Brian's Law

A Romp through Einstein's World by a 14-year old Princeton physics prodigy who thinks he is smarter than the Master

Physics is pure objectivity. There's no place for subjectivity in physics.
(Albert Einstein)

THEY SAY IT ALL BEGAN some 14 billion years ago, give or take. Nobody was there of course, but that's what they say. You have to admit people who can get their mind around something like this, that it was 14 billion years and not 14 trillion years or maybe just a couple of million are impressive and have to be few and far between. I know I could never have figured it out, not in a hundred lifetimes. And not only that, they figured out how it all happened too, well almost anyway. First there was nothing and then by some quantum quirk or other this strange *thing* happens to show up. No warning no explanation, no nothing. Just this strange something suddenly there, a pinpoint of incredible energy that held all the power you need to run a universe. Just imagine, all the power for the zillions of galaxies, to say nothing of our own sun and our puny earth-bound hurricanes and earthquakes, all there right from the getgo. All in that tiny whatever it was that just came along with no place to go because before it came along, there was no such thing as place. Not even a place for it to happen.

Really strange, though of course whatever happened just then couldn't really have been strange, when you think about it, because who was there around to think, Hmm, that's odd. OK, maybe God was around, but he wouldn't have said anything like that. This first something or other could have struck him like an artist might feel when he steps back from his canvas, Hey, that's really good!--but hardly strange. Anyway, to get on with it, these physicists say what happened was this tiny tiny little something just appeared, out of nowhere, so small nobody could ever think to measure it, zero size, the closest thing to nothing that you could get and still be something, the first little something ever, and it had so much pent up energy that it started to inflate itself at blinding speed like a huge cosmic balloon. And on top of it, it had to create the vast cosmic space it needed as it went. And they say it hasn't let up, its still expanding like crazy, and still making room for itself as it rips merrily along in all directions at once.

Truly amazing. Anyway, so now we got this tiny little spec or whatever inflating itself with a cosmic roar, and all kinds of new things start to show up on stage, a whole mess of unheard of oddballs--quarks and pions and neutrinos and anti-neutrinos and whatever, and then, out of that incredible soup, completely new things like atoms and molecules and eventually, way, way down the pike, even things like

tennis balls, and, thank God, our rare, *ex nihilo non nihil fit* physicists. What would we do without them? They're the guys who somehow or other have wrapped their mind around this whole crazy happening and figured it out, how we got something from nothing. I don't know what to marvel at most, actually, that something should have just inexplicably popped up from nowhere, bringing along with itself the somewhere it needed for itself to happen, or what this crazy spec of energy wound up producing, the teeming world we have today and these incredible genius minds. First we have this unheard of "singularity," then quarks, molecules, and eventually ectoplasm that organizes itself into thin folds of grey matter with a PhD that give out theories of everything, explaining it all, lock, stock and barrel, start to finish. Talk about the tail wagging the dog!

Think about it. From molecular soup to a theory of everything, in real time, while the whole shebang is still blowing up! You wonder if it keeps on going, what unheard of things will happen next? Maybe we will be able to go back in time and take a grandstand seat and watch it happen! I can see it now: some university physics lab with a ticket booth to the greatest show on earth. Not my idea, mind you, some of these guys really think time is a shuttlecock, not an arrow, so why not double back to the starting line some day. No kidding, we owe these gents a great debt, since it really bothers a guy/gal not to know where she/he came from, or where we're all heading on this crazy cosmic rollercoaster. I'm really serious. Not that any of it is good news exactly. It's all supposed to collapse one day in on itself, time, space, and all the stuff, PhD's included, all buried in some infinitesimal black sink hole with no place to go again. I can see why some guy cried out 'stop the world, I want to get off.' Must have been one of those brainy astrophysicists who saw the end coming. Or maybe one of those guys who swallowed Einstein's line that if you could see out far enough, you'd be looking at the back of your own head, that's all. So much for visionaries. Like I said, these guys are really something.

Well, that's enough of that. This is supposed to be a story about one of those brainy, latter day developments of the Big Bang, about a hairy little snot actually by the name of Brian Albert Einstein McCor, a budding boy genius with a mop of hair just like Einstein's who even as a little kid had everything all figured out by himself. A lot of people took this hairy little brat for some kind of singularity in his own right and would have loved to find a black hole to stuff him in!

No doubt about it, Brian was a prodigy. But obnoxious. A boy your age should be polite to people, his mother would tell him. But Brian said he wasn't being rude. Is it my fault if people don't know what they are talking about, he would answer. His mother would pat his hair down at such times and tell him, Don't ask so many questions, she would say. Just be nice. And promise you'll get a haircut.

Brian entered the freshman class at Princeton right after his fourteenth birthday with an already declared concentration in physics. Not very deep into his freshmen year, Brian's mother was asked to drop by and see the head of the physics department, Professor Zelnitsky. He wanted to talk to her about her son.

Brian's mother was hardly surprised. Brian was keeping up the family tradition. Brian after all had been named after her grandfather, Brian Ballister Duncove who

for a quarter of a century had been Lambert Professor of Physics at Princeton. This was back in the heydays when the German Einstein and the Austrian Goedel walked the shady streets of this charming Jersey town like two towering giants, talking German and making everyone around them feel like dwarfs. Brian's mother already saw her son one day joining the ranks of Duncove, Einstein, and Goedel. It was inevitable that the physics department at Princeton would quickly recognize her son's looming stature.

The truth is that Brian's namesake, Brian Ballister Duncove, would already be forgotten in the annals of physics were it not for some unflattering anecdotes. It was said locally that Einstein could never remember Duncove's name, which must say something about his contribution to science. But the real killer was when Einstein once referred to Duncove as Herr Dummkopf. Not that Brian Ballister Duncove was entirely inconsequential. He was one of the last holdouts in the world of physics against Einstein's theory of relativity. What really galled him was Einstein's ravaging of the notion of time. Imagine thinking that the time of day depended on whether a person was moving or standing still, heading east or heading west! God keeps the time, Duncove once shouted at a meeting. Duncove was an Episcopalian and liked things to be neat and orderly. It was all rather ironic actually because Einstein himself had recourse to a similar defense later when the new generation of physicists, the quantum kids--Einstein called them Quantumkinder--sought to disconnect effects from their causes, of all things, claiming that not causality but chance and probability accounted for what happens in the universe, from distant quasars right down to the new leaves appearing each spring on the trees of Princeton's charming lanes. Einstein, who loved his walks and bike rides down these lanes, dismissed such talk with his famous retort, *God doesn't play dice!*

Doubtless young Brian knew all about these controversies and had already formed an opinion as to where time and dice stood with God and vice versa. But it is safe to say none of these controversies registered with Duncove's granddaughter, Brian's mother, as she approached the offices of the physics chairman at Princeton College with her genius son in tow.

Professor Zelnitsky, Brian's mother said, reaching for the professor's hand, I believe you must have known my grandfather, Brian Ballister Duncove. He was . . .

Yes, Professor Zelnitsky interrupted, returning to his desk. I knew him slightly. Your son I see is attempting to carry on the family tradition, he said. The professor's effort to smile collapsed as he watched the youth move right past him to the bookshelves that lined his office. What was worse, just then rays of the afternoon sun broke through the office window and fell directly on the kid's unruly Einstein hair. The professor's face made it abundantly clear the halo effect was quite uncalled for. The mother for her part resolved to remind her son that Einstein accepted haircuts at his age. Brian for his part was busy checking titles.

