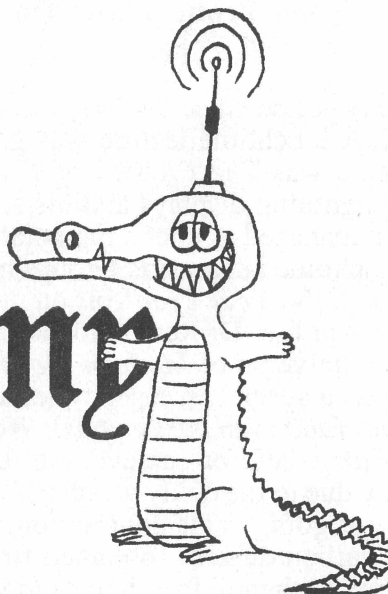


Jeremy



The Official Journal of The University of Sydney Physics Society

Volume 5 Number 3

August 1989

Editorial

So you've decided to come back then? No doubt you have been attracted to the prospect of another fun-filled and action-packed semester of study! Well, at least we can try to be happy about it. The lecture(r)s won't get any better, but at least you can seek solace within these hallowed pages. For those of you who actually managed to stay away from the University during the recent four week non-lecture period, welcome back to the real world. Sad, isn't it? But take heart and just think, only another $(12.0 \pm 0.5) \times 10^{15}$ nanoseconds to go until summer holidays.

Jeremy would have been out a week or so earlier but, unfortunately, our kindly printer (the person, not the machine) was ill for the last week of the hols. We suspect that the impending churning out of another thousand copies of *Jeremy* may have had something to do with it. But we are happy to say that she is back on her feet again, or at least was before collapsing from exhaustion after printing this issue.

Speaking of which, it is another bumper issue, with an enormous episode of *The Hitch Hikers Guide to The Physics Building*, along with almost three whole pages full of quotes as submitted for entry into the *Kit Kat Quotes Competition*. The Bodie strikes back with another set of mind-boggling problems in *Physics Forum*. We bring you an in depth study of one of last semester's third year lectures and have a look at how a typical lecture progresses in time. And there's some other junk in there too.

You may have already noticed by now that there are two mysterious looking trophies in the display case just outside LT8. These are the prizes for the winners of the *Kit Kat Quotes Competition*. The perpetrator gets the wooden one whilst the submitter gets the (brand new) urn, in which are sealed the Ashes of an original second ever issue (first ever issues are too rare and nobody is willing to part with one) of *Jeremy*. We thought we'd better display these trophies, since the wooden one has been around for three years now and only about five people had ever seen it before we unearthed it a couple of months ago.

Well, the page seems to be running out (at last), so we don't have to waffle on any longer: so just sit back, relax and enjoy the ride . . .

The Editors: Kim Lester (Physics IV, High Energy Physics)
David Mar (Physics IV, Astrophysics)

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Space Probe Finds Dinosaurs on Venus!!!

In the inter-Jeremy period since the May issue, The Physics Society have been up to some of their usual tricks again. A lunchtime lecture was given on the 31st of May by Dr Brian James of Plasma Physics. His topic was *The Physics of Thunderstorms*. He succeeded in impressing the audience with slides of lightning displays and his seeming reluctance to get too close to a Van der Graaf generator. He even managed to utter a memorable quote, recorded elsewhere in this magazine.

The Informal Lunchtime Discussion Groups have proceeded with phenomenal success. Uncle Dick Collins attempted to *Solve Your Problems* on the 18th of May, which led to a rollicking hour of free food, drink, physics and fun. Dr René Grogard of the C.S.I.R.O Division of Radiophysics led us on a tour through the universe of *Modern Cosmology* on the 1st of June. The last discussion group of last semester was a special emergency session given by Dr Paul Walker on the 8th of June on *How To Learn Physics (and even pass exams)*. We hope this helped all of you who turned up.

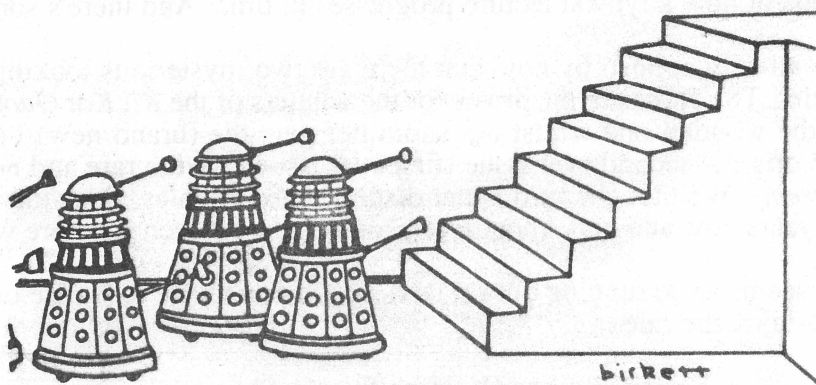
The *Perpetual Party*, held on the evening of the 2nd of June, was not a smashing success attendance-wise (possibly due to the chilly weather), but things certainly heated up when the Amazing Bubbling Punch Bowl got going. This contraption, which we hope to have improved by the next party, actually bubbled carbon dioxide (obtained from sublimation of dry ice) through the already potentially lethal mixture of ethanol, fruit juice and very little else. Because of the slightly less than expected attendance, everyone present got more than their fair share of food and drink. It is pleasing, however, to report that there were actually some first and second years present, as well as some others who seemed to have no connection with physics whatsoever. With a little warmer weather, hopefully the next party will be bigger and even better.

