



Assume a spherical cow of uniform density.

WHAT'S
HAPPENED TO
THE PHYSICS
BUILDING?!

Q&A WITH PROFESSOR
ZDENKA KUNCIC



WHAT'S ON IN PHYSOC?

- How to Give a Scientific Talk - 10/03
 - Welcome Drinks - 11/03
- Neuromorphic Nanotechnology - 17/03

WHAT'S ON IN PHYSOC?

Hey everyone! We hope your semester has got off to a good start. Thanks to everyone who came along to the PhySoc events last week. If you haven't, it's not too late!

PhySoc regular or not, we've got the upcoming events for you:

See you around!

-Justin

Talk: How to Give a Scientific Talk

Prof. Don Kurtz

1:00 - 2:00 PM, Tuesday, 10th March

LT337 (Formerly LT5)

Ever completely flubbed a lab talk? Learn how to not do that with this talk by guest lecturer, Prof. Don Kurtz. He'll be speaking on common pitfalls in and how to avoid them, and how to give engaging and communicative presentations (i.e. how to keep your audience from dozing to sleep, or plugging their ears). Talkception!

Welcome Drinks

5:30 - 7:30 PM, Wednesday, 11th March

Forest Lodge Hotel

Had a rude awakening by the start of semester? Wash away the trauma of those early morning starts with a beer or three! Whether you're a naive first year, a seasoned Honours student or a jaded postgrad, come along and share a drink with your physics colleagues!

PhySoc supports the responsible consumption of alcohol.

Talk: Neuromorphic Nanotechnology

Prof. Zdenka Kuncic

1:00 - 2:00 PM, Tuesday, 17th March

SNH LT 3003

Bring on the robot uprising! Prof. Zdenka Kuncic will be talking about her research on nanotechnology devices that mimic neurons, and the potential applications for these devices in improving machine learning and AI.

~~ASTRONOMY~~

ASTROLOGY



Aries: You are optimistic that you will have time for hobbies during semester but your impulsive behaviour means you decide to complete a derivation without assumptions and end up with no sleep let alone time for hobbies.

Taurus: You are extremely productive but uncompromising. Your lab partner struggles with these traits even though you are always right (in your opinion) and get the checkpoints.



Gemini: Your inconsistent nature means you get a different answer for each attempt at a question. Fortunately, you know 10 different ways how not to answer the question.

Cancer: You will face challenges during semester but Sheldon Cooper will be your guiding light. BAZINGA!



Leo: Your generosity means you try to help someone find the moment of inertia of a pyramid but your laziness means you approximate the pyramid to a thin rod.

Virgo: Your shyness means your only friend in physics is Prof. Possum.



Libra: Your reliable memory means you actually remember how to solve a differential equation after the summer.

Scorpio: You are resourceful and reintroduce Libra to Wolfram Alpha



Sagittarius: Your independence means you go to lectures alone. However, the new labelling of lecture theatres in the physics building means you usually turn up 10 minutes late.

Capricorn: You are responsible and disciplined, you go to all lectures and try to pay attention but your laptop keeps falling off the desk.



Aquarius: Your future is left as an exercise for you to solve.

Pisces: You get along with your lab partner. you both panic when the experiment shows gravitational acceleration is 13.2 ms^{-2} .



- Connor and Sam

Images edited from: Carmon Report (2019).Zodiac Sign Symbols. [image]

Available at:

<https://carmonreport.com/fashion/whats-my-star-sign-zodiac-symbols->

WHAT THE **** HAPPENED

Fact: Every person that has entered the physics building since the start of semester has ended up lost due to the new signage. We don't know exactly know why a single sign shows multiple paths to a single location, but we're willing to give explaining this phenomenon a go.

