Du Châtelet and Kant

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Du Châtelet and Kant
and
reception of Leibniz's legacy in the 18th century

Outline of the talk

1. Du Châtelet's *Institutions* 1735-1742

2. Kant's *True Estimation of Living Forces* 1746-49

3. Kant's reaction to Eberhard's criticism 1790

4. The *Lambert-Kant correspondence* 1764-1770

5. The reluctant reception of the Leibnitian legacy

6. On the reception of Leibniz's legacy in the 21st century

On the decisive role of programmes

1. Leibniz's programme	1671
2. Newton's programme	1687
3. Du Châtelet's programme	1740
4. Kant's programme	1746
5. Lambert's programme	1764
6. Kant's response to Lambert's criticism	1781

Between Leibniz and Kant

1. Leibniz (1646-1716)
2. Newton (1642-1726)
3. Du Châtelet (1706-1749)
4. Kästner (1719-1800)
5. Kant (1724-1804)
6. Lambert (1728-1777)

1. Du Châtelet's *Institutions*

The post-Newtonian period

- J. Bernoulli, La nouvelle Physique céleste (1735)

- Newtonianism in France (1730 - 1740)

- Euler, Mechanica (1736)

- Du Châtelet, Institutions (1740)

Newtonianism in France

Voltaire (1694 – 1778)
Letters concerning the English Nation (1733, 1734, 1735)
Eléments de la philosophie de Newton (1738)

Maupertuis (1698 – 1759)
Sur la figure de la terre (1738)
Since 1740 in Berlin

Du Châtelet (1706 – 1749)
Institutions de physique (1740)

Clairaut (1713 – 1765)
Théorie de la figure de la terre (1743)
… who worked to confirm the Newton-Huygens belief that the earth was flattened at the poles

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Institutions de physique (1740) **Translation of the Principia**

Clairaut (1713 – 1765)
Théorie de la figure de la terre (1743)
… who worked to confirm the Newton-Huygens belief that the earth was flattened at the poles

Du Châtelet's programme

"I have always thought that the most sacred duty of men was to give their children an education that prevented them at a more advanced age from regretting their youth, **the only time when one can truly gain instruction**. You are, my dear son, in this happy age when the **mind begins to think**, and when the heart has passions not yet lively enough to disturb it.

You must early on accustom your mind to think, and to be self-sufficient. You will perceive at all the times in your life what resources and what consolations one finds in study, and you will see that it can even furnish pleasure and delight." [Inst1742, Preface, I]

Descartes: "I ***am*** a thinking thing."

Du Châtelet: "How to ***become*** a thinking thing?"

The ideal of education

Du Châtelet:

"You are, my dear son, in this happy age when the **mind begins to think**, (…).
You must early on accustom your mind to think, and to be self-sufficient." [Inst1742, Preface, I]

Euler:

"I would even **request** that your Highness should **distrust** my sentence and absolutely not believe it until you have seen **for yourself** the thoroughness of the conclusions on which his demonstration is built." [Euler, *Letters to a German princess*, Letter CXIX] (1760-1762)

In the Cartesian spirit.

Euler, Elements of Algebra, E387, published in 1770

ADVERTISEMENT BY THE EDITORS OF THE ORIGINAL

WE present to the lovers of Algebra a work, of which a Russian translation appeared two years ago. The object of the celebrated author was to compose an Elementary Treatise, **by which a beginner, without any other assistance**, **might make himself complete master of Algebra**. The loss, of sight had suggested the idea to him, and his activity of mind did not suffer him to defer the execution of it. For this purpose M. Euler pitched **on a young man**, whom he had engaged as a servant on his departure from Berlin, sufficiently master of arithmetic, but in other respects without the least knowledge of mathematics. (…). This young man, however, has not only retained what his illustrious master taught and dictated to him, but in a short time was able to perform the most difficult algebraic calculations, and to resolve with readiness whatever **analytical questions** were proposed to him.

The ideal of education

and

the analytic turn

Du Châtelet as follower of Descartes and Leibniz

"Descartes appeared in that profound night like a star come to illuminate the universe. The revolution that this great man caused in the sciences is surely more useful, and perhaps even more memorable, than that of the greatest empires, one, it can be said, that human reason owes most to Descartes. For it is very much easier to find the truth, when once **one is on the track of it**, than **to leave those of error**." [Inst1742, Preface, V]

In the spirit of Leibniz:

This approach was already chosen by **Leibniz in his response to Locke** (written in **1704**). The text was, however, unknown to Du Châtelet for the *Nouveaux Essais* were only published in **1765**.

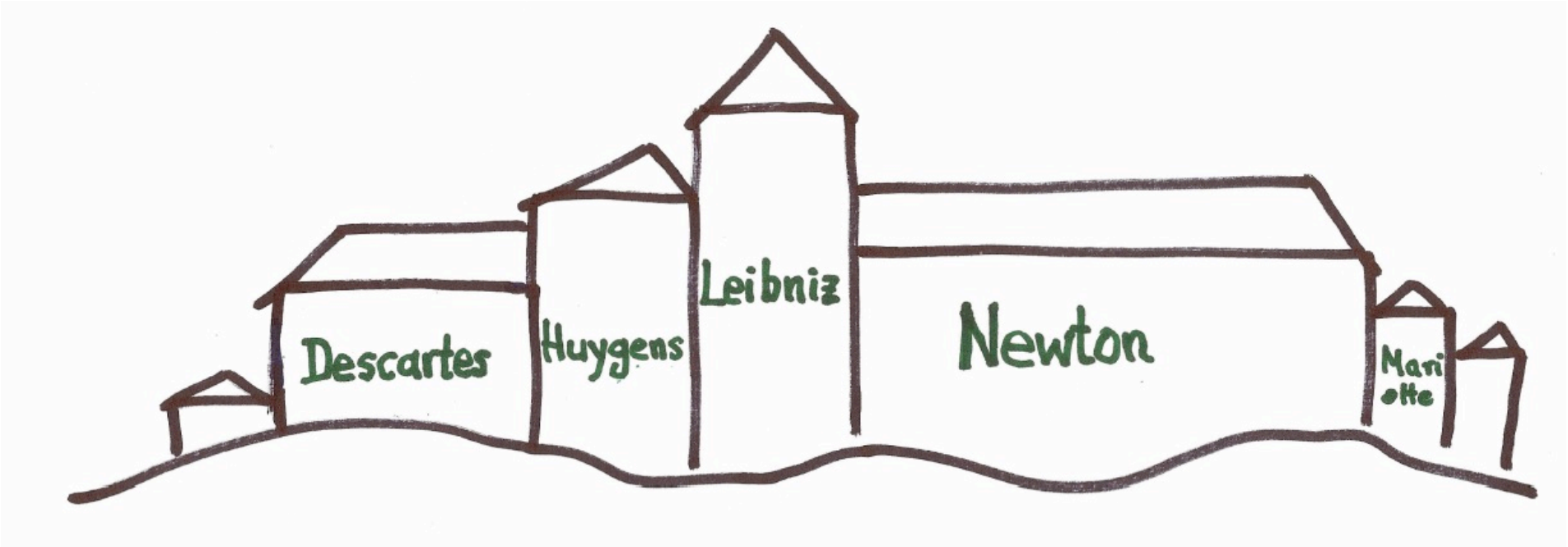
Leibniz:

"I have thought also that I could profit from the labour of another not only to lessen my own (**since in fact it is less difficult to follow the thread of a good author** than to work wholly independently), but further to add something to what he has given us, which is always easier than to start from the beginning." [Leibniz, Nouveaux Essais] (**1704**)

Du Châtelet:

"Physics is an immense building that surpasses the powers of a single man. Some lay a stone there, while others build whole wings, but all must work on the solid foundations that have been laid for this edifice in the last century, by means of geometry and observations; still others survey **the plan of the building, and I, among them**." [Inst1742, Preface, XI] (**1742**)

Du Châtelet: Physics is an immense **building**



The exceptional role of Descartes

The merits of Descartes, the criticism of Descartes

“Descartes appeared in that profound night like a star come to illuminate the universe.” [Inst1742, Preface, V]

“How much we are obliged to Descartes.” [Inst1742, Preface, V

“Abuse of the word principle by Descartes.” [Inst1742, §. 2]

The big Three: Descartes, Newton, Leibniz

.

