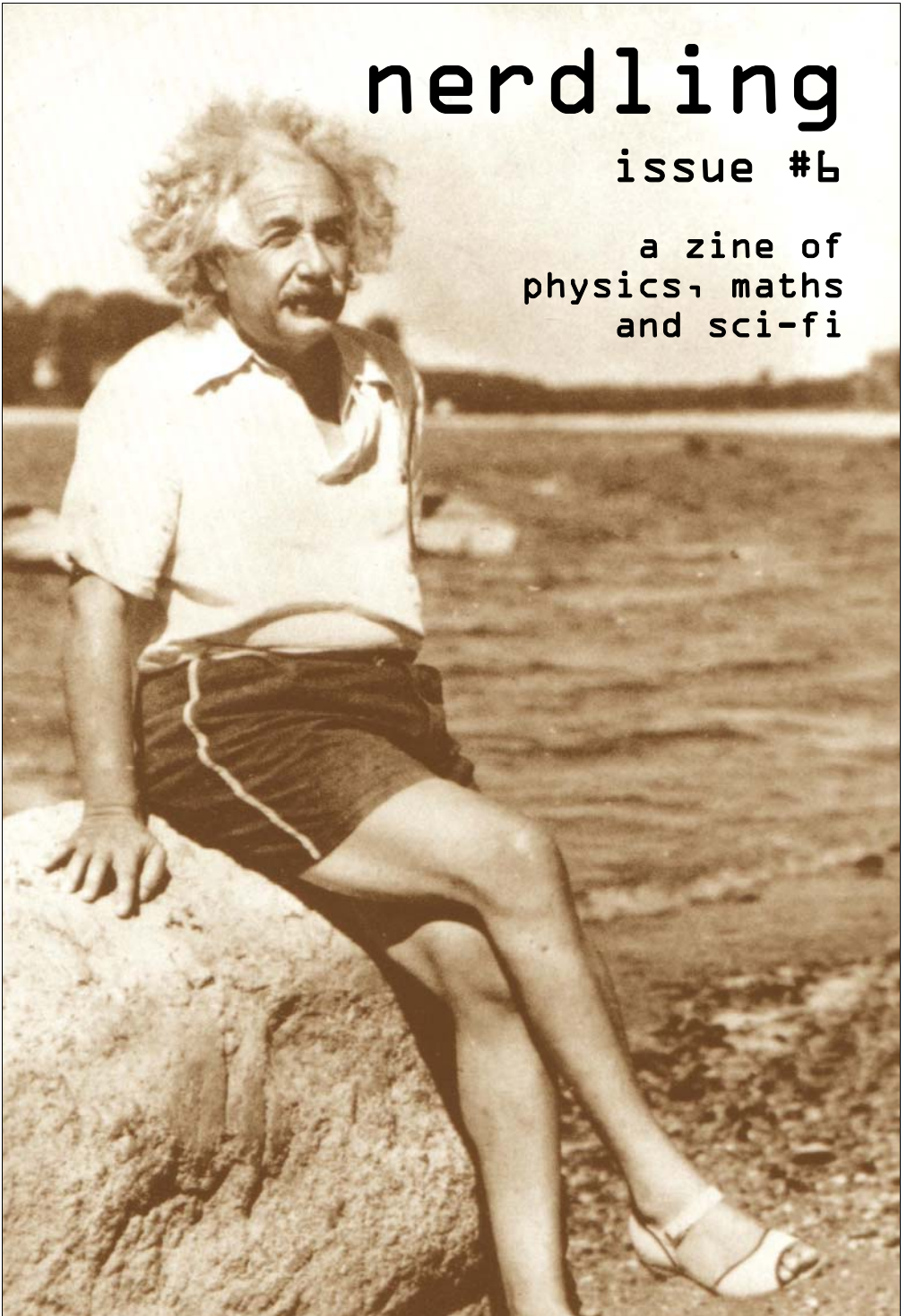


nerdling

issue #6

a zine of
physics, maths
and sci-fi



“It’s impossible to be a nerd and be cool at the same time!”

This was the statement made unashamedly by a surface-physics researcher at my university yesterday. And maybe after a first glance at our cover-girl image of Einstein in his natty beach sandals, you might be inclined to agree with him.

Well ain’t we taught you nothin’ in the last five issues? Come on! By now you should know that ‘nerd’ is the new hepcat. I mean check it out, even Heather Graham is trying to jump onto the wagon.