The professor snapped to the point. Madame, he said, let me be frank. One of our instructors feels your boy is not ready for Princeton. He has asked me to remove your son from his class.

Brian's mother sat up abruptly. Brian's SAT was 1600, she said.

Yes, well, the professor went on, let me be more direct. Your boy is fourteen, I believe. Still an adolescent. Perhaps in a few years, he said, his voice trailing off. He could not take his eyes off this unacceptable play of light on the boy's head as he flipped pages in one of his books.

What's age got to do with anything, Brian said over his shoulder. His voice cracked, the lower registers of his voice still being new to the job.

Brian, his mother said, that's not polite. Come over here and sit by me. She patted the seat next to her and then turned to Professor Zelnitsky. Are you suggesting Brian is having difficulty with his class work, she asked. The arch of her eyebrows suggested this was hardly possible.

Not exactly, Madame, the Professor said. He looked over at the boy now slouched down besides his mother, still peering into one of his volumes. This has to do with attitude, he added, not aptitude, not for the moment at least.

Professor Zelnitsky picked up an examination bluebook on his desk. He explained that Brian's physics instructor had given a little ice-breaker quiz to the freshmen class asking them to demonstrate how a barometer could be used to measure the height of a building. Not only did Brian not answer the question, the professor said, he. .

I did so answer it! Brian cried, nose poking up, a trace of red in his boyish blue eyes.

The professor waited for the moment to settle and then opened the bluebook. Your son wrote one sentence, he said. He began to read aloud, the cost to his dignity telling in every word: *You can measure the height of a building with a barometer by attaching a string to the barometer, going to the roof of the building, lowering the barometer to the ground, and then measuring the length of the string used.* The professor put the bluebook down. That's not even clever, he said looking at the mother.

I answered the question, Brian said, boyish eyes hardening.

Your son knows very well what he was doing, Zelnitsky said. The poor professor looked out his office window and thought about things he could be doing.

A wry smile crept over the boy's face. There's lots of answers to that question, Brian said catching the professor's reluctant eye. Like you could go to the architect and offer him the barometer if he would tell you the building's height. The professor's cold stare forced Brian to quicken the pace. OK, he said hurriedly, on a sunny day you could put the barometer on the ground next to the building and measure the two shadows. The professor's stare grew ominous and Brian had to turn to his mother. You figure the ratio of the barometer's shadow to the barometer's height, he said to her. And then, using the ratio, you take the building's shadow and get the height. Using the ratio, Brian repeated to her hopefully. He swung back to the professor. Or you could, he began but now it was his turn to be cut off.

This has nothing to do with physics, the professor said aloud to the mother. Nothing whatsoever, he repeated. Professor Zelnitsky came out from behind his desk. This had gone far enough.

I can give you physics, Brian said, throwing the professor's book down, voice now in excitable registers. Take the barometer with the string attached and go up to the roof. Then lower the barometer so that it almost touches the ground and start swinging it like a pendulum. You can use the period of the arc to calculate the height of the building. Or you could just do something stupid like just dropping it from the roof and timing the fall.

Brian looked at the professor with a mixture of merriment and boyish hope. 32 feet per second squared, he said turning to his mother.

The professor stood before them, addressing the mother. I'm sure your boy knows the simple answer to a simple physics question, he said. That's clearly not our problem.

What's a correct answer? Brian said, voice rising. I answered the question, right? I can give you some more ways to measure the stupid building....

The professor stuck out his hand like a traffic cop. Young man, he said. We don't mock science in this department. He looked over at Brian's mother who fell into a fit of blinking. You understand we are not running a day school here at Princeton, he said. The professor turned to go back to his desk. The matter could now be considered closed, *finito*.

Brian's mother reached for her purse and put on her glasses. Brain, undeterrable, leapt up after the professor. I have a question, he said.

The professor stopped and turned slowly in his tracks, an effort not unakin to what it would take to turn the QE2 in Manhatten's East River. What is it, he managed at length.

You knew Professor Einstein, Brian asked, right?

Professor Zelnitsky studied the boy for a long moment, not unaware of the trap. Yes, I knew him, he allowed. Why do you ask?

I heard you had long conversations with him, Brian said, eyes lighting up.

Zelnitsky permitted himself a restrained nod. We spoke a few times, he said. When I was a student here. The professor sat down tentatively, on the very edge of the chair next to Brian. I was quite a bit older than fourteen I must say, he added.

For Einstein, Brian said, everything in physics begins with the observer, right?

That's hardly Einstein, the professor said. You don't do physics without observation.

Right, Brian said. But I mean Einstein went further than that. He makes everything start with the observer. Like if there's no observer, there's no universe.

You can put it that way, Zelnitsky said, voice dull as wet noodles.

So, Brian said, who observed the Big Bang?

The professor laughed for the first time that morning. Einstein had nothing to do with the Big Bang, he said. He never liked the theory, as a matter of fact.

But there was a Big Bang, Brian said.

Professor Zelnitsky stood up and backed away. If there was a Big Bang, young man, it was a singularity, which means physics knows nothing about it. Not a thing. Not even Einstein.
Being a self-respecting department chair at an Ivy League school, with scores of publications to his name, Zelnitsky should have ended the session right then and there and, indeed, would have done so were it not for Brian's next statement.

I think Einstein was wrong, he said. About the observer, I mean. And he's wrong about some other things too, he added.

Smart as Zelnitsky was, this was momentarily too much even for him to absorb--a fourteen year old in his office questioning the last 100 years of science--not before Brian, that is, seizing the moment, began to do a core dump. Such is the way with genius they say. Long silences as if nothing is going on, maybe even fourteen years of it, and then things start pouring out. That's exactly what happened with Einstein, too, 100 years ago in 1905, except that at his age then, Einstein was old enough to be Brian's father.

What are you saying, Zelnitsky asked despite himself.

Einstein got it wrong, Brian said, sitting up and running hands through his hair.

Einstein got it wrong, Zelnitsky repeated, a short sentence he found impossible to parse.

Yeah, Brian said. Einstein's world is upside down. The observer is very important, sure, but the observer arrives last in the sequence of things, not first the way Einstein has it. If A is going to observe some B, B's got to already be in place , right? So A can't be so absolutely up front the way Einstein has it. And Einstein's observer is a loner too, isolated from every B by the signals that connect them, and these signals can travel no faster than the speed of light, so no A is ever in sync with any B. Einstein is absolutely against simultaneity. And he's wrong about that. He's wrong about some other things also.

The enormity of the nonsense he was hearing seemed to disorient Zelnitsky. The boy must be mad.

Yeah, Brian said, core dump now in full swing. Take motion, for example. Suppose God went around and zapped everything in the universe except a single atom. According to Einstein, that atom couldn't move. That's because to him, the only way that observer A can say that some B is moving is because he sees B moving relative to himself or to something else, right? So for Einstein there is no such thing as pure motion in empty space. Because the observer can never detect pure motion, only relative motion, motion of some B relative to some A. So if there's no observer

around, a solitary atom can't move. That's what you get if you make the observer the one true god.