Institutions de physique, 1740. Published anonymously.

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PHYSIQUE.

A PARIS;
Chez PRAULT fils, Quai de Conty, vis-à-vis la descente du Pont-Neuf, à la Charité.

M. DCC. XL.
Avec Approbation & Privilége du Roi.

Edition 1742: Descartes, Newton and Leibniz are now missing in the frontispiece.

The *Institutions* are now addressed to her son.

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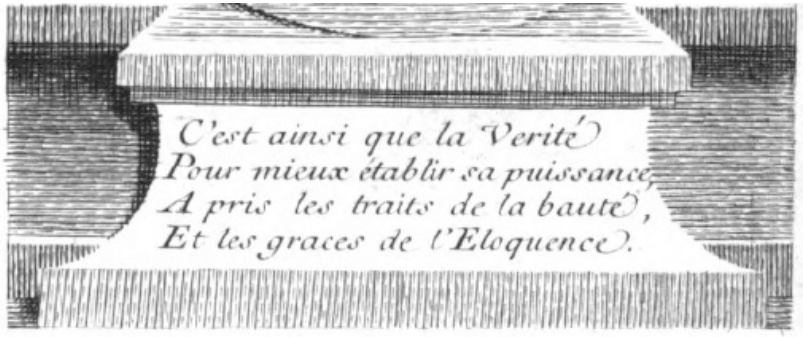
C'est ainsi que la Verité
Pour mieux établir sa puissance,
A pris les traits de la beauté,
Et les graces de l'Eloquence.



C’est ansi que la Verité pour mieux etablir sa puissance, a pris les traits de la bauté, et les graces de l’eloquence.

It is thus that truth, in order to better establish its power, has assumed the features of **beauty**, and the graces of **eloquence**.

Eloquence and style

Euler:

“In reading your *Institutions de physique*, I have likewise admired the **clarity**, with which you treat this science, and the **facility**, with which you explain the most difficult things about the movement, (…).” [Euler, Letter to Du Châtelet, 1741]

Mme. De Graffigny:

“Mme. de Graffigny, who read her essay [*On fire* (1737)] first and Voltaire's afterwards, thought the latter not at all worthy of the former. "It is true," she said, "that when women mix themselves up with writing they surpass men. (…) But how many centuries does it take to produce a woman like her?” [Hamel] (1910)

A further admirer of Du Châtelet, the **young Kant**:

"I can not help making a comment here **about the way** in which the Marquisin attacks her opponent's doctrines. It seems to me that she **could not have chosen a better way** to hit him the most sensitive stroke than to give to its conclusions the **feature of something strange and absurd**. A serious presentation lures the reader to proper attention and investigation, **leaving the soul open** to any reason that may enter it from one side or the other. But the whimsical figure under which she lets the opinions of her adversary take possession immediately of the weak side of the reader and **destroys in him the desire for a closer consideration**." [Kant, True estimation] (**1749**)

Kant on Leibniz

How did Kant get rid of Leibniz.

"As he claims in his Philosophisches Magazin (vol. I, p. 289), Mr. Eberhard made the discovery that 'the Leibnizian philosophy contains just as much of a critique of reason as the new philosophy, while at the same time still introducing a dogmatism based on a precise analysis of the faculties of knowledge. It therefore contains all that is true in the new philosophy, and in addition a well grounded extension of the sphere of the understanding.' He does not, to be sure, explain why these things were not long ago recognized in the philosophy of the great man and in its daughter, the Wolffian. (…)

We could accept the denial of originality, were it not for the fact that the **older critique contains in its results the exact opposite of the new one. "**

It therefore seems best to leave the great man out of the picture

"Moreover, he sometimes speaks as if he will not vouch for Leibniz (…). **It therefore seems best to leave the great man out of the picture** and to consider the propositions which Mr. Eberhard offers in his name and uses as weapons against the Critique as his own assertions.

Otherwise we would find ourselves in the nasty situation wherein the blows **which he administers to us in Leibniz's name strike us**, but we, in justifiably returning them, hit a great man, thereby drawing upon ourselves the hate of those who admire him." [Kant On a discovery]

=> As a result, the Leibnitian theory is not at all discussed.

=> As a further consequence, neither the relation Leibniz-Eberhard not the relation Leibniz-Kant had been analyzed or, is to be expected to be analyzed.

=> As a further consequence, neither the relation Leibniz-Eberhard not the relation Leibniz-Kant had been analyzed or, it is not to be expected that they will be analyzed.

The "point of retirement" of the reader's soul is defined. The reader is freed from "laborious reflection" on Leibniz.

"The power of the soul that governs judgment and contemplation is of a languid and calm nature; **she is happy to find the point of her retirement**, and likes to remain silent with the one who **abandons her from a laborious reflection**; therefore it can easily be persuaded of such ideas as to reduce one of two opinions at once to probability, and to declare the effort of further investigations unnecessary." [Kant, **True estimation**] (**1749**)

To declare the effort of further investigations unnecessary => **dispensable, superfluous, "entbehrlich"**.

Result

1. The relation Kant-Eberhard had been clarified.

2. The relation Leibniz-Eberhard had **not been satisfactorily** analyzed: "**It therefore seems best to leave the great man out of the picture** and to consider the propositions which Mr. Eberhard offers in his name and uses as weapons against the Critique as his own assertions." [Kant]

3. The relation Leibniz-Kant had **not been satisfactorily** analyzed.

Conclusion: Kant is **opening a new field of expectations**.

"As for the rest, may the Critique of Pure Reason continue to maintain itself, **if it can, through its intrinsic solidity**. Once put in circulation, it will not disappear without at least calling **forth a more solid system of pure philosophy than has hitherto been at hand."** [Kant, On a discovery]

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Kant final statement is appropriate to confirm Du Châtelet’s theory and the consequences which had been drawn by d’Alembert.

Kant's final statement is appropriate to confirm Du Châtelet's theory and the consequences which had been drawn by d'Alembert.

D'Alembert: "In fact, it is the **young geometers in France as well as in foreign** countries who have directed the fate of the two philosophies. The old one is proscribed to such an extent that its most zealous partisans no longer even dare mention the vortices with which they formerly stuffed their works. If **Newtonianism were to be destroyed in our time by any cause whatsoever**—the numerous partisans that it now has would doubtless play the same role that they have made others play. Such is the nature of minds; such are the results of self-esteem, which governs philosophers at least as much as other men, and of the opposition that all discoveries, both real and apparent, must meet. [d'Alembert, Discours] (1751)

=> If **Kantianism were to be destroyed …**

“We cannot, therefore, be disturbed by his explanation of sensibility as a confused mode of representation, **but rather must set in its place another one which is more in accordance with his purpose**. Otherwise his system will contradict itself.” [Kant, On a discovery]

This was formerly one of the reasons why Kant criticized Leibniz and justified his distinction between sensuality and reason.

Therefore, Kant moved toward the doctrine of Leibniz and tried to **improve** it instead of **reject** it by the removal of internal contradictions.

