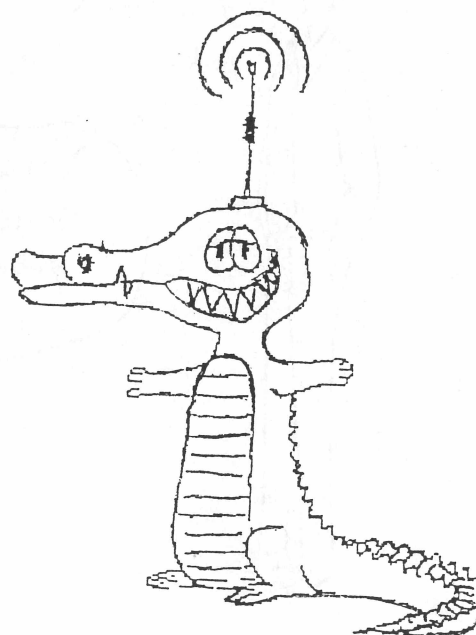


Jeremy

“Enlightening physicists since 1985”

The *Official* Journal of Physoc, the Sydney University Physics Society.
Beware spurious imitations.



Anyone who dares to mock Jeremy will have to deal with his 1114kg friend Chao Yai, the world's largest known crocodile. Moses, you've been warned.

Volume 16, Number 4, October 2000.

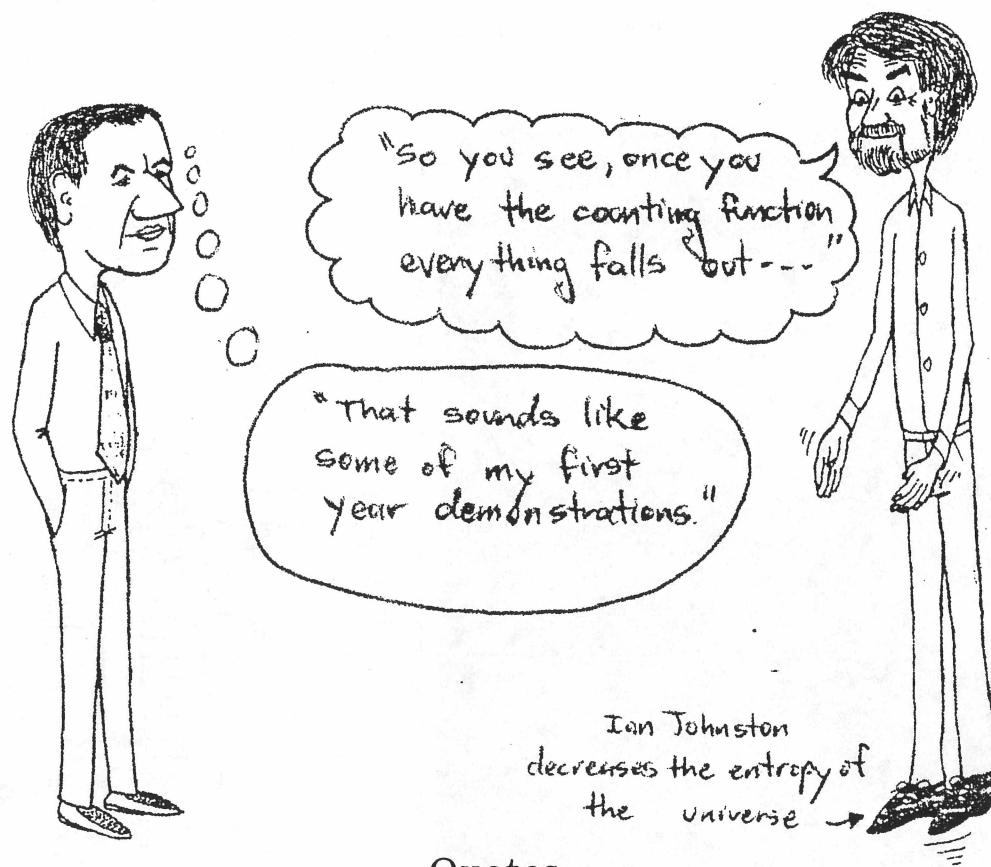
Editors: Chris Barton, Edward Boyce, Amy Dickings and Kiran Krishna.

