

FROM NATURAL HISTORY TO NEUROSCIENCE: MEMORY AND PERCEPTION IN A.S. BYATT'S FICTION*

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ABSTRACT

Although scientific ideas run through the whole of Byatt's fiction, it is in her novella "Morpho Eugenia" (1992) and in the last two titles in her quartet, *Babel Tower* (1996) and *A Whistling Woman* (2002), that questions such as sexual selection, the physiology of perception and the chemistry of memory come to the fore. The question of memory is addressed in scientific and non-scientific terms. Jacqueline Winwar tries to locate the electro-chemical moment of memory by training her snails to avoid certain stimuli and seek out others. Two papers at the Body and Mind conference deal with the biology of memory. That memory is inseparable from history and perception is shown when Daniel Orton watches his daughter play Perdita in *The Winter's Tale*, and his intensely private memory of his dead wife touches on the rebirth myth that Byatt had introduced in *The Virgin in the Garden*.

KEY WORDS: Literature and science, consciousness and the novel, memory, A.S. Byatt.

RESUMEN

Los conceptos científicos están presentes en toda la obra de A.S. Byatt, pero es en "Morpho Eugenia" (1992) y los dos últimos títulos de su tetralogía, *Babel Tower* (1996) y *A Whistling Woman* (2002) donde cuestiones como la selección sexual, la fisiología de la percepción y la química de la memoria ocupan un primer plano. La memoria está tratada en términos científicos y no científicos. Jacqueline Winwar intenta localizar el momento electroquímico de la memoria haciendo que sus moluscos aprendan a rehuir ciertos estímulos y a buscar otros. Dos de las conferencias en el congreso sobre el cuerpo y la mente se ocupan de la biología de la memoria. La memoria es inseparable de la historia y la percepción, como se demuestra cuando Daniel Orton contempla a su hija interpretar el papel de Perdita en *The Winter's Tale* y el recuerdo de su esposa muerta activa el mito del regreso a la vida que Byatt había introducido en el inicio de la secuencia.

PALABRAS CLAVE: literatura y ciencia, consciencia y novela, memoria, A.S. Byatt.

Science has reshaped the humanities of our time —science may even *be* the humanities of our time— because its ethical concerns, its social ramifications, and its political consequences are those which most fully engage us.

Joseph W. SLADE, *Beyond the Two Cultures: Science, Technology, and Literature* (1990)

In Tom Stoppard's play *Arcadia* (1993) Bernard Nightingale, a literature don, tries to prove that Lord Byron shot a second-rate poet in 1809 during a weekend in a country house. For Valentine Coverly, a graduate science student, the interest that Bernard and another literary scholar, Hannah Jarvis, show in the personalities of the writers they work on is something trivial. The question is not who got there first with the calculus, Newton according to the English, or Leibnitz according to the Germans. What matters is scientific progress. Bernard is not impressed:

BERNARD: Oh, you're going to zap me with penicillin and pesticides. Spare me that and I'll spare you the bomb and aerosols. But don't confuse progress with perfectibility. A great poet is always timely. A great philosopher is an urgent need. There's no rush for Isaac Newton. We were quite happy with Aristotle's cosmos. Personally, I preferred it. Fifty-five crystal spheres geared to God's crankshaft is my idea of a satisfying universe. I can't think of anything more trivial than the speed of light. Quarks, quasars —big bangs, black holes, who gives a shit? How did you people con us out of all that status? All that money? And why are you so pleased with yourselves? (61)

With his accustomed wit and verve, Stoppard echoes the controversy that F.R. Leavis and C.P. Snow had started in the 1950s about the comparative relevance of literature and science as ways of understanding the world and contributing to humane values. The dispute in *Arcadia* is comic and mundane: what Bernard cannot stomach is the fact that scientists enjoy greater status and receive more funding than academics in the humanities. And the quarrel is one-sided, too, since Valentine is not against the poetry so magnificently embodied by Lord Byron. Furthermore, Stoppard's play is a brilliant example of the use of scientific concepts as literary tropes. The second law of thermodynamics, entropy, and quantum mechanics are central to a plot about the loss of a young scientific genius and are simultaneously enacted through action and dialogue.