The Lambert-Kant correspondence

An offer of collaboration

Lambert to Kant,	**1765**
Kant to Lambert	**1765**
Kant to Lambert (not available)	**1766**
Kant to Lambert submitted *De Mundi Sensibilis*	**1770**
Lambert to Kant	**1770**
Kant's answer to Lambert in the *Critique*	**1781**
Kant to Johann III Bernoulli	**1781**

An offer of collaboration. Lambert to Kant

Lambert to Kant, Kant to Lambert **1765**

Reaction to Kant's *The Only Possible Argument in Support of a Demonstration of the Existence of God*

33.	13. November	Von Johann Heinrich Lambert	51
34.	31. December	An Johann Heinrich Lambert	54

Kant to Lambert **1766**

39a.	[unbestimmt]	An Johann Heinrich Lambert	73

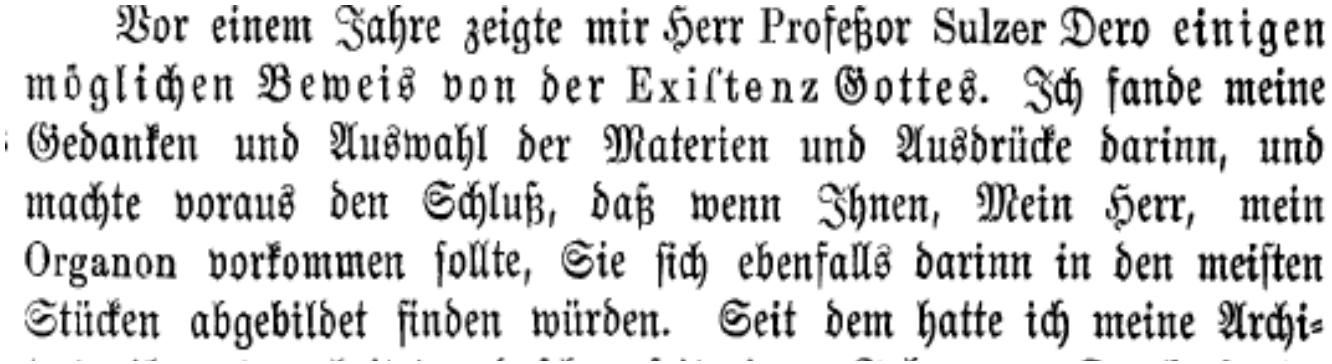
Lambert's first letter to Kant

November 13, 1765

Lambert's first letter to Kant, November 13, 1765

Lambert referred to Kant's *The Only Possible Argument in Support of a Demonstration of the Existence of God* (1763)

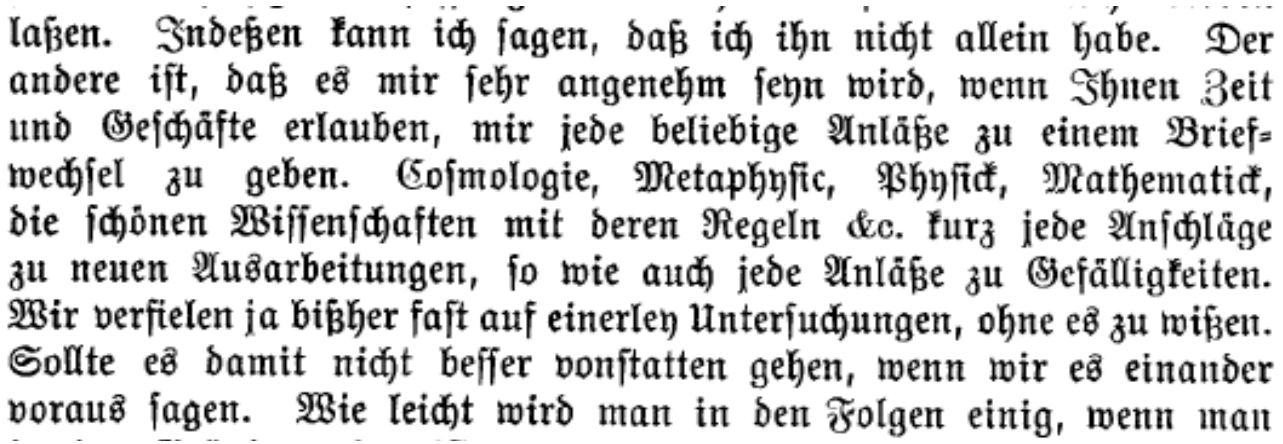
"I found in it my thoughts and choice of the matters and expressions, and did in advance the conclusion, that if my *Organon* should come to your knowledge, you would be found illustrated yourself also in the most pieces."



Vor einem Jahre zeigte mir Herr Profeßor Sulzer Dero einigen möglichen Beweis von der Exiſtenz Gottes. Ich fande meine Gedanken und Auswahl der Materien und Ausdrücke darinn, und machte voraus den Schluß, daß wenn Ihnen, Mein Herr, mein Organon vorkommen ſollte, Sie ſich ebenfalls darinn in den meiſten Stücken abgebildet finden würden. Seit dem hatte ich meine Archi-

Lambert's first letter to Kant, November 13, 1765

"The other wish is that it will be very pleasant to me if your time and business admit to give me **every arbitrary occasion** for a **correspondence**. Cosmology, metaphysics, mathematics, (…).Up to now we came on **almost the same examinations** without knowing it. Should it not be better if we forecast it each other."



laßen. Indeßen kann ich ſagen, daß ich ihn nicht allein habe. Der andere iſt, daß es mir ſehr angenehm ſeyn wird, wenn Ihnen Zeit und Geſchäfte erlauben, mir jede beliebige Anläße zu einem Briefwechſel zu geben. Coſmologie, Metaphyſic, Phyſick, Mathematick, die ſchönen Wiſſenſchaften mit deren Regeln &c. kurz jede Anſchläge zu neuen Ausarbeitungen, ſo wie auch jede Anläße zu Gefälligkeiten. Wir verfielen ja bißher faſt auf einerley Unterſuchungen, ohne es zu wißen. Sollte es damit nicht beſſer vonſtatten gehen, wenn wir es einander voraus ſagen. Wie leicht wird man in den Folgen einig, wenn man

Lambert’s programme from 1765

“We have heretofore hit upon almost the same investigations without knowing it. Would we not make better progress by advising one another in advance? How easily one reaches agreement in the consequences when one is agreed in the starting points, and how emphatic one can then be! **Wolff has brought approximately half of the method of mathematics into philosophy**.

The other half remains to be worked on, so we know what to strive for.” [Lambert to Kant, November 15, 1765]

Lambert's first letter to Kant, November 13, 1765

Nevertheless, Lambert's program **is different** from Kant's program, already in 1765 and even still more strictly in a later time.

"Wolff has accommodated about half of the **mathematical method** in the philosophy. The **other half** is to be done still, so that we have something what we can require."

voraus ſagen. Wie leicht wird man in den Folgen einig, wenn man in den Gründen eins iſt, und wie nachdrücklich läßt ſich ſodann der Ton geben. Wolf hat ungefehr die Helfte der Mathematiſchen Methode in der Philoſophie angebracht. Es iſt noch um die andere Helfte zu thun, ſo haben wir was wir verlangen können.

Common and controversial topics

(a) you would be found **represented yourself**

May be Kant was not so happy about that

(b) **occasion** for a **correspondence** on cosmology, metaphysics, mathematics

May be Kant was happy about that

(c) the other half of the **mathematical method** in the philosophy

Probably, Kant was not so happy about that too

Compare the later refusal in the *Critique*. Nevertheless, Lambert provided Kant with an alternative: **either** other half too **or** none of the two halves

Kant's answer to Lambert

December 31, 1765

Kant's letter to Lambert, December 31, 1765

"It is to me no minor pleasure to see the **favourable agreement** of **our methods** noticed by you, (…). I appreciate highly you invitation for a mutual communication of our drafts and, because I feel myself very much honoured by this offer, I will also not lack to make use of it (…)."

