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Gooney Ducks and Naked Physicists

Part LI
The Ouzo Proof
(Episode One)
Who Hid the Halibut on the Poop Deck?

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November 2019

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Abstract: An allegory of modern science.

*The Owl and the Pussy-cat went to sea
In a beautiful pea-green boat,
They took some honey, and plenty of money,
Wrapped up in a five-pound note*

Son of a gun! What a storm! Blew up outta nowhere!

Raging seas, howlin' winds, and spray comin' in from all directions...threatened to blow me overboard! I was saying my prayers—a Hail Mary—crawlin' like a crab across the deck on my hands and knees, when suddenly, a hand reached out and pulled me into the chain locker—the grimmest place on the ship!

Me: "What the?!! Harm! Thanks for pulling me in! What're you doin' in here?"

Harm: "That's obvious. Tryin' to stay alive! The question is, what the heck were you doin' out there? Battenin' down the hatches?"

Mac: "Hey, any port in a storm, huh, Bud?"

Me: "Hi, Major. Didn't see you there. Err...hope I'm not interrupting. Wait a minute. I know I'm the junior officer here, but...aren't you two supposed to be 'manning' your stations?"

Mac: "Ha, ha. That's a good one, Bud. Can a woman marine 'man' her station? Yeah, the old man's gonna have our guts for garters! But what can you do? Gotta protect your six!"

Harm: "Don't think it really matters anyway. What do you think, Bud? Don't know if we'll be able to ride this one out..."

Davy Jones locker? Yeah, that'd be the perfect ending to a wild voyage.

But, maybe I should start at the beginning...Let me introduce myself. I'm the ship's navigator, Patrick Roberts, Jr. But, ah shucks, in common parlance, everybody calls me Bud, you might as well, too. It was just another one of those routine voyages out of Bremerton on the USS Falmath...uneventful. But somethin' was up. You know how it is aboard ship. Lotta rumors flyin' around. Scuttlebutt had it we were on a top-secret mission.

Everything was just rumors 'til we made port in Callao. That's when the fun started.

We picked up some civilians, VIPs'. What a strange combination: A doctor of mathematics (Dr. Z) with his lady friend (Sharona), and an older gentleman. I thought at first, he was South American, but turned out he was Greek. Said his name was Archimedes. Huh! Archimedes? I know what you're thinkin'. Join the club. Yeah, right from the get-go, it was weird!

...Did I say weird? Strike that! Make that, *interesting!*

After formal introductions and all protocols had been observed, “Mac” (Major Sarah MacKenzie, our ship’s liaison from the Marines) and Sharona hit it off right away—thick as thieves. Nice change of pace...shipmates with, not just one, but *two* beautiful ladies.

Admiral Chegwidden, that ol’ sophisticated sea dog himself, took me aside and “suggested” I get chummy with Archimedes and Dr. Z. All I could say was, “Aye aye, sir!” Being the ship’s navigator, and a fellow mathematician, it was natural enough to strike up an easy friendship. Besides, I was curious.

I took the boys below. The conversation started out a little slow, but after we’d all sampled a little “jag” of Archimedes’ Ouzo (“Yamas!”)...and Dr. Z had told a joke about his New Guinean mathematician friend and his idea of a math snack—the “angle” worm—we all relaxed.

I asked how they all met. Dr. Z laughed and said, believe it or not, he and Sharona had run across Archie, of all places, at the Acropolis—in a snowstorm! (Huh! Who knew it snowed in Athens? Hard to picture Socrates and Plato throwing snowballs!)

Anyway, after clearing that image outta my head (I blame the ouzo effect...Oozo!)

I started listening again...Archie and Big Z were telling me about this new way of looking at math—sidestepping pi, giving it the ol’ heave-ho! Sounded strange at first, making pi walk the plank, but then it all started to make sense. All of a sudden, it went from weird to...*Wow!*

Archie said he’d come up with the basis of the idea, like centuries ago. He’d been kickin’ the idea around for ages (and he doesn’t look a day over 60, just a touch of grey—like Onassis).

He grabbed a table napkin, a felt tip, and drew out the first concept he’d started with:

The area of any circle is equal to a right-angled triangle in which one of the sides about the right angle is equal to the radius, and the other to the circumference, of the circle.



Me: “I remember, Arch; I read that in your book, ‘Measurement of a Circle’...the equation for the area of a circle is the same as a triangle, half the base times the height (or half the circumference times the radius).”

Archie: “That’s right, Bud. I won’t go into the proof, don’t wanna bore you with that, but...” Then, barely containing his quiet excitement, Archie said: “Tell him your dream, Z!”

