Week 6

Mathematics in the Humanities

En d'autres termes ils sont 3, mais en réalité ils sont 2+a, et c'est bien en ceci que ce 2+a, au point du a, se réduit non pas aux 2 autres mais à un 1+a. Vous savez que là-dessus j'ai déjà usé de ces fonctions pour essayer de vous représenter l'inadéquat du rapport de l'1 à l'autre, ce que j'ai déjà fait en donnant à ce a pour support le nombre irrationnel qu'est le nombre dit « nombre d'or ». C'est en tant que du a les deux autres sont pris comme 1+a que fonctionne ce quelque chose qui peut aboutir à une sortie dans la hâte. Cette fonction d'identification, qui se produit dans une articulation ternaire, est celle qui se fonde de ceci que en aucun cas ne peuvent se tenir pour support 2 comme tels, que entre 2, quels qu'ils soient, il y a toujours l'1 et l'autre, le 1 et le a, et que l'autre ne saurait dans aucun cas être pris pour un 1 .

C'est très précisément en ceci que dans l'écrit quelque chose, quelque chose se joue qui, à partir de ceci de brutal, prend pour « Un » tous les Un qu'on voudra, que les impasses qui s'en révèlent sont par elles-mêmes pour nous un accès possible à cet être, une réduction possible de la fonction de cet être dans l'amour.

(Lacan, *Encore*, January 16, 1973)

Novalis's Magical Idealism (1800)

14 "Der Roman als solcher enthält kein bestimmtes Resultat—er ist nicht Bild und Faktum eines *Satzes*. Er ist anschauliche Ausführung—Realisierung einer *Idee*. Aber eine Idee lässt sich nicht in einen Satz fassen. Eine Idee ist eine *unendliche* Reihe von Sätzen—eine irrationale Grösse—uneinsetzbar—inkommensurabel." *Ibid.*, pp. 356–357. For a description of the novel as a geometrical progression, see *ibid.*, p. 326.

The novel is not the image or reality of a sentence . It is an intuitive implementation—realization of an idea. . . . An idea is an infinite series of sentences—an irrational quantity —that cannot be posited (musically)—incommensurable. . . . The law of its progression, however, can be formulated—and it is by this that a novel should be evaluated.

Die Welt muß romantisiert werden. So findet man den ursprünglichen Sinn wieder. Romantisieren ist nichts als eine qualitative Potenzierung. Das niedre Selbst wird mit einem bessern Selbst in dieser Operation identifiziert. So wie wir selbst eine solche qualitative Potenzenreihe sind. Diese Operation ist noch ganz unbekannt. (from Aphorisms and Fragments)

Der Mathematische Mensch

Nur wenn man nicht auf den Nutzen nach außen sieht, sondern in der Mathematik selbst auf das Verhältnis der unbenutzten Teile, bemerkt man das andere und eigentliche Gesicht dieser Wissenschaft. Es ist nicht zweckbedacht, sondern unökonomisch und leidenschaftlich.... Spezialisten für manche praktisch wichtigen Teile der Mathematik Nichtmathematiker sind. Daneben aber liegen unermeßliche Gebiete, die nur für den Mathematiker da sind... Die Mathematik ist Tapferkeitsluxus der reinen Ratio, einer der wenigen, die es heute gibt. ...

Wir andern haben nach der Aufklärungszeit den Mut sinken lassen. Ein kleines Mißlingen genügte, uns vom Verstand abzubringen, und wir gestatten jedem öden Schwärmer, das Wollen eines d'Alembert oder Diderot eitlen Rationalismus zu schelten. Wir plärren für das Gefühl gegen den Intellekt und vergessen, daß Gefühl ohne diesen – abgesehen von Ausnahmefällen – eine Sache so dick wie ein Mops ist. Wir haben damit unsre Dichtkunst schon so weit ruiniert, daß man nach je zwei hintereinander gelesenen deutschen Romanen ein Integral auflösen muß, um abzumagern.

