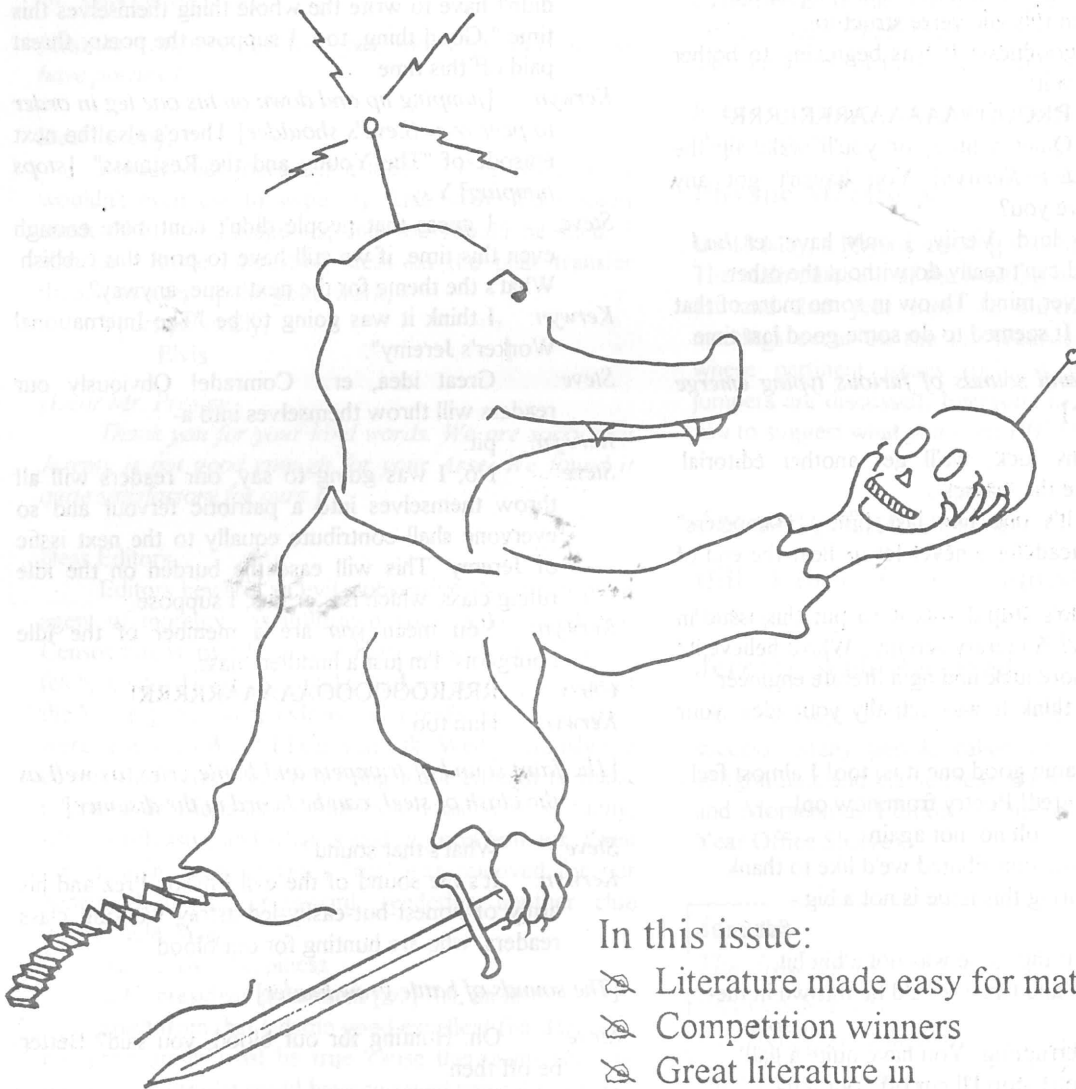


The Jeremy

Literary Supplement

Volume 10, No.2

June 1994



In this issue:

- ✂ Literature made easy for mathematicians
- ✂ Competition winners
- ✂ Great literature in
The Young and the Rest-Mass
- ✂ Physics 4-um
- ✂ Jelly snake dynamics
- ✂ More aliens as the secrets of background
cosmic radiation are revealed.

WARNING: Contains explicit lyrics that some viewers may find offensive

Editorial

[Enter three editors. Steve and Kerwyn are pulling a large cage behind them. Now and then guttural roars and the sound of someone bashing his head against a typewriter emerge from the cage.]

Steve: Methinks we are alone, and have escap'd
Once more the clutches of the evil readers.
Who, wallowing in rambunctious pride,
Would have us honour our deadline.

Kerwyn: Nonsense, master! We must hence!

Steve: So shaken as I am, so wan with care
That it is with no little dread I must rest awile
Amidst this shallow lair, and in so doing
Abandon this vile verse structure.

Kerwyn: Thank goodness! It was beginning to bother
me a little, was it!

Chris: *[from cage]* RROOOAAAAAARRRRRRR!

Steve: Rufus! Quiet a little, or you'll wake up the
lecturer! *[aside to Kerwyn]* You haven't got any
raw meat, have you?

Kerwyn: No, my lord. Verily, I only have...er...had...
two arms, and can't really do without the other.

Steve: Well never mind. Throw in some more of that
typing paper. It seemed to do some good last time.

[Kerwyn does so, and sounds of furious typing emerge from the cage]

Steve: With any luck, we'll get another editorial.
That'll appease the masses.

Kerwyn: Not if it's one like last time. "Hampsters"
indeed! The academics never let us hear the end of
it.

Steve: And who's stupid was it to put this issue in
verse, anyway? A literary Jeremy? Who'd believe it?
You'd have more luck finding a literate engineer.

Kerwyn: I...er... I think it was actually your idea, your
lordship.

Steve: And a damn good one it is, too! I almost feel...
yes! I feel inspired! Poetry from now on!

Kerwyn: *[groans]* oh no, not again....

Steve: Those who contributed we'd like to thank
For ensuring this issue is not a big -

Kerwyn: -failure,

Steve: Besides if this issue was not a big hit,
You, me and Chris would be thrown in the-

Kerwyn: -soup.

Steve: Stop interrupting! You have quite a gall!
If you don't stop I'll cut off your left-

Chris: RRRROOOOAAARRRR!

Kerwyn: Phew, that's a relief.

Chris: *[straining]* RUFUS - WANT - FOOD!

Steve: Now, Rufus, you know the rule. No food
until we have something to print. We editors aren't
made of meat, you know.

[frenzied rattling from within the cage. A few stray sheets of paper float out]

Steve: Good Rufus, good boy! Now we have
something to put in the next issue. Kerwyn, cut
your other arm off.

Kerwyn: What!? I've lost one limb already, and if
there's anyone around here with meat to spare-

Steve: Are you ribbing me about my spares?

Kerwyn: Alle Righte, spare your ribs, then, but next
time it's your turn. *[cuts own left leg off]* I feel
somehow as if I've been defeated.

Steve: Better than being disarmed, I suppose.

Kerwyn: *[feels he has been going out on a limb, and is
anxious to move on]* Anyway, what does the paper
say?

Steve: It says: *[reading]*

"The editors of Jeremy would like to thank
everyone who contributed to this issue, as they
didn't have to write the whole thing themselves this
time." Good thing, too. I suppose the poetry threat
paid off this time.

Kerwyn: *[jumping up and down on his one leg in order
to peer over Steve's shoulder]* There's also the next
episode of "The Young and the Restmass". *[stops
jumping]* Yay.

