Transgressions: a quantum approach to literary deconstruction

André Brink

Summary

Deconstruction has not taken root in the Anglo-Saxon world and is generally treated with suspicion outside France because it threatens the comfortable certainty of language and meaning. Both the terms of reference and the development of deconstruction can be compared to the development in the natural sciences of quantum physics and the theory of relativity. Quantum physics has absorbed and transcended the Newtonian notion of a stable physical world by advocating that light consists of both particles and waves. This seemed in traditional terms to be impossible: it was advocating two mutually exclusive forms of 'being'. What this meant in philosophy (and literature) was that reality was no longer perceived as stable and predictable. The word or the sign was no longer simply seen as a reflection of reality (particle) but played an active part in creating 'reality' (wave). Subsequently modern theorists have entered the myriad worlds of interpretations – a state of transgression (Derrida) or permanent revolution (Trotsky). The application of deconstruction is not a destruction of reality but rather a de*con*struction: meaning is posited as referential and changing and *not* as *non-existent*. The implications for literary studies is that a notion such as character, for example, can no longer be seen as a single, self-enclosed unit/essence, but is rather relational. Likewise narrative is part of, but different from, the story. In short, the convergence of text and reader brings the literary work 'into existence' (Iser), in the same way that the scientist cannot observe reality without changing it.

Opsomming

Dekonstruksie het nie in die Angel-Saksiese wêreld inslag gevind nie en word oor die algemeen buite Frankryk met agterdog bejeën omdat dit die knusse sekerheid van taal en betekenis bedreig. Sowel die verwysingsraamwerk as die ontwikkeling van dekonstruksie kan vergelyk word met die ontwikkeling in die natuurwetenskap van Kwantumfisika en die relatiwiteitsteorie. Kwantumfisika het die Newtoniaanse opvattings van 'n stabiele fisiese wêreld geabsorbeer en getransendeer deur te verkondig dat lig uit sowel partikels as golwe bestaan. In tradisionele terme het dit onmoontlik gelyk: daarmee is twee wedersyds uitsluitende vorm van 'syn' erken. Die implikasie in filosofie (en literatuur) was dat die werklikheid nie langer as stabiel en voorspelbaar waargeneem is nie. Die woord of die teken is nie meer eenvoudig waargeneem as 'n weerspieëling van die werklikheid (partikel) nie, maar het 'n aktiewe rol gespeel in die skepping van die 'werklikheid' (golf). Sedertdien het moderne teoretici die menige wêrelde van interpretasies betree – 'n staat van oortreding (Derrida) of 'n permanente revolusie (Trotsky). Die toepassing van dekonstruksie is nie 'n destruksie van die werklikheid nie, maar eerder 'n de*kon*struksie: betekenis word aanvaar as referensieel en veranderlik, en nie as afwesig nie. Die implikasies vir die literatuurstudie is dat 'n konsep soos bv. karakter nie langer gesien kan word as 'n enkele, selfbeslote eenheid/essensie nie, maar as iets wat deur verhoudings bepaal word. Desgelyks is die vertelling deel van, maar ook verskillend van, die verhaal. Kortweg: die byeenbring van teks en leser bring die literêre werk 'tot bestaan' (Iser), op dieselfde wyse as wat die natuurwetenskaplike nie die werklikheid kan waarneem sonder om dit te verander nie.

> Those who are not shocked when they first come across quantum theory cannot possibly have understood it.
>
> Niels Bohr

A preliminary clarification of terms:

Jacques Derrida, in response to a question by Henri Ronse on the feasibility of setting up a graphocentrism in opposition to logocentrism and on the consequent possibility of the transgression of closure: 'Even in aggressions or transgressions we have to do with a code to which metaphysics is irreducibly linked, in such a way that any gesture of transgression encloses us ... within the closure. But through the activity that takes place on either side of the limit, the inside field is modified and a transgression is produced which, as a result, is nowhere present as a fait accompli. One never settles down in a transgression, one never lives elsewhere. The transgression implies that the limit is always at work' (my translation from Derrida, 1972:21).

Gary Zukav, in response to the dictionary definition of a quantum as a quantity of something: 'A quantum is a piece of action. The problem is that a quantum can be like a wave, and then again it can be like a particle, which is everything that a wave isn't. Furthermore, when a quantum is like a particle, it is not like a particle in the ordinary sense of the word. A subatomic "particle" is not a "thing". (We cannot determine simultaneously its position and momentum.) A subatomic "particle" (quantum) is a set of relationships, or an intermediate state. It can be broken up, but out of the breaking come more particles as elementary as the original' (Zukav, 1983:275).

1

In the Anglo-Saxon world at large deconstruction is still very much a fourteen-letter word. In France itself Derrida was most acclaimed in the early Seventies when his writing could be experienced as a philosophical consequence and corollary of the Trotskyan political dictum of 'permanent revolution' rediscovered in the streets of Paris in May, 1968. Derrida's main misfortune was the fact that his deconstruction had become, briefly, a fashion, as Sartrean existentialism or Levi-Straussian structuralism had been turned into fashion in preceding years: inasmuch as it had become a fasion it was predestined to be superseded by other fashions. Inasmuch as it was/is infinitely more than a fashion, however, it will remain with us, be it subconsciously, for as long as quantum physics will remain with us. In the English speaking world (with a few fascinating exceptions), in Germany, in Holland, and also in South Africa, it has never taken root properly and is generally regarded, if not with derision or blank incomprehension, then at least with suspicion.