In the continuing saga of *Uncle Dick's Conundrum Corner*, we were shocked when we discovered that someone (not to mention any names, Derek McKay of Physics II) actually submitted a last minute entry. Not having received any entries right up until the day before the deadline that we set, we assumed that you were all a pathetic and lazy bunch of ignorant fools, and so went to press a day early. Derek, however, showed us that even a pathetic and lazy ignorant fool can sometimes meet a deadline. Together with his entry were a whole bunch of quotes and also some other stuff: original cartoons and little pieces, some of which you can see in this issue.

To make up for our underestimation of the likelihood of a last minute entry, Physoc sought out Derek last semester and presented him with a substantial reward right in front of his whole lecture class — namely a handful of Kit Kats from our official supply (graciously donated by Rowntree Hoadley). We have also submitted Derek's answers to Uncle Dick, who was pleased to award him a passing mark. What he gets in Uncle Dick's Electromagnetism course remains to be revealed.

Finally, Tim Hatfield and Richard Banks of Physics I, Accelerated, deserve a mention as the recipients of a handful of Kit Kats each. This presentation, which livened up one of Peter Krug's Laser Physics lectures no end, was for substantial contributions to the Quotes Competition.

J



"Well, this certainly buggers our plans to conquer the Universe."

Physics Forum

by

Bodie Seneta, postgraduate (Astronomy)

When *Physics Forum* hit the streets last time around, it met, I am pleased to say, with instant success. It had been released for no more than half an hour when that most frightening apparition, Kevin "Bigfoot" Moore appeared in my office and said "Have I got a book for you!"

Having calmed him down to the stage where I could get some useful information out of him, an interesting story unfolded. It turned out that a recent craze in the Plasma Physics Department was the

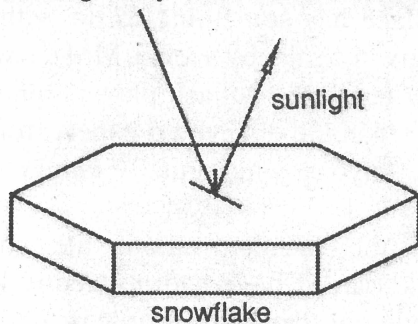


Figure 1: a snowflake drifting horizontally acts as a specular reflector.

observation of atmospheric phenomena caused by the interaction of particles in the atmosphere and sunlight. These often result in interesting displays, the common rainbow being a classic example. The interest was triggered by a book by Robert Greenler, which describes this and other atmospheric phenomena in a very intuitive way (see *References* below). So my question about specularly reflecting clouds came at just the right time.

What I saw over the Rockies on my plane trip was a *subsun*. Now remember I wondered how a cloud could reflect like a mirror. I figured that it couldn't be because the ice crystals were all oriented the same way, because I couldn't see

what could make them all line up with that kind of order. Well, as it turns out, they *do* orient themselves with remarkable uniformity. Ice crystals are in the shape of hexagonal prisms, which will be obvious to anyone who's ever seen a snowflake. In the upper atmosphere, they tend to be simple hexagonal prisms rather than the complex patterns we see at ground level. If the atmospheric conditions are right, then these prisms will tend to have short lengths (figure 1), which make them disc-shaped. Now as it turns out, these crystals will fall stably, like some autumn leaves do, if they're the right size. Greenler suggests making hexagonal prisms out of upholstery padding or styrofoam to illustrate this. Because of the low density of foam, these discs can be several centimetres across. For a material with a density as high as that of ice, stable orientation is obtained with sizes of 0.05mm to 2mm. The thickness is also important.

Because the ice is partially reflective, all these horizontal discs do indeed act to reflect the sun. Writes Greenler:

"...In the limit of perfect orientation, the spot becomes a reflection of the sun in the sea of horizontal mirrors. It is located as far below the horizon as the sun is above. Plate 3-7 [reproduced here as figure 2] shows a brilliant subsun below the wing of the airplane from which it was photographed. You can see such a display fairly commonly as you fly over ice-crystal clouds, and it is sometimes of dazzling brilliance. The subsun spot moves along with the airplane as it climbs, dives or turns, but disappears when the ice clouds vanish. I suspect subsuns account for at least some of the things reported as UFOs.

"If you watch the subsun formed in a thin cloud layer, through which you can see the ground, you will see that as it passes over a lake, pond or river, the subsun flashes with the brilliance of the sun reflected from the horizontal water surface - just what you would expect from the above explanation. The vertical dimension of the spot supplies a measure of the orientation of the crystals. I conclude that most of the ice crystals contributing to the subsun shown in Plate 3-7 have tilts smaller than 1 degree. This seems a surprising degree of orientation, but, judging from the appearance of subsuns, it is not unusual."

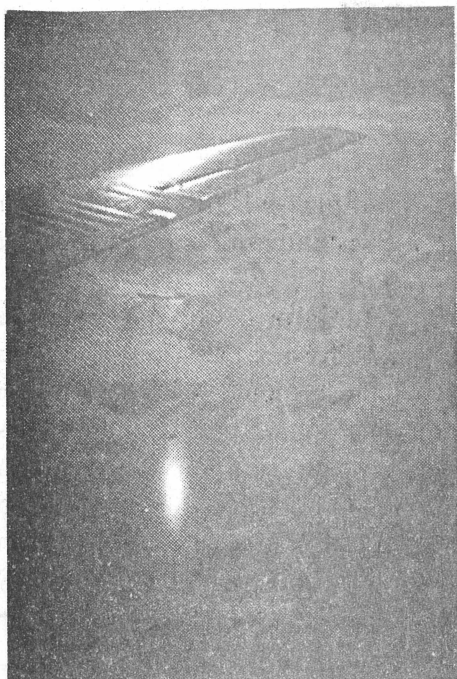


Figure 2: A subsun, as seen from an aircraft window. Reprinted from the reference.

