate come accadde per le altre
conferenze. E poi scrosciarono gli applausi, mentre io salutavo e scendevo dall'alta
cattedra per andare a riprendere posto fra i colleghi. E allora tutti a stringermi la
mano, a ringraziarmi, a far le meraviglie perché io avevo saputo farmi capire così
bene. E gl'italiani tutti mi confermarono che durante la conferenza i loro vicini
avevan mostrato di capire; o che dopo di essa avevan fatto dichiarazioni entusi-
astiche. Quanto alla sostanza, pare anche che sia // piaciuta. Un prof. dell'università
di Varsavia[356] m'ha chiesto subito di lasciargliela tradurre in polacco.[357] Guccia
vorrebbe riprodurla nei Rendiconti del Circolo matematico di Palermo[358]… Dopo
la mia, vi fu ancora la conferenza tedesca: ma con più scarso uditorio; e letta senza

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[355]Gösta Mittag-Leffler (1846–1927).

[356]Samuel Dickstein (1851–1939).

[357]Segre (1905a), published in *Wiadomości Matematyczne*, 9 (1905): 7–41.

[358]Segre (1905), published in *Rendiconti del Circolo Matematico di Palermo*, 19 (1905): 81–93.

colorito, riescì poco efficace. Nella Tribuna comparirà, credo, un telegramma sulla deliberazione di fare il nuovo congresso a Roma; e in esso si parla forse anche della mia conferenza.

45. Corrado Segre to Olga Michelli Segre, Airolo 15 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11510, fols. 1r-2v.

Per tutta la giornata di sabato, a Heidelberg, incontrando ora l'uno ora l'altro, ricevevo congratulazioni. Fu molto soddisfacente per me il vedere attenti alla mia conferenza uomini sommi come Klein, Noether, Zeuthen, e tanti altri che non ti nomino, perché a te sconosciuti, quantunque noti a tutti i matematici. Vi erano anche delle signore, mogli o figlie di matematici, venute per sentire l'*italiano*; e poi soddisfatte di averlo capito. Un americano diceva a Loria che egli aveva capito il mio discorso anche meglio che se l'avesse letto stampato. // […] Sabato alle 5 gran pranzo dal Weber, presidente del Congresso e scienziato illustre. D'italiani Volterra ed io. Di stranieri vari sommi, di varie nazioni. Io ero fra un austriaco e uno svizzero, coi quali ero già in relazione. Si è sempre discorso … in tedesco ben inteso. Fra parentesi: per // tutta la settimana ho fatto un grande esercizio di tedesco! Pochi furon quelli con cui potei parlar francese. Era poi un sollievo quando potevamo riunirci fra italiani! Altra parentesi: gl'italiani eran pochi (11), ma fecero buona figura. Oltre alla mia conferenza in seduta plenaria, parlarono nelle varie sezioni Volterra, Levi-Civita, Loria, Vailati, Capelli.[359] Io non potei sentirli, perché dovevo andare nella sezione di Geometria; ma pare che abbian fatto buona figura, specialmente i primi due. In ogni sezione vi furon [da 4 a 5 sedute, e come per la Geometria io ebbi da presiedere, così Volterra, Levi-Civita, e Loria ebbero da presiedere le loro sezioni. Tutti i congressisti dichiararono la loro grande soddisfazione del modo come si è // svolto il Congresso: sì per le comunicazioni, alcune delle quali veramente importanti, come per le relazioni personali che si fecero, per le belle feste, per il clima propizio, ecc. ecc. Furon 7 bei giorni di cui tutti conserveranno un ottimo ricordo! Ritornando al pranzo Weber, ti dirò che anche quello andò ottimamente, per la cordialità, come pel menù (che ti spedirò). Cominciato alle 5, verso le 8 potemmo Volterra, io e qualche altro congedarci dal Weber. […] Ieri viaggiai con Morera, benissimo. Pare che il mio buon collega non sappia staccarsi da me perché s'è fermato di nuovo qui, e qui starà tutt'oggi. Stamane abbiam passeggiato due ore insieme.

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[359] V. Volterra, Sur la théorie des ondes (Volterra's paper was not sent for the publication, cf. Vorvort, *Verhandlungen des dritten Internationalen Mathematiker-Kongresses in Heidelberg*, 1905 cit.: III); T. Levi-Civita, Sur la résolution qualitative du problème restreint des trois corps, 1905 cit.: 402–408; G. Loria, Pour une histoire de la géométrie analytique, 1905 cit.: 562–574, Sur l'enseignement des mathématiques en Italie, 1905 cit.: 594–602; V. Vailati, Intorno al significato della differenza tra gli assiomi ed i postulati nella geometria greca, 1905 cit.: 575–581, A. Capelli, Ein Beitrag zum Fermatschen Satze, 1905 cit.: 148–150, Über die Additionsformeln der Thetafunktionen, 1905 cit.: 272–274.

46. Extract of Corrado Segre to Olga Michelli Segre, Airolo 16 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11200, postcard.

Ti ho spedito ora, raccomandati, i giornali che ho preso a Heidelberg. Il nome che tu cerchi si trova solo in quello di Mittwoch, Mittag. I rendiconti del Congresso si ritrovan facilmente guardando i titoli dei vari articoli. Ancora non ho giornali col rendiconto della seduta di sabato. Ancora non ho finito di lavorare per quella conferenza! Un periodico americano ed uno di Ginevra vogliono subito da me un riassunto, da inserire nei loro rendiconti del congresso![360] Sarà presto fatto, fortunatamente.

47. Extract of Corrado Segre to Olga Michelli Segre, Airolo 18 August 1904

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11530, f. 1r.

Se non passerà il peso, unirò una lettera di un prof. d'università americana. Il congresso di cui parla è quello di St. Louis.[361]

48. Corrado Segre to Ernest J. Wilczynski, Turin 15 May 1906

EJWP, B2 F2, f. 1r-v.

Torino 15 V 06

Chiarissimo Dr Wilczynski,

Ella è stata molto gentile ad inviarmi il Suo bel libro,[362] ed io La ringrazio vivamente! Ho sempre pensato come Lei che la geometria projettiva debba estendersi alle proprietà differenziali degli enti geometrici, senza limitarsi, come di solito si fa, agli enti algebrici. Le Sue ricerche e in particolare il Suo libro, contribuiranno molto—io spero ed auguro!—a questo ampliamento del dominio della geometria projettiva! // Di nuovo La prego di gradire tanti tanti ringraziamenti miei, ed i miei migliori augurî pel Suo avvenire. Suo obbligatissimo C. Segre.

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[360]Cf. H.W. Tyler, The International Congress of Mathematicians at Heidelberg, *Bulletin of the AMS* 11 (1905): 191–205, in particular, on Segre's speech, 202–204; H. Fehr, Le 3e congrès international des mathématiciens, Heidelberg, 1904, *L'Enseignement Mathématique* 6 (1904): 379–400, in particular, 383–384.

[361]Segre is referring to the First International Congress of Arts and Science which would be held in S. Louis from 19 to 25 September 1904. The professor he mentioned could be Edwin Bidwell Wilson (1879–1964) or Ernest Wilczynski who were in Heidelberg at the ICM, or Eliakim Hastings Moore (1862–1932).

[362]E.J. Wilczynski, *Projective Differential Geometry of Curves and Ruled Surfaces*, Lepzig: Teubner, 1906.

49. Corrado Segre to Ernest J. Wilczynski, Turin 4 June 1906

EJWP, B2 F2, f. 1r-v.

Torino 4 VI 06

Caro Dr Wilczynski,

È la seconda volta che mi accade d'inviarle una lettera … in California, mentre Lei è in Italia! Ho piacere che Ella sia di nuovo qui, e spero che potrò rivederla e ringraziarla ancora—come già feci nella lettera inviata a Berkeley[363]—per la gentilezza che Ella mi ha usato inviandomi il Suo bel libro.[364] Questo libro m'è parso subito molto attraente, da uno sguardo sommario che vi ho dato. Ma io mi propongo di studiarlo minutamente nelle prossime vacanze estive; e conto di profittarne presto in qualche corso uni-//versitario. La ringrazio anche per la Sua gentile letterina[365]; e La prego di disporre di me, quando potessi servirla in qualche cosa. Suo obbl.^{mo} C. Segre.

50. Corrado Segre to Ernest J. Wilczynski, Brusson 25 August 1906

EJWP, B2 F2, f. 1r.

Brusson, 25 Agosto 1906

Caro Prof. Wilczynski,

Gradisca le mie vive felicitazioni per le Sue nozze! Sono lieto che queste abbiano stretto vieppiù i Suoi legami coll'Italia.[366] Le auguro ogni bene, nella famiglia come nella scienza! Suo C. Segre.

51. Corrado Segre to Ernest J. Wilczynski, Turin 23 January 1907

EJWP, B2 F2, f. 1r-v, All. f. 1r-v.

Torino 23 I 07

Caro Professore,

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[363]Segre to Wilczynski, 15 May 1906, Annex 48.

[364]Wilczynski (1906) cit.

[365]This letter seems to be lost.

[366]On 9 August 1906 E.J. Wilczynski married the Italian countess Inez Macola (1876–1975) of Verona, from whom he had three daughters. Cf. E.P. Lane, Ernest Julius Wilczynski In Memoriam, *Bulletin of the AMS* 39 (1933): 7–14 and E.P. Lane, Biographical memoir of Ernest Julius Wilczynski 1876–1932, *National Academy of Science Biographical Memoirs* XVI, 6 (1934): 293–327.

Io non credo che vi sia alcuna difficoltà a ciò che Ella concorra a qualche cattedra universitaria italiana che a Lei possa piacere. S'intende che con ciò Ella verrebbe a sottoporsi al giudizio di una Commissione, la quale dovrebbe confrontare Lei cogli altri concorrenti. In questo momento è aperto solo un concorso a cui Ella potrebbe prender parte: quello per la cattedra (unica) di Algebra e Geometria analitica a *Cagliari*. Non so se a Lei piacerebbe di andare in quell'Università, ove son pochi gli studenti di mate-//matiche, manca il 2° biennio di studi pel dottorato, e mancano biblioteche matematiche. In ogni modo io Le ho trascritto nel foglietto qui unito l'avviso di concorso. Veda Lei quel che Le convenga fare. Io sarei ben lieto che Ella venisse in Italia come professore universitario! Se Ella me ne esprimerà il desiderio, io La terrò informato di altri concorsi che vi fossero più tardi. Gradisca i miei cordiali saluti Suo C. Segre.