Es iſt mir kein geringes Vergnügen, von Ihnen die glückliche Übereinſtimmung unſerer Methoden bemerkt zu ſehen, die ich mehr=

der allgemeinen menſchlichen Vernunft den Strich halten. Dero Ein= ladung zu einer wechſelſeitigen Mittheilung unſerer Entwürfe ſchätze ich ſehr hoch und da ich mich durch dieſen Antrag ſehr geehrt finde, ſo werde ich auch nicht ermangeln davon Gebrauch zu machen, wie

Kant's letter to Lambert, December 31, 1765

(*) No letter could have been more desired and more pleasantly to me
(**) because I hold you as the first genius in Germany to perform important and durable improvements in current examinations
(***) I will also not lack to make use of your offer

Mein Herr!
Es hätte mir keine Zuschrift **angenehmer und erwünschter seyn können (*)**, als diejenige, womit Sie mich beehrt haben, da ich, ohne etwas mehr als meine aufrichtige Meinung zu entdecken, Sie vor das **erste Genie in Deutschland** halte **(**)**, welches fähig ist in derienigen Art von Untersuchungen, die mich auch vornemlich beschäftigen, eine wichtige und dauerhafte Verbesserung zu leisten.

Es ist mir kein gringes Vergnügen, **von Ihnen die glückliche Übereinstimmung unserer Methoden bemerkt zu sehen**, (…). **Dero Einladung zu einer wechselseitigen Mittheilung unserer Entwürfe schätze ich sehr hoch** und da ich mich durch diesen Antrag sehr geehrt finde, **so werde ich auch nicht ermangeln davon Gebrauch zu machen (***)**, (…).

Lambert's second letter to Kant

February 3, 1766

Lambert's second letter to Kant, February 3, 1766

Comparison of philosophical to mathematical knowledge

"I saw namely that where the mathematicians have succeeded in opening a new field which the **philosophers believed to have controlled completely** till then, the first had to turn around not only everything again, but brought it so on simplest and equally on simple-minded that the philosophic became about that point completely **uselessly** and in some ways even **despicable**."

Ich ſahe nemlich, daß wo es den Mathematickern gelungen iſt, ein
neues Feld zu eröfnen, das die Philosophen bißdahin ganz angebaut
zu haben glaubten, erſtere nicht nur alles wieder umkehren mußten,
ſondern es ſo aufs einfache und gleichſam aufs einfältige brachten,
daß das Philosophiſche darüber ganz unnütz und gleichſam verächtlich
wurde. Die einige Bedingung, daß nur homogenea können addirt

The origin of difference and opposition between **mathematics** and **philosophy**

explicitly expressed by Lambert and Schopenhauer

Lambert 1766

"I saw namely that where the mathematicians have succeeded in opening a new field (…), but brought it so on simplest and equally on simple-minded that the **philosophic** became about that point **completely uselessly** and in some ways even despicable."

Schopenhauer 1819

"… that the **self-sufficingness** and **clearness** of intuitive evidence appears in contrast with the **uselessness** and difficulty of **logical proof** (…)."

"… tritt die **Selbständigkeit und Klarheit** der **intutiven Evidenz** mit der **Nutzlosigkeit und Schwierigkeit der logischen Ueberführung** in einen Kontrast, (…)."

Lambert to Kant 1770

"All **changes** are bound to the **time** and cannot be thought without time. If the changes are **real** so the **time is real** whatever it may otherwise be. If the time is not real so no change is real neither."

Alle Veränderungen sind an die Zeit gebunden und laßen sich ohne Zeit nicht gedenken. Sind die Veränderungen real so ist die Zeit real, was sie auch immer seyn mag. Ist die Zeit nicht real so ist auch keine Veränderung real.

"However, it is possible for me to suppose that also even an *idealist*, at least in his imaginations, **must admit changes** like starting and stopping of the changes, which really happen and exist."

Es däucht mich aber doch, daß auch selbst ein *Idealiste* wenigstens in seinen Vorstellungen Veränderungen, wie Anfangen und Aufhören derselben zugeben muß, das wirklich vorgeht und *existirt*.

"And, therefore, the **time cannot** be considered as something which is **not real**."

Und damit kann die Zeit nicht als etwas nicht reales angesehen werden.

Einstein on space, time and matter 1918

“In former times one had believed if all things **disappear** from the world, space and time are still left. However, after the theory of relativity disappear **time and space** together with the things.”

“Früher hat man geglaubt, wenn alle Dinge aus der Welt verschwinden, so bleiben noch Raum und Zeit übrig. Nach der Relativitätstheorie verschwinden aber Zeit und Raum mit den Dingen.”

As a consequence an epistemological shift from **space-time-matter** relation to **cause-effect correlation** appeared.

From **Kant** to **Hume**

Einstein, Schrödinger => 5. Convergence

Kant to Johann III Bernoulli (1781)

(*) (I expected) that one could succeed in **combining** his efforts with my efforts to bring about **something perfect**

(**) which I also do not regard **now** (**1781!**) as impossible, but, because such a big mind has escaped this business, consider as lengthy and more difficult

… seine Bemühung mit der meinigen zu vereinigen, um etwas Vollendetes zu Stande zu bringen … (*)

… welches ich auch ietzt nicht vor unmöglich, aber, da diesem Geschäfte ein so großer Kopf entgangen ist, **vor langwieriger und schweerer halte**. (**)

Written AFTER the *Critique of Pure Reason* (1781)

The swan song

"The splendid man had done to me an objection against my notions of **space and time**, expressed at that time, which I have **answered** in the *Critique of the pure reason*, pages 36-38." [Kant, Letter to Johann III Bernoulli] (1781)

etwa um eben dieſe Zeit eingetroffen ſeyn möchte. Der vortrefliche Mann hatte mir einen Einwurf wieder meine damals geäußerte Begriffe von Raum und Zeit gemacht, den ich in der Critik der reinen Vernunft Seite 36—38 beantwortet habe.

Der
Transſcendentalen Äſthetik
Zweiter Abſchnitt.

Von der Zeit.

After the Lambert-Kant correspondence and the Kant-Eberhard controversy

Schopenhauer 1819

Competition between self-evidence and proof

"The Euclidean method of demonstration has brought forth from its own womb its **most striking parody and caricature** in the famous controversy over the **theory of parallels**, and in the attempts, repeated every year, **to prove** the eleventh axiom (also known as the fifth postulate).

Now this truth is supposed to be too complicated to pass as **self-evident**, and therefore needs a **proof**; but no such proof can be produced, just because there is nothing more immediate." [Schopenhauer, World, Vol. 2, Chap. 13] (**1819**)

On the methods of mathematics

Zur Methodenlehre der Mathematik

Schopenhauer 1819

"… that the **self-sufficingness** and **clearness** of intuitive evidence appears in contrast with the **uselessness** and **difficulty** of logical proof (…)."