Includes:

- tributes to Dick, Head of School
- entries for Jeremy's "New Particles" competition
- a resounding warning from the 19th century.
- the usual quotes, queen's report etc.

Other Retiring Academics

Laurie Peak and Ian Johnston, two long-serving associate professors, will be leaving the school at the end of the year. We thought we'd present a brief pictorial tribute.



Quotes

Is there some reason this place has emptied out, besides the Olympic Games?

Prof. Richard Collins, 20/9

This is a traditional university - ivy-covered buildings, ivy-covered professors ...

Senior academics - who needs them?

Let's celebrate this result with a different colour chalk - this is the type of celebration we have in relativistic quantum mechanics.

Prof. Peter Robinson

I don't hate opera - I just think it's the most stupid, self-indulgent art form there is.

Simon O'Toole

It'll work after I've had a coffee.

Tom Mauch

I need someone to write me the book 'Metric Tensors for Dummies.'

Edward Boyce

I can't believe you just used the words 'marble cake' and 'contour' in the same sentence.

Chris Thom

I didn't want to provoke him, I just tried to poke his eye out.

How do you spell IBM?

I can see infinitesimal changes. I can see them, but I can't detect them.

Audrey Lobo

Astrophysics would be so much easier if it wasn't for all these stars and galaxies.

Hugh Wilson

The Queen's Report



An anonymous second year reminded me today about the terrors of second year advanced electrodynamics. Sitting in a class staring at a blackboard swamped in mathematical language, searching in vain for that one word in English that would make everything comprehensible. Back when I started second year it was my initiation into and my introduction to the daunting and exciting world of "real physics". It was also the first time I had Dick Collins as a lecturer. Like most people in the school I have known Dick more as a teacher than as a Head of School. The enthusiastic guy up the front trying to convince us that we could solve any physical problem as long as we first considered it to be a sphere. The guy in the audience who has always asked the tricky questions in colloquiums and talks, just to make sure every speaker squirmed enough during question time. Outside the lecture theatre he has always been the sage we could turn to for praise, advice and trouble shooting whenever we came up with a sure fire no miss Nobel Prize winning perpetual motion machine based on sound physics.

Dick, I could thank you for being a great lecturer, for inspiring me to become a better scientist, for knowing everyone's name and showing interest in what every student does, or for just being a great guy, but more importantly I would like to thank you for that final "therefore" on the bottom right hand side blackboard of Lecture Theatre 2, that made advanced EM worthwhile.
Jocelyn Laurence

Nobody does it better,
Makes me feel sad for the rest,
Nobody does it half as good as you
Biggus Dickus you're the best.

We were just sitting
In Electrodynamics
We tried to copy
assignments.
But like many before us
The Prof who taught us
Busted us and gave us naught again.

And nobody does it better
And sometimes I'm glad no one could

Nobody does it quite the way you do,
Why'd you have to be so good?

The way that you trap heat
With two 8mil glass sheets,
The way you make really hot coffee
With just thermodynamics
Dewar and no tricks
MacGyver's found a compatriot in you

And nobody does it better
Makes me feel sad for the rest
Nobody does it half as good as you
Dick Collins you're the best.

A few words from Dick

by Dick Collins.

Forty four years is a long time to look back. For you disgustingly young students, it is an infinite length of time. For me, it's three quarters of my life. But that's how long it has been since I first darkened the doors of the School of Physics at the University of Sydney. Mind you, in those early undergraduate days, the shadow that I cast in the morning sunlight only slightly darkened the doors. I was just as tall then as I am now, but I had yet to fill out.

The School of Physics in the second half of the 1950's was an exciting place. (It still is!) Harry Messel was in the first flush of his career, and was making waves. He was also stinking the place out with his cigars. We always knew when Harry was around - there was something in the air. Students were a pretty unruly lot. We often gave our lecturers hell. Many of them deserved it. Paper aeroplanes were a serious business. I remember building an "aerodynamically perfect piece of paper" out of a full sheet of the Sydney Morning Herald, and floating it down from the back of Lecture Theatre 8 so that it landed on the lecturer's bench, to the acclamation of my friends. I don't tolerate that sort of behaviour in my lectures now. What a hypocrite!