Nonetheless, some people just don’t learn. So we must resort to the nerd course of action when people tell us we’re not cool: we must care to the value of sweet FA and keep doing what we want anyway. This is the secret key to life: as soon as you’re cool with not being cool, you’re cool. And once you have mastered this, you have attained the rank of true nerd. Welcome to the fold, brothers and sisters.

In case you need a kick start on your path to attainment, this issue is chockers with the good stuff. First up, the low down on what space is really being used for nowadays. Then, if you’ve never heard of a Degree Twaddle (°Tw) or can’t name the special unit used for measuring eels, turn to page 8 and brush up on your general knowledge of scientific measurement. There’s 14 good excuses to chuck a party on pages 16 and 17, the eagerly-awaited Part II of Women in Astronomy on page 18, then the weirdest journals you’ve ever heard of, some music, some literature, poetry, fashion...

Read on and prosper.

the editor
ubernerdling@yahoo.com.au



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What's getting launched? Spy satellites, shuttles or science missions—and by whom? We subvert the propaganda, conspiracy theories and Hollywood exaggerations to bring you the real picture.

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Do you prefer to measure your car's performance in yottameters per exasecond, or by rods to the hogshead? Find everything you wanted to know about measurement here.

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WHAT IS SPACE BEING USED FOR?

Spy novels make us think the sky is swarming with spy satellites. Hollywood gives us the impression that satellite-based weapons are getting launched all the time. NASA would be quite happy for us to believe that they're the only ones putting hardware into outer space. And the media seems to make us think that most launches involve the shuttle or the space station.

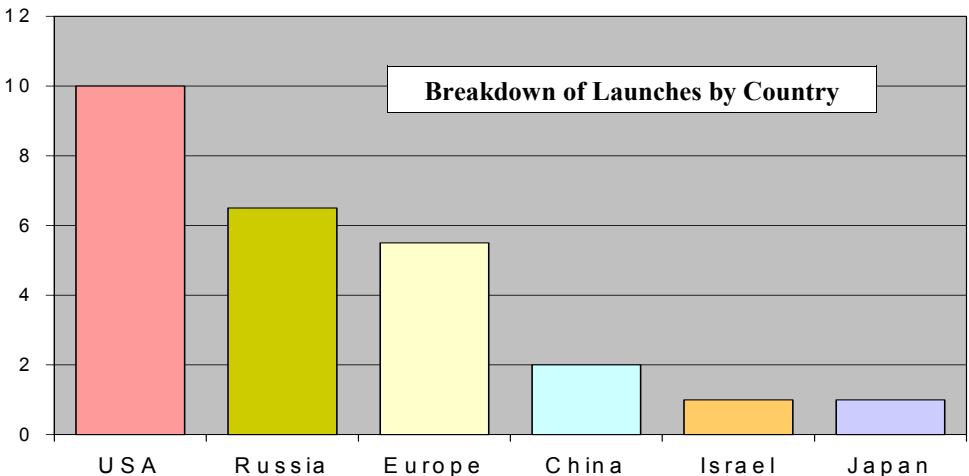
So what exactly *is* space being used for nowadays? Is it for commercial, military or scientific purposes? And who are the main players?

To unravel the mystery a bit, presented here is a breakdown of the 26 launches that occurred from May to August last year. The main pie chart on the facing page shows the purposes of the launches, with smaller pie charts representing the countries participating in each category. For example, of the five launches made for military or spy purposes, 80% (=4) were launched by Russia and 1 was launched by Israel.

As you can see, the most common purpose of satellites launched was for communications—the technology that we benefit from every day in the form of television, internet and telephone connections. Those who say investment in space technology has no relevance to the average Joe should also keep in mind the fact that five launches were of satellites engaged in scientific earth observations, which includes the monitoring of global warming, improved weather forecasting, and the study of oceans and rivers. Unfortunately, each launch of a scientific observation satellite was also matched by a launch for military or spy purposes. Perhaps the most concerning of these was the Ofek-5, the Israeli spy satellite launched south of Tel Aviv with the aim of exhibiting Israel's advanced missile capabilities during a period when Mideast tensions are at a height.