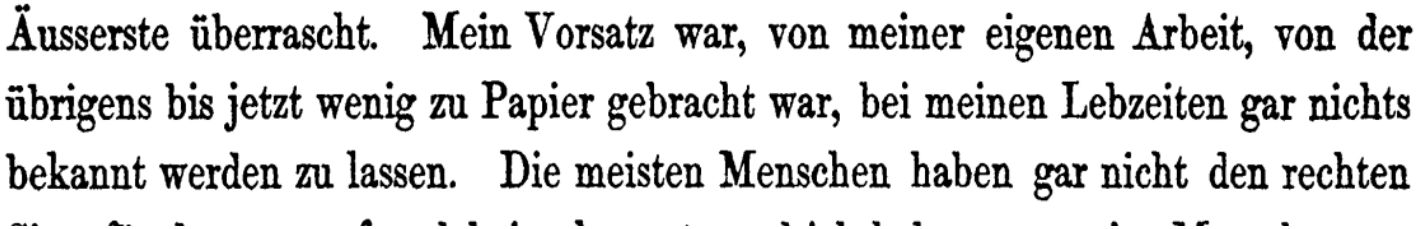
Lambert 1766

"I saw namely that where the mathematicians have succeeded in opening a new field (…), but brought it so on simplest and equally on simple-minded that the **philosophic** became about that point **completely uselessly** and in some ways even despicable."

Gauß 1829 - 1832

"My intention was, as far as my own work was concerned (since **1790**), of which incidentally **till present only little was written down**, to allow to be known **nothing at all** while my lifetimes."

"Mein Vorsatz war, von meiner eigenen Arbeit, von der übrigens bis jetzt wenig zu Papier gebracht war, bei meinen Lebzeiten gar nichts bekannt werden zu lassen. ."



Äusserste überrascht. Mein Vorsatz war, von meiner eigenen Arbeit, von der übrigens bis jetzt wenig zu Papier gebracht war, bei meinen Lebzeiten gar nichts bekannt werden zu lassen. Die meisten Menschen haben gar nicht den rechten

Gauß to Wolfgang Bolyai, March 6, 1832

"… and my conviction that we **cannot** demonstrate in **geometry entirely a priori** has become, possibly, still firmer."

"… und meine Überzeugung, dass wir in der Geometrie nicht vollständig a priori begründen können, ist, womöglich, noch fester geworden."

meine die ersten Gründe der Geometrie: ich weiss nicht, ob ich Ihnen je über meine Ansichten darüber gesprochen habe. Auch hier habe ich manches noch weiter consolidirt, und meine Überzeugung, dass wir die Geometrie nicht vollständig a priori begründen können, ist, wo möglich, noch fester geworden.

Gauß to Bessel, January 27, 1829

Gauß

First investigations some times around **1790**

"Meanwhile, I will not still probably arrive long to work out my very **extended examinations** about that point to the public announcement, and perhaps this will also never happen during my lifetimes, because **I shy the shouting of the Beotians** if I wanted to pronounce **my view completely**."

Inzwischen werde ich wohl noch lange nicht dazu kommen, meine sehr ausgedehnten Untersuchungen darüber zur öffentlichen Bekanntmachung auszuarbeiten, und vielleicht wird diess auch bei meinen Lebzeiten nie geschehen, da ich das Geschrei der Böotier scheue, wenn ich meine Ansicht ganz aussprechen wollte. — Seltsam ist es aber, dass ausser der bekannten Lücke in

Gauß to Bessel, January 27, **1829**

"… durch das, was **Lambert** gesagt hat. "

"… by that what **Lambert** has said, (…), it has become clear to me **that our geometry is incomplete**, and should get a correction which is hypothetical (…)."

[BESSEL *an* GAUSS. *Königsberg i. Pr., 10. Februar 1829.*]

{. . . . . Ich würde sehr beklagen, wenn Sie Sich »durch das Geschrei der Böotier« abhalten liessen, Ihre geometrischen Ansichten aus einander zu setzen. Durch das, was LAMBERT gesagt hat, und was SCHWEIKART mündlich äusserte, ist mir klar geworden, dass unsere Geometrie unvollständig ist, und eine Correction erhalten sollte, welche hypothetisch ist und, wenn die Summe der Winkel des ebenen Dreiecks = 180^0 ist, verschwindet. Das wäre die wahre Geometrie, die Euklidische die praktische, wenigstens für Figuren auf der Erde. . . . . .}

Weyl

"This, which has hitherto represented our knowledge of space and matter, and which was in many quarters claimed by philosophers as ***a priori* knowledge**, absolutely general and necessary, stands today a **tottering structure (vollständig ins Wanken geraten)**.

First, the physicists in the persons of Faraday and Maxwell, proposed the 'electromagnetic field' in contradistinction to matter, as a **reality** of a different category.

Then, during the last century, the mathematician, following a different line of thought (die Mathematik durch ihre **logische Minierarbeit**), **secretly undermined belief in the evidence of Euclidean Geometry**."

[Weyl, Space Time Matter] (**1919**, Engl transl. **1922**)

Programmes, quarrels and debates

On the decisive role of programmes

1. Leibniz's programme	1671
2. Newton's programme	1687
3. Du Châtelet's programme	1740
4. Kant's programme	1746
5. Lambert's programme	1764
6. Kant's response to Lambert's criticism	1781

1727 - 1781

Reception and recovery of the 17th century legacy

Descartes

Newton

Locke

Leibniz

Quarrels and debates

Newton-Leibniz: Priority in the invention of the calculus (1710)

Newton-Clarke-Leibniz: Foundation of physics and metaphysics (1716)

Why reception AND recovery?

Locke – Leibniz: *An Essay concerning Human Understanding* (**1690**)

Leibniz's answer: *Nouveaux Essays* (written **1704**, published **1765**)

Unpublished writings of Newton and Leibniz

18th century

Euler, *Anleitung zur Naturlehre* (written **1746**) *Instruction for Natural Science* published only **1862**

Gauß (1777-1852), non-Euclidean geometry (**1790**, 1822, 1831) **recovered** and published by Bolyai (**1831**)

The reluctant reception of the Leibnitian legacy

Postponed debates and postponed reception

Locke: *An Essay concerning Human Understanding* (**1690**)

Leibniz's answer: *Nouveaux Essais* (**1704**, published **1765**, German translation **1778**)

Reception of incompletely published Leibnizian and Newtonian legacies

Johann Bernoulli (1667-1748), Berkeley (1685-1753), Voltaire (1694-1778), Maupertuis (1698-1759), Daniel Bernoulli (1700-1782), **Du Châtelet** (1706-1749), Euler (1707-1783), Hume (1711-1776), d'Alembert (1717-1785), **Kant** (1724-1804), **Lambert** (1728-1777)

Leibniz is the champion of postponed reception of his work and postponed debates on this legacy

As a consequence, people expect a lot of new insights into Leibniz's thinking from almost all writings which are published even today for the first time.

They will not be disappointed. Famous examples:

Gerhardt

Russell, Couturat

Keynes => **Newton**

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Leibniz's writings on natural science, medicine and technique

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Leibniz‘s first steps towards modern physics

LEIBNIZ

Writings on natural science, medicine and technique.

Starting point: **Huygens**, Wren and Wallis, **Rules of collision**, **1669**
Disproving of Descartes' rules by experiment and theory. =>

1. De rationibus motus,	1669	unpubl.
2. Theoria motus abstracti,	1671	**publ**.
3. Motion is somewhat relative => **relational turn**,	1675	unpubl.
4. Definition of dead and living forces,	1676	unpubl.
5. Metaphysical Definitions => **substantial turn**.	1678-80	unpubl.

=> Staring point for Du Châtelet in **1738**.
Similarity between **Leibniz and Du Châtelet**: Reference to **Huygens**, *Institutions*, §. 319. Difference: Leibniz had not to refer additionally to **Newton t**oo.

LEIBNIZ

Starting point: Huygens, Wren and Wallis, **Rules of collision**, 1669
Disproving of Descartes' rules by experiment and theory. **=> A**

1. De rationibus motus,	1669	unpubl.
2. Theoria motus abstracti,	**1671**	**publ. => B**
3. Motion is somewhat relative => **relational turn**,	1675	unpubl.
4. Definition of dead and living forces,	1676	unpubl.
5. Metaphysical Definitions => **substantial turn**.	1678-80	unpubl.