Literary critics – even those who dared to progress from Formalism and Phenomenology towards Structuralism or the fringes of Post-structuralism – seem to feel, quite understandably, the need of paradigms, more or less infallible frameworks of reference, the comfort of structures, the reliability of maps (even when these turn out to be 'maps of misreading'). They are prepared to abandon the reassurance of 'the one correct reading' and to make allowances for 'several readings', for 'clusters of meaning', for 'a spectrum of possibilities', provided these can always be 'controlled' by referring back to

the text, which has taken over the earlier authority of the author and his notoriously unreliable intentions: but they are *not* prepared to accept a *limitless* freedom of reading, an *endless* process of supplementarity, *inexhaustible* 'différance', *boundless* iterability, an *unchecked* proliferation of traces – what Michael Ryan termed the '*open* possibility of displacement' (Ryan, 1982:5), or the '*infinite* extendability of reference' (1982:7 – my italics in both cases). At most, they are prepared to suggest, as Ronse did in the question to Derrida cited above, 'graphocentrism' as an answer to 'logocentrism', attempting to replace earlier paradigms with at least the notion, or the hope, of 'a new paradigm'. Which, of course, is precisely what deconstruction cannot and will not do, as it continues to use, in its pulverising of the 'system', the only available tool it has, namely the system itself.

Those critics in search of a 'new paradigm' are happy if they can link the new to the old; they are reassured only if they can discover in it traces of what had preceded and perhaps predicted it from within the limits of their earlier systems. But they stop short of identifying 'book' and 'freedom', which, if not a starting point (something precluded per definition) at least marks a moment of transition, of transgression, of thought into language: I am referring to the fact that in Latin *Liber* designates both 'book' and 'free'. Sir William Smith's *Latin-English Dictionary* informs me that *Liber* was the early Italian god of vegetation and growth; in fact, an early shape of Bacchus. Through a process of transference the name later came to designate the inner bark or rind of a tree; and this, of course, was the material from which paper and books were made. Which means that, in one sign, the old binary opposition between 'nature' and 'culture' is resolved. While one branch of our tree, in a manner of speaking, became the sign of the written word, of *écriture* as Derrida would term it, of lists and catalogues and registers, of letters and rescripts and decrees, the other pointed towards meanings like 'freely growing, free, unrestricted, unhampered, open, unoccupied'.

Let us ponder for a moment this 'unoccupied', which, from the branches and roots I indicated, characterises the book, the writing, the text as uninhabited by final meaning, reminiscent of the 'transgression' we began with, in which no one settles down. All it offers is a network of traces – 'the moving finger writes, and having writ moves on' – a 'dance of particles', as physicists might term it, which collide, divide and reunite endlessly and unpredictably.

'Network', indeed. For we know that our word *text* is derived from *textus*, a weaving, a woven cloth, a web (hence its kinship with the world of textiles). In addition, we need to know, perhaps, that the Buddhist practice of *tantra* also suggests a weaving, a network (Sanskrit *tantra* = to weave). And if in the crisscross of our texture we are blessed enough to catch a glimpse of what Mahayana Buddhists call *prajna,* wisdom, it should come as no surprise: for in *prajna* stirs the sounds of *paramita*, a Sanskrit word meaning, literally, 'to cross over', which, by a *commodus vicus,* brings us back to the *transgression* our discourse offered as its starting point.

If all this sounds like fun and games it is a significant reflection of deconstruction as one of the most vital preoccupations of *homo ludens* in his passionate pursuit of Zeno's arrows. The reference is, of course, to the

classical image Culler uses on more than one occasion – cf. Culler, 1979:163 and 1983:94 – to explain Derridean concepts like 'trace' or 'différance': the arrow in flight, whose position can be ascertained from one split-second to the next at specific points in space, which excludes all notion of motion; and the only way to explain motion in this context would be to discover, in each 'present', here-and-now state of the arrow, traces of its past and future states: a continuous experience both of 'difference' and of 'deferment'.

These are the images of deconstruction dismissed by the 'paradigmatic' critics as fanciful, incoherent, anarchic, or useless. But what I wish to attempt in this paper is precisely to demonstrate that the notions of deconstruction are identical to those of quantum physics; that to adhere to phenomenological or structural models of thought or of texts is as untenable in our time as to cling to Newton's Laws. Phrased in a different way: if we accept the validity of the proven experiments of Einstein, Bohr, Heisenberg, Schrödinger and many others in the fields of relativity and quantum physics, deconstruction must be seen as the inevitable extension of these discoveries into philosophy and literature. (It goes without saying that I am a writer, a critic, and a literary theoretician, *not* a physicist or a mathematician; I have read as assiduously as I could relevant texts by scientists like Einstein (1962), Bohr (1934, 1958), Heisenberg (1963, 1974), De Broglie (1939) and others, and by physicist philosophers like Fine, Feinberg, Finkelstein etc. (cf. Colodny, 1972) but in addition I am quite unashamedly indebted to some studies written for laymen (cf. Gribbin, 1984) and even *by* laymen (cf. notably Zukav, 1983). And what I am offering here, is quite explicitly a *layman's* view of some of the aspects of quantum physics as I perceive it in the light of recent developments in literary philosophy. What I have to say is by its very nature tentative and provisional; I am aware of transgressing my limits, but that is the very purpose of the exercise, in an attempt to bring to light some of the more startling developments in a discipline foreign to my own, and to suggest some of the possible implications and applications of these findings within the field of literature. In many cases, as I shall try to demonstrate, precisely the most revolutionary new ventures in quantum physics tend to underline the relevance of Derridean deconstruction.)