In *Beyond the Two Cultures: Essays on Science, Technology, and Literature* (written before the publication of *Arcadia*), there is a section on "the metaphorical allure of modern physics" showing the attention lavished on concepts such as entropy in contemporary literature, which is ironical in view of the fact that, as Joseph W. Slade observes:

There are at least two ironies here. The first is that the relevance of relativity theory and quantum mechanics to imaginative writing and literary criticism is receiving extended attention just as the scientific supremacy formerly accorded physics is beginning to pass to biology [...]. A second irony is that Werner Heisenberg himself denied that physics could have much influence on literature. (15)

* This essay is part of a project funded by the Spanish Ministerio de Ciencia y Tecnología, BFF-2003-05143.

Pace Heisenberg, the elegance, originality and sheer difficulty of concepts such as the complementary and uncertainty principles in quantum mechanics have something to do with their appropriation by literature. Michael Frayn dramatises in *Copenhagen* (1998) the relationship between Niels Bohr and Werner Heisenberg, the two Nobel Laureates that in the 1920s developed “the Copenhagen Interpretation” that revolutionised theoretical physics and eventually would lead to work on nuclear fission and, during World War II, to the atomic bomb. Frayn’s play is a remarkable achievement from the perspective of stagecraft, since he manages to create and sustain interest in a work built solely on conversations between three characters (the two scientists and Bohr’s wife) that incorporate a good deal of technical material. Whereas Stoppard finds in the play of ideas the source of pleasure and meaning, Frayn privileges the moral and political issues Bohr and Heisenberg had to face as scientists and citizens.

Both *Arcadia* and *Copenhagen* were written and performed in the 1990s; in the same decade and at the beginning of the twenty-first century, the English novel engaged in a wide-ranging exploration of how developments in biology and neuroscience bore on the view of human beings that underlies literature, and more specifically, on the role of fiction as a record of human consciousness.

1. NO GHOST IN THE MACHINE

In his review of David Lodge’s *Consciousness and the Novel* for *The Times Literary Supplement*, Jonathan Bate begins by observing that literary theory has always been a parasitical discipline, feeding off rhetoric in ancient times, linguistic and anthropological structuralism in modern times, and identity politics in recent years. He goes on to ascribe much of Lodge’s success as a critic and novelist to “his keen eye as a parasitologist: he always seems to know where the theoretical flea is going next, almost before it jumps” (25). As Lodge tells it, his interest in consciousness studies was first awakened in 1994 by a review in *The Tablet* of Daniel Dennett’s *Consciousness Explained* and Francis Crick’s *The Astonishing Hypothesis*. As the title of the review (“From Soul to Software”) shows, recent work on neuroscience challenges the view of human nature enshrined in the Judeo-Christian religious tradition, and Lodge realized that it also challenged “the humanist or Enlightenment idea of man on which the presentation of character in the novel is based” (2).

Lodge charts the history of the presentation of consciousness in the English novel, from Jane Austen’s intelligent use of free indirect discourse and Henry James’s painstaking analysis of the inner life of his characters, to the very different surface presentation of novelists in the 1920s (Anthony Powell, Evelyn Waugh) who dispense with analysis, rely on dialogue and turn away from depth to surface. According to Lodge, this trend is connected with the “emergence of a new narrative medium in the twentieth century —cinema” (72).

After reviewing the different ways in which fiction has historically presented human consciousness, Lodge analyses the implications for the novelist of the new views on concepts of the mind, and thus the self, coming from neuro-

science. This is not a new phenomenon in the history of literature; evolutionary theory impinged not only on writers' religious beliefs, but also on the very structure of their narratives and their presentation of character, as Gillian Beer, among others, has shown (Beer *passim*).

In his 2004 review of several books on the subject, Oliver Sacks states that “the neuroscientific study of consciousness has now become a central concern, one that engages scientists all over the world,” and mentions new developments such as computerized neural modeling and others that combine to make “the quest for the neural correlates of consciousness the most fundamental and exciting adventure in neuroscience today” (43).