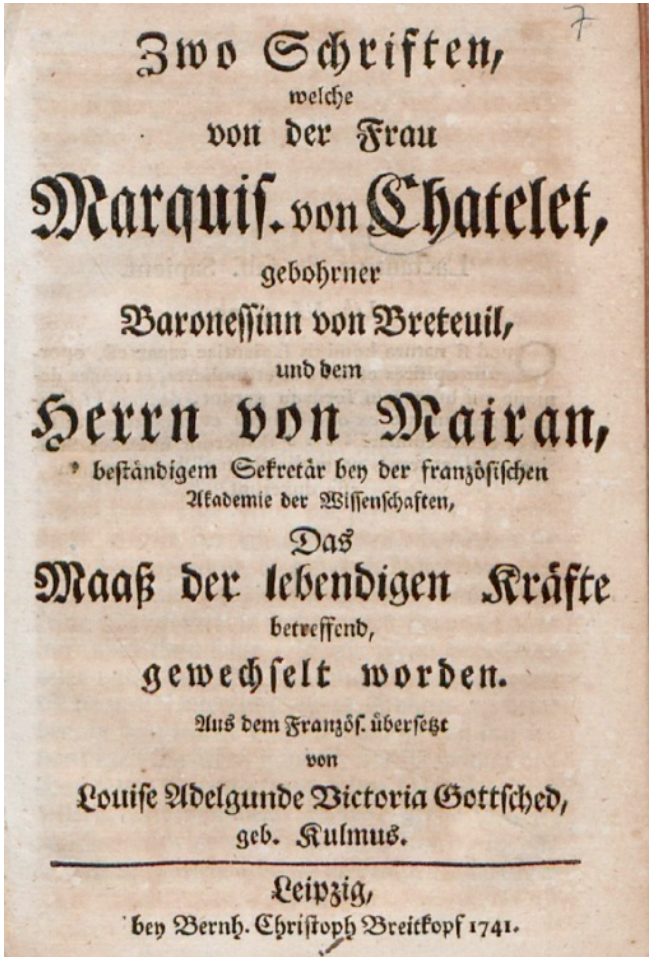
A => Staring point for Du Châtelet in 1738.
Similarity between **Leibniz and Du Châtelet**.

B => Comments by **Voltaire** (**1738**) and the **Gottschedin** (**1741**) on Leibniz's Theoria motus abstracti.
Comments by **Leibniz himself**: New System (**1686**), Specimen dynamicum (**1695**)

Du Châtelet, the Gottschedin and Lady Conway

Luise Adelgunde Victorie Gottsched (1713-1762)

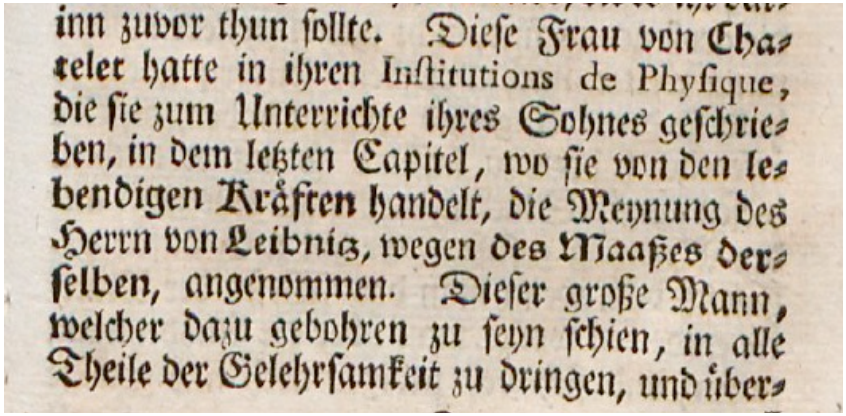
The comment of the Gottschedin on Leibniz



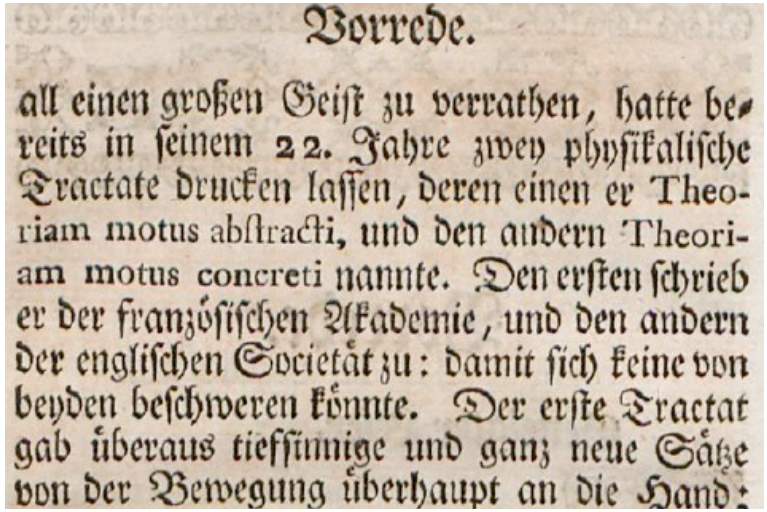
Zwo Schriften,
welche
von der Frau
Marquis. von Chatelet,
gebohrner
Baroneſſinn von Breteuil,
und dem
Herrn von Mairan,
beſtändigem Sekretär bey der franzöſiſchen
Akademie der Wiſſenſchaften,
Das
Maaß der lebendigen Kräfte
betreffend,
gewechſelt worden.
Aus dem Franzöſ. überſetzt
von
Louiſe Adelgunde Victoria Gottſched,
geb. Kulmus.

Leipzig,
bey Bernh. Chriſtoph Breitkopf 1741.

The “complete Leibniz” of **1671 i**n the treatise of the Gottschedin



inn zuvor thun ſollte. Dieſe Frau von Chatelet hatte in ihren Inſtitutions de Phyſique, die ſie zum Unterrichte ihres Sohnes geſchrieben, in dem letzten Capitel, wo ſie von den lebendigen Kräften handelt, die Meynung des Herrn von Leibnitz, wegen des Maaßes derſelben, angenommen. Dieſer große Mann, welcher dazu gebohren zu ſeyn ſchien, in alle Theile der Gelehrſamkeit zu dringen, und über-



Vorrede.

all einen großen Geiſt zu verrathen, hatte bereits in ſeinem 22. Jahre zwey phyſikaliſche Tractate drucken laſſen, deren einen er Theoriam motus abſtracti, und den andern Theoriam motus concreti nannte. Den erſten ſchrieb er der franzöſiſchen Akademie, und den andern der engliſchen Societät zu: damit ſich keine von beyden beſchweren könnte. Der erſte Tractat gab überaus tiefſinnige und ganz neue Sätze von der Bewegung überhaupt an die Hand:

aber machten eine Generalphyſik aus. In allen beyden Werken bezeigte ſich **Leibnitz** noch als einen **Carteſianer**. In beyden gab er den leeren Raum zu, und betrachtete darinn die Materie nur als eine bloße Ausdehnung, der es gleich viel iſt, ob ſie ſich beweget oder ruhet. Allein wie **Leibnitz** einer von denen Weltweiſen war, die ſich durch kein Anſehen blenden laſſen; und die groß genug ſind, nicht nur einer jeden Meynung weiter nachzuforſchen, ſondern auch, ſo bald ſie deren Ungrund erkannt haben, dieſelbe öffentlich fahren zu laſſen: ſo hat er auch in

dieſen zweyen Stücken, nachmals eine ganz andre Meynung gefaßt. Er hat z. E. dafür gehalten, daß, wenn man das Weſen der Materie entdecken wollte, man über die Ausdehnung gehen, und ſich bey ſelbiger noch eine gewiſſe

Kraft

Kraft einbilden müſſe, die keine bloße geometriſche Größe mehr iſt.

