ART THOU MATHEMATICS
A Play on Words
by Charles Mobbs

Cast of Characters

A Southern SENATOR
A senior citizen

A MATHEMATICIAN
Middle-aged man

ARTIST
Middle-aged man

POTTER
Young man

CRITIC
Middle-aged woman

The AUTHOR
The author

Scene: Curtain closed.

Curtain opens.

Scene: The stage is divided into two areas. Stage Right is a desk and chair.Stage left are two chairs, which are inclined away from each other at 45 degrees. SL of the SL chair is a desk, and SR of the other chair is a complex wire sculpture on which ARTIST is working. The sculpture is a figure made of black-and-white wire. The figure is half-enclosed by a "corner" of wood; the wood US just behind the wire is black; the attached wood, which faces SL and is thus invisible to the audience, is white.SENATOR is sitting at his desk and chair, SR. MATHEMATICIAN is standing CS.
SENATOR : (addressing MATHEMATICIAN) You understand, sir, that this is not a court of law. These hearin's are conducted solely for the purpose of allowin' us to decide if relevant legislation should be passed, and, if so, what kind. Ah take it you understand what we're aimin' for?

MATHEMATICIAN: Yes, I believe so.

SENATOR: Well, then, why don't you just start at the beginnin'? Please relate how you first became aware of the peculiar circumstances under discussion.

MATHEMATICIAN:
It was May 13, Sunday, as I recall. I woke up that morning with a slight headache, as if some sort of pressure were being exerted in my head. I didn't realize how apt that thought was!

SENATOR:
Ah'm sure.

MATHEMATICIAN:
Well, the headache was bothering me, but I tried to ignore it, and get some work done. Most people don't realize it, but actually professors of mathematics are required to do far more than teach... or even profess, if you see what I mean.

SENATOR:
Ah'm not sure Ah do. But please continue.

MATHEMATICIAN:
Yes. As I was saying, as a professor of mathematics, I must not only teach, but I am also expected to do original research. It's not the teaching I mind; I rather enjoy it. I don't really even mind doing the research. Both occupations are rather enjoyable, in fact. Now that I think about it, I derive a great deal of enjoyment from both....

SENATOR:
You were about to make a point?

MATHEMATICIAN:
Quite. At any rate, I decided to work on a little piece of formalism which was related to the transcendence of a number known as gamma. I was trying to use a method analogous to Kummer's use of ideals to construct the set of all possible equations to which gamma could be a solution; then I needed only to prove that these equations were not algebraic, using a technique similar to Abel's, and I would be done. But I'm sure you would not be interested in the details.

SENATOR:
Yore perception is remarkable.

MATHEMATICIAN:
The night before, you see, I had thought of a rather interesting approach.

SENATOR:
Before you go on, could you tell the committee if you get any government support for this work?

MATHEMATICIAN:
No; this is kind of a hobby of mine.

SENATOR:
Ah'm glad to hear that, Professor. The American people don't want their tax dollars spent on no grammar of transcendental meditation. I'd go so far as to say it sounds pretty un-Christian.

MATHEMATICIAN:
The transcendence of gamma, sir. It's a mathematical.... Yes, sir. (pause). The night before, you see, I had thought of a rather interesting approach. However, as I sat down at my desk, I could remember quite clearly the idea that I had in mind the night before. This I found quite disturbing.

SENATOR:
Whah's that?

MATHEMATICIAN:
The problem was that although I could remember it quite clearly, as far as I could tell, the idea was absolutely useless. It was rather unsettling.

SENATOR:
Ah appreciate that.

MATHEMATICIAN:
After trying for several hours to regain my lost insight, I decided to read the current issue of the American Mathematical Society monthly journal to clear my mind. I found that I had no difficulty following the papers there, but I still found it impossible to progress with my own problem. Up to a point, you see, I could completely understand where I needed to go with the problem, but past that point I could not concentrate, and my mind simply would not function. I attributed the difficulty to overwork

and spent the rest of the day cutting out Mobius strips of various sizes and shapes, and trying to construct a Klein's bottle out of Play-Doh.

SENATOR:
So what happened the following day?

MATHEMATICIAN:
I went to the university the next day as usual. I still had a headache, but the day went smoothly until I got to class. (MATHEMATICIAN pulls chair to CS. Calls out to SL). Mr. Potter, sit here please (pointing to chair. Potter, a student, sits in chair)

MATHEMATICIAN:
(pointing toward audience to an imaginary chalkboard) Now since we can integrate F in closed form...(Potter raises hand). Yes, Mr. Potter?

POTTER: Professor, how do we know that?

MATHEMATICIAN:
Well, obviously....(Stops. Turns to SENATOR) I was about to snap an answer when I realized that I did not know the answer to his question. Now it is not entirely unusual for me not to be totally familiar with all the subtleties of a given lecture, since I can usually derive any answer I don't know. The lecture appears thoroughly prepared, even though I may not have spent much time on it.

SENATOR:
No doubt.