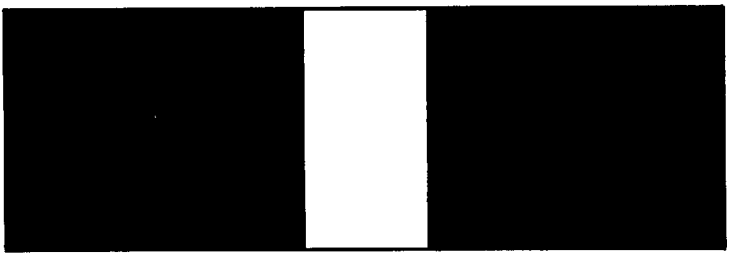
2

Quantum mechanics, most commentators are quick to point out, does not so much *replace* Newtonian physics as *include* it, just as Derrida makes no attempt – can make no attempt – to 'replace' logocentrism. 'We have found the limits of our previous theories,' affirms Zukav (1983:45). Heisenberg (1974:114): 'All the words or concepts we use to describe ordinary physical objects, such as position, velocity, color, size, and so on, become indefinite and problematic if we try to use them of elementary particles'. What characterised Newtonian physics (as it characterised literary Formalism and its offspring) was the notion of the satisfactory and complete whole in which all parts functioned with complete predictability, without either lack or superfluity, like a perfect and selfcontained clockwork set in motion by a divine

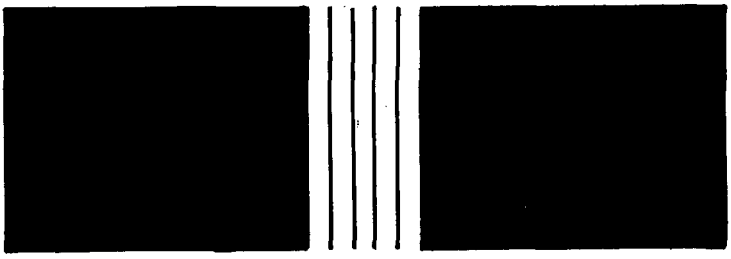
Auctor. This placed on the scientist the onus of detached, objective observation of a reality 'out there' (cf. Zukav, 1983:55). And it was only with Einstein that, among other things, the relativity of observation and measuring became apparent (cf. Einstein, 1962); and with Heisenberg that the famous 'Uncertainty Principle' was accepted as a decisive factor in scientific enquiry and experimentation (cf. Heisenberg, 1963). 'If classical physics displayed paradigms of causality or determinism,' says Arthur Fine in 'Some Conceptual Problems of Quantum Theory' (in Colodny, 1972:3), 'then quantum physics was seen to display paradigms of acausality and indeterminism.'

In *Physics and Philosophy* Heisenberg describes the so-called 'double-slit experiment' which marked the watershed between the traditional way of detached, 'scientific' observation and the quantum experience, i.e. the discovery that 'what happens depends on our way of observing it or on the fact that we observe it' (1963:51; the experiment and the conclusions to be drawn from it are described on 51-57).

The background to the double-slit experiment may be summarised as follows: as early as 1803 Thomas Young determined to everybody's satisfaction that light is a wave phenomenon. If light is let through an opening larger than its own waves, it passes through unhindered, to cast a pattern of the opening (square, round, diamond-shaped, etc.) on a wall behind it. But if light is let through an opening *smaller* than the amplitude of its waves, it is diffracted, i.e. it spreads out like a fan in exactly the way waves in the sea would spread out from a narrow opening in a harbour wall. To set up Young's type of experiment a screen is used containing two of these tiny slits to let through light from a specific source to a sensitive screen on the opposite side of the dividing screen. First we close slit 2 and record the pattern formed on the back screen by the light passing through slit 1; then we repeat the process with slit 1 closed, allowing the light to pass through slit 2 only. The result, a simple additive pattern, which differs almost imperceptibly from the original single pattern, looks something like this:



Pursuing the experiment, light is then let through both slits simultaneously, resulting in a completely new pattern of alternating bands of light and shadow, of different intensities, on the back screen, because the two sets of waves coming through the two slits interfere with each other.



This concept of light as waves, proved by every conceivable kind of experiment, persisted until Einstein, following in the footsteps of Max Planck, 'proved', just as convincingly, that light did *not,* in fact, consist of waves but of myriads of small particles, so that a single beam of light could be compared to a stream of birdshot emitted by a shotgun. Einstein proved this 'particle' quality of light by firing photons (i.e. the 'birdshot' in a beam of light) at a metal surface, from which electrons were literally broken loose by the impact (just as one billiard ball would send another flying if it strikes it: the image is Zukav's). Every single time a photon strikes an electron, it hits it right off the surface of the metal sheet, i.e. right out of the atom to which it belongs.

There seemed to be no issue out of this contradiction: after all, particles may be conceived of as 'entities' inasmuch as they can be isolated in time and space; waves only 'possess' amplitude and frequency and can only exist *in* motion, *as* motion. The two forms of 'being' are, in every conceivable respect, mutually exclusive. So it would seem, at first sight, ludicrous that J.J. Thomson should have been awarded the Nobel Prize in 1906 for proving that electrons are particles, while his son was awarded the same prize in 1937 for proving that electrons are waves. Yet both were right, and through the accumulated experimental evidence of the French physicist Louis de Broglie it became the 'essence' of quantum physics (Derrida would place *essence* 'under erasure') that 'not just photons and electrons but all "particles" and all "waves" are in fact a mixture of wave and particle' (Gribbin, 1984:91-92). One of the most startling demonstrations of this is Heisenberg's description of his 'ideal experiment' in which the two-slit screen is used, with a photographic plate behind it to register the light which hits it. Only, in this experiment, a single photon is fired off at a time, not a steady beam of light. As Heisenberg rightly says, it should be possible to describe what happens to that single photon from the moment it is fired off by the light source, via its trajectory through either slit one or slit two, until it hits the screen. But the amazing thing is that, if only one slit is open, the photon may hit a point on the screen which is totally black when both are left open. This means that it gets 'scattered', that 'interference' takes place when both slits are open, *even if there is only one photon to travel through either of the two slits.* It is as if, when both slits are left open, the photon, travelling though slit 1, 'knows' that slit 2 is open and therefore changes its course as if it 'expects' another wave to hit it.

