ANDREA DEL CENTINA

ABEL'S MANUSCRIPTS IN THE LIBRI COLLECTION: THEIR HISTORY AND THEIR FATE

It is well known that Guglielmo Libri owned three of Abel's manuscripts: that of the great memoir presented to the Paris Academy in 1826, and those of the last two works he wrote. Actually Libri also had another one in his hands. Here is, in short, the story of these manuscripts and of the search for the most famous of them, the Parisian memoir, which has been lasting for a century and a half.

Monumentum aere perennius

On September 1825, at the age of twenty-three, Niels Henrik Abel[1] received a grant from his University and started his scientific journey through Europe. He was in Berlin until March 1826, then he went to Dresden and Prague. In April he was in Wien for six weeks and then he crossed North Italy and Switzerland. From Zurich he went on to Paris: the focus of all his mathematical ambitions.

Abel arrived in Paris on July 10th 1826 and soon began to work on what would become his most famous memoir. The 24th of October he wrote to his teacher and friend Holmboe[2]: «Je viens de finir un grand traité sur une certain classe de fonctions trascendantes […] Et j'ose dire, sans vanter, que c'est un bon travail. Je suis curieux d'entendre l'opinion de l'Institut…».[3] On October 30th 1826, Abel personally presented to the Paris Academy of Sciences his work entitled *Mémoire sur une propriété générale d'une classe très étendue de fonctions transcendantes*. Here he states his main theorem, today known as "Abel theorem", in the following form:

> Si l'on a plusieurs fonctions dont les dérivées peuvent être racines d'une 'même équation algébrique', dont tous les coefficients sont des fonctions 'rationnelles' d'une même variable, on peut toujour exprimer la somme d'un nombre quelconque de semblables fonctions par une fonction 'algébrique et logarithmique', pourvu qu'on établisse entre les variables des fonctions en question un certain nombre de relations 'algébriques'. […] Le nombre de ces relations ne dépend nullement du nombre des fonctions, mais seulement de la nature des fonctions particulières qu'on considère.[4]

[1] For more information on Abel's life see the article by A. Stubhaug in this volume. See also A. STUBHAUG, *Niels Henrik Abel and his times*, Springer, 2000.

[2] Bernt Michael Holmboe was assistant at the Cathedral School in Oslo and Abel's teacher of mathematics.

[3] *Oeuvres complètes de N. H. Abel*, par S. Lie et L. Sylow, Christiania, 1881, II, p. 260.

[4] ID., I. In the following of his paper Abel will denote that number by p. This integer characteristic p for any curve $f(x,y) = 0$, which occurs here for the first time in the history of mathematics, was later studied by Bernard Riemann in the paper *Theorie der Abelschen Funktionen* of 1857. Later Rudolf Clebsch will call p the genus of the curve. In some sense Abel's theorem marks the birth of Algebraic geometry. See the note by O. A. Laudal in this volume.

The proof of this general theorem proposed by Abel hymself is very simple. In essence it follows from two elementary facts: first, any symmetric rational function of the roots of an algebraic equation is a rational function of its coefficients; second, the integral of a rational function is the sum of a rational function and a finite number of logarithms of rational functions. Thus Émile Picard was induced to write: «Sous cette forme, le théoreme parait tout a fait èlémentaire, et il n'y a peut-être pas, dans l'histoire de la Science, de proposition aussi importante obtenue à l'aide de considérations aussi simple».[5]

For the rest of his stay in Paris Abel simply waited. What would it not have meant for his career to return to Norway with his memoir having been acclaimed by the Academy?

Legendre and Cauchy were named referees of Abel's memoir. Legendre had published the first volume of his *Traité des fonctions elliptiques et des intégrales eulériennes* the year before, and the second volume was in the press. For forty years he had worked on the subject, so he was in a good position to appreciate Abel's work. Nevertheless he left the manuscript to Cauchy. The latter was certainly the leading active mathematician in Paris, but too busy with his own research to pay attention to that of others. Thus Abel's manuscript remained forgotten on his desk.

In December Abel left Paris and made his way back home, and died without ever receiving an answer from the Academy.

The first part of *Recherches sur les fonction elliptiques*, written while returning, was published in Crelle's journal on September 1827. The second, completed after his arrival in Norway, appeared in the first issue of the following year. This work received admiration across all Europe, and definitely placed Abel among the greatest mathematicians.

In *Remarques sur quelques propriétés générales d'une certaine sorte de fonctions trascendantes*, Abel again considered the problem studied in the Parisan memoir, but from the less general point of view of "hyperelliptic functions". With this was aiming to attract the attention of mathematician. In a footnote he wrote: «J'ai présenté un mémoire sur ces fonctions à l'Académie royale dés sciences de Paris vers la fin del l'année 1826». [6]

In his letter to Legendre on November 25th 1828, Abel returned to this matter: «Outre les fonctions elliptiques, il y a deux autres branches de l'analyse dont je me suis beaucoup occupé, savoir le théorie de l'integration des formules différentielles et la théorie des équations. A l'aide d'une méthode particulière j'ai trouvé beaucoup de résultats nouveaux, qui surtout jouissent d'une très grand généralité. Je suis parti du problème suivant de la théorie de l'intégration» and he explains to Legendre his theory.[7]

The following year, on January 6th, four months before his death, Abel wrote a short account on his results in *Démonstration d'une propriété générale d'une certaine classe de fonctions trascendantes*.