Zelnitsky remained speechless, stupefied at the desecration taking place before him. Had not the great Einstein himself come there in his day, sat in these very chairs? But there was no stopping Brian at this point.

So how did motion get started in the first place, Brian went on, waving his arms as if to take in the entire universe. When the Big Bang went off, if there was only one thing around at the start, some solitary B, then according to Einstein, B would have to be frozen. It couldn't move, not until some A showed up, right? So B could move relative to it. Otherwise it's frozen. And if there were a bunch of things at the start, they couldn't start out moving either, because according to Einstein, A and B and C and whatever all depend upon the speed of light to put them into a relationship so they could move relative to each other, like Einstein said. So until that light signal came along, all these things are frozen. So the universe didn't start off expanding, it started out frozen solid, right? Until the first light signals got around to everybody and said, OK guys, relationship established, everybody start moving. Brian began to giggle.

Zelnitsky was able to rouse himself at this last bit of idiocy. He spoke not a word, just came over and held out an icy hand to the mother and said, Good day, Madame. Then Zelnitsky went to the door of his office, tore it open, and with a sweeping gesture indicated the room must be vacated, at once.

Zelnitsky stood in the doorway waiting for deliverance but Brian, ever the brat, remained in his seat looking down at the floor, struck by some new thought. The mother stood by her son, not knowing what to do, torn as it were between an implacable force and an immovable object, to put it in physical terms.

Good day, Madame, the professor repeated in a preternaturally loud voice that must have raised eyebrows in the neighboring offices. Brian looked up at this point and had enough good sense to break his chain of thought, get up and join his mother. In the doorway, though, he stopped and looked straight into the eyes of the hapless Chair. That's where Einstein made his big mistake, he said, by starting out with a lonely observer who's only connected by the travel of light. But, Brian added gleefully, I think I know how to fix it.

Good, the professor said refusing the look, and maybe you can measure the height of your 'stupid building' while you're at it. Whereupon the door was shut, unmistakably, leaving Zelnitsky alone at last.

Outside on their way down the mother said, Brian, why can't you just be nice. But Brian was worlds away, working something out. Nothing is ever really solitary, he mumbled. Then a look of total glee lit up his face of fourteen years. *Ein*stein, *Zwei*stein, he said and once again fell into giggling. And promise your mother you'll think about getting a haircut, his mother said running a finger through Brian's hairy tangle and shaking her head at what she had brought into the world.

In the elevator, descending with his mother, while the universe was still expanding and the good professor Zelnitsky was recovering himself, Brian then and there formulated a new first law of physics, even replete with equation. It struck him as so fundamental it would come to be known as Brian's Law Above All Laws. He knew it was more fundamental than $E=mc^2$ but Brian wished like anything he had a chance to talk to old Einstein about it and find out what the master thought. Brian never had a father to go to, and even if Einstein was wrong, to Brian Einstein was still like the father he never had.

Anyway, this is what Brian came up with in all its sudden, disarming simplicity:

Nothing exists by itself.

True, his law had none of the arcane majesty of $E=mc^2$, but to Brian's mind his law was infinitely deeper. Just as Einstein had looked beyond Newton's absolutes of space and time and discovered relativity, Brian knew that he had just seen beyond relativity. And what he glimpsed was a truth as absolute as any could be—*nothing exists by itself*. It's simplicity spoke its defense. And the equation that expressed it was equally irreducible:

C = B + A.

C stood for cosmic reality, the *everything* that exists.
B stood for this *everything* minus the observer (i.e., C-A).
A stood for the observer.

And here was Brian's explanation for what it's worth. The way Einstein and modern physics saw it, the cosmos C is always going to be on uncertain grounds because it's main component B only exists if observer A can affirm B. So B can only exist if A says so. And A's observations of B are shaky because A is completely isolated from B by the time delay associated with light travel. True, for Einstein the speed of light is the glue, the one absolute that holds the world together, but it's just as true to say that light travel separates A from B and keeps them both in isolation. Now, for Brian, all this gets reversed with his new law. The obsever A comes last, not first, and A has a world to observe because B is already there to begin with, as a given. A does not have to reach out to find B, B is already there ahead of A reaching out to him. And B's givenness gives the cosmos C a steady, not a shaky foundation. But most especially, Brian's law holds that A is not an island disconnected from B until B's light signals get around to A. Reality doesn't work that way, Brian says. Reality is always B + A. *Nothing exists by itself.*

And then, in the very next breath, Brian realized his law had a serious flaw. The problem was still the observer. True, the observer is a finisher not a starter, and true, the observer is never stuck off by himself. Reality was B + A. All true. Yet, there was still something about the observer that escaped him, something he needed to figure out. No problem, the boy Brian had no doubt it would fall in place soon enough. Idiocy or not, as you will see the Einstein kid was just getting started.

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So that's the way it was with our boy Brian by the end of his first weeks at Princeton. He was already on his way to redefining not just the science of physics, but, heaven help us, the science of everything. In his own mind, to be sure. As for the outside world, Brian quickly became an eccentric presence on the Princeton campus, what with his Einstein hair and the stories bandied around about him and Zelnitsky. Miraculously, Brian was not removed from Physics 101, probably because he stopped going to class, except on the days exams were given to absolutely cream them. Brian used the hour to sit in on an advanced course in theoretical physics, given for upperclassmen by an elderly member of the faculty, a good buddy of Zelnitsky's. Brian would slip into the back of the lecture hall and slouch down in a chair, every so often mumbling at something the professor would say. The presence of this muttering kid with the hair slouched in the back of the lecture hall amused the upper-class students no end. And luckily the old professor never noticed. He spent most of his time with his back to the class, scrawling equations and diagrams on a blackboard the length of the platform, lecturing over his shoulder.

It happened, however, that one day this professor, in a relaxed moment during a lecture on relativity, set aside his chalk and began to reminisce about an encounter he had with Einstein back in the days when he too was an undergraduate. He related how he and a few other students went over to the nearby Institute for Advanced Studies one afternoon where Einstein worked, i.e., did his heavy thinking, hoping they might get a chance to meet the master. They got into the building on some pretext or other and then all paraded single file past the great man's office. Happily Einstein's door was open and when he saw them he waved them on in. Einstein was in a good mood and gave them coffee and before long began entertaining them with some amusing thought experiments, the sort of mental gymnastics that had made him famous. But the thought experiments that day were hardly serious and mostly poked fun at Einstein himself.

Einstein said there were two rocket ships that took off, one heading in one direction at near the speed of light the other heading in the opposite direction also at near the speed of light. On the first rocket ship is Herr Doctor Professor Z and on board the second ship, going in the opposite direction, is his wife, Frau Herr Doctor Professor Z. Now, obviously, if each spaceship is going in opposite directions at near the speed of light, then the distance between them is increasing at nearly twice the speed of light. How, Einstein asked, can this be? We know, since relativity, he said, that no event in the universe can take place faster than the speed of light and yet here we have a distance increasing at nearly twice the speed of light. The professor stopped and smiled. So, he said pointing to the class, how do you answer Einstein here?

A number of hands shot up and the professor nodded to a bright young female student in the front row. She stood up and explained that Einstein had shifted the scenario from physics to mathematics. When we talk about the distance increasing at twice the speed of light, she said, we are not dealing with a physical fact. No spaceship has actually traversed this distance at nearly twice the speed of light. The distance separating the Doctor and his wife is a mathematical construct, arrived at by summing two physical facts, the speeds of each of the airships. The problem turns on mathematics, not physics, she said and sat down.