When in an interview with Craig Raine reprinted at the end of *Consciousness and the Novel* Lodge says that “the novel is about consciousness in all its aspects and implications” (292), it is easy to see what drove him to place the old two cultures debate in the context of research in neuroscience and Artificial Intelligence. Like most of Lodge's fiction, *Thinks...* (2001) is set on a campus, but whereas in former works the main characters were professors of literature engaged in the critical wars of the 1970s and 1980s, the story centres now on the evolving relationship between Ralph Messenger, a cognitive scientist on the cutting edge of the profession, and Helen Reed, a novelist who has come to Gloucester University to teach a creative writing course. The novel is in some ways a comedy of contemporary sexual mores; as usual, Lodge's keen eye for changes in British middle-class life is evident in the details on food, clothes, leisure, technology (a whole chapter is written in e-mails), etc. But the core of the novel is the dialogic relationship between Ralph and Helen, the cognitive scientist and the novelist.

Helen is at first dismayed when Ralph explains that the old dualism of body and soul, or brain and mind, is being dismantled, and that human consciousness is being explored as a function of the brain's chemical and electrical activities. As Wilson and Bowen put it in their account of the neuroscience revolution: “Monistic theory views mind and consciousness as part of the functioning of brain: mental processes are brain processes” (159). The concept of the soul as “the ghost in the machine” has given way to the study of the brain as the machine that produces thoughts, memories, feelings—consciousness in short—in ways not yet fully understood. Ralph comments that man is the only animal that knows he is going to die, and later Helen connects his views on consciousness with traditional religious accounts: “In fact—when you think about it in this light—the story of Original Sin in Genesis could easily be a myth about the advent of self-consciousness in evolutionary history” (107).

As a novelist, Lodge solves brilliantly the problem of having to convey a good deal of background information on cognitive science, different theories on the mind and mental processes, and experiments that try to replicate the working of the human brain. Most of this sort of material is presented in the course of conversations between Ralph and Helen, and is further elaborated in Ralph's recording of his flow of thoughts and in Helen's journal. But it would be wrong to give the impressions that *Thinks...* is a series of discussions on neuroscience. As a matter of fact, Lodge is quite inventive in the ways he intertwines scientific con-



cepts and literary devices. To give just two examples. Ralph tells Helen about a paper written in the 1970s —“What Is It Like to Be a Bat?”— that advanced the hypothesis that it is quite impossible to know what it is like to be a bat, *ergo* the scientific investigation of consciousness is impossible. Ralph of course dismisses the argument, but Helen finds it interesting enough to give her students copies of the *Encyclopaedia Britannica*’s article on bats and tell them to write a short piece on “What Is It Like to Be a Bat?” in the style of a well-known modern novelist.

The second example is the way the novel embeds the concept of theory of mind (TOM) that Ralph explains to Helen. The idea is important enough for Lodge to single it out in the interview with Raine:

Central to the novel is the idea that a crucial stage of ordinary human development is the acquisition of a “theory of mind”. You discover in infancy that people can have different interpretations of the world. This opens up the possibility of deceiving them. Therefore deception is built into human life very deeply. (293-4)

Consequently, it is fitting that the plot of *Thinks...* should turn on adultery in the past and the present, and that most characters engage in sexual deception of one kind or another (including a topical nod to paedophile rings in Internet). Historically of course, adultery has been one of the central concerns of the European novel, and in his previous campus novels *Changing Places* and *Small World* Lodge had connected adultery with academic life and literary genres. *Thinks...* briefly enacts a significant connection between scientific ideas of the self and some aspects of literary theory. Lodge borrows his character Robyn Penrose from *Nice Work* and has her give a lecture on “Interrogating the Subject.” Beneath the all-too-familiar jargon (fetishization, phallogocentric), Helen perceives similarities between Robyn’s discourse and Ralph’s:

Both of them deny that the self has any fixed identity, any “centre.” He says it’s a fiction that we make up; she says it is made up for us by culture. It’s alarming that there should be so much agreement on his point between the most advanced thinking in the sciences and the humanities. (225-6)

Further on, Ralph will dismiss poststructuralists as “basically hostile to science” (228). It is left to Helen, in her lecture at the end of the international conference on cognitive science, to put the case for literature as a non-scientific form of knowledge and perception: “literature is a written record of human consciousness, arguably the richest we have” (316). During her stay at Gloucester University she has learned that the Christian idea of the soul and the humanist idea of the self are both under attack today, not only by scientific discoveries about the structure and function of the brain, but also in the humanities, where poststructuralism posits the self as a myth, just a junction for converging discourses (319).

Helen takes as her text Marvell’s “The Garden” (which interestingly is also one of the epigraphs to Byatt’s *A Whistling Woman*) and finds in its stanzas the assertion that “human consciousness is uniquely capable of imagining that which is not physically present to the senses” (318). The key word here is, I think, “uniquely.”



