JEREMY

ISSUE 3: "Better quality reportege than the Sydmey Norning Herald"
May, 2008

Reporting for Physoc

Picking Up Girls FOR PHYSICISTS

Welcome to another instalment of Jeremy's *for Physicists* guides. This week we aim to bring your knowledge up to date with the latest in women. In the absence of a good theoretical model, or even a David Attenborough documentary, females have confounded even the brightest and most promising male physicists. Do female physicists need advice about guys? Not likely - they're intelligent, and in high demand, being outnumbered to men by 50 to 1 in physics departments around the country [1]. The question is, how does the humble male physicist overcome his reputation as a nerdy, self-interested freak and make his deadly mark on the opposite sex? Well you're lucky to have an expert on such matters reporting for this very newsletter [2]. Watch and learn. Listen and learn? Read and learn? Ok, I'm off to a bad start, but bear with me...

She's NOT out of your league!!

The first piece of advice that is given in any self-respecting dating manual is to know your limits. However, the physicist is no ordinary subject. Do not forget this: you are in a league of your own. It is hard for any red-blooded woman to resist the charms of an impromptu napkin fluid-mechanics calculation, or a quick mental logarithm. What I'm trying to say is that if you play your cards right and utilize your years of Physics training, you will have members of the opposite sex literally begging for the next term in your Taylor series. Here's how:

The use of pick-up lines

Yes, they're numerous, and sure, they're amusing when drunk, but the use of pick-up lines is one of the most contentious fixtures in the physics pick-up routine. Personally, I find the sincere use of pick-up lines a no-go zone. However, this depends on both your audience and your level of intoxication. If you must use them, steer clear of the obscene: "Would like to see the exponential growth of my natural log?" (I've never witnessed a successful application of this one) or "I'm hung like a Foucault pendulum", or even "A freak lab explosion left me with this 16-inch penis" (slap guaranteed, or your money back). No, go for the subtle: "I wish I was your secant line so that I could touch you in at least two places" or sweet: "you make me want to be a better physicist". Be charming and be original - no one wants to hear yet another Bayesian statistics joke. And *yes*, she does know what happened when the Higgs boson walked into a bar. Remember, witty inclusions of nerdy jargon is a huge turn-on for any woman, but don't rely on prepared lines to get you through it. This is like taking a one-sided A4 crib sheet into an exam - the fact that you know these formalae is not impressive in itself - you've got to know how to use them to get the top score.

Lisa Randall: among the most-cited theoretical physicists in the world. Two of her scientific papers are among the 5 most influential theoretical works of the past decade. Hot.

In the midst of a widespread decrease in scientific interest in the wider community, pictured above is one of a number of serious proposals aimed at boosting public interest in physics. Despite strong student support, this innovative teaching method has not yet been trialed at Sydney University.

> **"If there's one thing that physicists have that's bigger and broader than the average male, it's their throbbing scientific knowledge"**

You can never have too much confidence

Believe, it or not, the title of this section is a fact [3]. If there's one thing that physicists have that's bigger and broader than the average male, it's their throbbing scientific knowledge. Use it to your advantage by challenging other men to a speed derivation of the coupled-mode equations, for example. Play up your knowledge of all areas of physics and *make stuff up* if you don't know it. Your typical wild-type women won't know what a Fourier series is, nor will she care if you're talking crap about them. In any napkin-top calculation you care to exploit during your pick-up routine, be sure to use as many Greek characters as possible. Remember: no one will be checking this work! For the first time in your life, you have free reign to exploit your massive analytic tool (theoretical physics) purely for its aesthetic value!! In the dating world, anything goes - tensor indicies go unmatched, vector identities are abused, and dimensional arguments are ignored. Entropy has even been known to decrease in some of the more outrageous romantic calculations I've come across. But let's face it, the last thing a physicist on the verge of scoring needs is to be pulled up on a sign error. Regardless of the modulus of the error, there is no argument when it comes to technical disputes: in romantic situations notation is abused for effect.