Concorso per professore ordinario alla cattedra di Analisi algebrica e Geometria analitica nella *R. Università di Cagliari*. I concorrenti dovranno far pervenire al Ministero dell'Istruzione Pubblica (Divisione per l'Istruz[ione] superiore) la loro domanda in carta bollata da £ 1,20 non più tardi del 30 aprile 1907, e vi dovranno unire:

(a) un'esposizione, in carta libera e *in cinque copie*, della loro operosità scientifica ed eventualmente didattica;
(b) un elenco, in carta bollata e *in sei copie*, dei titoli e delle pubblicazioni che presentano;
(c) i loro titoli e le loro pubblicazioni; queste ultime, possibilmente, *in cinque esemplari*.

Sono ammessi soltanto lavori pubblicati, e fra questi dev'esservi almeno una memoria originale concernente la disciplina che è oggetto della cattedra messa a concorso. I concorrenti che non appartengono all'insegnamento o all'amministrazione governativa, devono inoltre presentare il certificato penale di data non anteriore di un mese a quella del presente avviso. // Non sarà tenuto conto delle domande che perverranno dopo il giorno stabilito, anche se presentate in tempo utile alle autorità …, e non saranno neppure accettate, dopo il giorno stesso, nuove pubblicazioni o parti di esse o qualsiasi altro documento.

52. Extract of Corrado Segre to Olga Michelli Segre, Rome 5 April 1908

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11920, f. 1r-v.

A Pisa salì soltanto il Bianchi.[367] Bertini,[368] che pure era venuto a salu//tarmi non partì, perché ha il figlio convalescente d'influenza, e non sta ancora pienamente tranquillo. Dice che spera di poter venire domani. Speriamo! Da Pisa, per prudenza,

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[367] Luigi Bianchi (1856–1928).
[368] Eugenio Bertini (1846–1933).

ho fatto spedire ancora un telegramma a Castelnuovo, firmato Loria e Segre. In treno, facendo da interprete a un signore francese e famiglia, scoprii che era un matematico congressista di cui conosco le opere. E così si fece una conversazione piacevolissima, a cui presero parte anche Loria e Bianchi. Molto elegante, anche in treno, la sig[a] Loria. // Arrivando a Roma si vide con grande soddisfazione che vi erano i facchini […]. Ho visto Pincherle[369] colla figlia (fidanzata), Volterra, Pizzetti,[370] Maggi,[371] Gerbaldi, Borel, Runge,[372] Levi-Civita, Enriques e Signora, ecc. tutti qui all'albergo. // Dopo la gita fino al telegrafo son ritornato qui, e credo che passerò qui la mattina, per riposare. È un buon posto di osservazione: passano qui, come t'ho detto, tanti congressisti! Fano mi dice che sono iscritti al Congresso circa 700 persone. È molto, trattandosi di matematici. […] Oggi passerò il pomeriggio ai Lincei, ove è il quartier generale del congresso.

53. Extract of Corrado Segre to Olga Michelli Segre, Rome 5–6 April 1908

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11930, fols. 1v-2v

Stamane sono arrivati D'Ovidio e Morera. Abbiam fatto colazione in parecchi al ristorante Nazionale. […] Poi da Aragno ove si unirono a noi i due Levi,[373] Vailati, ecc. Mi scordavo di dirti che son qui anche i coniugi Severi come i coniugi Enriques. Poi giunse da Aragno Guccia con Poincaré, scienziato sommo che da gran tempo desideravo conoscere. Guccia mi consegnò il *chèque* di 3000 £ e la mediaglietta d'oro che domani io dovrò consegnare al vincitore, dopo letta la relazione. Questa mediaglietta egli fece già vedere a varie persone; ma sopra è incollata una listina di carta in modo da nascondere soltanto il nome del vincitore, che non si deve conoscere prima della proclamazione! // Una copia in argento di quella medaglia ha regalato a ciascuno di noi tre commissari. Alle 15 avevamo seduta ai Lincei, non del Congresso, ma dell'Accademia. Il Presidente Blaserna[374] cominciò con un saluto ai 5 illustri soci stranieri che eran presenti: Noether, Zeuthen, Gordan,[375] Darwin,[376] Mittag-Leffler. Vi era pure la giovane figlia di Noether,[377] *dottrice* in matematica. Ed assistevano come spettatori vari congressisti stranieri, di cui così ho fatto la conoscenza. […] // 6 mattina. Prima d'andare alla seduta inaugurale al Campidoglio (col Re; ma è prescritta la redingote, non il frac) aggiungo due righe. Iersera alle 18 sono andato dai Volterra, ove ho trovato con lui

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[369]Salvatore Pincherle (1853–1926).

[370]Paolo Pizzetti (1860–1918).

[371]Gian Antonio Maggi (1856–1937).

[372]Carl David T. Runge (1856–1927).

[373]Beppo Levi (1875–1961), Eugenio Elia Levi (1883–1917).

[374]Pietro Blaserna (1836–1918).

[375]Paul Gordan (1837–1912).

[376]George Howard Darwin (1845–1912).

[377]Emmy Noether (1882–1935).

Mittag-Leffler e un altro svedese. Ho visto la sigᵃ Angelica,[378] che sta bene e ti saluta. Mi son goduto molto i 3 bambini che han subito stretto amicizia con me, e mi han fatto grandi discorsi. La Luisa si ricordava i nomi delle nostre care figliole. Son rimasto fin le 19¼, senza che giungesse la sigᵃ Virginia,[379] che era andata ad un concerto colla sigᵃ Mittag-Leffler.[380] L'ho vista più tardi al ricevimento dal Rettore, ove ho potuto andare senz'essere insonnito (forse grazie ad una tazza di thé che avevo preso da Volterra). Folla immensa, ottimo trattamento a cui ho fatto onore.

54. Extract of Corrado Segre to Olga Michelli Segre, Rome 6–7 April 1908

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11940, fols. 1r-2r

Ho letto or ora la mia relazione sul premio Guccia,[381] davanti ad un pubblico immenso. Come già a Heidelberg son riuscito, parlando ad alta voce, lentamente, e con colorito ad incatenare l'attenzione di tutti; quantunque in maggioranza fossero stranieri e non in grado di capire sempre. Il gran segreto fu svelato! La Commissione (Noether, Poincaré e Segre), non riconoscendo degno del premio nes//suno dei concorrenti, ha cercato fra i lavori stampati nel triennio sull'argomento i più meritevoli, ed ha concluso col premiare Severi.[382] Questi assisteva alla seduta, insieme colla Sigᵃ. Grandi applausi. Congratulazioni anche a me per la mia relazione! Domani sera gran pranzo all'albergo del Quirinale, offerto da Guccia alla Commissione e al vincitore.

Domattina 1ᵃ seduta della sezione di Geometria, presieduta da me. Stamani la seduta d'apertura si fece in Campidoglio alla presenza // del Re. Dopo i brevi discorsi di Nathan,[383] Rava[384] e Blaserna[385] vi fu quello, più lungo, di Volterra su la matematica in Italia negli ultimi cinquant'anni.[386] Disse, brevemente per

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[378]Angelica Volterra, mother of Vito Volterra.

[379]Virginia Almagià Volterra, wife of Vito Volterra.

[380]Signe Lindfors, wife of Gösta Mittag-Leffler.

[381]M. Noether, H. Poincaré and C. Segre, Relazione del Concorso Internazionale per la Medaglia Guccia, *Atti del IV Congresso Internazionale dei Matematici Roma 6–11 Aprile 1908*, vol. I, Roma: Tip. R. Accademia dei Lincei, 1909: 209–216. This prize was mentioned on the more important journals of the time: JDMV 17 (1908): 65, 72.

[382]Noether, Poincaré and Segre, Relazione del Concorso Internazionale …, *Atti del IV Congresso …1908*, vol. I, 1909 cit.: 211–216.

[383]Ernesto Nathan (1848–1921, Mayor of Rome. Cf. ICM 1908 Opening Speech by E. Nathan, *Atti del IV Congresso Internazionale dei Matematici …*, vol. I, 1909 cit.: 25–26.

[384]Luigi Rava (1860–1938, Minister of Education. Cf. ICM 1908 Opening Speech by L. Rava, *Atti del IV Congresso Internazionale dei Matematici …*, vol. I, 1909 cit.: 28–30.

[385]Cf. ICM 1908 Opening Speech by P. Blaserna, *Atti del IV Congresso Internazionale dei Matematici …*, vol. I, 1909 cit.: 27.

[386]V. Volterra, Le matematiche in Italia nella seconda metà del XIX secolo, *Atti del IV Congresso Internazionale dei Matematici …*, vol. I, 1909 cit.: 55–66.

ciascuno, qualcosa sui vari indirizzi, nominando quasi tutti i matematici italiani. Citò "il mio amico Segre" molto onorevolmente.[387] Però il tema era troppo spinoso: come si fa a contentare tutti e a dire in pari tempo la verità? Sicché ho già sentito varie critiche!

55. Extract of Corrado Segre to Olga Michelli Segre, Rome 20 April 1908

UTo-ACS. *Documenti di famiglia. Lettere di Segre alla moglie*, 11990, fols. 1v, 2v.

Stamane ho avuto la visita di Fano, che è qui di passaggio per andare a Messina. Abbiam preso qualche accordo, nell'ipotesi (che è quasi certezza) che egli vinca // il concorso. […] Quanto alla lettera di Noether[388] mi ha soddisfatto molto, non solo perché mi dà ragione, ma anche perché riconosce che non è tanto facile risolvere la difficoltà che io ho sollevata: egli stesso non lo può fare.

56. Corrado Segre to Ernest J. Wilczynski, Turin 20 April 1908

EJWP, B2 F2, fols. 1r-2v.

Torino 20 IV 08

Caro Prof. Wilczynski,

Le ho inviato giorni sono una copia che ancora avevo della mia Nota sulla riducibilità delle trasformazioni Cremoniane.[389] Ed ho scritto a Castelnuovo che Le inviasse un esemplare della sua propria, se ancora ne aveva. Quanto all'altra questione che Ella mi faceva nella Sua lettera del 29 III, ho interrogato mio fratello Arturo,[390] che è docente in questa Facoltà di Lettere, e conosce i giovani che si laurearono qui in questi ultimi anni. Egli mi ha detto che potrebbe raccomandare il *Dr Carlo Calcaterra*,[391] dottore in lettere, laureatosi qui // con pieni voti assoluti nell'autunno scorso, con una buona tesi di letteratura italiana. Mi dice mio fratello che questo giovane è serio, accurato nei suoi studi, modesto e colto; e che è stimato anche pei versi che ha pubblicato negli anni 1906–07. Egli invierà presto la sua domanda, corredata dei suoi titoli.

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[387]Volterra (1909) cit.: 63–64.

[388]This letter seems to be lost.

[389]Segre (1900–01).