Helen finds abhorrent and ultimately unconvincing the idea of the self being advanced by some cognitive scientists and literary theorists. No matter how powerful as explanatory models, there is something missing in scientific accounts of human consciousness that ignore the celebratory note struck by Marvell and also the tragic dimension in consciousness that results in “madness, depression, guilt, and dread” (319). The confrontation between literature and science ends in stalemate and a sober tribute to human endurance. Ralph survives what looks like a life-threatening disease and Helen gets over the shock of the discovery of her late husband’s infidelities. There may be no ghost in the machine, but the machine is nonetheless capable of great achievements in the realms of thought and feeling.

2. THE LIFE OF THE CREATURES

In chapter 3 of *On Histories and Stories*, A.S. Byatt examines the effects of Darwinian ideas, and of changes in our sense of the nature of time and the nature of human relations, on recent fiction. If DNA studies show that all living forms are closely related, Byatt finds a corresponding interest in the history of the creatures in some recent novels. Thus Lawrence Norfolk’s *The Pope’s Rhinoceros* opens with a long account of the formation of the Baltic which has herring shoals as central consciousness. Byatt sees also elements of natural history in Julian Barnes’s *A History of the World in 10 1/2 Chapters*, which begins with the journey of Noah’s Ark narrated by a woodworm, and Graham Swift’s *Waterland*, which includes the chapter “About the Eel” considered by Byatt “the best, the most imaginative, the most surprising chapter in a book where the human characters, perhaps intentionally, are banal” (70).

Natural history, in the form of reptiles, insects and snails figures prominently in the fiction of Byatt herself. One of the main characters in her second novel, *The Game* (1967), is a herpetologist who has studied two species of caiman in the Amazon region. She uses as an epigraph to the same novel Coleridge’s comparison of the principle of the imagination with the emblem of the serpent, ancient symbol of wisdom. The serpent is of course central to *Paradise Lost*, the work of English literature that, second only to Shakespeare’s plays, is a key intertext in Byatt’s tetralogy. Christabel LaMotte, the fictitious Victorian poet in *Possession*, has written a long narrative poem about the half-woman, half-serpent/fish fairy Melusina, which includes this description of the lower body of the protagonist:

The sinuous muscle of her monster tail
Beating the lambent bath to diamond-fine
Retracting lines of spray, a dancing veil
Of heavier water on the breathless air

How lovely— white her skin her Lord well knew.
The tracery of blue veins across the snow...
But could not see the beauty in the sheen
Of argent scale and slate-blue coiling fin... (121)

While we can place Byatt's interest in snakes in a long literary and mythical tradition, her use of the social insects has more to do with natural history; the reading that went into her novella "Morpho Eugenia" (in *Angels and Insects*) included E.O. Wilson's *Insect Societies* but also the novels and essays of George Eliot, the writings of Victorian Amazon explorers and children's classics like *Alice in Wonderland* and *The Water Babies*. Like so much of Byatt's short fiction, "Morpho Eugenia" is an example of cross-fertilization (cf. Lara *passim*). The main story foregrounds both the impact of Darwinian ideas on Victorian society, and late twentieth-century studies of insect societies which bear on human social patterns. Simultaneously she draws the reader's attention to the parallels between life on an antheap and in a Victorian country house (especially between upper-class, incessantly child-bearing women and sexless workers), but nevertheless eschews anthropomorphism in order "to show insects as Other, resisting our metaphorical impositions" (*On Histories and Stories* 116).

Byatt manages to breathe new life into what is by now almost a commonplace: the Victorian who faces the implications of Darwin's views on evolution and natural selection for his belief in human beings created by God in his likeness and then redeemed by his Son. In Sir Harald Alabaster she has created an Anglican vicar with intense scientific interests who desperately tries to find in the beauty and harmony of the universe the proof of God's existence. Sir Harald seeks reassurance from his son-in-law William Adamson, which Adamson is too honest to give, prompting Sir Harald to momentary despair:

'The world has changed so much, William, in my lifetime... I used to love to see paintings of the Annunciation —the angel with his wings dipped in the rainbow, of which the butterfly and the bird of Paradise were poor, imperfect echoes, holding the gold and white lily and going down on his knees to the thoughtful young girl who was about to be the Mother of God, love made flesh, knowledge given to us, or lent. And now all that is as it were erased, and there is a black backcloth on an empty stage, and I see a chimpanzee, with puzzled eyes and a hanging brow and great ugly teeth, clutching its hairy offspring to its wrinkled breast —and is *this* love made flesh?' (69. Emphasis Byatt's.)