That is very good, the professor said. You are quite right. Einstein told the story to remind us that physics deals with facts and mathematics deal with, well, with mathematics. Everyone in the class laughed knowingly at this remark. Then the professor said, But there was more to the thought experiment. The Frau Doctor was having a birthday on day three of their journey and the Herr Doctor wanted to send her a birthday greeting. Especially because he had missed doing so the year before, at some expense to their marriage. So, 24 hours into the journey, he sends her a message in the form of light signals. Now, Einstein wanted to know, given that these two people are fleeing from each other in opposite directions at near the speed of light, what are the chances that this light signal will ever reach the Frau Herr Doctor in time for her birthday.

Again, hands shot up and the professor called on a young male student up near the front. The signals will never reach her, he said. The photons of light will barely leave Herr Doctor's spaceship. And why is that, the professor asked. We can see this by simple analogy, the student said. If you are standing on a moving platform going one hundred miles an hour in one direction, and you have a gun with a muzzle velocity of one hundred miles per hour and you fire it in the opposite direction of travel, the two velocities, moving in opposite directions, cancel each other out. The bullet will just drop to the ground. The doctor's spaceship is traveling in one direction at near the speed of light, so the same can be said for any light signal sent back in the opposite direction to the Frau Doctor. It'll go nowhere, or at most the signal would just crawl away.

Yet, the professor said, these light signals are traveling somewhat faster than the spaceships, so presumably they eventually could catch the other spaceship, yes or no? Maybe, theoretically, the student said. But never in time for this year's birthday. The professor and the class all smiled at this. The bright young woman in the front row raised her hand again. I disagree, she said. We know that travel at velocities approaching the speed of light slows time down dramatically. Perhaps an equation could be worked out where Herr Doctor's message might very well arrive on time for his wife's birthday. Another hand shot up. What about the curvature of space, this student said. If you are traveling at near the speed of light and time is slowed down very dramatically, and space is curved as Einstein said, then it seems to me two spaceships traveling through curved space in opposite directions should eventually meet up. At some point they are traveling toward each other, not away. The universe is finite so, hey, who knows, that could happen in time for Frau Doctor's birthday.

The class found that amusing also and the professor concurred with a comical gesture. We had fun with Einstein that day too, he said. Einstein told us we can be thankful God does not ask us to move about at the speed of light, so we don't have to worry about such problems. Then Einstein indicated we should leave because he had some work to do. But before we left he told us one more thing. With a merry twinkle in his eye, he said, So you young people remember now, when you get married, if we want to keep peace in the family, we should not put too much distance between ourselves and our spouses.

The class enjoyed all this very much and the professor, pleased with the effect, looked at his watch just as Brian strolled up to the front. I have a thought experiment, he announced.

The professor had heard about this kid with the hair from Zelnitsky at a faculty meeting, but before he could react Brian began to speak. He had a thought experiment he wished to present, he said, something that occurred to him during the previous discussion. He explained that it concerns an event that takes place on the first spaceship and that affects the second spaceship simultaneously, independently of the speed of light.

Brian, not bothering with permission, turned to the class and began, his voice strong and no longer cracking. It happens, he said, that Herr Doctor on the first spaceship gets sick and dies. His death affects the Frau Doctor on the other spaceship at that very moment because now it makes her a widow. So here we have an event on the second spaceship which is effected instantaneously by an event on the first spaceship. The two events are simultaneous. According to Einstein, that can't happen. For Einstein, no event on the first spaceship can affect the second spaceship at a rate faster than the speed of light travel. And yet here we have two interlocked events which occur instantaneously and simultaneously, at great distances from each other, having nothing to do with the limits imposed by the travel of light. How does Einstein explain this? Brian turned back to the professor, eyes bright with innocent hope.

The professor, caught between annoyance and amusement at such a silly notion, tilted to the silly notion first, encouraged no doubt by the titters in the hall.

Well, he asked, what is the event on the second spaceship. The wife doesn't know she is a widow. And until she knows, there is no second event.

She doesn't have to know it, Brian says. What's true for the Doctor is true for the wife.

Yes, that's true of course, but truth in the order of logic, the professor said. There are no physical effects as yet. No effects until she learns that she is a widow.

It's not just logic, Brian insisted. There are physical effects also.

And how is that, the professor said beginning to enjoy the class reaction. The poor lady, he said, is still going to be angry that her husband missed her birthday. The amusement increased and the professor grew more pleased with himself.

It doesn't matter whether she knows it or not, Brian said, raising his voice. There's one less married couple in the universe. That's a physical fact, even if nobody knows it. A fact is a fact, right? And every corner of the universe is affected by it.

Well, the professor said, suddenly serious, there may be one less married couple in the universe, that's true, but it has no physical significance for the Doctor's wife, nor for anyone else for that matter, not if no one knows about it.

You mean, Brian asks, if no one knows she's a widow, then she's not a widow.

Exactly, the professor said. Logically, yes, she's a widow, but it means nothing, it has no physical significance for her if no one on her spaceship knows about it.

OK, OK, Brian said, but suppose before he dies Herr Doctor buys a lottery ticket just at the point of the drawing, and then finds out that he's won. He's the only one who knows about it. What you're saying is that the Doctor is rich now but the Frau Doctor isn't. She'll be rich later on. Brian had to giggle at the thought.

The professor frowned. What I'm saying is that truths are truths and events are events. Lottery drawings are events that have to be communicated for them to mean anything, he said. You're getting them confused, young fellow, the professor said with a paternal shake of his head..

Brian was stopped by that for a moment and had to look down to marshal his thoughts. Then, raising his head in triumph he cried, OK, so what you're saying is that truths have no physical effects until they are communicated. And what I'm saying is that truths can have physical effects whether they are communicated or not. In my example, the physical effect is instantaneous.

And just what are these physical effects, the professor said.

Frau Doctor has become a rich widow, Brian shouted almost springing off the floor. And the tax people are already figuring out what she owes.

The professor saw by now that he had been entertaining adolescent nonsense. The class hour was up anyway so he waved to the class with a gesture of comic futility and began to gather his notes. Before long Brian was standing alone in the front of an empty hall, plunging his hands deep into hair, student laughter still echoing in his ears. Actually the laughter didn't bother Brian that much. What really concerned him was the question of what old Einstein would have thought. Competitive though he was with his surrogate father, Einstein's opinion still mattered to the boy.

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The hall was not entirely empty. The bright young woman from the front row had stayed behind. She came up to Brian and said, Hi, there. You know that took a lot of nerve.

He didn't get it, Brian said. He didn't get anything I said.

He's a physicist, she laughed. You know the type. Physicists can't take anything seriously unless it shows up somewhere on a measuring device.

Brian looked at her appreciatively. I'm Brian, he said. What's your name?

Penny, she said. Brian saw that she had a nice smile.

Care for a beer, he said?

A beer, she said. She laughed. How old are you anyway?

We can go to Tony's, Brian said. They know me there.

Penny hesitated. Sure, why not, she said finally. Everyone's talking about you, you know. The boy with the Einstein complex, she said pointing to his head.