[390]Arturo Segre (1873–1928), brother of C. Segre, was a teacher at the Liceo M. D'Azeglio in Turin and a historian of the Savoy Kingdom.

[391]Carlo Calcaterra (1884–1952).

Ho ricevuto a suo tempo la Sua Memoria sulle superficie,[392] che ho letto con interesse. Non so se Ella abbia osservato nelle due mie Note, che Le inviai l'anno scorso, una certa tendenza ad occuparmi di geometria differenziale projettiva.[393] Anche nel corso // che ho svolto quest'anno intorno a certe parti della geometria della retta ho dato speciale rilievo alle questioni projettive generali, cioè che non esigono l'algebricità degli enti considerati.[394] Son persuaso che in questo campo della geometria differenziale projettiva vi sia molto da mietere! Ella ha fatto molto bene ad occuparsene; e può esser contento dei Suoi risultati. Da molte parti ho inteso gli elogi del Dr Sisam[395]; ed io sarò molto lieto se l'anno venturo lo avrò fra i miei scolari!

Il Congresso di Roma è riuscito bene. Mi spiacque che né Lei, né altri miei amici Americani, // non abbian potuto venire. Ho fatto la conoscenza personale di E.H. Moore.[396] Vi era anche Newcomb,[397] che già conoscevo. Il prossimo congresso si farà a Cambridge (England). La medaglia Guccia fu conferita a Severi, mio antico allievo. Cordiali saluti Suo aff^{mo} C. Segre.

57. Charles H. Sisam to Ernest J. Wilczynski, Turin 12 December 1908

EJWP, B2 F10, fols. 1r-2v.
   Turin, Italy 12.XII.08
   Dear Professor Wilczynski

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[392]E.J. Wilczynski, Projective Differential Geometry of Curved Surfaces, *Transactions of the AMS*, 8 (1907): 233–260, 9 (1908): 79–120, 293–315.

[393]Segre (1884e), (1906).

[394]Cf. Segre's *Notebook* 21, *1907–08 Capitoli vari di Geometria della retta*: 43–48, in Giacard,i 2013.

[395]Charles Herschel Sisam (1879–1964). On his stay in Turin see Sect. 4 above. Born in Cedar Rapids, Iowa, Sisam studied as an undergraduate at the University of Michigan. He received his Ph.D. from the Cornell University in 1906, having submitted, under Snyder's supervision, the dissertation *Classification of Scrolls of Order Seven Having a Rectilinear Directrix*. Then he went to postdoctoral studies in Europe at Göttingen and Turin. Returned to the United States he taught at the Naval Academy and the University of Illinois. In 1918 he obtained the chair of Mathematics at Colorado College and retired in 1948. Sisam spoke at the ICM in Toronto in 1924 and in Bologna in 1928. He was cooperating editor of the *Transactions of the AMS* (1930–1935).

[396]Eliakim Hastings Moore (1862–1932). American mathematician, from 1892 until his death he was head of Mathematics Department at Washington University. After his Ph.D. received from the Yale University, where he submitted the dissertation, supervised by Huber Anson Newton, *Extensions of Certain Theorems of Clifford and Cayley in the Geometry of n Dimensions*, he went to continue his studies in Germany (Parshall 1988; 1989).

[397]Simon Newcomb (1835–1909). Canadian and American astronomer and applied mathematician, he was Professor of Mathematics in the U.S. Navy and at Johns Hopkins University.

I hope you will excuse me for having delayed so long in writing to you. I have been trying for some time to find an opportunity to write to my friends, but the days fly past so rapidly that it has gotten to be December before I knew it. We spent a very pleasant summer in Göttingen where I attended Klein's and Hilbert's lectures and read in the library.[398] I liked it very well there although not so well as I do here. As soon as the semester ended we spent a month travelling up the Rhine and through Switzerland and arrived in Turin on the third of September. // We spent several days looking for suitable apartments and finally settled down in the apartments occupied by Professor Dowling,[399] of Wisconsin, when he was here a couple of years ago. We are very comfortably located and the people in the dining-room—who are mostly students—are very kind about helping us with the language; which meant a good deal to us, especially at first.

While Turin is not considered to be of especial interest to travelers, we have found it a pleasant and interesting place to live in. It is well laid out and maintained with a great deal of civic pride. On clear days the snow-clad Alps in // the distance are very beautiful and form, according to our ideas, one of the chief attractions of the city. There are also, here, several interesting collections of art and antiquities.

I am most highly pleased with Professor Segre. He fully lives up to all the nice things I heard about him before I came here. In his lectures he speaks very distinctly and I have had no difficulty whatever in following them. In his lectures this year he is covering, in a general way, the entire field of Geometry.[400] In our private conferences at his home he is very approachable, makes me feel entirely at liberty to come where I want to, and is very stimulating. I am working on some properties of triply infinite varieties // in five dimensions, with references to line geometry. I am very much pleased with the results I have obtained thus far. Professor Beman[401] of Michigan, has been in Rome all this fall. He is devoting his time primarily to seeing the sights, however I take it, and only secondarily to Mathematics.

We had our first snow-storm here yesterday morning. When we arose, the ground was really covered. It snowed a little more during the morning but by night the snow was all gone.

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[398]On Sisam's stay in Göttingen cf. JDMV 17 (1908): 87.

[399]Linnaeus Wayland Dowling (1867–1929). He graduated from Adrian College in 1890 and obtained the Ph.D. of Philosophy at Clark University in 1895, with the disseration *On the Forms of Plane Quintic Curves*, supervised by William Eduard Story. He went in Turin to attend the course of Advanced Geometry on *I Gruppi in Geometria*, held by C. Segre in 1906–07, cf. Segre's *Notebook* 20 (in Giacardi 2013). Returning to the United States, he gave his entire service of 33 years to the University of Wisconsin, becoming successively Instructor, Assistant Professor, Associate Professor, and Professor of Mathematics. His special field of research was geometry, and he was the author of textbooks on Analytic Geometry, Projective Geometry, and Mathematics of Insurance. In obituary of L.W. Dowling it is underlined his love for Italian culture (Linnaeus Wayland Dowling In memoriam, *Bulletin of AMS* 35 (1929): 123): "His knowledge of the language and literature of Italy, where he studied under the geometer Segre, was exceptional; and he was an ardent reader and lover of poetry.".

[400]Cf. Segre's Notebook 22, *1908–09 Rassegna di concetti e metodi della Geometria moderna*, fols. 239, in Giacardi 2013.

[401]Wooster Woodruff Beman (1850–1922).

Wishing you a Merry Christmas and a Happy New Year, I remain yours truly Char. H. Sisam.

58. Charles H. Sisam to Ernest J. Wilczynski, Turin 29 March 1909

EJWP, B2 F10, fols. 1r-2v.

Turin, Italy March 29, 1909

Dear Professor Wilczynski

Your favor of March 14 was duly received. I was quite surprised to hear of the problem you have given. Mr. Börger[402] and I fear that there may be some chance for a conflict. My problem is not in the least algebraic and depends fundamentally on some invariants of a system of differential equations. It deals with three-spreads in n dimensions which satisfy four, or more, partial differential equations of the second order. The three-spreads in S_5 satisfy four such equations and form an important particular case. I have determined under what conditions a three-spread satisfies more than four // such equations and have shown that, if it satisfies four, it has at each point, four tangents having contacts of the second order with the three-spread. I have determined under what conditions the three-spread has, at each point, an infinite number of such tangents and under what conditions two or more of the four tangents coincide.

As my results are already worked out I will ask Dr. Börger to let me furnish him with the results for this part of the problem insofar as they may be useful to him in building up the other phases of this interesting problem. In return, I shall be glad, if I am informed as to what he is doing, to keep out of his way. I shall write to Dr. Börger, too, in regard to the matter. // I was very glad to hear of yours campaign in regard to the matter of appointments. I have already heard something about your address although I have not read it. There certainly is a "crying need" for such a reform in America and I am glad that you have set your shoulder to the wheel to bring it about. If I can be of any service to you in the matter I shall be glad to do so. I have, in fact, already done a little stirring among my friends. Mrs. Sisam and I are both very sorry to learn of Mrs. Wilczynski's ill health. We hope that her trip next summer will bring her, not only a great deal of happiness but better health as well. I fear that // we shall not see you next summer as we leave about the middle of June for Paris.

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[402]Robert Lacey Börger (1873–1932). In 1907 he discussed his Ph.D. Thesis *On the Determination of Ternary Linear Groups in a Galois Field of Order p^2* under Leonard Eugen Dickson's supervision. He was instructor at the University of Illinois and he moved to Ohio University in 1916. Cf. Zitarelli, David, Hilbert in Missouri, *Mathematics Magazine* 84 (2011): 351–364, in particular 357.

Mr. Denton seems to have done very well with his master's thesis[403] and to have conferred a great deal of credit, not only upon himself but upon his teacher.

Have you talked over with Dean Townsend,[404] yet, the matter of revising the courses in Geometry which we discussed together last spring? Yours truly, Charles H. Sisam.

Care of Paolo Longo, via Pio V 16, Torino, Italia.

59. Corrado Segre to Ernest J. Wilczynski, Turin 16 April 1916

EJWP, B2 F2, fols. 1r-2v.

Torino 16 IV 16

Caro Prof. Wilczynski,

Ebbi la Sua lettera del 9 III,[405] e più tardi la memoria Yeaton.[406] Ho dato un rapido sguardo a questa, fidandomi per i particolari nella revisione che Ella già ne ha fatto. E poi, persuaso che essa lo meriti, l'ho inviata per la stampa agli *Annali di matematica*. Potrà essere stampata nell'autunno di quest'anno.[407]

La interesserà sapere, a questo riguardo, che il Prof. G. Fubini[408] in seguito a una questione che gli avevo posto, ha fatto in // questi ultimi tempi delle ricerche di geometria projettiva-differenziale delle superficie, in cui figurano le Sue *Directrix-Curves* (che egli chiama "linee di Wilczynski"),[409] insieme con altre (che egli chiama "di Darboux-Segre")[410] che Ella ha pure incidentalmente nominato in una Sua Memoria.[411] Queste ricerche di Fubini La interesseranno certamente. Una Memoria è in corso di stampa negli *Annali di Matematica*.[412] Una Nota è uscita già nei *Rendiconti Lincei* di febbrajo (vol. 25 fascic.º 3º)[413]: e si riferisce a quelle

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[403]William Wells Denton (1882–1961). In 1912 he would have discussed his Ph.D. Thesis on *Projective Differential Geometry of Developable Surfaces*, under Edgar Jerome Townsend's supervision.

[404]Edgar Jerome Townsend (1864–1955).

[405]This letter seems to be lost.

[406]Chester H. Yeaton (1886–1970).