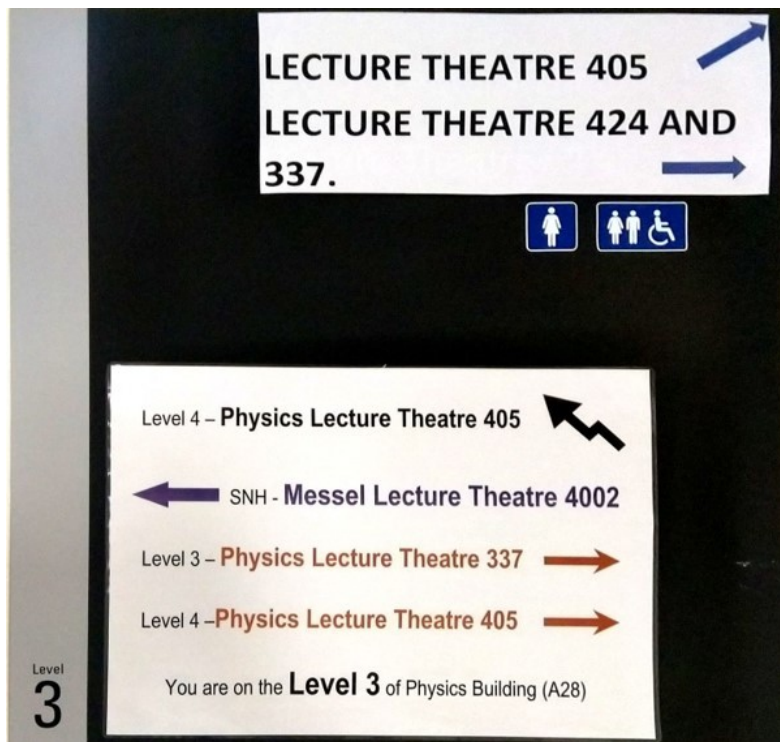


Figure 1: Sign at the top of the Slade staircase in the physics building that supposedly directs you to lecture theatre 405.

Option 1:

Observe Figure 1 (right), you are trying to get to this new lecture theatre, LT405, you have just climbed the stairs outside the Slade lecture theatre to the third floor and you meet this sign. You are met with three options, by travelling diagonally upwards and to the right you will apparently make it to room 405. How? A gravitational anomaly will allow you to float in this direction and a warp in space-time will allow you to travel through the ceiling of the third floor... duh.

Option 2:

If you follow the arrow directly to the right you will follow a plane that has a shape similar to the roller coasters found in first year mechanics questions. Depending on your initial velocity, you will either travel far enough around the curves to just make it to the lecture theatre 405 or come to a halt outside lecture theatre 337.

Option 3:

If you are unlucky you will follow the third path to lecture theatre 405, although this method is unlikely to get you to class on time, or with your features intact. The quantum physics department have an SSP student experimenting with a teleportation device. A bug in the system means people standing in front of the sign are often dematerialised before travelling a zig-zag path diagonally upwards to the left and then occasionally appearing at lecture theatre 405.

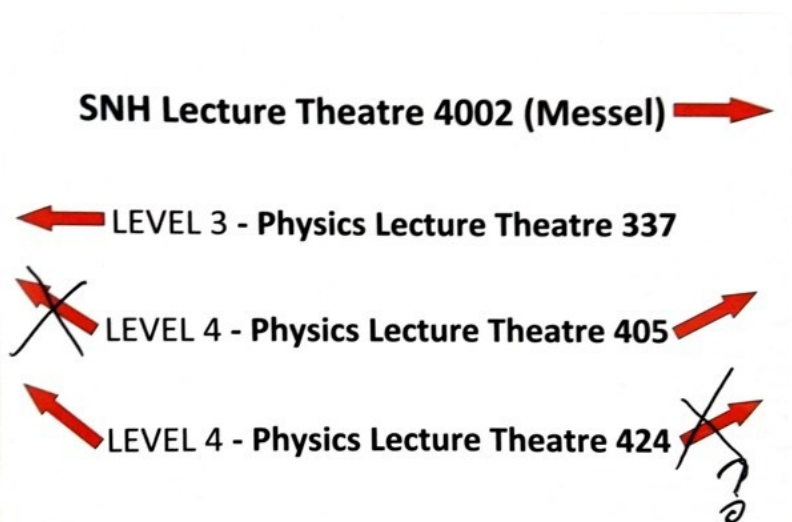


Figure 2: Sign at in the physics building that the quantum physicists got to.

TO THE PHYSICS BUILDING?

