

## HISTORICAL-MATHEMATICAL PARIS.

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## I. ILE DE LA CITÉ AND THE VOLTAIRE-CHÂTELET PARIS.

The World War has naturally turned the steps of many of our advanced students to the paths their intellectual ancestors trod soon after the American and French revolutions, namely, to Paris. There will still be large numbers who go to Germany and England, and many who go to Italy, but for some years to come it is probable that Paris will attract American students more than it ever has in the past and more than any other single city of Europe. For these students, and for the more casual visitor of mathematical tastes as well, this article has been prepared in the hope that new interest may be added to their sojourn in what is, all things considered, the most attractive city of the world. Having spent much time there during repeated visits spread over a period of more than forty years, I have naturally come to know a considerable number of the places of mathematical interest, and my collection of autograph letters of those who have made the science what it has become in the last three or four centuries has supplied considerable information as to where the various writers and their correspondents lived and labored and died. I have also been aided by such works as those of the learned M. Cain (for example, his *Promenades dans Paris*) and by the more detailed but less well-written work of the Marquis de Rochegude (*Promenades dans toutes les Rues de Paris*), but I have naturally selected only a few of the many spots of historic interest that anyone could readily find if he should attempt such a pretentious piece of work as a book upon the subject. In many cases the houses mentioned are still standing, as, for example, two on the Rue de Bac and one on the Rue de Lille, but in any event the mere location has enough interest to make some reference to it worth while.

Beginning with the most ancient part of the city,—the Lutetia of Cæsar's time, now a part of the Ile de la Cité, upon which Notre-Dame stands,—we may turn to that little gem of Gothic architecture, the Sainte-Chapelle in the ancient Palais de Justice. It was constructed in 1245–1248 by Saint Louis as a fitting receptacle for the Crown of Thorns and a portion of the True Cross, and it seems to have had as one of its canons Rollandus, whose general treatise on mathematics, written c. 1425, has come down to us in manuscript copy.<sup>1</sup>

On the north side of the Palais de Justice, and entered from the Quai de l'Horloge, is the Conciergerie, the most ancient prison of the city. It was here that Jean Silvain Bailly<sup>2</sup> was confined before his execution in the Reign of Terror. While he was still in favor of the revolutionists he was mayor of Paris, although carrying on his studies in mathematical astronomy, and lived in the Hôtel de la Mairie which stood where is now No. 14 of the Rue des Capucines, a street which runs from the Rue de la Paix to the Boulevard des Capucines. He also lived for a time at No. 21 (old numbering) of the Rue de Chaillot, once the principal street

<sup>1</sup> This copy is now in the library of Mr. George A. Plimpton, New York City.

<sup>2</sup> Born in Paris, Sept. 15, 1736; guillotined Nov. 12, 1793.

of the village of Chaillot, the Colloelum of the 11th century, but now a residential section southeast of the Arc de Triomphe de l'Étoile, so called to distinguish it from the Arc de Triomphe du Carrousel. It was on July 17, 1791, that he and Lafayette directed the charge on a mob which had demanded the surrender of the king. After his execution (1793) in the Place de la Concorde<sup>1</sup> his body was buried in the ancient cemetery (1659–1865) of the Madeleine, now (since 1865) the Square Louis-XVI, on the Rue Pasquier, a little south of the Gare Saint-Lazare.

If we rank Voltaire<sup>2</sup> in our guild because of his work on the philosophy of Newton,<sup>3</sup> we shall naturally find many spots in Paris connected with his name, and portraits and statues in great number and often of much excellence. The present Rue Molière, running from the Avenue de l'Opéra to the Rue Richelieu, for example, was once the Rue Traversière, and at the old number 25 was a house which was rented to the Marquise du Châtelet,<sup>4</sup> and there Voltaire lived for some time, setting up a little theatre for his plays. Around the corner, at No. 8 of the Rue de Richelieu, the street on which the Bibliothèque Nationale fronts, was the café of Charlotte Bourette, who was known as the Muse Limonadière, and whom Voltaire esteemed for her wit. Farther up the Rue de Richelieu, at No. 102, stood a house which Voltaire owned and in which his niece, Mme. Denis, lived after the death of the Marquise du Châtelet. Next door, at No. 100, stood the house of Voltaire's friend, Mme. de St. Julien, whom he often visited. Voltaire also lived (1732 and 1733) at what is now, No. 20, Rue de Valois, in the same vicinity, east of the Palais Royal. Not far from here, at No. 161, Rue Saint-Honoré, is the Café de la Régence, which I well recall as still prominent in the artistic life of Paris when I was a boy. Its predecessor stood a little to the east, at the Place du Palais Royal, and was frequented by Voltaire as well as by Benjamin Franklin, Diderot, Napoleon, and other makers of history. Over on the Ile Saint-Louis, at No. 2, on the Rue Saint-Louis-en-l'Île, is the hôtel (mansion) of Nicolas Lambert de Thorigny, sometime president of the Cour des Comptes, built in 1680. The Marquise du Châtelet lived there for a time, and Voltaire was, as usual, a guest of the house. His sister, Mme. Mignot, mother of Mme. Denis (to whom Voltaire was greatly attached), lived at No. 133, Rue Saint-Antoine, a continuation of the Rue de Rivoli and leading into the Place de la Bastille. Although the Bastille has long since ceased to exist,<sup>5</sup> when the wanderer stands upon its ancient site he may reflect that Voltaire was twice imprisoned there,<sup>6</sup> for his rash utterances on the rights of man. Voltaire was baptized (1694) in the church of Saint-André-des-Arcs, which was built in 1210.

