Iris Murdoch: days without writing[1]

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[1] In honour of her friend, A.N. Wilson's moving tribute to Iris's dedication as a writer: "Her patient, humble working life was an example to any writer. *Nulla dies sine linea*, as Erasmus decreed – not a day should pass without writing something. She was entirely without fuss in her approach to work. When JOB broke his ankle, she sat at the end of his hospital bed with a large pad, writing her novel. If she had an hour to kill waiting for a train, out would come the pad once more. There was no nonsense about need to write in a special place or with special nibs. She was humbly the servant of her craft…." (Wilson, 2004, p. 263)

In 2005, you published a report examining changes in the writing of the author Iris Murdoch from the start of her career, the peak of her career and finally the end of her career when she was considered to be in the early stages of Alzheimer's disease. This case may be relevant to our understanding of memory processes and deficits in Alzheimer's disease. Can you provide us with some background information about this case?

Jean Iris Murdoch (IM) was one of the most acclaimed novelists of the twentieth century. Born in Dublin in 1919 into a middle-class protestant family, she was educated at Badminton School and then Somerville College Oxford, from where she graduated with a first in Greats (Ancient History and Philosophy) in 1942. Following wartime service in the Treasury and a post-war attachment to the United Nations, she returned to academic philosophy, first at Cambridge and later Oxford, where she became Fellow and Tutor at St. Anne's College in 1948.

IM wrote several short works of fiction (most of which she later destroyed) before the publication in 1953 of her first novel *Under the Net*, a first-person narrative that chronicles the adventures of a down-at-heel writer/philosopher in post-war London. Encouraged by the immediate success of this initial offering, IM carried on writing and her reputation as a novelist continued to grow, such that in 1963 she was able to retire from teaching philosophy and devote herself exclusively to writing.

Her creative method was highly individual: for up to eight months she would concentrate on carefully working out the cast of characters together with their interrelationships and roles in the plot, before spending six months writing out the text of the book, in longhand, working from beginning to end. To enquiries about progress during the planning stage, she would often reply: "The book is finished. All I have to do now is write

it."[2] She never used a typewriter, and never owned a computer. There is no evidence that she agonised over choice of words or made extensive use of dictionaries or thesauri, and an examination of her handwritten manuscript pages confirms that she seldom indulged in large-scale or repeated revisions of passages. Her publishers would be sent longhand manuscripts, which they often complained they could not read, but she eschewed any editorial interference. In consequence, and as illustrated in the manuscript and published versions of a passage from chapter 17 of IM's 1956 novel *The Flight from the Enchanter* reproduced in Figure 1, the texts that appear on the pages of the print editions of her novels are, more or less, identical to the spontaneous output of IM's creative mind.

- Figure 1 near here -

IM's work attracted outstanding critical acclaim. Reviewing *Under the Net* in 1953, Kingsley Amis hailed its author's '...brilliant talent.' Three years later, *The Flight from the Enchanter* was praised for its '...double and deceptive quality: crystal clear, but reflecting darkness.' *The Nice and the Good* (1968) was shortlisted for the Booker Prize in 1969, as were *The Black Prince* (1973), *The Sea, The Sea* (the 1978 winner), *The Good Apprentice* (1985), and *The Book and the Brotherhood* (1987). In 1987, IM was created Dame Commander of the British Empire in recognition of her contribution to British literary life.

Over the following decade (1987-97), IM produced two philosophical works - *Metaphysics as a Guide to Morals* (1992) and *Existentialists and Mystics* (1997) - as well as three further novels, the last of which (*Jackson's Dilemma*) came out in 1995. *Jackson's Dilemma* tells of the lives and love affairs of a group of friends, with the manservant Jackson

[2] John Bailey – personal communication.

as a shadowy, behind-the-scenes protagonist. The novel was received 'respectfully' but without enthusiasm, and IM would later reveal that she had been dogged by an intense and distressing 'writer's block' while working on it. A year earlier, she had become uncharacteristically inarticulate while taking part in an unscripted question-and-answer session about her work at a conference (Bayley, 1998), and diary entries from as early as 1993 are noted by her biographer as already being reduced to 'heart-rending simplicity' (Conradi, 2001).

As is often the case in more conventional clinical situations, the possible significance of these changes went unremarked until much later. Yet in retrospect, they can be seen as deeply ominous, clearly presaging the later decline in her intellectual abilities. She did undergo a specialist review at the Radcliffe Infirmary, Oxford, where she was reassured that there was nothing wrong, but her difficulties, particularly with words, persisted. A diagnosis of probable Alzheimer's disease was made after a further clinical assessment by JRH who found her to be profoundly amnesic as well as significantly anomic. JRH and KP assessed her again in November 1996 and June 1997, her condition deteriorating markedly even over this seven-month interval: in early November 1996, she achieved 20/30 on the Mini Mental State Examination (Folstein et al., 1975), with points lost mainly on tests of attention and orientation. By the following summer, she could identify her surroundings only by the name of the city (Oxford), was unable to perform serial subtraction or reverse spelling, and could register but not recall a three-item word-list, yielding a mini-mental score of 10/30.

The controversially candid three-volume memoir written by her husband, John Bayley, describes IM's rapid decline into dependency over the following year, her need for increasing supervision and her fascination with children's daytime television. The final weeks of her life were spent in an Oxford nursing home, where she '...declined food and drink for some time' before her death on February 8th, 1999.

IM had granted permission for her brain to be examined by a pathologist after death, and changes characteristic of Alzheimer's disease were shown to be both present and widespread, confirming that the clinical diagnosis made during life had been correct. The pathologist's report is reproduced in full in Figure 2.

- Figure 2 near here -

How did you first realise that this case was interesting?

When *Jackson's Dilemma* was first published in 1995, many readers (ourselves included) found the experience of reading it less than satisfactory. It was clearly different from any of IM's earlier works: admittedly, its characters were true to type in their detachment from the inconveniences of life and their capacity for prolix discussions about love and metaphysics, but the world in which they moved seemed immaterial and unconvincing, while the narrative was simple almost to the point of banality. The critics showed a similar lack of enthusiasm. Even though many of them were Murdoch's contemporaries, admirers and friends, most managed to remain vague enough to preserve a fitting respectfulness. A.S. Byatt, for instance, compared the structure of the novel to '… an Indian Rope Trick … in which all the people have no selves and therefore there is no story and no novel', while Penelope Fitzgerald noted that the economy of the writing made it appear '… as though Murdoch had let her fiction wear through almost to transparency'. Kate Kellaway found *Jackson's Dilemma* '… not a perfect novel: the narrative itself is, at times, a little distrait: like Jackson [a central character], it often moves with scant explanation'. Hugo Barnacle, though, was more outspoken, comparing the book to '…the work of a 13-year-old schoolgirl who doesn't get out enough'.