What to Wear

Having studied last month's *fashion* edition, you should now be well-prepared for what to wear for the big event. Trust me, there is nothing hotter than a "Physicsts do it in superpositions" tshirt. Come to think of it, I've never seen a guy who *wasn't* wearing a multi-coloured propeller hat actually attract a woman. It boils down to simple sports mechanics: the advanced physics player will get the fundamentals right and will stand out from the hair-gelled, erect pink-collared regulars. Subtle touches don't go unnoticed either - all women have a remarkable attention to detail [4]. Think a pen holder in the top pocket - a classic finishing touch that will surely be noticed and appreciated. And if, like me, you never leave home without your calculator, make sure that it's handy in case of an emergency. However, only make use of the calculator if it's absolutely necessary. The line "I'm a human calculator, baby, and you know how to push all my buttons" may bring more success than a rigorous calculation (as tempting as it may be).

What are you doing reading this article?!

When you could be out scoring at will without fail. The Jeremy guarantees success with the approaches described above or your money back [5].

-BF

Notes

[1]: Near enough's good enough...
[2]: Unfortunately, both for your chances of learning something useful from this article, and for the author's hormonal needs, this could not be further from the truth.
[3]: This statement is actually false.
[4]: Despite being a sweeping statement, its truth is undeniable.
[5]: This is a free newsletter.

Write To Jeremy!

LETTERS

This month our inbox was blasted by some stimulated emission from CUDOS. Here's a selection of the many complaints we received regarding sun reflected off the windows of offices in A29. You'd think these people were vampires...

Letter to the Jeremy:

Are the people in the physics annexe who constantly angle their windows such that the morning sun burns directly into CUDOS exercising some kind of sadistic sense of irony? Can something be done about the tinted death sheet currently weilded by the heartless people in astro and complex systems?

Sincerely,

Sick-of-squinting student.

Letter to the Jeremy:

Man, I dunno what kind of sick pleasure youse guys get in the annexe from using your windows to direct the sun straight onto my retina but fugeddabout it! I know every photon is precious for you astronomers but my simmo's have plenty in them already. It's fading my Jimi Hendrix t-shirt.

It's home time! See youse later,

Sahand-Bra

Do you a letter for the Jeremy? Anything, anything at all: write in to jeremy@physics.usyd.edu.au

Dear Jeremy

Dear Jeremy,

As a coffee-drinking physicist, I often urinate.

Lately I had been disgusted by the fact that physics urinals were being flooded. The procedure was this: somone's unphysically thick urine - or long hair? hm. - would occasionally clog up the urinal, yet people would persist in letting their waterfall soar, unperturbed by the inches of yellow fluid beneath their feet.

My pet name for the physics urinal had become "Philip the Urinal".

This issue has recently been fixed, and I have nothing to complain about.

Might I suggest that next time we fix public facilities AFTER my complaint?

A copious urinator.

Dear Jeremy,

I see the male toilet's urinals are clogged again. What do physicists drink that makes their urine have such high viscosity?

Regards,

Wet Shoed Physicist

Dear Copious Urinator and Wet Shoes,

This was a popular item of correspondence, but don't worry, problem solved. You may have noticed that the coffee machine was out of order for cleaning recently - now that the cockroach residue has been removed from the filter nozzle, the 'treacle' effect you have observed should disappear. If the problem does persist, then further cleaning tablets will be secretly added to the coffee supply to clean out the coffee drinkers' nozzles.

Cheers,

Jeremy

Dear Jeremy,

It has come to my attention that some members of faculty, students, etc bring their own tea-making accoutrements (teabags and so forth) for use in the Physics Tea Room. I myself am partial to the occasional soothing cup of lemongrass tea, but am afraid of the verbal barbs that may fly my way, and the inevitable tags of 'elitist','tea snob', and others that aren't fit for your fine publication. Should I announce my prediliction for fine teas to the world, or conform, keep my status in the Physics community and stick to Lipton Black?

