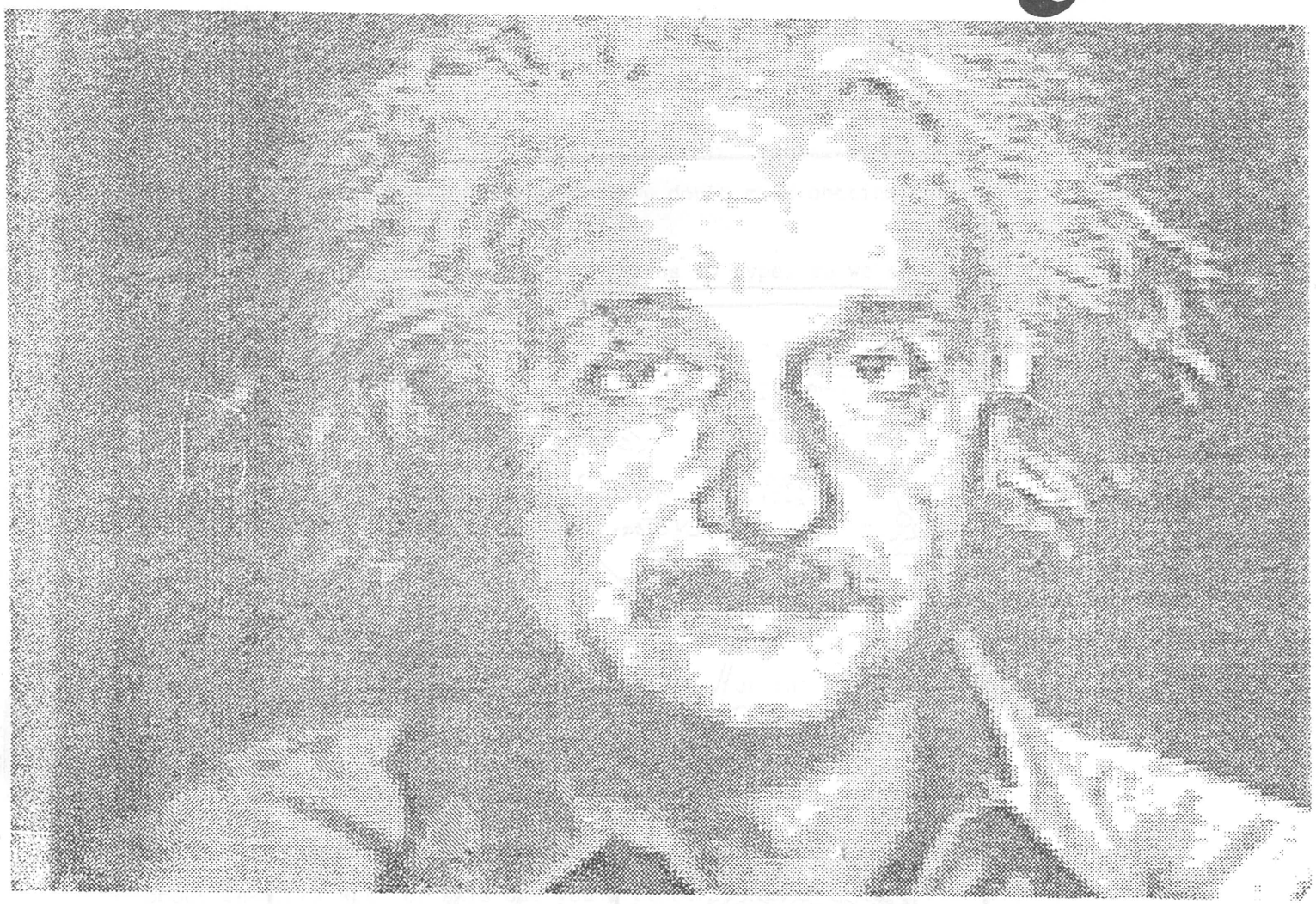
The Official Journal of The University of Sydney Physics Society

Jeremy



Albert Einstein, when asked to describe radio, replied: "You see, wire telegraph is a kind of a very, very long cat. You pull his tail in New York and his head is meowing in Los Angeles. Do you understand this? And radio operates exactly the same way: you send signals here, they receive them there. The only difference is that there is no cat."

Editorial

Welcome to the second edition of Jeremy for the year. The production of this journal seems to be a rather random and chaotic process, but after much fuss, here we have it. There is nothing of a serious nature in this issue, exactly the way it should be, so enjoy. Keep those quotes coming in, the KitKat competition is still running, and with any luck, there should be another two issues before the end of the year (or else the Physoc president will kill me.)

Mick Pope
(Editor and maniac Phd student.)