In February, Legendre informed Jacobi: «J'ai reçu de Abel une lettre fort interessante, où me parle d'une grande extension qu'il a donnée à ses recherches en prouvant que des propriétés analougue à celles des fontions elliptiques peuvent s'appliquer à des trascendantes beaucoup plus composées. C'est une grande généralisation de la belle intégrale d'Euler. On trouve une très-bel échantillon de ces nouvelles recherches dans le 4e cahier T.III. du Journal de M. Crelle pag. 313».[8]

When Jacobi became aware of Abel's result and footnote, answered Legendre. On March 14th 1829 writing from Koenisberg he wrote:

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[5] E. PICARD, *Traité d'Analyse*, Gauthier-Villard, Paris, II, 1926[3], p. 464.

[6] *Oeuvres complètes de N. H. Abel*, par S. Lie et L. Sylow, Christiania, 1881, I.

[7] ID., II.

[8] C. G. J. JACOBI, *Gesammelte Werke*, Bd. 1-7, Berlin, 1881-1891, I.

Quelle découverte que cette généralization de l'integrale d'Euler! A-t-on jamais vu de pareille chose! Mais comment s'est-il fait que cette découverte, peut être la plus importante de ce qu'a fait dans les mathématiques le siécle où nous vivons, étant communiquée à votre Académie, il y a deux ans, elle a pu échapper à l'attention de vous et de vos confrères.[9]

Legendre replied to Jacobi on the 8th of April:

Les commissaires nommés pour examiner le Mémoire furent M. Cauchy et moi. Nous nous aperçûmes que le Mémoire n'était presque pas lisible, il était écrit en encre très blanche, les caractères mal formés; il fut convenu entre nous qu'on demanderait à l'auteur une copie plus nette et plus facile à lire. Les chose en sont restées là: M. Cauchy a gardé le manuscript jusqu'ici sans s'en occuper, l'auteur M. Abel paraît s'en être allé sans s'occuper de ce que devenait son Mémoire, … Cependant j'ai demandé à M. Cauchy qu'il me remette le manuscrit qui n'a jamais été entre mes mains et je verrai ce qu'il y a faire pour reparer, s'il est possible,…[10]

Abel died on Monday, April 6th at the age of twenty-seven.

The Academy was officially informed of Abel's death by Legendre at the meeting of June 22nd.

The next year the revolution broke out in France, and Cauchy followed his king into exile. So the manuscript of the Abel Parisian memoir remained hidden and forgotten among the many documents and sheets that Cauchy left behind him.

In 1832 the octogenarian Legendre completed the third and final supplement of his *Traité*. A copy was sent to Crelle to be reviewed. In the accompanying letter, Legendre wrote:

Vous verrez que je suis parvenu à tirer du beau théorème de Mr. Abel une théorie toute nouvelle, à laquelle je donne le nome de "Théorie des fonctions ultra-elliptiques", laquelle est beaucoup plus étendue que celle des fonctions elliptiques et cependant conserve avec cell-ci des rapports très intimes. En travaillant pour mon propre compte, j'ai éorouvé une grande satisfaction, de rendre un éclatant hommage au génie de Mr. Abel, en faisant sentir tout le mérite du beau théorème dont l'invention lui est due, et auquel on peut appliquer la qualification de "monumentum aere perennius".[11]

Crelle charged Jacobi with the review: no one was better qualified than he. In one point Jacobi disagreed with Legendre: instead of Legendre's "ultraelliptic functions", he preferred to call those functions "Abelian trascendentals", since they were first introduced by Abel, and suggested naming his result "Abel's theorem".[12]

Finally the manuscript was printed

On July 17th 1831 the Baron Maurice, Swiss mathematician and member of the Paris Academy, wrote to the Swedish Ambassador Lowenhjelm pointing out the great scientific relevance of having Abel's collected works published. Maurice suggested that His Royal Highness the Crown Prince certainly should be interested in supporting such a project. Lowenhjelm transmitted Maurice's letter to the famous chemist Berzelius of Stockolm, who then sent it to Professor Hansteen in Christiania, adding: «L'Académie n'a pas les moyens de publier une semblable édition, et la gloire nationale qu'on pourrait en acquérir reviendrait

[9] ID.

[10] ID.

[11] Cfr. *Nachrichten von Büchern*, «Journal für die reine und angewandte Mathematik», 8 (1832) p. 413. Qui Legendre cita il poeta Orazio: "exegi monumentum aere perennius".

[12] ID. p. 415.

uncontestablement à la Norvège. Si l'Université de Christiania se chargerait de l'affaire, le Storthing ne refuserait certainement pas de voter les fonds nécessaires.»[13]. Hansteen presented the proposal to the University Senate, which in a short time approved publication. Holmboe was named editor in charge. In collecting all Abel's unpublished manuscripts for preparing the edition of his works, Holmboe attemped to obtain a copy of the Parisian memoir from the Academy, but he received no answer.[14] Thus Abel's masterpiece was not included in the *Oeuvres Complètes* which appeared in 1839.[15]

Only after a formal request from the Norwegian Government to the French authorities in 1840, was Abel's manuscript was finally found among Cauchy's documents, and published.

Libri[16], professor of mathematics at the Sorbonne and member of the Paris Academy, had the responsability of supervising the printing. At the end of the printed article Libri added the following note:

> L'Académie m'ayant fait l'honneur de me charger de surveiller l'impression de ce Mémoire, je me suis appliqué à corriger, autant que possible, les fautes d'impression. Cependant, n'ayant pas les manuscript sous les yeux au moment où je livrais les épreuves, je ne saurais me flatter d'avoir toujours réussi. Il m'a même semblè que dans certains endroits (notamment dans les conséquences et les développements numériques tirés de l'inegalité 103), il y avait quelques inexattitudes de calcul: mais je ne me suis pas cru autorisé à rien changer dans ce beau travail. J'ai donc obtenu de l'académie la permission d'insérer ici cette note, que je saurais terminer sans exprimer encore une fois mon admiration pour l'illustre géomètre de Christiania, dont la science déplorera toujours la fin prématurée.[17]

Libri had a great admiration for Abel, and in fact in 1833 he wrote an impassioned biography of him, focusing on Abel's mathematical discoveries[18]. This biography was the only one available for many years before that by C. A. Bjerknes dating from 1884.