Steve: I guess that people didn't contribute enough
even this time, if we still have to print this rubbish.
What's the theme for the next issue, anyway?

Kerwyn: I think it was going to be "The International
Worker's Jeremy".

Steve: Great idea, er... Comrade! Obviously our
readers will throw themselves into a-

Kerwyn: pit.

Steve: No, I was going to say, our readers will all
throw themselves into a patriotic fervour and so
everyone shall contribute equally to the next issue
of Jeremy. This will ease the burden on the idle
ruling class, which is...er...us, I suppose.

Kerwyn: You mean *you* are a member of the idle
bourgeois. I'm just a huddled mass.

Chris: RRRROOOOOOAAAAAARRRRR!

Kerwyn: Him too.

*[The faint sound of trumpets and battle cries, as well as
the clash of steel, can be heard in the distance]*

Steve: What's that sound?

Kerwyn: It's the sound of the evil Physoc Prez and his
army of honest-but-easily-led-astray working class
readers, who are hunting for our blood.

[The sounds of battle grow louder]

Steve: Oh. Hunting for our blood, you said? Better
be off then.

Kerwyn: Thought I could smell something.

[exeunt]



Correspondence

Dear Eds,

Congratulations on a most exciting and intriguing issue. It really brightened up the lecture in which I understood nothing. I don't understand much since it has been claimed that I have blond roots. I am only writing this so I can get published in this magnificent tabloid. Keep it UP.

Love,

ARCH.III

PS. CAN I SUBSCRIBE?

[Thanks , ARCH III, we love you, too. Especially if you have parties.]

Dear Jeremy,

I think your journal is a load of s**t [sic], that I wouldn't even use to wipe my Arse with; Your jokes about Elvis are outrageous, and you should be sued. I also have some interesting ideas on the phat transfer theory, so keep up the good work,

Yours.pelvically,

Elvis

[Dear Mr. Presley,

Thank you for your kind words. We are sorry that Jeremy is not good enough for your Arse. We found it quite satisfactory for ours.]

Dear Editors,

Editors beware, an evil, subversive, Nileist inspired agent of morality has infiltrated your ranks as editors. Censorship is rife!!! All the butt, fuck, crap, sodomy, felch, falatio [sic], necrophilia and even the joke about the VC, a gerbil, some nylons and a really speedy laxative were removed! Why? I hear you ask. Well obviously the editors don't credit us with being adult enough to make informed decisions as to what is serious, what is funny, what is offensive and what is said in good humour. Even the most innocent of verbs "rut" was removed for our benefit, from the crossword, rendering another clue inexplicable. Why?

peace, love, happiness

E.U. president encumberit [sic] (ha, ha ha)

apart from that a damn good excellent (hard) job.

p.s. creationism must be true 'cause there's no way the physics department could have survived natural selection.

*[Well, what can we say? Other than to assure you that we do not tolerate the use of obscene words like "Ch*m*stry" or "Bio**gy" in this Journal either.]*

Letters should be short and have the sender's full name and student number / department. Include a pen name you want used if you like, but we won't publish anything unless at least WE know who you are.

Bits and Pieces

Is it Doom for the microlab?

The editors (amongst others) have noticed a large proportion of the microlab processing power seems to be used for the dubious pastime of DOOM.

For those of you not familiar with this game, it involves the graphic slaying of aliens with a variety of explosive weapons (with the exception of the chainsaw). The great attraction is to be able to play it on the network and slay your friends. If this is you please do not change network set up or start up files, use a boot disk, and please vacate the computers for those who want to work.

Jeremy neither supports nor discourages this phenomenon.

Physoc Meetings

On 18 May, a Physoc meeting was held during lunchtime. The main outcome of the meeting was that Physoc needs 1st and 2nd year input to survive. Regular Physoc meetings occur on the 1st Wednesday of every month where pertinent issues such as parties and football jumpers are discussed. Everyone is welcome - We need you to suggest what you want PHYSOC to do for you.

The Committee

Jeremy Exclusive:

Bill Tango is a Chemist by undergraduate training

Jeremy Well Received

The first issue of Jeremy for 1994 met with resounding success. Many people called on the editors both to congratulate and blame them. Back issues of this Historic and Momentous Edition can be obtained from the First Year Office Shelves.

Jeremy

The Journal of the University of Sydney

Physics Society

Published in 4 editions each year

Editors: S. Edney

K. Foo

C. Poulton (Science III)

The opinions expressed in this publication are not necessarily those of Physoc, its executive or the editors of Jeremy.

Jeremy

*S.U. Physics Society
School of Physics A28
University of Sydney*

Short and Sweet: Matt's president's report

Welcome to yet another fun packed issue of this most captivating of Journals. (ie., it should keep you entertained slightly longer than the place mats at Pizza Hut)

Since the last issue the Annual General Meeting has been held, in which the following office bearers were elected:

President and Party organiser	Matt Sheumack
Vice President	Daniel Burn
Treasurer [#]	Tanya Hill
Secretary	Greg Stevens
Jeremy Editors	Steve ('Big') Edney ☺ Kerwyn ('Medium') Foo ☹ Chris ('Skinny') Poulton ☺
Advertising	Bryan Gaensler Geoff Facer
Talks organiser	Tanya Feletto
Committee	Graham Carey Brendan Yerson Kalvis Duchmantor Tara Kelly David Huone
Physoc mascot	Doug Craigie

[Apologies to anyone whose name is spelled wrong. Handwriting is difficult to read. MATT! - ☹]

The outgoing president did appear at the meeting, but nobody is really sure why. [getting a bit personal there... is there some history here that you'd like to share with the world, Matt? - ☹]

Another achievement at our AGM was the incitement of a Physoc Rugby Jumper, the design (etc.) of which appears [maybe, we don't know yet] elsewhere in this Journal.

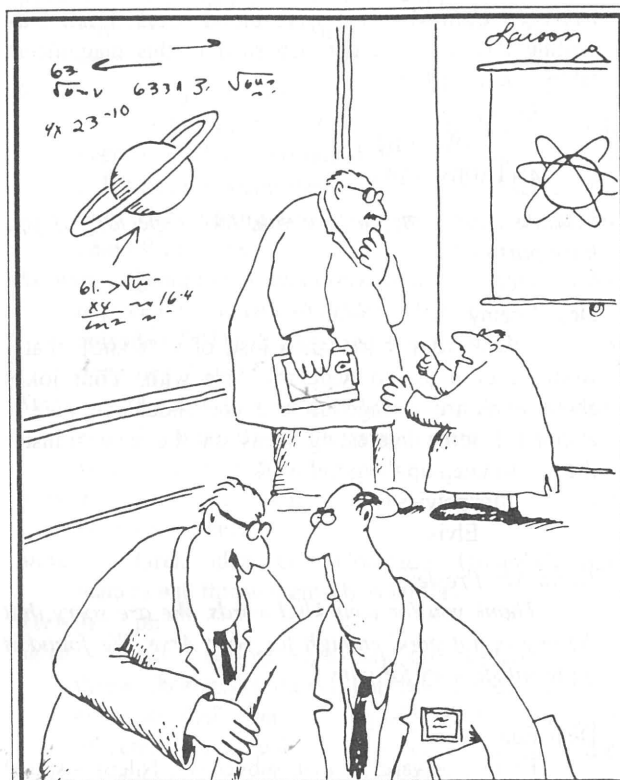
Finally, the word which will be on many peoples minds as they are reading this: EXAMS! (if it wasn't on your mind, it is now. Try sitting still for three minutes and not thinking of exams) [It still seems that being president does not imply one's competence in grammar - ☹] Anyway, all the best of luck