IM herself, in a post publication interview for *The Guardian*, described the difficulties that she had experienced while writing the book, claiming that for the first time in her life she

had suffered from ‘writer’s block’, and that these and other unfamiliar difficulties had taken her to a ‘very, very bad, quiet place’ (Coles, 1996).

At the time this interview was published, we were working together at the MRC Cognition and Brain Sciences Unit (CBU) in Cambridge, studying the effects of Alzheimer’s disease and other dementias on the brain’s ability to process different aspects of language. Our colleague, Matt Lambon Ralph, brought a cutting of the interview to one of our Thursday morning research meetings, and pointed out the remarkable similarity between the words IM had used to describe her difficulties, and those often used by patients with early onset dementia when they presented to our clinic for diagnosis. There were a multitude of clues: the hesitancy and lack of confidence in some of her utterances; the generic and repetitive vocabulary; the subtle deviations from syntactic propriety; and most poignantly of all the underlying melancholy in the way she comes across to the reader. The following extracts from the interview are particularly illustrative:

> *Did she find it difficult to live up to her reputation? ‘Well, the books I’ve written in the past I’ve done quite quickly, and known what to do and been geared up by them. But I’m afraid at the moment that I’m just falling, falling... just falling as it were. But I may get better. I hope so’.*
>
> *There is a copy of* Conversations with Isiah Berlin *lying open at her feet. What else is she reading at the moment? ‘Um, well, quite a lot of things, but I haven’t found anything which would be really useful to me. I find I haven’t got anything at the moment, and this is really rather startling to me. I feel as though maybe the whole thing has packed up. But I hope, I really do believe actually, I could get on and find myself in a happier state, but I don’t think so at the very moment. I’m just wandering, I think of things and then they go away forever.’*

and later:

> *'I've slipped out of the university now,' says Iris. 'But I do every day try and collect something or other to myself.' Then she gives me a beautiful, generous smile. 'Your arrival may help me.'*

At the end of the interview, John Bayley confides in the interviewer that:

> *'We've been to see doctors you know and they say the old brain's very crafty. It can come up against a block and for a bit things seem a bit strange, but then it finds its way around these things again.'*

Can you summarise the main features of this case?

IM agreed to be examined at her home in Oxford by a research team from the CBU in November 1996, and soon afterwards travelled to London for a volumetric MRI scan at the Institute of Neurology. The latter revealed established atrophy, with a posterior emphasis and undoubted hippocampal involvement, though - unusually for Alzheimer's - the volume loss was somewhat asymmetric (see Figure 3). The neuropsychological deficits were also highly characteristic of AD: she displayed scant knowledge of current events (a point to which we will return) and had extreme difficulty committing lists of objects to memory. Her copy of the Rey complex figure is shown in Figure 4, and she was unable to reproduce any elements of it from memory. IM was unable to produce the names of many familiar objects and animals when presented with line drawings, her responses suggesting an underlying loss of semantic knowledge, with descriptive or circumlocutory errors (a kangaroo was 'a beautiful creature that jumps'; a squirrel 'a dear little creature'), and deficiencies in attribute knowledge (an owl was 'about 2 feet' in size, and a violin played by having its strings 'picked'). A transcription of IM's Cookie Theft picture description is reproduced in Box 1.

- Figures 3 and 4 near here -

- Box 1 near here -

IM's clinical profile could therefore be summarised as a mixed picture of verbal and nonverbal memory deficits coupled with profound semantic and visuospatial impairments – a profile entirely compatible with the early-to-middle stages of an Alzheimer type dementia. In itself, this was an unexceptionable presentation of a common disease, but unlike the majority of patients with the condition, IM also had a detailed and extensive record that reflected her cognitive activity over a period spanning more than four decades of her life. The similarities with the Nun Study (Snowdon et al., 1996, Snowdon et al., 2000) did not escape our attention at the time, nor later when, like the Minnesota sisters, our single case gave permission for her brain to be examined histologically after death. Unlike the Nun Study participants, however, IM had been a prolific writer for the whole duration of her adult life, which meant that we not only had access to large volumes of text from her early thirties, but from the entire lifespan right up to the earliest symptomatic period, including the normally silent 'presymptomatic' phase of the illness, during which the damage caused by plaque and tangle build-up appears to be compensated for by the patient's 'cognitive reserve'.

What was this case's patterns of spared and impaired abilities?

The idea of a detailed analysis of the 'odd-ball' novel *Jackson's Dilemma* arose from the fact that IM's dementia had been diagnosed less than a year after she had finished the work, implying that physical degenerative changes would have been accumulating in her brain throughout the eighteen-month period between conceiving the ideas behind the novel and delivering the finished manuscript to her publisher. It was possible, therefore, that by subjecting the language of the book to the same kinds of analyses as we had been using in

Cambridge to examine the breakdown of speech in patients with early Alzheimer's disease, we might reveal similar changes in the writing. If these changes were to appear, then the much-discussed 'unusual character' of the work would be open to fresh interpretation. Furthermore, if it were to be informative, the retrospective language analysis technique might also prove useful to the problem of how to study the elusive "silent" presymptomatic phase of early Alzheimer's disease.

Alzheimer's sufferers experience linguistic difficulties in both spoken and written modalities (Forbes et al., 2004). Although there are obvious differences between these two modes of production – not least the greater degree of cognitive control that is available while writing than while speaking – both ultimately depend on a functioning language system. There had been little previous work on changes in the linguistic aspects of writing in Alzheimer's disease, so it was from studies of spoken discourse that we derived predictions of changes that could also be looked for in written texts. Three major candidate markers emerged: the extent of the vocabulary (how repetitious was the text?); the frequency of the words used (how unusual was the language of the work?); and the syntactic structure of the sentences (how complex were the sentences used to express the ideas of the book?). If the language used in *Jackson's Dilemma* had been influenced by the neurodegenerative process, then a comparison with the findings of identical analyses in a selection of IM's earlier novels would be expected to reveal systematic linguistic changes along one or more of these dimensions.

