# Euler and d'Alembert—Brothers Only in Mind

## Their Relation to the Prussian King Frederick II and the Russian Empress Catherine II

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**Abstract:** Euler and d'Alembert did not only essentially influence the intellectual life of the 18th century but also especially the fortune of the Royal Academy of Sciences and Humanities in Berlin and of the Imperial Academy of Sciences in St. Petersburg. If one compares the origins and the childhoods of these two outstanding representatives of the European Enlightenment, a greater difference can hardly be imagined. Euler was religiously educated in a Protestant family of a parish priest who published writings against the hated freethinkers as the leading mathematician of his time. D'Alembert was a foundling who grew up in the household of a master craftsman and became the leading freethinker of the French Enlightenment and an equal rival of Euler as far as analytical mechanics was concerned. Their dealings with King Frederick II of Prussia and Empress Catherine II of Russia were also completely different. While Euler gained the respect, but never the favour of the King, d'Alembert enjoyed the friendship of Frederick II without ever giving up his independence. While d'Alembert politely refused all offers of the Empress, Euler returned to St. Petersburg after Catherine had fulfilled all of his demanding claims.

**Keywords:** *Berlin academy, Catherine II, d'Alembert, Enlightenment, Euler, Frederick II, freethinkers, Russian academy*

## Preliminary comparative considerations

If one approaches the rooms of the president on the third floor of the building of the Berlin-Brandenburg Academy of Sciences and Humanities today, one sees the two busts of Jean Le Rond d'Alembert and of Leonhard Euler. These two men had not only a formative influence on the intellectual life of the 18th century but also on the fortune of the *Académie Royale des Sciences et Belles Lettres* of Fredrick II of that time. If, however, one compares the origins and childhoods of these two outstanding representatives of the European Enlightenment a greater difference can hardly be imagined.

When Euler was born on April 15, 1707 his father Paulus was a Protestant, reformed parish priest in St. Jakob on the Birs in the direct neighbourhood of Basel, Euler's native town. His mother was the daughter of the parish priest Brucker in Basel. Euler grew up together with three younger brothers and sisters in the small village of Riehen near Basel, where his father became the parish priest in 1708. The rural seclusion, the religiously determined family life that taught discipline shaped Euler's own piousness. His later strong dislike of freethinkers, of the representatives of the French encyclopaedia and atheists who increasingly determined his years in Berlin is rooted in his childhood. He himself was married twice, he had thirteen children with his first wife. Eight of them died however already at an early age. Euler died on September 18, 1783 in Petersburg.

D'Alembert, on the other hand, was an illegitimate foundling born on November 17, 1717. His name Jean le Rond was the name of the place where he was found, that is, of the Parisian church Saint-Jean-le-Rond. What an irony of the history of science that a leading representative of the French encyclopaedia was named after a church! His mother was the later celebrated society woman Claudine Guérin de Tencin, who rejected him in his lifetime. His father was the general of artillery Louis Camus Destouches who made d'Alembert's comprehensive education possible. The infant was abandoned in front of the mentioned church and was picked up by the married couple Etiennette Gabrielle Ponthieux and Alexandre Nicolas Rousseau, a master glazier.

 Up to age 48, he lived together with his foster parents, he never married and had no children. Since 1765 he lived together with his lady-friend Julie de Lespinasse who had nursed him back to health when he was seriously ill. Her death struck him hard. On July 9, 1776 Frederick II wrote him a letter of condolence. Seven years later, on October 29, 1783, that is, six weeks after Euler, he himself succumbed to a painful cystitis.

## Euler and the Prussian king

Ever since he had come to power on May 31, 1740, Frederick II had been determined to reactivate the Berlin Academy of Sciences and Humanities. He was interested in attracting the best scholars to Berlin, especially Leonhard Euler from St. Petersburg, the *grand algébriste* ('great algebraist'), as he wrote to the extraordinary legate of the Saxon country in St. Petersburg, Ulrich Friedrich von Suhm (Stieda, 1931, p. 7).

Frederick's legate Axel von Mardefeld had the confirmation of Suhm's offer in his hands on February 15, 1741. Already the following day Euler tendered his resignation from the Russian service. The King's offer to come to Berlin for 1,600 thalers annually seemed to be very attractive for him in view of the uncertain political situation in St. Petersburg after the death of Anna Ivanovna. Elisabeth Petrovna's coup d'état in December 1741 happened after Euler's departure.

But the Russian academy did not let its most famous academician go so easily. Especially the counsellor of the academic office and managing director of the academy, Johann Daniel Schumacher, resisted Euler's petition. Euler needed considerable efforts and the support of Frederick's confidant before Euler and the King attained their goal. On June 19, 1741 Euler, together with his family, left the place of his previous activities so that he arrived in Berlin on July 25.