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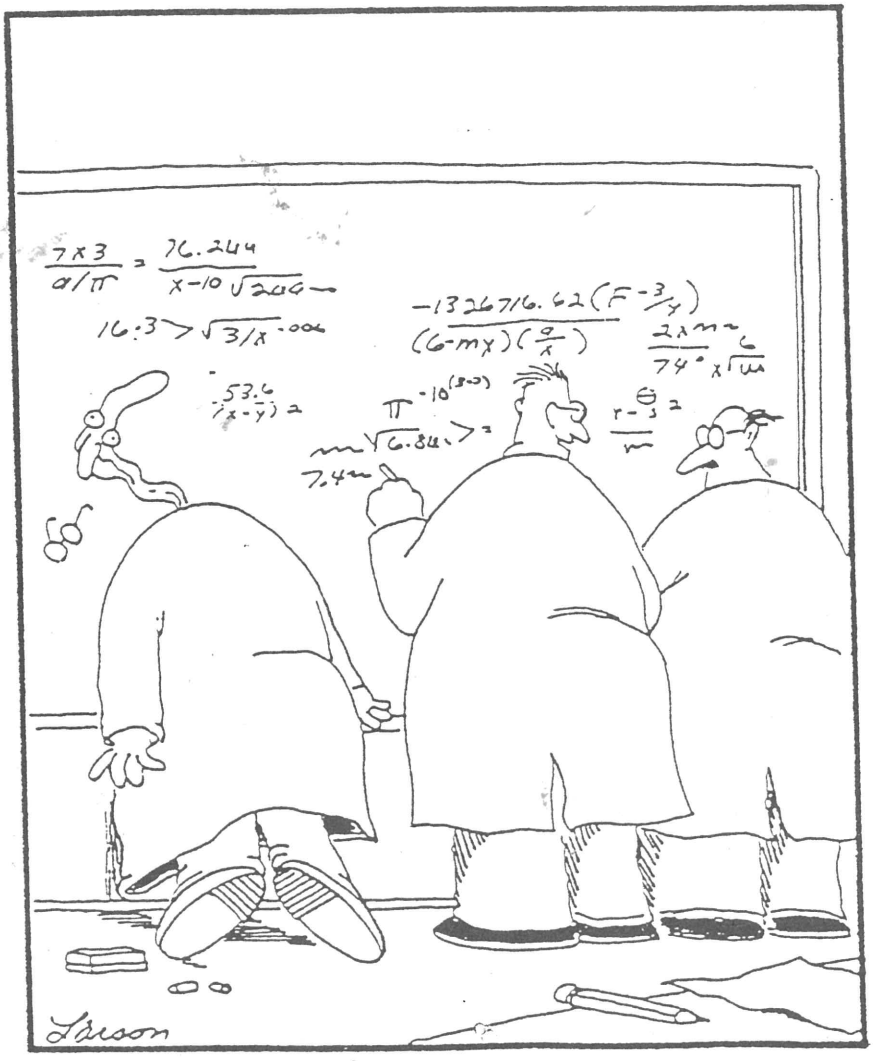


"Ha! Mick's blown his cerebral cortex."

The KitKat Quotes Competition

Yes, it's the KitKat quote competition, where you can win a box of KitKats for the stupid things your lecturer says (well the more stupid things they say).

Neil Cramer:

"There is something wrong with this result, so we'll fix it up with a fudge factor."

"... our old friend the fugacity..."

"This is a typical thecreticians assumption. It may have no relation whatsoever to reality."

"Some of you are saying, 'why the hell are we doing this?'".

Peter Robinson:

"We no longer have to paint our electrons - which in the real world is not much of a goer."

"Electrons I guess are modest, and like to appear fully clad."

"It's a fine approximation, provided you don't mind getting the wrong answer."

"Everyone who does a Phd in Physics learns to type, so we're all set to get jobs as secretaries."

"Bosons are party particles, they like to get together."

"... it got to 130K, which is quite warm - but still overcoat weather."

Ross McPhedran:

Student: "When is the assignment due?"
Ross: "I don't think any of us are particularly fussed about that."

"Too much rigour in maths leads to rigor mortis."

Martyn de Sterke:

"Does this work? The answer is yes and no - but the yes is more important."

"Don't do this unless someone holds a gun to your head - but some people do this for a living."

"Damn it! I forgot my notes again!"

"I've pulled a couple of fast ones here, but I'm not going to tell you about them, except for this one you'd probably discover very soon anyway..."

"I've got a homework set here for those of you who take this course for real."

Don Melrose:

"The problem can be hidden by just waving your hands."

Foreign lands:

Unnamed maths honours student:

"Is gamma constant?" (About the Lorentz factor.)

The Physics of Cartoons

by David Mar

A lot of people might think that animated cartoons are nothing more than amusing diversions from everyday life. However, if you are willing to look beneath the surface and think about the underlying *physics* which governs the way in which cartoon characters behave and interact with their world, you will see that there are profound insights to be had, and lessons to be learnt which apply equally well to the physics we learn here at university.