They both laughed and set out for Tony's, Brian as unselfconscious as ever and this bright young lady piqued with curiosity. On the way Brian told her a joke he made up on the spot. There were these two physicists who had been working for years on a grand unified Theory of Everything, all laid out in a single equation on the blackboard. The day they worked out the last details they opened a bottle of champagne to celebrate. One of the physicists, lets call him A Brian said, when he went home after that, discovered his house had burned down and his wife had left him. He had a heart attack and wound up in the hospital. When B, the other physicist, came to visit him, he found A looking very worried. What's wrong, B said. It's our Theory of Everything, A said. I have this gut feeling we may have left something out.

That gave Brian and Penny another good laugh

At Tony's Brian ordered a diet coke and a beer. When the drinks were delivered, Brian reached for the beer. Underage drinking, Penny said with her ready laugh. You're going to get me in trouble. She was all of eighteen, itself not unprecocious for a Princeton junior.

Brian took a big gulp. He made a face and took another gulp. Then he wiped his mouth with his sleeve and leaned over towards his new friend.

What to hear about my new law, he said?

Sure, she laughed, sipping coke. Why not.

OK, Brian said. Here it is: *Nothing exists by itself.*

That's silly, she said. It doesn't say anything.

It says everything, Brian protested.

Nothing exists by itself, she repeated. It just states the obvious.

So what if it's obvious, he said. It's important. Suppose the opposite were true.

It's just silly, she said.

It's anything but silly, he said. The shortest distance between two points is a straight line. That's obvious too. Is it silly? Everybody's been quoting Euclid about it for two thousand years.

But what's the point, Penny said. You can build on Euclid. What can anybody do with this silly law of yours?

My law is fundamental, Brian insisted. Name something in the universe that doesn't depend on it.

Penny pushed her drink away. You're cute, she said. The young lady made a move to get up. You know I really shouldn't be here, she said. I have exams tomorrow.

You don't get it either, Brian said slumping back in his chair.

OK, Penny said, settling back. Explain it to me.

Brian took a paper napkin and wrote out his equation, C = B + A. He explained what each of the variables represented. The variable A stood for the observer, he said. Einstein looked at the world through the eyes of an observer and turned the world of physics upside down. But the problem is Einstein's whole methodology is upside down and backwards.

Penny laughed but the music was minor key. Oh, really, she said.

Yeah, Brian said, for one thing his observer isn't real. He's a cardboard character. Brian emptied the beer bottle into his glass and took a big swig, wiping his mouth with his sleeve in that ritual way. Then Brian held up the bottle. Look, he said, you know what the world has in common with this bottle?

Penny gave Brian a little smirky smile and shook her head playfully. I can't imagine, she said. Tell me.

They're both *things,* Brian said. Right? And do you know what makes this bottle a *thing,* what makes the world a *thing?*

Penny's smile faded. It's not that easy for a bright young junior to abide a freshmen bent on enlightening mankind, especially a motor-mouth who has yet to shave, even if he is cute.

OK, I'll tell you*,* Brian said. We do. The observer makes them *things*. That's what my equation says, right? Sure, this bottle exists without us looking at it, but what is it? It's not a bottle, it's an organized flux of spinning particles or whatever. But without the observer it's not a bottle, not to this table, not to a fly on the wall, not to the moon. It's not a bottle to itself. And the world isn't a world either, it's just some swirling 'whatever' until observer A in my equation comes along. Even the spinning particles are our constructs, for God's sake, Brian said, voice rising.

Penny's expression became pure smirk as she glanced around at the neighboring tables. Didn't Einstein say as much? she said in a calming tone. We take in sense impressions and turn them into objects, isn't that what he said?

His observers are stick figures, Brian said loud as ever, and stick figures can only give you a matchstick world. It takes real observer to make a real world with real things in it. Einstein's observer is a dreamed-up fiction he used for his thought experiments.

Others at a nearby table began looking their way and Penny frowned. Brian, she said quietly, you're getting light years away from physics, into biology or sociology, or who knows what. Maybe even religion. She let out a little laugh. You should meet

my boyfriend Ivan. You and he would get along famously. She summoned a nice smile and began to gather her things.

Wait, listen, Brian said calming down. OK, sure, physics is different from biology and the rest, but you don't have physics without an observer, right? And you don't have an observer without biology and a lot of other stuff. Look, he said, real observers just don't measure and calculate, they live and breathe and worry about tenure and have kids. How can you understand the world if you don't understand the observer science depends on? Like, how did the flux, the B in my equation, produce A so that the B flux could observe itself? How did we get this A? Einstein never answered that question. He never even asked it.

Penny put her things down. OK, Brian, she said with a laugh. You have all the answers. Where did this observer A of yours come from?

Brian looked at Penny, took a swig of beer and broke out into a grin. You're the physicist, he said. You tell me.

Penny rolled her eyes and looked around for her ready laugh. OK, she said finally. From the Big Bang, courtesy of natural selection. Where else?

You're saying that A came from B, then, Brian said. From the raw stuff.

Absolutely, Penny said. Where else is this A of yours supposed to come from?

Where did the Big Bang come from? Brian said.

Who knows, Penny said rather more weakly, sensing a weakness.

Exactly, Brian said eager to spring it. We don't know where B came from and we don't know where A came from either. If we can live with one unknown, what's wrong with two?

Come on Brian, Penny said. Why bring in another singularity? One mystery is enough.

If you can't explain how the raw B flux could produce its own observer, then you're stuck with a mystery like it or not. And so far no one has a clue. So if we can live with one mystery, we can live with two, right? Why not? Why not a Big Bang singularity to explain B, and a Silent Touch singularity to give us A. Did you ever see Michaelangelo's painting where that old figure stretches out his finger to touch the young guy's finger? That guy is observer A in my equation. He's getting his job assignment. He has to get up off his butt and give B its finishing touches. Brian began to giggle at the thought.

Brian, you're just a hopeless poet at heart, Penny said. Not even a very good one maybe, but you're definitely cute, she added with a laugh.

Brian stopped, took a final slug of beer and looked over at Penny. That's where Einstein lost it, he said. What does a stick figure know about the sticky leaves?

The sticky leaves, Penny repeated with a big laugh. My boyfriend Ivan would definitely enjoy that. He's a liberal arts major and a Dostoevsky freak. He's crazy just like you.

Brian paid no attention but suddenly his eyes lit up. He grabbed the napkin he had just thrown down and began stabbing his finger at the equation. I just realized something, he cried. The C in my equation, the Cosmos, it's not the *sum* of B and A. It's the *product*. Brian jumped up from his chair. Yeah, that's it, he cried, knocking the beer bottle over. Penny had to keep it from rolling off the table.

Take it easy, Brian, she said. You almost broke your world.

No, listen, Brian said flopping back down into his chair. I really have it now, he said. He reached for the napkin. He crossed out the old equation and wrote a new one under it:

~~C = B + A~~
C = B ∗ A.

That's really got it, he said, excitement rising again. A isn't something that's *added* to B. A *magnifies* B. Don't you get it?, he cried. That magnification is our C, our incredible world with its sticky leaves and all.

Brian, quiet down, Penny said reaching out to calm him.