Some of our lecturers were real characters. Dr Wall, who taught us Maths, owned only one tie, and wore it every day. (We bloke students all wore ties, too.) Dr Smith-White, also a Maths lecturer, wore a tattered old black gown. I was actually privileged to witness its demise - he took a larger than normal step backwards, and caught the heel of his shoe in it, ripping it from his shoulders. Spectacular stuff! Professor T G Room taught us about tensors - millions of a_{ijkl} 's all over the blackboard, written in tiny script. The following memorable exchange occurred in one of these lectures in 1958: Student: "Excuse me, Professor, but is that an i or a j there?" Professor: "You can tell my i 's from my j 's by the sign of the radius of curvature." Professor Room also lectured us (note that I didn't say taught us) about Projective Geometry - the only course that I ever took in which I learnt exactly nothing.

I also recall Dr Builder's relativity lectures. Builder was, in fact, an excellent lecturer. The only problem was that he had never accepted Einstein's theories as being a reasonable representation of the natural world. So we got Builder's Theory of Relativity. This probably explains why I've never been full bottle on this bit on Physics.

My Honours year in 1960 had many memorable experiences. I well remember the first task assigned to us - to move many tons of lead from the tower at the western end of the building to the tower at the eastern end. No gloves or protective clothing were provided. We all came out black. My Mother really went crook. Shortly afterwards, I started to lose my hair, but I'm sure that this experience had nothing to do with it. I did my Honours project with Dr Don Millar, a lovely bloke, and now a good friend. He started me off by asking me to assemble a cloud chamber. He handed me a large glass cylinder, with the advice "Be very careful with this Dick, it's extremely expensive." I carried it out of his office, and immediately dropped it on the floor. He found me in the foetal position, expecting to be drop-kicked across the hockey field. I clearly recall him looking at me with infinite compassion, and then going to a cupboard from which he took another glass cylinder, saying "Never mind, I have several more." To this day, I remain grateful to Don for not truncating my Physics career at that point.

Another task allocated to us Honours students was to solder up a pile of electronic circuits. The reason given for this was that it was good for our souls (and also presumably for our careers) to learn how to solder. In fact, I think that we were just slave labour. This communal soldering took place in the electronics laboratory in the western end of the building. We students spent many companionable afternoons sitting in a row, feverishly soldering away. Now the genius who had designed the soldering sweat shop had installed hooks on each soldering iron so that, when not actually melting solder, they could hang up, and not burn a hole in the bench. The

MAKE YOUR OWN DICK COLLINS™ MASK



INSTRUCTIONS

- 1) Cut along dotted lines
- 2) Carefully punch holes in each side with sharp implement
- 3) Connect holes with enough string, fishing line or razor wire to fit comfortably around your head.
- 4) Wear to lectures to intimidate lecturer (but in a nice kind of way)

only trouble was that, in the hooked state, they were oriented so that the hot tip of the iron was pointing upwards, and outwards. Our convivial soldering sessions were therefore frequently punctuated by short, sharp screams as one of our number would back into a high temperature soldering iron tip. Again, my Mother used to get really cranky about the holes burnt in my trousers. If you were ever to examine the bums of the Honours Class of 1960 (and that is something that I most sincerely hope you are never moved to do), you will probably find quite a few small arrow-shaped scars - reminders of those happy days in our youth spent acquiring essential physicist's skills.

Then there were the Progress meetings - amongst the most tedious experiences of my life. There is a host of stories about these special occasions, but to learn of them, you will have to buy my book (see below).

In all of this, did we learn any Physics? We must have, I suppose, although not much of that part of my experience as an undergraduate at this University is memorable. What I remember most are the fun times. Like when our friend Monty Newman asked us all to vote for his mate Nicholas Chelonia in the annual elections for the Students' Representative Council. Frankly, most of us didn't give a stuff about the SRC elections, but a mate of a friend is a mate, so we all fronted up and did as asked. The day after the election, Monty greeted us in high excitement, telling us that Nick had indeed been elected. We really couldn't see why this was such a big deal, until we learnt that Nicholas Chelonia was the Department of Zoology's pet tortoise.

Perhaps the most memorable thing that happened to me whilst I was a student, and certainly the most important, was that I met my future wife, Marilyn. This year, we celebrate our 38th wedding anniversary. A word of advice to all you young ones: if you see something that you really want, go for it with your ears back, and repel all boarders. It worked for me.