[#] actually recorded as "treasure" in the minutes... strange as Tanya herself was taking them

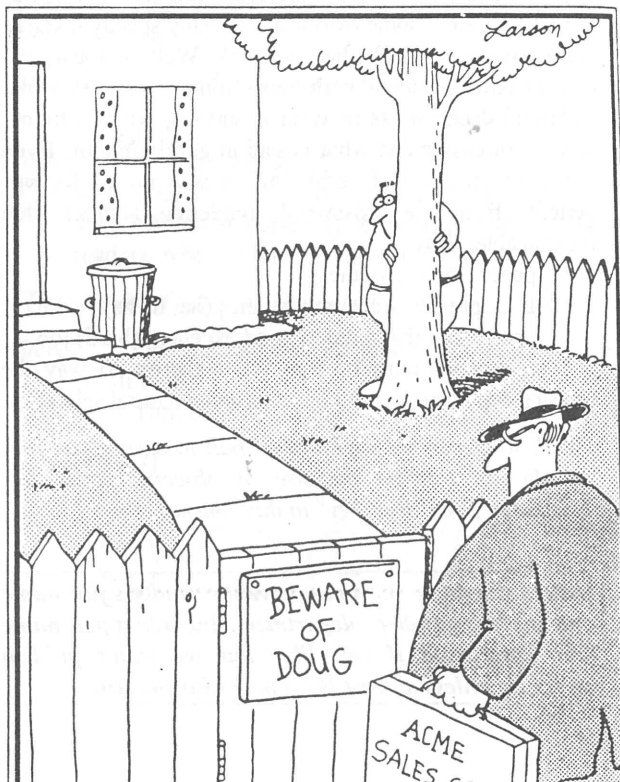
(we'll need it) and in the words of that tall skinny guy with the pratty voice:

"May you all do well, but not as well as me."

Matt



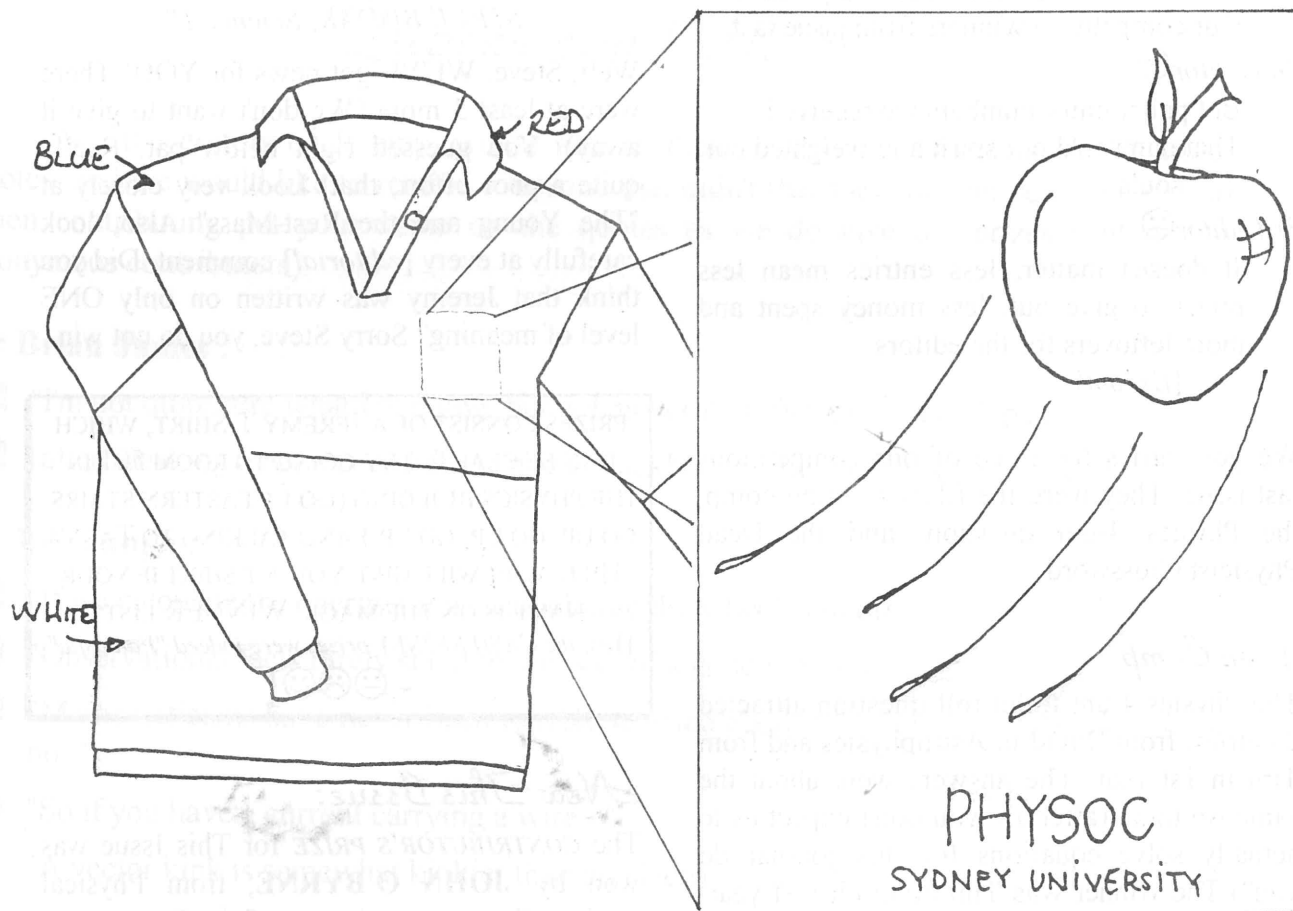
"There goes Williams again... trying to win support for his Little Bang theory."



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or

Elizabeth Hing

in Room 501 of the Physics Building
(Go upstairs from LT 1). or e-mail
"thill@physics.su.oz.au"

in the First Year Office.

HURRY! HURRY! HURRY!

"More Jeremy Competitions..."

[Three editors enter]

1st editor☺:

Congratulate we with lauds and plaudits,
Our competition winners from issue last.

2nd editor☺:

But paltry entry numbers we received,
That dampen'd our spirit and weighted our
souls.

3rd editor☺:

It doesn't matter, less entries mean less
prizes to give out, less money spent and
more leftovers for the editors.

[Exeunt]

We got entries for three of our competitions last issue. They were the Elvis spotting comp, the Physics 4-um question, and the Dead Physicist Crossword.

4-um Comp

The Physics 4-um toilet roll question attracted 2 entries: from David in Astrophysics and from Tim in 1st year. The answers were about the same we think (after all, you don't expect us to actually solve equations for this journal do you?) The winner was Tim Schmidt (1st year) for his mercifully short answer.

Dead Physicist X-Word

We had only ONE ENTRY in the Dead Physicist X-Word. The entry was from Erik in Astronomy, who got all but one answer. See elsewhere for the solution. Erik wins.

Spot the Elvis

We got ONE, YES ONLY ONE entry in the "Spot the Elvis" Comp. He wrote a nice letter:

*"Elvis appears on: [...blah blah blah...]
All up Elvis appears 10 times in the first issue of Jeremy for 1994 - Really quite a poor effort that. We have to raise the standard of Elvis use in future issues of Jeremy. At least 20*

occurrences of Elvis per issue, or else this is one reader you will immediately lose!