Thanks, Kevin, for helping to clear that up.

On the subject of squash balls and blackboards, the plot has thickened. I met a student at the last PhySoc party who tried bashing a squash ball against a blackboard in the second-year lab (if love makes fools of us all, then physics must make us look like complete idiots), and failed to get the central spot to appear. The only difference between his experiment and mine was that his was on a hard blackboard, while mine was on that horrible, squeaky blackboard in room 318, which has a flexible surface. So the flexibility of the surface has something to do with it. Supporting evidence is given again by Kevin Moore, who points out that bruises sustained by squash players tend to be annular in shape rather than the disc you'd expect from a simple collision. Is there anyone who actually *knows* the answer?

With respect to the problem about the chalk "floating" down the blackboard, I have had no feedback at all. Surely there's someone out there who's at least willing to hazard a guess!

Now, I have some more problems for you. I've used up most of my space, so there are only two:

The Case of the "Glow in the Dark" Sticker

The chances are that somewhere in your home you have something with that green phosphorescent stuff embedded in it to make it glow in the dark. In my case I have several stickers and an appalling T-shirt that glows with the constellations of the northern hemisphere (presumably for the budding astronomer; the company that made it also offers other "scientific" T-shirts).

When you shine light on this stuff, the molecules in it are easily excited by the incoming photons, but are prevented from de-exciting immediately by some mechanism (it varies between phosphors) which can cause the phosphor components to remain in an excited state for minutes or even hours at a time. The gradual de-excitation provides light. That's not the problem. This is:

Shine white light on your glow-in-the-dark stuff. If you turn out the lights, it will glow. Now, cover up half of the glowing object, and shine *red* light on the other half (I used a high intensity LED, which peaks at around 680nm). The half you shone the light on should glow more brightly than the covered half, right? Wrong! It actually glows much more dimly, which surprised me when I first tried it. Something about the red light enables the electrons to make the transition to the ground state much more easily than they otherwise would. Can anybody help?

Hydrophobic Water Droplets

This seems to be something of a contradiction. Before the chemists among you start to panic, let me explain. Suppose you have a pool of water which is so disturbed at one end that it splashes, but

which is fairly smooth at the other end, a small waterfall or a fountain into a pond for example. Sometimes a splash will throw a droplet into the air and it will land on the water surface. Instead of instantly merging with the main body of water, however, it will skitter around for a few seconds on the water surface, apparently frictionless, before disappearing. The appearance is very similar to that of water skaters moving about on the surface of a pond.

Surface tension obviously has something to do with it. My guess is that somehow the surface tensions of both the droplet and the water surface are strong enough to prevent the instant recombination of the two. Then the surfaces at the interface are perfectly smooth, which explains the frictionless skitter. But why don't the water molecules in the droplet mingle with those in the pool? Since water molecules have a strong electrostatic polarisation, could there be some macroscopic orientation of molecules that prevents the surfaces at the interface from tearing each other apart? Maybe one of you can do some experiments with soap and oil, which bond to water molecules in interesting ways and no doubt affect the droplet surface.

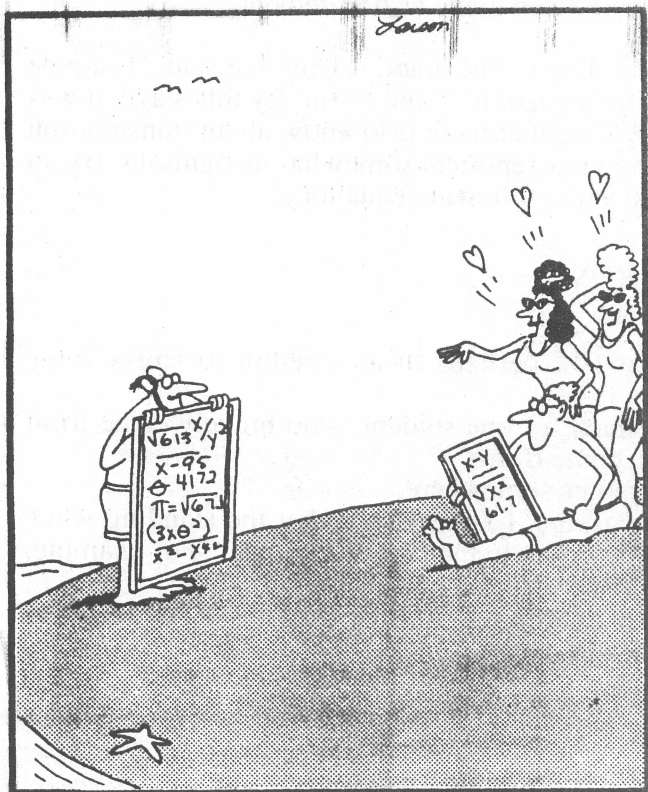
As an incentive, for this one I am offering a prize to the first person who can give me the right answer. Since I don't know what the right answer is, you'll need to include a reference. The prize is a "Drover's Mate" flick knife, worth less than the paper *Jeremy* is printed on and more useless than a lecture pad full of thermodynamics. It was given to the School of Physics along with other things in return for the use of one of our Van de Graaf generators in a bank advertisement, and no-one here can think of what to do with it.

As in the last column, I may be contacted by addressing correspondence to me via the Physics Society mailbox.

References

R. Greenler, *Rainbows, Halos and Glories*, Cambridge University Press 1980

J



"OK, sir, would you like inferno or non-inferno? ... Ha! Just kidding. It's all inferno, of course - I just get a kick out of saying that."

Third Year Thrills

by David Mar.