MATHEMATICIAN:
(To SENATOR) This time, however, I was quite at a loss to explain the assumption in question. The haziness in my mind irritated me so much that... (Turns to student). This assumption cannot be fully explained without extensive reference to the differential metric spaces associated with the eigenfunctions expanded around Z-6. Since you're familiar with eigenfunctions.... you are familiar with eigenfunctions, I assume?

POTTER:
(looking miserable): No sir.

MATHEMATICIAN:
Well, ask me again when you've caught up with the rest of the class. (Student slinks out)

MATHEMATICIAN:
(to SENATOR) I later felt rather bad about that whole exchange.

SENATOR:
Whah’s that?

MATHEMATICIAN:
I should have said the eigenfunctions were expanded about the Lagrangian. Sounds more plausible.

SENATOR:
Please continue.

MATHEMATICIAN:
For the next few weeks things just got worse, and I began to realize that many of my colleagues were having their own troubles. Word starting getting around that a lot of us were running into brick walls, metaphorically speaking of course. It seemed to first strike the mathematicians, then physicists, then even a few biologists. Within a few weeks, people started noticing that even simple calculations were becoming difficult. But what really pushed me to the limit, as we say in the business, is that the A.M.S. journal had to suspend publication for lack of submissions. There was even an e-mail conference on the problem. As I said at the time, we mathematicians must be in union, or we most assured will be conjugated in intersection. That's a little trade joke.

SENATOR:
Ah agree.

MATHEMATICIAN:
Despite all our problems, academic life still had to go on. The loss of all creativity really wasn't such a big deal; the typical tenured professor hasn't had an original thought in years. One day I was out on a typical academic kind of mission, the unexpected results of which we are still trying to sort out.... (As he speaks ARTIST and CRITIC enter SL, with ARTIST sitting CS next to and working on sculpture, and CRITIC sitting SL. MATHEMATICIAN turns and "knocks" on CS "door" to their "office").

CRITIC:
(not looking up): Go away!

MATHEMATICIAN:
(Crossing in front of ARTIST.): Darling! How you've been?

CRITIC:
(Eyeing him suspiciously): Now what? You out of Xerox paper?

MATHEMATICIAN:
(turning to ARTIST, who ignores him). Not finished yet, hmmm?

CRITIC:
You here for me or him?

MATHEMATICIAN:
Both actually. I just found out that my NSF grant proposal was funded.....

SENATOR:
Ah thought you didn't have govahment funding?

MATHEMATICIAN:
Not for the transcendence of gamma. My NSF grant is for a different project.

SENATOR:
Oh?

CRITIC:
Oh? (MATHEMATICIAN, about to reply to SENATOR, holds up finger to SENATOR, then turns to CRITIC.)

MATHEMATICIAN:
(excited as only a nerd can get): It's quite interesting, actually. You know that mathematicians often think they know something long before they can actually prove it. A famous example is the 4-color map theorem, which mathematicians have been trying to prove for over a hundred years. It was finally proved a couple of years ago, but using a new approach to mathematical proof, which is to break down the problem into thousands of special cases and prove each case with computers. Most really important

proofs are done that way these days. (At this the ARTIST turns around, interested).

CRITIC:
So you guys have been replaced by automation? Now that's progress!

MATHEMATICIAN:
(Stares at a for a moment, then continues): Yes. Well, there's a very hot theorem these days called the "big" theorem, because it's really a big compendium of a lot of known facts that lead up to a certain important fact. We know that this important fact is true, because all the steps leading to the fact are true, but no one has ever been able to string them altogether into a single proof. We got our grant to use computers to do that: to put together all these facts into a single linear string of reasoning which will directly prove the main important fact. My calculations indicate that we can do this in probably no more than a hundred thousand individual special cases, which with a couple of post-docs programming full-time we can probably knock off in a couple of years!

CRITIC:
(ARTIST and CRITIC stare at MATHEMATICIAN somewhat incredulously): And the purpose of this whole thing is to prove something that's already known?

MATHEMATICIAN:
Yes, but .... (looks nervously over shoulder to SENATOR, who is showing great, if stern, interest). Well, see, no one has ever put all the pieces together before, so we don't know exactly why the big theorem is true.

CRITIC:
And you think having a computer run through a hundred thousand special cases is going to enlighten you?

MATHEMATICIAN:
(Pause) That is a problem. But the reason the NSF awarded me this grant is that I was able to prove that there is no way to prove this kind of theorem in any other way.

CRITIC:
First: How on earth could you prove such a thing? Second: why on earth would you bother?

MATHEMATICIAN:
Oh, mathematicians love to prove that things can't be done, at least given certain assumptions. Probably the most famous proof in mathematics is the ancient Greek proof that some numbers, like square roots, cannot possibly be expressed as a ratio of whole numbers. The story is that a follower of Pythagoras (of the famous triangle theorem) was trying to prove just the opposite, because the Pythagoreans worshipped whole numbers as the foundation of the universe. However, when the follower assumed, for example, that the square root of two is a ratio of some two whole numbers, that led to a mathematical contradiction. Appalled, he tried to destroy the proof, but too late: when the Pythagoreans found out, they drowned the fellow for blasphemy.