[407]Yeaton, Chester H., Surfaces characterized by certain special properties of their directrix congruences, *Annali di Matematica pura ed applicata*, (3) 26 (1917): 1–34.

[408]Guido Fubini (1879–1943).

[409]G. Fubini, Invarianti proiettivo–differenziali delle curve tracciate su una superticie e definizione proiettivo-differenziale di una superficie, *Annali di Matematica pura ed applicata*, (3) 25 (1916): 229–252, in particular 233 and 249–251.

[410]Fubini (1916) cit.: 229, 230, 233, 243–244, 250.

[411]E.J. Wilczynski, Projective Differential Geometry of Curved Surfaces, *Transactions of the AMS* 10 (1909): 279–296, in particular 282.

[412]Fubini (1916) cit.

[413]Fubini, Guido, Su una classe di congruenze W di carattere proiettivo, *Atti R. Accademia dei Lincei Rendiconti Classe di Scienze fisiche, matematiche e naturali* 313, 5, 25 (1916): 144–148.

superficie su cui il sistema delle linee di Wilczynski è un sistema coniugato. (Sono // dunque un caso particolare di queste superficie quelle del Dr Yeaton). Fubini dimostra che tali superficie si posson anche definire come quelle che son falde focali di congruenze rettilinee, che fan corrispondere sulle 2 falde focali le linee Darboux-Segre (particolari congruenze W). Un altro lavoro di questa serie è stato inviato da Fubini ai *Rendiconti* di Palermo.[414] Egli non mancherà certo d'inviarle gli estratti, a suo tempo, forse tutti insieme. Per risparmiar tempo, posso pregare Lei di comunicare al Dr Yeaton ciò che in questa lettera lo può interessare? Voglia anche // raccomandargli a nome mio di usare molta cura, quando sarà il momento, nella correzione delle bozze del suo lavoro (i giovani principianti non vedono facilmente gli errori di stampa: bisogna che usino più attenzione che noi maturi!). S'intende che poi le rinvierà direttamente alla Stamperia da cui le riceverà. Tanti cordiali saluti a Lei. Auguri al Suo discepolo Dr Yeaton. Suo aff^{mo} C. Segre.

60. Corrado Segre to Ernest J. Wilczynski, Turin 2 March 1917

EJWP, B2 F2, f. 1r-v.

   Torino 2 III 17

   Caro Prof. Wilczynski,

   il sig. A. F. Carpenter[415] mi manda un suo scritto per gli *Annali di matematica, Some fundamental relations in the projective differential geometry of ruled surfaces*,[416] dicendomi che me lo invia dietro suggerimento di Lei[417] in conseguenza io prego Lei di dirmi qual è il Suo pensiero sul valore di quello scritto. Quanto a me, ho dato finora solo un'occhiata ai risultati del lavoro, ed ho potuto controllare con rapide considerazioni sintetiche alcune applicazioni che l'Autore fa delle sue formole. Ma m'im-//porta molto avere da Lei un giudizio sulle formole stesse. Scusi del disturbo, e gradisca i miei cordiali saluti Suo aff^o C. Segre.

[414]Fubini, Guido, Applicabilità proiettiva di due superficie, *Rendiconti del Circolo Matematico di Palermo* 41 (1916): 135–162.

[415]Allen Fuller Carpenter (1880–?). Born in Marengo, Iowa on 12 January 1880, he studied at the Department of Mathematics of the University of Nebraska (1908–09). In 1915 he received Ph.D. from the University of Chicago where he submitted his dissertation on differential geometry, under Wilczynski's supervision: Rules Surfaces whose Flecnode Curves have Plane Branches, *Transactions of the AMS* 16 (1915): 509–531. Carpenter was faculty instructor with rank of captain at the University of Washington, then the chairman of the Mathematical Department at the same University.

[416]Carpenter, Allen Fuller, Some fundamental relations in the projective differential geometry of ruled surfaces, *Annali di Matematica pura ed applicata*, (3) 26 (1917): 285–300.

[417]The words "di Lei" are underlined in the manuscript.

61. Virgil Snyder[418] to Corrado Segre, Ithaca 21 November 1922

UTo-ACS. *Carteggi, Annali di Matematica*, 12480, f. 1 typewritten letter with autograph signature.

Department of Mathematics Cornell University Ithaca N.Y.

21 Novembre 1922

Caro Professore Segre

Rispondendo al suo chiesto, voglio dire che il *Bulletin Amer*[ican] *Math*[ematical] *Soc*[iety] per l'anno presente non costa [al]la Biblioteca matematica di Torino nulla.

Il "Council" della Società non ha, fino ad ora, fatto una decisione finale concernente le soscrizioni Europee mentre il cambio è tanto disastroso. Per quest'anno però, io mi sono permesso di presentare il *Bulletin* alla Biblioteca di Torino, in considerazione parziale della gentile accoglenza che ho trovato in Torino. Durante il mio soggiorno a Torino mi ricordo d'una conversazione con Lei concernente gli *Annali* e, in particolare, d'una osservazione che Lei ha fatto: "… va male, lo stato finanziario degli *Annali* è molto difficile". Quest'occasione mi ha data l'opportunità di chiamare l'attenzione dei matematici Americani sugli *Annali* e di pregarli di accrescere il numero delle soscrizioni. Dopo la seduta della Società in Settembre ho mandato una lettera ai soci (una copia di questa lettera si trova in questa busta)[419] pregandoli di prendere gli Annali, o almeno di aiutarli.

Fino ad ora ho ricevuto i seguenti sottoscrittori,[420] e una summa in denaro. Inoltre vi sono alcuni, non so quanti, che hanno mandato le loro soscrizioni direttamente agli editori in Milano.

Le mando due checks, l'uno per Lire 1904, che rappresenta la summa che io stesso ho ricevuto, l'altro viene dal Sig. Moore in Cambridge,[421] pagando per i quindici soscrittori in Cambridge. Per queste summe la prego di pagare tutte le soscrizioni, e di ritenere il resto per le spese generali degli *Annali*.

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[418]Virgil Snyder (1869–1950). Born in Dixon, Iowa in 1869, Snyder attended Cornell University, after graduating from Iowa State College in 1890. Supported by a W. Brooks fellowship from Cornell, in 1892 he went to study mathematics under Felix Klein's guidance in Göttingen, where he received his Ph.D. with the dissertation *Über die Lineare Complexe der Lie'schen Kugelgeometrie* (1895). Then he returned to Cornell where he stayed for his entire career. Snyder was an invited speaker at three International Congress of Mathematicians, he served as president of the Society (1927–28) and supervised over forty Cornell Ph.D., three of whom were speakers at the International Congress of Mathematicians over the years. He was a fellow of the American Academy of Arts and Sciences. He died in Ithaca in 1950.

[419]Cf. Annex 61.1.

[420]Cf. Annex 61.2 *Elenco dei soscrittori agli Annali di Matematica*, sent by Snyder.

[421]Clarence Lemuel Elisha Moore (1876–1931). He had travelled for a year in Europe, where he was influenced by E. Study in Bonn and by C. Segre in Turin (Struik 1989, 166). In 1904 C.L.E. Moore received his Ph.D. in Mathematics from the Cornell University, having submitted the dissertation *Classification of the Surfaces of Singularities of the Quadratic Spherical Complex*, under V. Snyder's supervision. From 1904 on he took a position at the MIT were he stayed until his retirement in 1931. Cf. Sect. 4 above.

Mia moglie ed io noi ricordiamo con gratitudine nostra visita a Torino, ed in particolare, della affabilità di Lei e della sua gentile signora. Speriamo di rivedere loro più tardi. Con cordiali saluti il suo Virgil Snyder.

61.1 Virgil Snyder to the Members of the *AMS*, Ithaca 18 September 1922

UTo-ACS. Carteggi, *Annali di Matematica*, 12470, f. 1 typewritten letter with note "Copia della lettera circolare"

Ithaca, New York September 18, 1922

My dear colleague,

Among the numerous adjustments made necessary by present economic conditions, are several concerning mathematical books and periodicals. The increased price of American publications has afforded at least temporary relief, and various gifts and subventions to a number of European periodicals have supplied them with new life and vigor.

Among those still adversely affected is the *Annali di Matematica*, published by Tipo-Litografia Off Carte Valori Turati Lombardi e C, Via Rovello 16, et Milano, Italy. Its present editors, L. Bianchi, of Pisa, G. Jung, of Milano, E. Pincherle, of Bologna, and C. Segre of Torino, have succeeded in tiding it over thus far, partly by their own personal contributions and partly by advances from public spirited Italian banks, but this relief is at best temporary and of course cannot be continued indefinitely. Notwithstanding this struggle, the standard set by the *Annali* has been maintained, and it continues and will continue to rank among the highest mathematical periodicals.

Neither the editors nor the publishers are making any appeal, but after I learned of the condition I felt it my duty and my privilege to call attention of fellow Americans to it, and personally to invite them to cooperate with me in a step that will help themselves as well as the *Annali*.

My proposals, approved by the Council of the American Mathematical Society is to have a representative in each institution to join with his colleagues in providing for one or more subscriptions, or in making cash contributions for the purpose. Will you kindly serve in that capacity for

The periodical appears quarterly, and costs 40 Lire per volume. Subscriptions may be sent to me or directly to the publishers. Cash contributions should be sent to me. About November 15 I shall send the total amount received to Professor Segre. Sincerely yours, Virgil Snyder.

61.2 List of Subscribers to *Annali Di Matematica*[422]

UTo-ACS. *Carteggi*, *Annali di Matematica*, 12490, f. 1r-v.
 Elenco dei soscrittori agli Annali di Matematica

Professor I.A. Barnett,[423] Saskatoon, Saskatchewan, Canada.
Professor S. Lefschetz,[424] 937 Missouri St. Lawrence, Kansas, U.S.A.
Professor E.B. Stouffer,[425] 1019 Maine St. Lawrence, Kansas, U.S.A.
Professor Thomas E. McKinney,[426] 222 North University St. Vermilion, South Dakota, U.S.A. (Sig. McKinney ha pagato per quattro anni, 1923–1926).
Professor John A. Miller,[427] Swarthmore College, Swarthmore, Tenn. U.S.A.
Professor L.P. Einsenhart,[428] Princeton University, Princeton, New Jersey.

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[422]Segre added in the ms: "(vol. 1° della 4ª serie)". Not by hand of Snyder, with some corrections by C. Segre.

[423]Isaac Albert Barnett (1894–1974). He received the Ph.D. in Mathematics from the University of Chicago in 1918 with the dissertation *Differential Equations with a Continuous Infinitude of Variables*, advisor Gilbert Ames Bliss.