As a Darwinian naturalist and Amazon explorer, Adamson is an appropriate vehicle for the fictional presentation of issues Byatt has long been interested in. The curious episode of the wedding dance of thousands of winged ant Queens and their suitors is an example of the laws of Natural Selection, and he paints a specially poignant picture of the fate of the males once they have fertilised the Queen. As Matty Crompton drily observes, "I am quite overcome with pity for these poor, male creatures. I must admit I had never seen them in that light before" (120). Despite the fact that a few pages back Adamson himself had qualified Matty's anthropomorphism ("Analogy is a slippery tool," said William. "Men are not ants." 116), it is obvious that he perceives a parallel between the drones and his own position in the Alabaster household.

Sally Shuttleworth places "Morpho Eugenia" among the group of contemporary British texts that dramatise the Darwinian moment in Victorian history, and



further observes that both Byatt's novella and Graham Swift's *Ever After* (1992) "feature a male protagonist who is a naturalist and follower of Darwin and who finds himself fundamentally at odds with his clergyman father-in-law" (148). Far less conventional is Byatt's deployment of the Darwinian concept of sexual selection. In his essay on this aspect of evolutionary theory, George Levine asserts that, although Darwin's views are rooted on Victorian ideology, his theory of sexual selection "remains fertile and disruptive" (45). Levine reaches the conclusion that, "if followed out to its fullest possibilities in directions Darwin established but did not follow, it might very well imply the intellectual superiority of women" (51). Levine is interested in the contradictions between Darwin's patriarchal ideology and the ultimate implications of his theory of sexual selection; in Byatt's novella, plot and characters enact some points of Darwinian theory. Beautiful Eugenia, soft, white and golden, constantly breeding, is the conventional female whose sole purpose in life is to be impregnated. Matty Crompton, intelligent, active and an original storyteller, can be read as the next step in women's evolution. Both of them select William Adamson for very different reasons. It is not for nothing that, as we saw above, William identifies himself with the fate of the drones. The end of the story is curiously optimistic, with the new couple leaving behind their subordinate position in the Alabaster household and setting out on a voyage of scientific and personal discovery.

3. THE MATTER OF THE MIND

Antonia Byatt shares Lodge's insight that literature, and specially the novel, cannot ignore the new hypothesis about human consciousness that is being advanced by neuroscience. If the link between works like *Possession* and "Morpho Eugenia" and the last novel in the quartet is sexual selection, the link between Byatt's widespread use of intertextuality and her interest in painting and science is creativity. In *A Whistling Woman* Hodder Pinsky gives a scientist's definition of creativity: "Creativity was the generation of new ideas, new explanations" (151).

In the first novel of the quartet, *The Virgin in the Garden* (1978), the intellectual framework is overwhelmingly literary, something to be expected in a story that centres around the performance of Alexander Wedderburn's verse play *Astraea* in a north Yorkshire country house in the summer of 1953, and which finds it natural to weave into its fabric lines and images from Spenser, Shakespeare, Milton, Wordsworth, and Keats. There are scattered references to science, mainly biology, in *The Virgin in the Garden* and *Still Life*, but it is not until the third novel in the sequence, *Babel Tower* (1996), when Jacqueline Winwar and Luk Lysgaard-Peacock's research interests are introduced:

'There has to be something wrong with the planaria experiments, I cannot believe memory is carried that way.'

'We could try and repeat the experiment,' says Lysgaard-Peacock.

'I'd like to get up something with snails,' says Jacqueline. 'They have large neurones. You could do something interesting on the chemistry of memory.'

Frederica thinks about sex and is quite unaware that she is hearing the first discussion of what will be a scientific advance, an important piece of research. (236)

In a gesture that may bring to mind the role of *Babbletower* in *Babel Tower*, but which turns out to be rather different, *A Whistling Woman* opens with eight and a half pages in italics. The story-within-the story is now a children's narrative whose hero's name, Artegall, is taken from *The Fairie Queene*. The excerpt that Agatha Mond reads aloud to the children engages in an allusive game with the odd title of the novel by means of some weird creatures in her story, "the Whistlers." When Agatha finishes reading her story, the listeners are disappointed by the lack of closure. This may be a self-referential gesture to the author's own position when putting an end to a narrative she had begun working on forty years before.