Having survived the horrors of a first year lecture[†], your two intrepid reporters (us actually, again) decided to try their luck in a third year lecture during the dying weeks of first semester. Disguise was not necessary this time around. The third years could not have noticed an elephant sitting in the row in front of them through the by now permanently glazed expressions on their faces; due of course to their past years of experience in surviving lectures.

The decision to infiltrate the lecture was made on the spur of the moment; when we saw that the living legend himself, Ian Johnston, was giving the lecture and had one of those nifty gadgets for overhead projecting a Macintosh computer screen on to the front wall. I.J. was setting up the apparatus on one of the two OHP's in Lecture Room 5 a few minutes before the hour, watched by your reporters, when Paul Walker sauntered in and absconded with the other OHP. Wasting no time, I.J. quickly delegated one of us to procure another from somewhere else in the building, by fair means or foul.

In the meantime, I.J. set up a video camera to display the screen of a spectrum analyser on a television facing the theatre. He grabbed the attached microphone and sang a soft note into it. The analyser responded dutifully with a beautiful trace of the harmonic content of the note. "Great," said I.J. and then switched the instrument off; otherwise leaving it set up for use during the lecture.

By now, some students were beginning to arrive and I.J. distributed a page of his copied notes and diagrams amongst them. The lecture course was on Acoustics. Coming in at the end of the course and seeing only a copy of section 4.6 of the notes left your reporters somewhat in the dark, but we were determined to extract some entertainment value from the proceedings.

"Good morning," began I.J. "Since we're nearing the end of this course, I'll be going through things today in even more waffly detail than I have been previously."

He continued by mentioning musical instruments as an application of the study of air pressure waves in pipes. "And you can tell what's going to happen in a woodwind instrument by the intuitive analogy to an electrical circuit." Yeah, right. "Today, let's talk about holes."

I.J. then proceeded to play a few notes, or at least we think they were meant to be notes, on a recorder. This amazing demonstration of course led naturally on to the next statement.

"Holes are inductive."

I.J. drew an equivalent circuit for a transmission line on the board. "This," he said, "is a pipe full of air. The behaviour is governed by this differential equation..." and so on. By this stage, it was painfully obvious that this third year class knew everything that there is to know about transmission lines (though they may have a different story), leaving your reporters somewhat incognisant. By an argument which totally eluded this reporter, I.J. arrived at the following equation:

$$\frac{d^2V}{dx^2} = -\omega^2 L' C' V$$

"Minus, minus, minus, minus, minus!" went I.J., perhaps in an attempt to stress some particular point about the equation.

At this juncture, the excitement became too much for one student, who bravely came forth with a question. "Excuse me, where does that equation come from?"

I.J. immediately replied with: "Oh... it's in the notes somewhere."

Moving on to the effects of multiple holes in a pipe, I.J. explained that the standing wave pattern is changed by the presence of holes all the way down to the end of the pipe. "For example, there are two different fingerings for B on a recorder."

I.J. tried one of them. The recorder emitted a clear note. He tried the other. The recorder screeched something pitched about three tones above the first note.

"Um... let's try that again."

Screech!!

[†] *First Year Fever*, Jeremy, 5, 1, (March 1989), pp 10-11.

"Anyone here know the two fingerings for B?"

One of the students volunteered: "Actually, it's G that has two fingerings."

"Well... anyway, the important thing is that you can get the same frequency by using a different arrangement of holes..." I.J. was here demonstrating the well developed lecture technique of distracting the students from the fact that the lecturer doesn't know what he's talking about. "... and it's important to realise that these notes begin as a random collection of frequencies when you first blow into the instrument. These waves all reach the other end of the pipe and then slosh back and forth, until you get a feedback effect and resonances are set up, at which point the notes are selected and you hear them."

Hearing this talk of notes "sloshing back and forth" made your reporters wonder if music would ever be the same again.

By this time, the OHP had arrived and I.J. had to make sure that it was in working order. He continued to talk uninterruptedly about woodwind instruments whilst he literally crawled on the floor to plug the OHP into the powerpoint situated under the front desk. Nothing stops a real Pro! Having completed this task, he turned to the spectrum analyser.

"This will show you the harmonic (?—Ed.) content of my voice," I.J. said as he switched it on. He then proceeded to sing a note into the microphone:

"Aaaaaaaaaaaaaahhhh... I can't get any response out of this thiiiiiiiiinnnnnnnggggg..."

The television screen showed that famous experimental result: the Law of Lecture Demonstrations, a simple corollary to Murphy's Law. In other words, the spectrum analyser had gone bung. I.J. continued to sing as he fiddled with some of the knobs, dials and cables.

"Aaaaaaaaaaaaaahhhh... that's a bit betteeeerrrrr... this bloody connectoooooerrrr..."

Eventually he had the thing working properly. He then began explaining some things about the human vocal tract.

"The vocal chord should give me... ah, should give me... oh, I don't know what it should give me."

I.J. went on to talk about the ranges of frequencies which must be present in a sound for it to be recognisable as some particular phoneme. He demonstrated by singing various vowel sounds into the analyser, cracking notes that no man has cracked before. Most vowels appeared to require harmonics at about three hundred hertz. I.J. pointed out that soprano's voices are so high pitched that they miss this harmonic altogether.

"... and that's why you can never understand what a soprano sings. Remember that; next time you write an opera, don't give the soprano any of the important lines."

The moment we had been waiting for was now imminent; I.J. turned on the OHP and the Macintosh. He had a programme ready which would display the shape of a standing air pressure wave in a pipe. The LCD screen that was plugged into the computer and laying on the OHP gave a very faint image when projected; a little disappointing for the snazzy little device that it was.