[424]Solomon Lefschetz (1884–1972). He was a Russian born, Jewish mathematician who from a young age was educated in Paris, where from 1902 to 1905 he attended lectures by E. Picard and P. Appell. In 1905 Lefschetz went to the United States of America and working for Westinghouse Electric Company in Pittsburgh he had the misfortune to lose both his hands and forearms. He received the Ph.D. from Clark University in 1911, submitting the thesis on algebraic geometry entitled *On the Existence of Loci with Given Singularities* (advisor William Edward Story). Then he was appointed an instructor in mathematics at the University of Nebraska in Lincoln (1911–1913) and at the University of Kansas in Lawrence (1913–1915). Promoted to Assistant Professor in 1916 and to Associate Professor in 1919, he became full professor in 1923. For his contributions he was awarded the Prix Bordin (1919) and the Bôcher Memorial Prize (1923). Then Lefschetz went to Princeton as a visiting Professor (1924) and there he accepted a permanent post as Associate Professor, becoming Henry Fine Research Professor in 1933.

[425]Ellis Bagley Stouffer (1884–1965). He was Professor of Mathematics and Dean of the Graduate School at the University of Kansas. After the degrees of Bachelor of Science and Master of Science from Drake University at Des Moines, Iowa, in 1911 he received a Doctor of Philosophy degree from the University of Illinois discussing the thesis *Invariants of Linear Differential Equations, with Applications to Ruled Surfaces in Five-Dimensional Space*, under E.J. Wilczynski's supervision.

[426]Thomas Emery McKinney (1864–1930). Student at J. Hopkins, in 1905 received his Ph.D *Concerning a Certain Type of Continued Fractions Depending upon a Variable Parameter*, under E.H. Moore's supervision. He was Professor of Mathematics and Astronomy at the University of South Dakota.

[427]John Anthony Miller (1859–1946). Pupil of Heinrich Maschke, under his supervision Miller received the Ph.D. at the University of Chicago, discussing the dissertation: *Concerning Certain Elliptic Modular Functions of Square Rank* (1899). He was Professor of Mathematics and Astronomy and vice-president of the Swarthmore College.

[428]Luther Pfahler Einsenhart (1876–1965). He was introduced to differential geometry at Hopkins, after a lecture by Thomas Craig. He received his PhD in 1900 and he went to Princeton, where he took part in founding and leading the American school of differential geometry (Truesdell 1984, 416).

Professor J.W. Alexander,[429] Princeton University, Princeton, New Jersey.
Professor A.F. Carpenter,[430] University of Washington, Seattle, Washington.
Professor C.F. Craig,[431] 311 Ehnwood Ave., Ithaca, New York, U.S.A.
Professor Arthur Ranum,[432] 3 Central Ave., Ithaca, New York, U.S.A.
Professor Virgil Snyder,[433] 214 University Ave., Ithaca, New York, U.S.A.
Dr. J.R. Musselman,[434] Johns Hopkins University, Baltimore, Maryland, U.S.A.
Dr. F.D. Murnaghan,[435] Johns Hopkins University, Baltimore, Maryland, U.S.A.

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[429]James Waddel Alexander II (1888–1971). After his studies in mathematics and physics at Princeton, where he obtained the bachelor degree (1910) and the master degree (1911), in 1912 he went to Europe to further his studies at Paris and Bologna. In 1915 he received from Princeton the Ph.D with the dissertation *Functions Which Map the Interior of the Unit Circle Upon Simple Regions*, under Oswald Veblen's supervision. Then he was instructor and lecturer at Princeton and from 1917 served as a lieutenant in the U.S. Army Ordnance Office at the Aberdeen Proving Ground. Returned to Princeton, Alexander was appointed Assistant Professor (1920) and was promoted to Associate Professor in 1926 and full Professor in 1928. He married the Russian Natalia Levitzkaja and they spent time from 1917 until 1937 in Chamonix or in the Swiss Alps, where Alexander used to climb mountains.

[430]See footnote 415 above.

[431]Clyde Firman Craig (1881–1964). In 1908 he received from Cornell University the Ph.D. in Mathematics, submitting the dissertation *On a Class of Hyperfuchsian Functions*, published on the *Transactions of the AMS* 11 (1910): 37–54.

[432]Arthur Ranum (1870–1934). Born at La Crosse, Wisconsin, he received the bachelor degree from the University of Minnesota (1892). Then he studied mathematics at Cornell University (1893–96) and in 1896–97 was a graduate student at the University of Chicago. Then he was Professor of Mathematics and Astronomy at the University of Washington (1897–1904), instructor in mathematics at the University of Wisconsin (1904–05). In 1906 he was awarded his Ph.D. in Philosophy at the University of Chicago, under Leonard E. Dickson's supervision, with the dissertation *The Group of Classes of congruent Matrices with applications to the Group of Isomorphisms of any Abelian Group*, Chicago: University of Chicago, 1906. He was Assistant Professor at the Cornell University from 1907, where he spend the rest of his career.

[433]See footnote 418 above.

[434]John Rogers Musselman (1890–1968). He received his Ph.D. in Philosophy from the Johns Hopkins University in 1916, under the direction of Arthur Byron Coble. He was a teaching assistant at Gettysburg Academy (1910–1912), an instructor in mathematics at the University of Illinois (1916–18) and at Washington University (1920–1928), a Professor of Mathematics at Western Reserve University in Cleveland (1928–1961). Some of his articles are published on the *American Journal of Mathematics*.

[435]Francis Dominic Murnaghan (1893–1976). Irish mathematician who moved to the Johns Hopkins University in 1913, after his first-class honors BA in mathematical sciences. Here he received a Ph.D., under the supervision of Harry Bateman and Frank Morley, presenting the dissertation *The Lines of Electric Force Due to a Moving Electron*. According to C.A. Truesdell, for two decades he had dominated the activity in mathematics and mathematical physics at Johns Hopkins for his contributions to group theory and mathematics applied to continuous mechanics (Truesdell 1984, 60, 406–409, 419–431).

Dr. C.A. Nelson,[436] Johns Hopkins University, Baltimore, Maryland, U.S.A.
Professor D.P. Bartlett,[437] Mass. Institute of Technology, Cambridge Mass.
Dr. F.S. Woods,[438] Mass. Institute of Technology, Cambridge Mass.
Dr. C.L.E. Moore,[439] Mass. Institute of Technology, Cambridge Mass.
Dr. N.R. George,[440] Mass. Institute of Technology, Cambridge Mass.
Dr. L.M. Passano,[441] Mass. Institute of Technology, Cambridge Mass.
Dr. H.B. Phillips,[442] Mass. Institute of Technology, Cambridge Mass.
Dr. J. Lipka,[443] Mass. Institute of Technology, Cambridge Mass.
Dr. F.L. Hitchcock,[444] Mass. Institute of Technology, Cambridge Mass.
Dr. G. Rutledge,[445] Mass. Institute of Technology, Cambridge Mass.
Dr. N. Wiener,[446] Mass. Institute of Technology, Cambridge Mass.
Dr. S.D. Zeldin,[447] Mass. Institute of Technology, Cambridge Mass.
Dr. L.H. Rice,[448] Mass. Institute of Technology, Cambridge Mass.

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[436]Cyril Arthur Nelson (1893–1984). In 1919 he received his Ph.D. from the University of Chicago, where he presented the dissertation *Conjugate Systems with Conjugate Axis Curves*. Nelson taught at different colleges and at the Johns Hopkins University. From 1927 he accepted a position at the New Jersey College for Women and later became affiliated with Rutgers University until his retirement in 1959.

[437]Dana P. Bartlett (1892–1929).

[438]Frederick Shenstone Woods (18??–1934) In 1895 he received the Ph.D. from Göttingen University, discussing the dissertation *Über Pseudominimalflächen*, under F. Klein's supervision. Returned to the United States he played an important role in upgrading mathematics instruction at the MIT and other technical schools (Parshall and Rowe 1989, 15–16).

[439]See footnote 421 above.

[440]Nathan R. George, Jr. (19??–1936).

[441]Leonard Macgruder Passano (1866–1943). Author of mathematical textbooks. On his teaching at the MIT cf. (Struik 1989, 170).

[442]Henry Bayard Phillips (1881–1947), Assistant Professor of mathematics at the Massachusetts Institute of Technology.

[443]The name "J. Lipka" has been added by C. Segre on this list, after the delivery of Snyder's letter dated 5 January 1923. Joseph Lipka (1883–1924) was Polish born, emigrated to America as a child. He was educated at the Columbia University, where he received his Ph.D. in 1912, under Edward Kasner's supervision. In 1921 Lipka went to Italy for study under T. Levi-Civita and he represented the MIT at the 700th anniversary of Padua University in 1922 (Struik 1989, 169).

[444]Frank Lauren Hitchcock (1875–1957). In 1910 he obtained a Ph.D. from Harvard University with a thesis entitled *Vector Functions of a Point*.

[445]George Rutledge (1881–1940). He received his Ph.D. from the University of Illinois in 1915 with the thesis *The Number of Abelian Subgroups of Groups Whose Orders are the Powers of Primes*, under George Abram Miller's supervision. At the MIT he was Instructor (1915–23), Assistant Professor (1923–29); Associate Professor (1929–34) and Professor (1934–1940).

[446]Norbert Wiener (1894–1964).

[447]Samuel Demitry Zeldin (1894–1965). Born in Russia Zeldin obtained the Ph.D. from the Clark University in 1917, with the thesis *On the Structure of Finite Continuous Groups with a Single Exceptional Infinitesimal Transformation*. (Struik 1989, 170).

[448]LePine Hall Rice (1870–1933). At the MIT he was Instructor (1919–29) and Assistant Professor (1929–1933) (Struik 1989, 169).

Dr. R. Douglass,[449] Mass. Institute of Technology, Cambridge Mass.
Dr. K.L. Wildes,[450] Mass. Institute of Technology, Cambridge Mass.
Dr. J.S. Taylor,[451] Mass. Institute of Technology, Cambridge Mass. //
The[452] Library Iowa State College, Ames, Iowa, U.S.A.
Professor W.L.G. Williams,[453] White Hall, Ithaca, New York, U.S.A.

62. Virgil Snyder to Corrado Segre, Ithaca 8 December 1922

UTo-ACS. *Carteggi*, *Annali di Matematica*, 12510, f. 1r.

American Mathematical Society, Virgil Snyder, 214 University Avenue, Ithaca N.Y.

Ithaca, il 8 dec. 1922

Caro Professore Segre,

Dopo averle mandato l'altro "check" per gli *Annali*, ho ricevuto alcuni contributi ritardati. Ecco un piccolo incremento.[454] Speriamo che anche altri seguiranno. Mia moglie ed io desideriamo esprimere i nostri auguri migliori per un felice capo d'anno per Lei e per la sua gentile signora. Con cordiali saluti, suo Virgil Snyder

63. Virgil Snyder to Corrado Segre, Ithaca 5 January 1923

UTo-ACS. *Carteggi*, *Annali di Matematica*, 12580, f. 1r.