During the 1960's and 1970's, I was away from the University - in industry, in the United States doing a Ph.D., and at the New South Wales Institute of Technology (now UTS). During this time, I learnt some Physics, but mostly I learnt about people, and life. It's all going to appear in the book!

I returned to the University in 1980, in another capacity from my earlier incarnation. Of course, the students looked a lot younger, and now, 20 years on, you look younger still. In my new role, I have found out about other parts of the academic world - on the other side of the lecturing bench, and the examination paper, and the administrative process. I have also seen much more clearly the dedication of the academic staff, and have come to admire how hard they work, for such low financial return. But I have also learnt that there are many other returns from the academic job that are far more rewarding than money.

I came to love the teaching experience and have found great joy in sharing how I feel about Physics with others. It is a great thrill for me to see the spark of comprehension in students, and to find my own understanding of this subject grow in the process. My parents always said that I should have been an actor, and I think that I find some performing outlet in teaching. But it is much more than that, because mostly an actor is pretending. When I teach, I do not.

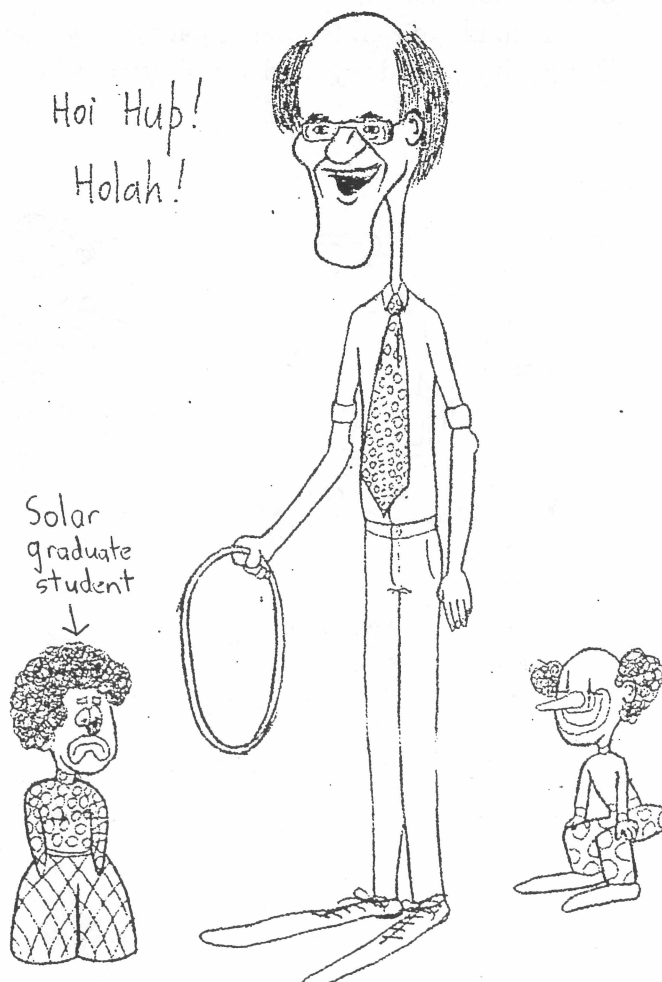
Even at my advanced age, I still do not feel myself too far removed from being a student. (The doctors call it "living in denial.") I can therefore still appreciate the challenges experienced by students in the learning process, and I can empathise with the difficulties that you are facing. I can also share the satisfaction that you obtain from your achievements. It is a great thrill to sit on the stage in the Great Hall and to watch the faces of new Graduates as you each walk up to the Chancellor to receive your testamur. It has been an honour, and an awesome responsibility, to be your guide and mentor. For many of you, I have been privileged to have developed a close relationship that I know will last for the rest of my life.