CRITIC:
(Pause) What a beautiful story! I can see why a person would go into mathematics after hearing that one.

MATHEMATICIAN:
(Over his head) There's always resistance when new kinds of numbers are discovered, which are still reflected in our names for them. Those Pythagorean numbers which aren't ratios of whole numbers came to be called irrational, but include some of our most important numbers, like pi (as in R-squared). Later, negative numbers and imaginary numbers were similarly discovered and given similarly disparaging names. But the principle of mathematical contradiction turned out to be one of our most powerful tools. A somewhat similar principle was used in a famous proof by Godel. In effect, Godel proved that there are true facts we can never know for sure in mathematics, by constructing a statement that asserted its own unprovability.

ARTIST:
Now that one I like.

MATHEMATICIAN:
As it happens, my little proof was based on a similar concept. I assumed that a certain class of proofs could be written in a certain simple way (that is, without computers), and this assumption eventually lead to a requirement to divide by zero. Since that is impossible, we are forced to conclude that these proofs, while possible, cannot be simple.

CRITIC:
I'm sorry, did I miss something? Is this supposed to be of interest to us?

MATHEMATICIAN:
Well, now that I have funding to do this project, I'm going to need space to put the post-docs and the computers.

CRITIC:
Ahhhhhh.

MATHEMATICIAN:
(Quickly): Look, I know this is awkward, but there's really no place else for them and as you know in these days of budget crunches the administration puts an extremely high priority on space allocated to funded projects.

ARTIST:
Meaning big science.

SENATOR:
(Indicating artist): Does this guy get tax dollars to make that crap?

ARTIST:
(To SENATOR): No, I don't take government grants. They're nothing but grief, since I would have to contend with the artistic taste of people like Your Honor. I manage to get by by teaching students who want to learn and by selling my work to people who want to buy it, as opposed to selling my soul to committees (indicating MATHEMATICIAN). Go ahead, tell the Senator what you really think of him.

CRITIC:
That's why I love academia; the fights are so vicious because there's so little at stake.

MATHEMATICIAN:
Of course the Arts faculty should obviously have space, just not here in the Annex. I'll do everything I can to help.

CRITIC:

Go to hell. If you're so sure about the administration, why bother to come to us? Just clear it with the Space Committee.

MATHEMATICIAN:
(Pause): I already did. We just all thought it would be better if you guys and I could come to a mutually amicable agreement on timing. Besides, you have the right to appeal, of course. I'd like to convince you that cooperation now would be best for everyone concerned. (Long pause. ARTIST shrugs, turns back to sculpture, CRITIC looks at MATHEMATICIAN, who is clearly uncomfortable).

CRITIC:
I guess this computer-proof stuff is all you guys have left, now that mathematicians can't think anymore.

MATHEMATICIAN:
You mean that article in the Times? Obviously as usual the papers exaggerate, although I have to admit a lot of us have been feeling a little under the weather lately. Most likely a flu was going around at the last conference and we haven't quite recovered yet.

CRITIC:
Oh, I heard it's a pretty world-wide thing. Not to mention the escalating number of bounced checks they keep talking about.

MATHEMATICIAN:
There's no possible link between the two. Believe me, the kind of reasoning we do has nothing to do with balancing check-books.

SENATOR:
If it's so far removed from the real world, then why the hell are we payin’ for it? (ARTIST looks at MATHEMATICIAN and just smiles).

CRITIC:
Come clean. You guys are in big trouble; everybody knows it. Maybe you should be trying to deal with that instead of proving something you already know.

MATHEMATICIAN:
(Considers her). Well, maybe something is up, but we have no idea what to do about it. Honestly, the best guess is

that it's some kind of medical problem, but we've been through every test you can imagine and the boys in the lab can't find anything wrong. Short of some kind of miracle cure, I don't know, computer proofs may be all we have left. So the last thing we would want to do is drop the single avenue which we know works.

ARTIST:
Maybe you guys have just run out of ideas.

MATHEMATICIAN:
Well, it's not like we don't still have things that we're working on. We have thousands of unsolved problems. It's just that suddenly we can't seem to take any new steps toward those problems.

ARTIST:
No, I mean maybe you have literally run out of ideas. You said this Godel fellow proved that a lot of true ideas can't be proved. Maybe you've already proven all the ideas which can be proved.

MATHEMATICIAN:
Charming thought, but quite naive. Actually, we can also prove that there are an infinite number of provable theorems too, so we can never prove all of them.

CRITIC:
Wait a minute, if there are an infinite number of provable theorems, how can there be any theorems left which aren't provable?

MATHEMATICIAN:
This is the kind of situation where a little bit of knowledge is a dangerous thing. It turns out that infinity is a much trickier concept than you might think. In fact, some infinities really are more equal than others, or, to put it a more informative way, some infinities are larger than others.