IM's fiction reached the height of its popularity well before the era of electronic texts, and none of them was commercially available in this format in 2004 when we started to assemble the material for analysis. Approaches to IM's publisher (Chatto & Windus) with requests for the electronic versions used in typesetting some of the texts were unsuccessful, yet in order to carry out our analyses within an acceptable time frame (i.e., weeks, rather than

years), electronic versions of three texts (*Under the Net*, *The Sea The Sea*, and *Jackson's Dilemma*) were essential. Eventually, these were acquired using a document scanner and commercial optical character recognition (OCR) software. The texts in question were chosen as representing not only the early and late phases of IM's writing career, but also the period when she was at the height of her powers, winning the Booker Prize and other public plaudits. In fact, we wondered whether, in addition to a deterioration culminating in *Jackson's Dilemma*, we might also find a *positive* development between IM's early and mid-career writings.

The Concordance software developed by Dr. Rob Watt of the Department of English at the University of Dundee www.concordancesoftware.co.uk proved to be another invaluable electronic tool: one of Concordance's basic functions was the transformation of a text into an alphabetical word-list complete with occurrence counts, line references, and contexts. This made possible the analyses that confirmed many of our predictions: one of the most striking results came from an examination of the rate at which words are re-used. Figure 5 plots the ratio of the total number of words (word tokens) to unique usages (word types) in successive thousand-word chunks of the three texts. A steeper curve indicates a greater number of types-per-token, and thus a more innovative, less repetitive use of vocabulary. Clearly, given that the number of words available in a language is finite (English contains an estimated quarter of a million word types), all texts will eventually have to 'recycle' words at some point, resulting in an inevitable flattening of its token-to-type ratio. The location of this point in a text will, however, depend on its lexical variety, and the figure clearly illustrates that it is reached earlier in *Jackson's Dilemma*, and later in *The Sea, The Sea* than in *Under the Net*. The technique thus accurately reflects an enrichment of IM's repertoire over the first two and a half decades of her writing career, and an impoverishment at the end of it.

- Figure 5 near here -

A similar pattern emerged when we looked at the lexical frequency (usages per million words in samples of written and spoken language) of the vocabulary of the three books: *Jackson's Dilemma* was associated with the highest overall frequency of usage, and *The Sea, The Sea* with the lowest, suggesting that the unusual (low frequency) words had become less easily available while IM was writing her last novel – a well-established phenomenon in studies of spoken language in patients with Alzheimer's disease. In contrast, syntactic complexity (which was modelled using sentence length, clause length, and short-range repetition of grammatical function words) showed little or no variation. This pattern fits with some (though not all) previous studies of the syntactic aspects of language in early Alzheimer's disease. Differences may have been undetectable in our analyses because we could not implement the comparisons on as large as scale as we were able to do with the lexical measures. Le et al. (2011) and Pakhomov et al. (2011) later revisited the question of change at a syntactic level, modelling the emergence of differences across a larger selection of texts using diachronic computational methods. Both later studies did identify changes in grammatical complexity, while Le et al. also claimed to have found similar effects in the later works of another prolific 20th century novelist, Agatha Christie.

Do you think this case contributes to our understanding of how the normal mind works?

Alzheimer's disease is a progressive condition caused by the accumulation of toxic protein species that affect the structure of nerve cells and their interconnections, leading to their eventual destruction. Once this degenerative process is established it is impossible to stop, let alone to reverse, and its cumulative effect over time is thus characterised by a progressive disappearance of neuronal elements, shrinkage of brain substance, and gradual erosion of the

intellectual abilities of the sufferer. Visible changes in behaviour and performance lag to a variable extent behind the onset of pathological change in the brain. This is because, like many other organs of the body, the brain has a reserve capacity built into it, meaning that information processing can continue at a constant level even after a proportion of the brain's physical constituents have been destroyed. It follows, therefore, that the beginnings of the destructive process caused by Alzheimer's disease will always predate the onset of intellectual difficulty. The length of this lead-time is almost certainly variable and, for obvious reasons, difficult to determine. Some investigators have argued that it may extend back over years, or even decades (Ohm et al., 1995). More recently, evidence has begun to emerge that intellectual activity and/or occupational complexity may help to lengthen the silent, early phase of the disease, and thus delay the devastating effects of neural degeneration on patients and their families (the "cognitive reserve" hypothesis). (Alladi et al., 2013, Boots et al., 2015) A lifetime of thinking, teaching, and writing creatively about the most profound and difficult questions that can be asked concerning human existence, must surely have qualified IM to have benefited from this sort of 'protective' effect.

Do you think that there is anything unique that the report of this case added to our knowledge?

From a literary perspective, the changes that we found in *Jackson's Dilemma* showed that similar effects can certainly be sought in the writings of other authors. Those who were known to have suffered from neurodegenerative disease would be expected to show similar profiles, while others who died with all cognitive faculties intact should perhaps present a pattern of initial development that more closely resembles the findings from the first half of IM's career. As already noted, Le et al. (2011) documented analogous changes in the written output of Agatha Christie, supporting the long-held suspicion that her later years (and later

works) were affected by cognitive decline. Le et al. also studied the writings of PD James who was still alive at the time and was not known to show signs of cognitive impairment. The absence of any change in the PD James corpus thus provides further support for the status of written language as a potential early disease biomarker. To determine whether the same changes might also be detected in the casual, unpublished writings of people who wrote for pleasure or out of necessity, rather than as a profession, PG was awarded grant funding by the Medical Research Council to develop the 'Cognitive Archaeology' project, to collect, archive, digitise and analyse informal writings (mainly letters and diaries). The project aimed to scale up the approaches used in the IM project for application to much larger and diverse datasets. Results of a preliminary survey of a set of 80 digital text archives, each spanning between 2 and 3 decades of an individual's life, is expected to be published in late 2017 or early 2018.

Can you specify why this case was relevant in relation to the knowledge at the time and would she still be relevant to the knowledge of today?

In 2004, the quest for inexpensive, easily detectable dementia biomarkers was just gaining momentum. Another 'Holy Grail' of the time was a means of detecting the emergence of the earliest stages of Alzheimer's and other degenerative dementias. It was, and remains, axiomatic that the most desirable time for 'switching off' progression of the condition with disease modifying agents is while symptoms are still at a mild stage. Indeed, this was what motivated the first formal definition of the syndrome of mild cognitive impairment (Petersen et al., 1999) and its subsequent refinements (Dubois et al., 2007).

