Dynamics

Jason

Hi, friends. I have three somewhat different ideas here, and I'm not sure which to follow up, although I'm definitely heading towards 1799 and Descartes. There are three things here – one is my original idea. Second are the results from some 1799 digging while Liona was up here. Third is an idea of where I'm headed now: going after Descartes.

First

Gauss, in his 1799 proof of the so-called fundamental theorem of algebra, makes a statement that would shock most readers of his paper. While discussing the failed methods used by Euler to prove that every algebraic equation of n^{th} degree has n roots, Gauss remarks that for equations of the fifth degree, it could be proven that it is *impossible* to give a method of generating an expression for the roots. Is it possible to be certain of the existence of something, whose specific character remains yet unknown? Is such a demonstration the opening of a door to search for a desired, describable object, or might there exist actual existences whose fundamental nature is known only in this way (negatively)?

Gauss's demonstration and words are best left as an aside to come later, or as a box or appendix.

Kohler writes in a similar vein in his *Place of Value in a World of Facts,* on the nature of *transphenomenal* concepts.[1] Empiricists are of a mind that all of our ideas come from perceptions, for how else would they enter the mind? Yet, the experience of having something "at the tip of one's tongue" demonstrates the existence of something active in the mind, whose particular expression eludes us at present, but whose distinctness is known by the inapplicability of wrong attempts to get the missing thought: they are not *right.*

[1] Is "concepts" an ok word here?

Kohler even gives the example of potential, as something which certainly has no phenomenal existence, even if you allow forces as phenomenal. I would also bring up the classic demonstration by Leibniz of *vis viva.*

[Optional: Kubie on the preconscious.]

Let's take a look at Fermat. He proffers the bold hypothesis that light's motion is guided by the necessity that its traversed paths be least-time. Is this an example of having something at the tip of one's tongue? Is the "real" (to an empiricist), efficient cause yet unknown, although we know that it must exist by the requirements of least-time, or is least-time itself a full-fledged existence?

I do not believe that any efficient cause may truly exist on its own, or, better said, justify its own existence. Yet, what of final causes? Can we be content at having a final cause, or need we have a hope, although one that may not be fulfilled within our lifetimes, that an efficient cause, whose proximal effects may be used to further Man's power, shall possibly be found?

That brings the question back to economics. I wonder, do final causes play a role in the machine-tool principle? The enactment of a successful crucial experiment would seem to require an *efficient* cause.

And that brings me back to Koehler – he says that the advancements made through machinery have made men put too much attention upon external conditions and constraints imposed upon a process (mechanics), without giving thought to a dynamically created whole *as* an order.

We must understand efficient causes from the standpoint of final causes, but what of final causes? If they do not make themselves felt efficiently, of what would they be *causes?*

Second

February 18, 2009

Reading *Unknown Quantity* (the algebra history book), I realized the need to go after Descartes in a serious way, after going through the 1799 paper.

The demonstration of an existence whose presence is required by an action that must necessarily have a cause - demonstrating a *dynamic.* Transitive verbs, rather than adjectives and nouns, are reality. Nothing occurs without a cause for why it should be so, rather than otherwise. In 1799, Gauss offered a fundamentally new proof of the so-called Fundamental Theorem of Algebra. His refutations of the proofs put forward by d'Alembert, Euler, and Lagrange

expose them as charlatans, trying to describe the existence of something whose necessary presence had not been established. Gauss offers summaries of their attempted proofs, returning to one major error – assuming that roots of an algebraic equation must necessarily exist, and then spending a great deal of effort demonstrating the possibility of *expressing* these roots. For those readers who are hesitant to accept Gauss's summaries, excerpts from the proofs of d'Alembert and Lagrange are offered. Bougainville's summary of d'Alembert's proof (which is cited by both Lagrange and Gauss) includes:

LXVII.

We will now demonstrate two general Propositions of great use for imaginaries: the first, is that any imaginary of an arbitrary form can always be reduced to $A+B\sqrt{-1}$, where A and B are real quantities. The second is that any imaginary root of an arbitrary equation can also be expressed by $A + B\sqrt{-1}$[2]

LXX Theorem.

Any algebraic quantity, composed of any number of different imaginary quantities, can always be brought to the form $A + B\sqrt{-1}$, where A and B are real quantities.[3]

LXXV.