The first, and most obvious, difference between our world and that of cartoons is that the speed of light is different. We are used to c being $2.998 \times 10^8\,\mathrm{m\,s^{-1}}$. In a cartoon, however, c is limited to the speed of 50 frames $\mathrm{s^{-1}}$. If you consider the special relativistic equation for a retarded gravitational field potential,

$$\phi_g(t) = \frac{G\,m\,(t - \frac{r}{c})}{r^2},$$

it can be seen that the gravitational force pulling cartoon characters down is delayed by a significant amount of time, r/c. This explains the phenomenon of cartoon characters running off the edge of cliffs, and not beginning to fall until several seconds afterwards.

Another obvious difference is that cartoon magnets are invariably much more powerful than the sort available to us. How many times have you seen Wile E. Coyote try to catch the Road Runner by feeding him ball bearings and then training a simple horseshoe magnet on him? By considering the magnetic Lorentz force,

$$F = q\,\mathbf{v} \times \mathbf{B},$$

and the simple Ampère law,

$$B = \frac{\mu_o}{4\pi}\frac{I}{r}$$

we can see that the attractive force is proportional to the square of the electronic charge. The observations then imply that the charge on a cartoon electron must be several orders of magnitude greater than the 1.6×10^{-19} C with which we are familiar.

Cartoon characters display an astounding ability to teleport from one place to another without traversing the intervening space. This is clearly a quantum tunneling effect. A cartoon character's wave-function is governed by the usual time-dependent Schrödinger equation,

$$i\hbar\,\frac{\partial \psi}{\partial t} = \left(\frac{i\hbar^2}{2m}\nabla^2 + V(\mathbf{r},t)\right)\psi,$$

which has the standard spatial solution

$$\psi(x) = A \exp\left[\sqrt{\frac{2m(V-E)}{\hbar^2}}\,x\right]$$

in regions where the potential V is greater than the cartoon character energy E. Since subatomic particles are the only objects which display tunneling behaviour in our world, we must conclude that Planck's constant is approximately fifteen orders of magnitude larger in cartoons than our value of 6.626×10^{-34} J s.

This large value of h also explains the fact that cartoon characters can accelerate to great speeds extremely quickly, and that they sometimes appear to be in several places at once. The Heisenberg Uncertainty Principle,

$$\Delta x\,\Delta p \geq \hbar,$$

states that the product of uncertainties in position and momentum must exceed Planck's constant divided by 2π. Since the constant has such a large value, it is very difficult to both spatially localise and assign a speed to a cartoon character.

Cartoon characters have an ability to catch fire, or place their hands on hotplates, without feeling any pain for several seconds. Examining the Boltzmann relation,

$$E = \frac{3}{2}kT,$$

which specifies the thermal energy of objects at temperature T, or the Weidemann-Franz thermal conductivity law,

$$K = \frac{\pi^2 k^2 \sigma}{3e^2}T,$$

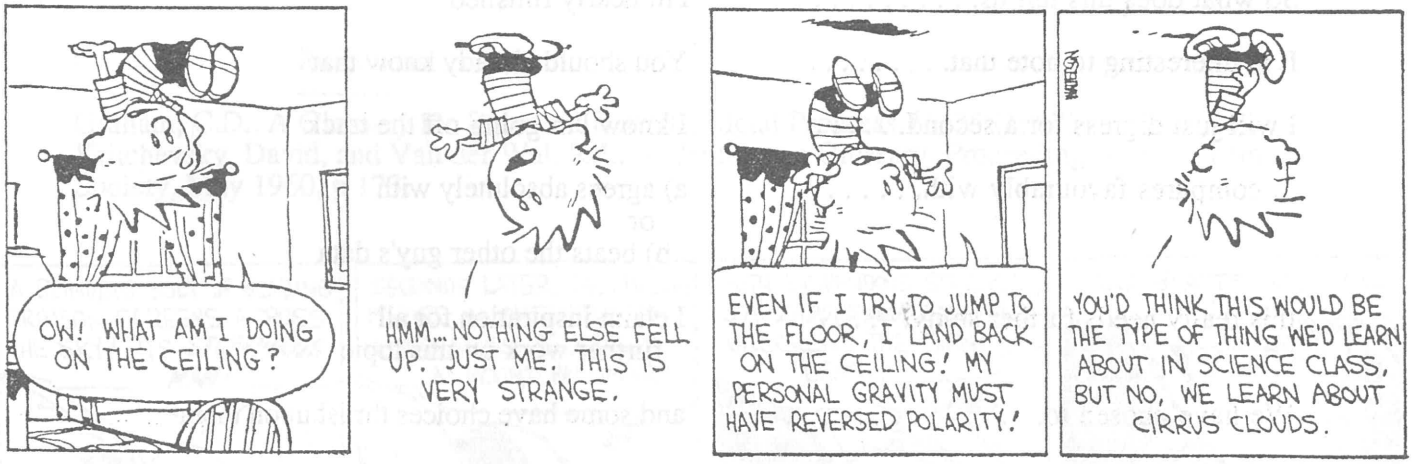
we can see that cartoons must have a much lower value of the Boltzmann constant than our $k = 1.38 \times 10^{-23}\,\mathrm{J\,K^{-1}}$.