It is certainly arguable that the case has even more relevance to today's state of knowledge. As the decade of smartphone apps, online shopping, Twitter, Facebook and the gig economy draws to a close, the search for value in big data is in danger of becoming the

new gold rush. The data on offer in the form of recorded language are among the most potentially valuable of all, with information about the affective state, consumer preferences, opinions and political allegiances of millions of people waiting to be unlocked (Garrard & Elvevag, 2014). Seen in this context, a corpus the size of IM's written work (an estimated 5 million words) is a data miner's dream, with the potential not only to reveal correlations between linguistic and cognitive change, but to support the rapid evaluation of new computational approaches to analysis in 'real world' material. If, in the coming decade, patients in dementia disease modifying drug trials can be regularly monitored for progression using a composite of measurements made on samples of spoken language (a sort of 'mental blood test'), perhaps obtained through the medium of an 'intelligent personal assistant'; and if, as a result, the duration of such trials shortens, and increasingly effective treatments begin to be licensed sooner, a small part of the credit will remain due to IM and her novels.

Were there any relevant data that you did not manage to publish on this case?

The late 1990s were an exciting time to be working in the dementia research group at the MRC Cognition and Brain Sciences Unit in Cambridge. Not only were we seeing patients with unusual constellations of deficits and game-changing neuropathological lesions, but we also had frequent opportunities to construct and administer bespoke cognitive assessments designed to probe areas of special relevance to individual cases. IM was one of these: we wondered whether memory for the products of one's own imagination could represent a unique type of material, on which performance might well differ from that observed using more conventional materials, such as words, stories and faces.

There is a scene in Richard Eyre's 2001 film *Iris* about IM's life, in which the heroine – still in the relatively early stages of her illness – is seen watching Tony Blair deliver his 1996 party conference speech. As Blair rhetorically asks what are his three main priorities for

government, and answers himself with the phrase ‘education, education and education’, IM turns haplessly to her husband John Bayley and asks, ‘Why does he keep saying that?’

There is evidence both from John Bayley’s account and from our own clinical assessment that IM did indeed have severe problems with this kind of material. The Addenbrooke’s Cognitive Examination (Mathuranath et al., 2000) that was administered on 16/06/1996 included four ‘Retrograde Memory’ questions: the names of the current and previous Prime Ministers, the leader of the opposition and the American President. When we asked her the name of the Prime Minister, IM thought for a bit, then said ‘I don’t know’; but then reassured us ‘It’s all right, someone will know’. Later, we showed her a series of 106 pictures of faces, half of which were famous and half not. We first asked if the face looked famous, or familiar to her. If she said no, we moved on to the next face. If she said yes, we asked for the person’s name. If she could not name the person (which was almost always the case) we asked why the person was famous.

IM’s famous/not famous judgements were impaired, though well above chance level: 74% of the 53 famous faces were identified as famous, and 83% of the anonymous ones as not famous. By contrast, her ability to name famous faces was almost non-existent: fully correct responses were given only to pictures of the Queen and Hitler; the Queen Mother (still alive then) was named as ‘The Queen’, Prince Charles as ‘Prince’ and when prompted (‘Prince of what?’) ‘Prince of Wales’. In some cases, she could provide a plausible approximation, such as ‘The king of the other side of the world’ for Bill Clinton (who was US President at the time) and ‘The top of the… he’s running England’ for John Major (who was still the Prime Minister).

Sometimes she would give the impression of knowing more than she could say. For example, to a picture of Boris Yeltsin, she said ‘a very powerful person’ but answered a probe question (‘Where is he powerful?’) incorrectly - ‘America’. Another example was

Marilyn Monroe, whom she described as being ‘in the theatre, she was very famous. I’d know her name if I heard it’. Yet when KP probed with ‘Greta Garbo?’ IM responded ‘YES!’ as though that was the name she had been thinking of all along.

Instead of trying to name the person, IM would sometimes volunteer information about either their nationality or profession, both of which could sometimes be right (John F Kennedy: ‘American’; David Steel: ‘in England’; Luciano Pavarotti: ‘something in the theatre) but just as likely to be wrong (Duke of Edinburgh: ‘He’s an American, he has a jolly time in America’; George Bush: ‘He’s a splendid chap and able to do lots of things; he’s English’; Norman Lamont: ‘On the stage’; Albert Einstein: ‘In the theatre’).

We wondered whether retrograde memory of the titles of and characters from her own books might show a contrasting preservation. KP therefore devised two tests of ‘Iris Murdoch literary knowledge’ and administered them in April 1997. The first was a two-alternative forced choice between the title of one of her books and a similar-sounding title of a real 20th century book written by someone else: e.g., ‘The Unicorn’ [Iris Murdoch, 1963] vs. ‘The Waves’ [Virginia Woolf, 1931]. To the question ‘which of these two books did you write?’ IM scored 25 out of 29, making a single incorrect choice, and responding ‘I don’t know’ or ‘both’ to the remaining three. In the second test, IM was presented with the title of one of her novels, together with the names of two of her fictional main characters – one from the book shown, and the other from one of her other 28 novels. On this latter test, IM made only 12 out of 18 correct choices, many of them after long deliberation. In contrast, her husband rapidly made 17 correct selections. When the year of the book was taken into consideration, no effect of chronology was evident.

What are the short comings of this case?

However clear-cut the differences that we detected in IM's texts, it goes without saying that examining data from only three time points in a series spanning more than forty years meant that several opportunities were necessarily missed. The most important was the ability to look for the point in the series where critical variables began to turn from the levels that they had reached during the writing of *The Sea, The Sea* towards those documented in the final work. To have found evidence of a monotonic change in language characteristics beginning even before the subtlest and earliest behavioural manifestations would have been a stunning discovery. Change point analysis (Taylor, 2000) provides a statistically robust method for detecting changes in time series of this nature, and could have been implemented had the required volume of data been acquired. Later studies (such as those of Le et al. and Pakhomov et al., both cited above) were based on larger numbers of text samples, but both faced the same difficulties in acquiring the data accurately in digital format. Acquisition of the texts of all the novels was gradually completed using OCR between 2004 and 2007 by a series of temporary research assistants and interns working with PG at the Institute of Cognitive Science, but the painstaking task of error checking and standardisation is still only around 70% accomplished.