A pipe outline appeared on the screen and I.J. typed in a frequency which caused a standing wave pattern to appear above it. I.J. changed the pipe so that it expanded to twice the diameter halfway along its length. The first frequency typed in showed a wave that changed slope at the interface, and so did not fit the requirements for a standing wave. I.J. showed that a lower frequency would satisfy the boundary conditions properly. He then displayed a pipe that constricted to half the diameter halfway along. The original frequency again did not work.

"So what frequency should I try now? Who says lower?"

Your reporters instantly raised their hands, having of course worked out that a lower frequency would indeed satisfy the boundary condition. None of the third years shared our insight.

"Who thinks higher?"

A few third years put their hands up.

"Well, I think you guys should take a lesson or two from our fourth years here. It should be a lower frequency."

I.J. entered the lower frequency. He watched in astonishment as the computer traced out a wave which was obviously worse than the first.

"Aaaargh! I apologise to all those third years who said higher, and I berate the fourth years!"

I.J. entered the higher frequency and as the computer traced out the perfect standing wave your reporters pointed out to him that we didn't have to take his exam. Besides, he'd said wavelength, hadn't he?

So saying, we slunk off into the background as the lecture came to its end. Better luck next time!

J

Anatomy of a Physics Lecture

by Derek McKay.

- 09:55 Keen Science students arrive.
10:00 Other Science students arrive.
10:05 Engineers arrive.
10:06 Lecturer begins by reminding students what they can't remember from last time.
10:20 Engineers finally settle down.
10:35 Lone Arts student arrives.
10:40 Lecture demonstration goes horribly wrong.
10:50 Students get ready to leave.
10:54 Lecturer states he is now where he wanted to be at the start of the lecture.
10:55:01 Lecture theatre deserted.

J



The Quotes Competition

The quotes are finally beginning to flow in! We knew they were out there. First, second, third and fourth years are all represented in the following sample, which sees that solid performer of past years, Dick Collins, make his 1989 debut in sizzling form. We also see the beginning of a deluge of foreign quotes, with specimens from three different subjects. We always knew those chemists were a crazy lot.

Just to get you all even further motivated to listen to your lecturers, The Physics Society is pleased to announce the inauguration of another prize for the winning quote of the year submitter. We have managed to unearth an original copy of the second issue of *Jeremy* ever published (from 1986) and have ceremonially burnt it on the winter solstice (21st of June). The Ashes have been sealed in a silver urn which now forms part of the new, perpetual trophy which will be awarded to the winning quote submitter, after being engraved with his or her name. To have a chance at being the first person to be presented with this trophy, simply record any worthwhile quotes you hear from your lecturers and deposit them in the Physoc mailbox, behind the Main Office door, near LT8. Enough preamble, bring on the quotes!

Graham Derrick:

"Good morning . . . let's talk about rotating spin functions."

"This theorem is true subject to certain topological constraints that I don't understand — so I won't try to prove it."

Brian James:

"In mediaeval Europe it was believed that ringing the church bells during a thunderstorm would protect the building from lightning. This led to the death of a lot of bell-ringers."

Peter Krug:

"The mere fact that I am standing here now and that I haven't disappeared in a big burst of electromagnetic radiation is proof that my atoms haven't collapsed."

"Imagine my left hand is an oxygen atom, my right hand is another oxygen atom and, you guessed it, my head is a carbon atom. Now a molecule has vibrational motion . . ."
(We leave the rest up to you — Ed.)

"For those not studying our exciting first year physics course that's all a laser is, a device that you point at someone and they vapourise instantly."

"Let's talk about **another interesting** property of light."

Kevin Moore:

"If you didn't do this assignment in ten minutes, you should just drop physics."

"Assume the earth has a uniform gravitational field, i.e. it is flat, of infinite extent, non rotating and of uniform density."

David McKenzie:

"You can do the whole thing in polar coordinates, but it's just an exercise in self congratulation."

Bob Shobbrook:

"Even five or six metres is pretty tiny compared to infinity."

Bill Tango:

". . . and we want to avoid electromagnetism wherever possible, don't we."

"We all know about electrical engineers, don't we."

Neil Cramer:

"S. M. stands for Statistical Mechanics, not Sado-Masochism . . . although some people think they're the same."

Paul Walker:

- "If you need a stronger signal you can just stand there and ask the star to come closer."
"... you get into this Adam and Eve situation under a waterfall and then you start talking about physics. Check it out next time you happen to be standing under a waterfall."
"Some people watch *Neighbours* and some people just like to read about op-amps."
"You know, you get onto a bus and you see all these people asleep — kind of like a lecture."

Bernard Pailthorpe:

- "I'll give some more lectures on this topic — I don't know how many yet but it'll be more than two and less than four."
"If anybody understands this could you come and explain it to me later?"
"Stop quoting me!"

Don Melrose:

- "When I say it's obvious, of course it isn't obvious."
"These are the formulae you'll see in any text book, but the derivation of them is manifest nonsense."
"Now if you can learn to think like a theoretical physicist you can look at that equation and say the result is obvious."
"Well, with all that waffle, I'm going to come back to the semi-classical formalism."
"Let me now become a non-relativistic physicist."
"The expression for the power radiated is this . . . is this right Ross?"
Ross McPhedran: "Well, as far as I know."
"To my embarrassment, I've gotten the signs wrong. Well, no, I didn't get them wrong. In fact, I got them right."
"I find this result quite surprising and it must have profound implications, but I have no idea what they are."