A lot is different in the University these days, and a lot is the same. You students are more serious (not a bad thing), but your thirst for knowledge and understanding is as strong



"Graduate students are the cheapest form of servo-mechanism ever devised" ↓

↑ Dick's first year lectures were always fun

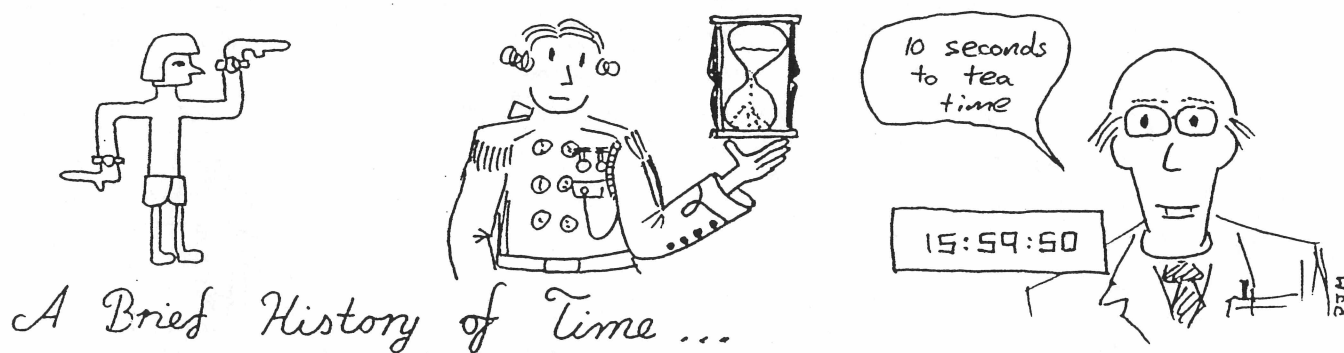


as ever. You remain appreciative of good teaching, and unforgiving of bad. As a group, I think that the students of today are smarter than we were - certainly most of you are a lot smarter than I was. And that gives me much satisfaction, because I feel good about handing over to you the responsibility of this side of the academic endeavour.

Perhaps the change in the University that gives me the most satisfaction is the extent to which the relationship between academics and students has strengthened. I well remember in my Orientation Week being told that the academic staff really didn't care whether we passed our exams or not. Yes, that was actually said! Before my Honours year, I don't recall having a single, meaningful, one-on-one conversation with a member of academic staff. Things now could hardly be more different. And that is good.

Obviously, I have very mixed feelings about leaving the University. On the one hand, I will miss a lot of things - the joy that I experience in teaching, the stimulation of conversation and argument with my colleagues, the excitement of my research work. Most of all, however, I will miss my interactions with you - my students. But one must move on. I have been back here for more than 20 years, and that's long enough. I am looking forward to doing many new things - renewing some industry interactions, writing a couple of books (most of you will be in one of them, either collectively or individually), getting back to do more woodwork, satisfying a long-standing desire to take up pottery and to make heaps of misshapen coffee mugs, and spending more time with my wife and family, including our young grandson. I will, of course, be here from time-to-time, and will watch with interest how the School continues to rise to meet the challenges that it will inevitably face. I am not pessimistic about the future of the University or the School, nor of the discipline of Physics. What now face us are just the challenges of this time. My predecessors had different challenges to meet than I did, and my successor's challenges will be similarly different. I am particularly pleased that Don Melrose will be the next Head of School - he will do a superb job. I have every confidence that the School of Physics will rise to meet the challenges that it faces, and that the future will be even better than the past.

I thank you all for being part of my wonderful experiences in the School of Physics at the University of Sydney, and I wish you well.



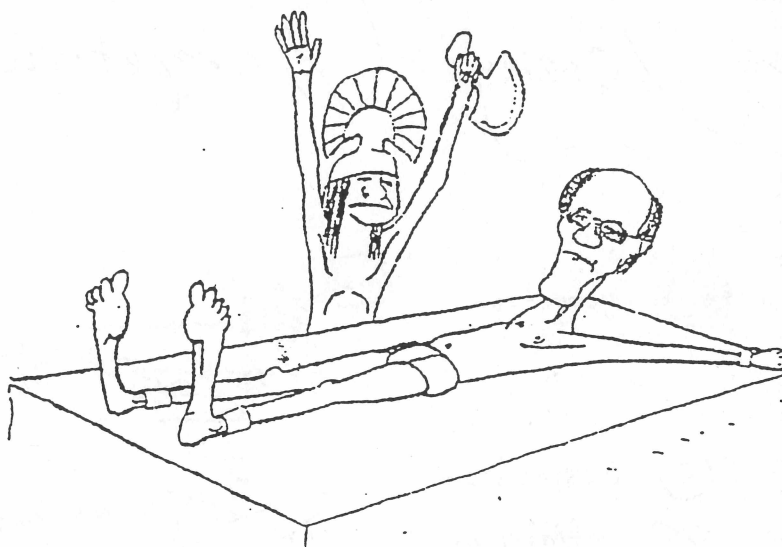
↑ Dick always understood the importance of taking a break

Dick's Ear : The Mystery Revealed

by Edward Boyce.

