

L'Équation de Kolmogoroff. Vie et mort de Wolfgang Doeblin, un génie dans la tourmente

by Marc Petit

PARIS, RAMSAY, 2003, ISBN 2-84114-641-3. SECOND EDITION REVISED, PARIS, GALLIMARD (FOLIO 4240), 2005, ISBN 2-07-030495-7. GERMAN TRANSLATION: FRANKFORT, M. EICHBORN, 2005, *DIE VERLORENE GLEICHUNG. AUF DER SUCHE NACH WOLFGANG UND ALFRED DÖBLIN*, ISBN 3-8218-5749-8

REVIEWED BY BERNARD BRU (TRANSLATED BY CHANDLER DAVIS)

Note added by the editor: Wolfgang Döblin's tragic story has given rise to two documentary films which are complementary to each other. One of them [1] is intended primarily for a mathematical audience and concentrates on Wolfgang Döblin, whereas the other one [2] takes more into account on Alfred Döblin, as well. (O.P.)

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In the spring of 2000, at the request of the legatees, the Commission of 'sealed documents' (*plis cachetés*) of the Académie des Sciences of Paris opened file 11668, deposited 26 February 1940. This was an envelope containing a manuscript entitled "Sur l'équation de Kolmogoroff," received by mail from Wolfgang Döblin, duty telephonist in a French infantry regiment on the Lorraine front. Two months later, 21 June 1940, the soldier Döblin killed himself in a small village in the Vosges. He was 25 years old, a little older than Galois, a little younger than Abel, and like them already creator of a mathematical corpus.

What was different this time was that Döblin's memoir was published complete soon afterward in the *Comptes rendus de l'Académie des sciences* (December 2000), and announced in January 2001 by AFP (Agence France Presse) in a story recounting the special circumstances of its deposit at the Académie and the astonishing modernity of its contents. It anticipated

stochastic calculus as it is practiced not only in the universities of the world, but also in major banks to calculate costs and profits of financial products subject to market uncertainties. Was it this latter fact that attracted attention, or the tragic history of a genius lost in the agonies of the Second World War, or perhaps the rare event of the two coming together? In any case, the media were swept up by the AFP story, and one saw around the world more or less confused accounts of modern probability theory, with its big names Kolmogorov, Itô, Doob, ..., Döblin. The last was also, it turned out, the son of a German writer, also a genius: Alfred Döblin, the author of *Berlin Alexanderplatz*, a refugee in Paris with his family after the Reichstag Fire. The stuff of colorful stories!

The press soon abandoned this vein as really not that rich, but a Paris publisher on the lookout for a publishing coup took it on himself to commission a work presenting for a relatively large curious reading public the whole Döblin file. That led to the book under review. Though not intended for the same readership as *The Mathematical Intelligencer*, it merits review here by its considerable substance and originality. Not only has the author, Marc Petit, done a painstaking literary and scientific investigation, telling us of the thousand false leads and lucky hits as he experienced them; he has tried to establish in the story of the sealed document what it may have of the hidden and of the universal, seen by a poet and a painter, at all levels—including at last a sort of space of reconciliation imagined by the author between the father and the son, who didn't much like one another: Reconciliation of souls but also of cultures, the poetry of Alfred and that of Wolfgang mysteriously meeting. These two poetries, though written in languages and at intellectual levels widely different, have a human weight going beyond the words of the one and the formulas of the other, in

the tragic context of the rise of Nazism and the Second World War, and the author, without stretching the point, and avoiding dryness and pretentiousness, makes it visible, almost palpable, by the power literature gives of free use of words, those mysterious things, revealing their secrets, assembling them by dint of inspiration and the spirit of language, making them say more than any human or exact science could get from them without lapsing into absurdity. In short, this is a literary work which deserves to be looked at more closely.