Dick Collins:

- "I didn't need to write that much, but I felt you should suffer a little pain."
"You should write d^2F if you want to be pedantic, or even correct."
"The earth's field is half a gauss, which is 0.5×10^{-4} tesla, which is $3/5$ of nothing."
"... which we symbolise by 'curl', which is short for curl."
"Wow! You guys have got some problems."
"There's no doubt that the signs are positive, otherwise I won't get the right answer."
"I hate air-traffic controllers."
Referring to $\int \mathbf{B} \cdot d\mathbf{l} = I$: "Before you go home tonight, you will have seen it in all its glory."
"When you look in Sears, Zernansky and Young you'll see that they just write it down. By the end of today you'll see why they just write it down."
"I'll assume the world is convergent."
"I haven't done anything smart, I've just done something tedious."
"The Physics Department is so broke we only have little pieces of chalk."
"If you unplug the source the needle is deflected. When you plug it back in . . . Oh! . . . the fuse blows. Let's try that another way."
"You don't have to believe in fields, but it helps because we set exam questions on them."
Picking up Frankyl, the second year text: "Imagine for a moment, a cylinder."
"... and Frankyl comes up with this load of crap."
"We fall back on the symmetry arguments which are either intrinsically obvious or remotely obscure."
"You've got to know these things as well as your own name, or maybe even better."
Referring to Maxwell's equations: "It certainly excited me when I was your age and sexually active."
"I'm not going to argue with some jerk who's introduced some weird notation."

FOREIGN QUOTES

Mark Sceats (Physical Chemistry):

"But you have to be a masochist, not only to do this subject but to solve this equation. But we're not masochists . . . much."

"It has a simple equation which is too complicated to quote here."

"So you get a linear line."

Terry Gagen (Pure Mathematics):

"It's better not to think, and then no harm will come to you."

"Conic sections have been studied for over two thousand years for religious reasons."

"It's an attractive rule, but it's useless."

"Take your hand off her!"

Sue Halmagyi (Computer Science):

"Life is a cost benefit equation."

Nigel O'Brian (Pure Mathematics):

"This example is looking a bit suspicious."

". . . and you work out the determinant, which I don't want to do and you probably don't want to watch."

"Consider the normal vectors as a bunch of pine trees, if you have a sufficiently warped imagination."

D. D. Ridley (Organic Chemistry):

"This is inorganic, physical chemistry crap!"

"I don't know how many molecules there are in the earth . . . well, I suppose it's a fair few."

". . . and nobody's taken any notice, and that's a good idea."

"There are some hassles doing it the way the sun does . . . it gets a bit hot."

"Let's have a look, and this is a complex problem . . . well, let's not have a look."

Geoff Ball (Pure Mathematics):

"If in doubt, say 'by definition'."

"Fortunately, after today we get on to practical stuff, which will bore you for the rest of the year."

Don Napper (Physical Chemistry):

"We will all, one day, be oxidised."

"I will get great joy from giving them a zero in the exam. I have to get my kicks somehow."

"How dare you smile in a thermodynamics lecture!"

"We have now in . . . what year is it . . . oh, 1989."

Julia James (Inorganic Chemistry):

"None of us are perfect, especially you lot!"

J

The Relativistic Swordsman

A fencing instructor named Fisk,
Fighting duels was terribly brisk,
So quick was his action
The Fitzgerald contraction
Foreshortened his foil to a disc.

J

Life, The Universe and Physics

A Tragedy in Four Acts

by David Mar and Kim Lester.

There is a theory which states that if ever anyone discovers exactly what the Universe is for and why it is here, it will instantly disappear and be replaced by something even more bizarre and inexplicable.

There is another theory which states that the result will be a physics department.

Anyway; when we last left our intrepid explorers they were trying to find their way out of the physics building. They had just narrowly escaped being entranced by a sorcerous figure who appeared to have taken several captives already. Desperately looking for an exit, the group continue to wander the corridors.

Act Three

"Let's try up these stairs," suggested Trillian.

She led the way up to an area from which several doors and a short passage led. An open set of double doors labelled "Second Year Laboratory" beckoned. Sounds of clanking chains and cracking whips emanated from the large room beyond. Angry, yelling voices drifted out.

"Do a chi-squared test!!!"

Crack!

"Is that liquid paper?!!"

"What do you mean 'the equipment is no good'?! Do it again!!!"

"Where are your error bars!!!"

An especially loud whip crack split the air, followed by a soul-chilling scream.

"Let's try down the stairs," amended Trillian as she about-faced.

The Hitch Hikers Guide to The Physics Building says several things about physics labs.

Labs were originally designed to expose the students to the process of doing experimental work and so teach them both about physical phenomena and experimental techniques. The oppressive nature of the working environment and the assessment schemes has, however, slowly changed this objective. Now labs are used for the express purpose of preparing the students for all of the times in their lives when they will be expected to endure physical and mental anguish whilst working well beyond their capacities for weeks on end without sleep, food, water or adequate equipment. On this last point, it is a well known fact that lab equipment is not so much designed and built as unearthed in archaeological digs.

And so it goes on.

Two flights of stairs below the lab, the group were startled to see a large, flashing, red light with a sign mounted beneath it saying "Do not so much as breathe when red light is flashing". The group stopped and held their breaths. Zaphod, who really needed a drink soon, gave up first.

"Hey guys," he said as he walked nonchalantly up to the door under the light, "I'm sure there can't be anything that dangerous down here."

He opened the door, which was labelled "TORTUS Lab, Tokamak Room", and poked his heads inside.

"Hi guys," the others heard him say, "could you tell us how to get out of this building?"

The next thing any of them knew was the flashing of a red beam of laser light accompanied by the vapourisation of a large chunk of wall behind Zaphod, together with the simultaneous explosion of shouting from behind the door.

"Get out!!! We're doing a run!!!"