Yours sincerely,

Cuppa Confused.

PS: What is your position on bringing actual leaves (e.g. fresh mint) into the building to make a fresh brew?

Dear Cuppa,

Like ugly teenagers, physicists take pride in rejecting mainstream society. But rather than dying their hair black and crying about it, they have huddled together in the corners of bars, clutching textbooks like "Numerical Analysis Using Excel" (verified sighting last weekend). Physicists are a tolerant lot, accepting nerds of all stripes, regardless of social skills, dress sense or beverage snobbery. That said, lemongrass tea is often associated with those who have previously inflicted adolescent psychological harm on many members of the physics community, so as you decant your brew an eyebrow may be raised and the atmosphere might get tense. But as long as you are publishing enough papers, you are more than welcome to drink whatever you like in the tea room, be it coffee, alcopop or even the insipid chai latte. How's your h-number these days, Cuppa?

Cheers,

Jeremy

Do you have problems? Write in for free advice! jeremy@physics.usyd.edu.au

Proposal for a fusion device, to be built in a backyard

Ivan Gottderhorn and Leon Olkatt

Abstract

In this abstract we discuss our paper in a way, that it does not actually depict the paper, but uses glowing terms and jargon in a non representational way. We discuss the prospect of backyard fusion and propose a method of construction of a backyard fusor.

1 Introduction

In this letter, as suggested by Ostrikov [1], we propose a method of constructing a plasma fusion device, based on the famous Hirsh-Meeks (H-M) fusor, that can be constructed in the average garden shed. The H-M fusor is considered the future of fusion technology as it requires much less space than a tokamak, although the H-M fusor still has the disadvantage of its vacuum pump leaving greasy marks on the lab-floor. Like the tokamak, the H-M fusor still requires a large power supply, a difficulty which is the subject of active research. We feel that with the possibility of construction of such devices in average garden sheds, the average intelligence of the population will increase according to the Darwinian principle[2].

2 Description of Hirsh-Meeks Fusor

The fusor consists of two spherical electrodes with a common centre point, with the inner electrode being negatively charged. Coronal discharge is sufficient to ionise the fuel gas (typically Deuterium) thus forming a plasma. Once ionised, the ions would happily make their way to the inner electrode, because it is obviously very attractive. This produces a positive shell around the cathode. High speed ions penetrate this shell, hopefully bumping together on the inside and fusing. Obviously all experiments have to be conducted at low pressures. This is because experimentalists are delicate souls and if placed under too much pressure tend to make almighty stuff ups and then have the gall to claim that they have actually discovered something, for which no theory actually exists. [3]

3 Outline of Construction

The vessel for the backyard fusor is a really large olive jar[4]. Firstly eat all the olives. The positive electrode is made from two tea strainers stuck together with stickytape. This initially caused the authors some difficulty, however, after inspecting the IEC device at the University of Sydney, the solution became obvious. The cathode, properly called a star cathode may be made from a pair of keyrings. To make the vessel suitable for vacuum, Selley's Roof and Gutter sealant makes a perfect water and air tight seal. It also keeps out insects. To achieve a suitable vacuum a full turbomolecular vacuum pump and backing pump system is required. The authors are assured these are readily available. A suitable power supply would be the high voltage supply from a microwave.

4 Conclusions

If you really want to make your own fusor in your backgarden it can actually be done.[5] The brilliance of our scheme is the use of both the tea-strainers and the roof and gutter sealant. We believe this to be novel and helpfull suggestions. If you want to actually know about fusors, talk to Joe Khachan.

References

[1] Kostya Ostrikov, 3rd Plasma Physics Course 2007.

[2] www.darwinawards.com

[3] http://en.wikipedia.org/wiki/Farnsworth-Hirsch_Fusor

[4] One of the authors' mum has some large glass olive jars.