Our final observation is that cartoon characters are often squashed into very small spaces, with apparently little or no damage. This clearly indicates the presence of some form of space-time curvature. A cursory glance at the Einstein general relativity equation

$$G_{ik} = -\frac{8\pi G}{c^4}T_{ik} - \Lambda g_{ik}$$

shows us that the space-time curvature tensor G_{ik} relates to the mass-energy tensor T_{ik} with a multiplicative factor of G, the gravitational constant. It is immediately obvious that cartoons must have a greater gravitational constant than our own $G = 6.67 \times 10^{11}\,\mathrm{N\,m^2\,kg^{-2}}$.

It can be seen from these observations that the world inhabited by cartoon characters is substantially different to our own. By studying cartoons, we can gain great insights into the physical laws which govern the universe. So next time you sneak home early when you should be attending a 4 o'clock physics lecture, justify it by watching the *Bugs Bunny Show* when you get home.



CONFERENCE GLOSSARY

Robina E. Otrupcek, Division of Radiophysics, CSIRO, Sydney.

As a convenience for students attending A.S.A conferences for the first time I have accumulated some phrases used at the Hobart A.S.A. Conference in May 1986 with possible interpretations. It may be useful when presenting a paper to be able to string many of these phrases together with appropriate separators to fill that first five minutes.

DURING PRESENTATION

This is a typical spectrum.	My best one
I want to mention briefly.	I have to include my pet theory
That gives us some idea.	That's all the data I could get
Perhaps one more interesting point is. . . .	Now for the main point
One possible explanation is.	**MY** interpretation
. . with relative ease.	promises, promises. . .
These are only theoretical predictions.	I know it would never really work
If you do the transformation by eye.	Shut one. . .or better still both
"arbitrary units".	they're all different
Not a trivial matter.	too hard for me
It turned out that.	Just like I predicted
We came up with.	The computer surprised us with
During normal operation of this instrument.	which we haven't yet achieved
What I'd like to talk to you about. . .	Here I go!!
So what does this tell us.	I'm nearly finished
It is interesting to note that.	You should already know that
I will just digress for a second.	I know I'm going off the track
. . compares favourably with.	a) agrees absolutely with or b) beats the other guy's data
this really needs further study.	I claim inspiration for all further work on this topic
We have chosen to.	and some have choices thrust upon them
We analysed only those events within a degree or so.	It was that or my wife would divorce me

I'd like to show you quickly.	flash Harry??
I'd like to outline very briefly.	I'm running out of time and I have a lot more to say
The implication of that is.	Seeing you can't work it out for yourself
had a question mark against it.	It didn't fit the model
these monitors supply useful information.	You can tell it's turned on
One other thing I've been doing.	I couldn't quite get a separate paper out of this

DURING DISCUSSION

That is an interesting question.	I don't know the answer
I'm glad you asked that.	seeing I suggested earlier you do just that
I'm unable to comment.	You wouldn't like my answer
One can say.	My opinion is
We're still sorting out a problem there.	Why did you have to ask THAT!!
What I'm getting at is.	You dolt. . .can't you understand?
Are you saying in effect.	WHAT!!!
Are there special problems in.	Why on earth didn't you
Yes!. . .Ahhhhh!.	HELP!!!

I also would like to include a list of useful words that don't mean anything but help to space out your presentation. . .

actually	basically	clearly	effectively
essentially	in effect	mainly	of course
rather	really	simply	somewhat

References

Graham, C.D., A Glossary for Research Reports, Metal Progress 71, 75 (1957)
Kritchevsky, David, and Van der Wal, R.J., A Conference Glossary, Proceedings of the Chemical Society, May 1960, p 173.

Lifetime Prediction Equation for Professors of Physics

Abstract

A failure prediction model is advanced which attempts to include all the factors known to affect the lifetime of Professors of Physics. Experimental data indicates that the equation is accurate over the range of 0 to 30 years although one instance of an extended life has appeared at the Applied Physics Department at the University of Sydney.

The equation expresses lifetime in terms of adjustable parameters. The parameter U is the "Universal Lifetime Constant" and has been obtained from analysis of the failure rates of professors extending over the past fifty years.

