Mathematics in Fiction: An Interdisciplinary Course[1]

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Abstract: This article describes my experience in creating and teaching a course on mathematics using works of fiction as the primary texts. The goal of the course was to give the students an appreciation for the beauty, power and significance of mathematics. The methods of the course are both summarized and critiqued.

Keywords: mathematical fiction, interdisciplinary, mathematics, literature

What is it that we try to get across to the students in the mathematics courses we teach? Certainly, one thing is knowledge of a particular mathematical subject, the definitions, techniques, and theorems that make it up. But, there is something more fundamental that I hope to convey as well. I try to get my students to appreciate mathematics as something beautiful, useful and amazing, and I try to get them to understand what it means to say that I do mathematics research. In the end, however, since the grade in the course is based on their ability to answer questions using mathematical facts and techniques alone, I fear that this is all most students get out of the class.

In the Spring of 2002, I taught a very unusual course that I created and hoped would better enable me get these other more impressionist, metamathematical ideas across to the students. Entitled "Mathematics in Fiction" and offered through the Honors Program at the College of Charleston, the course was designed to be somewhere between a humanities course and a mathematics course. In particular, as described in the course proposal that I had submitted the previous year, it was to be a course in which we read and watched works of fiction (plays, movies, novels and short stories) with the purpose of learning about mathematics and its place in our society.

Many non-mathematicians seem surprised by the idea of this class. The marriage of fiction, being a creative art, and mathematics, often perceived as the antithesis, may seem unnatural. However, to those of us who know mathematics well, it too becomes a creative art. Moreover, as I will explain, there is an unexpectedly large body of literature that can be described as "mathematical".

1 Mathematical Fiction and a Website

It was in 1999 when I wrote some book reviews for the *AMS Notices [12, 13]* of a novel and collection of short stories of mathematically oriented fiction that I first became an enthusiast of this particular genre. It is true that the presence of mathematics in a story make it more enjoyable for me due to my interest in mathematics, but there is a more practical side to this study as well. I realized

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that mathematical fiction both reflects and shapes the attitudes of the general public towards mathematics. For instance, notice how much attention the film *A Beautiful Mind [11]* has brought to mathematics, and how it has further blurred the distinction between mathematical ability and mental illness for many who have seen it (cf. *[14]*.

At first, one might think that the number of works of fiction that explicitly discuss mathematics in a non-trivial way must be very small. (I initially expected to find no more than 75 works of this sort.) As it turns out, there are many more than this, and as I locate new examples every month, I believe that I still do not have a good idea of the cardinality of this set. So far, I have "collected" over 300 works of fiction that are listed and reviewed on my Website, the Mathematical Fiction Homepage *[15]*.

This site is visited and utilized by people just "looking for something to read", by mathematics teachers seeking reading to stimulate their students, and by students doing projects for school. According to the counter it has had 46,526 visitors since May 2000. It is a very rare day when I do not receive any e-mail about the site, and I frequently find my mailbox full of suggestions for new works to include, questions about the works that I list, and appreciative thanks from professors, teachers and students.

The diversity of the works in almost every regard is also surprising. They represent a variety of ages, genres, and degree of mathematical sophistication. Visitors to the site can view the list of works by genre (such as the 36 classified as mysteries or the 32 fantasies), chronologically (from 414 BC until the present), alphabetically (by author or by title), and by their mathematical content or quality ratings (determined by votes of the visitors themselves). Almost all of the works listed then include a brief review by myself or one of the many strangers who have helped me out since this project began. These reviews provide information about the role that math plays in the work and links to related Websites as well as summarizing the plot.

So, "mathematical fiction" has turned into a very interesting – and time consuming – hobby for me. But could I turn it into a *class*?

2 The Proposal

In my proposal to the Honors Program, I suggested that in this interdisciplinary class we would read works of fiction, applying the standard techniques of literary criticism, but do so with the goal of answering these questions: *What is mathematics? What do mathematicians do and what is their role in society? What do authors think the answers to these questions are?*

I also suggested that the class would be interdisciplinary in the sense that the students would be free to pursue their own interests and use the techniques from their own area of expertise. For example, I would expect psychology students to be able to discuss questions of a connection between mathematics and insanity as a representative of the field of psychology, I would try to refer questions of historical accuracy in the works which we were reading to the history majors in the class, the many philosophical issues that these works raise would bring us to questions that we might not be able to answer without the assistance of philosophy majors, and so on.