Frederica's story is no so central in *A Whistling Woman* as in the previous novels in the quartet. Byatt is on record as having intended from the very beginning to have some six important characters in each of the novels, and she was unhappy when the BBC radio dramatisation of the sequence in 2003 took the title *The Frederica Quartet*.¹

If *Babel Tower* embedded a dystopian story set in revolutionary France and a good deal of information about debates on language, education, the visual arts and cultural change in the 1960s, *A Whistling Woman* foregrounds scientific research by making several of the main characters scientists and by having as the climax of the novel a conference on body and mind at North Yorkshire University.

The foregrounding of philosophical and scientific issues in the novel does not preclude the presence of the dominant images in the tetralogy: blood and stone, the tower and the garden, darkness and light. The references to Manichaeism point to the dualism underlying the story: we have on the one hand a group of characters in search of oblivion and eventually death (Joshua, Ruth, Ellie, Eva, Paul), and on the other characters who believe in the value of human creations such a language, art, literature, science and altruism (Frederica, Daniel, Wijn Nobel, Jacqueline and Luk, among others). The novel also activates the Freud/Jung dualism, although perhaps the central binary opposition is reason vs. irrationality. Frederica has a moment of revelation while listening to a lecture on D.H. Lawrence's doctrine of blood knowledge:

She thought of F.R. Leavis's *Education and the University*, which she had studied, and which said that the English Department was at the centre of any educational endeavour. This suddenly seemed, as she listened to Lawrence's dangerous nonsense abstracted from Lawrence's lively drama and held up for approval, to be nothing more than a Darwinian jockeying for advantage, a territorial snarl and dash. What is important, she thought, *is to defend reason against unreason*. (364. Emphasis added.)

¹ At the time of writing, one can have access to the interview in the web site www.asbyatt.com. The interview took place in May 2002.

If scientific discourses are central in *A Whistling Woman*, it is striking the continuing presence of religion in the novel. Britain in the 1960s was not yet the post-Christian society it has since become, and Christianity has played a part in the tetralogy from the beginning, both in a negative manner, in Bill Potter's militant atheism, and more positively in Daniel Orton's pastoral work as an Anglican curate. In the BBC radio interview I have already mentioned, Byatt says that when in *The Virgin in the Garden* Bill is against the marriage of his daughter Stephanie with Daniel because he is a clergyman, she was parodying the situation in some Victorian novels where the father does not want his daughter to marry an agnostic. The loss of belief in Victorian England as a result of the impact of Darwinism has been dealt with by contemporary novelists (as it was at the time by the Victorian themselves); as we have seen, Byatt's key text in this respect is "Morpho Eugenia." Her interest in this question goes beyond Victorianism though, and encompasses the effect of the loss of religious belief on contemporary fiction. As she observes in *On Histories and Stories*:

I have also a concern, as will be clear from these essays, with the relations between religious thought and narratives and narrative works of art. I was much impressed, as a young writer, by Iris Murdoch's understanding of the effect on the moral life—and therefore on fiction—of a true understanding of the removal of a divine source of morals and a transcendent sanction of behaviour. (79)

Initially, the religious community in *A Whistling Woman* is under benign Quaker influence, but in the course of the novel it degenerates into a sect. Images of blood and stone become literal in a sinister way when the members of the community engage in a mock stoning ceremony, and a pregnant young woman gives birth without medical assistance in a welter of blood. When Daniel visits the community in search of his estranged son, the narratorial voice dwells on the historical and literary vigour of a system of beliefs which appears now bound with mental disorder and the compulsion to renounce the self:

The house was an old house. It had harboured Puritans and Non-conformists. Wesley had preached from its kitchen table. Daniel stood at the foot of the staircase and looked briefly up at the murky stained glass window which showed, though he could not see it, Christian and Hopeful crossing the Jordan to reach the heavenly City, "and the trumpets sounded for them on the other side." (397-98)

Religion, together with history, literature and individual experience, are part of the complex network of memory that the novels in the tetralogy record. *A Whistling Woman* also incorporates scientific accounts of the workings of human and animal memory. Byatt must have been conscious of the difficulty of embedding scientific discourses in the structure of her novel, and as a result she has designed two narrative episodes that because of their recurrent nature act as expositorys of ideas. The first is a television series of programmes that Frederica presents, and the second an interdisciplinary conference on body and mind at North Yorkshire University.