In the meantime, the impatient Frederick had admonished Suhm to bring Euler. There is no doubt that originally the King estimated Euler very highly and called him a credit to his academy (Stieda, 1931, p. 11).

Yet, the time of Euler's coming was not favourable for meeting with the King. Frederick was at the first Silesian war. He wrote only a short letter to Euler from the camp in the neighbourhood of Reichenbach: He is happy to hear that Euler feels at home. If Euler should need other things besides his pension he must wait for Frederick's return to Berlin (Euler, 1986, p. 297).[1] Euler, eager for action, was indeed forced to remind the King of his promise to refund him his travelling expenses. The correspondence between the King and Euler was that between a monarch and a zealous inferior to whom the King dictated what he had to do or not and whom he sometimes rebuked rather bluntly.

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[1]    All translations of German and French written texts are my own.

After the first Silesian war that the King successfully ended with the peace of Breslau—Silesia remained a part of Prussia—Euler wrote to the King without being asked on January 19, 1743 in order to advise him to use the calendar revenues of the new province for the foundation of an academy of sciences. These would nearly suffice to run an academy on the level of the academy in St. Petersburg or Paris. Two days later the King rather indignantly answered from Charlottenburg:

> Your letter of the 19th of this month has informed me of your ideas about the alleged financial sources of an academy of sciences. But I believe that you have committed a sin against the ordinary rules of calculation being accustomed to the abstractions of the quantities of algebra. Otherwise you would not have been able to imagine such a great income from the sale of the calendars in Silesia. (Euler, 1986, p. 302f)

This was a rather clear reprimand. The King did not like such personal initiatives. Yet they were an idiosyncrasy of Euler. President of the Academy, de Maupertuis, who was well-disposed to Euler described it in a letter to his friend Johann II Bernoulli in the following words:

> Euler is—very generally speaking—a most peculiar personality, a continual nuisance who likes to interfere in everything, though the structure of our academy and the orders of the King don't permit any interference to anybody […] This is another of these family secrets that should not be repeated. (Fellmann, 1995, p. 84)

The King, however, praised his mathematician when he had successfully carried out his orders, for example the work on the Finow canal, the assessment of a lottery, the checking of proposals for technical improvements or the expert opinion about decisions regarding the staff. But there is no trace of the matey, friendly tone that characterizes Frederick's correspondence with d'Alembert in his correspondence with Euler. Euler's private requests fell on deaf ears. He always refused them: it did not matter whether they concerned his brother's support, his objection to the enlistment of his nephew in the military service, the marriage of a daughter with the Cornet van Dehlen or the employment of his son Johann Albrecht at the Academy of Knights.

While the King most eagerly waited for the first meeting with d'Alembert, he delayed seeing Euler for the first time. Only on September 6, 1749, four years after the end of the second Silesian war, and eight years after Euler's arrival

in Berlin, the first meeting between the two men took place at the court of Potsdam. This did not prevent the King from forming an opinion about Euler much earlier as his correspondence with his eldest brother, Crown Prince August Wilhelm, reveals.

On October 28, 1746 the crown prince sent him a letter from Berlin to Potsdam that typically enough was just as little included in Preuss's selection of Frederick's correspondence as the King's answer. Therein one reads:

> Mr de Maupertuis has introduced me to the mathematician Euler. I experienced in him a confirmation of the truth that all things are imperfect. He applied himself to acquire logical thinking so that he has made a name for himself. But his appearance and his clumsy expression darken all these beautiful properties and prevent one using them. (Volz, 1927, p. 95f)

Three days later Frederick answered him revealing his opinion about Euler to his brother:

> I already assumed that your conversation with Mr Euler would not please you. His epigrams consist in calculations of new curves, of some conic sections or astronomical measures. Among the scholars there are such outstanding calculators, commentators, translators and compilers who are useful in the republic of sciences but who are not at all brilliant apart from that. They are used as Doric columns in architecture. They have their place in the fundament as support of the whole building and of the Corinthian columns that are its ornament.

He added a harsh remark about Prince Moritz of Anhalt-Dessau: "Prince Moritz is here. He is the same in the art of warfare what Euler is in science, even a bit less. I tell you, he bores me to death and I shall get him off my back as soon as possible."

The brother answered him on November 1, 1746: "Nothing is more right than your consideration about the pedantry most of the scientists fall to… After all, I accept the pedantry of people who achieve outstanding results in their discipline. But the pedantry of average people becomes completely unbearable."