While S. Lie and L. Sylow were preparing a new edition of Abel's Collected Works, they attempted to get the manuscript of his masterpiece from Paris:

> Il nous a paru très désirable de pouvoir collationner le mémoire imprimé avec l'original, et M. Sophus Lie obtint en 1874 de l'Académie des Sciences de Paris la permission de consulter le manuscrit d'Abel; mais il fut constaté dans les archives de l'Académie que le manuscrit ne s'y est pas trouvé après l'impression du mémoire.[19]

Thus the manuscript Abel's Parisian memoir had disappeared once again from the Academy archives.

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[13] C. A. BJERKNES, *Niels-Herik Abel, sa vie et son action scientifique*. Mémoire de la Soc. des Sciences physiques et naturelles de Bordeaux, 3^{e} série, I, Paris, Gouthier-Villars, 1884.

[14] ID. pp. 344-345

[15] *Oeuvres complétes de N. H. Abel, mathématicien, avec des notes et dèveloppements, rédigées par ordre du roi par B. Holmboe*, Oslo 1839.

[16] See the appendix for a biographical note on Guglielmo Libri.

[17] N. H. ABEL, *Mémoire sur une propriété générale d'une classe très étendue de fonctions transcendantes*, «Mémoires présentés par divers savants à l'Académie Royale des Sciences de l'Institut de France», t.VII, Paris, 1841, pp.176-264.

[18] G. LIBRI, *Abel (Nicholas-Henri)*, In Biographie Universelle 56, Paris, 1834, pp. 22-29.

[19] *Oeuvres complètes de N. H. Abel*, par S. Lie et L. Sylow, Christiania, 1881, II.

The manuscripts of Abel's last two works

Libri had loved books, printed or manuscript, since his youth, but in Paris he developed the bibliomania for which he is known to history. Here he bought regularly at auctions, but also, especially manuscripts, from private sales. Among the earliest, and one of the luckiest, was that of the Arbogast collection that he made in 1839.[20] In the late 40s Libri's library was already among the largest private ones in all Europe, estimated at thirty thousand volumes.

In 1848, at the time of the February revolution, an old accusation against Libri resurfaced: he was charged with having committed thefts from French public libraries, and he fled to London. Despite his haste, he was able to box and ship masses of books and manuscripts. What was found in Libri's apartment at the Sorbonne was confiscated by French authorities: all those documents, letters and manuscripts are preserved in the National Library of Paris.

In London Libri continued to trade in books and manuscripts all over Europe, and there he also held ten auctions between 1849 and 1865. The first of the great sales, in the spring of 1859, was announced in the *Catalogue of the extraordinary Collection of Splendid Manuscripts…*in magniloquent tones. Here 1190 manuscripts of «all ages, all languages, and every branch of human learning» as Libri wrote in the extensive introduction to the catalogue, were put for sale.[21] Among the very precious midlle-aged upon vellum, there were scientific manuscripts and "autographs" (i.e. author's own manuscripts and signed letters) by Galileo, Kepler, Leibnitz, D'Alembert and other eminent mathematicians and scientists. Numbered 5 and 6, the manuscripts of the last two of Abel's works, appeared in the catalogue and Libri described them exactly as follows:

5 ABEL (N.H) Précis d'une Théorie des Fonctions Elliptiques, 4*to*. Sæc. XIX. on paper

An autograph manuscript (with the author's signature at the beginning) of this Norwegian mathematician, who died when only twenty-six years old, and whose admirable discoveries in the elliptical functions will be recorded as long as mathematics are held in honour. This Manuscript, consisting of fifty-six columns besides four pages of introduction, contains many corrections and alterations, which have never been printed in the Journal de M. Crelle, where this *Précis* was published.

6 ABEL (N.H) Démonstration d'une Propriété générale d'une certaine Classe de Fonctions trascendantes, 4*to*. 1829, on paper

In the author's handwriting, with a short German note, dated Christiania, 6 Jan. 1829, respecting the printing of this Démonstration, and the illness of his intended bride [*sic*], also in his autograph with signature. Abel died on the 6th of April, 1829.[22]

Despite the publicity, the sale fetched a disappointing amount. Perhaps, the reason was that the English collectors were not eager to acquire scientific manuscripts as was the French Michel Chasles or the Italian Prince Boncompagni. The *Précis* was bought by the London bookseller Quaritch for 2 shillings and 6 pence, but the other remained unsold.[23]

[20] This collection was assembled during the great revolution by Luis François Antoine Arbogast, lecturer of mathematics at Strasbourg and deputy to the Convention. Here Libri discovered manuscripts of Fermat, Descartes, Euler and d'Alembert.

[21] Cfr. G. LIBRI, *Catalogue of the Extraordinary Collection of Splendid Manuscripts, Chiefly upon vellum, in Various Languages of Europe and the East, formed by M. Guglielmo Libri, the Eminent Collector, who is obliged to leave London in consequence of ill health, and for that reason to dispose of his literary treasures, which will be sold by auction by Sotheby & Wilkinson*, Days and Sons, London, 1859.

[22] ID.