$$t_f = \frac{U}{PROFESSOR}$$

where

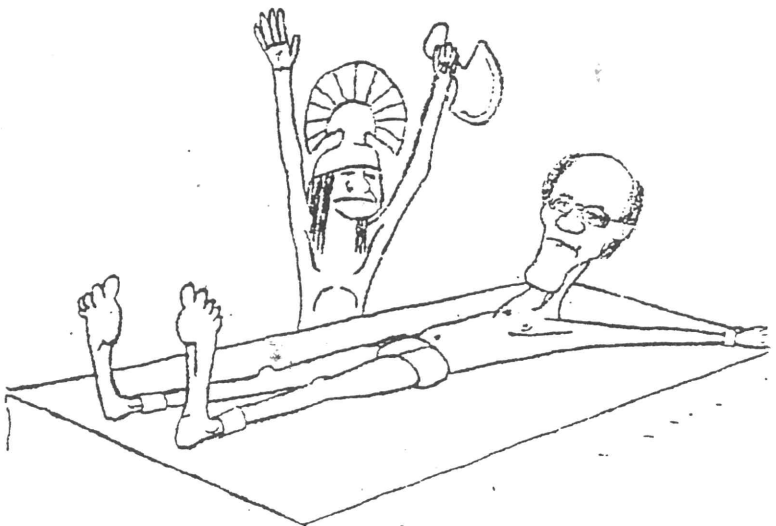
P = total number of post-graduate students
R = the number of committee memberships
O = total number of papers accepted for publication
F = distance travelled by public transport each day
E = total number of lectures given
S = number of positions held simultaneously
O = number of conferences attended
R = total number of experiments conducted

and t is the time-to-failure

Insertion of various values for the Universal Lifetime Constant and parameters for the reported case at the University of Sydney predicts a lifetime of only 0.1 years.

A certain Professor Richard Collins has dealt a severe blow to the theory by recently celebrating a birthday which indicates a lifetime nearly two orders of magnitude larger than this figure. There is as yet no indication of diminishing activity.

The authors therefore conclude that the lifetime prediction equation requires additional work before it can be universally applicable.



A correction function to the Lifetime Prediction Equation for Professors of Physics.

abstract

The lifetime prediction equation for professors of physics has consistently been unable to account for extended lifetimes of more than 0.1 years. In this paper, a correction function is derived that seems to account for the observed lifetimes. It is based on the Hair, Height and Beard effect .

The lifetime prediction equation determines the theoretical lifetime of a physics professor according to several variable parameters and the Universal Lifetime Constant . Unfortunately, many examples can be cited where this equation grossly underestimates the actual lifetime of the professor. Indeed, the case of Professor Richard Collins, in the Department of Applied Physics illustrates this.

The original derivation applied only to ideal professors (ie infinitesimally hairy, and infinitely bearded). In extending the result, the Hair, Height and Beard effect must be taken into account, and results in a correction of the ideal time to failure. If this is applied to the equation, the following result is obtained:

$$T_f = t_f \exp[\, i*h \,] / \exp\,[\, -H*B^{-1}]$$

where

T_f = Corrected time to failure
t_f = Ideal time to failure
h = height
H = Hair Volume (equal to the integral around the head of the hair growth coefficient, ζ)
B = Inverse Beard Volume.

Considering the case of an ideal Professor Collins, $B^{-1} = 0$ and consequently, $T_f = t_f$ which corresponds to the ideal time to failure. In actual fact, Professor Collins is known to have an infitely small but non zero Inverse Beard volume, which is not compensated by H. The correction function ($\exp[i*h]/ [-H*B^{-1}]$) is small, and, consequently, T_f is large. Notice also the periodic dependence of Tf on the height of the professor. This would account for the variations observed in professors with the same Hair and Inverse Beard volumes. Results obtained for other professors of the School of Physics were confirmed by observed values and shows our theory to be correct.

THE PANCAKE THEORY OF GALAXIES

Many models have been developed to explain the observed shapes and motions of normal galaxies. None have been able to explain all galactic types, although some have been quite successful in describing individual classifications. This new pancake theory will, I believe, revolutionize galactic theory and possibly redirect other areas of research.

In its essence, the theory is based on the assumption that galaxies are in fact pancakes made by beings of much larger dimensions than ourselves. This assumption can be justified by looking at the consequences and showing that they lead quite naturally to the current observations of galaxies.

Spiral galaxies have always been popular, as our own belongs to this group. These can easily be explained as the early stages of pancake production. Experienced pancake makers will start with a blob of batter in the centre, hence forming the central bulge, and then spiral outwards with the batter. This creates firstly a spiral pattern with a void between the arms, and as the pancake progresses the batter spreads out between the arms and the older areas become dark and form the dust lanes that we observe.

This method of pancake production causes the motion observed in that as the batter moves around and outward it slows down because it heats up and becomes more viscous, producing slower motion in the outer arms than in the centre. All of the tipping and turning required to make the pancake sets up random motions in the less viscous central region, accounting for the wide velocity range observed at galactic centres.

The spherical, or elliptical galaxies are closely related to the pancake spiral galaxies, but are less predictable in their motions. This follows naturally from the assumption that these galaxies are close cousins of the pancakes, in fact they are made from the same ingredients, just put together differently. I contend that the obvious explanation for spherical galaxies is that they are dumplings. This accounts for their roundish shape and since they are either cooked in casseroles or deep fried, in their formation they often rotate, but not necessarily in a predictable, uniform way. The dust lanes often seen across the face of these galaxies correspond to the bits that stick to the outside of the dumpling when cooked in a casserole.

The irregular galaxies which have variable structures can also be comprehensively explained as the first attempts of the chefs making dumplings and pancakes. It is a well known fact that the first pancake made in each batch is always a failure and ends up as lumpy mess with random motions all over the place. It is also accepted that at least one of the dumplings in any meal will fall apart creating a denser, thicker globule, but no less random than the pancake type.