(Musil, *Der Mathematische Mensch*)

A path not taken

It has been claimed that the book *La disparition* by George Perec (a book written entirely without the letter "e"), that refers several times to Poe's Dupin (but Perec apparently made a point of denying that it was a detective novel) was inspired in part by Lacan's reading of *The Purloined Letter*. (The reference for this is *La lettre fantôme* by Ali Magoudi, in the library but inaccessible.) Perec was a member of Oulipo, founded by Queneau (whom we meet again next week) and the mathematician François Le Lionnais, and even now includes several mathematicians among its members, one of whom is the author of detective novels.

The affinity of mathematicians for detective novels does needs no explanation. (And vice versa: Lisbeth Salander, in Stieg Larsson's *Millenium* trilogy, attempts to solve Fermat's Last Theorem; and Poe was an outstanding student of mathematics at West Point.) Throwing Lacan into the mix would deserve a course by itself.

From H. Mehrtens, *Moderne Sprache Mathematik*, 1990

In the end [Lacan] emphasizes the "writtenness" of the language of mathematics, mathematical signs, the letters are "l'écrit" and have the brutality of a useful self-identity.

Lacan does not speak the language of mathematics, he takes it as a metaphor for the metonymic in order to defend himself against the metaphorical of the traditional language of psychoanalysis.

The machine and its language, generated from the modern in contradiction to the counter-modern, can stand as a template for the non-autonomous subject that speaks mathematics.

dings nur, nachahmt. Hier findet sich, und das scheint mir bemerkenswert, eine besondere Fortsetzung der Geschichte der mathematischen Moderne. Diese Sprache, die nur sich selbst spricht und darum keinen ›Sinn‹ hat, bekommt einen Sinn dort, wo gegen den Sinn gesprochen werden soll. Vielleicht könnte man so sagen: Lacan spricht nicht die Sprache der Mathematik, er nimmt sie als eine Metapher des Metonymischen, um sich des Metaphorischen der traditionellen Sprache der Psychoanalyse zu erwehren. In der deutlichen Wendung an die Sprache der Mathematik, die ›nichts sagen will‹, ordnet sich Lacan ein und setzt sich zugleich ab von dem, was als Strukturalismus gilt und als umfassendere Fortsetzungsgeschichte zur Moderne der Mathematik erzählt werden könnte.[72]

For Lacan the metaphor is a matter of speech, of the mind or the soul, if you wish. Metonymy, on the other hand, belongs to the body, because it signifies abutment, touching. Having admitted that, the metonymic language of mathematics becomes a language of the body "purified" for controllability, suitable for Lacan's undertaking because it speaks the bodies of its signs that string together. The signs are an object-ish [gegenständliche] alienation of the body [Leib] written on another body [Körper]. Linearized they obtain controllability as object and rule of operations. In such a way the language of signs would be reduction of the language of bodies to that which can be controllably alienated. In this sense the modern of mathematics brings the separation, the barrier to consciousness, that the sign institutes [der Zeichen besteht] between the subject of the mathematician and the other. The self-controlled body is no long at one with the bodies of the signs, as Helmholtz sought to reestablish over the empiricism of perception, or Poincaré over the Darwinist grounding of convention.

Work on the machine would then be the exhaustion of the possibility of embodying this bodily language. The machine does not know the desire to find itself in the other, the self in metaphorical substitution to secure in the touching of the other body. Nor does the machine know the lack of desire that arises because the Ego does not quite find itself in the other. Thus the machine obtains a purity that it makes into the object of another's desire. It becomes symbol of self-control, that as the other, the opposite wants to be controlled. Here one sees most of all a desire for consistency, lack of contradiction. Each inconsistency is an error that wants to be eliminated. In mathematics however, that under complicated boundary demarcation has been separated from computer science, there remains even in the metonymy of strings of signs the infinite, with which the undecidable and the danger of inconsistency are constitutive. Contradiction can be an error in sense that the entire language of a theory must be reviewed, because it enforces new perspectives. So in the infinity of variations of mathematical infinity the locus of the desired knowledge remains here as the locus of the other.