<sup>1</sup> The guillotine was at the entrance to the Champs Elysées.

<sup>2</sup> François Marie Arouet, who took the name of Voltaire (anagram on Arouet le jeune = Arovet l. i.); born at Paris, November 21, 1694; died at Paris, May 30, 1778.

<sup>3</sup> *Éléments de la philosophie de Newton*, Amsterdam, 1738. Compare this MONTHLY, 1921, 303–305.

<sup>4</sup> Gabrielle Émilie Le Tonnelier de Breteuil, born at Paris, December 17, 1706; died at Commercy, September 10, 1749. She spelled her married name in the full form,—Chastelet.

<sup>5</sup> The upper part of the Pont de la Concorde was built from the stones of the Bastille.

<sup>6</sup> In 1717 and 1726, more than sixty years before its destruction.

It stood on the present Place Saint-André-des-Arts,<sup>1</sup> near the Point Saint-Michel, and was demolished about 1800. In 1793 it became the Temple de la Révolution. Voltaire once worked as a clerk in the office of Maître Alain, No. 1, Rue des Grands-Degrés, so called from the steps leading down to the quai, and he became a mason in the lodge of the Neuf Soeurs which stood at No. 80 of the Rue Bonaparte; but the atmosphere of the Quartier Latin was perhaps not so well suited to his maturer years, although he lived for a time in Rue Mazarine and in 1743 was living at No. 23, Rue Fontaine Molière. He died in the house of the Marquise de Villette, at No. 27, Quai Voltaire, as an inscription states. The present name of the quai, formerly the Quai des Théatins, was given in memory of this event, as was that of the Rue Voltaire which branches off at No. 211. His final resting-place is appropriately in the Panthéon, the Valhalla of France.

As to busts, bas-reliefs, and statues of Voltaire, Paris has been over-generous. Houdon's bust in the Comédie Française is the best known, but the statue by Caillé (1885) on the Quai Malaquais is also familiar to every visitor to the book-stalls on the Rive Gauche.

As to the Marquise du Châtelet<sup>2</sup> and her family, Tonnelier de Breteuil, there are various interesting spots connected with each. The family owned a hôtel at No. 14, Rue Portefoin, a little to the southeast of the Conservatoire des Arts et Métiers. They also owned (1760) a place at No. 56, Rue des Francs-Bourgeois, near the Palais des Archives Nationales, and somewhat earlier (1728) one at No. 4, Place des Vosges, on the same street. In 1752 the marquise was living at No. 18 of the same Place.

## II. THE QUARTIER LATIN.

Returning in our wanderings to the Quartier Latin, and to names more mathematical, at No. 1, Rue de la Sorbonne, Hermite<sup>3</sup> died in 1901, and on the walls of the Église de la Sorbonne is his *médaille*. At No. 2 of the Rue Rollin, which opens on the west side of Rue Monge, Pascal<sup>4</sup> died, as an inscription states, at the house of his sister, Marguerite Périer, who afterward wrote his biography. Descartes lived at No. 14 of the same street. A little to the south, parallel to and east of Rue Monge, is the Rue de la Clef where, at No. 38, Monge<sup>5</sup> lived for a time. He also lived in Rue de Dragon, a little to the west of Saint-Germain-des-Prés and to the south of Boulevard Saint-Germain. One of the letters<sup>6</sup> written from Linz, when he was with Napoleon on the Austrian campaign, is addressed to Madame Monge at "Rue neuve Belle chasse No. 3," the Rue de Bellechasse (formerly Belle Chasse). The part between the Rue Saint-Domi-

<sup>1</sup> The change from *arcs* to *arts* is relatively recent.