The common readings in the class were all to be made available to the students for free (no textbook purchase required) as PDF files on the College

Library's "Electronic Reserve" system, as were class notes and assignments. (Fortunately, as I was informed by our librarian, for a first time course, we were able to do this legally without having to obtain permissions of the copyright holders.) So, all of the common readings were short (either short stories, plays or excerpts from novels). In addition, the students would read several longer works of mathematical fiction throughout the semester, but they would be free to choose these works on their own, subject to my approval.

Finally, in the proposal, I explained how the grade would be determined from a combination of in-class essays based on the common readings, reports based on the longer works that they read individually, and two mathematics quizzes testing their familiarity with the actual mathematics that we would be learning along the way. In addition, various options were available for extra credit, including writing original mathematical fiction, performing plays in class, finding examples of mathematical fiction which I have not yet added to my list, and writing more reports.

I was pleased and somewhat surprised when the proposal was accepted, and I was given the opportunity to describe the class to a group of honors students as a sort of "advertisement" prior to registration. I honestly feared that there would not be enough interest in the class and that it would consequently be cancelled. Instead, it turns out that the class filled up quickly. The result was a pleasantly diverse class of 20 students including only two mathematics majors, a physics major, a computer science major, and a theater major, as well as several English, philosophy and psychology majors.

3 Reading Sets

The common reading materials for the course were divided into sets by topic. In this section I will briefly describe the reading materials for a few of these sets to give you an idea of the content of the course and as a guideline for anyone else who might consider teaching such a class.

The first readings in the class were designed to show the students how mathematicians *feel* about mathematics. Whereas many non-mathmaticians tend to think of mathematics as cold and unemotional, mathematicians tend to feel very differently about it. This was already apparent in the name I chose for the set: "The Fire in the Equations." (I stole that name from the title of a course on mathematics in science fiction at Dartmouth *[28]*, coincidentally co-taught by College of Charleston graduate Jody Trout.)

One of the readings for this first set was *The Devil and Simon Flagg* by Arthur Porges *[22]*, a short story in which a mathematician challenges the devil to prove or disprove Fermat's Last Theorem. (Obviously, this was written pre-Wiles!) In the end, the devil is unable to prove the theorem and so owes the mathematician fame, fortune and other great rewards. However, he is so caught up in his attempt to prove the theorem that he has completely forgotten about the deal and instead simply wants the mathematician's help to prove a few lemmas. Anyone who has been unable to stop thinking about an intriguing mathematical problem can immediately identify with the devil in this situation, but I was hoping that even students who have only thought of mathematics as an emotionless task that they had to complete for school would also be able to empathize. In any case, this was a subject of discussion.

Several of the readings made use of metaphor and analogy to non-mathematical topics in order to convey "the fire in the equations". So, a standing assignment throughout this reading set was for the students to identify and analyze these metaphors. For instance, in *A New Golden Age* by Rudy Rucker *[24]*, a mathematical experience is likened to driving a sports car in a drag race. "What," I asked the students to consider, "could mathematics have in common with this non-mathematical situation?" (The students had several answers, but I remain convinced that Rucker – a mathematician himself – was suggesting that the car and mathematics are both *powerful*.) Perhaps my favorite of the mathematical analogies that we discussed is the description in Alan Lightman's novel *Good Benito [18]* of what it is like to make a mathematical discovery. He compares it to the moon rising from behind a tree on a dark night which at first provides only enough light that you can barely make out the outline of the tree, but eventually allows you to see around you and know where you are.

I wished that there was a story that presented the feeling of an actual discovery that we can consider from a historical as well as fictional perspective. So, I wrote (and we read) a very short story *[16]* that puts you "inside the mind" of James Clerk Maxwell as he discovers and learns to understand the significance of the famous wave equation that bears his name *[19]*. Although I do not really know the situation surrounding this discovery, and it will probably never be possible to know for certain, I have Maxwell anxious because he is keeping dinner guests waiting while he is algebraically manipulating symbols that represent the interaction of electrically charged particles and a magnet. He is just about to stop when he finds that he can manipulate it to reproduce D'Alembert's wave equation. He barely has time to consider the implications, the existence of electromagnetic waves with variable frequency and amplitude and even the possibility of using them to encode sound waves, before he has to stop for dinner. Using nothing but a paper and pen (and his brain, of course), Maxwell discovered the invisible electro-magnetic waves that we use today for sending information via television or radio and for reheating left-overs. We discussed this as an example of using mathematics to learn new things about the real world simply by thinking, and the exciting feeling of discovery that accompanies it.