[5] http://blog.makezine.com/archive/2006/11/teen_goes_nucle.html

Physical Review Focus: Coherence of mesoscopic quantum traffic systems

A group of german physicists have devised a novel way to produce enormous mesoscopic quantum systems, which are systems consisting of a very large quantity of particles that still exhibit quantum effects. Such systems could provide a method for extremely accurate fine measurements of parameters.

The german physicists, working with civil engineers, simply constructed a roadsign, instructing motorists to "get in both lanes" (see figure 1). Prof. Schmidt, leading the group, expalined that "until now, physicists have been working under physical law, attempting to shape physical systems to these laws. Why not simply use

"... and then increase to a 4WD or semi-trailer for the more precise fractional measurements"

the laws of traffic alongside the laws of physics?". Schmidt found that in Germany, the high adherence to road rules provided a perfect platform for naturally generating high coherence entangled states. These "NOON" states, which are a particular form of Schrodinger's Cat states, are the states where a single car is both entirely in the left lane and entirely in the right lane. "These Schrodinger's Car states are useful because we can put a target substance to be measured in one lane, and measure the relative effect on the Car state later on, by the standard interferometric process". The magnitude of the effect turns out to be proportional to the number N, so for an average vehicle this number is quite large, about 10^{28}, with which "one can measure the shortest travelling route to astounding accuracy."

To do this one would start by sending a very small system through the 'traffic

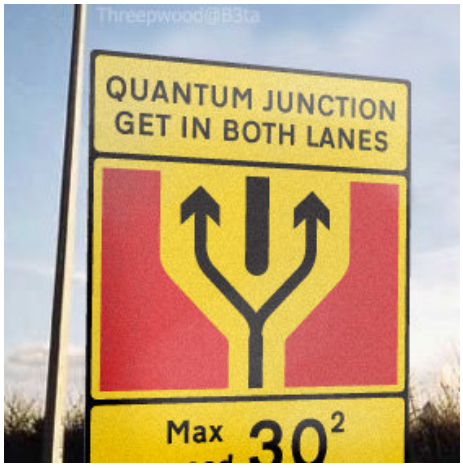


Figure 1: Australian trials have begun for car interferometers, but scientists find coherence is reduced by high speed collisions.

interferometer' to get a ballpark value of the quantity in question, "Perhaps a bicycle or a Mini Cooper", and then increase to a 4WD or semi-trailer for the more precise fractional measurements. "A large group of measurements would be built up extremely quickly, given the large number of coherent traffic objects on the busier roads." Each car behaves approximately as a large number of particles in a position eigenstate.

However, one problem that arises with the large number of particles involved is the 'decoherence time', which is the time it takes for the quantum superposition of the car in both lanes to collapse to a classical everyday probability of the car either being in one or the other. This is due to the random interaction of the atoms of the car systems and the environment's. For objects the size of cars, this decoherence time is proportional to the exponential of the number of atoms N, so works out to be $\exp(-10^{28})$ s. "This is exponentially shorter than the smallest step of time (The Planck time, of order 10^{-44} s), let alone the time taken to travel any distance in a superposition." explains Schmidt, "so we need to utilise relativistic effects to extend the observed distance."

Special Relativity states that, from an external observer standing next to the road, as a car's velocity approaches

"as a car's velocity approaches the speed of light, the rate of time onboard the car will slow down, as well as the car seeming compressed lengthways."

the speed of light, the rate of time onboard the car will slow down, as well as the car seeming compressed lengthways. "What we need to do is have the car travel fast enough that it can travel far enough along the road that we can measure it before it decoheres in its new temporal frame of reference."

"What we would like, then, is at least 100 metres of a coherent Schrodinger's Car state over which to evolve and subsequently be measured." With a car travelling at about the speed of light this would mean an observed coherence lifetime of 3×10^{-7} s, meaning the minimum relativistic gamma factor required for the interferometer is $\gamma = 3\times10^{-7}/\exp(-10^{28}) \approx \exp(10^{28})$. The energy required to accelerate a car to this corresponding velocity is about 10^{28} times greater than the energy available from all the mass in the observable universe. Schmidt is hopeful, however; "We are working on building a new autobahn to handle the required velocity. Once that is solved, the availability of road vehicles would make this quite a viable interferometer."