[23] Cfr. G. LIBRI, *The Libri Collection of Books and Manuscripts. Prices and Purchasers'Name*, Puttick and Simpson, London 1868, p. 1

Just how Libri came into possession of these manuscripts is not certain, but he must have acquired them from Crelle. Crelle had great admiration for Libri not only as a mathematician, and had published several memoirs by him in his journal, and as bibliophile, scholar and man of letters. From Berlin on the 1st of November 1842 Crelle wrote to Libri:

> Monsieur je vous remercie très humblement de la lettre que vous m'avez ecrite le 14 Août dern. et que j'ai reçu par M. Jacobi,[24] avec les autograph des Descartes, Torricelli et Roberval que vous avez bien voulu me communiquer. J'ai fait faire de fac-simile d'extraites de ces precieux morceaux, et j'ai l'honneur de vous les renvoyer ci-joint, avec le expressions de une très erve reconnensance. […] si d'ailleur vous voulez avoir la bonté de me communiquer encore d'outre authographes de géomètres célèbres je vous en serai très reconnaissant.[25]

So there was a good relationship between the two, and they were also in touch exanching manuscripts. When Crelle died his library was sold by the Berlin bookseller Asher and Libri may have bought the Abel manuscripts from him.

I do not know whether or not the manuscript that Quaritch bougth is still in existence. The other one probably remained in Libri possession. As far as I know no others of Abel's manuscripts were offered for sale in the following auctions that Libri held in London.

Even after all the sales, it seems that Libri retained as many as twelve thousand books, manuscripts, autographs and so on that he intended to reserve as tools for his future work as mathematician and historian.

In 1868 Libri's health conditions deteriorated. In September he decided to return to Florence, his birthplace. He sent to Florence, via Livorno, the whole mass of his documents, packed in twenty crates weighing two tons. Once in Florence this material was stored in Silvestro Gherardi's house.[26] Libri arrived in Florence in December, after a long, tormented journey. A year later he was dead. In his final testament, of August 17th 1869, Libri named four executors who were charged with precise tasks. In particular the bibliophile Count Giacomo Manzoni[27] was asked to advise the others in order that the books and the manuscripts, which constituted the larger part of the legacy, would fetch the best price possible when sold.[28] Manzoni was also charged with taking care of the twenty crates stored in Florence.

A great quantity, almost a half, of the manuscripts was sold cheaply (almost as waste paper) by his namesake cousin in spite of Manzoni.[29] Only a small part was luckily bought by Giuseppe Palagi[30] and later sold to the Province of Florence in 1872 and went to constitute the *Fondo Palagi-Libri* of the Biblioteca Moreniana. There is a nineteenth century handwritten inventory of this deposition.

The remaining part of Libri's inheritance was acquired by Manzoni and sent to Lugo on April 20th 1870. The same day Manzoni wrote to his son Luigi: «After six days of work, I

[24] C. G. J. Jacobi was twice in Paris, the first time in 1829 and the second time in July 1842.

[25] Biblioteca Moreniana, fondo *Palagi-Libri*, Filza 431 ins. 95.

[26] Silvestro Gherardi [1802,1879]. He was a physicist and matematician, he tought in Turin and Florence.

[27] Giacomo Maria Manzoni [1816,1889], he was a landowner, an bibliophile, and a great collector of book and manuscripts.

[28] G. CANDIDO, *Il fondo "Palagi-Libri" della Biblioteca Moreniana di Firenze*. In Atti del II° Congresso della Unione Matematica Italiana, Cremonese, 1941, pp. 841-885. Cfr. p. 864. The namesake cousin of Guglielmo Libri was one of the executors.

[29] This is clear from a letter of Manzoni to Gherardi preserved at the Trisi Library of Lugo. In this letter it is also written that the material sold amounted to 900 kilos about.

[30] For a biographical note on G. Palagi see the article of V. Fraticelli in this volume.

finished everything with the Libri's heirs, and this morning I sent from Florence station 15 crates of books and manuscripts that weighed 1148 kilos»[31].

In 1876 Manzoni sold to Prince Boncompagni some of the most important manuscripts left by Libri, among these the unique copies by Arbogast of certain manuscripts of Euler, Fermat and d'Alembert and a volume of letters of Charpit.[32]

When Manzoni died his library was sold in Rome, but in the fourth volume of the auction sale catalogue, that of manuscripts, only one previously belonging to Libri appeared.[33]

The search for the lost manuscript

The search for the manuscript of the Parisian memoir continued spasmodically.[34] The "Libri affair" and the note he posed at the end of Abel's printed article, encouraged a search for the manuscript among Libri's papers.

In 1942 Poul Heegaard[35] of Oslo thought he had found it at the Biblioteca Nazionale of Rome, but a later expert analysis in Oslo showed that that manuscript was only a handwritten copy of the printed article.[36]

It could be that René Taton[37] also searched for Abel's manuscript. In his note of 1947 he wrote: «Est-il perdu définitivement ou fût-il simplement soustrait par le bibliophile peu délicat? Rien ne permet de répondre de façon définitive puisque la trace de certains manuscrits possédés par Libri n'a pu encore été retrouvée».[38]

Giacomo Candido[39] had Abel's manuscript in his hands in 1940, just a century after it had disappeared, while studying the documents of the Palagi-Libri deposition at the Moreniana Library of Florence. «In 1935 Prof. Giovanni Sansone[40] of the University of Florence informed me about the existence at the Moreriana Library of that city, of an unexplored collection of manuscripts concerning Guglielmo Libri», wrote Candido in the introduction of his article[41]. In the same paper he described Abel's manuscript as "Trascription of the Abel's memoir made by Libri".[42] Two years later he wrote a small book entitled *On the missed publication in 1826 of the celebrated Abel's memoir*[43]. This booklet, published during the war, remained almost unknown. In it he gave a detailed story of the Parisian memoir, largely based upon Abel's biography by Bjerknes. Attached to the "copy" of the original manuscript, Candido found an autograph of Legendre which is of great historical interest:

[31] Archivio del Comune di Lugo, *Fondo Seganti*.