The most popular of the reading sets was the one on the mathematical idea of "dimension." I prefaced it with an actual mathematical introduction to the subject. It began with a simple example (in terms of a poem guiding us to a "buried treasure" hidden in the room) that developed the idea from the question of "How many different directions do we have to know so that we can identify any point in the room by saying how far we have to go forwards or backwards in that direction to get there from an initial starting point?" Without losing too many of the students, I was able to push this all the way to briefly discussing with them the ideas of higher dimensional spaces in mathematics and physics, including a very simplistic discussion of affine algebraic varieties in 6-dimensional space as well as Kaluza-Klein and "string" theories. We then read about fictional mathematicians experiencing higher (and lower) dimensional spaces in works such as *The Captured Cross-Section* by Miles Breuer *[6]*, *...And He Built a Crooked House* by Robert Heinlein *[10]* and *Message Found in a Copy of Flatland* by Rudy Rucker *[23]*. This set was the high-point of the class as the students seemed to really feel that they were learning to appreciate a new area of mathematics. It sparked many interesting discussions about the idea of "dimension" and the building of a model of (the shadow of) a tesseract.

In contrast, a set of readings that turned out to be very *unpopular* was the readings on the mathematical concept of "infinity". In fact, when I had the students select which topics we should cover in class, the set on infinity received the most votes. However, it seems that it was too difficult for many of the students to follow the mathematical themes. To begin with, we learned a little bit about arithmetic involving infinite quantities. For example, both *Hilbert's Hotel* by Ian Stewart *[26]* and *The Extraordinary Hotel* by Stanislaw Lem *[17]* give us an opportunity to consider the oddities of the countably infinite by noticing that a hotel with rooms numbered by all of the integers still has room for more guests (even infinitely many more guests) when all of the rooms are full, simply by moving guests up to higher room numbers to leave vacancies. More unusual properties of the countably infinite are presented in *The Gnome and the Pearl of Wisdom* by Richard Wilmott *[29]* which, from a mathematical point of view, merely demonstrates the existence of a non-convergent sequence of sequences but seems to produce the mysterious consequence that the countably infinite number of marbles placed into a countably infinite number of boxes all disappear. Finally, I made a fool-hardy attempt to introduce the students to the idea of trans-finite cardinality, infinite sets *larger* than the set of integers, the Cantor set, and Cantor's continuum hypothesis. Although these are very difficult mathematical concepts, I thought that presenting them in the context of a story would make it possible for the students to at least get an inkling of the mathematics that underlies them. There are really nice stories that address each of these ideas. Even *Hilbert's Hotel [26]* suggests the existence of sets larger than the number of rooms in the hotel, but the short play *Art Thou Mathematics* by Charles Mobbs *[20]* and *FYI* by James Blish *[4]* both discuss it rather explicitly. Moreover, we read *The Infinite Assassin* by Greg Egan *[9]*, a thriller whose resolution depends on understanding what it means to say that the Cantor set is an uncountable set with measure zero. For three or four the students in the class with the strongest mathematical ability, this was a very interesting reading set which introduced some mind-blowing ideas. Unfortunately, these ideas seem to have been too difficult for most of the students in the class. Even the students who read the novel *White Light* by Rudy Rucker *[25]*, a story that explicitly involves the continuum hypothesis, did not seem to understand this concept well enough to intelligently discuss it in their papers.

4 A Typical Class

Since there were readings assigned at nearly every meeting, a typical class would begin with me and the students sitting around a large table discussing what we had read. To "break the ice", I would usually start by asking some of the students to briefly summarize the plots of the works we had read. This was generally considered an easy task, one which the students would be eager to do in order to get credit for class participation without too much effort, but in the case of some of the more unusual stories (such as *[9]*) even this could be difficult.

We then moved on to an open discussion of the new readings. I generally tried to keep the conversation focused on the questions central to the course (such as "What do we learn about mathematics from this?" and "Why do you think the author included mathematics here?"), although occasionally the discussion went off on an entirely non-mathematical tangent.

It was during these discussions that the class would have most benefitted from greater student involvement. When one conversation seemed to be winding to a close, I would try to get the students to propose their *own* questions for us to consider next, but most often their silence would lead me to pull the next question from the list that I had prepared in advance. The most interesting conversations, at least to me, arose when the students had a completely different interpretation of the meaning of a story than I did. When a student and I disagree about something in a standard mathematics class, I am usually able to easily demonstrate which – if either of us – is incorrect. Here, however, things were not so clear.