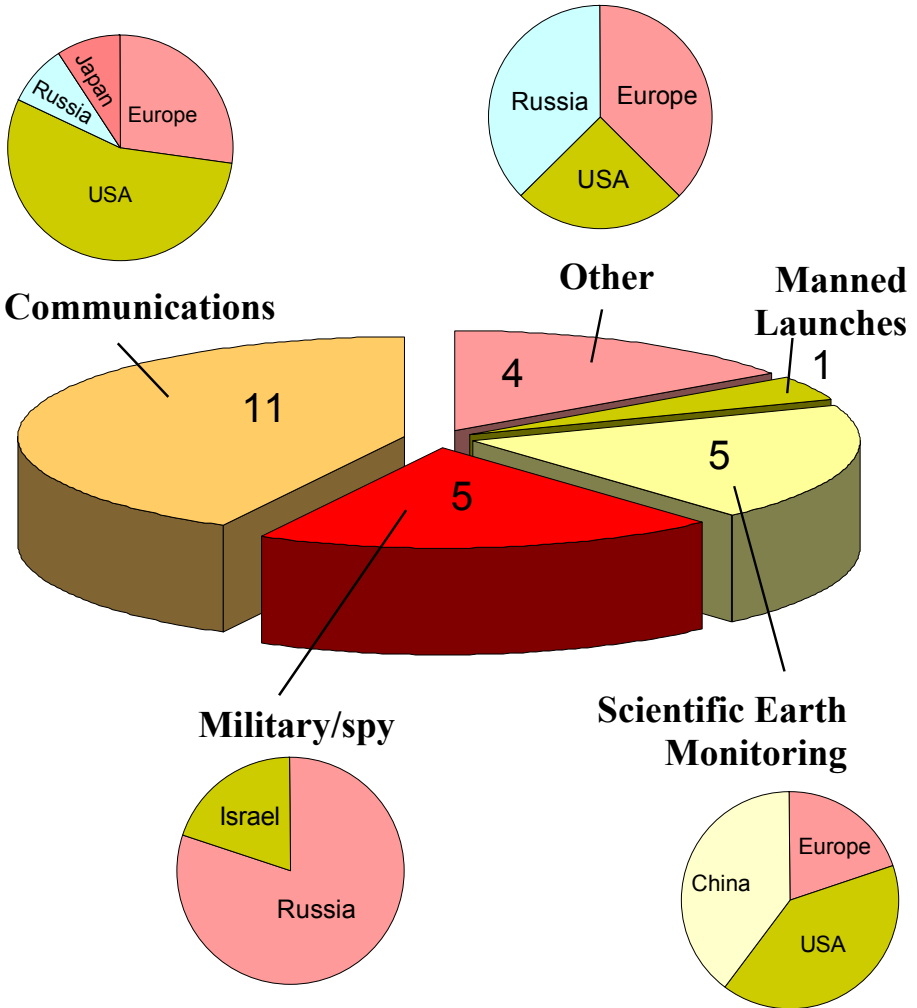
Note that for the purposes of clarity, the countries of Europe have been treated as one, due to the fact that their activities are united under the European Space Agency.

It is also worthwhile noting that the launches have been classified by country owning the payload, not the country launching it (in the few cases where these differ). China and Russia were actually responsible for several launches of European and American payloads.



Breakdown of Launch Purpose

Showing national participation in each category



Notes: the category 'other' includes:

- a satellite for commercial monitoring purposes (cartography, property surveying, etc);
- the \$159 million CONTOUR spacecraft, which failed in its mission to rendezvous with two comets when it broke into pieces less than a month and a half after launch;
- a Russian freighter delivering supplies and equipment to the International Space Station;
- and the launch of a 'mini-shuttle prototype of a European-Russian inflatable space vehicle from a Russian submarine in the Barents Sea'. Sounds cool, huh.

Apart from the above launch, perhaps the most interesting launch site used was the Odyssey Launch Platform that floats on the equator in the Pacific Ocean.

The one manned launch was the NASA shuttle Endeavour. The mission focus was assembly and repair of the International Space Station.



nerdling received this email a while ago and we found it strangely intriguing enough to reproduce it here for you.

>> Hi nerdling,
>>> I was looking through some journal articles and one of them
>>> referenced a work by "Zitter and God". It got me wondering what
>>> other works he has been involved in (apart from the Earth and
>>> Humanity and all that) so I did a search through the science
>>> journals for God as an author. The attached file shows the
>>> results. As you will see God has a strong preference to chemistry.
>>> I also found that Allah has more of a physics bent, Vishnu is a
>>> biologist, while Jehovah and Buddha are just plain lazy. Krishna
>>> on the other hand is a prolific researcher and publisher in
>>> comparison—I guess that he's had a long career. It also seems that
>>> while the Norse gods are a little patchy in their efforts, the Roman
>>> gods have all made a contribution to science in some form or other
>>> except Saturn. I tried to find anything by Saturn at all in science,
>>> humanities and even art but could find nothing. As the god of time
>>> I suppose he must have some philosophical objection to (or grudge
>>> against) learning in general. I also noticed that the Norse war-god,
>>> Tyr, has a strange fixation on sugar-beets.
>>> —Benjamin.

