Writing *Incompleteness* – the play[1]

By Apostolos Doxiadis

Late one evening, in December 2000, while I was reading a book about the modern English theatre, a quote from one of Harold Pinter's plays suddenly sparked off in my mind a series of associations, now lost, which ended in snippets of dialogue between Kurt Gödel and a lady dietician at the hospital where he spent the last two weeks of his life. Both the dialogue and the lady dietician are imaginary – as far as I know, anyway. Kurt Gödel, of course, is real.

This was one of the rare instances – at least in my own experience – of the underground, unconscious process in a writer's mind usually referred to as 'the Muse', giving you the very essence of a new work. Yet, despite the initial gift from the Muse, writing *Incompleteness*, my play about Kurt Gödel, was anything but easy going. The play took me twenty-eight months of almost uninterrupted labor to write, and I spent more hours on it than I've ever done on any other project, complete or – if you'll pardon the expression – incomplete. For it I abandoned, perhaps for ever, the very solid project I was working on at the time. And the writing caused me such misery, such anxiety, such crippling attacks of self-doubt and depression that I did not know were possible. Not that my life as a writer had been a garden of roses until then. But compared to the ordeals others go through, I was a happy man. Until Kurt G, the Lord of Incompleteness, entered my life.

In art there is never virgin birth. Every idea comes from somewhere else and any 'axiomatic', i.e. primary, irreducible, myths, go back to the beginnings of humanity and its reliance on storytelling to understand the world. No writer can discover a totally new story, as no explorer can discover a new continent.

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[1] Lecture given at the Mathematics and Culture Conference, Venice, March 2004, as "My twenty-eight months with Kurt G."

In the case of *Incompleteness* – the play, not the theorem – the primary source of inspiration was a real person and a real fact. The person is the modern era's greatest logician, and the fact is that he died a totally absurd death: hospitalized for a rather minor and certainly non-lethal ailment, he died of malnutrition, refusing to eat as he thought the hospital staff, doctors and nurses, were trying to poison him.

Incidentally, it's useful to say here that the hospital staff, doctors and nurses, were *not* trying to poison Kurt Gödel – to the best of my knowledge, anyway. And I mention this as when I tell about my play to people who do not know much about Kurt Gödel, I am often asked the question: "But *were* they trying to poison him?" This is quite a natural question, if you think about it: Kurt Gödel was a giant of logic and the first thing you expect a giant of logic to be is… well, logical. And since thinking the hospital staff are trying to poison you is definitely not logical unless they actually are or, at least, unless they *possibly* are – well, QED. After all, Kurt G was the world's greatest logician and a layperson, like my play's dietician, could be forgiven to equate this with being "the most logical person on earth". And if the most logical person on earth thinks such illogical thoughts, what hope is there for the rest of us?

 Now, while we are talking about a murder attempt, or the possibility of it, it is natural to ask the questions that would come up in a detective story: "Did professor Gödel have any enemies, to your knowledge?" And: "who would profit by his death?"

The second is easy to answer: no one in particular. But the first question goes much deeper. As far as anybody knows, Gödel did not have any enemies, no one to bear him a strong personal grudge – except of course the grudge all of us have against geniuses. He was a man who minded his own business, as very few people ever did. But there's the rub: for his 'own business' was of crucial importance to the history of humanity, and not just the intellectual. If we are speaking not at the personal but the cultural level, Gödel may have created an untold number of enemies – though all of them may not know it – through his work. Don't forget that when he published his great Incompleteness Theorem, in 1931, mathematicians -- having been spurred on by the great David Hilbert's battle cry *Wir müssen wissen, wir werden wissen! We must know, we shall know!* -- were searching for the exact opposite of what Gödel found, for a proof of *Com*-pleteness. And then, out of nowhere came this twenty-five-year-old Viennese graduate student, to prove that what everyone from Plato and Euclid

onwards thought was obviously the case, i.e. that mathematics is the one field of human knowledge where absolute and total certainty can prevail, was wrong. Yes, this virtual unknown showed that the central myth that – to many – gave mathematics its core value was in fact nothing but a phantasm. What's worse, a mistake.