<sup>2</sup> Compare this MONTHLY, 1921, 368-369.

<sup>3</sup> Charles Hermite (1822-1901), who proved the transcendence of  $e$ .

<sup>4</sup> Blaise Pascal, born at Clermont-Ferrand in 1623; died at Paris in 1662.

<sup>5</sup> Gaspard Monge, born at Beaune in 1746; died at Paris in 1818. He is known chiefly for his work in descriptive geometry.

<sup>6</sup> Whenever such letters are mentioned it is to be understood that they are at present in the author's collection.

nique and the Rue de Grenelle was formerly called Rue Neuve Belle Chasse. It seems, from the old maps, that this house stood at the corner of the present Rue Saint-Dominique. Monge also lived for a time at Nos. 7–9, Rue Bonaparte, as stated later.

To the west of Rue Monge, and nearly parallel with it, is the Rue d'Ulm which runs from the Panthéon south to Rue Claude Bernard. At No. 43, Rue d'Ulm, is the École Normale Supérieure, founded in 1795 and occupying the present building since 1847,—an institution with which have been connected many mathematicians of prominence, Jules Tannery being one of the last of those who have now passed away. At the next corner to the north and east of this school the Rue Lhomond continues the line of the Rue des Fosses Saint-Jacques. It was formerly called the Rue des Postes, and a letter was written from this street by Pierre Bouguer<sup>1</sup> on October 31, 1750. The first street to the north is now known as the Rue de l'Estrapade, known a century ago as the Rue de la Vieille-Estrapade, so called from the *estrapado* or *strappado* punishment there inflicted upon soldiers in early times. At No. 11, in a mansion still standing, there lodged Georges Marie Raymond,<sup>2</sup> professor of mathematics in Geneva, whose contributions to algebra appeared frequently in Gergonne's *Annales*.

At No. 9 of the Quai Malaquais, which extends westward from the Palais de l'Institut, Legendre<sup>3</sup> lived for four years (1809–1813). The building stands next to the École des Beaux Arts, on what was formerly part of the grounds of the ancient Abbey of Saint-Germain-des-Prés. Before this he lived at No. 12, Rue Condé, a street running north from the Palais du Luxembourg, one of his letters having been written from there in 1804.

Near the Pont Saint-Michel, and west of the Boulevard, is the Rue Saint-André-des-Arts, dating from 1179,—formerly Saint-André-des-Arcs. At No. 52 of this street, a fine old mansion at the corner of Rue des Grands Augustins, Joseph-Louis-François Bertrand<sup>4</sup> was born in 1822. The next parallel street to the north is Rue Christine where, in a dignified old mansion at No. 2, Laplace<sup>5</sup> lived in 1802. It leads to the east into the narrow Rue de Savoie, with numerous old houses, where, at No. 13 as an inscription states, Sophie Germain<sup>6</sup> died on June 27, 1831.

The Rue Mazarine runs southward from the Institut, and leads into the Rue de l'Ancienne Comédie where, at the oldest café in Paris, the Procope (No. 13), founded in 1689, d'Alembert, Voltaire, and many others among the intellectuals gathered. The café still stands, shorn of its ancient prestige, as is also the case with the old Comédie Française across the street, at No. 14.

<sup>1</sup> Born in 1698; died at Paris in 1758. He was engaged with Condamine and others on the figure of the earth. He contributed to the geometry of curvilinear figures.

<sup>2</sup> Born in 1769; died in 1839. Delambre wrote a letter to him at this address in January, 1822.

<sup>3</sup> Adrien-Marie Legendre, born at Toulouse in 1752; died at Paris in 1833.

<sup>4</sup> He was professor of mathematical physics in the Collège de France and died in 1900.

<sup>5</sup> Pierre Simon Laplace, born in 1749; died in 1827. Known primarily for his work in celestial mechanics.

<sup>6</sup> She was born in 1776. She is known for her work on the theory of elastic surfaces.