ARTIST:
Yeah, right.

MATHEMATICIAN:

It's true, and actually very easy to prove. Although laymen [looks at ARTIST] usually think of infinity as a sort of incomprehensible void, limitless by default, infinity can actually be studied quite rigorously using a mathematical system invented by Georg Cantor. Cantor's idea was to compare the number of objects in two sets by setting up a one-to-one correspondence between them. If any objects were left over, one set is bigger than the other. For example, here you have a set of pens, and here a set of brushes. To find out if there are more pens than brushes, just set the objects up in columns and rows, like this. If the columns and rows come out even, each set has an equal number of objects. If some objects are left over, one set is bigger than the other.

ARTIST:
Seems a bit round-about. Why not just count each one?

MATHEMATICIAN:
When you think about it, counting is doing the same thing: setting up a one-to-one correspondence between numbers and objects in a set. But what if you run out of numbers? Remember the primitive tribe which only has the numbers up to three, after which they simply refer to "many"? Cantor wanted to prove that different sets, such as the set of fractions and the set of whole numbers, are equal. He succeeded in doing that, by setting up a simples cheme by which each whole number could be assigned to one and only one fraction. That may seem like a round-about way to prove that infinity equals infinity. However, he went on to show that when you set up the same kind of scheme for all numbers, including all the numbers called irrational which are not fractions, this set of all numbers is unquestionably greater than the number of fractions and whole numbers. So he called the number of fractions Aleph Null, and the number of all numbers Aleph One. In fact, there are infinities which are even larger than that.

CRITIC:
Professor, here's a quarter. Call someone who cares.

ARTIST:
Anyway, I really don't see the point of proving something you already know. Whether there's no more ideas to be had,

or you guys are just not imaginative enough to come up with them, it amounts to the same thing: why don't you get a real job?

MATHEMATICIAN:
Me get a real job? Not to put too fine a point on it, but let's face it, what is the point of all this (indicating the sculpture)? Mathematics is not only beautiful, but it's indispensable for building bridges or fighter planes (nods to SENATOR). And aren't your sculptures just a way of "proving" an idea you already know? If you gotta message, use Western Union, for God's sake.

ARTIST:
As you said, a little bit of knowledge....As it happens, art is anything but a proof of what you already know. Art is more of an exploration, which is why I do art: I always end by discovering things I exactly didn't know before.

MATHEMATICIAN:
I don't see how an artist can make what he doesn't already have in him. At least scientists are forced to abide by the rules of the greater world out there, so the universe, in the end, makes us greater than ourselves. You guys just go by whatever you feel like. Freedom is necessity, and I just can't see you as necessary. (Looks smugly over to SENATOR).

CRITIC:
It's so cute to see amateurs try on adult-sized arguments. However, you probably should keep quiet in polite society.

MATHEMATICIAN:
Am I to take it that your credentials have expanded from literary critic to scientific critic?

CRITIC:
Let's just say that if the modern critic makes a living de-constructing artists' pretense to objectivity, de-constructing science is just too easy; no real challenge in it.

MATHEMATICIAN:
You're not going to pull that post-modern literary theory crap on us, are you? We're not on your tenure committee, so don't expect us to be such soft touches.

CRITIC:
I'm merely pointing out what is extra-ordinarily obvious, and basically easy to prove, as you would say. Scientists are different from artists, yes, but no more objective. They exist in a world which they have invented just as urely as artists. If anything, artists may be more objective. After all, the job of the artist is to make otherwise imperceptible perceptions concrete, making those perceptions accessible to the audience. Critics organize those perceptions. Scientists, on the other hand, are left with the rather uninteresting job of creating an internal world which they hope will match the perceptions articulated and organized by artists and critics. In other words, scientists are the lowest form on the conceptual food chain.

ARTIST:
Hey, that's a good one!

MATHEMATICIAN:
She didn't tell you that she considers the criticism of the art more important than the art.

ARTIST:
No, really?

CRITIC:
There's some truth to that. I'm sure you'd agree that the art is more important than the object which the art reflects. The object is merely the stimulus for the artist to create a more selected form of stimulus, which reflects the artist's world-view. Likewise, the art is the stimulus which allows the critic to produce a coherent concept of human nature.

MATHEMATICIAN:
So do tell us, Professor: You're a critic. As a scientist, I can tell you that there is more to a scientific discovery than the scientist. Is there really any more to a work of art than the artist?

CRITIC:
It's not really the right question, and there isn't a simple answer to the question you should have asked. However, the short version of the right answer is that there is a lot more to a work of art than the artist.

That's what critics are for: to help bring out the wealth that's buried in the art.

MATHEMATICIAN:
Perhaps buried, but even critics must have the good graces not to add something that the artist didn't intend.

CRITIC:
That's precisely what we are looking to do. The artist's intentions don't really interest us that much.

ARTIST:
Now wait a minute....

CRITIC:
The bottom line is that artists and scientists are as out of it as anybody. That's why they need critics.

MATHEMATICIAN:
Oh really? (addressing ARTIST) Is that why artists need critics?