Ah Thang You!

STEVE BUDAK, Science 1"

Well, Steve, WE'VE got news for YOU! There were at least 5 more (We don't want to give it away). You guessed right below par. Really quite a poor effort, that! Look very closely at "The Young and the Rest-Mass" Also, look carefully at every [editorial] comment. Did you think that Jeremy was written on only ONE level of meaning? Sorry Steve, you do not win.

PRIZES CONSIST OF A JEREMY T SHIRT, WHICH CAN BE CLAIMED BY GOING TO ROOM 501 IN THE PHYSICS BUILDING (GO UP EASTERN STAIRS, GO UP, GO UP, GO UP.) AND TALKING TO TANYA HILL, WHO WILL GIVE YOU A T SHIRT IF YOUR NAME IS ON THE MAGIC WINNER LIST.

[Yes, the CASH MONEY prizes were indeed "Fantastic"]

- ☹☹☹☹

New This Issue:

The CONTRIBUTOR'S PRIZE for This Issue was won by: **JOHN O'BYRNE**, from Physical Optics. Claim your prize now from Tanya.

New Competitions for this issue are:

📖 PLOT PREDICTION for "The Young and the Rest Mass"

📖 Physics 4-um, judged by Sue.

📖 Best Original Artwork submitted to Jeremy (can you do a better cover picture for us)

And of course there is next issue's CONTRIBUTOR'S COMPETITION.

The next issue of Jeremy has a **5 August** deadline, and will be **The Jeremy International Worker**. Of course, we still want serious articles. We can't write them, so please give us some.

Once Again it's the.....

Jeremy

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Quotes competition

We the editors of Jeremy, would like to thank every one who contributed these quotes, and we would like to remind everyone that didn't that they too can contribute. Also when contributing put your name on the quotes as we do give out prizes (but not to anonymous contributors).

Dr Brian James :

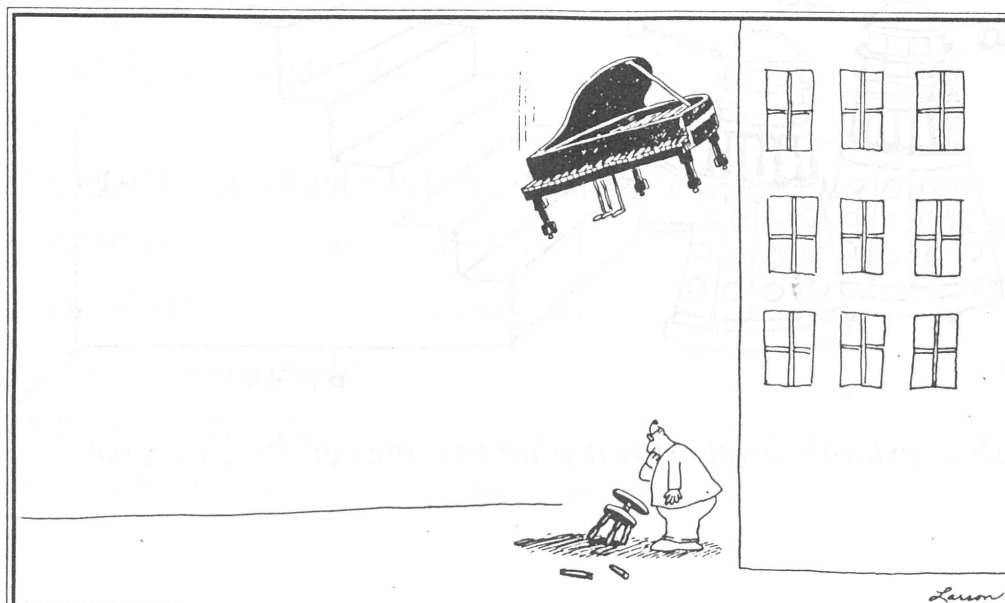
- 📖 "I'm not quite sure what I'm doing, but whatever it is it's wavelength dependant"
- 📖 (after breaking a pointer and damaging a blackboard) "Let's destroy the evidence..."

Dr Bill Tango :

- 📖 "If we calculate the energy for a point charge the wheels fall off."
- 📖 "Observational facts rarely stand in the way of a good theoretician."
- 📖 "Mathematicians have never been terribly worried about whether things are possible or not."
- 📖 "So if you have a current carrying a wire..."
- 📖 "A vector kink is somewhat kinkier than an electric field."

Dr Brian McInnes :

- 📖 "It would be a good idea if I thought sometimes before I said things."



And the quotes continue....

Prof Dick Collins :

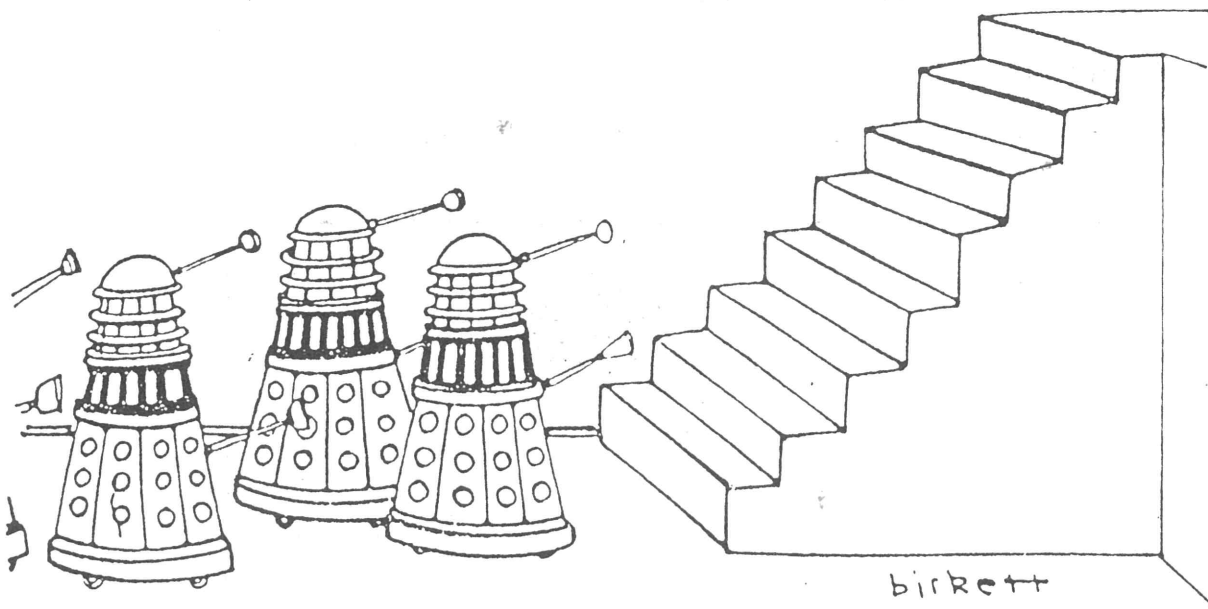
- 📖 "Swedes like digging holes in granite, they've been at it for 2000 years."
- 📖 "Like all D.E.'s you can't solve it unless you know the answer."
- 📖 "...and it beats the pants off everything, to say it more scientifically."

Dr Charlie Macaskill : (Applied Maths)

- 📖 "Don't think... thinking will get you into trouble!"
- 📖 "I would guess that most of you are here because you can't do titrations."
- 📖 "This shape goes zap, zap, zap, zap, zap..."
- 📖 "There's only one answer to any Applied maths question, it is usually Taylor's series."