In, short it is clear that all galaxies are made from essentially the same ingredients, they are simply different manifestations of the combined ingredients. Some represent the successful attempts of pancake and dumpling chefs, while others are the sad remains of the failed batter.

Peregrin Took.

Following is a list of actual experimental results of experiments that someone for some weird reason thought were necessary to spend thousands of dollars on performing. (From a pamphlet entitled 'Science Gone Insane' distributed by United Action for Animals). These few examples were taken from rec.humor.

Stupidity breeds entertainment.

"Burning out certain areas of a female cat's brain reduces its sexual activity whereas similar lesions have no effect on male sexual behavior. Cost:$141,400 U of CA Davis

Both young and old rabbits with nylon threads sewn through their eyelids and steel clips implanted in their skin respond to electric shock the same way. They flinch.
Williams College, Mass.

Rats react the same way to both live cats and toys that resemble cats. They are frightened. (brilliant, eh?) U of Hawaii

Wild rhesus monkeys are more frightened of rubber hoses that look like snakes than are laboratory-raised monkeys. U of Wisconsin

Rats forget how to perform simple tasks when repeatedly brain-shocked. Case Western Reserve U.

Old cats dream less than young cats. Cost: $439,000 (!) Stanford U.

Different types of monkeys behave differently... Cost: $118,000 U of Colorado, Boulder

Rabbit eyeball retraction is easily measured by pulling out the cornea, replacing it with a glued on contact lens, and directly shocking the optic nerve with electricity. Nothwest U.

The amount of dreaming cats do while sleeping has no effect on how much they eat. Cost: $235,119 Stanford U.

Dogs with narcolepsy-a disease causing uncontrollable sleeping-spend more time drowsy and asleep than normal dogs. Cost : $847,000 Stanford U. School of Medicine

Female rhesus monkeys sprayed with copulins - sex scents - have more sexual encounters than unsprayed monkeys. Cost : $164,000 Emory U.

Morphine addicted vervet monkeys given naloxone show _more_ body shakes, tremors, screaming, and vomiting than monkeys treated with natrexone alone. (Both cause morphine withdrawal). Cost: $225,000 Yale U.

And my personal favorite:
Although castration causes a significant decrease in the size of certain glands in male kangaroo rats, it does not affect their sunbathing habits.
^^

Central Missouri State U.

Plenty more (mostly gross mutilation), and all done in the 80s.
Don't ya just love medical science, (pass me another cat).

NASA'S GALILEO PROBE FINDS NO EVIDENCE FOR ELVIS ON EARTH

The Galileo science team today announced that the spacecraft's instruments failed to find any new traces of Elvis Presley during its flyby of Earth last December 8th.

Galileo, a joint project of the National Aeronautics and Space Administration and the European Space Agency, is a two-part spacecraft, consisting of an orbiter and an atmospheric probe, which will explore Jupiter and its satellites when it arrives there in December of 1995. On the way, it has encountered Venus, returned to pass Earth, and will encounter Earth once more at the end of this year.

Prelimnary analysis of the Galileo science data has concentrated on searching for characteristic profiles of the pioneering rock 'n' roll singer.

"It's a tough background subtraction problem," explained Dr. Edward Rock of Caltech. "We know the planet contains several thousand Elvis imitators. You have to distinguish the real thing from many objects of similar appearance."

The method used involved interdisciplinary comparison from several of Galileo's sensors. "For example, an Elvis imitator would have a very similar appearance to Elvis in the SSI [Solid State Imaging] and NIMS [Near Infrared Mapping Spectrometer] data," said Dr. Graham Finale. "But no imitator has Elvis's magnetism." Researchers combined data from Galileo's sensitive magnetometer, mounted on a 36-foot (11-meter) boom, with optical, infrared, and ultraviolet measurements. They are capable of identifying a single genuine Elvis among all the other features of Earth's landscape. This is a very sensitive technique– a feat equivalent to standing in St. Joseph, Missouri, and distinguishing a jellybean in a bowl of amphetamines in Memphis.

Instruments which measure radio emissions also studied the planet during the encounter. "We picked up numerous broadcasts of 'Heartbreak Hotel' and 'Hound Dog,' " Dr. Finale said. "But we were able to correlate nearly every one with the location of previously known oldies stations."

Galileo investigators were cautious about ruling out the possible existence of Elvis. "We can only set an upper limit," said Dr. Rock. "And we're guessing to some extent at the profile we're looking for. If Elvis has lost weight, for instance, he'd have a different infrared signature." According to the science team, there are 0.21 plus or minus 0.17 Elvises on Earth, a number described as "consistent with zero."

The most widely held theory on Elvis Presley is that he died on August 16, 1977. In the past few years, however, ground-based observers have reported sightings of Presley in such locations as Kalamazoo, Michigan. Since then scientists have been interested in more precise measurements of "The King."