A good example of such a disagreement concerns our interpretation of the following passage from *The Sand-Reckoner [5]* which accompanies a description of Archimedes sitting by the bed of his dying father, Phidias:

> "When Archimedes was growing up, Phidias had been the one person who really *understood.* It had often seemed to Archimedes that everyone else had a blind spot in the middle of the head. They could look at a triangle, a circle, a cube – but they couldn't *see* it. Explain it to them, and they couldn't understand. Explain the explanation and they stared and wondered aloud why you thought *that* was wonderful. Yet it was, *unspeakably* wonderful There was a world there, a world without material existence but only luminous with pure reason, and they couldn't see it! Only Phidias had seen it."

As part of one discussion, I asked my students what the author was trying to convey in that particular paragraph. It seemed clear to me that this paragraph both tries to demonstrate that mathematics is something *beautiful* to Archimedes and also to explain why Archimedes loves his father so. To my surprise, I found that more than half of the class read this and concluded that Archimedes loves mathematics because it gives him and his father a way to feel better than everyone else. The purpose of this paragraph, as some of my students read it, was to demonstrate how rude mathematicians are (suggesting that other people are *blind*!) and to show that Archimedes and his father were elitist.

I do not believe that I ever convinced the students that the author probably intended it to be read my way, nor did they convince me that this beautiful excerpt was meant to convey Archimedes as conceited. It was difficult for me to treat the student's opinions with equal weight to my own, but I made an effort to do so. I certainly recall some humanities courses I took as an undergraduate in which I decided to hide my true opinions from the professor when it became clear that their viewpoint was different than my own and I did not want to create that sort of situation in my own class.

After this, the class would transform itself from a discussion into a more standard lecture. Going to the blackboard, I would spend ten to twenty minutes preparing the students for the next reading assignment. This often involved some historical material (e.g. Who was Alan Turing and what was his role in the Allied victory in World War II?) as well as direct mathematical content. This mathematical content varied from a rather standard presentation of the proof by contradiction that there are infinitely many prime numbers to an arts-and-crafts project in which each student made and "experimented" with a paper Möbius strip.

I would conclude by suggesting the role that the new factual material from my lecture would play in the next reading assignment, tell them which files to download, and dismiss them for the day. It was rewarding that several students would generally stay beyond the end of class to talk with me about the readings. Most often they would just talk about why they did or did not enjoy them, but occasionally they would offer an interesting bit of insight after the class had gone that I wish they had been willing to bring up in class.

5 Guest Speakers

In my experience with mathematics classes, either as a professor or as a student, it is not common for the instructor to bring in guests to assist in teaching the class for a day or two. Perhaps this is more common in other fields. In any case, I did this a few times as part of the Mathematics in Fiction class, and it worked very well, leaving me wondering whether it should be done more often in standard mathematics courses.

During the reading set entitled *Mathematics on Stage and Screen*, we watched the movie *Pi [1]*, as well as reading and performing scenes from Tom Stoppard's *Arcadia [27]* and David Auburn's *Proof [2]*. For some of that time, Susan Kattwinkel (a professor from our Theater Department) sat in on our class and participated in discussions. In addition to her obvious expertise in the area, which added to the discussion, it seems that simply having someone new there also helped make the discussion more interesting and lively than it had been before. One of my fondest memories from the class is the time Susan said – to my surprise – that she has a bookshelf full of books on the mathematics of chaos theory since this has become an important topic in the theater.

Two female researchers from the Mathematics Department, Annalisa Calini and Liz Jurisich, came to join us after we read excerpts from Sue Woolfe's *Leaning Towards Infinity [30]*. That novel, unfortunately, presents a seemingly realistic portrayal of mathematics as a field so steeped in sexism that the (almost entirely male) participants at a conference taunt the only profesional female mathematician there to bear her breasts during her talk. Of course, this was a good opportunity to discuss the real sexism that has been part of mathematics, but I think that without the help of these guests it would have been difficult for me to convince the students that the situation today – even if not perfect – is far better than what the book portrays. [Annalisa's comment that she majored in physics rather than mathematics because in Italy nearly all math majors are female certainly surprised them!]