The mystery can be taken a step further. Suppose a light detector is set up at each of the two slits, to register the passing of a photon the moment it moves through a slit. If detector 1 reacts, it indicates that the photon has passed through slit 1; if 2 reacts, it indicates the presence of the photon at slit 2. Easy enough; and it seems feasible to predict the motion of the particle from its moment of emission until it strikes either 1 or 2. No, say the quantum physicist: 'No real particle called a photon traveled between the light source and the screen. There was no photon until it actualized at slit two. Until then, there was only a wave function. In other words, until then, all that existed were tendencies for a photon to actualize either at slit one or at slit two ... The real problem (Zukav continues), is that we are used to looking at the world simply. We are accustomed to believing that something is there or it is not there. Whether we look at it or not, it is either there or it is not there. Our experience tells us that the physical world is solid, real, and independent of us. Quantum mechanics says, simply, that this is not so' (Zukav, 1983:100-101).

This argument can be extended to include Schrödinger's famous cat. 'It is possible to set up an experiment in such a way that there is a precise fifty-fifty chance that one of the atoms in a lump of radioactive material will decay in a certain time ... Schrödinger, as upset as Einstein about the implications of quantum theory, tried to show the absurdity of those implications by imagining such an experiment set up in a closed room, or box, which also contains a live cat and a phial of poison, so arranged that if the radioactive decay does occur then the poison container is broken and the cat dies. In the everyday world, there is a fifty-fifty chance that the cat will be killed, and without looking inside the box we can say, quite happily, that the cat inside is either dead or alive. But now we encounter the strangeness of the quantum world. According to the theory, *neither* of the two possibilities open to the radioactive material, and therefore to the cat, has any reality unless it is observed. The atomic decay has neither happened nor not happened, the cat has neither been killed nor not killed, until we look inside the box to see what has happened. Theorists who accept the pure version of quantum mechanics say that the cat exists in some indeterminate state, neither dead nor alive, until an observer looks into the box to see how things are getting on. *Nothing is real unless it is observed*' (Gribbin, 1984:2-3, my italics).

Schrödinger himself found the idea so preposterous that he concluded there must be a flaw in quantum theory. But neither he nor any of his colleagues or successors has yet been able to prove such a flaw. Everything 'works'. The truly significant aspect of the uncertainty principle is that, 'at the subatomic level, *we cannot observe something without changing it* ... This means, in reference to "moving particles" anyway, that we can never see them the way they "really are", but only in the way we choose to see them!' (Zukav, 1983: 134-135). At most, one should conceive of such particles as no more than 'tendencies to exist' or 'tendencies to happen' (Zukav, 1983:57). In fact, two physicists, Eugene Wigner and John Wheeler, have suggested the possibility that, 'because of the infinite regression of cause and effect, the whole universe may only owe its "real existence" to the fact that it is observed by

intelligent beings' (Gribbin, 1984:208): that is, it is brought into being, it is 'made to happen', through a creative act of observation.

If this sounds like an exorbitant claim, consider the variation of the two-slit experiment proposed by Arthur Fine (in Colodny, 1972:4-6). If, instead of a single photon, a steady beam of light is directed to the tungsten screen through slit 1, while slit 2 is closed, we know by now what pattern to expect on the screen; we know, too, that if slit 1 is closed and slit 2 opened, a similar pattern is formed, which partly overlaps with the first as 'a simple additive pattern', different from the pattern of bands of differing degrees of light obtained if the beam of light is directed to the screen while *both* slits are open. There is no surprise in this, as we expect diffraction and interference to occur. But consider this variation, says Fine: if we place counters at each of the two slits to register the number of photons passing through each of them, the total indicated by the two will match the total of imprints on the tungsten screen – but the *pattern* on the screen will now resemble more closely the simple 'additive' configuration, *not* the 'interference' pattern. Yet the *only* difference between the two experiments lies in the fact that in the first we used no counters, whereas in the second we did. This means that when there were no counters present, light functioned like a wave, but when the counters were set up the wave changed into particles. Our observation 'created' reality.

That this 'act of observation' can – and should – be linked to language, emerges from the description of a party game narrated by Wheeler as part of his contribution to a symposium arranged in honour of the centenary of Einstein's birth: in a game of 'twenty questions' Wheeler was sent out of the room while the rest of the company had to agree on an object to be identified through his questions. Initially the replies to his questions came very quickly ('Is it an animal?' 'Is it green?' etc.), but gradually the answers took longer and longer, which seemed inexplicable, as only a straight 'yes' or 'no' was required each time. After Wheeler had finally found the answer – 'a cloud' – the secret was revealed: instead of agreeing on an object, the company had decided that each person, when asked, would give an answer referring to a specific object he or she had in mind, but which would at the same time be consistent with all the previous answers. 'What has this to do with quantum theory?' asks Gribbin. 'Like our concept of the real world existing out there when we are not looking at it, Wheeler imagined that there was a real answer to the object he was trying to identify. But there was not. All that was real were the answers to his questions, in the same way that the only things we know about the quantum world are the results of experiments. The cloud was, in a sense, created by the process of questioning, and in the same sense the electron is created by our process of experimental probing. The story stresses the fundamental axiom of quantum theory, that no elementary phenomenon is a phenomenon until it is a recorded phenomenon' (Gribbin, 1984:209-210). (Need one point at the obvious parallels with reception esthetics? Wolfgang Iser: 'The convergence of text and reader brings the literary work into existence' (Iser, 1974:275); Umberto Eco: 'The text is nothing but the semantic-pragmatic production of its own Model Reader' (Eco 1979:10); Roland

Barthes: 'The discourse is speaking according to the reader's interests' (Barthes, 1975:151) . . .)