Dr David Galloway : (Applied Maths)

- 📖 "Most books do this to death. This book does it to death but in a way that's easy to follow."
- 📖 "Don't mind me, I'm just here to lecture to you."
- 📖 "This constant is constant..."



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

Are **YOU** a mathematician with poor language skills?

Always desired but been unable to understand great literature and poetry?

Perhaps you need Crispy's all-new

The world's great literature (made easy for mathematicians)

Here are some examples..

Hamlet, Prince of Denmark. by William Shakespeare.

Let $y = (b+b) \vee \neg(b+b)$, $y \in \{\text{unanswered postulates}\}$

Furthermore, $y \equiv N(a) > N(b)$, where $N: \text{Actions} \rightarrow \text{Results}$ is Nobleness(mind)

Here $a \equiv$ to be an inverse function of $(S \cup A)$ where $s \in S$ is a sling and $p \in A$ is an arrow.

Also, $b \sim$ performing the integral:

$$\int_{\text{sea}} \underline{A} \cdot t \, dt$$

where $\underline{A}$ = arms operator

t = a trouble in regions dt

Note that the result of the action on $\underline{A}$ on the dynamic variable t causes t to vanish everywhere.

The Holy Bible (King James Edition)

Genesis 1: 1-5

Define **God** to be the god operator.

then, **God**(x) $\equiv$ "and God x "

Case $n = 0$;

God $\times$ (Heaven $\wedge$ Earth) such that (form) $\notin \{\text{Earth}\}$ and Earth = ϕ

and $\frac{\text{darkness}}{\text{face(deep)}} \wedge \frac{\text{spirit(God,t)}}{\text{face(water)}}$

God(said) " $\exists$ light" $\Rightarrow \exists$ light.

God(saw) ($\text{light} \in \{\text{Good}\}$)

Furthermore, **God** $\times$ (light,darkness) = light $\div$ darkness.

Lemma: God: Define 1. light $\equiv$ day.
2. darkness $\equiv$ night.

Luke 3: 23-38.

Note that $\exists$ Jesus (such that age = 30) $\subseteq$ Joseph $\subseteq$ Heli $\subseteq$ Matthat $\subseteq$ Levi $\subseteq$ Melchi $\subseteq$... $\subseteq$ Menan $\subseteq$ Mathata $\subseteq$ Nathan $\subseteq$ David $\subseteq$ Jesse $\subseteq$... $\subseteq$ Jacob $\subseteq$ Isaac $\subseteq$ Abraham $\subseteq$... $\subseteq$ Seth $\subseteq$ Adam $\subseteq$ God

Also Look out for more titles in this series...

Dickens, Charles " $\exists$ time s.t. time = sup(time) $\wedge$ inf(time)"

Coleridge, Samuel Taylor "... $\forall$ space $\exists$ water s.t.
board($t+\delta$) < board(t),
 $\forall$ space $\exists$ water s.t.
water $\notin$ {drinkable}"

and who could forget Rudyard Kipling's famous poem " $\Rightarrow$ "

Physics and Poetry

Although we may joke about Great Literature reduced to mathematics, there *are* examples of poetry coming from great Physics. In perhaps the only serious article written by the editors, I'd like to show that Physics isn't just a bunch of equations scratched out on paper by insensitive and isolated scientists.

Firstly, here is a poem, in Vietnamese, and its translation:

Con họa bức tranh chân trời tím
Rồi bước vào ngất những vì sao
Vân vờ với ánh nắng lụa đào
Đã quên mất đường về quê mẹ.

*I depicted a purple horizon
And got lost in it, picking twinkling stars
Flying with pink silk-like light
So I have forgotten my way home, far...*

Duong Phan, 1991.

This poem is about General Relativity. The "purple horizon" is space-time, big enough to get lost in, where the twinkling stars are. These stars exert gravitational force, which bend light around them (enabling the detection of planets). This is the meaning of "silk-like light", where light, like silk, can be bent around massive objects.

So, poetry and literature are not so far removed from physics, so maybe a Literary Jeremy is not so far fetched as it may seem.

Kerwyn Foo.

Dud Theories

On the Origin of the Cosmic Microwave Background Radiation and an Estimate of the Number of Technological Civilisations in the Universe

David Mar and Ariane Hemming

It has been known for some years now that the Earth is constantly receiving microwave radiation from all parts of the sky¹, at a characteristic black body temperature of $T = 2.7$ K. The most commonly accepted theory on the origin of this radiation is that it is a relic of the Big Bang. However, we postulate an even simpler explanation, which then allows us to make an empirically based estimate of the number of technologically advanced alien civilisations in the universe.

If we ask the question "Where does microwave radiation come from?", the obvious answer appears: Microwave ovens. Then, taking the observed temperature of the microwave background, we can deduce the number of microwave ovens in the observable universe, and hence the number of civilisations which have advanced to a technological level high enough to permit the invention and use of such devices.

Taking the Boltzmann relationship²,

$$E = \frac{3}{2} k T, \quad (1)$$

and substituting $T = 2.7$ K and the Boltzmann constant $k = 1.38 \times 10^{-23}$ J K⁻¹, we determine that the energy of the microwave background incident on the Earth is 5.59×10^{-23} J. Since this value only represents the microwave energy incident on the Earth³, we must scale it upwards by the ratio of the volumes of the observable universe and the Earth:

$$E_{\text{universe}} = 5.59 \times 10^{-23} \frac{\frac{4}{3} \pi R_U^3}{\frac{4}{3} \pi R_{\oplus}^3}, \quad (2)$$

where R_U is the radius of the observable universe and $R_{\oplus} = 6.37 \times 10^6$ m is the radius of the Earth. Measurements by astronomers indicate that the universe is currently 1.5×10^{10} years old, so $R_U = 1.5 \times 10^{10}$ light years, or 1.42×10^{26} m. So

$$\frac{R_U^3}{R_{\oplus}^3} = 1.11 \times 10^{58} \quad (3)$$

and $E_{\text{universe}} = 6.18 \times 10^{35}$ J.

¹Penzias and Wilson, 1965.

²Boltzmann, before he committed suicide.

³This is a gratuitous footnote

Now, the average energy produced by a single microwave oven⁴ is the product of the average power and the average cooking time, divided by a geometric factor of π^2 to account for the energy being spread in three dimensions:

$$E_{oven} = \frac{P_{oven} t_{cook}}{\pi^2}. \quad (4)$$

A typical microwave oven power⁵ is $P_{oven} = 700$ W, and the average microwave cooking time is $t = 360$ s (or six minutes), giving $E_{oven} = 2.55 \times 10^4$ J.

Dividing these two energies, we discover that the number of microwave ovens in the observable universe is

$$N_{oven} = E_{universe} / E_{oven} = 2.42 \times 10^{31}. \quad (5)$$

Now, the number of microwave ovens per technological civilisation can be calculated by multiplying the average population of a civilisation P_{av} by the fraction of the population which own such an oven F_O , also known as the oven factor. We know $P_{av} = 4 \times 10^9$ by averaging over all known technological civilisations⁶. The oven factor is harder to determine, but here we take the value to be 1%, a not unreasonable value. The number of ovens per civilisation is then 4×10^7 and therefore the number of technological civilisations in the universe is

$$N = N_{oven} / (4 \times 10^7) = 6.05 \times 10^{23}. \quad (6)$$

We therefore see that, to within the limits of accuracy of this calculation, there is one mole (6.02×10^{23}) of technological alien civilisations in the observable universe⁷! Dividing this number into the available volume, we discover that the average separation of civilisations is ~ 286 light years, and there should be $\sim 9 \times 10^8$ alien civilisations within our own Galaxy.