[32] See, I. GRATTAN-GUINNES & S. ENGELSMAN, *The manuscripts of Paul Charpit*, «Historia Math.» 9 (1982), pp. 65-75.

[33] See, A. TENNERONI, *Catalogo ragionato dei manoscritti appartenuti al fu Conte Giacomo Manzoni*, Città di Castello, Lapi, 1894.

[34] See, . P. MANSION, *Sur une légende relative à Abel*, «Mathesis» 29, 1909.

[35] Poul Heegaard [1871,1948] he is known for his researches on the topology of varieties of dimension 3, he taught at the University of Oslo.

[36] See V. BRUN, *Découverte d'un manuscript d'Abel*, «Rev. Hist. Des Sciences», VIII (2) 1955, p. 103.

[37] René Taton is a well known historian of mathematics.

[38] R. TATON, *Abel et l'Académie des Sciences*, «Rev. Hist. des Sciences», 1 ,1947, pp. 356-358.

[39] Giacomo Candido [1871, 1941], he was a historian of mathematics.

[40] Giovanni Sansone [1888,1979], he is know for his reserches on ordinary differential equations and tought at the University of Florence from 1924.

[41] See G. CANDIDO, *Il fondo "Palagi-Libri" della Biblioteca Moreniana di Firenze*, cit.

[42] ID. p. 846. In Italian: "Trascrizione della memoria di Abel fatta da Libri".

[43] G. CANDIDO, *Sulla mancata pubblicazione, nel 1826, della celebre Memoria di Abel*, Marra, Galatina 1942.

Ce mémoire a été mis d'abord entre les mains de M. Legendre qui l'a parcouru, mais voyant que l'écriture était peu lisible et les caractères algébriques mal formés, il le remit entre le mains de son confrère M. Cauchy avec prière de se charger du rapport. M. Cauchy, distrait par d'autres affaires et n'ayant reçu nulle provocation pour s'occuper du mémoire de M. Abel, attendu que celui-ci n'était resté que peu des jours a Paris aprés la présentation de son Mémoire à l'Académie, et n'avait chargé personne de suivre cette affaire auprès des Commissaires, M. Cauchy, dis-je, a oublié pendant très longtemps le Mémoire de M. Abel dont il était dépositaire. Ce n'est que vers le mois de mars 1829, que les deux Commissaires apprirent, par l'avis que l'un d'eux reçut d'un savant d'Allemagne [Jacobi], que le Mémoire de M. Abel, qui avait été présenté à l'Académie, contenait ou devait contenir des résultats d'analyse fort intéressants et qu'il était étonnant qu'on n'en eût pas fait de rapport à l'Académie. Sur cet avis M. Cauchy rechercha le Mémoire, le trouva et se disposait à en faire son rapport, mais les Commissaires furent retenus par la considération que M. Abel avait déjà publié dans le journal de Crelle une partie de son Mémoire présenté à l'Académie, qu'il continuerait probablement à faire paraître la suite, et qu'alors le rapport de l'Académie, qui ne pouvait être verbal, deviendrait intempestif. Dans cet état de choses nous apprenons subitemennt la mort de M. Abel, perte très fâcheuse pour la sciences, et qui parait maintenant rendre le rapport nécessaire pour nous conserver s'il y a lieu le recueil des savants étrangers, un des principaux titre de gloire de son auteur. [44]

The authenticity of Abel's manuscript did not escape Viggo Brun[45] of Oslo, when on October 1952 he had it in his hands. In one of his notes announcing his discovery we read:

Le P^r^ Sansone me signala un chapitre d'un livre publié par Giacomo Candido en 1942: *Sulla mancata pubblicazione della celebre Memoria di Abel* où il était mentionné qu'il existait à la bibliothèque Moreniana de Florence un manuscrit intitulé: *A. Legendre - Nota autografa, rinvenuta nel Fondo Palagi-Libri, attaccata alla copia, fatta dal Libri, della Memoria di Abel*. … Aussi, est-ce avec beaucoup d'émotion qu'aidé par M. le P^r^ Procissi, j'ai ouvert le vieux manuscrit jauni de la bibliothèque Moreniana proche l'église de Lorenzo. [46]

A microfilm of the manuscript was sent to Oslo and an expert declared that the manuscript was written by Abel himself.

What Brun found was not the complete manuscript, in fact it consisted only of the first 16 pages and the last one, the pages being numbered from 1 to 16 and 61.

Some times later Sansone informed Brun that: «Un examen minutieux, feuille par feuille, fait par le P^r^ Procissi à la bibliotèque Moreniana avait conduit au résultat heureux que tout le manuscript, sauf 8 pages, était retrouvé». [47]

I remark that neither in the inventory of the deposition, nor in Candido's description, is there any mention of this second part of the manuscript. Unfortunately I was even not awere of any reference left by Angiolo Procissi[48] too. With a closer and patient scrutiny of the documents of the seven boxes that constitute the *Palagi-Libri* deposition I rediscovered it.[49] After examining the two parts I saw that the pages 21-24 and 31-34 were still missing.

During my search for the Abel manuscript I learned that in 1959 the Moreniana Library was enriched with a new deposition. This stock of letters, booklets, scientific manuscripts and other documents, was acquired by the Province of Florence from a Florentine antique dealer.

[44] Biblioteca Moreniana, fondo *Palagi-Libri*, filza 436 ins. 2 (1).

[45] Viggo Brun [1885,1978] was a number theorist well known for the "sieve methods", he was professor at the University of Oslo.

[46] V. BRUN, *Découverte d'un manuscript d'Abel*, cit., p.104. Here Brun means the Church of San Lorenzo by Filippo Brunelleschi.