One step further, and one enters the 'many worlds interpretation' which, although it appears to have been appropriated by science fiction, remains well and alive within quantum physics, whether within the domain of the infinitely small (subatomic particles) or of the infinitely big (black holes and quasars). Returning us to the double-slit experiment, Zukav proposes the inclusion of a reaction in the observer ('I') to a signal from one of the two indicators set up to monitor the passing photons: if the photon passes through slit one, the detector emits a signal and I run upstairs; if it passes through slit two, the second detector emits a signal and I run downstairs. In 'normal' or 'real' terms, only one of these two possibilities can occur: either I run upstairs, or I run downstairs; I cannot do both at the same time. However, 'according to the Everett-Wheeler-Graham theory, at the moment the wave function "collapses" (i.e. at the moment when a detector at either slit 1 or slit 2 registers the passing of a photon, converting as it were a wave into a particle) the universe splits into two worlds. In one of them I run up the stairs and in the other I run down the stairs. There are two distinct editions of me. Each of them is doing something different, and each one of them is unaware of the other' (Zukav, 1983:106). And this happens at every imaginable point in life. Within seconds 'I' become such a multitude – Walt Whitman incarnate! – that no distinction between 'real' and 'possible' can be effective any longer. And these, we stand reminded, are the horizons opened not by the fertile imagination of a science-fiction writer, but by what has traditionally been regarded as one of the most 'fundamental' and 'exact' of all the sciences.

3

The whole of modern physics, and all the technology that depends on it, is quite literally unthinkable without assuming the duality of wave and particle: and it is important to emphasise once again that in every conceivable respect these two are mutually exclusive if approached in 'rational' terms or in terms of our 'real' experience of the 'real' world. In terms of Newtonian thinking, this duality *cannot* 'exist'; yet it does. Which means that an overhaul of our conventions of perception and thought is required. This is exactly what lies at the root of deconstruction, which has as its raison d'être the function 'to dismantle the principle of identity' (Magliola: ix), the undermining of logocentrism, i.e. the notion of signs as being 'preceded by a truth or a meaning already constituted by and within the element of the logos' (Derrida, 1980:14). In Derridean terms, the old authority lent to 'speech' as a guarantee of presence, and of metaphysical truth, would be the equivalent of an exclusive theory of particles. Just as the notion of a wave or a 'wave function' in physics does not supplant or exclude particles, Derrida has no intention of positing 'writing' *in the place of* 'speech'. The key to his entire 'grammatology' (which, in *Positions,* he explicitly describes as 'not a defence and illustration of grammatology (but) . . . the title of a question: on the necessity of a science of writing, on the condition of its possibility, on the critical labour

which should open the field and clear away the epistemological obstacles; but a question also on the limits of this science': Derrida, 1972:22, my translation) lies in the very argument that linguistic particles and waves remain inseparable.

Starting from a Saussurian awareness of language as a system of differences, he extends the notion of 'difference' itself (comparable to, say, different kinds of subatomic particles; i.e. differences in 'kind', in 'nature', in 'position') to an infinity of spatiotemporal relationships, an endless 'dissemination' both of *semes* and of *semen* (Derrida, 1981a): a 'wave-effect' of meaning which is, nevertheless, coexistent with the 'particles' of semes. In possibly the most famous – and the most misused? – utterance in *Of grammatology,* Derrida rejects the traditional question, 'What is the sign?' by 'challenging the very form of the question and beginning to think that the sign is that ill-named thing, the only one, that escapes the instituting question of philosophy: 'what is . . .?' (Derrida, 1980:19), which would be a perfect view of the breakaway from Newtonian physics by quantum physics.

Far from simplistically replacing 'presence' with 'absence', Derrida extends the concept by discovering the absences inherent to presence, in his image of the Mystic Writing Pad as 'a perpetually available innocence and an infinite reserve of traces' (Derrida, 1981b:112). Again, it may be helpful to bear in mind the double-slit experiment, in which the 'traces' of the photon between its source and the slit can only be deduced from the moment it is recorded, i.e. when it is no longer a wave but a particle. And that an entirely free play of 'meanings' can shed its wave-function and crystallise into particles, is evident from the close, intensive, rational precision with which Derrida clarifies his discourse – culminating, in one sense at least, in *Limited Inc.* (1978), where 81 densely argued pages are devoted to illuminate with stunning specificity that meaning can *not* be specific.

If much of this appears 'abstract', belonging to the 'subatomic field' of literary philosophy and theory, I should like to propose at least one area of 'application' which may prove invaluable in our everyday literary activity. Traditional theories of narrative, especially from E.M. Forster onwards, tended to pay much attention to the narrative element termed 'character'. A startling break with tradition was signalled when Barthes suggested the disappearance of character as such in his 'Introduction to the Structural Analysis of Narratives', first published in 1966 (cf. Sontag 1982). Following Propp (1938), Greimas (1973) and others, Barthes suggested an approach to 'character' based, not on 'essence', but on relationships established by action. In *S/Z,* four years later, 'character' is regarded as constituted by a code of semes ('When identical semes traverse the same proper name several times and appear to settle upon it, a character is created . . . The proper name acts as a magnetic field for semes; referring in fact to a body, it draws the semic configuration into an evolving (biographical) tense . . .': Barthes, 1975:67-68). Genette (1972 and 1983) firmly excludes all notion of 'character' from his narratology, even though in his brilliant analysis of *A la recherche du temps perdu* the dimension of *histoire* ('story') established by the *récit* ('narrative') clearly accommodates 'characters'. Now it would seem to me that an appli-

cation of the notions of 'wave' and 'particle' to narratology may yield useful results, if 'character' (i.e. personages within the 'story' dimension) is equated with the notion of 'particles', while what has traditionally been termed 'characterisation' (Barthes's semic code in the 'narrative' dimension) is equated with 'waves' or 'wave functions'. And precisely because of the indivisible unity of wave and particle in subatomic phenomena, the indivisibility of 'narrative' and 'story' will also be respected by such an approach. In fact, in the case of most of the codes proposed by Bathes in *S/Z* it seems to me that much could be gained by introducing into these notions the dual possibilities of wave *and* particle. I also have a hunch that linguistics, and the whole concept of transformations, stands to gain enormously by co-ordinating its approaches with those of quantum physics.