God's Recent Scientific Output

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- Riederer, Luborzewski, **God**, Bringmann, Scholz, Feineis & Moser: *Modification of tyrosine hydroxylase activity by chloral derived beta-carbolines in vitro* J. Neurochem. 2002 MAY Vol 81 Issue 4
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RANDOM BITS & PIECES ON SCIENTIFIC UNITS & MEASUREMENT

with stunning illustrations typical of the neo-reductionist cyber-emoticon idiom*

SI UNITS

The system of units used by scientists all over the world is called *Système International*, or SI for short. *Anything* measurable can be expressed in terms of the seven SI base units listed below. This is quite cool, and so are the ways they're defined nowadays:

Distance: **meter** (m). Defined with respect to the speed of light: it's the distance travelled by light in a vacuum during $1/299\,792\,458$ of a second. Most often it's still handier to use a ruler though.

Mass: **kilogram** (kg). No-one's been smart enough to work out a better way of defining the kilogram, than by pointing to a particular lump of metal in France and saying "Um, it's the same as *that!*" So if you think your bathroom scales just *have* to be out of wack, the only way to be *exactly* sure is to get on a Concorde and go to the International Bureau of Weights and Measures.

Time: **second** (s). The second is the duration of $9\,192\,631\,770$ periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom. More interesting though is how the second got its name: the ancients took the hour and divided it into 60, calling each resulting unit the 'first minute division' (hence, after a small pronunciation change, the *minute*); then they subdivided the minute into 60 and called each bit the 'second minute division' (which became just the *second*).

Electric Current: **ampere** (A). Listen to this: the ampere is defined with reference to various forces between infinitely long, infinitely thin, exactly parallel electric wires in a perfect vacuum. Given that none of these four conditions can actually occur in real life, so that you can never really check for yourself, this is quite a novel way to define a unit that you're getting charged for every day.

THE WORK THEY GIVE THE
VACATION STUDENTS AT THE
NATIONAL INSTITUTE OF
STANDARDS & TECHNOLOGY,
WASHINGTON DC :



DID YOU KNOW?

The French came up with the incredibly sensible metric system. They decided on a new unit of length, the **meter** (from the Greek *metron*, a measure). It was to be one ten-millionth of the distance from the North Pole to the Equator along a meridian line passing through Paris. Despite the obvious difficulty of doing this accurately, they arrived at an answer and in 1889 this distance, inscribed on a bar of platinum-iridium alloy, became the world's standard meter.



Temperature: **kelvin** (K). The kelvin is the fraction $1/273.16$ of the thermodynamic temperature of the triple point of water [i.e. the only temperature where, at a given pressure, water can exist as a solid, liquid and gas simultaneously]. It also gets the nerdling prize for nerdiest sounding unit in science. (e.g. alternative usage: ‘You look like such a Kelvin in that lab coat and pocket protector.’)

Amount of Substance: **mole** (mol). If you’ve got a mole of something (molecules, cats, whatever), you’ve got the same number of that thing, as the number of atoms in 0.012 kilograms of carbon 12. This is quite a lot (about 6 with 23 zeroes after it). This unit is generally only used by scientists, but can be fun to use more frequently in personal matters too: “Yes I can tell you my age, I am currently 3.83×10^{-23} molyears old thankyou very much.”

Light Intensity: **candela** (cd). The candela is the luminous intensity of a source that emits radiation of frequency 540×10^{12} hertz and has a radiant intensity of $1/683$ watt per steradian. Whether or not this adds up to be about the brightness of one candle, I am utterly unsure.



i.e. in stick figures, and using very unsubtle humour.

DID YOU KNOW?

The **acre** (from an old English word meaning field) was originally defined as the area that could be ploughed in a day by a yoke of oxen. Similar units include the French *journal*, north German and Dutch *morgen*, south German and Swiss *juchart*, Austrian *joch* and Czech *jitro*.

Another old English unit of land area is the **hide**, defined as the amount of land that could be cultivated by a single ploughman, or the amount of land necessary to support a family. Depending on local conditions, this could be as little as 60 acres or as much as 180 acres. The hide was more or less standardized as 120 acres (48.6 hectares) after the Norman conquest of 1066, but is now obsolete.