Ithaca 5 gennaio 1923

Caro Professore Segre,

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[449]Raymond Donald Douglass (1894–1960). He received his Ph.D. from the MIT in 1931 with the thesis *Stirling Expansions Derived by Means of Finite de la Vallèe-Poussin Summation*, under Rutledge's supervision.

[450]Karl Leland Wildes (1895–1986) was Instructor (1920–23) and professor at the Department of Electrical Engineering of the MIT.

[451]The name "J.S. Taylor" has been added by C. Segre on this manuscript, after the delivery of Snyder's letter dated 5 January 1923. James Sturdevant Taylor obtained his Ph.D. from the University of California in 1918 with the thesis *A set of five postulates for Boolean algebras in terms of the operations "exception"*, under the supervision of Mellen Woodman Haskell. Taylor was instructor in Mathematics at the MIT from 1919 to 1924.

[452]These last two names have been added by C. Segre on this manuscript, after the delivery of Snyder's letter dated 19 February 1923.

[453]William Lloyd Garrison Williams (1888–1976). He received his Ph.D. from the University of Chicago under L.E. Dickson's supervision in 1920 with the thesis *Fundamental Systems of Formal Modular Seminvariants of the Binary Cubic*. He joined Cornell University on an instructorship and was promoted to Assistant Professor in 1922.

[454]Snyder wrote "£. 290" in the margin of this manuscript.

Era una vera festa per me d'aver ricevuto la Sua gentile lettera appunto al capo d'anno. La ringrazio cordialmente per i buoni auguri. Sì, anch'io credo che sarà meglior che le sottoscrizioni, che io Le ho mandato, devono cominciare col volume XXXII, piuttosto [che] col volume corrente, di cui un fascicolo doppio è già uscito. In rispetto all'elenco dei sottoscrittori di Cambridge, mi rincresce molto d'aver fatto lo sbaglio di omettere due nomi.[455] Ho fatto una nuova copia che Lei vuole mandare al Professore Jung,[456] per suo uso. Recentemente ho ricevuto due di Suoi scritti, Commemorazione del Reye, e le superficie degl'iperspazi con ∞^2 curve spaziali. Per questi e per tutti gli altri, la ringrazio di nuovo. Per me e per mia moglie sarà difficile aspettare fino al tempo quando possiamo ritornare in Italia! Coi saluti cordiali a Lei e alla Sua Signora Suo Virgil Snyder. //

L'elenco completo dei 15 sottoscrittori agli "*Annali*" di Cambridge, Mass. Tutti collo stesso indirizzo Mass. Institute Technology, Cambridge, Mass., Stati Uniti.

Professor D.P. Bartlett
Professor F.S. Woods
Professor C.L.E. Moore
Professor N.R. George
Professor L.M. Passano
Professor H.B. Phillips
Professor J. Lipka
Professor F.L. Hitchcock
Dr. G. Rutledge
Dr. N. Wiener
Dr. S.D. Zeldin
Dr. J.S. Taylor
Dr. L.H. Rice
Dr. R. Douglass
Dr. K.L. Wildes.

Le sottoscrizioni devono cominciare col volume XXXII, non col volume corrente.

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[455]This typescript list (UTo-ACS. Carteggi. *Annali di Matematica*, 12590, f. 1r) was sent in attachment by Snyder, who must have realized that he had forgotten in the previous manuscript list sent on January 21, 1922 the two names Lipka and Taylor among the subscribers of Cambridge Mass. The typescript contains in the upper left the following note in pencil "R. 19.1.23". It probably refers to the date on which Segre sent the same list to Giuseppe Jung, at the time director of *Annali di Matematica pura ed applicata*.

[456]Giuseppe Jung (1845–1926).

64. Salvatore Pincherle to Corrado Segre, Bologna 27 January 1923

UTo-ACS. *Carteggi*, *Annali di Matematica*, 12640, c. 1r-2v, Letterhead of the *Unione Matematica Italiana*.

Bologna, 27.1.23

Carissimo Segre,

ti ringrazio molto delle informazioni che mi dai sull'azienda degli *Annali*; sono lieto dell'interesse che hanno mostrato per questi alcuni matematici americani, e ciò è un effetto dell'opera tua. Del resto mi pare che, nel momento attuale, l'America sia il solo paese del mondo da cui si possa attendere qualche aiuto finanziario.

Il gr. uff. Franchi,[457] direttore della Casa Zanichelli, uomo intelligentissimo, intraprendente, che ha incoraggiata ed incoraggia presso di noi la produzione matematica in un momento assai difficile, assumerebbe la continuazione degli *Annali*; ma avrebbe voluto garantita la copertura di una parte almeno del deficit, che calcola all'ingrosso in £. 10000 annue (cifra massima). Coi sussidi disponibili che sono presso allo Jung e presso di te, con qualche altro che si può spe[rare] // e con una piccola somma che, per il primo anno, l'U.M.I. toglierebbe al suo fondo di riserva[(*)] se il Consiglio direttivo acconsente, forse il Franchi assumerà l'impresa, anche in perdita per il primo tempo. Il tomo 32 diverrebbe, se il nostro progetto viene ad effetto, il 1° della 4ª serie; ciò è suggerito dal Jung medesimo. Il formato non verrebbe mutato, ma si ridurrebbero alquanto i margini, veramente eccessivi. Sugli altri particolari c'intenderemo facilmente; in quanto al rapporto fra il numero dei lavori di pura teoria e quelli di applicazione, quello da me proposto era un semplice modo di dire che i primi dovrebbero avere la prevalenza; del resto, la bontà del lavoro è naturalmente il primo criterio. Il comitato di redazione, anche per ragione di continuità, dovrebbe rimanere quale è; e se tu parli di cedere il posto ad un più giovane cosa dovrebbe dire un // vecchio quale io sono! Tu devi rimanere in tutti i modi, e così lo Jung che rappresenta il legame colla Direzione Brioschi[458] e che tanto ha fatto e fa per il periodico glorioso. Tutto dipende ora da una gita che il Franchi farà fra breve a Milano, dove vedrà la ditta Turati ed il prof. Jung; al suo ritorno, mi comunicherà la decisione, di cui mi affretterò ad informare te ed il Bianchi.

Circa al Comitato di redazione, aggiungo una proposta che vi sottopongo. Poiché vogliamo fare una parte all'applicazione, non sarebbe bene aggiungere un quinto membro appartenente appunto alle Scienze applicate? In quanto alla persona, mi rimetto a voi; uno di Milano forse andrebbe meglio perché gli *Annali* hanno appartenuto per tanti anni a quella città; ma forse anche il Colonnetti[459] andrebbe bene. Su ciò, mi rimetto interamente ai colleghi. Venendo alla votazione per il Consiglio direttivo dell'U.M.I., hai raccolto sul // tuo nome una bellissima

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[457]Oliviero Franchi.

[458]Francesco Brioschi.

[459]Gustavo Colonnetti (1886–1968).

maggioranza, per non dire l'unanimità dei votanti. Se vuoi rifiutare, farai a me e a tutti noi un grande dispiacere …, ma non ne vediamo il motivo. Anche per la questione internazionale, hai veduto dai primi numeri quanto siamo stati eclettici, e il fatto che numerosi periodici tedeschi ci hanno già chiesto il cambio dimostra che lo scopo puramente scientifico e pacificatore della nostra impresa è stato pienamente riconosciuto anche dagli ex nemici. D'altra parte, l'occhiata più superficiale data al nostro *Bollettino* dimostra che non fa doppio impiego con nessun altro nostro periodico. Dato tutto ciò, perché non vorresti essere dei nostri, onde aiutarci coi tuoi suggerimenti ed i tuoi consigli in un'opera che non potrà che giovare ai nostri studi prediletti? Scusa la lunga chiacchierata, e ricevi i miei più affettuosi saluti Tuo S. Pincherle.

[*] Costituito da un B[uono] del T[esoro] di £. 10000 dovuto all'elargizione di un grande industriale lombardo.

65. Virgil Snyder to Corrado Segre, [Ithaca] 19 February 1923

UTo-ACS. *Carteggi*, *Annali di Matematica*, 12660, f. 1r, typewritten, letterhead *Department of Mathematics Cornell University Ithaca, New York*

19 Febbraio 1923

Caro Professore Segre,

rispondendo alla domanda che Lei mi ha fatta nella Sua lettera recente, voglio dire che l'ultimo *check*, quello per Lire 290, rappresenta solamente contributi liberi, e non sottoscrizioni. Dopo aver scritto l'ultima volta ho ricevuto ancora altri contributi, e anche due sottoscrizioni, i cui indirizzi sono:

The Library, Iowa State College, Ames, Iowa, U.S.A.

Professor W.L.G. Williams, White Hall, Ithaca, New York, U.S.A.

Solo lieto di poter mandarle, con questa, un nuovo *check*; questo per Lire due cento sessanta (£. 260,00). Ho fatto mettere in nostro *Bulletin* che dice che le nuove sottoscrizioni devono cominciare col volume XXXII, di cui il primo numero sarà probabilmente uscito nella primavera di quest'anno.

Siamo qui in New York nel mezzo d'un inverno molto rigido e duro, ma non ostante, mia moglie ed io non vogliamo, non possiamo dimenticare la calda e simpatica accoglienza che abbiamo trovate a Torino. Desideriamo esprimere i nostri migliori auguri a Lei e alla Sua gentile signora. Con cordiali saluti, Suo Virgil Snyder.

66. Salvatore Pincherle to Corrado Segre, Bologna 15 May 1923

UTo-ACS. *Carteggi, Annali di Matematica*, 12790, fols. 1r-2r.