Poor late nineteenth-century, poor early twentieth-century! Oh, brave new world that had such people in it: people like Charles Darwin, Karl Marx, Friedrich Nietzsche, Sigmund Freud, Albert Einstein, Werner Heisenberg, Kurt Gödel. Seven people who did more than all the machine-guns and canons of the Somme Valley or the Panzer divisions of Hitler to end the old world and to create -- if not the answers -- at least the questions that started off the new, each one of them killing one of the sacred cows on which Western consciousness had fed for so long: Charles Darwin by challenging the most fundamental myth of all, of the direct descent of man from God, Karl Marx the myth of society being constituted and functioning according to higher principles, beyond and above human interests, Friedrich Nietzsche, a relativist greater than Einstein, exposing belief as manufactured by mechanisms energized by human weakness and need, Sigmund Freud de-idealizing romantic love and parenthood – two of the cornerstones of the bourgeois myth --, Einstein dismantling the Euclidean guarantee of the existence of an unbiased viewpoint – and thus in a sense of the metaphysical absolute – and Werner Heisenberg giving the final blow to the possibility of total determinism, even in that most verifiable world of experimental science.

You understand of course that, especially concerning the last two and Gödel, more important than the actual scientific consequences of these discoveries was the way these were perceived by society at large. For as each of them was assimilated into the sphere of common knowledge, a new sharp shock was given to self-image of a humanity. Man, the center of the universe? What a joke! Man, a being with the potential of an angel? No way. Man the idealist – a distortion. Man the pure – a pathetic fallacy. Man the knower of the world – what world? Man the craftsman of knowledge, the scientist. Well, only to a certain extent…

I think it is this sequence of negations that gives to the work of Kurt Gödel its central cultural importance, which incidentally also forms the sub-text of my play about him. The other thinkers mentioned, Darwin, Nietzsche, Marx, Freud, Einstein, Heisenberg, each dismantled an aspect of one central old myth – and in its place put

up an aspect of one new. If the old myth was theological in essence, the new was scientific: for every denial there was also an affirmation of a new, less exalted yet more practical modality of knowing. But with Gödel the fall hit a rock bottom. For his Incompleteness Theorem supplanted the very foundation on which rests the myth of an all-powerful rationality by showing that even in mathematics, which is symbolically at least the bedrock of the scientific approach and for this reason dubbed "Queen of the Sciences", yes, even in mathematics there are irreparable gaps, truths that can never be determined by reason. And as if this weren't enough, the insolent upstart showed – in fact *proved*! – that the breakdown was beyond repair.

So far so good. All this is interesting, but what does it have to do with art, and with that most living form of it that is the theatre? Gödel is of central concern to logicians and philosophers, but how can all this theoretical discussion be turned into a play meant to be seen by a human audience – and not bore them to death? *Les bons sentiments font de la mauvaise littérature*. Sonnets are written with words, not ideas, and drama speaks through stories with engaging characters. Gödel's theorem may be endlessly fascinating but what about Gödel the man?

Well, common theatrical wisdom has it that "drama is conflict" and a mathematician knows that there is no stronger conflict than paradox, the co-existence of two opposing views. And in Gödel's last days there lies a paradox that is not only intense and interesting, but in some ways – and this is what makes it so worthwhile as subject – a paradox that incarnates the essential drama of ideas that his great discovery unearthed: the ultimate failure of an ultra-rationalist viewpoint to give a complete view of reality. I've already mentioned the precise nature of this paradox: Gödel died from hunger, because he refused to eat, because he thought the hospital staff was trying to poison him. In other words the modern era's greatest logician, the man who has been dubbed by no less a genius than John von Neumann "the new Aristotle", died (from malnutrition) trying to protect himself from dying (by poison) – not a very logical situation, you will agree.