Ever since I've been at this university (i.e. since 1997) first year physics students have sat in the Slade Lecture Theatre, pondering the mysteries of physics. Why does time dilate when you travel near the speed of light? Why does the entropy of a closed system always increase and never decrease? Why is there a piece missing from Dick Collins' ear? In this hardhitting Jeremy exclusive, I am proud to answer the last question.

In the middle years of last century there was little awareness of the effects of sunlight on fair skin. Dick failed to "Slip, Slop, Slap" and consequently developed a skin cancer on his right ear. When the surgeon removed the cancer some of Dick's ear went with it. Let this be a warning to any solar energy physicist. Sometimes you mess with the sunlight, and sometimes the sunlight messes with you!



The Wit and Wisdom of Dick Collins: Quotes from previous Jeremy Issues

Graduate students are the cheapest form of servo-mechanism ever devised.
To solve this we apply the general physical principle of making things as easy as possible.
We had a great untruth before, so now this small untruth looks plausible.
Somewhere between when I was your age and when I lost my hair...
While it's moving the charge is in a moving state.
It's absolute in a relative kind of way.
Vectors are better than fingers because you don't run out of vectors.
Non conservative forces stink and we don't have much to do with them.
Like all D.E.s you can't solve it unless you know the answer.
This is called the Otto cycle. It is not related to the Otto garbage bin.
I can tell this by my calibrated eye.
If you jump out of a plane, you only reach 200 km/hr.
A rigid body is a different thing to a mortician than to a physicist.
I'm going to eliminate gravity - and most of the first row too.
I'm going to go into intergalactic space - we've done a lot of that this term.
You've got pretty well constant... no... It's a crummy experiment. I guess you've also got to have a good imagination. Trust me. It's a subtlety we don't wish to get involved in.
Well, you could write it down in terms of Bessel functions but that would be a terrible waste of your life.
Choose a small flat volume...

New Particle Competition

You may recall that Jeremy vol. 16, no. 3 had a competition in which readers were asked to invent new subatomic particles. Two bold first year students took up the challenge and their entries are reproduced on the following pages. The editorial team was split between the caton ion and the highly charged quaak, so Marcus Low and Peter Riley win \$25 each.

Jeremy Competition: New Particles!!



gorgatron



caton
ion



pufferfission



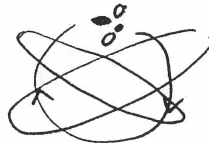
ecstatitron



infinित्रon



boomerang



annoyingly



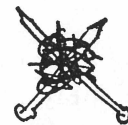
soup can (s-orbit)
propulsitron



ron



supersmall
tasty wonton



resultant
pompom

For more fun go to www.geocities.com/marcuslow1

by Marcus Low

Three New Interacting Particles

A new family of 3 interacting particles is described:

"i" - the ego

-1 - the superego

d - defined later

Creation starts with i, i and d.

Egos combine spontaneously to form superegos: $i \times i = -1$

The superegos combine by sexual liason with d's: $(-1 \text{ rooted by } d): \sqrt{-1} \text{ } d = id$

The id is destabilised by the ego (after Freud)