Option 4:

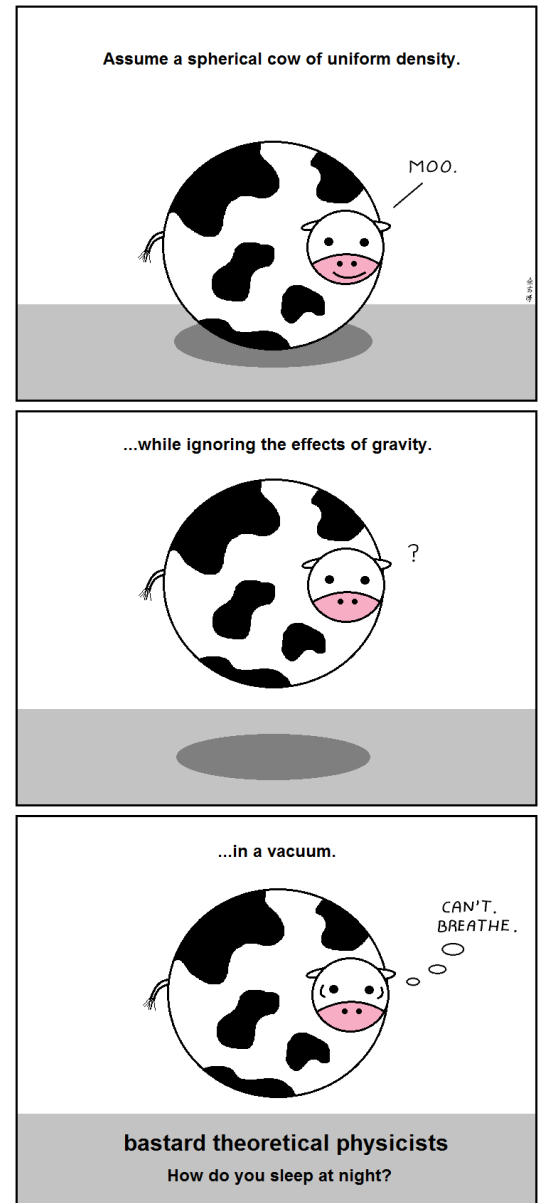
The sign (direction) shows that the quantum physicists aren't done. One obviously interpreted the signs as if the locations of the rooms were undetermined as a result of quantum superposition. To remedy the confusing signs, the physicist embarked on a journey to lecture theatres 405 and 424. At each destination they observed the location of the lecture theatres before crossing out the incorrect arrows on the sign.

Option 5:

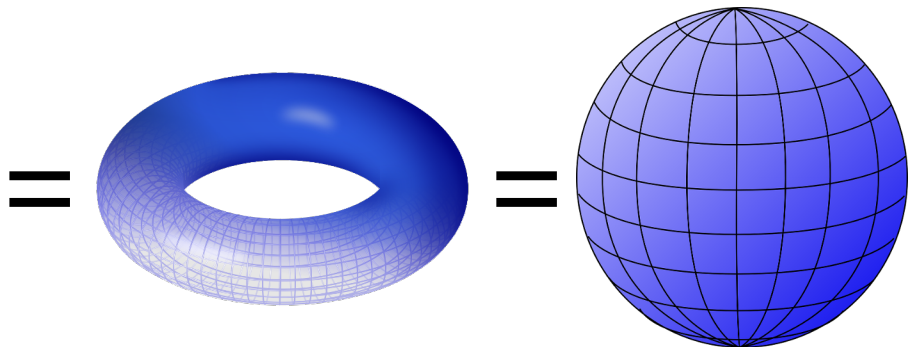
All these changes to the mapping of the area have fundamentally changed the topology of the physics building. Instead of its usual rectangular prism appearance, it is now a torus. It no longer matters which way you walk, you will always end up at your chosen destination eventually, assuming of course that you don't get trapped on a vertical loop around the edge. But really, if we think like engineers, we can do better than a torus. If we really try, we don't even need to worry about the hole and the physics building can be estimated by a sphere... just like the cow.

We've given you five perfectly reliable and accurate explanations for the necessity of the new signage. If you have any ideas why the lecture theatres were renamed please let us know at jeremy.physoc@gmail.com.

- Martine and Sam



Seawright, B. (2020). "Assume a Spherical Cow".
[online] Above the Market. Available at:
<https://rpseawright.wordpress.com/2013/08/15/assume-a-spherical-cow/> [Accessed 1 Mar. 2020].



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Zdenka Kuncic

Field: Interdisciplinary Physics

Should there be choccy milk at the next PhySoc event?

The safe answer is yes.

Tomato sauce in fridge or pantry?

In the fridge... wait, in the pantry if unopened.

Pineapple on pizza?

No, not for me.

What's your favourite bar in Japan?

I've visited a few, but none that stood out. In Tokyo, in particular there are so many and it's too busy.

Can you please explain your research in 30 seconds?

My main research is in trying to demonstrate a synthetic neural network that can learn, and that can process data that AI currently can't.

What have been your biggest influences?