Listen, Brian cried shaking her off, what happens if you took A out of C, if there's no observer left in the world. C shrivels up, right? All you have is the spinning particles, the raw B. You can assemble all the cans of paint and brushes and canvases you want but they'll never make a picture. That takes an artist, right? That's the A in my equation. A living artist, not a stick figure.

Oh, Brian, Penny said gathering her things, you don't belong in physics. They'll eat you alive.

They shoved Einstein aside too, Brian threw back at her. Until he published his papers and knocked the world for a loop.

Don't hold your breath, Penny said getting to her feet. But as she turned to leave she reached down and took the napkin and tucked it into her purse. Just in case I'm wrong, she said with her ready laugh.

Brian did not watch her go. His hands were furrowed deep into Einstein hair as if he was trying to grab hold of his brain (Brian's brain), maybe to cool it down. Then suddenly his mind raced off into something he knew he had to do.

* * * *

He had to get in touch with Einstein. He had to know what the master thought of his ideas. Brian got his bike and rode over to Einstein's old place on Mercer Street. He stopped in front of the small, white, two-story frame house, lived in now by strangers, and imagined going up to the door and Einstein letting him in. They would exchange a few words and then Einstein would take him up to his tiny office

on the second floor in the back and they would sit and talk. He would ask Einstein why, if he built his entire system on the observer and the fact that you can't say anything about the world except what the observer observes, why did Einstein end up turning the observer into a bloodless measuring device? No doubt about it, Einstein would have something to say. And Brian would show him where he was wrong. A bloodless observer is just a piece of equipment and what does equipment have to do with the really real.

Brian moved on past the house and biked down the tree-lined street towards the Institute where Einstein had his office, along with the other mental giants working there. There were woods by the institute with paths Einstein used to like to walk. Brian turned his bike down one of these paths and then, a ways into the woods, he stopped. It had rained earlier and the fall-colored leaves were dripping as a breeze stirred the woods. The late afternoon sun had come back out, its soft light creeping through the branches.

Brian got off his bike and sat on a rock. The rock was wet and he could feel the dampness run through his trousers. He got up and felt the seat of his pants. It struck him that he knew the rock was damp because his seat was damp and his seat was damp because he felt the dampness on his skin. As if the dampness were there only because he felt it. He remembered reading what Plato had said about a tree falling in the forest. If no one was there to hear it, Plato asked, would it make a sound? Brian looked at the wet foliage everywhere around him. Would anything be wet and damp without his being there to see it and feel it. He stooped over and ran his hands through a pile of leaves. The fallen leaves were wet and slimy and cool to his hand. Were the leaves slimy and cool by themselves, without him? He looked up at the trees all around him, wet leaves glistening like jewels in the setting light as a gentle wind stirred the branches. He heard in the distance a car door slam back at the Institute. He could hear distant voices. This had been Einstein's little world. He must have come here on afternoons like this to get away and must have felt the same autumn cool, smelled the same dampness rising from the earth, watched the peek-a-boo of sunlight in the leaves. Did he have the same reflections, Brian wondered? Now it was Brian's world, for as long as he stood there. And when he left, when no one was there, what would happen to the woods? What would be left? Something, but not wet, fall-colored trees and the smells of fallen leaves beginning to rot. No, just a mess of spinning nameless 'whatever.' He imagined Einstein stopping here, looking around, he too giving the woods its forms, its hues, shadows, the glitter of sunlight, the hardness of the macadam underfoot where he stood, the stillness, the brush of fresh cool breeze against the face. None of it was here without a beating heart to see, feel, smell, listen, even taste the woods. The woods were here because he, Brian, was here, and Einstein before him, and anyone else coming here and taking in the spinning 'whatever' and giving back the world. No piece of equipment could begin to do that. Why didn't Einstein get it?

Brian walked his bike along the path. He stopped before a puddle where a sparrow had been dipping its beak. It flew away as he approached, into a tree. He reflected that sparrow had no idea of the puddle, it was just a place to drink, it didn't know water was water, only something that it must have, or that a tree was a tree, only a place to hide. Only he, Brian, the privileged observer in his flesh and blood knew

these things. Everything, the soft, the hard, the slimy, the wet, the cold, they were only there because he was there. Without him, the woods were just moving particles that spun around and around. Even the particles were constructions, courtesy of someone's theory. Who heard the noise in the Big Bang? Face it, there was no bang. Who saw that first primeval flash of light? Without a retina, how can you speak of light? Without a flesh and blood observer, the world utters no sound, casts no shadows, never gets wet or dry, never turns hard or soft, hot or cold. Just raw spinning 'whatever' organizing in some way so that some observer could come along into the world someday, into these woods, and color it all in and say, you're a tree, you're a puddle, a rock, the breeze, the setting sun, the galaxy Andromeda, the universe. Einstein said there's no place for subjectivity in physics. But why?

A fresh breeze came up and stirred the branches, showering Brian with cool dripping rain. He didn't move. He stood there leaning on his bike, looking around, the stand of white birches in the woods just ahead, bushy foliage everywhere losing color, patches of slippery moss along the path green as old wine bottles. Brian stayed there without moving, dumbstruck, not at the stillness of a late afternoon woods drenched with an autumn rain and liquid sun. Brian closed his eyes. It was something else entirely. None of this is there without me, he said, the words only sounding in his mind. It's all for me, he said. It's all for me. Brian felt giddy, as if he were floating, his feet no longer touching the damp macadam path.

But then, as was his way, in the very next moment Brian saw something else. He spotted a squirrel poised by a tree watching him, ready to scamper off if he moved. Brian watched him back. Yeah, Brian thought, this little guy has his world too. This is his territory and I'm messing it up for him right now. His world and the squirrel's world were poles apart, but it didn't matter. Here they were connecting, trading stares. He doesn't know he's a squirrel to me, and I don't know what I am to him, but we're here for each other, we're here for each other. Then, in that wet afternoon instant, everything that had been happening to this boy since coming to Princeton slipped into place. Yes, it was true, *nothing exists by itself* , but there was a corollary that went even deeper, and this fourteen-year-old Einstein kid finally knew what it was.

* * * *

The truth is, of course, the kid Brian had a lot more to learn about a great many things, not the least of which was about himself. He might just possibly be as smart as Einstein (not really of course) but, for one thing, he was not even one hundredth as humble. Humility is not easy to find in physicists, Einstein was most unusual in that respect, so it would make an interesting story how Brian might have learned it, if he ever did. But I'm afraid it's not a story for here. The present account only takes us to the point where Brian was informed--along with his mother--that he would not be allowed to declare for physics, not now or ever, not at Princeton. It was a judgment arrived at by the entire physics faculty to a man (no women on the physics faculty) at a regular faculty meeting. Chaired by Zelnitsky to be sure. Brian might be gifted, it was half-acknowledged, and might do well in some other field, but not in physics for sure. Metaphysics perhaps.

The incident that brought this disaster about, Zelnitsky's last straw, deserves to be told. So if you, my reader will indulge me a bit more, that's what I'll do. It transpired that the famous Italian physicist, Piero Pieri, reputed Noble Prize shortlister, was giving a lecture at Princeton. Zelnitsky had gone to great lengths to get this prize speaker and was restricting attendance to Princeton faculty and just the physics grad students and upper-class undegrads. And of course the faulty and postdocs at the Institute for Advanced Studies nearby. It was to be a gala affair, with a reception following. Piero Pieri was reporting on his collaboration with Stephen Hawking and other cosmologists on one of the hottest topics of the day. The posters on the bulletin boards in the physics department put it plainly enough: Is Time Like an Arrow Or Can We Travel to the Past?