To begin with, a word about the author. Marc Petit is Professor of German Literature at the University of Tours. He has edited, translated, and commented on the works of Georg Trakl, the German baroque poets, Erich Arendt, Catharina Regina von Greiffenberg and on the last poems of Rilke. He is also an essayist, novelist, poet, painter, collector of masks, a specialist on the primitive art of the Himalayas, Not the background you expect for writing a mathematical biography, but reasonable for the present case of a mathematical genius with a poetic genius as father, and indeed a background indispensable for avoiding the usual weaknesses of scientific biographies with complex historic and cultural context. And the Döblin story is particularly complex, going from Polish to German to French and from literary to scientific.

How can one bring to life Wolfgang Döblin, or Galois or Abel, or anyone, his father, his son? First one inquires of the family, those still living who knew him, and his known ancestors. In the case of the Döblins, a Jewish family of Pomerania and Berlin, a Moskat family with its acrobats, its bankers, and its matrons who keep things going as well as they can: Marc Petit recounts their vagaries with glee. But everyone who knew 'Wolf' (his family nickname and his totem) reports that he spoke little if at all, so that one has to proceed by indirect, uncertain means. Petit exploits several devices, very fruitful but not common in this sort of work, and I will say a bit about them.

One device is to stop time and describe carefully a scene or a landscape in this randomly fixed instant, for example, to examine carefully a

photo of Wolf, one of the few one has; or to detail, using some texts of Alfred Döblin, a neighborhood of Berlin or Paris, or simply a café in Berlin in 1928 or Paris in 1934 where Alfred passed his afternoons watching the pretty girls go by, or the red brick buildings of the Institut Henri Poincaré where Wolfgang worked from 1935 to 1938, or the stands of a Russian Jewish grocery in Petit-Montrouge, the Paris quarter where the Döblins lived, etc. This array of disparate instants taken together give the book the richness, the depth, and the intrinsic fluidity of all life, which a linear narration could never convey, and which a snapshot reveals suddenly when one stops to observe the strange, indifferent, weary look of people who will die young or tragically.

Another of Marc Petit's devices, which indeed he mixes with this one, is to follow the autobiographical notes of the father, Alfred Döblin, a neurologist and reader of Freud, one of the most original writers of the 20th century and one of the most difficult. Petit illuminates these notes, or rather uses them to illuminate the secret life of Wolfgang. Let me try to explain the fruitfulness of this method. As with any of the truly great writers, one finds texts of Alfred Döblin with a power of evocation, even prophecy, to be understood in hindsight perhaps quite otherwise than their author did—though we can't be sure. A particularly fascinating example of this which Petit gives is the description of the slaughterhouses of Berlin in 1928 in *Berlin Alexanderplatz*. In a perfectly matter-of-fact tone, Alfred Döblin describes the arrival of the pigs at the slaughterhouse and their killing, organized and programmed by the responsible city officials. This unbearable passage could be fitted with no major change into the memoirs of Eichmann—as if Alfred Döblin already knew of the holocaust of the European Jews, as if he wanted it known that he knew of it. As Marc Petit points out at the beginning of the book, something similar is found in a magnificent autobiographical text of Alfred Döblin called *Voyage et Destin (Destiny's Journey)*, which reports the exodus of June 1940 as he experienced it. Petit suggests, in a superb passage, how Alfred Döblin's

wandering in the rain near the little station of Séverac where he had somehow come, the anguish and feelings of abandonment and exile from himself which overcame him then, could stand for the wandering and the feelings Wolfgang might have had in the rain in the forest of Rambervillers, the night before his suicide. The dates are very nearly the same. Such identifications have no factual sense but may give, with due reservations, a tragic sense of moments when the lives and deaths of these two human beings were mixed, father and son, so close but so distant.

We are dealing here with the powerful and sacred mysteries of literature, almost as fascinating as the mysteries of numbers, but belonging to a different universe. The evocation is not necessarily unique, it may adapt to possible futures. For example, one has to shiver reading some pages of Irène Némirovsky, say, the description of an annual fête of the Alliance française of Kiev before the First World War. This little blushing girl who recites verses by Racine, carefully rolling her r's—one can't help thinking that she is programmed to die in the Kiev slaughterhouses 30 years later, but Irène Némirovsky couldn't know it, being already in France by then; nor that she herself would die in Auschwitz in 1942.