Dr. Z: "Okey-dokey, Artichokey! Keep your shirt on, Dude. Just waitin' for you to finish.

Let's see...After Arch and I talked in Athens (later that night asleep in my room), inspiration struck! I had an epiphany—a dream of a new way of looking at math! I envisioned Archie's triangle reforming into a rectangle.

From there on, one by one, all the geometric shapes unfolded into rectangles!"

Archie: "Big Z called his dream 'Straightening Out Math,' or 'Geometry Unfolded'! But I (laughing) call it 'When Math Doesn't Go Right, Go Left!'"

(Yeah, the boys were a lotta fun.)

Picking up the felt tip, Dr Z. continued: "Lemme show you what I saw in my dream, Bud.

First, I saw a circle come forward and separate into two semicircles and two radii. Then the two semicircles straightened out, becoming two sides of a rectangle with the two radii as the other two sides of the rectangle!

The upshot is, the four parts of the circle unfolded into a rectangle (with sides of the semicircle and the radius) whose area is equal to that of the circle!"



Me: "By Jove...woudja look at that, Arch! Your triangle's also a rectangle!"

Archie: "You've got it, Bud. Simple, huh?"

And the best part is, there's no pi required. You can chuck ol' $A = \pi r^2$ out the porthole! To find the area of a circle, you just multiply the length of the semicircle times the radius,

$$A = (SC)(r) ."$$

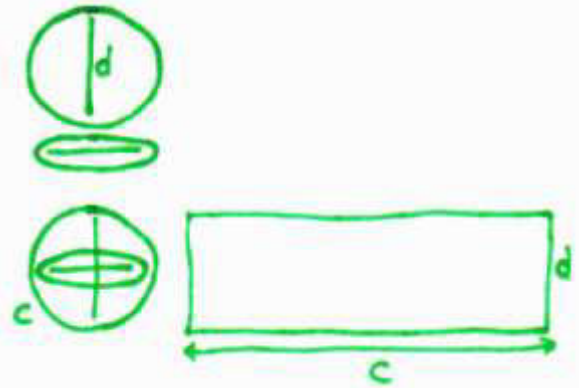
Me: (taking another sip of ouzo) "Wait a minute. I just had my own epiphany! Here we are out on the high seas talking about setting a new course for science—a 'Dialog on the Tides'. Does that make us Salviati, Sagredo, and Simplicio?"

Archie: "Ha, ha! I see you've also read your Galileo, Bud!"

Dr. Z: "Guys, guys! Lemme get back to my dream..."

Grabbing another napkin, and brandishing his felt tip (sorta like Skywalker or a younger Obi-wan Kenobi wielding a miniature lightsaber), Dr. Z began drawing again:

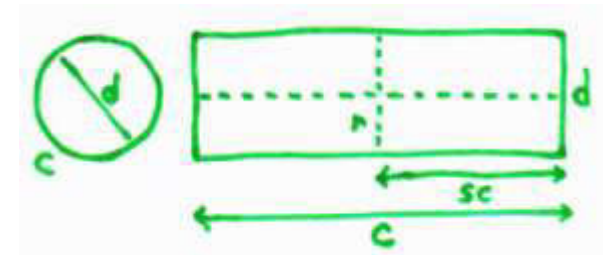
"Next, I saw two circles come forward and interlock to become a sphere! These two circles separated into two circumferences and two diameters. Then the circumferences straightened out to become two sides of a rectangle, and the diameters became the other two sides of the rectangle!"



Me: "I'm startin' to like this dream... So the four parts of a sphere (the two circumferences and diameters) unfolded into a rectangle. And the area of that rectangle equals the surface area of the sphere! Wow! Flattening the sphere! You boys are makin' math too easy!"

Archie: "Yeah, Bud. And the best part is, there's no pi in sight! Forget about $A = 4\pi r^2$! The real equation for the surface area of a sphere is the same as a rectangle—the circumference times the diameter, $A = C d$!"

Me: "Wait! I'm starting to get a hold of this origami math! Unfolding? How about folding? If I fold the rectangle in half both ways, (somethin' like this), the surface area of a sphere'd be equal to the area of four circles!"



Dr. Z: "Right on, Bud! That wasn't in my dream, but sure! Whatever 'folds' your boat, man! One rectangle with sides of the circumference and the diameter would be equal to four rectangles with sides of the semicircle and the radius."

Me: "Ooh, origami and ouzo! This is gettin' to be fun!"

Dr. Z: "But it gets even better, Bud! Now for the part that still gives me goosebumps!"

(Rumble of thunder)

Archie: "Sounds like a storm brewin'.