Instead of working with fixed entities or concepts, such an approach would not only respect, but add to, the awareness of *relations* already evident in literary theory and criticism for many years, but still not pursued far enough.

A report written by Henry Stapp for the Atomic Energy Commission is quoted by Zukav: '... an elementary particle is not an independently existing, unanalyzable entity. It is, in essence, a set of relationships that reach outward to other things' (Zukav, 1983:94); as a consequence, the physical world itself, in terms of the quantum experience, 'is not a structure built out of independently existing unanalyzable entities, but rather a web of relationships between elements, whose meanings arise wholly from their relationships to the whole' (quoted in Zukav, 1983:96).

4

A vital part of the play of relationships concerns 'complementarity', the concept proposed by Niels Bohr to explain the particle/wave duality of light. To return to this fundamental and fascinating puzzle, 'although one of them always excludes the other, *both* of them are necessary to understand light. One of them always excludes the other because light, or anything else, cannot be both wave-like and particle-like. How can mutually exclussive wave-like and particle-like behaviours be properties of one and the same light? They are not properties of light. They are properties of our *interaction* with light' (Zukav, 1983:116). This demonstrates 'the necessity of a final renunciation of the classical ideal of causality and a radical revision of our attitude towards the problem of physical reality' (Bohr, 1958:135); or, as Bohr affirms elsewhere, 'an independent reality in the ordinary physical sense can be ascribed neither to the phenomena nor to the agencies of observation' (Bohr, 1934:53). I should like to suggest that Derrida's concept of 'supplementarity' can be illuminated from this observation in quantum physics – and perhaps vice versa too. 'The book comes to add itself to nature (an additive supplement translated by the conjunction and), but through this addition it must also complete nature, fulfill its essence (a complementary, vicarious supplement expressed by the copula *is*). The closure of the library articulates itself and turns on this hinge: the logic, or rather the graphics, of the supplement' (Derrida, 1981a:53). If one uses this passage as an encouragement to 'restore'

culture, i.e. the book *(liber)* to nature *(liber)*, the whole notion of closure becomes turned inside-out, like a Möbius circle. Italo Calvino also offers a significant perspective on complementarity/supplementarity in *If On A Winter's Night a Traveller* (1981:171-172): 'I seem to understand that between the book to be written and things that already exist there can be only a kind of complementary relationship; the book should be the written counterpart of the unwritten world; its subject should be what does not exist and cannot exist except when written, but whose absence is obscurely felt by that which exists, in its own incompleteness.'

Much of the criticism levelled against deconstruction, derives precisely from a confusion about the relationship implied in what Bohr terms 'complementarity' and what Derrida might occasionally imply with 'supplementarity': critics who see the process of deconstruction as an exercise of getting bogged down in a quagmire of words endlessly signifying other words, with no issue from the text at all, often insist very vociferously on the fact that deconstruction appears to imply a denial of the 'real' world perceptible to the five senses, i.e. beyond the reach of language. I hope to have demonstrated in some of my examples from the experiments of quantum physics that precisely 'the real world out there' exists only 'under erasure'. As Zukav summarises the conundrum of this leap into the quantum world: '"Reality" is what we take to be true. What we take to be true is what we believe. What we believe is based on our perceptions. What we perceive depends on what we look for. What we look for depends on what we think. What we think depends on what we perceive. What we perceive determines what we believe. What we believe determines what we take to be true. What we take to be true is our reality' (Zukav, 1983:328). It is significant, as Zukav also points out, that our very word 'reality' is derived from the roots 'thing' *(res) and* 'think' *(revi)*. Heisenberg: 'What we observe is not nature itself, but nature exposed to our method of questioning' (Heisenberg, 1963:57).

Heisenberg does not deny the existence of the world 'out there' ('We know that the city of London exists whether we see it or not': Heisenberg, 1963:55) only the possibility of experiencing, observing or accounting for it as a *Ding an sich*. But it is important to bear in mind that Derrida does not deny 'the world out there' either: 'To allege that there is no absolute ouside of the text is not to postulate some ideal immanence, the incessant reconstitution of writing's relation to itself. What is in question is no longer an idealist or theological operation which, in a Hegelian manner, would suspend or sublate what is outside discourse, logos, the concept, or the idea. The text *affirms* the outside, marks the limits of this speculative operation, deconstructs and reduces to the status of "effects" all the predicates through which speculation appropriates the outside. If there is nothing outside the text, this implies, with the transformation of the concept of text in general, that the text is no longer the snug airtight inside of an interiority or an identity-to-itself . . . but rather a different placement of the effects of opening and closure' (Derrida, 1981a:35-36). He introduces a new awareness of permeability, of interpenetrability, of osmosis through a membrane, *a hymen* (cf. Derrida, 1981a:209). This in itself suggests transgression as an elemental act of language, of experience, of

'writing': transgressions of limits between wave and particle, energy and mass, time and space; between word and thing, word and thought, thing and thought.

5

In the 'ordinary' world, the 'real' world, I can sit down on a chair at a table, and pick up a knife and fork, and eat food from my plate, without experiencing any problem at all with the reality and the manageability of these things as things (except when I have just bought a new pair of glasses, which may create all kinds of disconcerting displacements). I can distinguish fork from chair, or plate from table, or myself from the food (at least until it has been disgested). So it may be argued that the experiments and theories of quantum physics, which concern primarily the subatomic world where no human eye has yet seen a proton, or a neutron, or an electron, let alone a 'virtual' particle or an anti-proton, do not concern our everyday existence. The point is, however, that many of the major technological 'facts' of our 'real' world *are the direct result of experiments on the subatomic level* (computers, lasers, digital watches, enriched uranium, nuclear energy...).

