

## Reflection Statement

*Down down down into the darkness of the grave...*

*Quietly they go, the intelligent, the witty, the brave.*

*If a woman's dance is mathematics,*

*Must she dance alone?*

JoAnne Growney, *My Dance is Mathematics*<sup>1</sup>

My Major Work, *Down the Rabbit Hole of Mathematical Literature*, proposes the possibilities of approaching mathematical reasoning through fictional writing. This notion has been explored through an analysis of how language features and symbols have been used in Lewis Carroll's *Alice in Wonderland* to represent the shift in the Victorian mathematical paradigm. Reconsidering the long-standing divide between the worlds of mathematics and literature, I argue that fusing these disciplines could create mathematical literature which would appeal to mathematicians and literary enthusiasts alike.

My dual love for mathematics and English literature inspired my Major Work. As a student undertaking the English Extension I and Mathematics Extension I courses, my subject selections have been met with many a raised eyebrow over the years. When

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<sup>1</sup> JoAnne Growney, *My Dance is Mathematics* (Wilkes-Barre, PA: Paper Kite Press, 2006).

picking my subjects in Year 10, I found that the general consensus amongst my peers, and even some of my teachers, seemed to be that students either have an affinity for mathematics or a talent in the humanities. This attitude was so noticeable that my enrolment in both courses generated some timetabling issues, as they were initially planned to run simultaneously. Although the stereotyping did frustrate me, I soon learnt that I too possessed similar prejudice when my English Extension 1 teacher informed the class that, in our Preliminary year, we would be completing a genre study on fairy tales and their appropriations. Immediately after this announcement, my excitement of being introduced to more challenging texts was substituted by disappointment, as I instead envisioned studying stories of Disney-like proportions. However, after being introduced to genre theory and the postmodernism movement, I quickly developed an appreciation of the malleability of texts. In particular, reading Angela Carter's "*The Bloody Chamber*," a collection of reworked fairy tales - which certainly would not have received Walt Disney's G-Rated approval - taught me that texts are socially, culturally and aesthetically fluid. This understanding was further enhanced when undertaking my English (Advanced) coursework as our comparative study of *The Matrix* and Ray Bradbury's short stories (Preliminary Module A) demonstrated the potential of the worlds of science and the humanities to blend to create texts that appealed to those interested in both fields. This set the groundwork for my appreciation of my HSC English Extension 1 coursework (Module A – Genre, Elective 3: Science Fiction) which, according to the module description found in syllabus, encourages consideration of "the possibilities of the genre for a range of audiences."<sup>2</sup> This got me thinking about the

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<sup>2</sup> Board of Studies, *English Stage 6 Syllabus*, (Sydney: Board of Studies, 2009), 82.

possibilities of merging my love for Mathematics and English to also appeal to a diverse audience. After asking my Mathematics teacher for some suggestions, she recommended looking at Lewis Carroll's *Alice in Wonderland*, as she remembered once reading that it was inspired by his obsession with imaginary numbers. This immediately piqued my interest, and set the foundations for my research.

As a cross-disciplinary investigation, my Major Work appeals to a very diverse audience, ranging from those interested in Victorian literature, absurdist fiction, and children's literature to mathematicians and Lewis Carroll enthusiasts in general. Based on my investigation into form, I could see my Major Work appearing in cross-disciplinary academic journals such as *The Journal of Humanistic Mathematics* which seeks to capture the "human face of mathematics" by emphasising the cultural, literary, aesthetic and sociological scope of mathematics.<sup>3</sup> With its emphasis on highlighting "underrepresentation issues in Mathematics," I believe that the arguments that I raise about the inadequate appreciation of mathematical literature would resonate well with this journal's readership.<sup>4</sup> Also, I believe that my Major Work could be published in hybridised literary journals such as the *Bellingham Review*, as my essay's focus on the convergence of the worlds of mathematics and literature is certainly in tune with the journal's aim to explore works which "nudge the limits of form and genre."<sup>5</sup>

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<sup>3</sup> "About this Journal," *Journal of Humanistic Mathematics*, accessed 1 August 2018, <http://scholarship.claremont.edu/jhm/about.html>

<sup>4</sup> *Ibid*,

<sup>5</sup> "Aims," *Bellingham Review*, accessed 6 August 2018, <http://bhreview.org/general-submissions-guidelines/>.

After determining my investigative focus, I began to look into Carroll's life, his mathematical philosophies and as well as the mathematical paradigm of the Victorian Age. For biographical information, Robin Wilson's *Lewis Carroll in Numberland: His Fantastical Mathematical Logical Life* proved to be an excellent source in expanding my understanding of Carroll's mathematical thinking.<sup>6</sup> Initially, I thought that *Alice in Wonderland* reflected Carroll's fondness of imaginative modes of mathematics; however, Wilson's work shattered this viewpoint, as I learned that Carroll in fact opposed the movement towards mathematical abstractions. In his analysis, Wilson flagged some mathematical principles which perplexed Carroll, including: imaginary number systems, abstract algebra, projective geometry and the quaternions. I was relieved to find that I already had some background knowledge in these areas, as I had studied these concepts in the Preliminary Mathematics Extension I course. However, realising the diversity of my target audience, I understood that I would need to explicitly explain some of the mathematics involved in order to ensure that I did not alienate some readers. After undertaking more research in this area, where I consulted the works and criticisms of mathematicians such as Augustus De Morgan,<sup>7</sup> Victor Poncelet<sup>8</sup> and William Hamilton,<sup>9</sup> I ensured that I provided explanations of the relevant mathematical theorems throughout my work. I also tested the clarity of these explanations by seeing if teachers, who were not from the Mathematics faculty, could understand them. Also,

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<sup>6</sup> Robin Wilson, *Lewis Carroll in Numberland: His Fantastical Mathematical Logical Life*, (New York: W.W. Norton & Company, 2010).