-Matt Palmer

Analysis and Solution of Corridor Congestion with Low People Density

In the city street

Men flow like leaves in autumn

Congestion occurs

Celebrities hire bodyguards to avoid it. Hermits live alone in caves to avoid it. Physics students cultivate odours to avoid it. No, I'm not talking about non-consensual sex, I'm talking about that thing where you're walking down a narrow corridor or footpath, and you notice someone just in front of you is walking along your time-reversed trajectory, and you dodge left as they dodge right, so you dodge right as they dodge left, and you both end up hopping from foot to foot trying to get past the other person. This mini-haka slows you down, frustrates you, and may even force you to interact with a stranger.

Town planners solved this problem for the car long ago, with the ingenious idea of *lanes*. Cars going one way travel in one lane, cars going the other travel in a different lane. Genius. But sadly, unless we issue and revoke walking licences, any idea requiring widespread co-operation will not work for pedestrians (vigilantes who have tried to revoke the walking licences of slow and incompetent perambulators, by use of crowbar, have generally been frowned upon by the establishment). Experiments with quantum coherence, where people enter a superposition of both left and right manoeuvring, are yet to bear fruit (see Physical Review Focus, p4).

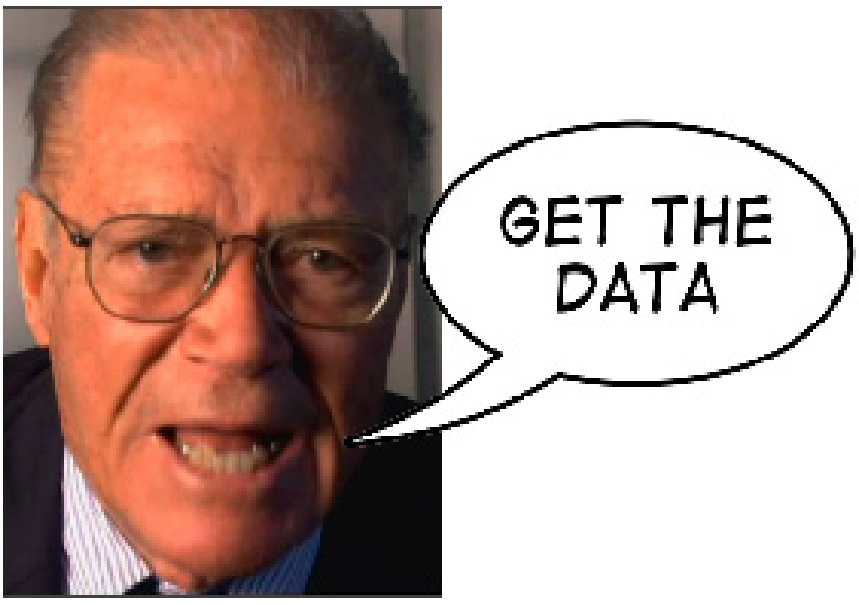
An individualistic tactic is required - you have to be able to get past both those who use your dodge technique, and those who don't. To develop such a sidestep scheme, Robert S. McNamara might instruct us to "Get the data". But in this case he would be wrong. A physical analysis will serve us better.

When you feint left and right as you approach someone, you are oscillating. Problems arise when the period, phase and amplitude of your oscillations are the similar to your nemesis's. If the integral w.r.t. time of the difference of transverse displacements is equal to or greater than the linear personal space of a participant (multiplied by the velocity of the walker, to fix the units), over a domain larger than their reaction time, then the two walkers will immediately stop oscillating and pass each other. If the two walkers independently change their period of oscillation, they will eventually pass each other (providing the period is greater than one of their reaction times). And this is what you see happening in corridors.