UNITS YOU NEVER KNEW EXISTED

Scoville unit: a unit measuring the hotness of chilli peppers. A measurement of 50 000 Scoville units means that an extract from the pepper can be diluted 50 000 to 1 with sugared water and the burn of the capsaicin (the ‘hot’ ingredient in chillies) will still be barely detectable by the human tongue. In practice, the measurements are now made with liquid chromatography. Actual chilli peppers have capsaicin concentrations from 5000 to 500 000 Scoville units.

glean: an old English unit of quantity for herrings, equal to 25 fish.

decipol: a unit of indoor air pollution introduced by the Danish environmental scientist P.O. Fanger in 1988. One olf is defined as the air pollution produced by one “standard person”, and one decipol is the perceived air pollution level in a space having a pollution source of strength one olf and ventilation at the rate of 10 liters/second with unpolluted air.

degree Lovibond (°L): a unit used in the U.S. to measure the colour (really the darkness) of beer and honey. The scale is open-ended, but most readings fall between 1 (a very light gold, or yellow) and 25 (a very dark brown).

degree MacMichael (°McM): a unit used to measure the viscosity, or thickness, of chocolate. Typical values range from around 60 °McM (very thin chocolates suitable for pouring into molds) to around 190 °McM (very thick chocolates

TOP 5 STUPIDEST SOUNDING UNITS

noggin: a traditional unit of liquid volume, used primarily in Ireland. The noggin is often taken to equal 1/4 pint; sometimes it is taken to be 1/2 pint.

slug: a unit of mass in the English foot-pound-second system. One slug is the mass accelerated at 1 foot per second per second by a force of 1 pound. The British physicist A. M. Worthington first called it a slug in a 1902 textbook. (Probably he had in mind older uses of the word to mean a weight or a projectile. In the 1600's a slug was a roughly shaped lump of metal shot from a primitive cannon.)

degree Twaddle (°Tw): a unit measuring the specific gravity of liquids denser than water. 1 °Twaddle represents a difference in specific gravity of 0.005 or 1/200.

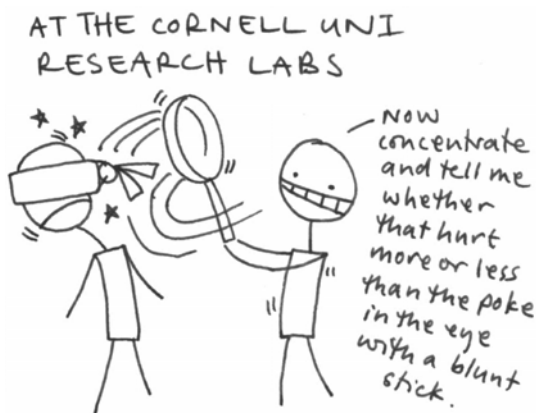
jerk: a unit of change in acceleration sometimes used by engineers. One jerk is equivalent to 1 ft/sec³, equal to 0.3048 m/s³.

snit: a U.S. unit of volume for liquor equal to 2 jiggers, 3 U.S. fluid ounces, or 88.7 milliliters.

suitable for hand dipping or forming around a center).

dol: a unit proposed for the measurement of pain. Researchers at Cornell University proposed the unit based on their studies of pain during the 1940s and 1950s; they defined one dol to equal 2 "just noticeable differences" (jnd's) in pain. However, the unit did not come into widespread use and other methods are now used to assess the level of pain experienced by patients. The name of the unit is from the Latin word for pain, *dolor*.

bind: an old English unit of quantity for eels, equal to 250.



*These units and the ones at top right taken from: **How Many? A Dictionary of Units of Measurement**, with permission from Russ Rowlett and the University of North Carolina at Chapel Hill. For more definitions, see <http://www.unc.edu/~rowlett/units/dictS.html>*

METRIC PREFIXES

Ever wanted to express your driving speed in zettameters per exasecond? Here's the list of metric prefixes to whack in front of your units and sound really impressive.

yotta- (Y-)	10 ²⁴	1 septillion†
zetta- (Z-)	10 ²¹	1 sextillion
exa- (E-)	10 ¹⁸	1 quintillion
peta- (P-)	10 ¹⁵	1 quadrillion
tera- (T-)	10 ¹²	1 trillion
giga- (G-)	10 ⁹	1 billion
mega- (M-)	10 ⁶	1 million
myria- (my-)*	10 ⁴	10 thousand
kilo- (k-)	10 ³	1 thousand
hecto- (h-)	10 ²	1 hundred
deca- (da-)	10	1 ten
deci- (d-)	10 ⁻¹	1 tenth
centi- (c-)	10 ⁻²	1 hundredth
milli- (m-)	10 ⁻³	1 thousandth
micro- (μ-)	10 ⁻⁶	1 millionth
nano- (n-)	10 ⁻⁹	1 billionth
pico- (p-)	10 ⁻¹²	1 trillionth
femto- (f-)	10 ⁻¹⁵	1 quadrillionth
atto- (a-)	10 ⁻¹⁸	1 quintillionth
zepto- (z-)	10 ⁻²¹	1 sextillionth
yocto- (y-)	10 ⁻²⁴	1 septillionth

*considered obsolete

† names are according to US rules

“EIN DECILITRE COKE, BITTE.”