Puissant<sup>1</sup> lived in the Rue Mazarine in 1826, as is shown by a letter written by Bouvard<sup>2</sup> to him in 1826, and Gaston Darboux<sup>3</sup> lived at No. 3 of the same street,—his official residence as *secrétaire perpétuel de l'Académie des Sciences*. Where the Rue Mazarine becomes the Rue de l'Ancienne Comédie the Rue de Buci runs to the west, and at No. 19 Mme. Denis, niece of Voltaire, was joint proprietor of a residence. In the Rue de Seine, nearly parallel to the Rue Mazarine and the best place in Paris for the collector of early mathematical portraits, Legendre lived at one time and the widow of the unfortunate Condorcet<sup>4</sup> died in 1822. She had lived before that (1812) in the Rue de Penthière, north of the Champs Elysées. At No. 4 of the southern part of Rue Mazarine, there called the Rue de Tournon, J. L. F. Bertrand died in 1900, and at No. 12, in an elaborate old mansion near the entrance to the Palais du Luxembourg, Cauchy<sup>5</sup> and Leverrier<sup>6</sup> both lived.

Not far to the east of the Rue de Tournon is the Place de l'Odéon where the Café Voltaire was much frequented by Voltaire and his friends. From here to the Boulevard Saint-Michel there runs the Rue Racine in which, at No. 30 as an inscription states, there died Auguste Comte (1798–1857), the founder of positivism, a writer on the philosophy of mathematics, and the editor of some of Pascal's works.

In Rue Bonaparte, the next street to the west of the Rue de Seine, Monge<sup>7</sup> lived in the hôtel of the Marquis de Persen (Nos. 7–9),—a building now given over to commercial uses. To the west of this street, and extending to the south from the church of Saint Sulpice, at No. 15 of the narrow Rue Servandoni with its ancient structures, the widow of François Vernet, the sculptor,<sup>8</sup> concealed Condorcet while he was writing his *Esquisse du progrès de l'esprit humain* (1793), the last work undertaken by him before he poisoned himself to escape the guillotine. The old house still stands, bearing a proud inscription of the incident, but looking dilapidated enough to conceal with perfect safety any unfortunate seeker after oblivion. Just before this, Condorcet lived a short distance away, at No. 71, Rue de Lille,<sup>9</sup>—from 1640 to 1792 known as the Rue de Bourbon, and again by the same name from 1814 to 1830. Twenty years before this time Monge wrote a letter to Condorcet, addressing it to him "Chez M<sup>r</sup> le M<sup>is</sup> d'Essé, Rue de Bourbon, St. germain," but no number was given. It was then one of the most fashionable parts of Paris and, being near the Quai d'Orsay, is still a diplomatic center. The well-known Rue du Bac crosses this street, and at No. 26 Baron

<sup>1</sup> Louis Puissant, born in 1769; died at Paris in 1843. He wrote extensively on algebra, geometry, and geodesy.

<sup>2</sup> Alexis Bouvard (1767–1843) the astronomer.

<sup>3</sup> Born at Nîmes, 1842; died at Paris, February 23, 1917.

<sup>4</sup> Marie-Jean-Antoine-Nicolas Caritat, Marquis de Condorcet, born at Nemours in 1730; died near Paris in 1793. He poisoned himself to escape the guillotine.

<sup>5</sup> Augustin-Louis Cauchy, born at Metz in 1788; died at Paris in 1867.

<sup>6</sup> Urbain-Jean-Joseph Leverrier (Le Verrier, 1811–1877) lived there in 1853.

<sup>7</sup> See page 109.

<sup>8</sup> He died in 1784.

<sup>9</sup> The fine mansion may be seen by entering the court.

Charles Dupin<sup>1</sup> died in 1873. The house still stands, and at No. 108, as an inscription states, Laplace died in 1827. It also crosses, farther south, the Rue de Sèvres where, in a mansion formerly standing at No. 16, Madame de Récamier spent the last thirty years of her life and held a notable salon at which all the academicians were received. Among those who frequented her house were Arago and Ampère, and it is of some interest to know that Victor Hugo was baptized there. The building was the ancient Abbaye aux Bois and was demolished in 1908. A few minutes' walk to the southwest of this locality, and near the Gare Montparnasse, is the modern Rue Littré where, at No. 5, Émile Lemoine<sup>2</sup> (1840–1912) lived.

Few who visit this scholastic and artistic part of Paris fail to enter the Musée de Cluny, but probably not many of these recall the fact that the old palace which houses it has a mathematical as well as an archeological interest. Lalande (1732–1807),<sup>3</sup> however, lived there for a time, and Charles Messier (1730–1817), the astronomer, followed him and died there in 1817, the tower serving at that time as the Marine Observatory. It was not until 1833 that M. Du Sommerard (1779–1842) installed his great collection there, the government acquiring it ten years later.

The Panthéon, too, is not usually connected in thought with mathematics, for the inscription, “Aux grands hommes, la Patrie reconnaissante,” is not ordinarily associated in the public mind with the mathematicians of the country. Nevertheless there is an indirect interest in recalling that it was here, in February 1851, that Foucault made his experiments relating to the pendulum and the rotation of the earth. He is not buried here, however, but in the cemetery of Montmartre.