Though speculation has been published in some journals that evidence for Elvis might exist on other planets and moons in our solar system, most scientists agree that Earth is the most likely place to find him. "If, as the new results suggest, there's no Elvis on Earth," said Dr. Torrance California, "this lends weight to the supposition that he really is dead."

Galileo's ultimate destination is an orbit around Jupiter. But to get there, it needs to pick up extra speed; it has made one encounter with Venus and another with Earth. The spacecraft will swoop by Earth one more time in December 1992. The Galileo flyby was an opportunity to employ advanced planetary-science instruments to observe the Earth. According to Ted Clarke, of the Jet Propulsion Laboratory, "Only two planets in our solar system had never had a flyby mission. One is Pluto. The other is Earth." During the encounter Galileo studied several aspects of the Earth-Moon system, which also served as a test of its instruments.

Having verified their search techniques in the Decmber 1990 encounter, scientists are now planning for the 1992 Earth flyby. At that time they expect to use Galileo to search for aviatrix Amelia Earhart and labor leader Jimmy Hoffa.

* * * * Here's the broadcast schedule for Public Affairs events on NASA Select TV. All times are Eastern. **indicates a live program.

Monday, 4/1/91

** 2:00 pm Galileo at Earth report from JPL

3:00 pm Speedway

5:00 pm Viva Las Vegas

7:00 pm Jailhouse Rock

All events and times may change without notice. This report is filed daily, Monday through Friday, at 12:00 pm, EST. It is a service of Eternal Communications Branch at NASA Headquarters. Contact: WSHIGGINS on NASAmail or at 202/555-8425.

NASA Select TV: Satcom F2R, Transponder 13, C-Band, 72 degrees West Longitude, Audio 6.8, Frequency 3960 MHz.

★★★★★

THE KING OF ROCK 'N' ROLL:

PHYSICS HUMOUR??????

Maybe space is getting blurry, yes, that's it!
--Scientists at NASA looking at Hubble pictures.

Q: What does a wavefunction say after being integrated too much?
A: psi [this one is funny in print if you use the greek letter]

Q: What do you get when you cross and elephant with a pygmy?
A: elephant pygmy sin theta

Big whirls have little whirls that feed on their velocity; and little whirls have lesser whirls, and so on to viscosity.
-- Lewis Richardson

Heisenberg may have been here.
-- grafitti in a physics lab

Ludwig Boltzmann, who spent much of his life studying statistical mechanics, died in 1906, by his own hand. Paul Ehrenfest, carrying on the work, died similarly in 1933. Now it is our turn to study statistical mechanics. Perhaps it will be wise to approach the subject cautiously.
-- David L. Goodstein [_States of Matter_]

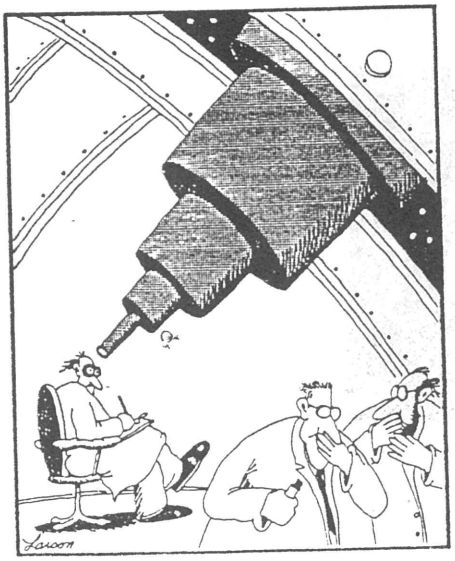
Surely, Professor Bohr, you do not really believe that a horseshoe over the entrance to a home brings good luck?
No, I certainly do not believe in this superstition. But you know, they say it brings luck even if you don't believe in it.
-- A house visitor and Niels Bohr

Beware the quantum duck. Quark! Quark! Quark!
-- unknown

There was a young lady named Bright
whose speed was far faster than light.
She left one day,
in a relative way,
and returned home the previous night!
-- unknown

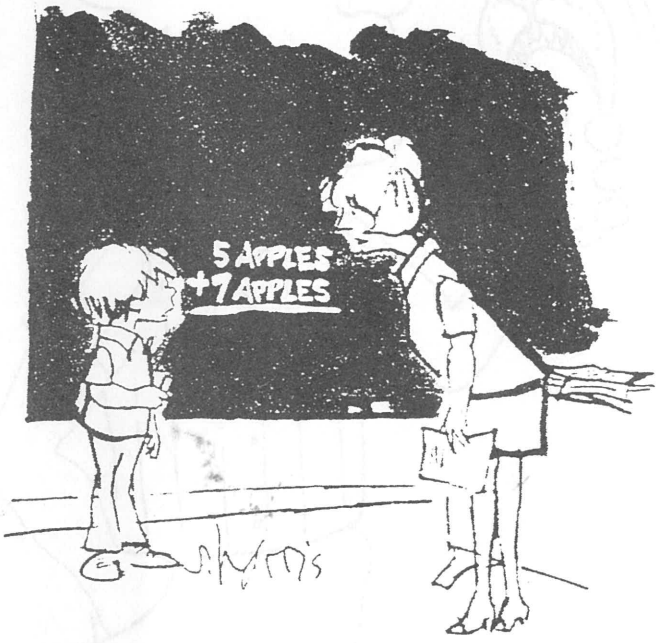
But in physics I soon learned to scent out the paths that led to the depths, and to disregard everything else, all the many things that clutter up the mind, and divert it from the essential. The hitch in this was, of course, the fact that one had to cram all this stuff into one's mind for the examination, whether one liked it or not.
-- Albert Einstein