In addition, when discussing the thorny philosophical issues surrounding Gödel's Incompleteness theorem, it was very useful to have our logician, Renling Jin, on hand to separate fact from hype. Although works of fiction such as *Uncle Petros and Goldbach's Conjecture [8]* and *Division by Zero [7]* present relatively accurate portrayals of the implications of Gödel's work, some authors either out of indifference or misunderstanding say things that are not at all justifiable. (For instance, in *Gödel's Doom [31]*, the incompleteness theorem is somehow misinterpreted as having direct implications for the existence of free will.)

6 The Final Report

During the course, the students wrote several short essays and one midterm report, took two mathematical quizzes and participated in discussions. However, from my point of view, all of this was merely practice for the final report. For their final reports, the students were expected to select three or more works of mathematical fiction and relate them to a common theme. Again, I suggested that they could choose something related to their main area of study. For instance, the novels *Kepler* by John Banville *[3]*, *The Sand-Reckoner* by Gillian Bradshaw *[5]* and *The French Mathematician* by Tom Petsinis *[21]* are all excellent works of mathematical fiction concerning the lives of historical mathematicians (Kepler, Archimedes and Galois respectively). Although I am not a historian, I would have liked to have seen a report on these three novels that included the sort of analysis that a historian would perform.

I knew that selecting an appropriate topic and works was going to be difficult for many of the students. Consequently, I began hinting that they ought to be thinking about the question of making such a choice very early in the class, and asked them to get approval from me by a certain date for their selection. With my help, each student was able to choose a topic and set of works which I thought had potential for a great report.

Among the titles I received were:

- Female Role Models and Mathematical Fiction
- The Child Prodigy in Mathematical Fiction
- Mathematics as a Conduit for the Nonrational Supernatural
- The Portrayed Insanity of the Mathematician
- Gödel's Incompleteness Theorem in Literature
- The Use of the Mathematicians' Stereotype in *Gulliver's Travels*, *Arcadia* and *The Wild Numbers*
- Higher Realms of Being and Mathematical Fiction

Even though I do occassionally put an essay question on a calculus or linear algebra exam, attempting to grade reports such as these was very far from my other experiences as a professor. In many ways, grading reports is a more pleasant experience than grading an exam. However, I must admit that I am very glad that we can usually avoid the questions of plagiarism and choice of sources that arise in grading essays. It seems that quite a few of the students in the class view the task of writing a report as the collection of relevant ideas from various Webpages and the editing of those pages together into a paper. Unfortunately, this can be done with a minimum of intellectual contribution on the part of the student. Moreover, there are many Webpages on the internet which are of questionable value (such as the Websites on projective geometry maintained by a religious group that believe human souls live at the point at infinity) that the students take to be as reliable a source of information as a piece of peer reviewed research.

7 What did the students get out of the class?

One interesting and unusual measure of what the students learned in the class are the multiple choice quizzes that they took. Although I would not expect them to be able to reproduce Cantor's diagonalization argument, they all know that there was a mathematician named Georg Cantor who said something about different sizes of infinity. These quizzes did not really test their computational ability, but rather focused on making sure that they had a casual knowledge of a large number of mathematical topics and historical figures.

Here are a few questions that appeared on quizzes in my class:

1. How many solutions are there to the equation $x^5 + y^5 = z^5$ where x, y and z are positive (non-zero) integers?

   (a) none (b) only two (c) infinitely many

   (d) nobody knows, this is an "open problem"

2. The decimal number system that we use is

   (a) so old that we cannot say for certain when or where it was developed.
   (b) about 3600 years old and was invented in Babylon.
   (c) about 2000 years old and was invented in Persia.
   (d) about 1000 years old and invented in India.

3. Which is a true statement in modular arithmetic?

   (a) $2 + 2 = 0 \mod 3$ (b) $2 + 2 = 1 \mod 3$

   (c) $2 + 2 = 2 \mod 3$ (d) $2 + 2 = 3 \mod 3$

4. Match the mathematical objects with their names by writing the appropriate letter (a, b, c,...) in the blank. (There is one extra letter.)

   ___ Tesseract
   ___ Twin Primes
   ___ Friends
   ___ Fractal
   ___ $\aleph_0$

   (a) The cardinality of the rational numbers.
   (b) Two positive whole numbers a and b such that $a - b = 2$ and neither a nor b can be evenly divided by any positive whole other than 1 and themselves.
   (c) A geometric object with fractional Hausdorff dimension.
   (d) Two whole numbers for which the sum of the prime factors of each gives the other.
   (e) A 4-dimensional geometric object.
   (f) An infinite number representing how many real numbers there are.