The remarks reveal in plain language why the "philosopher of Sanssouci", as the King liked to call himself, did not set great store by contact with Euler. Their contact with each other came indeed mainly about the administration, President of the Academy de Maupertuis, d'Alembert, d'Argens or de Catt. Spieß put it in

the following way: "Euler was the greatest of the mathematicians, but indeed only that." (Spieß, 1929, p. 171) The King highly regarded intellectually stimulating conversations and correspondence about questions of religion, philosophy, and politics and admired Voltaire and d'Alembert for this reason. For him Euler was a tedious pedant, no desirable member of a dinner party.

Hence it was unimaginable for him to appoint such a man President of the Academy. Euler noticed it with increasing displeasure and bitter disappointment that led him to make suspicious, even spiteful statements about the supposed rival d'Alembert. Only d'Alembert's noble behaviour and successful mediation between Euler and the King for a certain period of time brought the two mathematicians once more closer together.

Euler's and Frederick's interests, convictions and abilities were too different. Frederick was deist, while the devout Euler explicitly refused deism. As far as religion was concerned he had no sense for humour and became a zealot. If necessary, he fought by means of mathematics against Christian Wolff's contemporary philosophy, those who were sceptical about the truth of the biblical story of the Creation, and against the freethinkers and the adherents of the French encyclopaedia at the Berlin academy.

In 1747, he published the booklet *Rettung der Göttlichen Offenbahrung gegen die Einwürfe der Freygeister* ('Salvation of the divine revelation against the objections of the freethinkers'; Euler, 1747). He argued that difficulties and apparent contradictions could not discredit the Holy Scriptures. For that reason resurrection was an agreed truth, and the existence of devils highly probable. It must have caused shaking of heads in disbelief at Frederick's court that a man with an intellectual gift like Euler would make such statements.

In his famous *Introductio in analysin infinitorum* ('Introduction to the analysis of the infinites', Euler, 1748) he believed he could demonstrate a sufficient increase of population by means of the calculus of logarithms to show how ridiculous the objections were against the biblical story of the Flood. According to this story, mankind was recreated by only six persons.

Like his contemporaries, Euler was convinced that the earth was less than 6,000 years old (Euler, 1748, I, p. 115f).

The King did not like, even refused, mathematics. Higher mathematics seemed useless to him. He did not understand it. Still, in 1747, immediately after he had arrived in Berlin, Euler tried to teach the King otherwise with *Commentatio de*

*matheseos sublimioris utilitate* ('Treatise about the utility of higher mathematics'), written in Latin, which was published for the first time only in 1847 (Euler, 1847). But this effort was already futile because the King did not read Latin. Frederick was unsparingly gloating when Euler allegedly or really had problems with his mathematical studies.

In 1749, the King used him as an expert for the construction of water fountains in Potsdam. Euler warned him against taking unsuitable material for the water pipes and pointed out to him the necessary means. Yet his advice was disregarded so that the permanent failure was unavoidable. Nevertheless, this matter of fact did not prevent the King from holding Euler responsible for the failure and from reproaching him for the bad management of the works although Euler had never managed them (Spieß, 1929, p. 175; Eckert, 2008).

In 1765, the King established a commission that should make proposals for the improvement of the calendar revenues that had suffered from the deceitful Commissioner Köhler. Euler opposed to the reasonable proposal of the other three members of the commission to rent out the revenues so that they would increase from 13,000 thalers to 16,000. Frederick sent him an ironical letter on June 16, 1765:

> I would like to thank you for the details about which you have informed me in your letter as of the 13th of this month. For the revenues one does not need Köhler but one should lease the calendars for sixteen thousand thalers. This is by far more reasonable than your advice. And I myself, who doesn't know how to calculate curves, I know nevertheless that 16,000 thalers of revenue are worth more than 13,000. (Thiébault, 1828 II, p. 164f; Euler, 1986, p. 390)

In other words, the King showed Euler up. This convinced him in his intention to ask for his dismissal. Only after several repetitions of his request the dismissal was granted on May 2, 1766. The King's letter consisted of one laconic sentence: No word of thanks for the faithful, successful twenty-five years of activities for the academy and for the King. Both sides were embittered.