It is interesting to compare the full equation

$$N = \frac{3 \pi^2 k T R_U^3}{2 F_O P_{av} P_{oven} t_{cook} R_\oplus^3} \quad (7)$$

with the famous Drake equation⁸, much beloved of Carl Sagan:

$$N = N_* f_p n_e f_l f_i f_c f_L, \quad (8)$$

where N_* is the number of stars⁹, f_p is the fraction with planetary systems, n_e is the number of Earth-like planets per system, f_l is the fraction of those with life, f_i is the fraction of intelligent life, f_c is the fraction which develop a civilisation capable of using microwave ovens, and f_L is the fraction of the planet's lifetime for which the civilisation survives. There are six terms in the Drake equation which are unknown and unobservable at the current time, whereas in our equation *every* parameter is empirically determinable¹⁰. In fact, the largest single uncertainty rests with the oven factor, which we have taken to be 1%. Future observations will refine this figure, and so allow us to determine the number of alien civilisations with increasing accuracy.

⁴In microwaves only, i.e. neglecting any relativistically accelerated particles. Such particles do, of course, constitute the bulk of the cosmic ray flux in the universe, but we are not concerned with that here.

⁵Yes, most microwaves are more powerful than this, but often the oven is used on a low power setting. The stated power is an ensemble average. See any text on advanced thermodynamics (from the Greek, *thermos*, meaning oven, and *dynamis*, meaning rotisserie) for a full treatment of ensemble averages

⁶i.e. P_{av} is the human population of the Earth.

⁷Wow!

⁸First used by Sir Francis Drake to estimate the number of civilisations in the New World during the great age of European colonisation, and not by the astronomer Frank Drake as is commonly believed.

⁹"Billions and billions."

¹⁰More or less.

Relativistic Jelly Snake

Dynamics

Original concept by author(s) anonymous.

It has been noted by Anonymous et al. that Jelly snakes (such as may be commonly bought from any lolly store) exhibit dilations similar to that seen on object travelling at near light velocities.

A jelly snake may be stretched so that it's length is extended. This may be done by :

- 1) Pulling hard on either end.
- 2) Pulling really hard, really quickly on one end.
- 3) Holding one end and spinning it really fast.

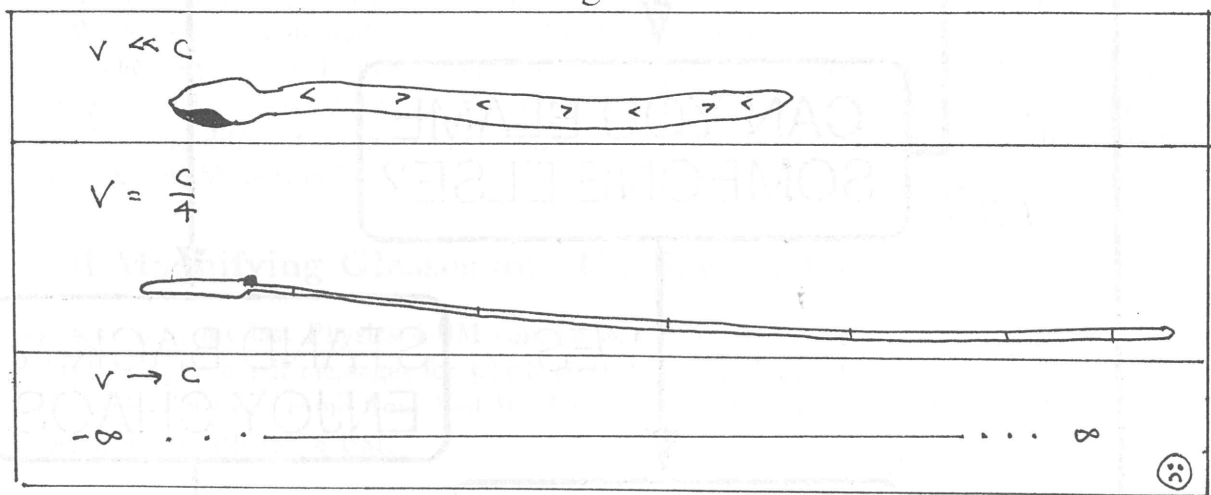
In the first two cases normal dilations can be seen, and it is easy to demonstrate qualitatively many of the relativistic properties that occur, without going into the domain of near light velocities by using these methods.

However it is only the third of these methods in which true Relativistic Jelly Snake Dynamics occur. It is noticed that at low velocities the snake's length is virtually unchanged however as velocities are increased the snake become thinner and longer. There is only one possible explanation for this. Relativity! These effects are drawn in fig 1. below.

In a short article such as this it is impossible to expound fully our complete theory, and so it is possible to mention only one interesting result. This is known as the Dirac Jelly snake effect where the length goes to infinity, the width goes to zero, but the total volume (and sugar content) remains constant. It is now realised that Dirac had jelly snakes in mind when he originally thought of his delta function.

I will not go further but hasten to add that it is unfortunate that the original author could not have developed his ideas further, to probe the deep and puzzling problems that still remain in this great and most interesting area of science.

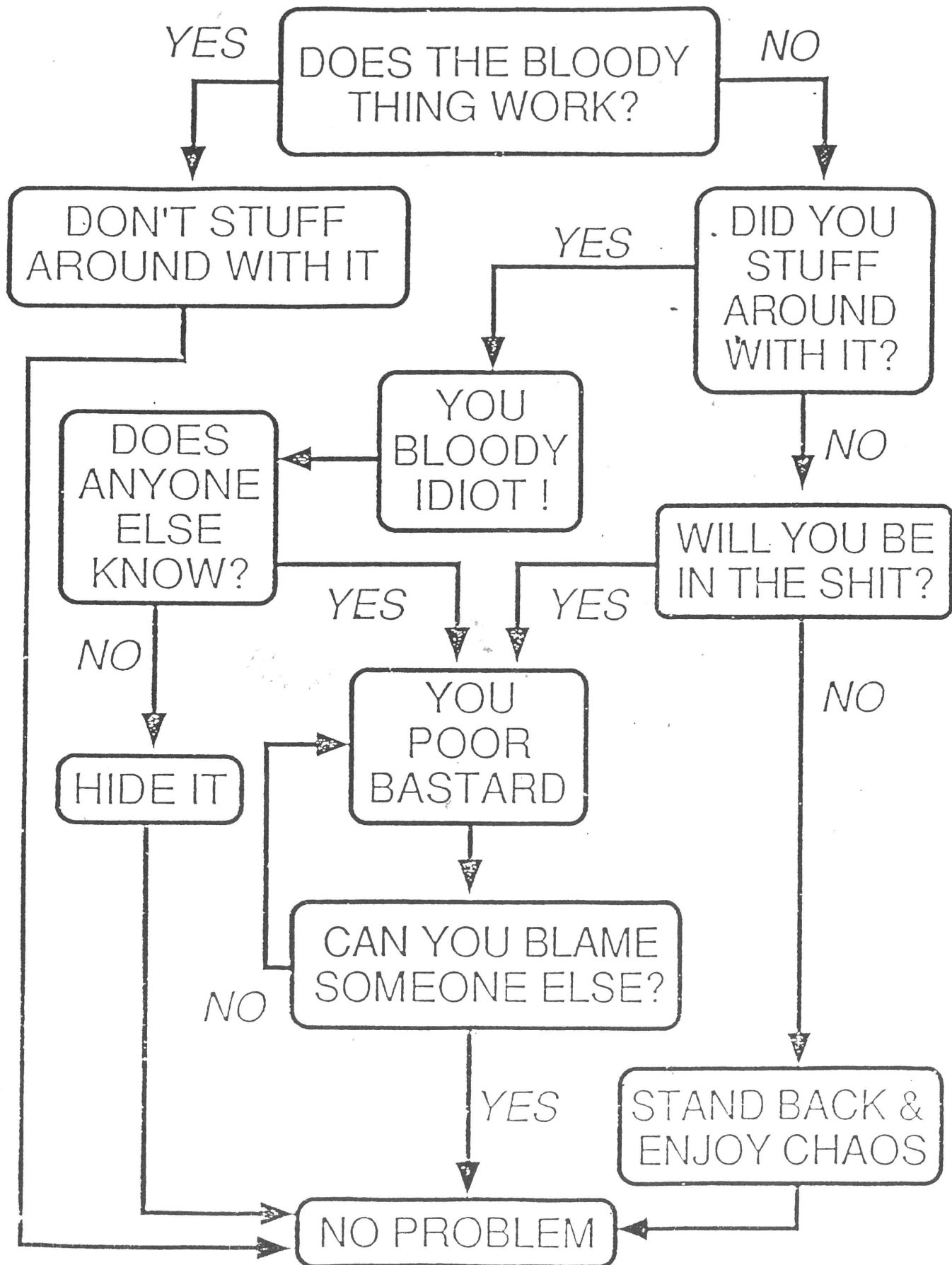
Fig 1.