Eben eine ſolche Unpartevlichkeit hat er auch bewieſen, als er in dem Märzmonate des 1686. Jahres in die Leipziger Acta Eruditorum eine Schrift unter folgendem Titel drucken laſſen: Breuis demonſtratio erroris memorabilis Carteſii et aliorum, circa legem naturae, ſecundum quam volunt, à Deo eandem ſemper quantitatem motus conſeruari; qua et in re Mechanica abutuntur. In dieſer Schrift

Leibniz referred of Lady Conway as a frame of reference for himself

"My approach somewhat closely those of the late Countess of **Conway** hold a **middle position** between **Plato** and **Democritus**, because I hold that all things take place **mechanically** as Democritus and **Descartes** contend against the views of **Henry More** and his followers, and hold too, nevertheless, that everything takes place according to a living principle and according to final causes-- all things are full of life and consciousness, contrary to the views of the Atomists." [GP III, 217]

Du Châtelet disagreed with **Locke** and **Henry More** concerning thinking matter and extended soul, respectively. [Inst1742, §. 77]

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Democritus (460-371)
Plato (428-348)
Descartes (1596-1650)
More (1614-1687)
Conway (1631-1679)

Kant analyzed the polemics of Du Châtelet against de Mairan

Kant deconstructed the objections of Eberhard making use of the Du Châtelet's art of argumentation

"I can not help making a comment here **about the way in which the Mm. Marquisin attacks her opponent's doctrines**. It seems to me that **she could not have chosen a better way** to teach him the most sensitive stroke than to give to its conclusions the feature of something strange and absurd. A serious presentation lures the reader to proper attention and investigation, leaving the soul open to any reason that may enter it from one side or the other. But the whimsical figure under which she lets the opinions of her adversary take possession immediately of the weak side of the reader and destroys in him the desire for a closer consideration.

The power of the soul that governs judgment and contemplation is of a languid and calm nature; she is happy to find the point of her retirement, and likes to remain silent with the one who abandons her from a laborious reflection; therefore it can easily be persuaded of such ideas as to reduce one of two opinions at once to probability, **and to declare the effort of further investigations unnecessary**."

Scaffold of a new dynamics. Kant, True estimation

“Now, after we have laid the foundation of a new power estimate, we should strive to indicate the laws that are associated with it, and which, as it were, constitute the **scaffold (Gerüste => Hypotheses => Du Châtelet) for a new dynamic**.
I am in the possession of setting out some laws according to which the vivification or vitalization of force is effected, but since this treatise endeavors **to sketch the first plan** of these so new and unexpected qualities of forces, I must rightly procure **that my readers** who are principally eager to be made certain by the chief being, wishing to see themselves entangled **in annoyance in a profound investigation of a minor matter**, especially since it is time enough to get involved in it, when the main work is firstly sufficiently secured and proven by experience.
As a result, I will endeavor to open with the greatest possible clarity only the most general and observable laws associated with our estimation of strength, and without which their nature may not be well understood.”

Kant's programme from 1746

Kant's later programmes

Kant's programme

1. Programme: True estimation (**1746-49**)

2. Letter to Euler (**1749**)

3. Kant met unexpected difficulties in realizing the programme.

4. Kant is aware of them. The means for the solution of the problems are not available. Kant is forced to bring about them by his own design.

5. Kant must bridge the gap between being **aware of the problem** and **having solved the problem**: "(…) wishing to see themselves entangled in **annoyance** in a profound investigation of a minor matter."

6. After numerous intermediate steps, the final solution of the problem is presented in the **Critique of pure reason** taking the shape of an "**answer to Lambert**" that never reached the addressee. (**1781**)

Letter to the editor of Lambert's correspondence: "(…) occasion on which I wrote to Herr Lambert, namely, when I sent him my dissertation, I suspect that Herr Lambert's reply may have arrived at about the same time. The excellent man had made **an objection to the ideas concerning space and time** that I had expressed, an objection **that I answered** in the *Critique of Pure Reason*, pages 36-38." [Kant, Letter to Johann III Bernoulli] (1781)

The subsequent intermediate steps are consequences of the initial programme and would not had be done without the initial one..

=> Du Châtelet's idea of the role of hypotheses.

=> Leibniz

First step: Freeing from the yoke of Aristotle.

Kant: Freeing from the yoke of authorities.

Kant is aware of the incompleteness of his solution. Kant must bridge the gap between being **aware of the problem** and **having solved the problem**: "(…) wishing to see themselves entangled in **annoyance** in a profound investigation of a minor matter."

Kant had to exclude the possibility that **Eberhard's objection** is of **Lambert-like type**. In the case of Lambert, after having accepted the criticism, it was necessary to reconsider the whole doctrine. Therefore, Kant chose another path and claimed that Eberhard had misunderstood his theory.

Eberhard's conjecture is not really proved wrong by Kant.

"We have heretofore hit upon almost the same investigations without knowing it. Would we not make better progress by advising one another in advance? How easily one reaches agreement in the consequences when one is agreed in the starting points, and how emphatic one can then be! **Wolf has brought approximately half of the method of mathematics into philosophy**.

The other half remains to be worked on, so we know what to strive for." [Lambert to Kant, November 15, 1765]

Lambert's offer and Kant's conclusion. There are two possibilities:

1. To complete Wolff's programme,

2. to **get rid of the Wolffian frame** and establish an alternative programme.

3. may be, it is possible to get not only rid of the **Wolffian frame**, but also of the **Leibnitian frame**?

"The single condition that only **homogeneous elements can be added** implies that all philosophical propositions whose predicates do not apply uniformly to their subjects **are rejected** by the mathematician. And there are entirely too many such propositions in philosophy. (…) Euclid does not derive his elements from either the definition of space or that of geometry but begins instead with lines, angles, and so on, the simple elements in the dimensions of space. In mechanics, we make little use of the definition of *Motion;* rather, we immediately consider what *accompanies* motion, viz., a body, the direction, velocity, time, force and space, and then we *compare* these things with one another in order to discover *principles.* I have been led to the conclusion that **as long as a philosopher does not carry his analysis of measurable objects** to the point where the **mathematician** can find unities, measures, and dimensions he must **surely still be hanging on to some confusion**, or at least the predicates of his propositions do not apply uniformly to the subjects." [**Lambert to Kant**] **On the relation between mathematicians and philosophers.**

The single condition that only **homogeneous elements can be added** implies that all philosophical propositions whose predicates do not apply uniformly to their subjects **are rejected** by the mathematician. [Lambert to Kant]

Famous problem: Dead and living forces.