I guess in general, I'm influenced by people who have been able to create new technologies that have really made a significant step in changing the lives of people across the world rather than incremental advances. And that's interesting because in academic research the focus is on incremental improvement on the research that came before so I'm looking to people in groups that are really doing things that are different from that standard method.

In terms of individuals, people like Simon Sinek. As a kid it was more about doing stuff that I found challenging. For example, I was always good at maths and I enjoyed it, but I found physics more challenging. Part of the reason for that was because physics was more conceptual and only when you think you know what's going on can you write down the formulas, whereas maths didn't have that conceptual challenge. ... As a kid I also had a big dilemma between science or music. I loved them both. I went down the science track because, well apart from career prospects, I decided that I needed something as a hobby and music could be that.

Anything else from when your childhood?

I always loved science fiction and my hero there was Isaac Asimov.

Have you gotten lost with the new physics buildings signs/numbers?

Yes! I have, oh my god! There is no such room as four zero something-or-rather. Don't ask me where that came from, I only work here.

Have you had many students use the 'getting lost' excuse because of the new signs?

At the moment no, because the only course I'm teaching is in honours and they have no excuse.

If you could magically solve one problem in your field what would it be?

So I think, in the current climate, pun intended, it would have to be climate change. Physics has so much to contribute to that, all the way from solar energy to climate change models and I don't feel like we're doing enough.

A problem we have here in Australia is that scientists don't have much influence on the government. In the US and Europe, scientists are involved in politics. Governments come to scientists for advice and vice versa and that's something we just don't have enough of in Australia. And coming back to climate change, that's a really good point, because there are still politicians that are in denial! It's embarrassing.

The Tea on Entropy

If you're anything like me, you enjoy your tea with a splash of milk. You pour your milk into the tea, but what would happen if you didn't use a spoon to agitate the mixture?

When the milk first reaches the water, there is obviously an uneven distribution of molecules in the mixture. We cannot change the microstates to result in the identical initial macrostate of milk and tea. Our tea has low entropy.

We know from First-Year thermodynamics that isolated systems will evolve towards their most probable macrostate, that of maximum entropy. The milk will diffuse into the water in such a way that the concentration gradient is minimized and the entropy of the system is maximized.

Since the milk-tea system is evolving from low to high entropy, this is an irreversible process. The probability that the tea will form a macrostate of lower entropy is $\approx 0\%$. Our tea evolves in one direction over time, meaning this system is actually revealing the arrow of time itself.

So, in the end, you will always eventually end up with homogenised tea even if you don't use a spoon to mix it (although your drink will be quite cold before that happens).

-Vish

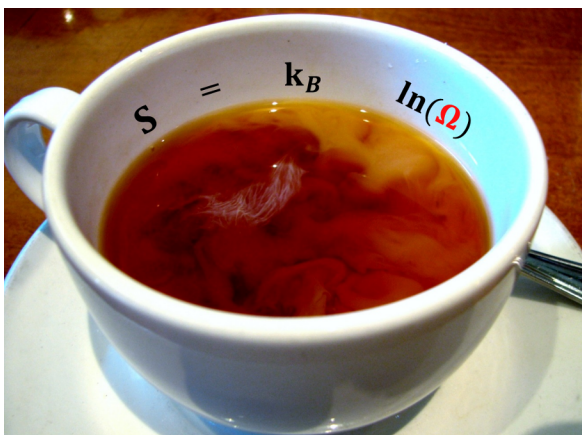


Image edited from original. Source: Snelgrove, X. (2005). Milk clouds in tea. [image] Available at: https://upload.wikimedia.org/wikipedia/commons/1/16/Milk_clouds_in_tea.jpeg

NEW (UNI) YEAR NEW ME: PROGRESS REPORT

So week 1 is over and I think I'm pretty on top of my New Years resolutions (refer to Jeremy edition 1 to see my resolutions)

1. I've been to all my tutorials so far (they don't actually start till week 2 ...)
2. Haven't gotten my logbook yet so it is definitely up to date !
3. The hot water taps in the tea room aren't working. I can't make tea so have to buy more coffee (that's not my fault)
4. I don't have to microwave smelly fish. Someone else is doing that for me
5. I was too fussy choosing a lab partner. Ended up being the only person without one
6. Talking to other people at nanoscience about physics counts as study, right?
7. So on top of the study! I've highlighted all my UOS outlines and have decorated my exercise books.
8. Didn't realise there was a PhySoc barbecue this week. Whoops. I'll be at the welcome drinks this week for sure!
9. Please, I would never use $g=10$. I have moved on from my HSC days
10. The mathematicians are making me cry!
11. Seem to have lost all my engineering friends.
12. The nanoscience lift was broken (again). Had to use the stairs