Of course I didn't invent the paradox, it was provided by history. What the Muse did, on that cold December evening, was to provide me with the crucial fictional character that gave it concrete dramatic form. This was a hospital dietician to whom I gave the name Mary Pearson. Imagine the situation: "Eat", says Mary Pearson. "No," says the world's greatest logician. "But you must," says Mary

Pearson. "I don't want to," says the world's greatest logician. "But why?" asks Mary Pearson. The world's greatest logician is silent. Mary Pearson says something along the lines of "I won't leave unless you either eat or tell me why you won't." And so on… From there on, my problem was not to generate material but to control it, to keep it audience-friendly but give it the precise meaningful form I intended. And this was, I swear to you, very difficult.

To see why, we have to leave Kurt G alone for a while and look at a subject which has become *très à la mode* in recent years, the relationship of mathematics to literature. As I have myself contributed something to this fashion, if that is the right word for it, I can speak from experience.

I want now to make two strong points, which may seem antithetical – but are in fact complementary – and then go back to Gödel, to see how they apply. The first is that literature that is mere propaganda is no literature – even if the subject of its propaganda is mathematics. And the second is that authors of literature should stay away from mathematical subjects, unless they also can speak intelligently and non-trivially, from a human point of view, about mathematics.

To elaborate on strong point number one:

When I wrote my novel *Uncle Petros and Goldbach's Conjecture* – in which, incidentally, Gödel's theorem plays quite a prominent, if not central role -- the last thing I wanted to do was to be a missionary for mathematics. Though I have studied mathematics, I was and am an *amateur* in both senses of the word, of non-professional and lover. But I've made my choice, many years back, to follow in the path of Aeschylus, not Archimedes. Before *Uncle Petros* I had written other novels, that had absolutely no relation to mathematics. I had directed plays, I had made films, all – I assure you -- one-hundred percent non-mathematical. And when I started out to write what some reviewers have called "the first novel of mathematical fiction", in 1992, I did not – repeat, *not!* – have a sense of being a part of a movement or school – let alone of starting one. In fact, to me the statement that *Uncle Petros* is 'about' mathematics seems to me as misguided as saying that Thomas Mann's *The Magic Mountain* is 'about' tuberculosis or Ibsen's *Ghosts* about syphilis – I am speaking of course *mutatis mutandis* and not comparing myself to these giants. My novel is about mathematics only in the sense that Stefan Zweig's majestic *Schachnovelle* (published

in English as *The Royal Game*) is about chess, which it isn't. Chess in it functions as a metaphor, the basis of a parable, as mathematics does in *Uncle Petros*.

Of course, the fact that I had studied mathematics was crucial to my choosing the subject – authors usually write about what they know. Herman Melville had tried to be a whaler, he wrote about whales. John le Carré had tried to be a spy, he wrote about spies. I had tried to be a mathematician, I wrote about mathematics.

Now, I need to emphasize this point, as some people in the mathematical community regard my novel, and others like it, as not just *about* mathematics, but also as conscious effort to bring it to the non-mathematical multitude. In fact I had the honor of receiving a prize in this country given for the *divulgazione* of mathematics, a word my dictionary translates as 'popularization'. And while the *mathematician manqué* in me rejoices at this, the author frowns. To me, literature is literature regardless of the subject, and it justifies itself only to the extent it is good literature. And although I admire books written with the express aim of explaining a field, like Jostein Gaarder's *Sophie's World* did for philosophy and Hans Magnus Enzensberger's *Number Devil* for the mysteries of numbers, I think they are, by that very intention, excluding themselves from the aims of fiction proper. Both these examples are great books. But they are not – or want to be, for that matter – great novels.