The other major shortcoming concerns the fact that the critical changes in IM's language were only demonstrated using an internal comparison (i.e., with IM's *own* language from other points in her life as a control sample). Although subsequent studies have demonstrated that the effects in question are seen in other writers affected by late-life cognitive disorders and absent from those who remain (ostensibly) cognitively intact throughout life (Van Velzen & Garrard, 2008, Le et al., 2011), the findings are still open to the explanation – which is either more or less prosaic, depending on your point of view – that

the structure and properties of *Jackson's Dilemma* resulted from a deliberate decision on IM's part: a stylistic experimentation in novelistic form.

The Murdoch scholar Richard Todd put forward a reasoned case for such a literary interpretation, though he emphasised narrative rather than lexical aspects of the text, and showed that in places there appeared to be confusion about the temporal order of events and the authorial point of view (Todd, 2006). For example, at the beginning of *Jackson's Dilemma*, the author assumes the voice of the 'omniscient narrator', only to violate its assumptions briefly at least once in what follows. Todd argues (correctly) that it is unwise to conclude too hastily that such inconsistencies reflect IM's mental state at the time of writing, even if they were unprecedented in the whole of her preceding literary output. As Garrard (2010) pointed out, however, the changes found in IM's writing were exactly those predicted from aspects of language and cognitive function known to be vulnerable in AD. It remains possible, if unlikely, that this was coincidence, but a far greater one would have been that IM chose consciously to mimic the characteristics of a condition that she was unaware of having.

Do you remember whether there were any issues that reviewers were particularly blunt about?

Two anonymous referees reviewed the first version of the original manuscript for the editor of Brain. In this version, we had confined ourselves to the comparison between *Under the Net* and *Jackson's Dilemma*, which had revealed the striking differences outlined above. The reviewers, however, highlighted the confound between natural stylistic development and the effects of early Alzheimer's disease on the differences between IM's first and last novels as the major shortcoming of the study. One reviewer explicitly suggested that adding a novel written at the height of her career to create a three-way analysis would provide a more credible longitudinal dimension, as well as making the time-course of IM's writing career

somewhat easier to appreciate. We therefore rapidly acquired and cleaned a digital text of *The Sea, the Sea*, which we then subjected to the analyses that had been set up for the two-book comparison.

Are there any assessments/paradigms that you would administer now to this case if she was available?

One of the things that make IM unique as a single case is that she *is* still available: as long as her books remain accessible in some form, the products of her cognition will enable assessment by any researcher with ideas about the nature and time course of language change in Alzheimer's disease. Follow-up studies have indeed replicated and expanded on our original findings and sampled across larger numbers of texts from the entire duration of her writing career. The idea has also prompted application of the same textual analytic approach when large longitudinal samples of written discourse have been available from patients with other neurodegenerative syndromes.

You first reported this case in 2005. Do you think this case is still informative now? Are we now better able to interpret her pattern of spared and impaired abilities? If so, in what way?

It turns out that *Jackson's Dilemma* was not IM's final work after all. A couple of years ago, PG came across an archived BBC Radio broadcast by John Bailey's former undergraduate pupil and lifelong friend of IM, the novelist A.N. Wilson. Wilson had spent a great deal of time with IM both before and after she had received her clinical diagnosis, while she laboured over the completion of her collected of literary and philosophical essays entitled *Existentialists and Mystics*. Wilson said that she spent a full two years 'writing and rewriting that bloody book' and that it was the effort that 'precipitated her dementia; although' he

added ‘no doctor would agree with me’. So if it can be established which sections of *Existentialists and Mystics* she was working on during the years immediately before and immediately after Alzheimer’s was diagnosed, it should be possible to: i) trace a progression in the changes observed in *Jackson’s Dilemma* (thus putting the relationship between these changes and the effects of the disease beyond reasonable doubt); and ii) identify other markers that may have been difficult to detect at earlier stages of the disease, and then go back to measure these same variables in pre-dementia texts.

We are now living in an era where ethics committees would like to foresee every step. How much serendipity was involved in your assessment?

The manner in which we learned about IM’s early symptoms (i.e., via a newspaper interview) could scarcely have been more serendipitous, nor could the timing of our initial invitation to her to take part in our research, during a period (often, sadly, a long one) when she was still in ‘diagnostic limbo’. It was also perhaps serendipitous that IM and her husband were both professional academics, steeped in learning, and with a deep-rooted love of scholarship. They seemed to understand instinctively the importance of scientific research into IM’s condition, so it was perhaps not surprising that they both agreed so readily to participate in testing and scanning experiments, even travelling to London on one occasion to take part in structural MR imaging sessions at the Institute of Neurology. When, after IM’s death, JRH wrote briefly to John Bailey to ask whether he would have any objections to a systematic examination of his late wife’s texts and potential disclosure of details of her condition, he replied [emphases preserved from the original]:

Dear Dr Hodges – John that is – apologies!

Of course I should be only too pleased for you to include all the personal data on Iris you find useful. (That is a V. interesting point about Jackson's Dilemma. *I find it very moving but strange in many ways. I'm sure Peter Garrard will find some interesting things there.)*

After the paper was published, we sent a copy to Professor Bailey and he wrote back expressing great interest in meeting PG at his house in Charlbury Road, Oxford. I recall sitting opposite him at the large kitchen table, on which back issues of the Times Literary Supplement and pieces of junk mail served as coasters and writing surfaces. I vividly remember as he explained to me why Henry James would have found our work *particularly* fascinating, and showed me numerous piles of pebbles and sticks, which he and Iris had collected over a lifetime of Oxfordshire walks and never, at Iris's insistence, thrown away. What startled me the most, however, was his deep, almost morbid interest in his wife's condition: his fascination with the MR images displayed in the copy of the paper, but most of all his earnest request to set eyes on the histology slides that we described in the case history. I think I muttered something about 'looking into that' but never followed it up.

References

Alladi, S., Bak, T.H., Duggirala, V., Surampudi, B., Shailaja, M., Shukla, A.K., Chaudhuri, J.R., & Kaul, S. (2013). Bilingualism delays age at onset of dementia, independent of education and immigration status. *Neurology, 81,* 1938-1944.

Bayley, J. (1998). *Iris: A Memoir of Iris Murdoch*. London: Gerald Duckworth & Co. Ltd.