ARTIST:
We always thought that those who can't, teach. And those who can't teach, become critics.

CRITIC:
That just proves my point. Artists are as clueless as scientists.

MATHEMATICIAN:
Can't beat that rhetorical device. Anything we say can and will be used against us in a court of academic clap-trap (Looking at SENATOR) But maybe I can come up with a more unimpeachable source to refute you. Can I have the house-lights please? (Searches the audience). Is the author out there?(Pause, a la Truth or Consequences).

AUTHOR:
Yes?

ARTIST:
Would you be kind enough to step up here for a moment?

AUTHOR: (From audience, looks around): Well, I'd really rather....Maybe just for a minute. (As he's walking up to stage). You know, the play is supposed to speak for itself. It's bad enough when you see these intellectual, talking-heads kinds of things where the author is just ramming his crackpot ideas down the throats of a captive audience. But to actually have the author up on stage, that's a bit much, isn't it?

MATHEMATICIAN:
I'm terribly sorry, but sometimes these things can't be helped. As the author, you have some responsibility...

SENATOR:
Hey, did he (indicating author) get any govahment money to write this piece of trash?

AUTHOR:
Senator, please don't exercise yourself. It's hard enough for professionals to get funding. Besides, I'd hate to have to include a science fiction play with my scientific grant proposals under the "other funding" section. People might get suspicious.

MATHEMATICIAN:
Just a moment and we'll let you go. As you know, in fact better than anyone, we were just discussing whether the art can be any more than the artist. Our critic here won't accept her colleague's own analysis, since he presumably is clueless. Still, I rather fancy she'll accept your version. So, please enlighten us. What did you have in mind when you wrote this play?

AUTHOR:
I must say that this is rather irregular. If I start explaining everything like that.... Oh, all right. I don't remember precisely how it started out, but as I recall I suddenly had an idea one day that as infinite series started expanding out to infinity, they would completely fill up mathematical space, leaving no room for other ideas. I thought that was very funny; anyway funny to a certain kind of mind. That's really all I had in mind, to sort of develop this mathematical joke. I don't think there's any point in making anymore of it than that.

CRITIC:

(who has been eying author rather suspiciously all this time): You're the one who wrote this play?

AUTHOR:
(Rather proudly) Well, yes.

CRITIC:
Then what makes you think you know anything about it?

AUTHOR:
Well, I... I'm the ... I'm the author, for God's sake!

CRITIC:
If you think I'm impressed, you've got the wrong girl. A few minutes with you, and even these hopelessly unsophisticated naifs will understand how out of touch the artist generally is.

AUTHOR:
I hate to pull rank, but let's face it, what do you think you know that I don't?

CRITIC:
Oh, please. First of all, why am I a woman (not a girl, by the way), and the mathematician a man? This is so obviously a reflection of your male bias, furthering your basically male supremacist world-view. I'm charitable enough to assume this isn't really your intention, just a side effect of your biases. So, there you are: as a work of art (again being extremely charitable) this play reflects a lot more than your intentions. It takes a critic to ferret out all the elements at play here.

AUTHOR:
Actually, I did try to make the mathematician a woman, just for variety, but it just didn't work.

CRITIC:
Don't bother explaining. We really don't need to hear it. Besides, I'm comfortable with my gender. (Looks at mathematician) Aren't you?

MATHEMATICIAN:
(Discomfited with this line of investigation). Well, of course, I... This isn't really getting us anywhere. (To Author): What we really want to know is, what's the point of all this?

AUTHOR:
(Pauses, looks around) I don't know.

MATHEMATICIAN:
For crying... (to CRITIC) all right, you win. (To Author) We'd love to extend this little chat, but the action's been held up long enough. Capisce? (Author looks around, almost responds, thinks better of it, exits SL)

MATHEMATICIAN:
Regardless, we do really have to come to some agreement about the space. Possibly we could have a transitional phase. The biggest problem we have right now is all the space this..... (to ARTIST) what would you call it, material? media?, takes up. I have no problem if you (to CRITIC) want to stay in the space a little longer; you just need a desk. However, for all the space your (to ARTIST) sculpture and media materials take up, I could have two post-docs and a Sun workstation in here. And let's be honest, that really is the kind of use to which the administration expects us to put this space.(During this speech, MATHEMATICIAN picks up some wire, the material of ARTIST's sculpture, and is absent-mindedly twisting and turning it).

ARTIST:
Hey, let me see that.

MATHEMATICIAN:
What?

ARTIST:
That wire (he takes from MATHEMATICIAN's hand). Look at this (he shows toCRITIC). This really has a lot of vitality.

MATHEMATICIAN:
What, this?

ARTIST:
You know, it's just the effect I've been after myself. Look at that tension, and then it almost resolves, but doesn't quite. Here (thrusts another piece of wire into his hands), see what you can do with this.

MATHEMATICIAN:

Well, I don't really...(Twists and turns the wire a bit). I'm not sure what you're...