The metric system may be international, but like any language it has its regional differences in usage. For example, here's how drink volumes are shown in different countries across Europe:

England: 350 mL

France: 35 cL (centilitres)

Switzerland: 3,5 dL (decilitres)

Germany: 0,35 L (litres)

UNNECESSARILY BIG QUANTITIES: THE GOOGOL

A googol is the number you get if you write down a 1 followed by one hundred zeroes. It was invented by the American mathematician Edward Kasner in 1938. According to the story, Kasner asked his 8-year-old nephew Milton Sirota what name he would give to a really large number, and "googol" was Milton's response. Kasner also defined the **googolplex**, equal to 10^{googol}, that is, 1 followed by a googol of zeroes.

Marge: *Now, I know you haven't liked some of my past suggestions, like switching to the metric system --*

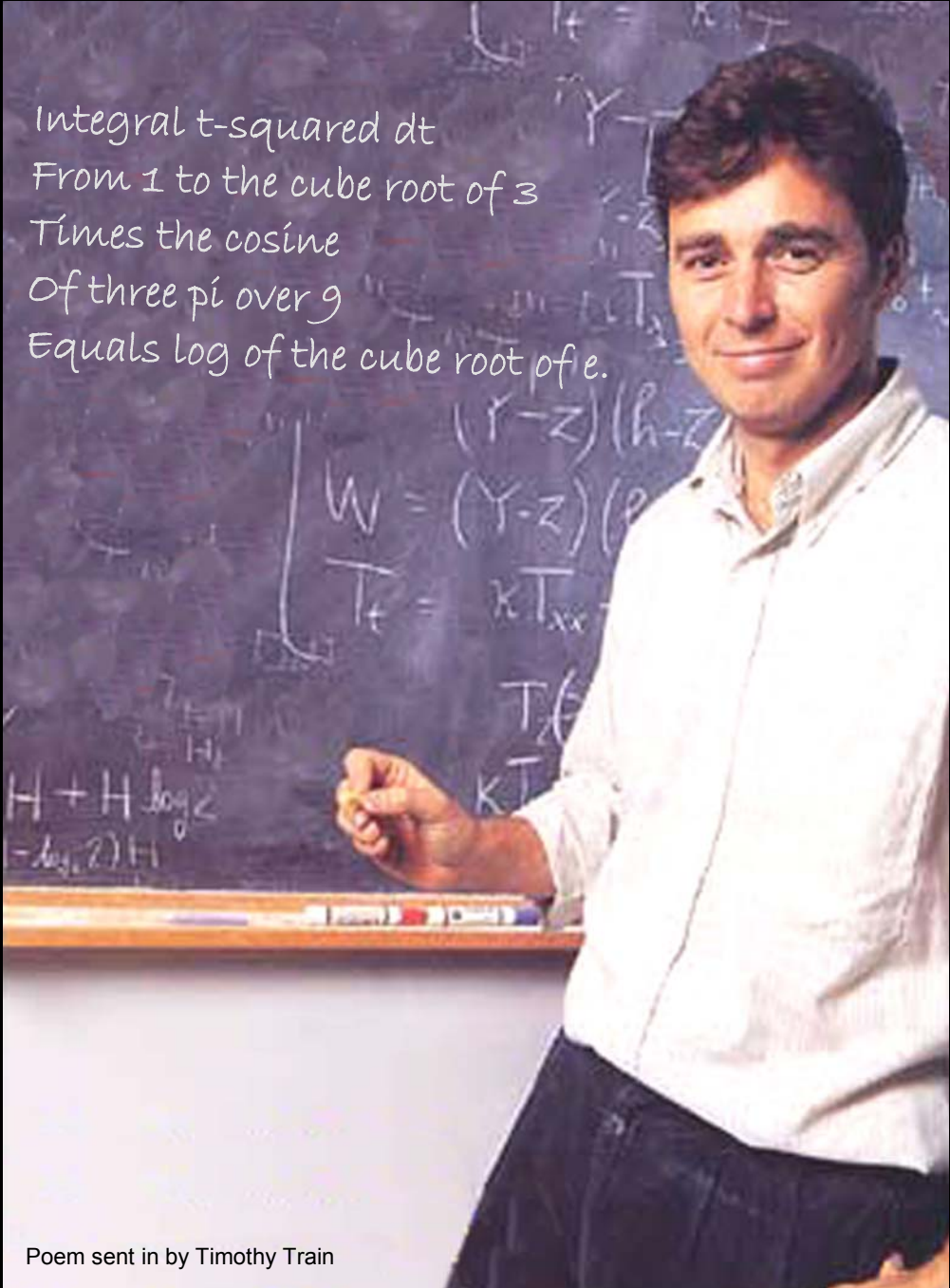
Abe: *The metric system is the tool of the devil! My car gets forty rods to the bogshead and that's the way I likes it.*