Boots, E.A., Schultz, S.A., Almeida, R.P., Oh, J.M., Koscik, R.L., Dowling, M.N., Gallagher, C.L., Carlsson, C.M., Rowley, H.A., Bendlin, B.B., Asthana, S., Sager, M.A., Hermann, B.P., Johnson, S.C., & Okonkwo, O.C. (2015). Occupational Complexity and Cognitive Reserve in a Middle-Aged Cohort at Risk for Alzheimer's Disease. *Archives of Clinical Neuropsychogy, 30,* 634-642.

Coles, J. (1996). Duet in Perfect Harmony. In: The Guardian.

Conradi, P. (2001). *Iris Murdoch - A Life*. New York: W.W. Norton & Company, Inc.

Dubois, B., Feldman, H.H., Jacova, C., Dekosky, S.T., Barberger-Gateau, P., Cummings, J., Delocourte, A., Galasko, D., Gauthier, S., Jicha, G., Meguro, K., O'Brien, J., Pasquier, F., Robert, P., Rossor, M., Solloway, S., Stern, Y., Visser, P.J., & Scheltens, .P (2007). Research criteria for the diagnosis of Alzheimer"s disease: revising the NINCDS-ADRDA criteria. *Lancet Neurology, 6,* 734-746.

Forbes, K.E., Shanks, M.F., & Venneri, A. (2004). The evolution of dysgraphia in Alzheimer's disease. *Brain Research Bulletin, 63,* 19-24.

Garrard, P. (2010). Literature, history and biology. *The Psychologist, 23,* 2-3.

Garrard, P., & Elvevag, B. (2014). Language, computers and cognitive neuroscience. *Cortex, 55,* 1-4.

Le, X., Lancashire, I., Hirst, G., & Jokel, R. (2011). Longitudinal detection of dementia through lexical and syntactic changes in writing: a case study of three British novelists. *Literary and Linguistic Computing, 26,* 435-461.

Mathuranath, P.S., Nestor, P.J., Berrios, G.E., Rakowicz, W., & Hodges, J.R. (2000). A brief cognitive test battery to differentiate Alzheimer's disease and frontotemporal dementia. *Neurology, 55,* 1613-1620.

Ohm, T.G., Muller, H., Braak, H., & Bohl, J. (1995). Close-Meshed Prevalence Rates of Different Stages as a Tool to Uncover the Rate of Alzheimers Disease-Related Neurofibrillary Changes. *Neuroscience, 64,* 209-217.

Pakhomov, S., Chacon, D., Wicklund, M., & Gundel, J. (2011). Computerized assessment of syntactic complexity in Alzheimer's disease: a case study of Iris Murdoch's writing. *Behavioural Research Methods, 43,* 136-144.

Petersen, R.C., Smith, G.E., Waring, S.C., Ivnik, R.J., Tangalos, E.G., & Kokmen, E. (1999). Mild cognitive impairment: clinical characterization and outcome. *Archives of Neurology, 56,* 303-308.

Snowdon, D.A., Greiner, L.H., & Markesbery, W.R. (2000). Linguistic ability in early life and the neuropathology of Alzheimer's disease and cerebrovascular disease - Findings from the nun study. *Vascular Factors in Alzheimer's Disease, 903,* 34-38.

Snowdon, D.A., Kemper, S.J., Mortimer, J.A., Greiner, L.H., Wekstein, D.R., & Markesbery, W.R. (1996). Linguistic ability in early life and cognitive function and Alzheimer's disease in late life - Findings from the Nun Study. *Jama - Journal of the American Medical Association, 275,* 528-532.

Taylor, W. (2000). *Change-Point Analyzer 2.0 shareware program.* Libertyville, Ill: Taylor Enterprises.

Todd, R. (2006). *What is Jackson's Dilemma?* In: Third International Iris Murdoch Conference, University of Kingston.

Van Velzen, M., & Garrard, P. (2008). From hindsight to insight - retrospective analysis of language written by a renowned Alzheimer's patient. *Interdisciplinary Science Reviews, 33,* 278-286.

Wilson, A.N. (2004). *Iris Murdoch As I Knew Her*. London: Arrow Books.

Figure Legends

Figure 1: Manuscript (left) and print (Penguin edition) versions of a passage from *The Flight from the Enchanter* (1956), illustrating the finality of the former in the creative process.

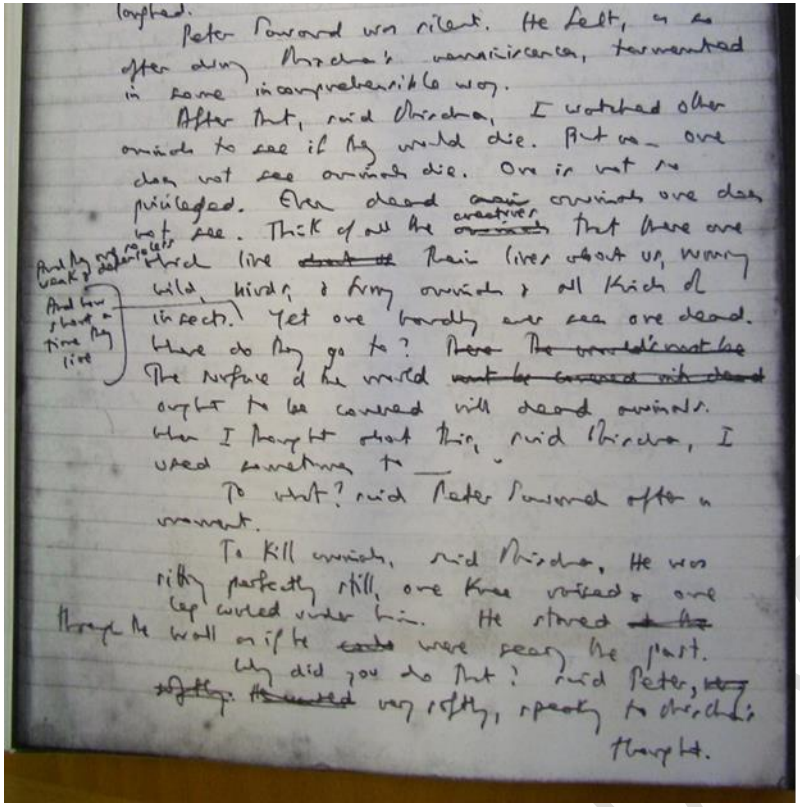
Figure 2: Neuropathology report of IM's brain

Figure 3: Sample T1-weighted images from IM's MRI (left hemisphere on right) showing bilateral hippocampal atrophy, moderate to severe global volume loss, with a temporal and parietal predominance.