ARTIST:
That's it! (Takes the wire again). Remarkable. (Shows to CRITIC, who looks on with some incredulity). Don't tell me you've never done this before.

MATHEMATICIAN:
What, sculpture? Hardly. ... Although, you know a kind of hobby of mine is the construction of Mobius strips and Klein's bottles. These are models of fascinating mathematical surfaces. Maybe that's given me a sort of...facility...you know, with multi-dimensional manipulations.

ARTIST:
Oh, no doubt. I've been working on this for weeks. Maybe you can give me some advice on it. See, the idea is that the background against which you look at something, in this case the sculpture, is as important as the thing itself. So you can look at this sculpture either against a black background (indicates the side of the half-enclosure, facing the audience) or a white background (indicates the side facing SL, and thus not visible to the audience). In turn, segments of the wire are either black or white. So the effect changes depending on the angle from which you look. My idea is to put the sculpture on a slowly rotating stand, but then you still have to change your position with regard to the black or white background. See? (Pulls MATHEMATICIAN to different positions vis a vis the sculpture).

MATHEMATICIAN:
Fascinating. Mind if I give it a try?

ARTIST:
(Wincing) Sure. (As MATHEMATICIAN turns toward the sculpture, ARTIST buries his hand in face, afraid to look. MATHEMATICIAN starts to tentatively pull wires here and there. In the following dialog, MATHEMATICIAN is primarily attending to the sculpture). By the way, I was a little unclear on that business about the infinite series filling up mathematical space. Sounded interesting.

MATHEMATICIAN:

Well, as our critic here noted, there's no reason to think the author knows any more than we do; less, really. He may have been trying to make a joke, but it was a rather implausible joke at that.

ARTIST:
But what did he mean by an infinite series?

MATHEMATICIAN:
An infinite series is the representation of the sum of an infinite number of terms, for example, 1/2 + 1/4 + 1/8 + etc. Often the sum of these series is a finite number, even though there are an infinite number of terms in the sum. In the case of 1/2 + 1/4 +1/8 + etc., we can easily prove that the sum equals1.

ARTIST:
You mean if you add up an infinite number of fractions, they only add up to a measly 1?

MATHEMATICIAN:
It depends on the series, but in the case I mentioned, yes.

CRITIC:
And you said earlier that basically the number of mathematical facts is equivalent to the number of possible infinite series?

MATHEMATICIAN:
(Still muttering into his sculpture): Something like that.

CRITIC:
Well, maybe that's why you've run out of ideas.

MATHEMATICIAN:
(Turning around): Excuse me?

CRITIC:
You've created a mathematical universe like a cave. It's been fun while you have filled the cave, to watch the oscillating waves, the varying rates of flow, and so on, but when the cave is full you no longer have a place to play. That's why artists prefer to create new universes.

ARTIST:
It would be rather tedious to spend your whole life on a single universe.

MATHEMATICIAN:
We don't "create" our universe. Mathematics is the universe. We're just trying to understand it. In any case, I don't see what that has to do with running out of ideas.

CRITIC:
Think about those infinite series. Their sole possibility for a meaning fulexistence is to expand to infinity. From the moment of conception, like all organic things, they tried to achieve their existential sense of being. They could be conceived in one infinity...what did you call it?

MATHEMATICIAN:
Aleph Null.

CRITIC:
But didn't you say the infinity of all curves, including infinite series, was a larger infinity, what was it, Aleph One?

MATHEMATICIAN:
Yes, but..

CRITIC:
So these infinite series were conceived in Aleph Null, but could only completely exist in a larger infinity. Possibly Cantor foresaw the problem but didn't quite succeed in patching up the system. Cantor expanded the mathematical universe to accommodate an infinity of infinities: a labyrinth of caves. This not only prolonged the pleasures mathematicians could derive from the quickly depleting system, but also made more room to accommodate the quickly expanding conceptual entities.

MATHEMATICIAN:
Cantor didn't "patch up" anything. He discovered...

CRITIC:
Don't you see, though, that Cantor settled on what turned out to be an unsatisfactory compromise. He created the infinities, but allowed that the great bulk of exploring had to be done in the smallest of the three infinities. Unfortunately, the infinite series were expanding to fill the largest, and thus the other two by default. Clearly this situation would be fatal, and we know the result: the mathematical universe no longer has room for any new

creative explorations because it is nearly completely full of expanded series. Soon there will no longer be room for any sort of new mathematical knowledge at all, which means that only previously calculated problems will be solvable.

MATHEMATICIAN:
(Standing up): Now who's being naive? Series aren't incomplete entities, they are only a method of arriving at certain conceptions. Mathematicians discover underlying facts about our universe from a previously existing structure; they don't make that structure. Besides...(In wandering about, he accidentally knocks over a broom. He leans over to pick it up).

ARTIST:
Hold on! Don't pick that up; it's wonderful! Look at that energy! Isn't that terrific (directed at CRITIC, who isn't quite getting the hint)? I can onl ywonder what you would do with more a liberating substrate. I don't suppose you've ever thought about location-specific sculpture?