<sup>7</sup> Augustus De Morgan, *Trigonometry and Double Algebra* (London: Taylor, Walton, and Maberly, 1849), 33.

<sup>8</sup> John Mulcahy, *Principles of Modern Geometry with Numerous Applications to Plane and Spherical Figures* (Dublin: Hodges and Smith, 1852)..

<sup>9</sup> Robin Wilson, *Lewis Carroll in Numberland: His Fantastical Mathematical Logical Life*, (New York: W.W. Norton & Company, 2010)

when I started my initial planning, I encountered G. H. Hardy's essay *A Mathematician's Apology*, where he expressed his disappointment that the mathematical community had failed to appreciate the aesthetic and linguistic potential of mathematics.<sup>10</sup> Hardy's views paralleled my own aims in writing this essay, so I decided an ideal way to lead my argument was by citing his work to highlight the history of mathematical literature's underappreciation.

After determining my mathematical focus, I proceeded to read and annotate *Alice in Wonderland*. During this time, I found it difficult to limit my focus, as I was overwhelmed by the fact that there was simply so much to analyse. Reading Melanie Bayley's "*Alice's Adventures in Algebra: Wonderland Solved*," helped to alleviate this concern, as I observed that she limited her investigation to specific chapters – privileging depth over breadth.<sup>11</sup> Noting this structural strength, I adopted the same form for my response, by focussing on the chapters 'Advice from a Caterpillar,' 'The Pig and Pepper,' and 'A Mad Tea Party.' Whilst Bayley's work assisted me with understanding Carroll's mathematical intentions, I still struggled to balance the mathematics with an analysis of language devices and techniques. I consulted other cross-disciplinary works to see how I could manage to strike a balance between the two areas. Christina Quynh-Nhi Nguyen's critical response, '*He kills her in her own humour*,' assisted me with this, as I was able

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<sup>10</sup> G.H. Hardy, *A Mathematician's Apology* (London: Cambridge University Press, 1967).

<sup>11</sup> Melaine Bayley, "Alice's adventures in algebra: Wonderland solved," *New Scientist*, December 16, 2009, <https://www.newscientist.com/article/mg20427391-600-alices-adventures-in-algebra-wonderland-solved/>

to study how she had integrated scientific jargon and concepts within her textual analysis.<sup>12</sup>

I also encountered some issues with my essay's form. When I started writing and submitting drafts for feedback, my teacher noted that my sentence structure was too formulaic. For further assistance, I consulted Brooks Landon's *Building Great Sentences: Exploring the Writer's Craft*, which encouraged me to rethink the way I was writing my paragraphs.<sup>13</sup> Reviving the sentence-oriented approach to studying writing, Landon provided a greater context for how exemplar writings are generated, showing me the importance of varying sentence length in academic writing to allow my ideas to smoothly crescendo. I also wanted to ensure that my work was engaging for both audiences, as sometimes I felt as though the mathematics was overshadowing the textual analysis. Reading Alexander Nazaryan's article, *Why Writers Should Learn Math*, proved to be useful in this respect, as it used humour and analogies to make connections between the literary and mathematical worlds.<sup>14</sup> This article opens with a playful comparison of the similarities of playing football and performing ballet. This inspired me to think of ways that I could draw links between the two disparate fields. One way I endeavoured to achieve this was through comparing Lewis Carroll to an imaginary number, emphasising the fact that like this abstract number system, his existence was seen as something of an impossibility to mathematicians and writers. I

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<sup>12</sup>Christina Quynh-Nhi Nguyen, 'He kills her in her own humour,' in *Young Writers Showcase 16*, (Sydney: NESA, 2017), 207 - 224.

<sup>13</sup> Brooks Landon, *Building Great Sentences: Exploring the Writer's Craft*, (The Teaching Company, 2008).

<sup>14</sup> Alexander Nazaryan, "Why Writers Should Learn Math," *The New Yorker*, November 2, 2012, <https://www.newyorker.com/books/page-turner/why-writers-should-learn-math>.

endeavoured to combine the two fields through my strategic use of headings. To appeal to mathematicians, I used mathematical concepts in my headings by including equations and mathematical analogies, whilst also employing playful alliteration e.g. “The Pig and Pepper and Projective Geometry” to sustain the interest of my literary audience.

Looking back on this journey, I have grown to develop a deep respect for mathematicians and writers who push past boundaries to create innovative works. I have also attained an appreciation of the essay form and certainly the value of fostering time-management skills. My knowledge of mathematical concepts has also expanded and I feel more hopeful about the prospect of moving towards cross-disciplinary studies. I aim for my audience to reassess their stance on the disparity of mathematics and literature, recognising how each field can assist in developing a greater understanding of the other, so that divergent thinkers such as Carroll, G.H Hardy and myself do not feel, in the words of JoAnne Growney, that we need to “dance” alone.

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