Figure 4: IM's Rey figure copy during a testing session on November 4th, 1996.

Figure 5: Proportions of word types (*y*-axis) to word tokens (*x*-axis) at 10^3 word intervals in the texts of *Under the Net, The Sea, The Sea* and *Jackson's Dilemma*.

Figure 1



Peter Saward was silent. He felt, as he so frequently did during Mischa's reminiscences, tormented in some incomprehensible way.

'After that,' said Mischa, 'I watched other animals to see if they would die. But no – one does not see animals die. One is not so privileged. Even dead animals one does not see. Think of all the creatures that there are which live their lives about us, birds and animals and all kinds of insects. Helpless creatures and who do not live for long. Yet one hardly ever sees one dead. Where do they go to? The surface of the world ought to be covered with dead animals. When I thought about this,' said Mischa, 'I used sometimes to – '

'To what?' said Peter Saward after a moment.

'To kill animals,' said Mischa. He was sitting perfectly still, one knee raised and one leg curled under him. He stared through the wall as if he were seeing the past.

'Why did you do that?' asked Peter, very softly, speaking to Mischa's thought.

Courtesy of Kingston University Library

Figure 2

NEUROPATHOLOGY REPORT

Surname:	MURDOCH	Forename:	Iris
Age/dob:	15/7/19	Died:	8/2/99
Sex:	Female	BB Ref. No:	JH60
PM No:		Date reported:	19th August 1999

MACROSCOPICAL EXAMINATION.

Specimen consists of the formalin fixed cerebral hemisphere, brain stem and the cerebellar hemisphere. Together this weighed 1038g. The left cerebral hemisphere length is 15.5 cms. Brainstem length is 5 cms from posterior commissure to obex. Normal pia arachnoid. Blood vessels at base of cerebral hemisphere are thin walled and patent, except for mild patchy atherosclerosis in the internal carotid artery and basilar artery. This atherosclerosis does not produce more than 20% narrowing.

External surface of cerebral hemisphere shows only a mild degree of cerebral gyral atrophy, which is particularly obvious and reaches a moderate degree in the temporal lobes bilaterally. The brain stem and cerebellar hemisphere are normally proportioned with no external abnormality. The cranial nerves are normally present.

The left hemisphere, right cerebellar hemisphere and left brain stem are serially sectioned. Coronal slices of cerebral hemisphere confirm the mild degree of cortical atrophy with accentuation in the temporal lobes. The amygdala and entorhinal cortex and hippocampus show a moderate degree of atrophy. The lateral ventricles are mildly dilated including the inferior horn. The basal ganglia and thalamus are normal in size and show no focal pathology. There is no significant reduction in central white matter.

Transverse sections through the hemi-brainstem show normally pigmented substantia nigra. The locus coeruleus is moderately pale but still identifiable. Otherwise, the nuclear and fibre tract pattern throughout the length of the hemi-brainstem is normal and there is no focal pathology. Slices through the cerebellar hemisphere show normal cerebellar cortex, white matter and dentate nucleus.

CONCLUSION

The macroscopic appearance is consistent with Alzheimer's disease. Microscopic examination is necessary to establish specific pathological changes. A supplementary report will follow.

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Cambridge Brainbank Laboratory