Now, I said that in *Uncle Petros and Goldbach's Conjecture* mathematics was a metaphor. But a metaphor, in order to work, has to be both interesting and clear. So, although in writing the novel I was innocent of any intention to be an apostle of mathematics, I was very much interested in making it intelligible to a literary readership. Yet my motive in this was purely technical – *writerly*-technical, I mean: if you write a novel about a man's obsession with a woman's beauty, you don't have to explain what that means, unless you are writing for an audience of Martians. Every reader has experienced beauty and all, to varying degrees, know of obsession. But we do not all know about whaling and that is why *Moby Dick*, apart from being a great novel, is a mighty good introduction to the gruesome art of killing cetaceans for profit. Recounting the dark, metaphorical tale of Captain Ahab, Melville also told us all we needed to know about whaling. And although it is quite possible that he may have enjoyed doing so, mainly he did it for two very logical ('technical') reasons: a) because it was necessary to understand his central hero and action and, b) because

most readers of novels have no experience of whaling – and let us thank God for that, for otherwise there would be no whales left.

So: deciding to write a novel with a mathematician as hero I had to – I just *had* to, you see -- tell the reader a few things about number theory and mathematical research for two very logical ("technical") reasons: a) because it was necessary to understand my central hero and action and, b) because most readers of novels – here whales and numbers differ – *do* have an experience of mathematics; but it is a very bad one. This is no place to speak of *arithmophobia* or the average non-mathematician's ambivalent relationship to mathematics created in school. I took it as an axiom, provided by reality: if I wanted to create a believable character in love with number theory, I had to give the reader an indication, at the very least, that number theory could be lovable.

This was the baggage of beliefs I carried when I started to work on *Incompleteness*. But now, perhaps because my new hero was not fictional but real, I had to think again about how mathematics and literature can be related.

And this takes me to my strong point number two:

Perhaps it is a prejudice of mine, but I know that in it I am not alone.   When I see a film about a great painter, I want to see him painting and I want to see his paintings, I want to understand *why* he is a great painter and why painting is so important to him – and how can I do that unless the director makes painting a crucial part of the story. And if I see a play about a great musician, I want to see the musician composing and/or performing, I want to hear the music. A central character's central passion should be incarnated for the sake of the audience. Imagine Peter Shafer's wonderful *Amadeus* without Mozart's music. Imagine *Romeo and Juliet* without the balcony scene.

Obvious as this truth may sound, it is very often ignored in our so called 'mathematical fiction' or 'drama' or 'film'. And of course there is an obvious point to be made in favor of this neglect: painting and music are photogenic, showing a guy scribbling symbols on paper or scratching his head isn't. But then, if we think mathematics cannot stand up the other subjects in literary or dramatic interest, why not leave it alone?

I want to take a bow to works like Denis Guedj's *The Parrot's Theorem*, with its attempt to guide the reader through a mathematical jungle, Darren Aronosky's film *Pi*, which in its own crazy way finds interesting analogues for the phenomena of chaos it is purportedly talking about, Michael Frayn's *Copenhagen* and Tom Stoppard's *Hapgood* or *Arcadia*, which find effective ways to blend theoretical with dramatic concerns, around major stories of physics and mathematics. But I have no good feeling for David Auburn's play *Proof*. It is a nice enough work, but how does a mathematician get into it -- its heroes could be chemists or physicists or biologists or literary historians, for all I know, the 'great breakthrough' at the nucleus of the plot could be any *x* discovery in any *y* science. And although I rather enjoyed the film *A Beautiful Mind,* I think that although it told us rather interesting things about madness, it said absolutely nothing about John Nash's mathematics. 'And why should it,' you may ask. Well, to me, obviously, because John Nash was a great mathematician. We had sexploitation. Now we also have math-ploitation.

In fact, to me the two works just mentioned functioned as cautionary tale, as I worked on *Incompleteness*, as models of what to avoid. For the more I worked on it, the more I realized that if a play about Kurt Gödel was to justify itself, and not be just about madness, anorexia, or the hospital system, then the mathematics, the Theorem of Incompleteness itself, had to play a central role in it. Putting Kurt Gödel last days on the stage and treating him as nothing but a weird psychiatric case (after all, not all old men who become paranoid about food in their last years are geniuses) was to me a task not worth the man it was supposed to serve. I did not want to do another *A Beautiful Mind* – by the way, I am here referring to the film and not the book, which presents a very well-rounded picture of John Nash's life and troubles.