The second proposition, namely that the imaginary roots of an arbitrary equation can be expressed as $A + B\sqrt{-1}$, seems to follow necessarily from the first; it does, however, require its own proof. For although we have demonstrated that any imaginary quantity can be reduced to $A + B\sqrt{-1}$, it could be doubted whether the same would hold for the imaginary roots of equations, because it would seem that at least in certain cases, these roots would not have any possible analytic expression. But the following Theorems leave no difficulty as regards this second proposition.[4]

Lagrange writes:

insert damning quote: Me too![5]

The style of Gauss's proof is taken from Lagrange's – both offer a summary of preceding attempts at proving the FTA, and then offer their own demonstrations. Gauss snubs Lagrange not simply by offering a remarkably short dismissal of his proof, but in his style of writing. While Lagrange com-

[2]Bougainville, p. 40

[3]Bougainville, p. 41

[4]Bougainville, p. 48

[5]I thought I had this damning evidence, but I think Lagrange's assumption that I was focusing on is actually OK.

plains that d'Alembert used geometrical considerations, making his proof invalid, Gauss seeks to offer a proof without the use of imaginary quantities, and resting entirely on geometry! The reader is encouraged to freshen up on Gauss's 1799 dissertation. Before embarking on his own proof, Gauss makes a remarkable statement in section 9. I allow myself to excerpt a paragraph:

It is true, pure equations stand out very much among all the others because of the ease of finding their roots by approximations and because of the beautiful relation which the roots together have among them. And it is therefore not to be censured that mathematicians have denoted their roots by a special symbol: But from the fact that this symbol is raised to the dignity, and comprised under the name, of analytic expressions just like the arithmetic symbols for addition, subtraction, multiplication, division, and powering, it does not at all follow that the root of any equation whatsoever can be expressed by these, unless it is tacitly presupposed, without sufficient reason, that the solution of any equation can be reduced to the solution of pure equations. *It is perhaps not so difficult to demonstrate quite rigorously the impossibility already for the fifth degree;* I shall report my investigations of this matter more fully in another place. Here it suffices that the general solution of equations, taken in that sense, is so far very doubtful. And a proof whose force depends entirely on this supposition has no weight. [emphasis mine]

Continuing in the direction suggested by the success of Al-Khwarizmi in giving a very general method for the solution of quadratic equations, and Cardan's (and Scipio del Farro's(?)) success with cubics, as well as the resolution of biquadratics, Gauss's predecessors had tried to find means of developing a method or algorithm for the exact determination of the roots of an equation. A general solution for the quintic had not yet been given. I found John Derbyshire's fun book *Unknown Quantity* to be provocative on this matter. According to him, one M. Vandermonde had done quite a bit of work on symmetrical expressions, a matter which figures very prominently in Gauss's objections to Euler's proof, and which Gauss uses to resolve a difficulty that Euler had been unable to. To use Derbyshire's example, Vandermonde expressed the roots of a quadratic *in terms of each other.*

$$\alpha = \frac{1}{2}[(\alpha + \beta) + (\alpha - \beta)]$$

$$\beta = \frac{1}{2}[(\alpha + \beta) - (\alpha - \beta)]$$

which, if the square root operator is allowed to mean either the positive or negative root, allows us to express the two roots as:

$$\frac{1}{2}[(\alpha+\beta)+\sqrt{(\alpha-\beta)^2}]$$

and $(\alpha-\beta)^2=(\alpha+\beta)^2-4\alpha\beta$ which now has everything in symmetrical terms! Written out, the roots are:

$$\frac{1}{2}[(\alpha+\beta)+\sqrt{(\alpha+\beta)^2-4\alpha\beta}]$$

the familiar "quadratic equation."

Anyhow, this isn't the place to get into Abel's demonstration of the impossibility of solving the quintic, and I'm not competent to go over it yet.

So, if no solution of a quintic or above can be expressed, how can it be stated that it must exist. This question is the heart of all discoveries: they are expressed *negatively.* What cannot *not* exist? And how may concepts without phenomenal clothing be born in the mind?

Insert Kohler: Place of Value in a World of Facts.

Leibniz's refutation of Descartes and his introduction of *vis viva* in such locations as his *Specimen Dynamicum, General Thoughts Respecting Problems in Descartes, Discourse on Metaphysics,* etc., is a perfect example. Leibniz's *vis viva* cannot fail to exist: the nature of bodies to act is required; Descartes' attempts to express the quality of bodies simply by their motion fails to grasp the true nature within them. Let us take up another of Leibniz's favorite ways of smashing Descartes: the motion of light. The French genius Pierre de Fermat had demonstrated that light moves along pathways of least time, rejecting the Cartesian mechanical explanations for light's motion.

See my editorial for Dynamis.