Another device, more evident but which Petit uses very intelligently, is to take up and analyze the texts of Alfred Döblin dealing with his son Wolfgang directly or indirectly. Thus, in his last novel, *Hamlet, ou la longue nuit prend fin*, published in 1956, there is a confrontation between a father and his silent son, or his dead son come back: Perhaps a reconciliation.

Sometimes Marc Petit, leaving his central characters, expands on incidents of German literature and politics of the first half of the 20th century, on France of the 1930s, on a great variety of subjects treated with mastery but concisely, in specifics or sketched, to give an idea of the period—a parade of events and people to delight the reader.

There are just these few letters by Wolf and some personal reminiscences which Marc Petit elicited and assembled—particularly valuable as the

majority of these eye-witnesses have died since the appearance of the book in 2003.

First, Claude Döblin, Wolf's younger brother, who shared his room in the Döblin family's Paris apartment, who went hiking with him, and who gives his view, his version of Wolf, his mother's favorite son.

Then his fellow members of the regiment, like Paul Beaujot, a worker from the Ardennes, 18 years old in 1939, who was Wolf's companion for weeks without penetrating his secret but who remembers him with warmth. Paul Beaujot represents in this story the people's wisdom and practical sense in a demented era, a Tolstoyan character. Taken prisoner in 1940 with his company, he spent the War on a Rhenish farm and soon fell in love with a village lass. When the Germans wanted to evacuate him to a POW camp, he ran away with his lover's help and hid in the woods with a German deserter until the Americans came. He had succeeded in stealing a German military rifle, of which he was proud, and he lived on game, easy to find at the time. Unlike many such stories, this one ends with the sweethearts marrying as soon as it became possible and living together up to his recent death.

Beaujot's reports of Wolf contrast sharply with recollections from colleagues in Zurich or Paris, depicting him as a private person, often contemptuous—as one can see already from the marginal notes he made in the writings of the best analysts of the time: 'Uninteresting', 'easy and well known', 'he doesn't understand at all', and so on. The only people in Paris who could get him to talk, apparently, were the very few young women he met, especially one, Marie-Antoinette Baudot, a student of Louis de Broglie. He was surely in love with her. Marc Petit describes their relations with delicacy, or rather, following one of his favorite methods, he evokes them via the sufferings of young Werther: Goethe can say more of the sufferings of young Wolf than those involved in that impossible love, beyond death, of him who loved though unloved and her who did not love or did not love enough.

And of course there are the mathematicians, born in 1915 like him and

taking mostly the same courses, who say what they can though they didn't really know him—Gustave Choquet, Laurent Schwartz, André Lichnerowicz, ..., and even more, those a little older who taught him mathematics, like André Magnier who was his Teaching Assistant and who still exclaimed in 1995 over the way the student Döblin had aced his calculus problems, arriving at the solution with never a wasted word. Magnier was then doing a thesis under Arnaud Denjoy. He asked Wolf a question he had not been able to answer, just to see what would happen. To his surprise, Wolf came back with the solution the next day. This is how Wolf came to the attention of his Paris masters, Darmois, Denjoy, Fréchet: By solving their problems in a breeze. Döblin was not a creator of concepts, but he had an extraordinary facility in solving the most difficult problems, catching them off-guard from behind, or, if he failed to evade their natural defenses, then making a frontal assault barehanded. Putting all these reports together gives a very fair picture of Parisian mathematical life between 1934 and 1939—at least a part of that life, and one of the richest parts, even though it is treated as incidental by the historians of the period, who generally focus on the birth of Nicolas Bourbaki, a brilliant mathematician but too closed and too Germanic for Wolfgang Döblin to be able to join.