Addì 15 Maggio 1923

Carissimo Segre,

rispondo subito alla tua lettera d'ieri. Non so come tu abbia pensato che nella circolare—che è stata dattilografata sulla bozza corretta da te—il tuo nome non figuri fra i componenti il Comitato di redazione. Vi sono i nostri tre nomi, in ordine d'alfabeto (Bianchi, Pincherle, Segre) e non mi pare che si potesse fare diversamente. A meno che nella copia a te giunta non sia accaduto qualche errore del copista, non riesco a spiegarmi il tuo dubbio, la cui sola espressione mi è rincresciuta assai! Il Levi-Civita, ufficiato dal Bianchi, e al quale io pure ho scritto facendo il tuo nome, ha accettato di entrare nel Comitato. Il suo nome non figura sulla circolare che era già in distribuzione, e ciò non si sarebbe potuto fare senza un accenno // doveroso al ritiro di Jung e alle sue benemerenze. Di ciò, e della assunzione del Levi-Civita al posto di Jung, sarà fatto cenno in una circolare (a stampa) che invieremo a tutti gli antichi associati e che annunzierà a questi, in modo ufficiale, l'inizio della nuova serie. Questa circolare servirà anche di prefazione al primo fascicolo.[460] Penserei che la redazione di questo documento si potesse combinare fra noi alla fine del mese, quando ci troveremo per le sedute dei Lincei, alle quali ritengo che interverrai senza dubbio. Ti pare che convenga questo modo di procedere? Questa circolare, inviata ai periodici esteri, potrà avvertire che si continuano i cambi. In quanto al 1° fascicolo (per il quale ho attualmente due soli lavori, quello di Sannia[461] e la conferenza di Cipolla[462] sulla metamatematica di Hilbert)[463] pare opportuno di diramarlo solo in Ottobre, quando ripiglia dovunque l'attività accademica. // Questo è l'avviso dell'editore, che del 1° fascicolo vuole fare una larghissima distribuzione. Lo *Jahrbuch*[464] è arrivato a Bianchi, il quale me lo ha ceduto per la nostra biblioteca di Matematica—quel periodico non esistendo nella nostra Biblioteca Universitaria; in quanto ai *Monatshefte*,[465] se giungono qui te li spedirò, e se li ricevi tu, puoi continuare a tenerli; solo ti prego di avvisarmi del loro arrivo. Dei *Math.-Annalen* procureremo di aver due copie come per il passato,

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[460]Cf. L. Bianchi, T. Levi-Civita, S. Pincherle, C. Segre, Avvertenza, *Annali di Matematica pura ed applicata*, (4) 1, 1923: I–III.

[461]Gustavo Sannia (1875–1930).

[462]Michele Cipolla (1880–1947).

[463]G. Sannia, Nuova trattazione della geometria proiettivo-differenziale delle curve sghembe, *Annali di Matematica pura ed applicata*, (4) 1, 1923: 1–18; M. Cipolla, Sui fondamenti logici della Matematica secondo le recenti vedute di Hilbert, *Annali di Matematica pura ed applicata*, (4) 1, 1923: 19–29.

[464]The periodical *Jahrbuch über die Fortschritte der Mathematik* began publication in 1869, and was published by Walter de Gruyter until 1943.

[465]The journal *Monatshefte für Mathematik und Physik* was founded by Gustav von Escherich and Emil Weyr in 1890 and was published until 1944.

il Bianchi avendomi detto che ne ricevevate una copia per ciascuno. Ben inteso i condirettori riceveranno, come per il passato, il fascicolo ed è giustissimo che si continui l'invio a Jung. La casa Zanichelli non è ancora riuscita ad avere da Turati né l'elenco dei cessati, né quello degli abbonati! Cordiali saluti dal tuo aff.mo S. Pincherle.

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67. Salvatore Pincherle to Corrado Segre, Bologna 3 November 1923

UTo-ACS. *Carteggi, Annali di Matematica*, 12800, fols. 1r-2v.

Bologna, 3.XI.23

Carissimo Segre,

rispondo anzitutto alla tua cartolina del 5.X, con cui mi chiedevi se abbiamo disponibili posti di assistente, autorizzandomi a stare zitto nel caso negativo. Effettivamente, non vi è attualmente qui alcuna vacanza di tali posti. Vengo ora a riscontrare la tua lettera del 30, e vi rispondo punto per punto.

(1°) Il tuo indirizzo è perfettamente noto alla Casa editrice, che ti chiede di scusare l'errore commesso dall'ufficio di spedizione, il quale ha confuso questo ind-irizzo con quello del destinatario di un recente invio di bozze. L'errore non si ripeterà.

(2°) Il 1867 sfuggito invece del 1897 sulla circolare sarà aggiustato nella ristampa della circolare stessa, che verrà ripubblicata a capo del 1° fascicolo. È poi ben naturale il mutamento della prima parte della circolare in "Col presente fas-cicolo si inizia" … che ora sottinteso …

(3°) Sulla copertina del fascicolo 1° è posto fascic. 1°, Novembre 1923. In quanto alla numerazione del volume, per maggiore chiarezza ho fatto scrivere così: // *Serie Quarta—Tomo Primo* (in maiuscoletto) (Tomo LVIII della Raccolta) (in carattere piccolo).

Così, mentre rimane l'addentellato col passato, l'indicazione per le citazioni (S. 4, T. I) è data dalla riga in carattere maiuscolo. Va bene?

(4°) Per i cambi, il meglio è, mi pare, che tutto vada alla Casa editrice, la quale farà poi la spedizione ai singoli con-direttori. Perciò, io lascio a te di metterti in corrispondenza con Bianchi e Levi Civita per quella parte dei cambi che desiderate; io mi rimetto a voi e mi darai solo notizie della vostra decisione. Ciò che mi resterà andrà, naturalmente, alla biblioteca del nostro Istituto Matematico. L'unico desiderio—vivissimo—è il conservare il Giornale di Crelle,[466] perché, dopo la guerra, la nostra Biblioteca Universitaria l'ha sos-peso, pur troppo! I cambi, attualmente, sono quelli che troverai nell'accluso foglietto che è tale e quale l'ha mandato a noi la Ditta Turati e Lombardi

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[466]Pincherle refers here to the *Journal für die reine und angewandte Mathematik* founded in 1826 by August Leopold Crelle and renowned under the name of Crelle's *Journal*.

(abbastanza ricco di errori). Lo puoi comunicare ai colleghi, e poi ti prego di ritornarmelo.

(5°)   Ho avuto anch'io, a suo tempo, la lettera del Lichtenstein,[467] ed una uguale // ha avuto anche il Bianchi. Ho disposto di fare conoscere quanto espone il L. [Lichtenstein] nelle *Notizie* del prossimo fascicolo del *Bollettino* dell'U.M.I. per gli *Annali*,[468] vedremo di trovare posto ad un fervorino analogo nel 2do fascicolo, il T[omo] essendo ormai completo. Secondo il tuo desiderio, mando la lettera di L. [Lichtenstein] al De Franchis.[469]

In quanto alla proposizione del mio libro rilevata dal Togliatti,[470] può darsi che il mio enunciato abbia una generalità che giustifica la tua obbiezione: ma in questi giorni sono stato così completamente assorto dagli esami, che non mi è stato possibile di vedere la cosa a mente quieta. Io direi che il Togliatti scrivesse a Picone,[471] e (dopo averne avuta la risposta e dopo che io ne avrò riscritto a te) redigesse una breve nota (simile a quella che mi hai mandata e possibilmente anche più concisa) che si potrebbe pubblicare nel *Bollettino dell'U.M.I.*

Per i "secondi insegnamenti" ormai aboliti, abbiamo, come voi, provveduto con incarichi. La Mat[ematica] Compl[ementare], che facevo io, la farà il Belardinelli[472] sotto la mia direzione, e la Geometria Analitica la farà l'Agostini. Per // la G. proiettiva e descrittiva, abbiamo chiesto il trasferimento di Bompiani, che speriamo ci venga concesso. Chisini[473] va a Cagliari.

Fra breve, spero prima del 15, uscirà il fascicolo degli *Annali*. Mi è costato molto tempo e non poca fatica: lo sanno la Casa editrice e la stamperia! Speriamo di essere riusciti; in quanto a materiale, ne abbiamo in abbondanza; forse per più di un volume. Ho avuto ieri anche una Memoria di Enriques, sulle funzioni algebriche di due variabili. Coi più cordiali saluti del tuo aff^{mo}. S. Pincherle.

Riparto degli scambi[474]

Bianchi
  Mathematische Annalen e (n. 5) *Acta math*[ematica]
  Segre (n^i 12, 14, 6, 9)
  Jahrbuch über die Fortschritte der Math[ematik]

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[467]Leon Lichtenstein (1878–1933). In 1918 he was one of the founders and the first editor of the journal *Mathematische Zeitschrift*. In 1933, as the Nazi party came to power in Germany, Lichtenstein abandoned his chair at Leipzig University and left to Poland, as he would have been dismissed anyway for being Jewish.

[468]*Bollettino dell'Unione Matematica Italiana.*

[469]Michele De Franchis (1875–1946).

[470]Eugenio G. Togliatti (1890–1977).

[471]Mauro Picone (1885–1977).

[472]Giuseppe Belardinelli (1894–1978).

[473]Oscar Chisini (1889–1967).

[474]UTo-ACS. Carteggi, *Annali di Matematica*, 12500, f. 1r.

Monatshefte für Mathematik und Physik
Journal des Math[ématiques] pures et appl[iquées]
Annales de l'Ecole Normale Supérieure

Levi-Civita (n[i] 3, 8)
Bulletin (?) de la Société Math[ématique] d'Amsterdam
Kansas University Quarterly

Pincherle (n[i] 1, 2, 4, 7, 10, 11, 13, 15)
Bulletin of the American Math[ematical] Society
Circolo Mat[ematico] di Palermo
Enseignement Math[ématique]
American Journal
Giornale di Matematiche di Battaglini
Fundamenta Math[ematicae]
Abhandlungen aus dem Math[ematischen] Seminar zu Hamburg
Journal für die reine und angewandte Math[ematik]

68. Grace Chisholm Young[475] to Olga Michelli Segre, Collouge La Couversion (Vaud) 19 June 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, 28, f. 1r.

Cara Signora,

come scriverle l'impressione triste che ci ha fatto la notizia della morte di nostro vecchio amico e maestro. Tanto era buono e caro. Mi ricorderò sempre di lui. Adesso Lei è sola, senza marito e figlie a Torino, e Le mando nostra simpatia e spero che si troverà conforto. Ma conosco troppo bene quanto è dura la nostra vita e quanto è difficile trovare conforto. Con saluti distinti di noi ambedue, Sua dev.[ma] Grace Chisholm Young

P.S. Prego di mandare mia lettera all'Elena e Adriana.[476]

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[475]Grace Chisholm Young (1868–1944). On his stay in Turin see Sect. 4 above and the article by Conte and Giacardi in this volume.

[476]Elena and Adriana were the daughters of C. Segre and O. Michelli Segre.

69. Virgil and Margarete Snyder to Olga Michelli Segre, Turin 12 July 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, f. 1r.

Cara Signora Segre

Avendo appunto letto della morte del Suo illustre marito, ci doliamo più di non potere dire. Desideriamo assicurarla della nostra simpatia profonda, e della nostra affezione sincera e cordiale. Il partito vivrà sempre nella nostra memoria. Suoi afflittissimi amici Virgil Snyder [e] Margarete Snyder.