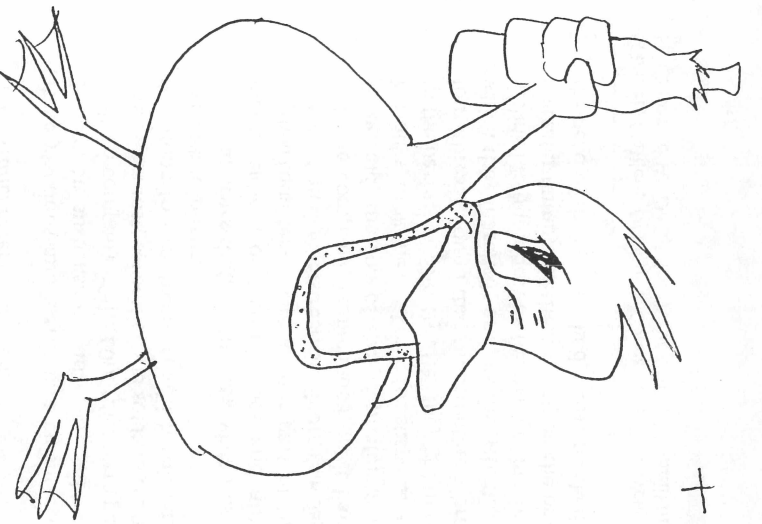
$$\begin{array}{ccc} id & \longrightarrow & i + i \\ \nearrow v & & \searrow d \\ i & & d \end{array} = i, i, d$$

It is seen that there is an input of an extra "i", this is the ego of the experimenter, as would be expected in an observer created reality.

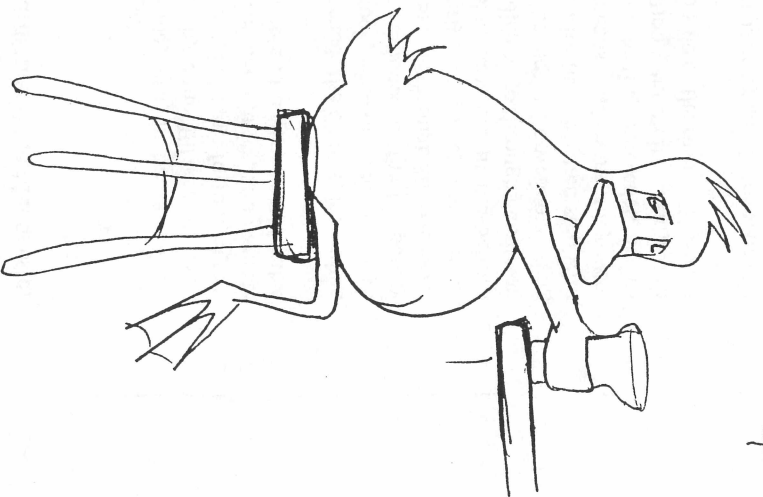
How is "d" conceptualised? $\Rightarrow \Rightarrow$

by Peter Riley

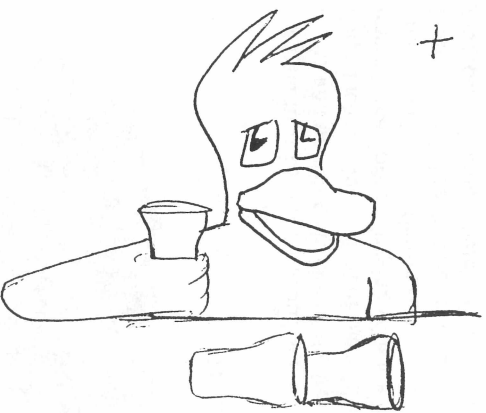
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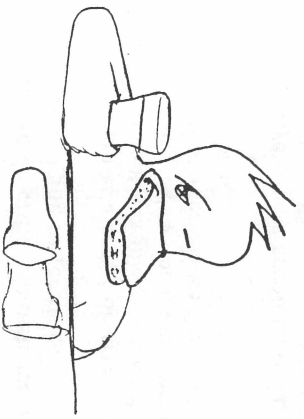
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SOME EXAMPLES OF "d" - THE HIGHLY CHARGED Q U A A K

A. B. Dickinson 'Differential Equations: Theory & Applications'

The smaller the ratio k/m , the sharper the resonance curve. An impressed force of frequency close to the resonant frequency of a mechanical system, may destroy the system.

2.19 EXAMPLES OF RESONANCE

Galileo described an instance of resonance* that is still used in the ringing of heavy free-swinging tower bells.

Even as a boy, I observed that one man alone by giving these impulses at the right instant was able to ring a bell so large that when four, or even six, men seized the rope and tried to stop it they were lifted from the ground, all of them together being unable to counterbalance the momentum which a single man, by properly timed pulls, had given it.

Eyewitness accounts of large bridges in resonance are particularly interesting. The rule that troops must break step when crossing a bridge may have originated in England after the collapse of the Broughton suspension bridge near Manchester in 1831. Excerpts from the accounts in the Manchester Guardian and the Manchester Chronicle, both of April 16, 1831, are given below.