"Whoah," said Zaphod as he slammed the door and turned to face the others, revealing a track of singed and smoking hair between his heads, "try to be polite and what do you get?"

"Come on," said Ford, "we're wasting our time. Let's go down this hall and see if we can find anyone who can tell us the way out of here."

The group wandered down the long corridor, passing various doors and stairways which no doubt led off into parts of the building just as strange and potentially dangerous as the areas they had already seen. They were very definitely not having a good time. Zaphod, in particular, was in danger of sobering up. Surely, one of his heads told the other, that bar must be around here somewhere.

A vaguely familiar area approached them. It looked like the section of corridor just outside the lecture theatre in which they had first appeared.

"Oh, this is great," began Arthur, "We've just been going around in . . ."

He was cut short by the sudden splintering of the lecture theatre doors. An immense, swarming horde of students poured out through the shattered remains of the doors, emitting a thundering cacophony of yelling, screaming and asking each other what they were doing at lunchtime. Amidst the pandemonium, Zaphod and Arthur were swept up in the stream of students and whisked away down the hall, whilst Trillian and Ford were forced to take refuge by jumping over a railing and landing on the stairs beyond.

Zaphod couldn't remember a worse experience in his life, with the possible exception of the time he had just a dozen or so too many Pan-Galactic Gargle Blasters. His heads were swimming as he was jostled along by the relentless throng of escaping students. He tried to focus on something, anything, and finally spotted Arthur lying on the floor in relative safety in a room just off the right side of the corridor. Zaphod struggled against the flow of people and managed to get a grip on the door frame. He read the words "First Year Office" as he hauled himself into the room and collapsed on the floor next to Arthur. Almost immediately, a female voice reached his ears.

"Ah, good. You've come for your lab allocation. Are you doing the normal or accelerated course?"

"Wha . . ." was all that Zaphod could get out before the source of the voice came over and dropped a huge bundle of papers into his reflexively outstretched arms. His arms gave under the enormous weight of the paper, which wasn't entirely a bad thing because he would not have been able to see over the top of the pile if he had held it.

The lady gestured towards the jumble of papers now on the floor and intoned, "Those are the tutorial problems that you have to do. All subsequent week's problems will be distributed in lectures. Now, what was your name?"

Arthur, who had recovered enough to see that he and Zaphod were in big trouble, whispered to Zaphod, "At three, ready? One . . . two . . . three!"

The two jumped to their feet and bolted out of the door. The hallway, now empty again and as deathly silent as before the mad stampede of students, beckoned and Arthur and Zaphod ran as fast as they could down it.

"Hey!" called the lady, now brandishing two volumes that would have done the *Maxi-Megalon Ultra-Complete Dictionary of Every Language Ever* justice, "You've forgotten your lab notes!"

Ford and Trillian had meanwhile made their way up the stairs to the next floor. Ford pulled out his Sub-Etha Sensomatic and tried to get some sort of reading that might indicate a possible way out. Perhaps some friendly interplanetary traveller would be passing by and pick them up.

"Damn!" exclaimed Ford, "It's not working!"

Ghostly images of unsolvable transcendental equations and impossible probabilistic functions drifted across its screen. "It looks like the effects of the Theoretical Department," he concluded.

Theoretical physicists have long been known to have adverse effects on electronic equipment, non-electronic equipment, other people and in fact almost everything. For example, there are vastly complex interactions between theoreticians and experimentalists, which create fabulously complex and highly unstable improbability waves. The practical upshot of this being that any remotely sensitive piece of equipment within any reasonable range of a theoretician will suddenly and inexplicably have a complete nervous breakdown.

A famous example of this occurred just above the surface of a small, dark and murky brown planet in the Zeegleese system. The planet, Pfughtioup (meaning small, dark and murky brown), housed a group of experimental physicists who had designed and built an anti-gravity device.

On the day of its great unveiling, the device was attached to a platform upon which the local important politicians, media personnel and some physicists had gathered. After some suitably irrelevant speeches (the Mayor's speech was actually for the opening of some public toilets due to be

held later that day — not that anybody noticed), the suitably impressive looking main switch was thrown. The platform rose gracefully into the green sky.

After a few seconds, a conversation started between two of the physicists on the platform. They were theoreticians.

"I say, Zurglefield old chap, splendid set of equations you solved to get this project off the ground, so to speak . . . ha ha."

"Yes, well, actually Arphiklephoeurst, I've been wondering about that. Have a look at this, would you?" replied Zurglefield, pulling out a sheaf of papers and handing them over.

After a few minutes of hum-ing and har-ing, Arphiklephoeurst spoke, "Ah yes. Look, you've got a **k** wrong here . . ."

"Oh dear, yes, you're right. Well, let me see, that gives, um . . ."

$$\frac{i}{2\pi} \sum_{j=0}^{\infty} \iint \langle \emptyset_j | \tilde{\emptyset} \rangle \exp \left\{ \frac{i \theta \mathcal{H}^{(0)}}{n^2 \hbar v} \right\} d\Omega = \left[\frac{\partial^2}{\partial \emptyset^2} - \nabla^2 \right] A(r, \theta, \emptyset) + i\mathbf{k} \times \mathbf{B}$$

. . . errr . . . "he paused.

"What's wrong?" asked Arphiklephoeurst.

The platform became nervous and trembled slightly.

"Um, ah, well, I'm afraid that it is impossible for this anti-gravity device to work. In fact, according to my calculations, we should be upside down in that peat bog over there."

Phooooooooooooooooowwwwww . . . thud, splat!!

As Zurglefield and Arphiklephoeurst crawled and squelched their way out of the mud a minute or so later, Zurglefield gasped to Arphiklephoeurst, "There you are, you see, I was right, it can't possibly fly!"