MATHEMATICIAN:
I haven't really had occasion... Although, you know, so much of mathematics is geometric. Sometimes certain trajectories are so beautiful, they seem to be forcing their way into view... I have sometimes rather given flight to my fancy, as it were, and in my imagination I have seen these equations explode into something quite else besides their literal graphical depiction.

ARTIST:
Oh, that must be it. Come on, give it a shot. Here, shove this chair over there next to the broom. I want to see what kind of geometric tension you can generate with larger objects. Don't think about it; just use your gut feeling.

MATHEMATICIAN:
I hardly see....well... if you insist. (After some hesitation, he moves the desk over near the broom, busies himself setting it just so, then after a moment glances back over his shoulder. The ARTIST is frowning, so MATHEMATICIAN busies himself some more, moving the chair back and forth. He glances once more).

ARTIST:

Of course, I didn't mean you couldn't move the broom, if you want to....

MATHEMATICIAN:
Oh, well if you'll let me do that ...(picks up broom, props it up on chair. It falls, he picks it up, then finally manages to get it to stay put, but precariously balanced).

ARTIST:
Amazing! I'd love to see what you could do with more expansive material. Although we're so limited here....

MATHEMATICIAN:
You've got all that stuff in the next room. That's just for sculptures,right? Hold on, let me take a crack at it (exits SL.)

SENATOR:
Hold on a goldern minute. Who's tellin' the story now?

ARTIST:
Senator, regardless of your rather regressive political views, you couldn't have gotten where you are today without being a shrewd judge of character.This is the part of the narrative in which you, probably subconsciously, begin to read between the lines of your narrator's story, and begin to appreciate why it is that while few artists think of themselves as scientists, all scientists like think of themselves as artists.

MATHEMATICIAN:
(Somewhat maniacally dragging out a rather motley assortment of "found" objects): Wow, this is great! Just what I need. (He begins to pile his objects into a clearly arbitrary and, let's face it, pointless grouping.) See, this idea just kind of came to me, of a bridge, you see (he places along piece across two piles, obscuring ARTIST, but not CRITIC, who is further SL). What do you think? (ARTIST Steps gingerly around the piles. Looks it over, then glances over to CRITIC, trying not to smile). No, you're right. It doesn't have quite the right effect. It's missing...., it's missing vitality! (He breaks it all down and begins maniacally to re-arrange the whole thing. He begins to sing "Mona Lisa", whose lines are interpolated in the following speech).

"Mona Lisa, Mona Lisa men have named you " I was just thinking too small! You said, what we need here is some location-specific thinking. Pardon me.(He pulls desk from CRITIC, who has been sitting behind, to CS, where he piles one heap on.) "You're so like the lady with the mystic smile"....(Looks perplexed for a moment.) Oh yes. (Looks around, goes to CRITIC, grabs chair).May I? (CRITIC jumps up just in time, and MATHEMATICIAN takes chair to CSL,where he piles another heap on, then places board on top of the two heaps).(Singing just the melody here). da da da da da da da da da da da da da da dada da da da da da da da (Considers a moment, looks at SENATOR who looks surprised, then looks at ARTIST, who jumps to protect his own sculpture). Aha! (Runs to get ARTIST's chair, piles a heap on it CSL, then runs to a rather surprised Senator). Excuse me (and practically dumps SENATOR to his feet while dragging chair to a spot SR.) "Do you smile to tempt a lover, Mona Lisa? Or is this a way to hide your broken heart? Many dreams have been laid at your door-step" (Once more he piles a heap on, then, while the rest look on in some amazement, he arranges the piles to lean precariously against one another). "They just lie there, and they die there" (Addressing ARTISTand CRITIC) So? (They exchange glances, ARTIST is about to speak). No, you're right, it's still missing something. (He considers). Got it! (Drags CRITIC to CSR, ARTIST to CSL., then goes to Senator). Sorry, Senator, but it can't be helped. (Drags him to CS Grabs some rope, one of his "found objects"). Here, Senator, would you be so kind? (Hands him one end of the rope. Begins to wind the rope around the three.) "Are you warm, are you real, Mona Lisa? Or are you just a cold and lovely, lonely work of art?" (After a few revolutions runs out of rope. Momentarily non-plussed, hands the end to the Senator).Hold this, will you? "Mona Lisa, Mona Leeeesa!" (Stands back to admire his handiwork).

ARTIST:
(Pause) Of course, these things usually take a little while to get just right.

MATHEMATICIAN:
Oh, I wish you could see it. It really is a thing of remarkable beauty. And it has such... such vitality!

ARTIST:
Naturally, it may be a bit impermanent, seeing as we can't stand here forever. Still, it's an interesting idea.

MATHEMATICIAN:
(Still tinkering with his piles) Once you have a clear idea, it's a piece of cake. I'm just having a little trouble getting this lumber to cooperate (upon which the wood he has been abusing breaks, leading to a collapse of his whole structure, leaving everyone involved in a heap surrounded by scraps).

