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News Extra: Ancient Document Discovered "Could be the greatest of all time if validated" says professor

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Bernoulli (1654-1705)

Notable for calculus were truly
James and brother John Bernoulli.
Also Daniel, John's son,
Was a capable one.
The conservation of energy he proved coolly.

Those mathematicians reigned supreme,
Who had the courage to dream.
Had I my druthers,
They'd all be my brothers,
And I'd be on a winning team.

News Extra: Ancient Document Discovered

"Could be the greatest find of all time if validated" says professor

by Shawn Dolezilek
The Associated Press

Members of the Archeology Department at Kansas State University held a news conference yesterday, describing the first translations of an ancient document discovered six months ago at a dig site just outside of Alexandria, Egypt.

"We knew we had something special as soon as we dug it up, but we wanted to be absolutely positive of the translation before we went public," said Edward Wycliffe, head archeologist of the dig which found the document.

The document itself has been carbon dated to 250 A.D., and the author claims to be the ancient mathematician Diophantus. In the document, he describes a "dream" he had about a particular mathematical problem. The extraordinary part of the document, and the controversial part, is the particulars of the dream. These first translators find evidence of specific sequences where he appears to be describing several modern concepts and appliances.

"If this holds up, these descriptions

make Nostradamus look like a side-show fortune teller," says prophecy expert Dan Drieffen.

The panel at the news conference noted that many copies had been sent to translation experts and the original copies to the Smithsonian for further scrutiny.

"We have no doubts our results will be validated," said Wycliffe. "And, when they are, we will be forced to take a serious look at ideas about the nature of time that we have previously found laughable."

THE DOCUMENT

Even now, these many years after I was smitten by my dream, it comes back to me as if I were still there. The otherworldly sights and putrid smells of my dream would have been enough to scare lesser men to death, but what I learned from my dream scares me even more. I have forced myself to call what happened a dream, for if I do not, the logical implications would have driven me to madness long ago. Or, at the very least, if I had tried to describe this scene to my contemporaries, I surely would have been laughed out of the Museum. Lying here, knowing now that I have per-

haps days, or maybe mere hours left to live does not lessen the sense of fright and wonderment I felt, oh, those many years ago.

I write this text more as an open letter to myself, in an effort to exorcize the memories of that day before I go forth on the Great Journey. After I have finished this and have died, my servants are to bury this a goodly distance from my wonderful city of Alexandria. I hope that time will claim this letter before it is ever found, but if any sons of the Roman Empire, many generations hence, find this work and wonder from whence it came, I am so obliged to tell who I am, and why my story is credible.

I am Diophantus of Alexandria, respected scholar and mathematician of the Museum at Alexandria, the same Museum the likes of the great Euclid and Eratosthenes taught at during the days of Greek primacy. Surely, my contributions to mathematics have been important enough that, provided this letter is ever found, my name will make my tale credible.

Even now, some fifty years after the fact, I still try to make sense of all

that I saw, but the fact remains: even my powers of perception and intellect are insufficient to make sense of it all. Therefore, I will attempt to tell my story exactly in the way it happened to me.

It was a typical midafternoon, not unlike any other in my home city. I had decided to go for a walk after a lecture at the museum. I was thinking about a problem of dividing a square number into two other square numbers. I was almost there, and through considerable trial and error, I was ready to make the problem work.

Walking across the Heptastadion, to the island of Pharos, I planned to travel out to the Pharos Turris, where the great lighthouse stands. I had made many trips to that tip of the island. Standing on a landing in the lighthouse, high above the ground, was an awe inspiring sight. Gazing out into the azure sea and watching the ships come into port, I had many insights into the great Mystery that is number. Even now, that landing surely still bears the chalk marks of my fervent computation.

I loved to run up the stairs to that top landing at full speed. I had done this so many times that I was sure I knew every worn stair by heart, or so I thought. This day, as I ran up the stairs, nearly to the landing, apparently I caught a toe on one of the steps. As my body was flung headlong through the air, I felt as a bird must feel. But about the time I decided my lack of connection to the ground was a problem, I saw stars, then blackness surrounded me ...

I thought I had regained conscious-

ness, but I was lying face down in an expanse of wet grass. This contradiction went straight to my brain; I was afraid that I had died and gone to Elysian Fields. But in short order, I had taken inventory of my body and the large lump I felt on the back of my head convinced me that I was indeed still alive.