Johann Bernoulli => Libori Summer School 2017. Reader

Newtonian type forces: **F1 + F2 = F3**

Leibnitian type forces: **Dead + Living = ?**

Transition Dead => Living and Living => Dead [Inst1742, §. 319]

Leibniz: Relation of point to line (=> discussed by Reichenberger [Reichenberger, Émilie Du Châtelets Institutions physiques])

“Analyzing the relation between philosophy and natural science in the end of the 20th century, Winter concluded:

“Châtelet emphasizes the importance of Leibnizian philosophical principles for science and the importance of hypotheses (…). This position is also represented by Kant, both in **his early writings and in the *Opus postumum***.
(…) the influence of her publications on Immanuel Kant - a question of particular interest in his precritical writings - has been little studied. A detailed analysis of Kant's idea of the true estimate of the living forces **will prove how intensively Kant has dealt with Du Châtelet's writings** (…). In addition, excerpts from Kant's **Posthumous Opinion**, (…) convincingly prove that the concept of living forces (…) and respresented (…) in his last writings and drafts since 1796 an essential theory.” [Winter, “Metaphysik der Natur” und “würkende Kräfte”]

“From here, the question arises to what extent other aspects of Kant's thinking in the pre-critical phase of his work also correspond to theories of Du Châtelets in natural science. It is essential in this context that in recent research, u. a. Mittelstrass, Langlois and Kerszberg, **Leibniz's influence on Kant's work is strongly emphasized again**, with Mittelstrass in particular emphasizing as an important aspect that essential parts of Leibniz's **work were not yet published at this time and thus not yet accessible to Kant**, so Leibniz's thinking for Kant was largely mediated by the lens of Leibniz-Wolff's philosophy.” [Winter]

LEIBNIZ

Programmes

Leibniz comment on the period between 1666 and 1676:

"While I was still a youth and followed Democritus, and Gassendi and Descartes, his disciples in this matter, in holding that the nature of body consists in inert mass alone, I brought out a small book entitled *A Physical Hypothesis,* in which I expounded a theory of both abstract and concrete motion. This writing seems to have pleased many distinguished men far more than its mediocrity deserved. There I set up the proposition that assuming this conception of the nature of body to be true, every colliding body must give its conatus to the body receiving the blow or directly opposing it as such." [Leibniz, Specimen, I (10)] (**1695**)

The programme of Leibniz (1671)

Descartes
Huygens, Wren and Wallis, Rules of collision (1669)

"Geometry must be written **without motion**, just through **situation**, that is locus or distance. In fact a straight line is the situation of a point to another point. Everything else originates from the composition of straight lines.
Following it there is the **discipline of productions**: the production of lines through motion or that of figures through sections. The last discipline is the **production of motions through motions**. In which it is not figures we are dealing with, but **force and effect**." [AVI, 2, N. 42(4)] (De Rationibus motus, **1671**).

The programme of Leibniz (origin 1671)

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=> Analysis situs => De Risi, Geometry and monadology (2007)

Following it there is the **discipline of productions**: the production of lines through motion

=> Barrow, Newton, Mehod of Fluxions

or that of figures through sections. The last discipline is the **production of motions through motions**.

=> whose first part is the realm of corpuscular theory

In which it is not figures we are dealing with, but **force and effect**."

=> metaphysical turn (1678-80) Back to Aristotle without the rejection of corpuscular theory

[AVI, 2, N. 42(4)] (De Rationibus motus, **1671**).

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=> **metaphysical turn** (1678-80) Back to **Aristotle** without the rejection of corpuscular theory

[AVI, 2, N. 42(4)] (De Rationibus motus, **1671**).

Newton

Programme

Newton's programme for physics

1. Phenomena and forces, Phenomena => forces,
2. Forces => phenomena

Newton's programme consists of two parts:

"(…) for all the difficulty of philosophy seems to consist in this – from the **phænomena of motions** to investigate the **forces** of nature, and then from these **forces** to demonstrate the **other phænomena**; (…)." [Newton, Principia, Preface]

First part: Principia (**1687**)

Second part: Johann Bernoulli (**1710**), already considered by Newton, but not published [Guicciardini, Reading the Principia]

"Johann Bernoulli stated that Newton had not solved the inverse problem of central forces. He published a solution consisting of the integration of a differential equation. In Proposition 41, Book 1, Newton, through a geometrical procedure based on infinitesimals, reduced the inverse problem to a quadrature (method (iii*b*) in §3.16).
I will show that Newton knew how to perform such a quadrature by the help of his analytical method of fluxions. However, he kept this solution hidden and insisted in publishing an *a posteriori* geometric solution in Corollary 1 to Propositions 11–13, Book 1 (method (i) in §3.16). This is an example of what we have termed 'quadrature avoidance': Newton knew the calculus solution, but preferred to publish a geometric one." [Guicciardini, Reading Newton]

KANT

Programmes

The programme of Kant (1749)

Getting rid of authorities, with one exception.

Du Châtelet: “The systems of Descartes and Newton divided the thinking world.” [Icht1742, Preface, VI]

Between the Cartesians and the Leibnitians

Kant: “The systems of **Descartes** and **Leibniz** divided the thinking and **calculating** world.” => New role of mathematics ad mathematicians.

“Kant’s aim in the *Living Forces* was to settle the *vis viva* debate. His strategy consisted of giving both camps their due. He wanted to show that the controversy persisted for such a long time because both sides had been partially right. The truth must accordingly lie in the middle, and the only possible …

… resolution of the issue will be a compromise. Instead of declaring one side to be the winner, Kant constructed a synthesis of the Cartesian and Leibnizian views. Such a mediating stance precluded allegiance to either view, and he went to great lengths to emphasize his impartiality. Already the preface begins with a declaration of independence.

Kant announced that he no longer wanted to respect the **authority** of someone like **Newton** or **Leibniz**; one no longer had to cower in fear of the sway of great men.

The argumentative structure of the book itself shows how its author avoids being pinned down to one of the standard views in the debate. Kant praised whom he criticized, and he criticized whom he praised. The first section is essentially a defense of Leibniz against Descartes; the second section is a defense of Descartes against Leibniz; and the third and concluding section is an attempt at transforming the two antagonistic views into complementary components of a comprehensive dynamics." [Schönfeld]

“Kant declared that he wanted to settle the debate once and for all and he intended to formulate in this tract the universal principles of dynamics (I 117). His concluding remarks glow with self-complacency. He expected to lay claim to ‘incontrovertible certainty’; it was ‘not difficult’ to resolve the mathematical aspect of the puzzle and ‘almost impossible to miss’ the solution to the ontological aspect of the problem. A ‘**brief absence of partisan spirit**’ and a ‘quick equilibrium of the inclinations’ sufficed to settle the dispute ‘immediately’.” (I 181).

=> **Du Châtelet**

“Guard yourself, my son, whichever side you take in this dispute among the philosophers, against the inevitable obstinacy to which the **spirit of partisanship** carries one: this frame of mind is dangerous on all occasions of life; but it is ridiculous in physics.” [Inst1742, Preface, VII]

"**Nonetheless, the *Living Forces* is fascinating**. It reveals how the mind of the budding philosopher worked. **Echoes** of thoughts that had been formulated here first **reverberate through the whole precritical period**, (=> and even later) despite Kant's quick rejection of the treatise. Attitudes emerged here that were **later transformed** into the dominant motives of his philosophizing. Assumptions that Kant boldly introduced in the *Living Forces* **later returned as problems** requiring solution or claims needing explication, and as a result, many themes of the *Living Forces*—the beauty and perfection of nature, the tension between physical influx and preestablished harmony, the concepts of substance and world, the idea that force generates space—blossomed into the topics of the major precritical treatises in the next decade, the *Universal Natural History* (1755), the *New Elucidation* (1755), and the *Physical Monadology* (1756)." [Schönfeld]

Summary

1. Du Châtelet developed a theory of science which is founded upon the legacies of Descartes, Leibniz and Newton.

2. The theory is appropriate to consider *impartially* the quarrels between Cartesians and Newtonians as well as between Cartesians and Leibnitians.

3. Her contemporaries admired Du Châtelet for her exceptional *style of writing* and *eloquence*.

4. The theory unfolded its potential also in the *second half* of the 18th century as it can be proved by analyzing the writings of d'Alembert, Euler and Kant.

5. Du Châtelet's theory applies to Newton's *first* problem, "from the phenomena investigate the forces".

6. Kant's theory applies to Newton's *second* problem which reads in Kant's terminology "to investigate the phenomena of a *possible experience* taken from forces".