The content of the television series is highly intellectual; the programmes are structured around a topic, a person, and an object. Thus, for example, for the programme on creativity the guests are a cognitive psychologist and a psychoanalyst, the person is Freud, and the object, a copy of a Picasso ceramic. In the programme on women, the guests are a novelist and a journalist, the person is George Eliot, and the object, a Tupperware bowl. The elaborate structure of the television programme seems a self-conscious comment on Byatt's writerly practice, characterized by the presentation of ideas and the description of the colour and texture of things.

Frederica's imagination, steeped in the metaphors of English Renaissance literature and the psychological sophistication of the European novel, has to take in now issues like the physiology of memory and the matter of mind in the aftermath of developments in molecular biology, genetics and ethology. While she is trying hard to understand Hodder Pinsky's lecture on "Metaphors for the Matter of the Mind," Frederica is made aware of her gaps in knowledge as a result of an exclusively literary education:

She realised that though she had understood what he had said, which was lucid, and interesting, she was profoundly ignorant, blackly, thickly ignorant, of *what he was talking about*. She knew the words, neurone, synapse, dendrite, and she liked them because she could do their etymology. But the human world—including maybe some of her own forebears—had invented microscopes, and telescopes, and dissected tissues and identified cells, and if it all vanished tomorrow she *would not know where to start*, though she might be able to write down quite a lot of *Paradise Lost* by heart (whatever her heart was and how it worked). (355. Emphasis Byatt's.)

The gap between literary and scientific knowledge is only one of the many issues that Byatt touches on in her narrative. Metaphor is central to Byatt's writing, and besides her obvious debt to Renaissance and Romantic poetry, she has acknowledged the influence of Sir Charles Sherrington's metaphors for mind and brain. Sherrington, who was the first to study the synapses and invented the term, also described visual perception with a metaphor. Byatt locates in the 1960s some scientific developments of the 1990s. Whereas the theme of the conference and Jacqueline's research have to do with neuroscience, there is also a link with "Morpho Eugenia" and female sexual selection in Luk's conference paper on non-sexual reproduction (cloning, parthenogenesis, budding) and the obsolescent male. Luk quotes Darwin's comment in a letter to his son ("The sight of a feather in a peacock's tail, whenever I gaze at it, makes me feel sick," 357) and stresses that non-sexual reproduction appears to be less costly. Luk's paper resonates in a novel where there is a false pregnancy and a real and unexpected one at the very end, and in which Frederica refers to parthenogenesis when speculating about Saskia's father.

The cultural history of the educated woman that the tetralogy privileges in *The Virgin in the Garden* and *Still Life* (see Hidalgo) gives way in *A Whistling Woman* to the problems faced by the woman scientist. Byatt wanted the tetralogy to end just before Women's Liberation gathered momentum in the early 1970s. *A Whis-*



ling Woman does record the sexual revolution of the 1960s and the greater freedom that the pill gave to women. In her television programme Frederica discusses with her women guests issues like menstruation that had been taboo. The tone is not too celebratory; Jacqueline has a brilliant scientific career ahead of her, but unlike her male colleagues, she has to pay a price:

I don't want to be a human being, said Jacqueline, feeling suddenly that she was very lonely in the world, that her choice of work had deflected or distorted her unthinking life. (414)

Memory is an important subtext in the tetralogy, inseparable from history and perception. In *The Virgin in the Garden* the reader was offered the coronation of Elizabeth II in 1953 and simultaneously the very different ways that historical event (and the then new medium of television through which it was transmitted to the world) would be perceived years later. Whereas *Babel Tower* recorded the legislative changes introduced by the first Harold Wilson government and the new trends in the arts and fashion, *A Whistling Woman* looks back on the 1960s as a period in which an upsurge of irrationality took the form of cults that implode and self-destruct, students' revolt against a demanding syllabus, and the wanton destruction of artistic and historical objects. In a vein reminiscent of the reflections on the coronation in *The Virgin in the Garden*, *A Whistling Woman* alludes to the ways in which memory filters experience:

Later —much later— when Frederica who had felt old at thirty was surprised at how she did not feel old at sixty —she looked back at this time of youthful turmoil, of overturning and jettisoning, as something very far away and finished, as the mild, indefinite, tentatively hopeful 50s were not finished. (49)

The question of memory is also addressed in scientific terms in the novel. Jacqueline Winwar is trying to locate the electro-chemical moment of memory by training her snails to avoid certain stimuli and seek out others (162). Two papers at the Body and Mind conference deal with the biology of memory. The first is a study of the different ways in which chaffinches and canaries learn how to sing. In the second, Jacqueline's boss discusses theories about the role of particular neurones in the formation of memory, and in doing so he uses Jacqueline's research results without acknowledgement. Raphael Faber's paper, which goes unreported, is on Proust and memory, an issue Byatt has also addressed in her essay "Memory and the Making of Fiction," where she singles out as uniquely human our capacity to form images in memory:

Why make works of art? Why not just live? Proust noted that the remembered experience was the paradisaical one, *because it was a memory*. We are individuals because we are self-conscious and we are self-conscious because we make images. We are self-conscious and therefore *interested* in the images we make and in the fact that we make them. We need to make images to try to understand the relation of our images to our lives and deaths. That is where art comes from. (71. Emphasis Byatt's.)

The examples I have cited do not exhaust the function of memory in the novel, or in the sequence as a whole. Whereas laminations (cutting up and pasting) had been central to *Babel Tower*, in *A Whistling Woman* we may speak of reverberations, related to the mirrors in the religious community and to the figure of the double that John and Paul Ottokar embody. We find examples of reverberation in the peacock inscribed in Luk's name, in the scarf that the scientist wears while giving his paper, in the peacock feathers with which he decorates his house to receive Jacqueline, and in the story about Darwin's reaction to the peacock's tail.

The concept of altruism also reverberates in the tetralogy. In *Still Life* altruism is on Stephanie's mind seconds before she dies. From a scientific perspective, Luk denies that creatures can act for the benefit of the species: "If you give up your life for another, he said, all your altruistic genes are annihilated with you, unless the other has as many of your genes as you do" (358). But no concept or image has the centrality of memory. In the most moving moment in the tetralogy, Daniel Orton watches his daughter Mary play Perdita in *The Winter's Tale*, and his intensely private memory of his dead wife touches on the rebirth myth that Byatt introduced in *The Virgin in the Garden* and which, in a different guise, is enacted in Shakespeare's play:

Daniel was quite unprepared for the effect this would have on him. She was acting a woman a year or two older than herself, and was full of the careful dignity of speaking great verse clearly. She was in her own world, not trying to charm, but enchanting. He saw, not his daughter, but his wife. Only for a moment, but entirely, and remembering life he remembered death, automatically, and his eyes filled with tears. (394)

I have observed that Agatha Mond's putting an end to her narrative in the first pages of *A Whistling Woman* may be a self-referential gesture since, like her character, Byatt withholds the sort of information readers expect at the end of a story. We know from the Prologue to *Still Life* that Frederica lives in London in 1980, is still style-conscious, still interested in painting, prosperous now, working as a critic for Radio 3 and friendly with Alexander and Daniel. But the Prologue says nothing about her two children and does not mention a husband or partner. At the end of *A Whistling Woman* Frederica is pregnant with Luk's child and both of them are uncertain about their future relationship. The last scene is reminiscent of the "Postscript" to *Possession* in its natural setting, the presence of springtime vegetation and the meeting of a father and his (here unborn) child. Frederica thinks again about the two works that have haunted her imagination throughout the sequence, *Paradise Lost* and *The Fairie Queene*, while the narratorial voice reminds us cautiously of the last lines of Milton's poem: "The world was all before them, it seemed" (421).

The presence of scientific issues and concepts in Byatt's fiction should not obscure the fact that her interest is primarily literary, that she makes literature out of science, just as Vikram Seth makes literature out of chamber music in *An Equal Music*. If David Lodge sees neuroscience from the perspective of its impact on the



novel as a record of human consciousness, Byatt focuses on the metaphorical power of scientific ideas and on the ways they impinge on the presentation of character in fiction. Her achievement lies in her ability to relate quite complex scientific developments to characters that live in historical time and are represented through language.



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