Sitting up, my eyes scanned my new environment, trying to assess exactly where I was and what had happened to me. What I saw before me was indeed shocking. I was sitting in the middle of a large, well-manicured lawn surrounded on three sides by large buildings, which were not of Greek or Roman design and were in fact quite peculiar. They were all large buildings, each more than three stories tall, and all shone in the sun with a brilliance that made my eyes hurt.

The last side of the field was bordered by a road. But on this road were things I have yet to comprehend. These things were traveling up and down the road at great speeds, greater than even the swiftest horse. I know they were inanimate because I could see people sitting in them, controlling the machine's movements. They were bright and shiny, like the buildings, but the wind blew a putrid and frightening smell from that direction, so I decided not to investigate further.

I decided to make my way to one of the buildings. I picked the largest, assuming I would be able to find some dignitary or scholar that would be able to explain to me where I was and perhaps what had happened to me.

As I approached the buildings, I began to encounter the people of this strange place. Their clothing was like nothing I had ever seen, even in the Nubian lands to the south of Egypt. Their clothing was very bright and colorful, and nearly all of them were carrying some type of packs on their backs. I also noticed the women of this land wore extremely revealing clothing.

Coming closer, I realized their speech was utterly foreign to me. When the first group I approached recognized my presence and turned to look at me, I became scared. What would these strange people do to me? Would they kill me on the spot, or take me into slavery? Mustering all my strength, I put on a smile and strode past them. Luckily, they did nothing. They watched me pass, and then went back to conversing in their strange language.

I could not explain how, but as I made my way through the crowds of people, their language became more and more understandable. I decided this had to be a dream, so I spent no time wondering how I could suddenly understand their speech.

Passing through the doors and into the building was quite a shock to me. It was quite warm outside, but when I entered the building, I was hit with a blast of cold air. It was amazing, hot outside and cold inside. However, it was no more amazing than anything else that had already happened.

Wandering down the hallway, I entered a room that I instantly recognized. A large room, going down into the ground as one approached

the front. A large table at the head of the room, and many rows of chairs to sit in, all facing the front. This had to be a lecture hall! All of the people outside all appeared to be young adults, they had to be students! Perhaps my dream would finally start to make some sense.

People began to file into the room, taking their seats and conversing about parties and classwork, topics not unfamiliar in my own lecture hall. I took a seat in the back of the room, deciding to sit and listen to the lecturer. I was interested in seeing what this dream lecturer was going to present.

An older man entered the room, carrying a large stack of papers with him.

“Good afternoon,” he said. “Today, I am going to present Diophantine equations to you, paying particular attention to one example we will examine with our graphers.”

I was shocked and amazed to hear my own name...what in the name of Alexander himself was going on?

“Diophantus spent most of his time exploring what we would call systems of equations,” the lecturer said. “Using our modern methods, we can set up the problems he looked at with two related equations, and, with substitution and algebra, solve for the variables, or find a general case solution for any possible set of variables.”

Even though it has been nearly 50 years since my experience, I still remember these words and the rest of the lecture as if it were yesterday, and I am still trying to under-

stand most of it.

“To get a better idea of what I am talking about, we will look at one particular problem he dealt with, namely ‘to divide a square number into two other square numbers.’ Does that sound like an equation to anyone?” asked the lecturer.

One of the students raised their hand, and said, “Well, how about $x^2+y^2=b^2$?”

“Exactly,” said the lecturer. “So you pick any square number you want for b^2 , then find a way to solve for x and y , right? Well, the trick is figuring out how to solve for x and y .

“What Diophantus found was that another equation was necessary to solve this problem, and he found that equation to be $y=ax\pm b$, where the b is related to the b^2 in the first equation, and a can be any integer. Of course Diophantus himself didn’t know about negative numbers, and any equation that would end up with a solution that would have been negative, he called impossible.”

A student raised his hand and asked, “So, how did he come up with that second equation?”

“Trial and error. Lots of it. We have no evidence to prove that this came from any other source than lots of trial and error. However, when we look at this system on our graphers, I think the reason for the choice will become obvious.

“I think, given the two equations, you should be able to solve this problem. So, for next time, pick a square number for b^2 and work out the solutions. But, for right now,

let’s go ahead and pull out our graphers, and we’ll see what this system looks like. I think you’ll see how and why it all falls into place.”

With this, all the students reached into their packs, pulled out small boxes and began manipulating them in some fashion. The lecturer was doing the same, but he was also doing something with another piece of equipment as well.

Suddenly, the lights went out and the machine the lecturer was working on spit out a huge beam of light against the far wall of the room. On the wall, I could see shadows on the wall that made out words and pictures.