- Hillary

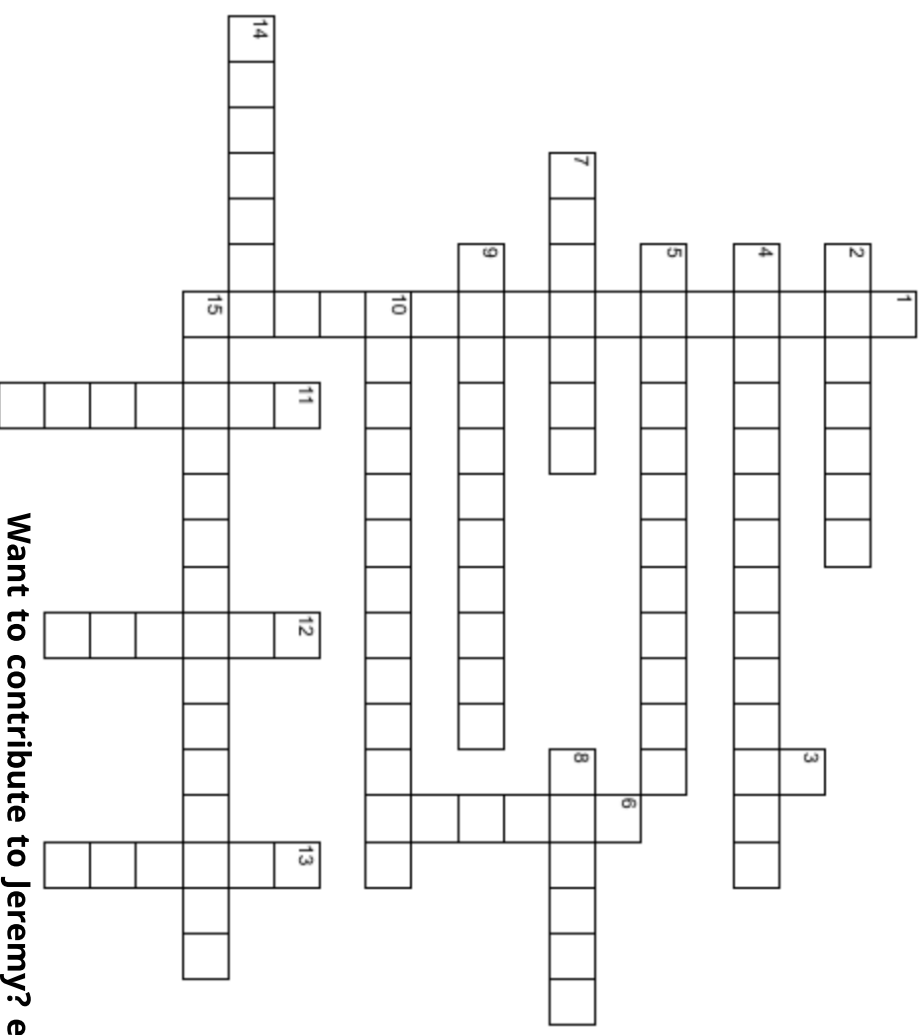
F I Z N Z I P Y Z Y S Y S I C S

Across

- 2) Physicist that shared the Nobel prize for discovery of the Zeeman effect
- 4) When directly translated from German means 'breaking radiation'
- 5) When there is a magnetic field, spectral lines divide
- 7) Celebrated as the "mother of the atom bomb" although she rejected the offer to work on the Manhattan project.
- 8) These come in six different flavours
- 9) Operator corresponding to the sum of kinetic energies and potential energies for all the particles in the system
- 10) Principle that treats forces and masses to be equal
- 14) Theorem that describes the relationship between symmetries of a physical system and its conservation laws
- 15) Professor at USYD Physics, known by the famous quote 'throw the baby out with the bathwater'

Down

- 1) The process of dressing up curves as a combination of sines and cosines
- 3) Chinese-American physicist who worked on the Manhattan Project
- 6) A giant rotating magnet that spits out EM radiation from its poles
- 11) First person to spot a pulsar
- 12) The largest underground tunnel where the smallest things travel
- 13) Changing a right-handed coordinate system into a left-handed one



Want to contribute to Jeremy? email
us at jeremy.physoc@gmail.com