70. Charles H. Sisam to Olga Michelli Segre, Colorado Springs 14 July 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, f. 1r.

Madame C. Segre Turin Italy

July 14, 1924

Dear Madame Segre

It is with the greatest sorrow that I learned a few days ago of the death, on May 19, of valued teacher and adviser, Professor Segre.

I was a student at the University of Turin during the year 1908–9. I attended Professor Segre's lectures, which will ever stand out in my mind as models of clearness, force and value. My fondest memory of that year, however, will be the sympathy, insight and self-effacing zeal with which he aided and guided my research work with him.

In Professor Segre, the world has lost one of its foremost geometricians, one whose numerous investigations are fundamental in several branches of geometry.

Far beyond this great loss to science, however, I feel the personal loss of a valued friend and a sympathetic co-worker. I join with you in your grief for the loss of a great and good man. Sincerely Charles H. Sisam.

71. Eduard Study[477] to Olga Michelli Segre, Umhausen, Oetzthal 6 August 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, 23, fols. 1r-2r.

Gentile Signora,

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[477]Christian Hugo Eduard Study (1862–1930). German mathematician, he was Privatdozent in Leipzig, professor at Göttingen in 1894 and full professor at Greifswald in 1897 and from 1904 at Bonn University. On his stays in Turin see Sect. 4 and the article by Brigaglia in this volume.

con profondo rammarico ho ricevuto, già mesi fa, la triste notizia della morte di Suo marito, partecipatami gentilmente dal Sig. G. Fano. Scrivo soltanto ora, dopo la chiusura delle lezioni, ed in viaggio, perché non stavo bene di salute, e prego di voler scusare il ritardo. Ho perduto nel defunto *un mio migliore amico*. L'ho potuto chiamare così da molti anni. Prima c'era qualche corrispondenza scientifica—mi sono sentito riunito // con lui per un comune interesse per la geometria, ho imparato molto dai suoi scritti, e poi, parecchie volte, ho avuto il grande piacere della sua presenza personale, specie in casa loro a Torino, riscontri di cui sempre serberò un grato ricordo, come di tutto che debbo a Loro. Anche nei miei ultimi lavori, scritti prima del triste avvenimento, che stanno in parte ancora per essere pubblicati, ho fatto ampio uso delle nozioni importantissime introdotte da lui, le quali faranno sempre onore al suo nome. // Mi rincresce molto di non potere esprimere in parole più adeguate quel che sento. Il mio italiano, che mai fu degno dell'idioma gentile, ha dovuto molto soffrire della conseguenze della guerra: da dieci anni non ho riveduto la "terra promessa". Spero però che Ella sentirà che queste mie povere parole vengono dal cuore. La prego di voler salutarmi anche le Sue figlie, delle quali serbo un grato ricordo. Gradisca, gentile Signora, i miei migliori auguri per Lei ed i Suoi cari. Sempre Suo E. Study.

72. Julian Coolidge[478] to Olga Michelli Segre, Cambridge Mass. 20 September 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, 8, fols. 1r-2v.

27 Fayerweather St. Cambridge Mass. Stati Uniti 20 IX '24

Chère Madame,

Est-il permis à un ancien disciple de votre mari de vous adresser quelques lignes d'appréciation de son très grande valeur comme savant, comme précepteur et comme ami? Je ne me flatte pas que vous vous souviendrez d'un Américain errant qui est arrivé à // Turin avec sa petite famille au moins d'Octobre 1903, pour suivre les cours de l'université, et surtout pour profiter de l'enseignement de votre illustre mari. Pour lui, pourtant, ça a été un évènement d'importance capitale. Non seulement a-t-il trouvé une impulsion scientifique dont il n'a cessé de profiter énormément depuis, mais, chose beaucoup plus précieuse, il a eu le privilège de // nouer de liens d'amitié avec son maitre, que chaque année depuis n'a que rendu plus forts. Je ne saurais vous exprimer, madame, ni l'estime que je ressentis pour votre mari comme savant, ni l'affection qui me lié à lui. Toujours je serai fier d'avoir été à la

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[478]Julian Lowell Coolidge (1873–1954). American mathematician, who received his Ph.D. from Bonn University in 1904, under E. Study's supervision, for a thesis entitled *Die dual-projektive Geometrie im elliptischen und sphärischen Raume.* On his stays in Turin see Sect. 4 and the paper by Brigaglia in this volume.

fois de ses élèves et de ses amis. C'est pourquoi je me permets maintenant de vous adresser // mes hommages les plus respectueuses, et ma sympathie la plus sincère. Agréez, madame, je vous en prie, l'assurance de mes respects les plus profonds. Julian Coolidge.

73. Gino Loria to Arturo Segre, Genua 10 December 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, 15, postcard.

Genova, 10 Dic. 1924

Egregio e caro Professore,

mi vennero spediti da Torino gli estratti dei due lavori postumi del nostro diletto Corrado; non so a chi io debba tale dono gentile, onde penso di ringraziarne Lei che certamente non è estraneo alla cosa. Aspetto di giorno in giorno copie di un volume di *Pagine di storia della scienza* edito dal Paravia e che io ho dedicato alla memoria del caro scomparso;[479] non appena possibile ne invierò una copia a Lei degno rappresentante della famiglia. Da tempo ho anche licenziato un articolo su "l'opera geometrica di C.S." ed appena ne riceva gli estratti non mancherò d'inviarne a Lei qualche esemplare. Quanto al progetto di pubblicare le lezioni[480] del Suo povero fratello, l'idea non è abbandonata ma l'esecuzione è irta di difficoltà, che io mi studio di vincere.

Gradisca i più cordiali saluti dal Suo aff.mo Gino Loria.

74. Guido Toja[481] to Adriana Segre Morpurgo, Rome 31 December 1924

UTo-ACS. *Documenti di famiglia. Lettere di Condoglianze*, 26, f. 1r.

Roma, 31 dicembre 1924

Gentile Signora Adriana Morpurgo Segre,

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[479]G. Loria, *Pagine di storia della scienza e della tecnica*, Torino: Paravia 1924, nnp: "The author of this book dedicates it to the beloved memory of Corrado Segre, whose name was not even erased by the death, so that the works of a man who devoted all his noble life to science and teaching might be remembered in Italian schools."

[480]From the first years of the 20th century the Teubner publishing company in Leipzig advertised the series of treatises on pure and applied mathematics, written by authoritative contemporary mathematicians. For instance, in 1906 poster the titles of the 19 volumes already printed were listed (indicated with two asterisks) and the seven being printed (indicated with one asterisk, as well as those planned in future. The latter included Corrado Segre's, entitled *Vorlesungen über algebraische Geometrie, mit besonderer Berücksichtigung der mehrdimensionalen Raume,* which was never delivered. Cf. B.G. Teubners *Sammlung von Lehrbüchern auf dem Gebiete der Mathematischen Wissenschaften mit Einschluss ihrer Anwendungen*. Cf. Fig. 2.1 above.

[481]Guido Toja (1870–1933).

La Biblioteca del Suo compianto Signor Padre[482] mi è giunta in modo perfetto: ho già scritto al Prof. Arturo Segre e voglio ripetere a Lei la mia riconoscenza. Studioso della matematica e ammiratore devoto di quanti la coltivano con vero successo e con spirito geniale, sono portato a tributare, direi quasi un culto a tutto ciò che ad essi più o meno intimamente appartiene. A Lei sarà, ne sono certo, dolce il pensare che la Biblioteca di Corrado Segre, collaboratrice della Sua opera gloriosa e nella quale Egli vive ancora, sia custodita con amorosa cura e commosso sentimento. Gradisca, Signora, le espressioni del mio distinto ossequio. Suo dev.mo G. Toja.

75. Corrado Segre's Library at the Department of Mathematics, Florence University

UTo-ACS. *Elenchi di opere e articoli, Schede bibliografiche*, 1–19 typewritten pages –BDMI Florence, Toja Room.

The engineer Guido Toja, who had been the founder and director of the National Insurance Institute, and then became a lecturer in Financial and Actuarial Mathematics at the Faculty of Economy and Commerce in Florence, in his will left his personal library to the U. Dini Mathematical Institute in Florence (Sansone 1963, 8–11). It included the mathematics volumes and offprints he had got the National Insurance Institute to purchase in 1924, after the death of Corrado Segre (Annex 74). In this way Segre's rich library was not dispersed and today it is still possible to consult it in Florence, at the BDHI, Toja Room. The volumes and the collections of Memoirs of some Italian and foreigner colleagues of C. Segre in his library have been identified thanks to the ownership initials that Segre put on the frontispiece and to the dedications by the various authors to the Piedmontese algebraic geometer, here pointed out with ('in homage').[483] Moreover, thanks to the recent donation of Segre's archives kept in Ancona to the Turin University by

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[482]Cf. Annex 75. In 1924 Toja, as President of the Council of the National Insurance Institute, proposed purchasing the mathematics volumes and offprints in C. Segre's personal library, underlining the need, for every enterprise of an industrial type, to have a library able to provide executives and technicians with tools for investigation and study. In the minutes we read: "Few opportunities have arisen to furnish the library itself with volumes regarding pure mathematics, although it is necessary to prepare an organic plan so that in the space of a few years the library of the Institute in suitable rooms in the new home can reach the desired potentialities and be such as to be fit for purpose with respect for the industrial and cultural technical aims of the institute. (…) However, he desires the unanimous consent of his colleagues." (De Donno 1988, 99: "Poche occasioni si sono presentate per fornire la biblioteca stessa di volumi riguardanti le matematiche pure sebbene sia necessario di preparare un piano organico affinché nello spazio di pochi anni la biblioteca dell'Istituto possa in locali adatti della nuova sede raggiungere le potenzialità desiderate e tale da rispondere allo scopo nei riguardi delle finalità tecniche industriali e culturali dell'istituto. … Egli desidera però il consenso unanime dei colleghi.").

[483]We are grateful to the staff of the Florence Library and, in particular, to Laura Bitossi, for having provided us with the book list and the information necessary to our reconstruction.

Silvano and Daniele Fuà, the grand-nephews of Corrado Segre, we have now available the original lists of books and journals in Segre's personal library at his own home in Turin, corso Vittorio Emanuele 24 (Appendix 1 in this volume). An accurate collation between the lists allowed to identify those books and offprints which have been sent to Toja in December 1924. The latter ones, called Memorie *by Segre, were made binding by Toja. Another collection of offprints from Segre's library have been donated by his wife Olga Michelli Segre to the Mathematical Library of Turin University in May 1924 (Giacardi and Roero* 1999, *446–447). Moreover, in March 1926 she offered to the same Library the valuable corpus of Segre's* Notebooks (Conte et al. 2013, *46, 69–76).*

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