"Hmmm," wondered Ford out loud, "I wonder if anyone around here can fix it."

"There's a sign over here saying Applied Physics," offered Trillian, "Up these stairs."

"Sounds good to me," said Ford, "Let's go."

The two strode up the stairs and through a set of double doors, to be greeted by the sight of a huge room full of complicated looking equipment. This instilled some confidence into Ford, which was quickly drained again when he caught a glimpse of a couple of students adjusting a very delicate looking piece of apparatus with a large wrench. A tall and reasonably confident looking man who at least appeared to know what he was doing walked past. Ford cornered him and began explaining at great length what was wrong with life, the universe in general, physics, the Theoretical Department in particular and his Sub-Etha Sensomatic.

The unfortunate professor tried to escape, but Ford kept a strong grip on him. Clutching at his head in anguish, the professor probably would have torn his hair out if he had not already succeeded in doing so marking second year exam papers. He tried the alternative of pulling Ford's hair out instead.

"Yeeeeooooooooowwwww!!!" Ford yelled and let go.

The professor, taking his chance, bolted up the nearby stairway and into his padded cell, slamming the door heavily behind him. Ford raced after him, followed by Trillian, and tried the door, but to no avail. He stared stupidly at the door, which stared stupidly back, announcing to whoever might be interested that Professor Dick Collins was locked inside. Ford tried the next door along, which was marked with the name Kathryn Collins. The door opened to a scene of mild chaos.

"No, you can't use the Mac, I've got work to do!" exclaimed a girl, brandishing what looked to Ford like a computer keyboard, "Jeremy will have to wait!"

The two cowering figures at whom she was swinging the keyboard scurried past Ford and disappeared down the landing. She put down the keyboard and turned to face Ford, eyes glowering.

"Oh hello," began Ford, "I was just talking to your . . . (his brain raced and made a logical deduction) . . . husband . . . (he paused, remembering the thinning hair, glazed expression and pre-digital watch) . . . sorry, your grandfather. I was wondering if you could give this to him to fix." He proffered the Sensomatic. "It doesn't work," he added helpfully.

The girl took the device gingerly. Ford left the room, calling back that he would return to pick it up later. He joined Trillian outside and they walked along the landing. They came to a door labelled "Fourth Years. Do not feed." Sounds of an argument drifted through the door.

"Get off that Mac! It's ours!"

"But I just need to print something!"

"Go use Kathy's Mac!"

"I did that last time!"

"Oh, stuff *Jeremy*!"

Ford and Trillian didn't wait to hear what happened next. They ran down the stairs, only stopping when they reached the bottom.

"Come on," said Trillian, "let's find Zaphod and Arthur."

"I saw them jump up on to the stairs when that crowd of students came out," said Arthur.

"You sure about that, monkey-man?" answered Zaphod, "Okay, let's go."

At the top of the stairs they were stopped by a large and surly security guard.

"That'll be two dollars."

"What for?" asked Zaphod.

"Tea."

"Tea?!" exclaimed Arthur.

"Tea," stated the guard.

"Yeeuuucchh!" said Zaphod.

Arthur fumbled in his dressing gown for some coins that looked reasonably acceptable. The guard accepted them after a minute's scrutiny and they entered the tea room.

Arthur poured himself a cup of tea whilst Zaphod stuffed both his faces with as many fancy biscuits as he could lay his hands on. He had some stiff competition from the other people in the room.

"Hey!" he spluttered between mouthfuls at the man who took the last shortbread, "Whaths the rusth?"

"There's a colloquium on in five minutes and we all have to go to it," the man gave a resigned sigh, "so we're all getting some sustenance." He wandered off into the throng.

"Not a bad cup of tea," said Arthur, coming over to Zaphod, "It's always better when you make it at home of course, but on the whole, not bad."

"Come on," Zaphod dragged Arthur out of the room, "let's get out of here before we get trapped in this colloquium thing. If it's anything like the lecture . . ." he let the last thought hang.

"Mmmm," said Arthur, drinking his tea, "could I have a biscuit?"

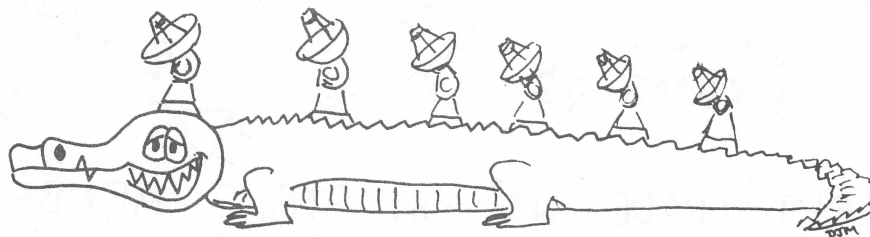
"Here," Zaphod gave him one from his pocket, and stuffed all of the rest that he had managed to grab into his mouths. He stopped chewing as he saw a tall figure with greying hair and beard and wild, penetrating eyes striding towards them, beaming radiantly. The figure was actually radiating, a soft white light not entirely unlike that given off by fluorescent tubes, and Zaphod noticed that his feet didn't seem to touch the floor as he walked. "Whoof iff fthat?!" he spluttered.

His query was answered by a group of people who had just left the tea room. They spotted the figure and bowed, whispering the words "Ian Johnston" reverently as they did so.

One of Zaphod's heads swallowed as much as it could in one go, nearly choking the other head, which was attempting to breathe. His mouths then hung open, unable to say anything. The incredible presence of the man precluded all other thoughts from his minds. Zaphod felt outcooled.

To Be Continued.

J



"The JEREMY crocodile, visits the Australia Telescope (or maybe it's the other way around)."

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