Frederick made fun of Euler's misfortune when Euler returned to St. Petersburg. On July 26, 1766 he wrote to d'Alembert: "A ship that carried Euler's x, z, and $k^2$ was shipwrecked. This is a pity because one could have completed six folio volumes with them. And Europe presumably will be robbed of the agreeable pleasure that this reading would have given to it." (Frédéric le Grand, 1854a, letter 31)

During the following ten years there was no communication between the two men. Yet in 1776 a kind of reconciliation of the King with Euler was achieved. Euler sent to the grateful King a mathematical correction of a planned pension fund for widows. Frederick thanked him that he had been elected honorary member of the Russian academy and added the placatory remark: "I congratulate the Imperial Academy of Sciences for being able to boast about a dean of your talents and your merits." (Euler, 1986, p. 396)

## D'Alembert and the King of Prussia

Five years after Euler's arrival in Berlin, the first contact between d'Alembert and the King of Prussia took place. In 1746, the Berlin Academy of Sciences and Humanities had proposed the prize question regarding the general cause of winds. The prize was awarded to d'Alembert, very much to Daniel Bernoulli's annoyance. The decision was strongly influenced by the President of the Academy de Maupertuis, who only in 1745 had come to Berlin. He friendlily recognized the achievements of his countryman.

Euler was frustrated because he had encouraged Bernoulli to participate in the competition (Winter, 1957, p. 71; Hankins, 1970, p. 46). Bernoulli's comment in his letter to Euler about his despised competitor was correspondingly polemical. He could make him an object of ridicule because of his hydrodynamics.

This behaviour was not detrimental to d'Alembert's increasing reputation at the court of Berlin even if he did not win a further prize of the Berlin Academy because of Euler's increasing dislike. On June 2, 1746 d'Alembert was elected foreign member of the academy. Still, in 1746, he wrote to Frederick II asking for permission to dedicate to him his award-winning writing which appeared with the dedication one year later (Frédéric le Grand, 1854a, p. 403). This was the beginning of a voluminous correspondence that comprehended 272 letters and ended only with d'Alembert's death. The King politely answered him: One would prefer to see himself instead of his book.

Five years later, d'Alembert sent his famous *Discours préliminaire* ('Preliminary discourse'), the introduction to the *Enyclopédie française*, that is, the prospectus of the French Enlightenment to the King. The King as well as all intellectual Europe were enthusiastic. D'Alembert flattered the King that he was such a successful commander and the King flattered d'Alembert for being such an

outstanding philosopher. On November 20, 1780 he would write him: "Very many people have won battles and have conquered provinces. But only very few men have written such a perfect work like the preface of the Encyclopædia." (Frédéric le Grand, 1854b, p. 185)

Already on September 2, 1752 he charged his confidant, Marquis d'Argens, with the inquiry whether d'Alembert would be willing to come to Berlin and become President of the Berlin Academy. At that time de Maupertuis had offered his resignation in the course of the quarrel with Samuel König and Voltaire about the principle of least action. The King did not accept it. D'Alembert, however, refused this offer in the same way as all the later, corresponding offers in spite of attractive conditions. Financial riches did not appeal to him. This behaviour had obviously to do with his experiences as a child in the household of his foster parents and their limited means. He died without any fortune because he took the view that the use of affluence is not legitimate if other people are deprived of the bare necessities (Arago, 1859, p. 179).

In contrast to d'Alembert, Euler revealed a strong business sense and single-mindedly increased his prosperity. He suffered from the inappropriate payment by the King of Prussia as he wrote to Müller in St. Petersburg (Juškevič & Winter, 1959, p. 219). He clearly formulated and put his demanding claims through to Catherine II.

D'Alembert's correspondence with the King, which lasted for more than thirty-seven years, testifies the mutual high respect, even friendship between the two men. D'Alembert is lavish with flattery and hymns of praise of all kinds saying that the King is justly called 'the Great', that he is a prince worth admiring in war and in peace, a hero of Europe (Frédéric le Grand, 1854a, pp. 404, 415f). He speaks about his eternal feelings of admiration and respect for the hero of this century. The philosophers and writers of all nations, especially of the French nation, had long considered him their leader. Europe hoped that he would not only be content with enlightening it, but that he would also pacify it (Frédéric le Grand, 1854a, pp. 458, 541, 630).

D'Alembert would hang his picture over his bed. He wished that the inscription on his grave stone would read: "Frederick the Great honoured him with his favours and his kindness (Frédéric le Grand, 1854b, pp. 5, 55). Sighing, he added the wish that his nature which made him the greatest of all kings, could also make him the happiest of all men. He sensitively liked to date his letters on the anniversaries of the King's victorious battles, for example on the anniversary

of the battle of Kesselsdorf or of the glorious battle in the plains of Liegnitz (Frédéric le Grand, 1854b, pp. 35, 53).