It was a fluke that Brian was able to attend. On the day of the lecture, he bumped into Penny by chance and asked her if she were going. Penny said it was her birthday and her boyfriend Ivan wanted to celebrate so that was that. And what are you going to do with your ticket, Brian asked. You'd like to have it, I suppose, Penny said, going into her purse. But you have to promise me to behave, she said. Zelnitsky will kill me if you don't. Brian didn't promise anything of the sort, of course. Just don't let him know where you got it, oh, please. she said handing it over. Brian said thanks, but wishing her a happy birthday, sadly, was still beyond the reach of a boy still pretty much stuck in himself.

The hall was quite full. Zelnitsky was seated in the front row center, surrounded by most of the physics faculty along with faculty from the Institute. Postdocs, grad students and upper-class types were everywhere else. Brian got there early and took a seat way off to the side a few rows behind Zelnitsky. Before long the hall was alive with expectation.

Piero Pieri began to talk about time warps and the prospects of reversing time and actually revisiting the past. Prospects for that he said were not unthinkable, as he was about to demonstrate. There were lots of equations on the board and probably no one in the audience fully followed, not even Zelnitsky, and certainly not Brian. But equations are equations, part intimidation, part seduction. Capturing cosmic eons in an equation, no matter how arcane, has its attractions.

Near the end of the lecture, Piero Pieri smiled out at the gathering and said he wanted say a few final words now not about the past but about the present. About our illusions regarding this particular aspect of time. He said that all of us, even cosmologists, live personal lives operating under an absolutely naive and theoretically incorrect notion of the present. Our idea of what we call 'the present world' is simply false he said. In what sense is the world in fact ever present to us? To illustrate this, he said, let us assume that there are two objects in the universe, X and Y, and ask the question in what sense can we say that any X is present to any Y, that X and Y co-exist in each other's present timeframe, like two actors appearing on the stage at the same moment. Of course, Piero Pieri went on, as Einstein pointed out, we know that true simultaneity of any two events in the universe is theoretically impossible. So, if X is a galaxy millions of light years away, and Y is an observer on the earth looking at its starlight, X is only present to Y in an historical sense. We

know in fact that it is quite possible X no longer exists and is no longer emitting light. So we can never say that X is present to Y. Only its past is present.

Now, Piero Pieri went on, let us move X closer and assume that X is the sun 93 millions miles away from Y our observer on the earth. According to Newton's action-at-a-distance, if the sun were to suddenly cease to exist, the loss of its gravitational tug on the earth would be felt immediately and Y would know it at once. But Einstein corrected this and we now understand it would take a full eight minutes before Y would feel the sun's demise. So when Y looks up at the sun, he could be seeing something that ceased to exist as many as eight minutes ago. He could continue to bask in the sun's rays for those eight minutes but what he is enjoying is the sun's past, not its present. And that's always the case. Now let's move X closer still, say, to someone standing one meter away from observer Y. Like everything else, Y is aware of X on the basis of signals X gives off. The fastest signal Y can receive from X is light. So Y sees X and knows that X is present on the basis of light travel. But here again, strictly speaking, what Y knows about X is only something true of X in the past. An extremely recent past to be sure, for light travels the distance of one meter in 3.3 billionths of a second. 3.3 billionths of a second is not much elapse of time, indeed, but the past is the past.

I think the point is clear enough, Piero Pieri said. No matter how we define X whether as a distant galaxy, as the sun, or the person standing next to Y, Y's experience of X is always an experience of X's past. The only difference in these examples is the interval that separates X from Y. In the case of the galaxy, the interval can be millions, even billions of years, in the case of the bystander, 3 billionths of a second. That is not much time, agreed, and in everyday life we safely ignore it. But in physics, the situation can be very different. Consider this: in the interval of 10 to the minus 10 seconds after the Big Bang singularity, i.e., in one billionth of a second after everything got started, there were already formed all the quarks, protons and neutrons that are needed to create hydrogen, helium, lithium, deuterium, in short, virtually all the matter that makes up our universe today. All this in the interval of one billionth of a second. So we see that in the interval it takes Y to blink as Y looks at X right next to him, a lot can have already happened.

So what does this really mean, Piero Pieri asked. It means that the only thing truly present to Y is Y itself, whatever Y is. We can think of Y as our consciousness, our self-awareness, and say that our self-possession alone encompasses the entire meaning of 'present time', but even that may be naive. The X and Y problem is still with us. For what is consciousness, after all, but a configuration of brain synapses, networks of neurons interacting. And inside these interactions are billions of X's and Y's, cells that must signal other cells through some wall of time. It's the problem of galaxies in another key, he said. And of what do these neurons consist but the very particles that were formed in that billionth of a second interval after the Big Bang. All these particles are also just so many interacting X's and Y's therefore, all separated by this wall of elapsed time. So in the end, we are forced to conclude that the only thing truly present to itself is the indivisible particle, each particle isolated from every other particle by some interval of time imposed by the speed of light.

The universe is a terribly lonely place therefore, Piero Pieri said in his wrap up. And from a cosmologist's perspective, as the universe keeps expanding, it can only get lonelier. The world we enjoy is already past tense. And who knows, he concluded, perhaps our fascination with travel to the past is driven by secret dread of a present tense that is already synonymous with cosmic loneliness.

At this Piero Pieri sat down to an abundance of applause and appreciative nods. Zelnitsky glanced around at those about him, proud as a peacock. It's true that physicists nowadays, nurtured as they are on the quantum revolution, seem easily drawn to theories that bugger common sense. If the theory isn't a bit weird, the great quantum theorist Neils Bohr used to say, it probably isn't true. Einstein fought this sort of thinking tooth and nail, all his life, but there's no stopping these guys. One of the wildest notions nowadays is the 'many worlds theory,' the idea that there isn't one universe but multiverses, with the number of universes reaching infinity raised to an infinite power. They say that every particle in the universe has multiple probable states, and that all of these states in combination with the states of every other particle must actually exist somewhere, producing endless universes in endless combinations. They call these multiple probable states the particle's superposition, and it's only when the observer looks at these particles that they collapse into the single states that go to make up our own particular universe. That's pretty wild you have to admit, but these physicists take this 'many worlds' idea as a perfectly reasonable hypothesis. They really do and we should too, probably, though it can give you a headache just thinking about it. It's fascinating, actually, that grown men with PhD's can entertain such far out notions, though there's a limit to this sort of thing even with them. Like these same guys would never subscribe to the multiplication of loaves in the Gospel story, for instance. They definitely have their limits. And the boy Brian with the unkempt hair was about to transgress their limits big time.

The applause and smiles and nods had hardly died down before Brian's voice could be heard addressing the speaker. What if X and Y are one and the same, he cried. He had to shout it several times before the hall was quiet enough to get the speaker's attention.

One and the same, Piero Pieri repeated, getting back on his feet. What is this, he said, moving to the edge of the platform. In a move as near to simultaneity as Einstein's theory would permit, Zelnitsky was also up on his feet.