The Manchester Guardian:

A very serious and alarming accident occurred on Tuesday last, in the fall of the Broughton suspension bridge, erected a few years ago by John Fitzgerald, Esq., whilst a company of the 60th rifles were passing over it; and, although fortunately no lives were lost, several of the soldiers received serious personal injuries, and damage was done to the structure, which will require a long time and a very considerable expense to repair.

It appears that, on the day when this accident happened, the 60th regiment had had a field-day on Kersall Moor, and, about twelve o'clock, were on their way back to their quarters. The greater part of the regiment is stationed in the temporary barracks, in Dyche-street, St. George's Road, and took the route through Strangeways; but one company, commanded, as it happened singularly enough, by Lieut. P. S. Fitzgerald, the son of the proprietor of the bridge, being stationed at the Salford barracks, took the road over the suspension bridge, intending to go through Pendleton to the barracks. Shortly after they got upon the bridge, the men, who were marching four abreast, found that the structure vibrated in unison with the measured step with which they marched; and, as this vibration was by no means unpleasant, they were inclined to humour it by the manner in which they stepped. As they proceeded, and as a greater number of them got upon the bridge, the vibration went on increasing until the head of the column had nearly reached the Pendleton side of the river. They were

*Galilei, Galileo, *Dialogues Concerning Two New Sciences*, "First Day," page 98, translated by H. Crew and A. Desalvio. New York: Macmillan, 1914.

DREADFUL ACCIDENT AT BROUGHTON SUSPENSION BRIDGE.

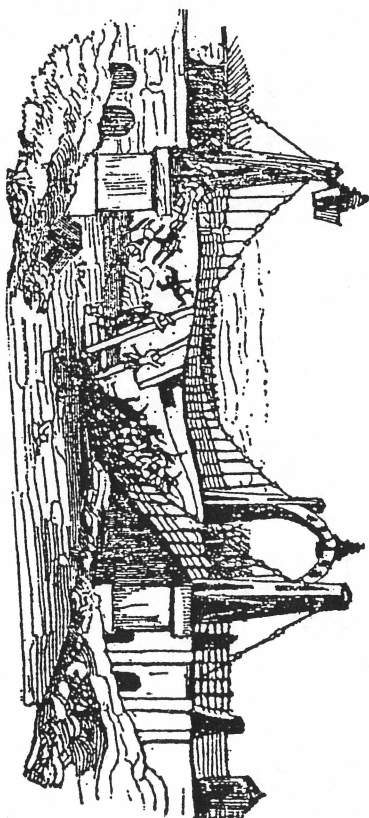


Figure 2.13(a)

then alarmed by a loud sound something resembling an irregular discharge of firearms; and immediately one of the iron pillars supporting the suspension chains, viz. that which was to the right of the soldiers, and on the Broughton side of the river, fell towards the bridge, carrying with it a large stone from the pier, to which it had been bolted. Of course that corner of the bridge, having lost the support of the pillar, immediately fell to the bottom of the river, a descent of about 16 or 18 feet; and from the great inclination thereby given to the roadway, nearly the whole of the soldiers who were upon it were precipitated into the river, where a scene of great confusion was exhibited. Such of them as were unhurt got out as well as they could, some by scrambling up the inclined plane which the bridge presented, and others by wading out on the Broughton side; but a number were too much hurt to extricate themselves without assistance, which was immediately rendered by their comrades.

... There is no doubt that the immediate cause was the powerful vibration communicated to the bridge by the measured and uniform step of the soldiers. If the same, or a much larger number of persons had passed over in a crowd, and without observing any regular step, in all probability the accident would not have happened, because the tread of one person would have counteracted the vibration arising from that of another. But the soldiers all stepping at the same time, and at regular intervals, communicated, as we mentioned in describing the accident, a powerful vibration to the bridge, which went on increasing with every successive step; and which, causing the weight of the bridge to act with successive jerks on the stay-chains, had a more powerful effect upon them than a dead weight of much larger amount would have had, and at length broke one of the cross-bolts by which the links of the chain are joined together. Perhaps this accident, alarming and injurious as it has been, may have the effect of preventing some more dreadful catastrophe in other quarters.