Figure 3

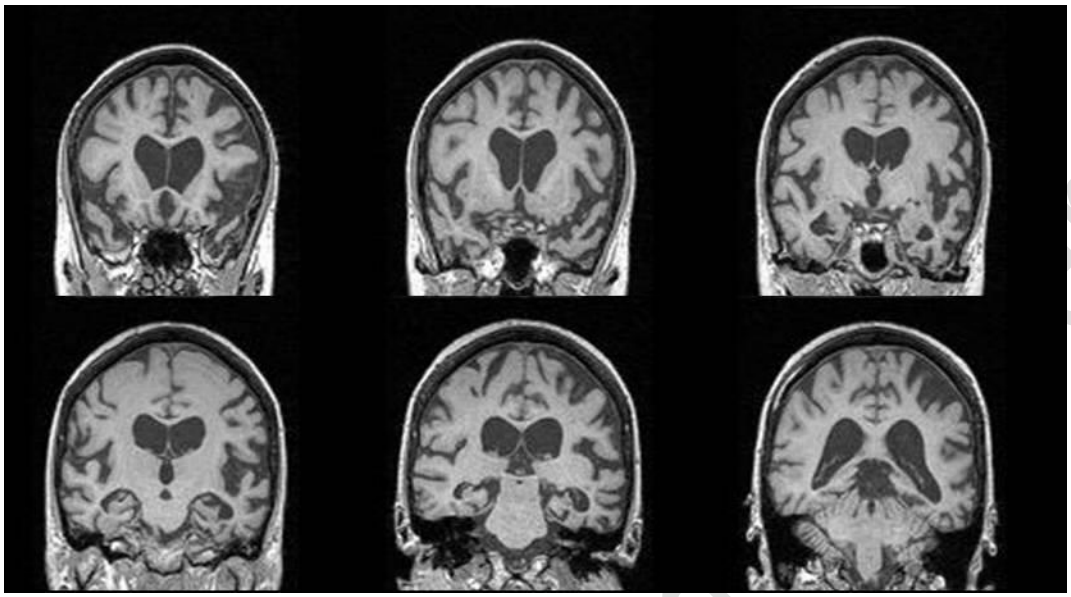


Figure 4

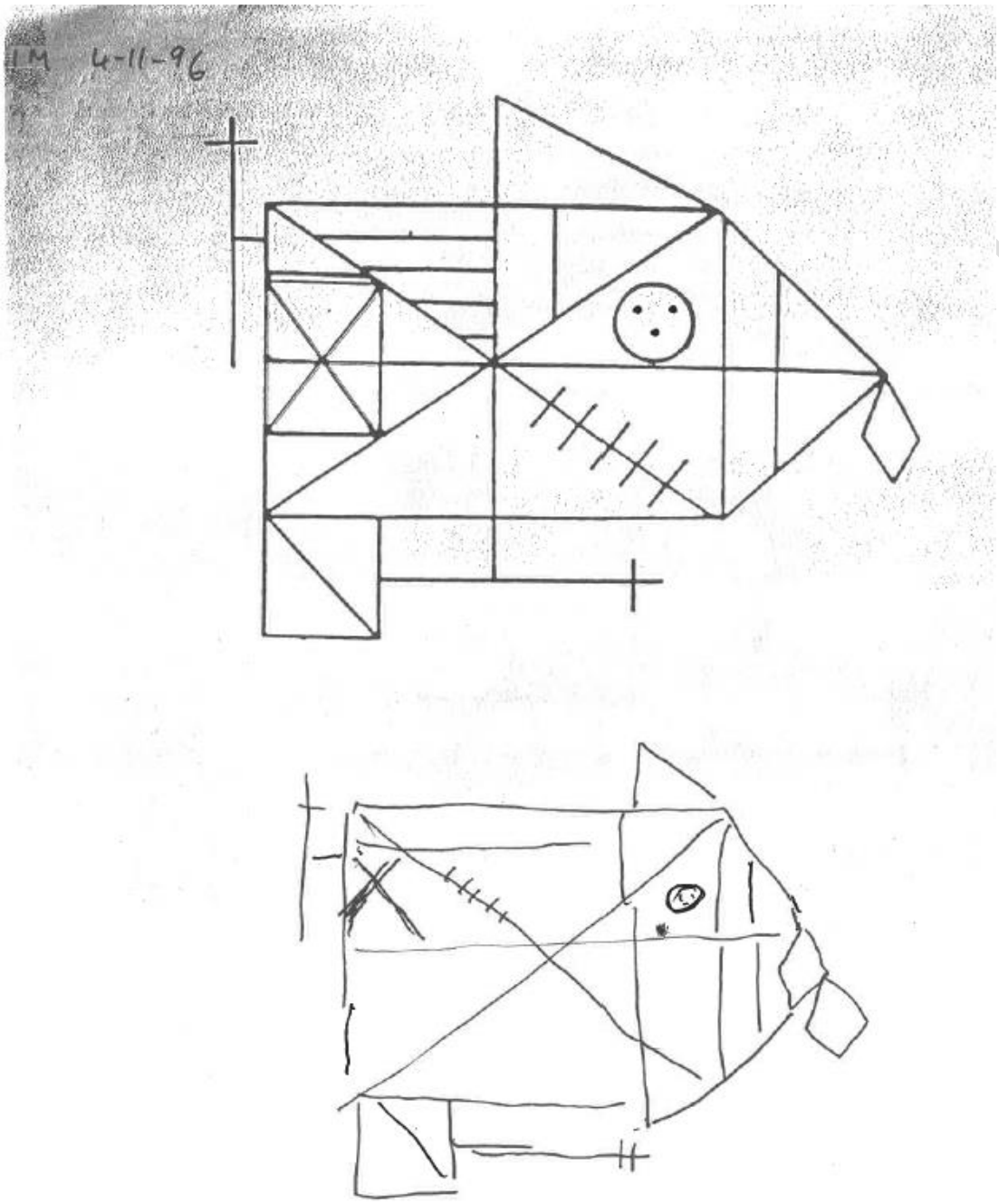
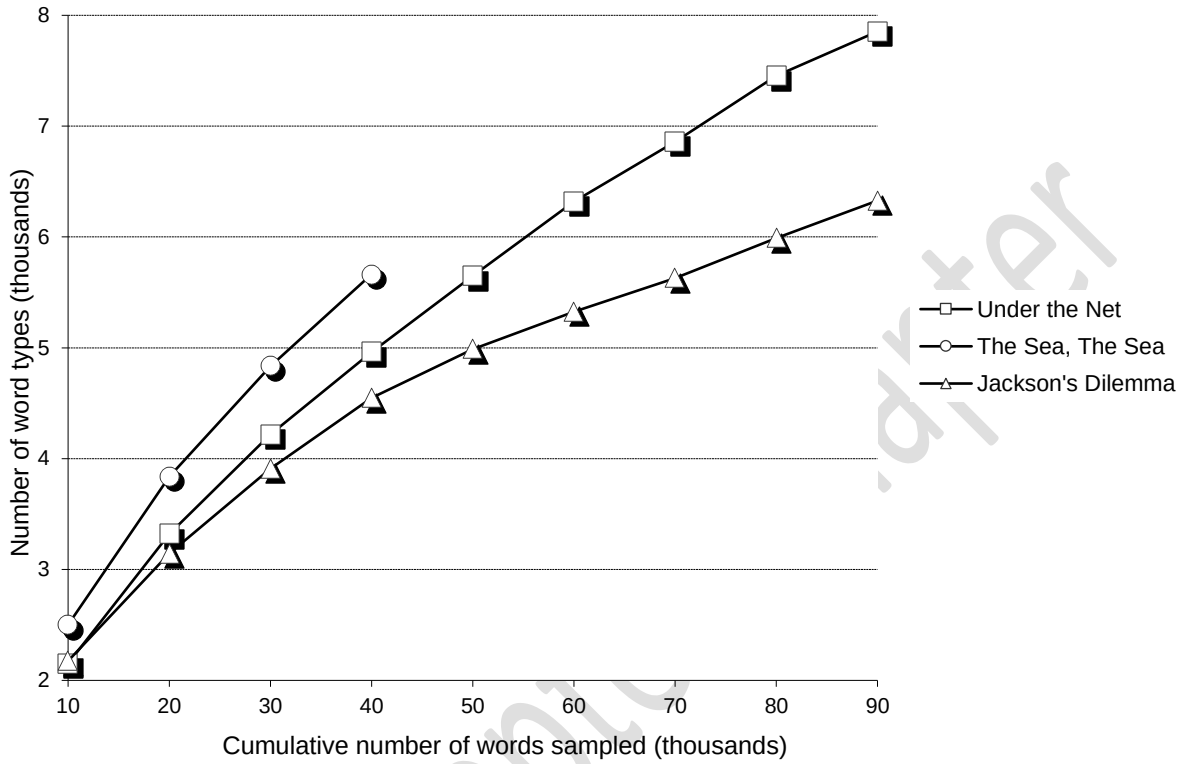


Figure 5



Box 1

The little girl is looking up to her brother. She holds up her left hand and puts her other hand into her mouth to help him. The boy had picked up ... a cookie or something – says so on the jar. Going to give it to the girl balancing in an [illegible] way. The girl is just holding a plate and various pieces of ... well ... something useful. Standing at a window. Whether the window is open is not quite clear to me. The thing where the water is running out. The girl doesn't bother. The window is open. Plate and two cups.