Brian came forward and stood immediately before the speaker's platform. What if X and Y are the same thing, he shouted to be heard What if they're the same person.

Piero Pieri peered down at the strange boy confronting him. I don't understand this question, he said. He looked over at Zelnitsky, then back at the boy's head of hair.

OK, OK, Brian shouted. What if Y bi-locates. What about bi-location.

Piero Pieri looked around. What is this bi-location?, he said.

Brian drew himself up. You know, the padre from your country who bi-locates. Padre Pion or something.

Pion, pion, Piero Pieri repeated puzzled, looking over to Zelnitsky for help.

Yeah, Brian said aloud. He was a monk. I read about him. They just made him a saint or something. Padre Pion. There was laughter in the audience at this. Some crypto-Catholic in the audience, no longer able contain himself, shouted out *Padre Pio, Padre Pio*.

Right, Brian said, Padre Pio. Lots of people saw him in two places at once. There's plenty of data. X and Y in two different places at the exact same time.

Is this serious?, Piero Pieri said looking accusingly at Zelnitsky. Zelnitsky, beside himself, started towards Brian.

No, listen, Brian shouted, dancing away. Suppose when he bilocates the padre is wearing a watch. The two padres both have the same time then, right? No time elapse, no past, no wall of time between them. So X and Y can be present to each other, one hundred percent, no matter how far apart, right? All you have to do is bi-locate. Brian began to giggle.

Zelnitsky motioned to two of the younger instructors to lead Brian away. Which is what they did and how Brian's budding career as a physicist ended on the spot. But as they led him away, the boy managed to get off some good parting shots about simultaneity and loneliness and how nothing exists by itself, all to the amusement of those who could hear him, save of course our long-suffering erstwhile Chair.

* * * *

Brian ran into Penny and her boyfriend Ivan not long after Brian's fate had become general knowledge.

Brian, she said, I heard. I'm so sorry.

Brian said it's OK. It's bothered his mother more than him.

Penny introduced Ivan and said she had told her boyfriend some of his crazy ideas. She said he liked the bit about 'sticky leaves.'

Yeah, man, Ivan said, that's my kind of talk. He patted his girl friend on the head. I keep telling her there's more truth in a butterfly than in $E=mc^2$.

Brian just looked at him and Penny made a face. And I told Ivan about your law, she went on, laughing again. She went into her purse and took out the napkin with Brian's equation on it. I even wrote your law down.

Nothing exists by itself.

That's true religion man, Ivan said. What you say goes right to the top. When Brian looked at him blankly, Ivan added, The Trinity, man, the Trinity.

Brian brightened. I've even made it better, he said.

Awesome, brother, Ivan said.

Penny studied Brian for a moment. I heard about the Padre Pio bit the other night, she said. Were you thinking of your law?

Not really, Brian said. Maybe. Bilocation can be predicted by my law, you know.

Penny smiled and shook her head. You really don't belong in physics, she said.

Why not?, Brian said. Physics deals with whatever's the case, right? Wherever it takes you.

Penny kept studying Brian. Brian, she said, physics will never stomach this subjectivity kick of yours. There's enough uncertainty in physics as it is. No two people ever see the same event the same way. You can't do science that way, you know that. In physics you try *not* to interact with the world. The idea is you watch it and measure it. You stand off at a distance and try to figure out what makes it tick.

Brian shook his head. What can you know about anything if you don't relate to it, he said. Brian took the napkin out of Penny's hand and, leaning against a wall, wrote a second phrase beneath her handwriting. Here, he said passing it back, these two theorems sum up my law:

Nothing exists by itself
Nothing exists for itself

Oh, Brian, Penny said, this isn't physics.

Maybe, Brian said, but it takes more than a slide rule to know what's what. I told you that before, he said looking at Penny like she was the hopeless one, but you still don't get it. Look, the A in my equation is the set of all beating heart observers. And they interact with the raw ingredients of the Big Bang and that interaction gives us C, our world. Then Brian's face lit up. He took the napkin from Penny and added an exponent to the A in the equation:

$$C = B * A^2$$

The observers interact with each other too, he said, handing it back to her. That pretty much says it all, he said. The world is the product of the raw 'whatever' of the Big Bang multiplied by the square of beating hearts. Brian took it from her again and re-wrote the equation in the format paralleling Einstein's equation:

$$C = ba^2$$

A bi-locating monk would get it, he said giving it back, the barest trace of smile appearing on his lips. Then the smile widened at the thought of the joke that had started him off: *Ein*stein, *Zwei*stein.

Far out, man, I like it, Ivan said slapping Brian on the back. $C=ba^2$ has got Einstein's $E=mc^2$ beat by beaucoup light years. He's making room for the butterflies and sticky leaves, Ivan said nudging his girlfriend.

Penny shook her head forlornly. Brian, you're totally impractical, she said. What can you do with this? The heart can't split atoms, can't launch a space probe to Mars, can't even earn a living for that matter.

It can say 'this is good,' 'all is well,' and 'go to hell,' Brian said.

Cool, Dad, cool, Ivan said trying to give Brian a high five, but Brian couldn't bring himself to play.

With a face of sad frustration Penny looked at the napkin. *Nothing exists for itself.* She spoke each of the words deliberately, like they were in a foreign tongue. Then she looked over at the boy with the Einstein mop standing before her, not even her height. So tell me, Brian, she said, and who do you exist for?

The boy Brian for once had no answer, but it's not so strange, after all. He was just a brainy kid with a complex. All he wanted to do was to prove the father he loved was wrong. But that, like everything else in this world, was only half the story.

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It's interesting how people react to the Big Bang, at least the ones who ever think about it. Physicists call it a singularity and hanker to peer back fourteen billion years to figure out how something like this could have happened. Mystics call it a Divine Work and long for the end times to witness the Artist's final brushstroke. And in between the beginning and the end there's all this uncertainty about any of it, even down to the destiny of the tiniest subatomic particle and the path it will take, or be given by some observer's observation if you will. We needn't be surprised, then, if Brian's career from this point on is aswim in uncertainty, or providential mystery if you care to call it that.

As for the observer, physicists have always put the observer in the catbird seat and they would have no real argument with Brian that the observer has more to do with the look of the world than meets the eye. Even Plato way back said that when we look at a thing, part of what we see comes from the object, the rest comes from us. That was Brian's point in spades. But Brian saw a big something else that neither Plato nor the physicists ever thought about, including the great Einstein--that the observer is a flesh and blood individual who himself is under observation, a point Brian would say just goes to prove his law, that an observer under observation doesn't just exist for himself. That's closer to the way mystics think, so Zelnitsky was probably right and Brian is probably more fit to be a monk like the Italian padre than Herr Doctor physicist with tenure and all. But then again, for all we know, he could become the manager of a 7-Eleven and wind up having a slew of kids. Not likely, but possible (in one of those many multiverses).

My reader, if you will indulge the author here one last time, let me share my fantasy of how this story ends, not in the near term, mind you, but way down the cosmic pike, when the Artist has laid down his brush and all the spinning set in motion those14 billion years ago has finally come to rest. It's a picture of amazing felicity.

I see Brian and Einstein in a luminous place, both now fully enlightened that you can only truly know what you love, walking arm in arm and laughing, and by some merry dispensation of sweet Providence that ever watches over them, both still needing a haircut.

--the end--