[47] ID.

[48] Angiolo Procissi [1908,1987] historian of mathematics, he tought at the University of Florence.

[49] Biblioteca Moreniana, fondo *Palagi-Libri*, filza 437 ins. 10.

Only in 1983 was a first inventory given, and the material, of about twenty-thousand sheets, divided into thirty-three boxes. Because of its content the new deposition has been named *Nuovo Fondo Libri*.[50]

Among these papers, I discovered some sheets with handwritten notes by Manzoni and other documents that belonged to him.[51] This convinced me that it was material coming from Manzoni's archives.

One of these notes, on the back of a sheet with the heading "Municipio di Lugo" (Town Council of Lugo) concerning the meeting of January 14th 1879, is as follows: «Manuscripts that belonged to Prof. Guglielmo Libri. They are mainly mathematical in character. To put them in order would require time that I do not have and will never have»[52]. This amusing note, that was written by Manzoni after his sale to Boncompagni in 1876, proves that he gave little importance to this part of Libri's documents.

Here I hoped to discover the still missing pages of the Abel manuscript.

By a meticulous inspection, sheet by sheet, of the content of certain boxes constituting the *Nuovo Fondo Libri*, chosen on the basis of the temporary catalogue, on July 6th 2000 I found eight hand-written pages numbered 21-24 and 31-34, that I thought to be the missing pages of Abel's manuscript; this because they are not copy from the printed article and they fit in perfectly with the other pages already known. These facts and the emotion of discovery made me wrong. Unfortunately I realized this only in the first days of February 2002, when I found other pages 31-34 undoubtedly written by the hand of Abel, at the Labronica Library in Livorno.[53] These pages were acquired in 1923, when after the death of Gioacchino Bastogi[54] his widow gave to the town council of Livorno his collection of autographs. The pages I found probably were bought by Bastogi, or by his father Pietro, in the 1880s from the bookseller Ulisse Franchi of Florence. In fact in that years, Giacomo Manzoni sold several items from his library to the auctions organized by Franchi.

By comparing these pages with the corresponding copies preserved at the Moreniana of Florence, I found very few linguistic or notational discordances. Hence, I think, these latter are (almost conformal) copies, made by Libri, of the Abel's manuscript.

So, unfortunately, the search for the missing pages of the Abel's Parisian memoir is not ended yet.

The manuscript of the Recherches

By further search at the Historical Archives of the Province of Florence, I learnt the name of the antiques dealer, now retired, who in 1959 sold the material of the Nuovo Fondo Libri. Unfortunately when I consulted him, he told me that he does not remember how he came into possession of Libri's archives.

I have should also say that in the catalogue of the sale of Boncompagni's library, one can find many letters that belonged to Libri.[55] This material was probably removed from the crates

[50] V. ARRIGHI, *Le carte Libri della biblioteca provinciale Moreniana*, «Rassegna Storica Toscana», XXVIII, 1883, pp.115-131.

[51] Biblioteca Moreniana, *Nuovo Fondo Libri*, cassetta 22, ins. 595, 596, 597.

[52] Biblioteca Moreniana, *Nuovo Fondo Libri*, cassetta 22, ins. 597, c. 4. In Italian: «Manoscritti del Prof. Guglielmo Libri. Sono per lo più matematici. Per ordinarli occorre il tempo e l'ozio che non ho e che non avrò mai»

[53] Biblioteca Labronica "F. D. Guerrazzi", *Autografoteca Bastogi*, cass. 1 ins. 1.

[54] Count Pietro Bastogi was born in Livorno in 1808, and died in Florence in 1899. Pietro Bastogi and his son Gioacchino [1856,1919] collected autographs for many years. Up to the donation, their Archives, of about sixty-thousand pieces, was preserved at Palazzo dell'Oriolo in Florence.

stored in Gherardi's house, by one of the many that handdle it, before Manzoni had sent them to Lugo, his hometown.

Trying to understand the fate of Libri's archive and that of Abel manuscripts in his possession I went, in the spring of last year 2001, to Lugo. There the Count Manzoni had his family palace, and his country villa "La Frascata".

By means of the letters that Manzoni wrote to his friend Gherardi and other documents, preserved in the *Gherardi* deposition of the Trisi Library and in the *Seganti* deposition of the Town Archives of Lugo, I have been able to reconstruct almost completely what happened to the Libri manuscripts belonging to Libri. To make a long story short:

As I mentioned earlier, when Manzoni died his library was sold by auction in Rome, but in the fourth volume of the sale catalogue, that of manuscripts, there is not trace of Libri's documents. Luigi Manzoni, the elder son of Giacomo, tried to sell the archives of his father, in its entirety, to the Italian government, but he did not succeed. Yet by 1893 it seems that Luigi Manzoni had sold some manuscripts and autographs to the French government. Unfortunately I am not yet able to identify them.

The great part of the Manzoni archives, and that of Libri, still remained in possession of the Manzonis. Over the years, this mass of papers was probably stored in some of the family houses, certainly at "La Frascata". The villa was partly destroyed in a fire on 1916, and many documents went lost. Although after the death of Giacono the fortune of the family declined, the Manzonis continued to be an influencial family in Romagna. After the war, in the night of July 7th 1945, the sons of Giuseppe, son of Luigi, and all the occupants of the villa, were killed in the wave of revenge that devasteted that region. During these events, and the day after, the "La Frascata" was plundered. In 1947 the lawyer Giuseppe Seganti, a friend of the family, bought from a nephew of Luigi what remained at "La Frascata" of Manzoni's archives. In 1986 Seganti's daughters sold this material to the Town Archive of Lugo.

This story convinced me that the material bought in Florence in 1959 also came from heirs of Manzoni who sold it after the war.