The King, too, was unstinting in his praise. In spite of d'Alembert's refusal in 1752 to come to Potsdam he paid him a pension of 1,200 francs since 1754 (Winter, 1957, p. 70) and personally told him of this decision on July 2, 1754 (Frédéric le Grand, 1854a, letter 4). He called him his Athénagoras, Protagoras, Diagoras, Pythagoras, and above all his dear Anaxagoras. Their first short meeting took place in Wesel in 1755. Immediately after the ending of the Seven Years' War, d'Alembert's sojourn of a little more than two months in the Potsdam castle Sanssouci followed in the summer of 1763. From Geldern he travelled in the King's entourage (Lübbert, 1913, pp. 17–20).

Frederick overwhelmed his guest with all signs of the truest, most intimate friendship and high respect. The direct witness in Potsdam, Dieudonné Thiébault attests to it (Thiébault, 1828, p. 129). Even d'Alembert's final departure did not change this behaviour. The King wrote him that he had the pleasure to have seen a true philosopher. He will reserve for him the position of president that can be occupied only by him, d'Alembert (Frédéric le Grand, 1854a, letter 16).

Frederick never abandoned the hope of enjoying the event of having his friend again as one of the people closest to him and he repeated this wish many times. Sometimes d'Alembert seemed to be nearly willing to fulfil the King's wish. But he always destroyed this hope, if necessary, at the very last moment, referring to his health problems. Health issues were indeed a recurrent subject in their correspondence. The King considerably suffered from the attacks of gout. While d'Alembert wrote about this subject in a rather disheartened and almost whining manner, Frederick was confident or self-ironical in spite of the troubles and tried to console and distract the friend.

Above all, the two partners discussed philosophical, literary, religious, political issues or questions regarding the academy, often subsequent to d'Alembert's corresponding publications. D'Alembert successfully proposed new academy members, for example Euler's Italian successor Guiseppe Luigi Lagrange, with whom the King was very content. On July 26, 1766 Frederick wrote to Paris revealing his black humour: "Lagrange is coming. I have replaced a one-eyed geometer by a geometer who has both of his eyes. This will especially please the anatomy class." (Frédérick le Grand, 1854a, letter 31)

On September 22, 1777 d'Alembert proposed the most famous prize question of the academies of the 18th century: "*S'il peut être utile de tromper le peuple?*" ('Is it useful to mislead the people?') (Frédéric le Grand, 1854b, letter 189). In 1780, the King forced the Berlin Academy to propose this prize question. Since it did not know which answer was expected, the prize was issued for each side of the argument, an approving and a rejecting solution (Knobloch, 1982, p. 128). The two partners had controversially discussed this question in their correspondence. While d'Alembert argued that the truth must always be said, the King accepted his maxim only for the first day of the world when error and superstition were still unknown (Frédéric le Grand, 1854a, letters 65, 71).

D'Alembert became the advisor and unofficial President of the Academy. He was well aware of this fact. Yet Frederick invited him in vain to come himself: "Finally come yourself as you let me hope in order to give life to this academy the soul of which you are, although absent, and gather the sincere approvals and the demonstration of friendship of Obotrite[2] people here that do you more justice than your compatriots." (Frédéric le Grand, 1854b, letter 164)

Frederick did not conceal his reservations and sneering remarks with regard to geometry and mathematics in his letters to d'Alembert either. At the end of 1764, he ironically wrote to the French philosopher: "Even if Newton has demonstrated the existence of nothingness only by means of x+b I avow that these creative geniuses can be worth admiring, but that they are not worth comparing with a thinker like Bayle." (Frédéric le Grand, 1854a, letter 21)

D'Alembert reacted skilfully and supremely well by partly agreeing with him. Frederick treats, he said, transcendent geometry a bit too poorly. It is indeed often only the luxury of idle scholars, but often also useful, for example, for explaining the world system (Frédéric le Grand, 1854a, letter 45). He sees that His Majesty harbours a secret grudge against geometry. Yet His Majesty is more a geometer than he believes and more than very many people who maintain to be geometers. For all the just, exact, and clear minds belong to geometry (Frédéric le Grand, 1854a, letter 97). It was difficult to say anything against such skilful flattery. Pitiful Euler was not capable of it.

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[2]    The King refers to a Slavonic tribe in Mecklenburg.

## D'Alembert and the Empress of Russia

Among the four personalities discussed here, Catharine II the Great, was by far the youngest. She was twenty-two years younger than Euler and seventeen years younger than Frederic II the Great. Voltaire flattered her by calling her "Semiramis of the North". In 1744 she came to Moscow as the fifteen-year-old German Princess Sophie Auguste, a daughter of the Prussian general Christian August, Prince of Anhalt-Zerbst. There she converted to the Orthodox Church. A year later she married Peter, Duke of Holstein-Gottorp who ascended to the throne as Emperor Peter III on January 5, 1762. But already on July 17, 1762 he was killed.