—The Simpsons episode
"A Star is Burns"

Apologies to bubble 'n' squeak who was the first to draw people's heads as balls with lines across them. Unlike mine, hers are cute and brilliant and you can find them in her zines, available via bubblesqueak@hotmail.com



"A mathematician who is not also a poet will never be a complete mathematician." — Karl Weierstrass



Integral t-squared dt
From 1 to the cube root of 3
Times the cosine
Of three pi over 9
Equals log of the cube root of e.

Poem sent in by Timothy Train

Quotes

"What's so big about being normal? The rest of us aren't normal, and that's what makes us so great."
-Fry, *Futurama*

★

"It always took half an hour to forty minutes to get the thing going, so we [...] took an oxygen tank like the kind scuba divers use and blew it through a 10-foot-long pipe. We were grilling in 30 seconds. Every year we got it faster..."

-G.Goble, *Purdue University, who won the Ig Nobel Prize in Chemistry, 1996, for his world record time for igniting a barbecue grill in three seconds using charcoal and liquid oxygen.*

"I'd like to acknowledge all of our Servicemen who were willing to become constipated for the country."

-J.W.Britton, in his paper "*The Constipated Serviceman: Prevalence Among Deployed US Troops*" (*Military Medicine, Issue 158 p346, 1993*) which was awarded an Ig Nobel Prize for medicine.

★

"What do we need a bunch of Nazis running around the space station for? The only thing the Chinese have in terms of helping the space program is what they've stolen from us."

- *Dana Rohrabacher, Californian Congressman and chairman of the Space and Aeronautics Subcommittee, upon being asked his opinion of Chinese plans to become involved in the International Space Station. Quoted in Ad Astra magazine, Sep/Oct 2002.*

"We at the National Space Society hope that this issue will [...] focus our attention to the trans-national character of space exploration. No cultural biases or restraints. Space is truly for every nation and people."

-Kirby Ikin, *Chairman of the Board of Directors of the National Space Society, in his foreword to the same issue of Ad Astra magazine.*

Great Non-Sequiturs in Science Fiction: *Return to Mars* by Captain W.E. Johns

RETURN TO MARS

“You
see,”
said
the
Professor,

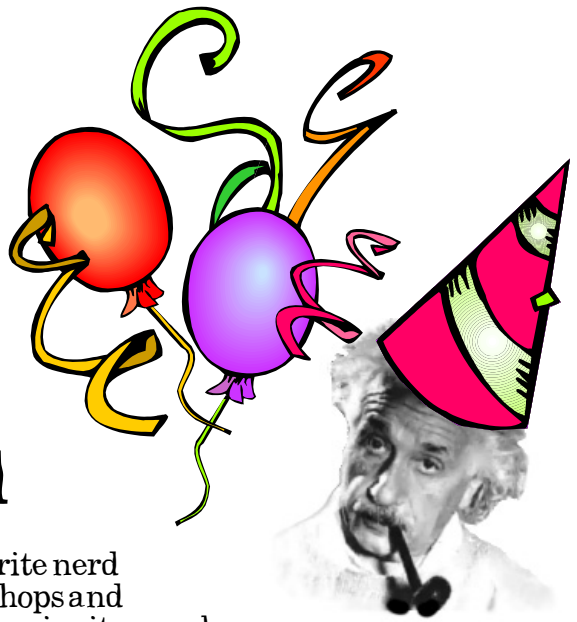
“our imaginations are limited to the things we know and understand. Anything beyond that we call fantasy. A man cannot envisage a higher form of life than himself. He cannot make allowances for things which on Earth do not exist. There, perhaps, lies our greatest danger; for it is almost certain that on this trip we shall see things, and do things, which our common sense will tell us cannot be true. So be prepared.”