I knew from the start that unless the audience understood something of the meaning of the Theorem of Incompleteness, in a language that was concrete and theatrical, Gödel onstage would be, as an unkind reader of an early version of the play told me, just "another old fart with an eating problem". It was only by supporting psychology with philosophy, by making his private troubles a metaphor for the truth that his theorem had dug up – in other words the realization of the incapacity of logic to fully understand the world and the options that leaves us, as human beings – that the project of a play about Gödel would become meaningful.

I think the reason it was so difficult to write was precisely this clear demand, that I be loyal to my subject, both the man and the ideas. I obviously had to invent a lot: practically nothing is known about Gödel's seventeen last days in the hospital, except the central fact mentioned above. There was no dietician called Mary Pearson, and from the little information we have from his doctors, it seems Gödel was very uncommunicative, certainly displaying none of the garrulity and the ironic wit that are his in the play. But one does have to invent, if the purpose is to make the material speak meaningfully. The question is how to invent in the service of the subject, and not with mere effect, or popularity – let alone popularization! – in mind.

So: one more time, as with *Uncle Petros*, with *Incompleteness* I started to write a human drama and not a piece of 'mathematical fiction'. I had a mathematician – a real one this time – as a hero, sure. But he had to live in a theatrical play. And I wanted to write this play – otherwise it was not worth writing – only if I could produce something that could justify itself both as literature and as a key to at least a part of meaning of the Incompleteness Theorem for our lives – and this of course through the tragic end of its creator...

We live in a world endowed with huge repositories of logic and even greater such of information – but, alas, so little wisdom. And it is wisdom that we need above everything else, if we are to understand our predicament and survive the works of our stupidity and our darker nature. We cannot of course become wiser by the mere wanting it. But there are wise people around us – not many, but they exist – and it is one of the functions of art to give them voice. To me, Kurt Gödel presented an ideal chance to talk about this most important matter, this most essential block to real wisdom which is its equation with logic. Gödel is a perfect subject, because he is the man who had actually opened the gate to this truth, by demonstrating beyond any doubt that logic is not omnipotent.

The Muse brought him, on a cold December evening. But after the original first gift it was up to me, it was up to perspiration, not inspiration. But hardest of all was the fact that I had decided I did not want to produce a play that was 'merely' effective or 'merely' dramatic. This put me back in the mentality of the mathematician, where you are given problems and premises and have to go from there. In fact I found myself in an ironic situation: I had abandoned mathematics for literature especially to get out of such entanglements, to write as one swims or makes

love, to create freely, simply, to go where my inclinations, instincts, passions, words, went. And then, the Muse – all hallowed be Her name! – gave me a project where I had to effect a mix between the hardest elements of the two worlds: the clear problems and need for clear answers, the demand for rigor and precision from the side of mathematics on the one hand, and all a passionate, almost uncontainable intensity of uncommon passions to give form to, on the other.

If Gödel's dilemma in his last days was to eat or not to eat, mine in writing about him was at every moment to be loyal to him – his ideas, his grandeur – or not. To have made a nice little piece about an old fart refusing to eat would have been no great problem, the jokes kept flowing in. But I would be kidding myself if I thought it was about Kurt Gödel – though many might have enjoyed it and some even believed it. But to create a play about him that, though remaining audience-friendly, tried to make visible what I consider to be the deeper meaning of his result – and, incidentally, what *he* himself saw as its meaning, as we learn from his personal writings – in other words that humankind cannot live by logic alone... Well, that was a hell of a mountain to climb.

Thank you.

Incompleteness, a play and a theorem, by Apostolos Doxiadis, was first staged in a workshop production in Athens, June 24-28, 2003. The first presentation of its finished form will be given at the Aurora Theatre Company, Berkeley, California, in a rehearsed reading, on May 24, 2004. To learn more about the play, visit www.apostolosdoxiadis.com or write to apostolosdoxiadis@mail.gr