Catherine took over the lead and looked for an educator to her only son Paul, heir to the throne and son of chamberlain Sergei Saltykov. She was well educated, spoke German, French, and Russian fluently and was an adherent of the French Enlightenment. She called herself a pupil of Voltaire without ever having seen him. She chose the twelve years older, celebrated philosopher and mathematician d'Alembert.

Already on September 2, 1762 she commissioned her extraordinary ambassador and confident d'Odar to invite d'Alembert to Moscow. D'Alembert most politely answered immediately refusing the invitation. He was not up to this task of education, he said. This was true, no false modesty. His weak health would not endure Moscow's harsh climate. His few friends were his consolation and his happiness. This most valuable possession cannot be measured in terms of money. Moreover he could not refuse King Frederick II of Prussia of what he grants to other princes. Already more than ten years ago the King made him the most advantageous offers and repeated them many times. He would be unworthy of his good reputation among the foreigners if he did anything for a prince that he did not dare to do for Frederick (D'Alembert, 1887, letter 2). From then on d'Alembert repeated the same reasons again and again.

Other confidants of Catherine, such as Nicolay, Pictet, and Schouvalov, continued the dialogue before the Empress sent his personal answer with the help of her educator of Prince Panin. She appealed to the humanity of his philosophy. One does not achieve one's aim if one does not cultivate it, even though one is able to do it. She believed that she could easily invalidate his arguments: He could bring his friends with him. With regard to d'Alembert's last argument she used

a delicate irony. While she understood his gratitude to the King of Prussia, Frederick had no son after all (D'Alembert, 1887, letter 7).

Yet, d'Alembert steadfastly refused all offers even though in Paris Catherine's legate Sergei Saltykov promised him 100,000 livres as princely annual pension (D'Alembert, 1887, p. 212; Lübbert, 1913, p. 6). He couched his refusal in a gallant flattery: A prince who has such a mother needs neither a teacher nor books.

Catharine's flatteries did not come second to d'Alembert's explanations. His works were, she wrote, the works of a genius, adorned with good-heartedness. She had written to one of the greatest geniuses of their time. In St. Petersburg he could continue the *Encyclopédie* that was forbidden in France. D'Alembert, however, insisted on telling the truth about his modest talents. Even the Empress could not reduce the distance between St. Petersburg and Paris or bestow him with the necessary health for such a long journey. He would have preferred to get hints instead of compliments from Catherine on how he could improve his *Essai sur les éléments de philosophie* ('Essay on the elements of philosophy') as had been done by the King of Prussia. This was indeed a rather risky reproach to the Empress. Furthermore, one can doubt that Catherine liked the repeated comparison with Frederick.

Only on May 10, 1764 was d'Alembert elected member of the Russian Academy. The late election was not the least a consequence of Euler's disparaging comments about the French scientist made in 1754 and later on, too. In 1754 the permanent secretary of the Russian Academy and official contact for foreign members, the historian and geographer Gerhard Friedrich Müller, had asked Euler whether d'Alembert should be appointed to a professorship of higher mathematics in St. Petersburg. Euler curtly advised him against doing this: "It should be worth taking into account that he is the most quarrelsome man in the world. This is exactly the reason why he is hated by everybody in Paris." (Juškevič & Winter, 1959, p. 71) Euler could be indeed very hurtful.

Nine years later, in June 1763, he furiously wrote to Müller that he wanted to leave Berlin and the sooner the better (Juškevič & Winter, 1959, p. 221). He accused d'Alembert of unbearable arrogance and of the impudence of wanting to defend all of his errors in the most impertinent way. It did Catherine credit that she remained unimpressed by these defamations of character even though she had come to power only a little earlier.

On the contrary, she asked d'Alembert for advice in reorganizing the academy. He politely answered and laconically added that in his opinion one should treat writers and artists like merchants. One should encourage and protect them and not stop them. She did not come back to her issue. She was happy about his convalescence after a severe illness. On August 31, 1766 it gave her great satisfaction to write him: "Euler and his sons have just arrived in St. Petersburg. I hope that they will not freeze and turn into ice. Their genius and enthusiasm will arouse the academy." (D'Alembert, 1887, p. 246) In this respect, Catherine II was not wrong.

Just like Frederick, she did not succeed in winning d'Alembert for her court. But unlike Fredrick she never even made his acquaintance. Like Frederick she was able to win Euler from Frederick, of all people, who had wooed Euler away from Russia to Berlin. For seventeen years Euler was active at the Russian Academy after he had worked for Frederick for twenty-five years.