This really is the main attraction of Marc Petit's book for a mathematician interested in the history of his subject. Without any attempt at a historical treatise, Petit takes on difficult historical problems, and his observations are not at all routine. By studying the Döblin papers in the German literary archives at Marbach, and also the archives of the Institut de France and the Institut Henri Poincaré in Paris, Marc Petit has been able to compare Wolf's Berlin projects and the changes in orientation brought about by his Parisian exile. This is a study of the cultural factors in the work of a mathematician—something rare, and offering much to anyone trying to explain the psychology of invention and to sort the random from the determined in mathematical creation, which Petit compares to poetic

creation, without of course equating them, which would be quite wrong (and stupid).

Among the documents unearthed and translated by Marc Petit, one is particularly remarkable. It is a sort of profession of faith written by young Wolfgang when he was still a student at the Lycée of Königstadt in Berlin. Calmly and gravely, Wolf declares his intention to concentrate on economics and statistics. He did indeed enroll in a School of Political Science in Berlin, but was expelled in 1932 for socialist propaganda and radical anti-Nazism. At the Lycée his favorite subject was geography (which in Germany was highly economic and statistical) and not mathematics. In calmer times he might well have had a brilliant career as an economist in Germany or the USA, leading to a Nobel Prize.

When he got to Paris, Wolf followed the course in mathematical statistics of Darmois at the Sorbonne, so he had not yet totally departed from his original project. Darmois was an exceptional teacher, the best there was in Paris, and what he taught must have seemed at once to young Wolf perfectly clear, with a transparency congenial to him, though hardly related to German statistics. Darmois, along with the whole Paris school of probability, Bertrand, Poincaré, Borel and the rest, had none of the German prejudices against chance, probability—these airy myths firmly denounced by the positivists of the Vienna and Berlin Circles and the Prussian scientists running the University, the *bêtes noires* of Cantor. (They even made a point of avoiding speaking of physical 'forces' in front of their students, Marc Petit tells us—drawing on the student memories of Alfred Döblin—for fear the naïve students would think of them as celestial powers.) In Paris, though one didn't go so far as to believe in the existence of chance, still less of probability, Gallic skepticism did not prevent 'admitting chance' as a guiding idea, a primitive intuition, in the same way one admitted 'force', which one did not know about but which could underlie sound, clear reasoning. The Parisian notions don't necessarily exist, but they are clear and transparent and that is enough—a sort of conceptual fancy footwork which must have delighted

young Wolf thinking of his grandfather Max, a tightrope-walker.

Darmonis was speaking of Markov chains that year. How could he really do it without letting himself speak of chance, which is constantly changing the course of events without thinking of the past? From that point, a free spirit like young Wolf's can immediately imagine the motion described and calculate its asymptotic behavior. This he did at once, not knowing that he was innovating, or rather that he was refining and generalizing the famous study of card-shuffling presented by Hadamard to the Bologna Congress of 1928. Hadamard, too, admitted chance and looked at the sequence of shuffled card decks as the trajectory of a dynamical system continually perturbed. This may provide an explanation for the change in Wolf's perspective, for his finding his true calling. It is over-reaching to claim to resolve in this way the mystery of Döbblin's creativity, but can one ever resolve such a pure mystery? At least the book of Marc Petit lays down some interesting benchmarks, and in this respect as in others it is irreplaceable.

Then the mathematical work itself. One might think that of this Petit can teach us nothing. As he says sensibly, mathematics can not be popularized. It can be pursued only within mathematics, and in this the author claims no competence. This is not the object of such a book, for there are already numerous analyses of Döbblin's work done by able mathematicians, to which one can turn as needed. Just the same, looking more closely and reading between the lines, one sees quite clearly in Marc Petit's book the broad lines and the enterprise of Döbblin's work. This can be simply stated. Wolfgang Döbblin principally attacked the two biggest problems of probability theory of the 1930s, problems of enormous intrinsic difficulty, which he determined to consider in the greatest possible generality so as not to make them too easy.