Leibniz uses this example in a large number of papers, including the *Discourse on Metaphysics, Tentamen Anagogicum,* his *Unitary Principle of Catoptrics and Dioptrics,* etc. Here we can directly see Descartes' wicked attack on the human mind, as echoed by his followed Clerselier. His objection to Fermat stems primarily from his fanatical, emotional belief that anything corresponding to a human "idea" could not possibly be a cause in the universe – no metaphysics allowed here! Leibniz directly takes this up in such locations as the *Leibniz-Clarke Correspondence,* where he places

metaphysics, rather than mathematics, as the opposite of materialism.[6] The proximal, efficient causes of actions in the universe may possibly be expressed in corporeal, phenomenal terms, but the reason for these efficient causes to array themselves the way they do must be sought outside them, in goodness and wisdom.[7]

Descartes' thoughts on light and motion are not much taught or referenced today, since he was so incredibly wrong. He is still, however, held up as a great "philosopher" and mathematician. Fermat not only blew Descartes apart on the question of light, but he thoroughly trounced him in the field of what is now called analytic geometry.

Descartes did embrace the convenient notation of Viète, in which both known and unknown quantities are represented simply by letters of the alphabet, with the difference that while Viète used vowels for unknowns, Descartes used letters at the end of the alphabet. (Supposedly, he used x, y, and z interchangeably, but the printer had many x's left over, since they are more rarely used in French than are y and z.)

Descartes' supposedly amazing discovery of representing the ordinate and abscissa of a curve by an algebraic equation was not unique to him – Fermat did it first, and was able to achieve much more success.[8] Descartes turned the world on its head, considering geometry as a convenient way of expressing algebra, and rejected geometrical-mechanical curves without an algebraic representation between the ordinate and abscissa, insisting that nothing could be done with them. Fermat took a particular delight in showing Descartes to be an idiot on this front, finding tangents to the cycloid, and several other mechanical curves of antiquity whose names escape me at the moment.[9]

I would be very happy to learn more about the historical setting of Descartes, and about his networks. He was clearly a political operative,

[6]Clarke claims that Newton is not a materialist, since he acknowledges the existence of mathematical principles, which principles are not material. Leibniz responds that all materialists accept the existence of mathematical principles, since they use them to describe the relations among all that material. Metaphysics is in opposition to materialism, not mathematics. Saying *why* it is so, instead of *what* happens is a true search for cause.

[7]The word *cause* is clearly a matter of importance. It is nearly *verboten* among many today to consider a natural cause as resembling in any way a human *cause* or purpose for action. This is the substance of Clerselier's freakout to Fermat. See the Dynamis editorial.

[8]Which Descartes admitted!

[9]Later, Descartes accepted the cycloid, since you could plot a point at will, not so for the quadratrix or the spiral.

and by all accounts a real jerk. Knowing the history would make the errors in his thinking less abstract and put them in a context, like the way the COS3 and Devil pamphlets worked. I am pretty passionate about destroying his reputation and malignant influence on humanity, and although it might seem technical, I think that hitting him on the flank that seems the least obvious – mathematics, might have some use. I won't know until I look into it more.

Third

Research on the History of Descartes' Mathematics

Without having too specific of a goal in mind, I have a personal desire to wipe out Descartes, and I believe that researching his mathematical and geometric work would be time well spent. I'm not yet sure what I will find, but I do know that his errors in physics and light have been pretty well covered at this point, especially now that Sarah's article has been published. I do have a guide to my study of Cartesian geometry:

– His mathematics was not original.

– This will require going through Viète, for starters – what was new with Descartes besides changing the letters?

– Did he know about the work Fermat was doing at around the same time? Fermat was in conversation with Mersenne, after all. Compare his *Géométrie* to Fermat's work

– Are there any other people who had almost the same thing besides Viète on algebra and Fermat on analytic geometry?

– His mathematics was wrong.

– I hear that he rejected physical curves, believing that curves existed to represent algebra instead of creating mathematics to understand physical processes.[10]

– Fermat took a great joy in showing that his mathematics is wrong, finding tangents and arc lengths of physical curves from the Greeks, and in resolving equations in much simpler ways than Descartes said was possible.

[10]This is not quite true. Although in his *Géométrie* he does reject any curve whose y-coordinate cannot be expressed in terms of x in a definite way, he does loosen up a bit elsewhere to look at the cycloid and the cissoid, although the quadratrix is completely out. You could construct any point on a cycloid you cared to, but a quadratrix can be made only by repeated bisection of the arc of the circle, meaning that not any point could be examined.

– His mathematics was politically deployed to promote oligarchism.

– I have a book, *Descartes: An Intellectual Biography*, and Bob Ingraham's book on the Anglo-Dutch system, which should be a good start at figuring out how he was deployed.[11]

Anyhow, David Shavin says he can't recall us having pulled together a good history of Descartes' promoters, so I think it will be time well spent to look more into this incredibly obnoxious person!

[11]The intellectual biography book cites quite a few other sources, and articles available on JSTOR. The source of Descartes' money is mysterious – he didn't officially ally himself with any particularly rich patrons, and his inheritance is not large enough to cover his expenses. One article mentions a guy named Peiresc, who funded Mersenne, Gassendi, etc., but not Descartes – has anyone heard of him?