When in 1772 d'Alembert stubbornly pleaded for the release of French prisoners of war from captivity—it was the year of the first division of Poland and in the middle of the Russian–Turkish war—she was astonished and gave a negative answer. She would release them after a peace agreement *dans son temps* (D'Alembert, 1887, p. 261). After ten years the correspondence between d'Alembert and Catharine stopped there. D'Alembert felt snubbed. Catharine's former admirer became a critic of her life and her actions. But this matter of fact had no consequences because Catharine's court was dominated by favourites and flatterers like Denis Diderot who compared her to a goddess (Aretz, 1931, p. 233f).

In 1782, her son Paul, whom d'Alembert had refused to educate, met him in Paris under the name of a Count von Norden. With regard to this refusal because of the climate and his health the Grand Prince gallantly said to d'Alembert that this was the only bad calculation that he had carried out in his life (Lübbert, 1913, p. 17).

## Euler and the Empress of Russia

A year after Catharine had come to power, the estrangement between the King of Prussia and Euler had increased to such a degree that on May 17, 1763 Euler began to speak with Müller in St. Petersburg about his possible departure from Berlin:

> I am currently selling my estate in Charlottenburg as well as my house here in order not to be bound by anything if my fate should lead me away. Now I don't care who will be in charge of the local presidency. One says that Mr. d'Alembert has proposed the Knight de Jaucourt for this position because he does not want to come himself. (Juškevič & Winter, 1959, p. 18)

He mentioned the rising prices in Berlin and the wish that Empress Elisabeth had communicated to him in 1750 that he would return to St. Petersburg according to his conditions. At that time he was not able to accept this offer owing to circumstances.

This was a clear hint that was at once understood in Russia. Catherine was indeed more successful than her predecessor Elisabeth, though not immediately, to fetch back Euler to St. Petersburg without having direct correspondence with him as with d'Alembert. Only one single letter from Euler to the Empress, sent in 1776, is known. Therein Euler asked her to defend the rights of the German reformed church in legal proceedings against the French church (Euler, 1975, p. 200).

Catherine charged the assessor of the academic chambers, Grigoriy Nikolaevich Teplov, well known to Euler from previous years, with her offer. Already on July 7, 1763 Teplov told Euler that Catherine had ordered to appoint him to a mathematical professorship. He would become director of the mathematical class, secretary of conferences, and would receive 1,800 rubles annually. His son would become ordinary professor and get 600 rubles annually. If Euler will not be content he is asked to submit a contract according to his own proposals (Juškevič & Winter, 1961, p. 433f).

Thus the Empress herself supported Euler's return and increased the offer that the financial counsellor Johann Kaspar Taubert had recommended her. But even this offer was finally surpassed.

Müller pressed for a quick decision and for Euler's departure already in summer 1763. But on July 19, that is, on the same day when Müller congratulated him

that Teplov has rightly drawn up the engagement for him, Euler told him that he could not accept the Russian offer for financial and private reasons for the time being. His dismissal had to be carefully realized. By all means he had to be dismissed without punishment and move away in perfect amity. At this point it was not possible, especially because the question of presidency was not clarified. If d'Alembert had become president he would be able to speak to him more openly, things could be easily arranged.

For the same reasons he most humbly thanked Teplov for his brilliant propositions one week later (Juškevič & Winter, 1961, p. 434). If d'Alembert had become president, nothing would have hindered him from handing in his resignation. Everybody would blame him for submitting to such a president. Thus he could not take the plunge. Moreover he was not interested in the position of the secretary of conferences because too much correspondence would keep him from working. In a few months everything would be decided. However, in this matter Euler was wrong—two years had to pass.

Euler's disparaging words about d'Alembert strangely differ from d'Alembert's noble attitude with which he wrote in quick succession three letters to Euler in July and August 1763. He regretted the possible loss of Euler in Berlin. He sent him his best wishes. He had the impression that he had successfully informed the King about Euler's importance and the threatening loss. In 1764, he congratulated him that 400 thalers had been granted to his son annually. He had persuaded the King to do that. He advised him to remain in Berlin for the sake of his fortune.

But a new vexation caused Euler a lot of trouble. His son was not admitted to the Academy of Knights. The sale of the calendar was rented against his own proposition, on the King's order. There were unknown intrigues in connection with the vacant presidency. Euler was fed up with this situation and absolutely determined to leave Berlin. On December 21, 1765 he informed the secretary of conferences Jakob Stählin in St. Petersburg about his decision and about his wish to become Vice President of the Petersburg Academy, a position that still had to be created.