There is only a very rough (and even partial) inventory of the *Fondo Seganti*. An inspection, lasting several days, produced nothing important but the certainty that once among those sheets there was another manuscript of Abel! In fact I found there the following card written (in Italian and French) by the hand of Giacomo Manzoni:

Abel Niels Herik

§§ VIII,IX and X. of the *Recherches sur les fonctions elliptiques*

This precious autograph contains the original manuscript corresponding to the printed version from p. 221 to p. 251 of the first volume of the *Oeuvres complètes d'Abel*, Christiania 1839. We know from the notice of prof. B. Holmboe, editor of these works that Abel wrote his papers "en français, mais les neuf premièrs mèmoires ont été traduits par M. Crelle en allemand, d'ou on les a de nouveau traduits en français. Quant aux originaux des oeuvres publièes de notre auteur on n'en a point trouvé dans ses papiers". These autographs are part of them, and they came, I thought, to Professor Libri (from whom I have got them) after the death of Mr. Crelle whose library was sold by Asher the year 1856 in Berlin. (see my catalogues)[56]

[55] D. B. BONCOMPAGNI, *Catalogo dei manoscritti ora posseduti da D. Baldassarre Boncompagni*, Tipografia delle Scienze matematiche e fisiche, Roma, 1892^2.

[56] Archivio Comunale di Lugo, *Fondo Seganti*, busta 21, ins. 1.

Umberto Bottazzini then told me of a letter which confirms what Manzoni said. In this letter, on 21st July of 1889, Vito Volterra[57] wrote from Florence to his teacher Enrico Betti[58]:

In Lugo I met Ricci[59] and together we went to visit Count Manzoni. In his library I found many papers coming from Libri, which may become very precious once the authenticity is proved. First of all I found many sheets that I figure as Abel's autographs.[…] Unfortunately I fear that everything will remain buried in the library without possibility of scrutinizing and publishing, because Manzoni did not allow us to take pictures, nor even another visit.[60]

So Libri also had in his hands the manuscript of another very important memoir of Abel, or at least a part of it, the one that, with the works of Jacobi, started the modern theory of elliptic functions.[61]

Epilogue

After the publication of the first edition of the *Oeuvres Complètes*, Holmboe held the manuscripts left by Abel. In September 1849 his house was destroyed by a fire and this caused the loss of a great number of them. What escaped the fire is preserved at the National Library of Norway in Oslo, but there are no complete memoirs.[62]

The manuscript sold in London, if still in existence, is buried in some private library in England or elsewhere. Of the manuscript of the *Démonstration*, that probably remained in possession Libri's, I found no trace of it during my searches. It could have been lost with the part sold by the cousin of Libri to a paper merchant, and that neither Palagi nor Manzoni were able to have back.

The manuscript of the *Recherches* is not in the depositions that I inspected. Perhaps it was sold by Luigi Manzoni to the French Government, or it followed the destiny of those in Holmboe's possession and burn at "La Frascata".

What about the still missing four pages of the Parisian memoir?

Once Libri wrote:

Cependant, lorsqui'il s'agit de manuscripts, on ne doit jamais déspérer de rien. Souvent ce qu'on croit perdu n'est que caché, et il ne faut pas oublier que les manuscripts autographes de Galiée, que sa correspondance inédite, qu'on supposait depuis long-temps anéantie, ont été retrouvés un beau jour dans la boutique d'un charcutier auquel un domestique, qui le avait découverts dans un vieux silo, les vendait au poids.[63]

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[57] Vito Volterra [1860,1940], he is well known for the "Volterra-Lotka equations" of biomathematics. He was a student of Betti in Pisa.

[58] Enrico Betti [1823,1892], his topological studies influenced H. Poicaré, who introduced the "*Betti numbers*".

[59] Gregorio Ricci Curbastro [1853,1925], with his student Tullio Levi-Civita developped the "Absolute differential calculus" used by A. Einstein in his theory of relativity.

[60] Scuola Normale Superiore, archivio *Betti*. The letter is in Italian: «Fui a Lugo e vidi il Ricci. Egli mi condusse presso il Conte Manzoni. Ho trovato nella sua biblioteca molte carte provenienti dal Libri che potranno dirsi preziosissime quando ne sarà provata la autenticità. Prima di tutto ho trovato varii fogli che figurano come autografi di Abel. […] Disgraziatamente tutto ciò temo che resterà sepolto nella biblioteca senza potere essere esaminato con cura né pubblicato, perché il Conte Manzoni non permise che si prendessero fotografie né che si tornasse…».

[61] Probably the sections of the *Reserches* not mentioned by Manzoni went lost in the sale by the namesake Libri's cousin.

[62] Cfr. A. STUBHAUG, *Niels Henrik Abel and his times*, cit. p.252.

[63] G. LIBRI, *Fermat*, «Revue des Deux Mondes», 1845, pp. 679-707.

This is my hope too.

Anyway after all it has gone through, it seems to me very lucky that the Parisian memoir, to which Abel had attached so much hope, has been reassembled almost completely, and it is now exhibited on the occasion of bicentennial of his birth.

APPENDIX

For a better understanding of the events I have described above, I think it useful to include here a short biography of Guglielmo Libri, who, as we saw, had a central role in the whole story.[64]

Nomen est omen

Bruto Icilio Timoleone Libri Carrucci della Sommaja Count of Bagnano, better known as Guglielmo Libri, was born in Florence on January 2nd 1802. He had an excellent education, inspired by the new illuministic ideas cultivated in his family. In his youth he was taught history and philosophy, French, English, some German, and studied Italian and literature almost to perfection. To the age of fourteen he enrolled in the University of Pisa where he attended lectures on Greek, Logic, Law, Geometry, Trigonometry, Physics and Chemistry. At first he decided to specialize in Law, but almost immediately changed to a doctorate in Natural Sciences.