“Okay,” said the lecturer. “What do we want for our square number? How about we use one? Okay, now what does the first equation look like?”

“It’s a circle.”

“That’s correct. What about the second equation?”

“A line.”

“Right again, but what are we going to pick for the a in the equation? Let’s go ahead and pick one as well. What’s the b going to be in the second equation?”

“One.”

“Right, oh, also let’s use the minus to begin with. So, adjusting for how we have to enter the equations into our graphers, we have these two equations:

$$y = \sqrt{(1 - x^2)}$$

$$y=x-1$$

“So, what does this look like graphically?”

The lecturer began manipulating the machine again, and the following picture was drawn on the wall. (Figure 1)

“Now, what does this tell us? Well, just looking at the first equation, I would say intuitively that we can see that $x=0$ and $y=1$ or -1 or vice versa. Well, that gives us four fixed points, where our circle intersects the x and y axes at four places. Now, for our second equation we picked $a=1$, so we should see a line with a slope of one, and since we picked minus b , the line should pass through the point $(0,-1)$, which it does. But a line passes *through* a circle at two points, so what’s the other intercept? In this case it’s $(1,0)$, which we also know is a solution. What if we pick a different number for a ? Will all this still hold true? Let’s say $a=4$, make the change in your graphers, but leave the graph of the other line there as well.”

Again manipulating the machine in front, the picture changed to look

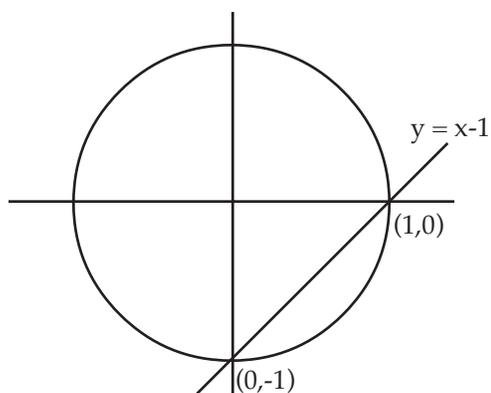


Figure 1

like this: (Figure 2)

“Now,” he said, “go ahead and trace the intercept point for this second equation and give me the coordinates. $(0.48085, 0.87680)$ Ok, so now take these numbers, square them, and add them together. What do you get? 0.9999949625 . Well, that looks pretty close to one to me. I think that should let you better see the relation between these systems of equations and their graphs. Also, all of our work here was done in the first quadrant, just as all of Diophantus’ work was. But, even restricting ourselves to the first quadrant, we still have an infinite number of solutions, so you should be able to see why these are called ‘indeterminate equations.’”

“Well, that’s about all the time we have for today...I’ll see you next time.”

With that, the lights came on. Apparently, the lecturer saw me for the first time. Pointing at me he said, “You, you aren’t enrolled in this class, are you?”

Everyone in the class suddenly turned and looked at me. Someone asked me where the toga party was.

Afraid I had broken some taboo against attending lectures in inappropriate dress or some other infraction, I turned and ran out of the lecture room, down the hall, and out of the building. Unfortunately, as I was running down the steps, I tripped on my toga and fell headlong to the ground. Again, the blackness surrounded me...

“Master Diophantus...Master Diophantus,” was the next thing I heard. When I opened my eyes, I was again in the lighthouse, lying on the landing. A young servant was standing over me. He had been sent out to search for me, since I had been expected at dinner several hours earlier.

I pushed all my thoughts to the back of my mind and accompanied him back to the Museum. I spoke of this tale to no one, and soon discounted the whole thing as a dream or hallucination. But, I never was able to explain why I had bumps on the back and front of my head, or how I suddenly solved the division of a square into two squares problem.

--Diophantus of Alexandria

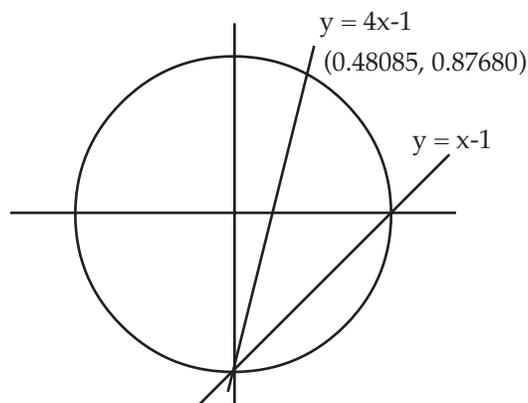


Figure 2