Taken in this way…, "pure" mathematics would not be "the honor of the human mind" but rather the language of its body, that releases itself from the speaking Ego and thereby from the fantasy of the subject and the "unification" with the desired other in love. Its actualized infinite, however, reconstitutes out of the letter-script a goal of desire, the unreachable locus of the other. This locus [or place] can be written, but the Axiom of Choice shows that one cannot be in it. The discourse on set theory and actual infinity also concerned that.

For Lacan the body is the locus of the Real. So modern mathematics, insofar as it gives itself over to bodiless sign-bodies and at the same time seeks the consistency of sign-systems, is both nearer and more remote from the Real than earlier mathematics. The reply of the counter-moderns, their hope, that such bodiless mathematics by contradiction is false, and the true unity and consistency in one's own body is proven in intuition and in the act of speaking of one, two,... would then produce the Supplement for it, the self-writing machine, that is a body with immaterial soul, that nevertheless appears not to know pleasure and desire, pure ascetic and mystic, rational only for others, not in itself and not for itself. Was this not the ideal of the speech of the young Brouwer?

Therefore, in the conflict and cooperation of the moderns and the counter-moderns the "scientific ideal" of the mathematician was finally accomplished, the annihilation of the autonomous subject in the language and product of mathematics. And Lacan used precisely this effect for the psychoanalytic deconstruction of the subject, in order to find the way back to the body. Gauss and Kleist, who were quoted in the prelude to this text, are associated to this "way back" in order to mark the splitting of the way of language. Gauss's dream of thinking without body has been realized in the computer. And Kleist also wrote about the consciouslessness, guiltlessness, and with this the complete grace of marionettes, and also the sentence "Thus paradise is bolted shut and the cherub is behind us; we must journey through the world, and see, whether perhaps somewhere in the back something is open again." Thus the word "paradise," that Cantor created, an additional meaning and a continuation. Hilbert and Brouwer, Turing and Bourbaki, were way-stations on the journey through the world of the promise of a written, artificial paradise, in which machines dwell, that remains closed to the body.

Probabilistic vs. deterministic: Laplace

Laplace is responsible for the classic formulation of determinism:

We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes.

Pierre Simon Laplace*, A Philosophical Essay on Probabilities*

Probabilistic vs. deterministic in Pynchon

As Laplace's title indicates, the book was written because a philosophical commitment to determinism cannot overcome the practical impossibility of computation of future trajectories. Probabilistic methods, of which there are many, are sufficient to predict long-term behavior of the system of interest. The odds built into state lotteries guarantee that they are profitable to the state on average.

The philosophical showdown is dramatized in *Gravity's Rainbow* by the confrontation between the determinist Pointsman and the probabilist Roger Mexico. Pynchon is clearly on the side of free will vs. predestination.

The rise of Big Data as a means of adjusting algorithms, selling advertising, and manipulating elections, on the other hand, doesn't only call Pynchon's probabilistic romanticism into question… it is also a powerful attack by an inductive logic based on correlation on the deductive causal logic that underlies determinism.

Determinism vs. chaos in Stoppard's *Arcadia*

Stoppard's play *Arcadia* uses mathematics to illustrate a rather different literary topos, namely the transition between classicism and enlightenment, and romanticism. This is represented in the first place by the revolution in English gardening from the orderly vision of the imagined Arcadia of the title to the picturesque style introduced by Noakes. For our purposes, though, enlightenment is represented by Newtonian mechanics, culminating in the classic formulation of deterministic physics (Laplace is paraphrased without attribution in one of Thomasina's early lines).

Romanticism corresponds to two themes that were very much under discussion when Stoppard wrote his play. In the first place, Thomasina immediately anticipated the *second law of thermodynamics* (decades ahead of time) after hearing Septimus explain the new theory of heat (due to Carnot in the 1820s, anachronistically advanced by more than a decade by Stoppard). This directly provides an authentically mathematical formulation for the inevitability of tragedy — perhaps the first in the history of theater — and of course the most immediate form of irreversible "heat death" is implicated in the specific tragedy of this play.