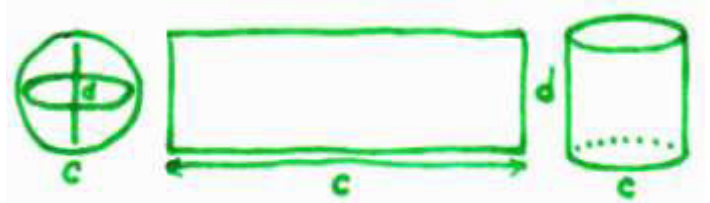
Anything to worry about, Bud?"

Me: "Naw. With the admiral in control...no worries, mate!"

After exchanging uneasy glances with Archie, Dr. Z continued:

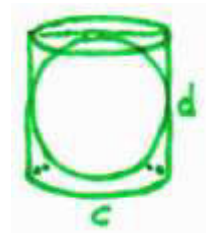
"As I was saying...After the sphere unfolded into a rectangle, that same rectangle then rolled up into a cylinder!"

Me: "Whoa, doggy! That's a goosebump for sure! Math transforms and evolves, right before my very eyes! The birth of a new species of math! Like an armadillo, the sphere unfolds into a rectangle and then rolls up into a cylinder! Which means..."



Dr. Z: "That's right, Bud!

Don't know about rectangular armadillos (maybe I just need another shot of ouzo), but the surface area of a sphere, the area of the rectangle, and the area around the cylinder are one and the same!"



Me: "Looks like you boys opened up a can o' worms and blew the lids off both ends!"

Archie: "And if you put the sphere into the can of angle worms, er, I mean, the cylinder..."

Me: "I get it! They all have the same circumference and diameter, so they all must have the same equation for area—length times height!"

Dr. Z: "Wild, isn't it? Makes everything pretty simple, huh?"

With the circumference the length and the diameter the height...

- the surface area of the sphere equals C times d, $A = C d$,
- the area of the rectangle equals C times d, $A = C d$,
- and the area around the cylinder (not including the top and bottom) also equals C times d, $A = C d$.

Me: "Holy roly poly! C times d, how hard can it be? One size fits all!"

(Another grumble of thunder. The ship begins to subtly pitch and roll, and the bottle of ouzo slides across the table.) Archie reaches out to make a quick save: "Whew! That was close! Coulda been tragic! Almost put an end to the boozin' and cruisin'. I'm only a landlubber, but the seas seem pretty angry, my friends. Sure there's no cause for alarm, Bud?"

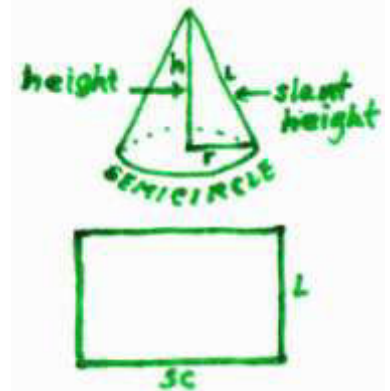
Me: "It's probably just you boys 'rockin' the boat' with your new math. But, I'll go topside and have a look-see. (Returning drenched to the skin) You're right, Arch. Bit of a blow out there. Big waves. There's lifejackets and water skis stowed in the compartment, over there. Take your pick. You know, just in case."



Dr. Z struggles into a jacket, and helps Archie into his: "Yeah, Sharona packed my speedo, but this is way better.

So gentlemen, shall I continue? Alrighty then...in the last part to my dream, a right

triangle came forward and rotated 360 degrees, to become a cone. The cone then separated into four parts. Two of the parts, the semicircles, straightened out to become two sides of a rectangle, and the two hypotenuses of the right triangle (the slant heights) became the other two sides of the rectangle."



Me: (incredulous) "Awesome! The area around a cone (not counting the base) is equal to a rectangle with sides of the slant height and the semicircle of the base, or $A = (SC)(L)$. So the triangle is like a compass, and area of a cone is just a circle with an inclined or raised up radius! Man! Finding the area around a cone is that easy?"

Dr. Z: "Kinda blows your mind, doesn't it, Bud."

Me: "It's like the storm blew us clean into another ocean and I just got 'Bermuda Triangled'! Cuz all my preconceptions of area calculation just disappeared!"

Dr. Z: "So whaddya think, Arch? Now that Bud can exactly calculate the area of a circle, the surface area of a sphere, and the area around a cylinder and a cone, is Bud wiser?"

Me: "Ha, ha, ha! 'Budwiser'? You boys are hilarious! But I got another one for ya. How do you calculate the area around a barrel of laughs?"

Dr. Z: "Ya got me there, Bud. But speaking of barrels, or should I say cylinders, of laughs...Tell him the rest, Arch, since this is your pet proof."