Three days later he wrote to the imperial chancellor Voronzov and formulated his demands concerning his move to St. Petersburg: the position of a vice president, 3,000 roubles annually, lodging for nothing, 1,000 rubles annually for his son Johann Albrecht, etc. His demands surpassed by far the offer Empress Catherine II made in 1763. Yet she was extremely happy about Euler's coming and granted

all of his demands except the position of the vice president. She had already another candidate for this task, namely Count Vladimir Grigorevich Orlov.

The Empress welcomed him and his sons and invited him for a meal. She gave him 8,800 rubles as a gift so that he could purchase a house, and 2,000 rubles for furnishings. She overwhelmed him with all signs of favour. When his house burnt down in 1771 she gave him 3,000 roubles as compensation. Even in his year of death, people were full of admiration for the blind scientist. The Empress had appointed her lady-friend, Princess Yekaterina Romanovna Dashkov, director of the Academy. When she assumed office in 1783 she was accompanied by Euler (Spieß, 1929, p. 198). The most distinguished position, next to that of the president, was already occupied by Jakob Stählin. Yet the Princess said to Euler: "You don't have the position you deserve. But whichever position you choose it will be certainly the first."

## Epilogue: two mathematicians—concluding comparative considerations

Euler and d'Alembert died shortly one after the other in autumn 1783. Their death marked the end of an epoch in the 18th century. Euler was one of the most productive mathematicians of all times who had contributed important, often pioneering writings to nearly all fields of pure and applied mathematics, especially to differential and integral calculus and their applications in mechanics and engineering. D'Alembert was the only *philosophe* (philosopher) who next to Condorcet has gained his reputation in science. Even such a critical author like Truesdell categorically stated: "However obscure his statements and procedures, one thing is certain: D'Alembert obtained new results of the greatest value." (Truesdell, 1960, p. 188)

And, indeed, in the field of analytical mechanics, especially of celestial mechanics, d'Alembert was Euler's equal. Their correspondence testifies that they appreciated each other as brothers in mind in this respect. In 1747, Euler praised his French colleague: D'Alembert's treatise about the motions of the Moon is certainly of greatest profundity (Euler, 1980, p. 266). His superiority in the most difficult calculations is evident everywhere. Euler even granted him that d'Alembert had more successfully dealt with the planetary motions in a resisting medium than he had himself (Euler, 1980, p. 293). D'Alembert gratefully returned this

commendation: nobody is more profound and more skilful in hydromechanics and in the planetary theory than Euler (Euler, 1980, p. 288).

This behaviour did not exclude their long disputes about logarithms of negative numbers or about the theory of the oscillating chord where, according to the latest information, d'Alembert adhered to false opinions even though he was the first to solve the wave equation of the oscillating chord named after him. D'Alembert restricted the solution of the partial differential equation to real, analytic functions. Euler admitted also more general functions with regard to a plucked chord (Thiele, 2007, p. 98). In 1757, competition and rivalry finally led to a longstanding break that could be gradually surmounted again only in 1763.

In the 19th century, the astronomer François Arago compared the two scientists and Lagrange (Arago, 1859, p. 133f) claiming that Euler, d'Alembert, and Lagrange, provided with an equal mathematical genius, worked indeed in completely different ways. Euler calculated without any obvious effort as men breathe, as eagles sustain themselves in the air. D'Alembert said about himself in a letter to Lagrange from 1769 cited by Arago: "I am not very much in favour of occupying myself a very long time with the same subject without interruption. I leave it and I come back to it whenever I remember it without being deterred. And mostly this dissipated doggedness leads to a success for me."

While Arago emphasized the elegant clarity of Euler's and Lagrange's treatises, d'Alembert was not free of this reproach in his opinion. Carl Gustav Jacobi, one of Arago's contemporaries, emphatically repeated this reproach: "It is completely impossible to choke down one line of d'Alembert while one still reads most of Euler's writings with great pleasure." (Spieß, 1929, p. 139)

As a consequence, only Euler provided some of d'Alembert's results with a satisfactory form that he had taken from him, partly without citing him as in the case of the precession of the equinoxes (Hankins, 1970, pp. 42, 50). Conversely, in view of Jakob and Daniel Bernoulli's groundwork, Truesdell saw d'Alembert's contribution to the principle named after him—it makes it possible to constitute the equations of motion of a mechanical system with compulsory condition—only in the insight that those ideas are general and can be applied in order to get the differential equations of motion for a large class of dynamical systems (Truesdell, 1960, p. 191). D'Alembert's abstract method abstaining from experiments that tried to base mechanics only on matter and motion without using the notion of force increased the difficulty of understanding his texts.

Laplace's famous statement, cited by Guglielmo Libri, seems to be so much more justified: "Read Euler, read Euler, he is the master of all of us." (Thiele, 2007, p. 93)


## Acknowledgement

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