Libri showed an exceptional aptitude for Mathematics and Physics: in 1815 he presented a memoir on "a new electrometer" and in 1820 his memoir on the Theory of Numbers attracted the attention of Cauchy and Gauss.

In 1823 at the age of twenty two he became professor of Mathematical Physics at Pisa. But since he felt that his future lay elsewhere, he left the position (with the privilege of the title and salary until his death) the following year.

In 1824 Libri made his first journey to Paris, where he was presented to the Académie des Sciences by the great naturalist Alexander von Humboldt. In Paris he met Fourier, Ampère, Laplace, Biot, Poisson, Arago, among others, and at the evening parties of Arago he brillianty conversed with them not only of science but also of matters political. Libri was soon received in all the best places and introduced to the King by the Tuscan ambassador. He also met powerful politicians, among them François Guizot, his future patron, who at that time was organizing the opposition to King Charles X.

Once returned in Italy in 1825 he started to work on some memoirs, in Mathematics and Phisics, that later were also published in the Crelle's journal, and thougth out the whole structure of what was to become his masterpiece, the *Histoire des sciences mathématiques en Italie*.

[64] For an extended biography I refer to P. A. MACCIONI-RUJO & M. MOSTERT, *The life of Guglielmo Libri (1802-1869); scientist, patriot, scholar, journalist and thief: a nineteenth-century story*, Hilversum, Verloren Publisher, 1995.

Libri was again in Paris in 1830. He renewed his friendship with Arago and other scientists, and also read several memoirs at the Academy of Paris. In spite of his aristocratic genealogy, he took part in the July revolution, so actively that a newspaper reported that he "fought bravely". Having returned to Tuscany, Libri became implicated in the February plot to wrest a constitution from the Grand Duke, and after it failed he went into exile in France. In Paris the political climate was favourable to him, and he was helped by several friends, first of all Guizot (the future Minister of Foreign Affairs), Villemain (the future Minister of Public Instruction) and Arago (the most influencial member of the Academy). Libri was known to be a talented mathematician and many European Academies were eager to recognise his merits, among them Torino, Palermo and Berlin. In 1832 he was elected corresponding member of the Geometry section of the Academy of Sciences of Paris.

He became a French citizen in1833 and from then on he was free to pursue his academic career. With the death of Legendre in the January of 1833, a full position became available at the Academy. Supported by the physicist Biot, the mathematician Poisson, the chemist Thénard but mainly by Arago, Libri was elected. Thereafter his career knew no limits: the following year he became professor at the Sorbonne, in 1839 he was named inspector for the French libraries, and in 1843 he was elected to the Collège de France. Libri's election did not received Arago's support and marked the beginning of his harsh disputes with him.

Libri reached the summit of his career and fame with the arrival of the year 1848. During the February revolution, the old accusation of 1842 against him, namely of having committed thefts in French public libraries, resurfaced. Libri felt that his time in France, as that of the Monarchy, was over. He would not have any longer the protection of Guizot, the powerful Minister of Foreign Affairs. So Libri fled to England. Here he was welcomed by the scientific and literary communities: he was a member of the British Historical Society, a good friend of de Morgan[65] (who remained one of his faithful defenders) and of Antonio (Sir Antony) Panizzi[66].

On July 22nd 1850, Libri was sentenced in Paris to ten years in jail. He remained safely in London since there existed no extradiction treaty between France and England. The same year his chair at the Collège de France was declared vacant.

The "Libri affair", which produced much excitement among scholars and in "high society", was disputed and eagerly commented on for a long time the world over.

From London he organized his bitter battle against the conviction of 1850. He also continued to buy and sell books and manuscripts, and he started to write his memoirs which, however, were never finished or published. The cost of his legal campaign and the expenses of the publication of the pamphlets he wrote in his defence, were only in part covered by the income deriving from his trade. These were among the main reasons that started the decline of his finances.

From 1858 Libri was forced to sell, in a series of auctions, a larger part of the best of his collections of books and manuscripts. He wrote extensive introductions to the catalogues, often describing at great length the items put on sale. This was unusual at that time and attracted criticism, but Libri's style was pioneering and had a strong impact upon the book trade.

In 1868 Libri felt he did not have much longer to live and decided to go back to Florence, his birthplace. He took with him what remained of his library and all his documents, some

[65] Augustus de Morgan [1806,1871], astronomer and mathematicians, he was professor at University College in London.

[66] Antonio Panizzi [1797,1879], keeper of Printed Books at the British Museum. He was a friend of Libri since the two met in Paris in the 1830s.

dating from his early youth. Libri left London in June 1868, but settled down in Florence only in December, after a long tormented journey due to his poor health.

Libri died in Fiesole, the small Etruscan town on the hills surrounding Florence, in September of the following year.

His guilt was completely proved by Léopold Victor Delisle, General Administrator of the Bibliothèque Nationale of Paris, only after the death of the fouth Earl of Ashburnham in 1878 to whom, in 1847, Libri sold part of his collection of ancient and extraordinary manuscripts.

Acknowledgement

It is a pleasure to thank the many librarians of the Biblioteca Moreniana of Florence and of the Biblioteca Trisi di Lugo for their kind assistance during my pursuit of the *Fondo Palagi-Libri*, *Nuovo Fondo Libri* and *Fondo Gherardi*. In particular I thank Cristina Luschi, of the Labronica Library of Livorno, and Antonio Curzi, of the town Archives of Lugo, the latter for his help during my protracted scrutiny of *Archivio Seganti* and for his permission to have copies made of many documents.