The first goes back to the origins of the subject: The 'central limit' problem. One has a sequence of independent variables with the same distribution (or not), one disposes them in a row or in

a triangle, and one forms partial sums of them reduced by constants. This provides a family of distributions (the 'powers' of the given one, if there was only one), and one asks for limiting distributions of that family. In the simplest case, this gives Laplace's theorem on convergence to the normal distribution, but the problem in general is unexpectedly complicated, and indeed still open in part. It was much more so in 1936 when Wolf attacked it, following Lévy, Khinchin, and some others. His published results on this topic are universally agreed to be exceptional, but one doesn't actually know how far he got with it, because his last manuscript on powers of a probability law is unfinished and incomprehensible. It seems he obtained some characterization of the set of limiting distributions of the powers of a given law (its domain of partial attraction), but one does not know the nature of his characterization or the methods used.

The second problem, more recent, is the problem of Markov, to build a general theory of Markov processes, in the following sense: To study all the nonhereditary motions subject to chance and a determined force field—two concepts, chance and force, which however problematic physically and metaphysically can have perfectly clear mathematical sense. When the motions are described in discrete times (say, by the integers), this is the general theory of Markov chains, of which Döbblin, generalizing the classical results of Markov, Poincaré, Hadamard, and others, gave an astonishing version, written in 1937 and published in 1940. When time is continuous, we have what was then called the problem of Bernstein–Kolmogorov, which is to solve probabilistically the 'Kolmogorov equation', the integral equation relating the probabilities of the motion's passing from one state to another in a given time. By solving probabilistically we mean we are seeking to study motion to infinity or in the neighborhood of a point, or, say, the probability of the motion crossing, or never crossing, a given curve (the problem of gambler's ruin). The only case that is beginning to become really clear is Brownian motion, for which Lévy

would give, at the end of the 1930s, the first delicate study. Otherwise, what one has is an analytic theory which, under strong hypotheses, leads to parabolic partial-differential equations (the Kolmogorov equations—not to be confused with the Kolmogorov equation), which give interesting existence results but do not answer the simplest questions, not even ensuring that the motion under these hypotheses can be continuous.

The 'sealed document' of Döbblin gives for the first time a general theory of the case of Markov motions (whose time laws satisfy the Kolmogorov equation), which are continuous except in irregular points (Döbblin's version of the present theory of diffusions). These motions, which Döbblin calls regular, can be represented locally in terms of Brownian motion and, of course, of forces acting on them deterministically. (Note in passing that it is this case that motivates classical stochastic calculus: Regular motions satisfy a differential equation having a deterministic term in dt and a stochastic term whose differential element depends only on ω , where ω is given by chance.) Döbblin is able, thereby, to study the asymptotic behavior of the motion, provide its local analysis, solve the problem of gambler's ruin—in short, to answer the questions arising in this context as completely as possible. The last works of Wolfgang Döbblin, interrupted by the German offensive of May 1940, take up the equation of Kolmogorov in the case of a motion admitting discontinuities of the first kind. One supposes that these works cover the subject, but one does not know exactly.

Without any pretensions to be a mathematician, Marc Petit does his best to explain all this as clearly as possible. One can only congratulate him on a conscientious effort, assisted by Marc Yor, who edited the sealed document at the Académie and is one of the best specialists in this area.

I much regret that this review, besides its incompleteness, may be a lost cause, for the book has so far not been translated into English and may therefore remain inaccessible to most. That's the way it goes. Since 11 September 2001, English publishers no

longer translate any (or hardly any, less than 3%) of what is published in French or in any foreign language. But does that mean we have to break off the conversation? With Salman Rushdie (New York, 30 April 2007), one might wish rather that anglophone publishers would again listen in and continue to do so. May we hope that *The Mathematical Intelligencer* soliciting a

review of Marc Petit's book is a portent that this is possible?

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