Coming out from the Panthéon we face the Rue Soufflot. At No. 14 there stood, from 1217 to 1790, the convent of the Dominicans, or Jacobins, where Albertus Magnus<sup>4</sup> taught in the Middle Ages. Around to the right, as one leaves the Panthéon, stands the Église Saint-Étienne-du-Mont, dating from the 16th and 17th centuries, and it is here that Pascal was buried, as is recorded by an inscription on a pillar back of the chancel.<sup>5</sup> Descartes<sup>6</sup> was also buried here, but his remains were later (1819) transferred to Saint-Germain-des-Prés. In the Bibliothèque Saint-Geneviève nearby is the oldest known French algorism, a parchment manuscript of *c.* 1275, but of course the great collection of mathematical manuscripts is in the Bibliothèque Nationale.

The Sorbonne lies a little to the northeast of the library of Saint-Geneviève,—not the ancient building which I remember as a boy, and where generations of

<sup>1</sup> Born in 1784; died in 1873. Prominent because of his works on mechanics and differential geometry. See this MONTHLY, 1921, 121.

<sup>2</sup> One of his letters is dated there October 13, 1894.

<sup>3</sup> See this MONTHLY, 1921, 207.

<sup>4</sup> Count of Bollstädt and bishop of Regensburg. His works include a certain amount of astronomy and some mention of Pythagorean arithmetic. Saint Thomas Aquinas also taught there.

<sup>5</sup> See this MONTHLY, 1921, 64.

<sup>6</sup> Born at La Haye, March 31, 1596; died at Stockholm, February 11, 1650.

mathematicians had taught since the Middle Ages, but the new and imposing edifice which has gradually replaced its ancestor during the last forty years. Across the Rue Saint-Jacques, to the east, is the Collège de France, where many of the greatest of the French mathematicians have taught. The present building was completed about 150 years ago. The square in front was formerly called the Place Cambray, and a letter of Lalande was written there on October 14, 1800, the year after the death of Montucla whose history of mathematics he edited in its second edition, the letter having probably been written at the collège.

Three letters of Jean-Nicolas-Pierre Hachette<sup>1</sup> were written from "Rue d'Enfer St Michel n° 31." The Boulevard Saint-Michel was opened during the Second Empire, and its present name dates only from 1867. It was formed by straightening and enlarging the ancient Rue de la Harpe, Rue d'Enfer, and other minor streets. The Rue d'Enfer was the portion lying south of the present corner of the Rue Soufflot. In late Roman times it was the Via Infera (voie inférieure, the lower route), a name corrupted as early as the 13th century to Rue d'Enfer (hell's street). The next street to the south of Rue Soufflot is Rue Royer-Collard, known before 1846 as Rue Saint-Dominique-d'Enfer. At No. 15 is found the Impasse Royer-Collard (opened in 1590), formerly called the Impasse Saint-Dominique. It was here that Hachette probably lived, for another of the letters bears the address "Impasse st. dominique d'enfer." Poisson<sup>2</sup> dates a letter from No. 20 of the same street, where he seems to have been living in 1814.

When Rue Soufflot was completed, in the middle of the 19th century, Rue Hiacinte (Hyacinthe) was closed. It ran from the eastern entrance of the Luxembourg gardens to the present Rue Saint-Jacques, and Hachette also lived here,—at No. 20 in 1814 and at No. 8 in 1830, as is shown by two other letters of his.

Down by the river the Palais de l'Institut, built in 1663, is of course closely connected with the history of mathematics, especially in the class of the Académie devoted to this subject and physics. D'Alembert,<sup>3</sup> for example, was the secrétaire perpétuel during the latter part of his life.

*(To be concluded in the next issue.)*

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## CYCLIC OPERATIONS ON DETERMINANTS.

By A. L. CANDY, University of Nebraska.

"A determinant is not altered in value by adding to all the elements of any column (or row) the same multiples of the corresponding elements of any number of other columns (or rows)."

This is a well-known theorem that is stated in substantially the same form in

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<sup>1</sup> Jean-Nicolas-Hachette (1769–1834), well known for his works on algebra and geometry.

<sup>2</sup> Siméon-Denis, Baron Poisson (1781–1840). He wrote on probability, equations, and the calculus.

<sup>3</sup> Jean-Baptiste-le-Rond d'Alembert, born at Paris in 1717; died at Paris in 1783.