In the second place, and more optimistically, Thomasina inventss*chaos theory* (anticipating Kovalevskaya) — and *apparently the* Mandelbrot set, which was a huge fashion in the early 1990s, when Stoppard wrote the play — intuitively, in response to her dissatisfaction with the Newtonian mathematics that could not explain anything of genuine interest, specifically love and the forms of nature. (Postcards with images of the Mandelbrot set were on sale at London rave parties that spring … I brought a few back…)

Septimus wasted the last decades of his life in an attempt to work out the implications of Thomasina's insight, but it was futile because it had to wait for the advent of electronic computing and the line of research exemplified by Valentine.

Robert Musil on mathematical inspiration

the solution of an intellectual problem comes about in a way not very different from what happens when a dog carrying a stick in its mouth tries to get through a narrow door: it will go on turning its head left and right until the stick slips through. We do pretty much the same, only with the difference that we do not go at it quite indiscriminately, but from experience know more or less how it should be done. And although of course a head with brains in it has far more skill and experience in these turnings and twistings than an empty one, yet even for it the slipping through comes as a surprise, is something that just suddenly happens; and one can quite distinctly perceive in oneself a faintly nonplussed feeling that one's thoughts have created themselves instead of waiting for their originator. This nonplussed feeling refers to something that many people nowadays call intuition, whereas formerly it used also to be called inspiration, and they think they must see something suprapersonal in it; but it is only something non-personal, namely the affinity and kinship of the things themselves that meet inside one's head.

(*Man without Qualities*, chapter 28)

The mathematician as literary archetype

Thales, so the story goes, because of his poverty was taunted with the uselessness of philosophy; but from his knowledge of astronomy he had observed while it was still winter that there was going to be a large crop of olives, so he raised a small sum of money and paid round deposits for the whole of the olive-presses in Miletus and Chios, which he hired at a low rent as nobody was running him up; and when the season arrived, there was a sudden demand for a number of presses at the same time, and by letting them out on what terms he liked he realized a large sum of money, so proving that it is easy for philosophers to be rich if they choose, but this is not what they care about.

(Aristotle, *Politics*, 1259a)

On the other hand

take the case of Thales, Theodorus. While he was studying the stars and looking upwards, he fell into a pit, and a neat, witty Thracian servant girl jeered at him, they say, because he was so eager to know the things in the sky that he could not see what was there before him at his very feet. The same jest applies to all who pass their lives in philosophy.

(Plato, *Theaetetus*, 174a)

Archimedes, according to Plutarch

And yet Archimedes possessed such a lofty spirit, so profound a soul, and such a wealth of scientific theory, that although his inventions had won for him a name and fame for superhuman sagacity, he would not consent to leave behind him any treatise on this subject, but regarding the work of an engineer and every art that ministers to the needs of life as ignoble and vulgar, he devoted his earnest efforts only to those studies the subtlety and charm of which are not affected by the claims of necessity.... And therefore we may not disbelieve the stories told about him, how, under the lasting charm of some familiar and domestic Siren, he forgot even his food and neglected the care of his person; and how, when he was dragged by main force, as he often was, to the place for bathing and anointing his body, he would trace geometrical figures in the ashes, and draw lines with his finger in the oil with which his body was anointed, being possessed by a great delight, and in very truth a captive of the Muses. And although he made many excellent discoveries, he is said to have asked his kinsmen and friends to place over the grave where he

should be buried a cylinder enclosing a sphere, with an inscription giving the proportion by which the containing solid exceeds the contained.

(Plutarch, *Life of Marcellus*)

If one thinks of the constant religious concern of mathematics, so there would no longer be room in the modern of mathematics for the bodilyness of Christ and the mother of God. The ban on images returned as intellectual construction in the metaphor of the Absolute, that mathematics is again and again. Here the question arises whether the insistence on "intuition" also resonates with this element. This can be tested historically on the religiously directed aspect of mathematical discourse and its traditions, from Cusanus or Leibniz to Cantor, Hilbert, or Weyl And perhaps this aspect is the scandal of the modern? And perhaps this also leads to the metaphors of "skeletal", "bodiless," "rootless," "juggler-ish" that were applied to "Jewish mathematics"?