Reference : Allen, Cadbury, et.al.

from original sketches by author(s) unknown.

Problem Solving Flowchart



Physics 4-um

Welcome Back To Sue B.

We're glad to hand over this job to her much more capable hands.

Physics Forum

Sue Byleveld

After a brief foray into a rather different style of Physics 4-UM questions, I'm back with the good old fashioned column that you all have grown to love so much. Specially brought to you to add just that little extra entertainment to a second year optics lecture! In fact, no matter what year you are in Physics 4-UM will have you puzzling over questions your lecturers are very unlikely to raise.

For those of you who joined our illustrious School of Physics this year and haven't seen much of Physics 4-UM in action, this is your chance to ask all about those strange and bizarre effects you notice in your everyday life. (No, **not** the ones you see after drinking too much cider at a Physoc party.)

Some of you may just remember back to the last issue of Jeremy last year. In that issue I presented two puzzles in the 4-UM. One, dare I say it, was sent to me by a Chemistry student! Yes, these are the lengths we have to go to to find material for Jeremy. But, after all this effort it appears that this mystery is doomed to remain unsolved. I haven't received a single idea about this one. Were you all so stunned that a Chemist was asking Physics questions that you simply couldn't bring yourself to write the answer down? Never fear, by now I am sure you have all recovered and can now sit down and comfortably contemplate the springs and acid and odd things in the question. For those of you who have forgotten or weren't around here's what our friendly Chemist was puzzling over.

Springs and Things Revisited

"Imagine I take a spring which I proceed to compress thus storing a certain amount of potential energy within the spring. While the spring is compressed I set it in some material which maintains the compression e.g. concrete or wax. The ends of the spring remain still exposed. I now immerse the entire system in a large beaker of 10M Hydrochloric acid until the spring is entirely dissolved. Now remembering that energy cannot be created or destroyed - Where has the potential energy stored in the spring gone?

The only answer I have is that the energy goes into increased heat when the spring is dissolved i.e. dissolving two springs of the same mass in the same amount of acid will give a measurably different temperature change if one of the springs is compressed. However I am not sure if this is true."

Of Magnifying Glasses and the Second Law

As soon as my last Physics 4-UM column was published in Jeremy I received one of those truly cryptic email messages for which certain postgraduate students within the school are famous. This one came from Neil Broderick and claimed to explain the problem posed by Alan Roy in Physics 4-UM.

So what was the solution? Was the 2nd law of thermodynamics violated or even valid at all? Would we all come back to our desks tomorrow to find them impeccably tidy and the universe in an incredible state of order? Well I don't know about you, but my desk was as chaotic as ever. The solution was obvious, well to Neil at least ("I deny it"). He explained:

"The solution to Alan's problem is quite simple. The lens he describes cannot exist due to the Kramers-Kronig relations."

Now I thought that sort of thing was illegal, at least in Tasmania. Some of you will be wondering at this point what on earth was the question that this was the answer to. For those of you who are, I'll recap the question:

"Take two black body radiators. Let the hole in one cavity have twice the area of that in the other, and point the two holes at each other through a magnifying glass. Let the two cavities come to equilibrium, at which time the power radiated from the area $2A$ of one cavity into the other cavity equals the power radiated from the area A of the other cavity back into the first. This means that although the cavities are at equilibrium, each radiates a different amount of power per unit area, so they are at different temperatures, which violates the second law of thermodynamics."

With a bit of gentle persuasion, Neil explained why these Kramers-Kronig relations made the lens in the question impossible.

"K-K says that the absorptive (which describes how the light levels diminish because the lens absorbs some light) and dispersive (which determines the speed at which the light travels in the lens) parts of the refractive index are linked. I suspect the only material with zero absorption and constant refractive index is the vacuum."

So, this is not really a paradox after all. We can't have a system like this because our friendly magnifying glass would absorb some of the light and change the whole set up. For his efforts Neil wins free entry to the next Physoc party!

And now, for something a bit closer to our own everyday experiences here are some questions from one of our resident Physoc forth year students and general fun person, Bryan Gaensler:

Recycling and Slamming Doors

If you hear the sound of doors being slammed around the Physics building it has nothing to do with Bryan's frustrations with Physics IV, he's simply doing some experiments. Here's his question:

"When the window is open, why is it easier to shut the door (even on a still day)?"

And here's another question from Bryan. This time on the Physics of recycling:

"Before recycling milk cartons and soft drink bottles, they must be filled up with water

and washed out to remove anything that might attract insects. When emptying milk cartons, which have a spout, down the sink, the water flows out smoothly. However, when emptying a soft drink bottle, which has a circular neck, the water "hiccups" as it comes out.

Why?"

I hope you enjoyed Physics Forum in this issue of *Jeremy*. Please write to me via the Physoc Mailbox, and remember I'm not just looking for answers, but also new questions. I look forward to hearing from you. Don't forget those prizes! Happy puzzling!