Somewhere, in our transgression of the limits of our 'real', ordinary, functional world into the subatomic world, disconcerting changes begin to obtrude upon the consciousness. A table seems solid. So does a splinter of wood from it, a fibre taken from that splinter, a molecule removed from the fibre, even an atom isolated from within the molecule. But one further step creates a remarkable shift, a dissolution, a transition from what seemed like solidity to flux, from mass to energy. In this realm the experimenter encounters what many commentators have termed a 'dance' of subatomic particles which replaces the classical model of the atom as a microcosmic repetition of the solar system with its planets and their satellites moving around the nucleus of a sun. In the Feynman diagrams we witness electrons emitting virtual photons which are then absorbed by other electrons, the unpredictable annihilation of some particles and the inexplicable emergence of others, an interaction of particles and antiparticles (the latter even being conceived of as particles moving backward not only in space *but in time*). What is involved, as Gerald Feinberg explains in 'Philosophical Implications of Contemporary Particle Physics', is 'the formation of new kinds of matter from previous forms not containing them ... In this process there is no doubt that the things present at the beginning are quite different in kind from those present at the end and that a real transformation has occurred ... (The) different forms of matter, or Subatomic Particles, can be readily created or destroyed, when there is enough energy available' (Colodny, 1972:35). This shows a significant correlation with Derrida's persistent demonstrations of the proliferation, the interchanging, the destruction and recreation of meaning in the text. (Cf., as a random example, his deconstruction of *pharmakon* in 'Plato's Pharmacy': Derrida, 1981a:61 et seq.)

The startling discoveries in the subatomic world have led to the introduction of the so-called S-Matrix, 'based upon *events*, not upon things,' as Zukav

summarises it: 'Dancers no longer stand apart as significant entities. In fact, the dancers are not even defined except in terms of each other. In S-Matrix theory there is only the dance' (Zukav, 1983:267) – just as, in Greimas's narratology, characters dissolve into mere actantial patterns (Greimas, 1973) This is reminiscent of one of Derrida's remarks on supplementarity: 'According to the structure of supplementarity, what is added is thus always a blank or a fold: the fact of addition gives way to a kind of multiple division or subtraction that enriches itself with zeros as it races breathlessly toward the infinite' (Derrida, 1981a:262). If this leads to an indeterminacy of significance, one need only return to the double-slit experiment, in which limitless possibilities are open to the electron as a wave function *en route* between light source and screen, until the moment we intervene as observers, forcing our measuring apparatus on to the experiment and hence causing the freely moving electron 'to choose one course of action out of an array of possibilities' (Gribbin, 1984:171). This restriction affects not only the 'position' of the electron but its 'nature', its 'momentum', *its equivalent of 'meaning':* 'By choosing to measure position precisely, we force a particle to develop more uncertainty in its momentum, and vice versa: by choosing an experiment to measure wave properties, we eliminate particle features, and no experiment reveals both particle and wave aspects at the same time' (Gribbin, 1984:160).

And yet, to return to our 'real' world, in spite of this 'uncertainty principle' underlying all natural phenomena, in spite of the 'fuzzy' quality of some of the more exciting modern developments in mathematics, in spite of both special and general relativity as demonstrated by Einstein, in spite of the 'disappearance' of mass, of solidity, at a certain station on our journey into the microcosm, we manage all right, thank you. We do not sit on knives or eat with chairs; tables do no suddenly start subdividing, nor do forks dissolve into energy. And, by the same token, we still manage to understand one another when we speak (even if it is 'more or less'). If I say, 'The man sits under the tree', my listener will not, I trust, decode it as meaning 'A cat ran across the street'. There may be a measure of indeterminacy, a fan of meanings opening up from each speech act, but it is neither indefinite nor infinite. There is a beginning and an end to the spectrum of meanings implied in our discourse. Or isn't there . . . ?

I am reasonably confident about the solid state of the table I sit at; but I must confess I feel less certain about words. I am not altogether despairing, however; and I have never encountered in deconstruction an intention to annihilate totally the communicative function of language (it remains deconstruction, not destruction; and no-one should underestimate the importance of a French *con*). We can all 'follow' Derrida, even in his most abstruse arguments, in his intensive activation *and* elucidation of meaning. What is undermined, what must be undermined if we wish to survive in a post-quantum world, is the implicit faith in the logos. If we are aware of the fact that even the most solid 'thing' in our world only *seems* solid because our means of perception are too coarse and crude to perceive it otherwise, and if we accept that we find our way through objects which are, in fact, latent bombs, vast masses of energy holding together in what we perceive as certain shapes and

sizes because that is how we have come to experience them, one treats the 'real' world with some more humility than before. Similarly, if through deconstruction we have become aware of the seething mass of indefinite signifying energy dancing below the seemingly solid surface of every word we utter, we may venture a bit more deeply into the territory of meaning.

It can be illustrated from fiction, by comparing *One hundred years of solitude* with, say, Zola's *Rougon-Macquart* cycle: in both cases a family saga is narrated, tracing through several generations all the ramifications of initial impulses. The significant difference is not simply that which separates Zola's fierce naturalism from the 'magic realism' of García Marquez, but the way in which Zola explores his narration to give the impression of immediate, unobstructed access to the 'story' – opposed to the way in which, in *One hundred years* ..., everything resides within the narrative moment as such. After having 'followed', through a hundred years, the vicissitudes in the lives of the Buendia family, we discover that the entire story has been a *prediction* by the gypsy Melchíades, an act of literary alchemy (which is a central code in the text): what we have conceived of as particles, turn out to be waves; or, inasmuch as they remain particles, each is accompanied and in fact negated by its own antibody (the 'real' Aurelianos and Arcadios counteracted by the fabrications in the alchemist's papers). A spacetime continuum has contracted; what we have conceived of as a movement forward in time, turns out to be one in the opposite direction; while contained 'within' the narrative, our measuring instruments – like Einstein's clocks and rods – have contracted and lost their relevance. There is, literally, no end to the proliferation of possible meanings.