I suspect that most non-math majors would score very poorly on one of these quizzes. However, as demonstrated by their quiz scores, my students knew that Goldbach's conjecture states that even numbers greater than four are all decomposible into a sum of two primes and that nobody today knows for certain whether this is true. They all know well Alan Turing's role in the development of electronic computers and that the decimal expansion of the number π probably (but not certainly) contains every finite string of digits.

Having this sort of "cultural" knowledge of mathematics and the ability to casually refer to it in conversation may well be useful to these students just as the limited knowledge of philosophy, literature and art that I gained as an undergraduate has served me. [A magnificent example of a non-mathematician discussing mathematics this way is the interview with Tom Stoppard on the mathematics in the play *Arcadia* which is available from the Mathematical Sciences Research Instutute *[32]*.]

More importantly, I think they have a better idea of what mathematics is like for a mathematician. One student, on the last day of class, commented that he now knew that mathematicians think that mathematics is *beautiful*. He had previously believed that mathematicians only liked mathematics for its usefulness, and that anyone interested in beauty would have majored in art or in English as he had.

During the class we addressed many stereotypes of mathematicians that appear in fiction. I find that insanity, sexism and arrogance are common traits of fictional mathematicians. And, though I cannot claim that all mathematicians are sane, unprejudiced and humble, my opinion is that these characteristics are greatly overemphasized in fiction. However, I am afraid that despite my comments, reading all of these works of mathematical fiction may only have served to reinforce these stereotypes.

I also hope that the students have learned something about the *usefulness* of mathematics, since a good many of the stories presented mathematics in the context of applications (either real or fantastical). However, the most frequent response I received from the students when I asked them what they were getting out of the class was something like "I'm reading a lot of really cool stories that I would not have read otherwise." Thinking back on it, I suppose that is what I would have said about the literature classes I took as an undergraduate as well. I am left wondering whether the students in my class really did get out of the class all that I hoped they would, and whether I (unknowingly) got more out of my own literature classes than I realized.

8 Conclusion

It was certainly a lot of fun to teach a course in mathematical fiction, and quite a change from my usual teaching load. The course received many positive evaluations from students who claimed that they had a much greater appreciation and knowledge of mathematics after the class, and I feel that those students got something out of the course that they could not easily have gotten anywhere else. Two students in particular, one a math/philosophy double major and the other struggling to choose between being an English major and a math major, told me that this class succeeded in synthesizing their interests in a unique way that they really appreciated. This is precisely the sort of thing I was hoping to achieve with this class. However, I cannot be entirely positive about the experience.

During the class, I was aware of a sense of frustration on the part of many of the students. Some of them were able to read the stories, but were not able to really grasp the mathematical concepts. Many of these same students were not frequent participants in the class discussions, choosing instead to sit quietly and listen to their classmates. I can see that these students were not getting much out of the class, and that was reflected in the evaluations the course received which included several from angry and disappointed students. They complained that the mathematical material was too difficult and was only suitable for math majors. I believe that they should have been able to really understand the mathematics if they had put a greater effort into it and had sought me out for help outside of class. However, since their grade did not directly depend on their understanding of these mathematical concepts, hardly anyone in the class did so. There were those who “got it” and those who did not. I also think that these students were reluctant to become as involved in the class as I had expected them to be when I wrote the proposal. It may well be my own fault in some way, but the students seemed to be willing to receive information from me in the class, but not generally to contribute themselves.

I made changes in the class structure to try to correct these problems as I noticed them. For instance, I switched from having in-class essays to grading the students on their participation in the discussions, hoping to get the students who were suffering privately to ask the questions that would help them get more out of the class. I also reemphasized my goal of having each student particpate in the discussion as a representative of their area of expertise. There was a slight improvement with these changes, but they may have come too late.

In the end, I would say that this was a less-than-entirely-successful experiment which came *close* to achieving its goal. I am hopeful that if I have another opportunity to teach such a course, I will be able to do a better job by keeping in mind the problems that developed this first time around. It is still my belief that mathematical fiction can be used as a resource to educate people about mathematics as a subject in a way that would be difficult to duplicate in a traditional mathematics course. I would therefore encourage any other school that is interested in trying such a course to do so. If you do, please make use of my Mathematical Fiction Homepage *[15]* to identify works of fiction that you would like to use, and please write to me so that I may offer my assistance as well.

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