When a distinguished and elederly scientist says something is possible he is probably right; if he says that something is impossible he is almost certainly wrong.
-- Arthur C. Clarke

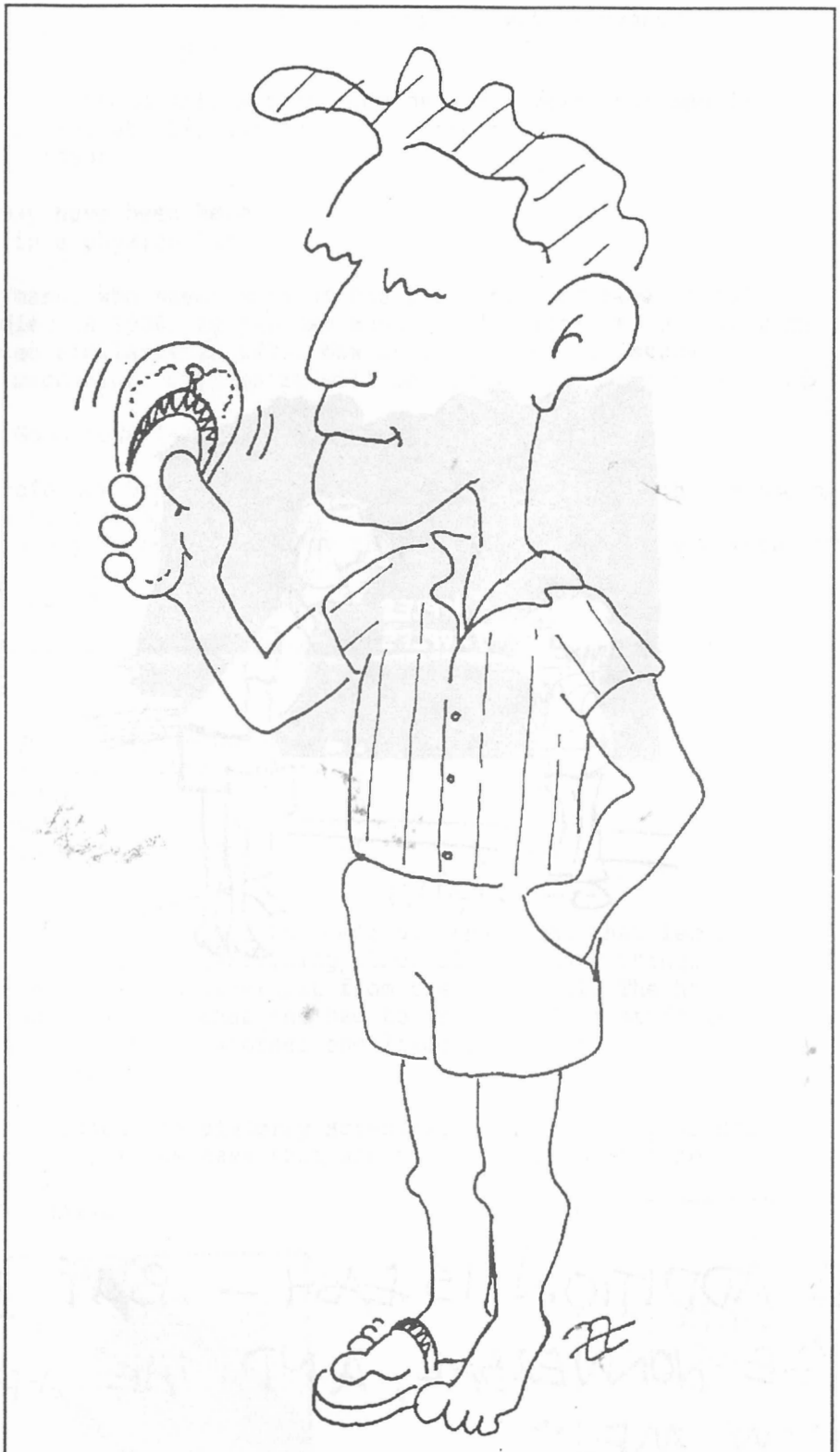


"Eraser fight!!"

? THE YOUNG DON ?



"THE ADDITION IS ~~EASY~~ – BUT I TEND TO BE NONVERBAL, AND THE APPLES THROW ME."



Don argues about that last minus sign.