ARTIST:
Possibly we need to get some sturdier materials.

CRITIC:
I've always said the medium is the message.

MATHEMATICIAN:
(Starting to disentangle himself): Perhaps I could use a little practice. Still, I think you could see what I was getting at. It was rather like your context idea, but here the effect I was after was a kind of implosive energy.

CRITIC:
Implosive energy?

MATHEMATICIAN:
Sure, you know, not a blank certainly, and not energy, exactly, but the kind of... vitality... you get when something implodes in on itself. It's like going through zero and beyond, at least beyond multiplying by zero, more like dividing... (Stops and stares into space).

CRITIC:
(Disengaging herself from pile) This is really for professionals only. Don't try this at home, kids.

ARTIST:
(Also disengaging. To CRITIC): You all right?

MATHEMATICIAN:
Dividing by zero! My God!

CRITIC:
Well, conceptual art is all well and good, but keep the mathematical metaphors out of it. The audience is half-gone as it is.

MATHEMATICIAN:
No, I mean really dividing by zero!

ARTIST:
I thought you said you couldn't do that. It's a contradiction, or something.

MATHEMATICIAN:
Yes, that's certainly the usual assumption. But with all this implosive energy, and black becoming white, and so on, it just came to me- why not?

CRITIC:
Why not what?

MATHEMATICIAN:
Why not divide by zero?

CRITIC:
But wouldn't that give you infinity?

MATHEMATICIAN:
Yes, BUT WHICH ONE??

CRITIC:
Oh, you mean...

MATHEMATICIAN:
Right. Aleph Null, or Aleph One, or what?

CRITIC:
Well, you got me, but...

MATHEMATICIAN:
Wait, hear me out. (Starts pacing around the piles on the floor). Suppose we just define a number, call it sigma, which we define as equal to 1 divided by zero.

CRITIC:
So?

MATHEMATICIAN:
So, with just a couple of rules, this number would have very interesting behavior (Picks up a piece of cardboard, starts scribbling).

CRITIC:
(To ARTIST): You and your mind games. Now look at this mess.

ARTIST:
Well how was I to know he'd go off the deep end like that?

MATHEMATICIAN:
Got it! The magnitude of Sigma is between Aleph Null and Aleph One. It basically punches a hole in the continuum. But the fascinating thing about Sigma is its periodic behavior. It essentially....

CRITIC:
So what, you just make up a new number?

MATHEMATICIAN:
Sure, I told you, mathematicians do that all the time: irrational numbers, transcendental, imaginary, negative... they all started out that way. Of course, there'll be a lot of resistance...

CRITIC:
What did you call this new number? Sigma?

MATHEMATICIAN:
Sure, Sigma for... solipsistic! These new numbers are solipsistic!

CRITIC:
So I guess we just throw out three thousand years of mathematics.

MATHEMATICIAN:
Certainly not. Just as when the other new sorts of numbers were introduced, they never invalidated previous results, they just expanded the conditions. So, for example, when the hypothesis that parallel lines never meet was re-assessed, it didn't throw out the Euclidean geometry with which we're all familiar. It just expanded our repertoire of possible geometries, called non-Euclidean geometries. Non-Euclidean geometries turned out to apply better than Euclidean geometries to the large-scale surface of the earth, and even to the large scale structure of the universe.

CRITIC:
Whatever.

MATHEMATICIAN:
Whatever! Whatever! Don't you see? The continuum has been breached! There's room, there's room! My head is swimming! Wait, wait. Let me think. The transcendence of gamma; I was almost there. (Sits down to scribble). I got it! The last bit of the proof! Gamma really is transcendental!

SENATOR: Ah'm warnin' you, Mister.

MATHEMATICIAN:
Stuff it, Senator. (To CRITIC and ARTIST): Don't you see, there is literally a whole new universe of mathematics to explore. And to hell with computers.

ARTIST:
Ahem. Speaking of which, didn't you say that your NSF grant proof involved the impossibility of dividing by zero?

MATHEMATICIAN:
(Stops short): Why, yes.... I suppose this would mean... (Scribbles a bit more, then looks at Senator). Well, back to the drawing board (Giggles). Maybe those post-docs can go work for the Senator, re-drawing voting districts. That's a problem in non-linear optimization if I ever heard one.

CRITIC:
Of course, now that computers are not the only way to prove your "big" theorem, maybe you can come up with a proof that really tells you something.

MATHEMATICIAN:
Are you kidding? Who cares about the big theorem? We have a whole new universe out there. Of course, I guess I'll have to put my artistic career on hold...

ARTIST:
Well, we'll just have to soldier on without you.

MATHEMATICIAN:
Anyone for a drink? I think the faculty club is still open.

(MATHEMATICIAN escorts CRITIC and ARTIST out SL. As he is about to go, he gives his sculpture an affectionate pat.

Just after he leaves, the back "wall" of his sculpture comes crashing down, burying the Senator, who has just struggled free. Blackout, and curtain.)