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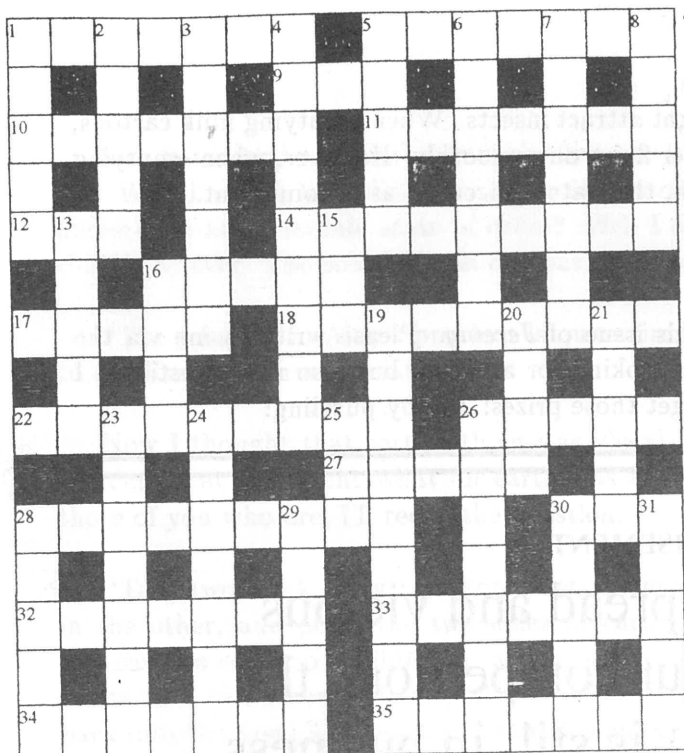
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The Cryptic Crossword

Across

1. and 5. SETTLER. (7,7)
5. see 1.
9. We hear that drink leads to illness. (3)
10. Ram a nag (7)"
11. Enduring one bad gin. (7)
12. Such self esteem in Lord George Gordon. (3)
14. No tea or I owe you make you infamous. (9)
16. Oriental dish confuses Pauli. (5)
17. Safe refuge but not quite heaven. (5)
18. Drunk Prime Minister in plaits shows no loyalty. (9)
22. Governs tyrannically over operation "newspapers". (9)
26. Territory or performer? (5)
27. Us non commissioned lose nothing on horse says girl. (5)
28. Scrambles to sanctify around a crustacean. (9)
30. Volcano blowing its top back to bug. (3)
32. Commanded they be arranged (7)
33. Disregarded the errant negroid. (7)
34. Worms hide around eastern standard time. (7)
35. Imbeds fractured steel between two poles. (7)

$$\frac{U}{R} = \frac{E_{rest}}{c^2}$$

The Young and the Rest-mass

(A Soap Opera of space-filling proportions)

The editors of Jeremy regret to inform our readers that due to circumstances beyond our control (lack of contributions), we have been forced to continue *The Young and the Rest-mass*. If this unfortunate state of affairs continues, Steve ☺ will write the next episode.

You have been warned!

Episode 2: The Beast Within

Seated at the consoles which control the Big Universal Radio Photometer, our three heroes watch with mixed fascination and awe as a string of numbers pour across their screens.

"It's another message!" yelled Spark.

"Quick!" cried Dr Criterion, "Feed it into Di's Synchronised To Outer-space Message Analyser (or Cryptic Homogeniser) and we'll soon have the BURP output!"

Di and Spark leapt to their consoles and soon a long ribbon of paper emerged from the control panel. Before they could read it, however, the tall and magnificently shoulder-padded figure of Professor Aliena Masque entered the room and bore down on them.

"What do you think you're doing, Vergence?" said Aliena, her eyes flashing. "We are meant to be looking for Extra-terrestrial Life Visible In Sky, not fooling around with some crusty old has-been" she glared at Criterion, "and his no-hoper student!" She menaced at Spark.

"Calm down, please Aliena" said Dr Criterion, "I'm confident that these results will conclusively show the existence of Extra-terr-"

"They show nothing of the sort!" retorted Aliena, snatching the readout from Spark's hands.

At this point, a small mousy figure entered the control room. She is Aliena's laboratory assistant, Elizabeth L. Function. Ms Function wears her glasses in the type of unassuming way that means that she will blossom at some point later in the series into a smouldering love interest.

"Professor Masque, you're wanted on the phone." she said.

Aliena snarled and dropped the BURP output. Her extremely long and pointy stiletto heels tore at the paper as she stalked out.

"Thanks, Beth." sighed Spark, looking soulfully at the newcomer.

"Er, yes and what does the message say, anyway?" asked Di Vergence briskly.

"It says 'LLAU OYYORT SEDL'LIW DN AEDAV NIOT T' OUB A ERA EW' sorry Di, nothing new there." replied Dr Criterion. "Perhaps you and I could-"

"Perhaps you'd like to take a stroll around the Photometer, Beth." said Spark, gazing at the bemused and bespectacled Ms Function.

"Yes, I think I'll come too." interjected Di, quickly. "The photometer is so beautiful at night."

Spark and Beth leave, with Di following between them. Left in the room is Dr Ray Criterion, who begins to scribble furiously on the blackboard, thrusting up equations with such furious energy that his long stubby piece of chalk brakes with a shriek.

Meanwhile, Spark Station, Di Vergence, and Beth L. Function were walking in the darkness around the photometer.

"The stars are so beautiful." said Beth.

"They are, aren't they." replied Spark.

"I can't help but feel nervous." said Di, awkwardly. "What's that strange light in the sky?"

"It's not important." insisted Spark, gazing at Beth.

"It's getting closer!" exclaimed Di.

"She's right!" cried Beth, "It seems to be hovering right over us!"

There was a prolonged flash of blinding light, in which all three of them are obscured. When the light was gone, Only Spark and Di remained.

"What was that light?" asked Spark.

"Probably just ball lightning. Where's Beth?" replied Di.

"I expect she just sensed that we wanted to be alone." responded Spark. "Anyway, that's not important."

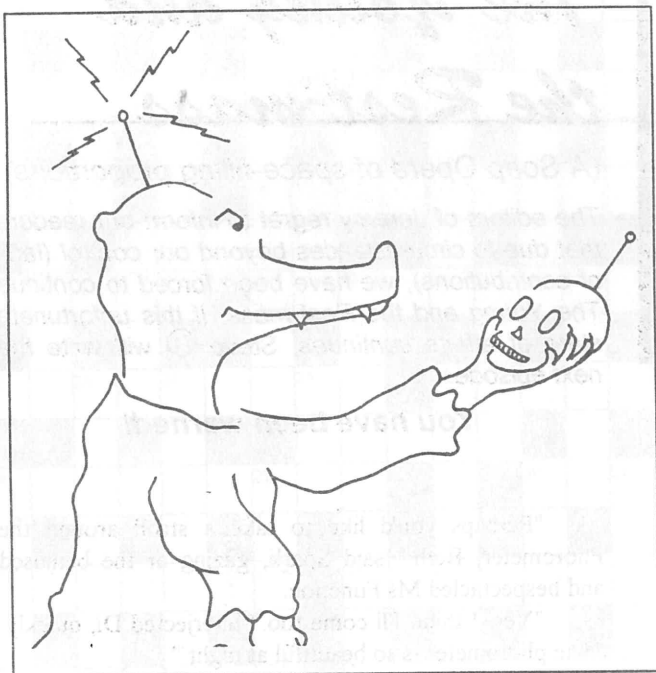
"Isn't it?" asked Di, her eyes clouding over.

"Di, I have something very important to tell you." said Spark, manfully.

"Yes, Spark?", Di responded, her eyelids fluttering.

"Di, I... I..."

What bizarre confession will Spark make to Di? What has happened to Beth? Does anybody care? I don't - Steve will be writing the next episode. Anyway, tune in next issue and hear Dr Ray ask Di "Want to come up to the roof and check out my 18-inch..... telescope?"



The Jeremy Back Page

Next Issue
Deadline:

5 August

*This issue of Jeremy was brought to you by the
Cauchy Sequences (x_n) and (y_n) and by the
generalised coordinate $\mathcal{Q}_4$*

Thanks:

- ✗ All of our contributors, named and anonymous
- ✗ Nick for industriously raytracing another crossword
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- ✗ Satan for giving us extra funds in return for our souls
- ✗ Creationists for giving us lots of laughs

No thanks:

- ✗ All of our non-contributors (all anonymous cowards!)
- ✗ God, for punishing our sinful ways
- ✗ The E.U., for obvious reasons

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