And yet, we 'understand' the novel. This, too, I believe, can be explained by a transgression into literature from quantum physics. After all, a decisive aspect of quantum theory has been, from the beginning, a reliance on the statistical predictability, not of isolated phenomena, but of 'quanta'. In Newtonian physics it is regarded as possible, *in principle,* 'to predict *exactly* how a given event is going to unfold if we have enough information about it' (Zukav, 1983:51); in quantum mechanics, scientists are concerned with the prediction of 'probabilities' (Zukav, 1983:53). Hence, if our familiar beam of light is shone through the two slits in the screen, it is wholly and completely impossible to predict where each photon is going to land on the recording screen – yet it *is* possible to predict what the final pattern on the screen is going to look like. That is, the probable percentage distribution of photons on the screen can be predicted – but not the individual course of separate photons. Similarly, it is predictable that one-half of the atoms in a given lump of radioactive material will decay within a specified time: but there is no way of predicting *which* individual atoms will decay (this is the basis of Schrödinger's cat 'experiment'). If these observations are transferred to deconstruction, it seems to me that another useful insight can be gained: we may be able to construe a more or less circumscribed 'set' of probable meanings from a text, even though it will be impossible finally to pin down the individual subatomic particles of meaning which continue to change, or disappear, or die. Derrida's practice appears to me to bear this out.

What concerns us, as much in literature as in quantum physics, is not what we 'have' or what we can 'define', for that is tenuous; but what we can glimpse of wave-particles of meaning which continue to transgress, in all directions, all 'reasonable' limits imposed on them, just as we continue to transgress our boundaries to experience the full complementarity, the supplementarity, of our interaction with texts, as a result of which the most amazing 'things' can start happening.

Resistance to this 'dreaming in a different key' as Santayana termed it, is understandable. The position of the person who glimpses the new is described quite movingly by one of the pioneers of quantum physics, Louis de Broglie: 'Having habits of mind formed in great part by the teaching he has received and by the ideas which prevail around him, he often hesitates to break with customs and seeks to reconcile with them those new ideas whose necessity he perceives. Nevertheless, little by little, he finds himself forced to arrive at interpretations which he had not in the least foreseen in the beginning; and often ends up by being all the more convinced of them the longer he has tried in vain to avoid them' (De Broglie, 1960:144).

References

Barthes, Roland. 1975. *S/Z.* London: Jonathan Cape. (First published in French, 1970.)

Barthes, Roland. 1982. Introduction to the structural analysis of narrative. In: Sontag, Susan (ed.). *A Barthes reader.* London: Jonathan Cape. (First published in French, 1966.)

Bloom, Harold (ed.). 1979. *Deconstruction and criticism.* London: Routledge and Kegan Paul.

Bloom, Harold. 1982. *Agon: towards a theory of revisionism.* New York and Oxford: Oxford University Press.

Bohr, Niels. 1934. *Atomic theory and the description of nature.* Cambridge: University Press.

Bohr, Niels. 1958. *Atomic theory and human knowledge.* New York: John Wiley.

Calvino, Italo. 1981. *If on a winter's night a traveller.* London: Secker and Warburg. (First published in Italian, 1979.)

Colodny, Robert. G. (ed.). 1972. *Paradigms and paradoxes: the philosophical challenge of the quantum domain.* London: University of Pittsburgh Press.

Culler, Jonathan. 1979. Jacques Derrida. In: Sturrock, John. *Structuralism and since.* London: Oxford University Press.

Culler, Jonathan. 1983. *On deconstruction.* London: Routledge and Kegan Paul.

de Broglie, Louis. 1960. *Physics and microphysics.* New York: Harper & Bros. (First published in 1955.)

Derrida, Jacques. 1972. *Positions.* Paris: Editions de Minuit.

Derrida, Jacques. 1978. *Limited Inc.* Supplement to *Glyph 2.* Baltimore and London: Johns Hopkins University Press.

Derrida, Jacques. 1980. *Of grammatology.* Baltimore and London: Johns Hopkins University Press. (First published in French, 1967.)

Derrida, Jacques. 1981a. *Dissemination.* London: The Athlone Press. (First published in French, 1972.)

Derrida, Jacques. 1981b. *Writing and difference.* London: Routledge and Kegan Paul. (First published in French, 1967.)
Eco, Umberto. 1979. *The role of the reader.* Bloomington: Indiana University Press.
Einstein, Albert. 1962. *Relativity. The special and the general theory.* London: Methuen. (First published 1920.)
Genette, Gérard. 1972. *Figures III.* Paris: Editions du Seuil.
Genette, Gérard. 1983. *Nouveau discours du récit.* Paris: Editions du Seuil.
Greimas, A.J. 1973. Les actants, les acteurs et les figures. In: Chabrol, Claude (ed.). *Sémiotique narrative et textuelle.* Paris: Larousse, Collection L.
Gribbin, John. 1984. *In search of Schrödinger's cat.* London: Wildwood House.
Heisenberg, Werner. 1963. *Physics and philosophy.* London: George Allen & Unwin. (2nd impr.)
Heisenberg, Werner. 1974. *Across the frontiers.* New York: Harper & Row.
Iser, Wolfgang, 1974. *The implied reader.* Baltimore and London: Johns Hopkins University Press. (First Published in German, 1972.)
Magliola, Robert. 1984. *Derrida on the mend.* West Lafayette, Indiana: Purdue University Press.
Propp, Vladimir. 1938: *Morphology of the folk tale.* Indiana: Indiana University Press.
Ryan, Michael. 1982. *Marxism and deconstruction.* Baltimore and London: Johns Hopkins University Press.
Woolf, Harry. (ed.). 1980. *Some strangeness in the proportion.* Reading, Massachusetts: Addison-Wesley.
Zukav, Gary. 1983. *The dancing Wu Li masters.* London: Fontana. (First published by William Morrow, New York, 1979.)