"Sure, skinheads usually have zero amplitude, and expect the other person to get out of the way, but this can lead to knife fights when two collide."

What you see less frequently is people modifying the amplitude of their oscillation. Sure, skinheads usually have zero amplitude, and expect the other person to get out of the way, but this can lead to knife fights when two collide. But to see a person move two or more body lengths sideways is a spectacle. Especially when performed at high speed, this maximises the difference integral and the pedestrians can continue on their journey with a phase shift of only $\pi/2$. Sure you'll look like an epileptic crab, but you can walk straight past the people laughing at you, without danger of walking into them.

- Felix Lawrence



Robert S. McNamara

PUZZLES!!

Fusing Physicists

Each issue we blend the face of three physics students with one particular physics staff member. This week I give the treatment to Tom Grujic (Honours '08), Madhura Killedar (PhD), and Felix Lawrence (PhD). One member of staff, three students. You do the math - which academic is it? For last week's issue, Tim Bedding was again a popular choice, but the actual solution was Kostya Ostrikov (pictured). We've also had complaints that this puzzle section is too hard - and calls for more staff and less student (typical). I think that this week's is much easier...?

Suggestions for people to blend in the future are also welcome at **jeremy@physics.usyd.edu.au**

Equation Spot the Difference

We're back! Prize to the nerdiest response to the differences in the Ricci curvature tensor (written in terms of Christoffel symbols). Of course, the Einstein equation in vacuum sets this quantity to zero. Send equation spot the difference requests to **jeremy@physics.usyd.edu.au**

$$R_{\alpha\beta} = \frac{\partial\Gamma^{\gamma}_{\alpha\beta}}{\partial x^{\gamma}} - \frac{\partial\Gamma^{\gamma}_{\alpha\gamma}}{\partial x^{\beta}} + \Gamma^{\gamma}_{\alpha\beta}\Gamma^{\delta}_{\gamma\delta} - \Gamma^{\gamma}_{\alpha\delta}\Gamma^{\delta}_{\beta\gamma} \qquad R^{\odot}_{\alpha\odot\beta} = \partial_{\zeta}\Gamma^{\zeta}_{\alpha\beta} - \partial_{\beta}\Gamma^{\odot}_{\alpha\odot} - \Gamma^{\delta}_{\beta\gamma}\Gamma^{\gamma}_{\alpha\delta} + \Gamma^{\odot}_{\alpha\beta}\Gamma^{\delta}_{\gamma\odot}$$

MyScience

The Science Foundation for Physics, at the University of Sydney is looking for people to become involved as mentors in a primary science program called MyScience.

MyScience is a collaborative project between ACU (Australian Catholic University), IBM, The Science Foundation for Physics, DET, and STANSW. The project involves assisting primary teachers and pupils to learn how to develop skills in scientific investigation.

The program for 2008 is going full-steam ahead with three primary schools already working on scientific investigations with sixty dedicated mentors from the University of Western Sydney and the Australian Catholic University. Another eight primary schools are about to come on board which will make a total of 780 school students reaping the benefits of this innovative program for this year.

With the additional schools we are in need of scientist mentors willing to devote time to helping out these budding scientists. Scientist mentors assist the students (in two face-to-face visits and online) by giving advice on resources and aspects of methodology such as fair testing, and generally encouraging the students throughout the investigative process.

For further information on the program please go to: http://myscience.com.au/

If you are interested in becoming a mentor please contact:

Alex Viglienzone, Education and Administration Officer

Science Foundation for Physics

Tel: (02) 9036 6188

Email: alexv@physics.usyd.edu.au

Next Issue!

Please write in with any letters, questions, complaints, random rants, or anything else. The quality of this magazine is such that we'll publish anything, try us. The aim is to be a social outlet for physics students, so if there's anything you want to let out, let it out on us! **jeremy@physics.usyd.edu.au**