CHAPTER V

THE MAN OF MARS

FOR the first time Rex was able to make a really close study of a living Martian. In physical appearance he was much like themselves, and dressed differently could have walked down a London street without attracting attention.

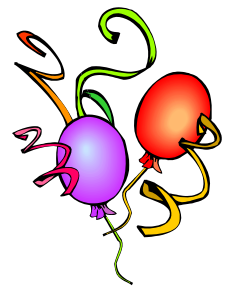
upcoming birthdays: march & april



Instructions: pick your favourite nerd from the list below, go to the shops and get snags and beer and balloons, invite a pack of mates over, crank up the music, and chuck a massive birthday party.

- March 1: **Ron Howard** (1954): Film maker whose works include *A Beautiful Mind*, *Apollo 13*, *Willow* and *Cocoon*.
- March 5: **Gerhardus Mercator** (1512): Flemish geographer, cartographer, and mathematician who devised and produced the system of map projection now known as Mercator projection.
- March 9: **Yuri Gagarin** (1934): The first man in space. Gagarin's flight took place on April 12, 1961, aboard the craft *Vostok*. His single orbit of the earth lasted 1 hour 48 minutes, and took him on an elliptical path that reached a maximum height of 327 km.
- March 11: **Douglas Adams** (1952): author of works including *The Hitch Hiker's Guide to the Galaxy* trilogy in five parts, the Dirk Gently novels, the dictionary-of-sorts *The Meaning of Liff*, a few *Dr Who* episodes, and a heap of other stuff.
- March 14: **Albert Einstein** (1879): German-born physicist, best known as the creator of the special and general theories of relativity. His Nobel Prize, however, was for neither—it was awarded for his work on the photoelectric effect, which was an important step towards the new world view of quantum mechanics.

- March 17: **William Gibson** (1948): father of cyber-fiction, best known for his novel *Neuromancer*.
- March 22: **William Shatner** (1931): played Captain James T. Kirk in the original Star Trek series.
- March 26: **Leonard Nimoy** (1931): played the Spock in the original Star Trek series.
- March 27: **Wilhelm Roentgen** (1845): Discoverer of X-Rays, and recipient of the first Nobel prize in physics. In some languages, X-Rays are known as Roentgen rays in his honour.
- March 31: **René Descartes** (1596): French philosopher, scientist, and mathematician, sometimes called the father of modern philosophy. Descartes attempted to apply the rational inductive methods of science, and particularly of mathematics, to philosophy. Amongst his works are essays on geometry, optics and meteors. He was the first person to use the last letters of the alphabet (x,y,z) to designate unknown quantities, and the first letters (a,b,c) to designate known ones. He also invented the method of indices (as in x^2) to express powers of numbers.
- April 1: **Anne McCaffrey** (1926): Fantasy writer
- April 3: **Jane Goodall** (1934): British authority on wild chimpanzees. At the age of 23 she traveled to Kenya and met palaeontologist Louis Leakey, who assigned her to study chimpanzees in Tanzania's Gombe National Park. She discovered that chimpanzees, previously thought to be vegetarian, ate meat, and that they were capable of tool usage, planning and intelligence. She also observed chimps expressing awe, waging warfare, and using medicinal plants to cure illness. Her emphasis on individual animals, whom she named instead of numbered, revolutionised primatology.
- April 25: **Guglielmo Marconi** (1874): Italian electrical engineer and Nobel laureate, known as the inventor of the first practical radio-signalling system.
- April 26: **A. E. Van Vogt** (1912): Science Fiction writer.



Women in Astronomy

Part II: The Light at the End of the Dark Ages



The story so far: in ancient Greece it seemed like chicks were being given a pretty fair deal in physics and maths, with many women welcomed into the inner intellectual circles of Pythagoras and Plato. But meanwhile an insidious subtext was brewing: mathematics and astronomy were linked with the 'male' realms of intellect and the heavens, whereas earthly 'female' concerns were considered imperfect and impure. Gradually women were seen as being unfit to practice, and it all culminated around 400 AD when the female mathematician and astronomer Hypatia was viciously killed by a mob of zealots. Were things to get better or worse in the following centuries? Read on and be shocked...

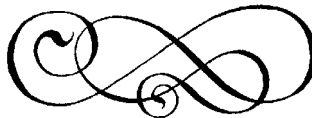
If the status of women in science sounds like it hit a low point at the time of Hypatia's murder, just wait until you hear about the twelve hundred years that were to follow. It is not a nice story.

Education was restricted to the clergy... and the church started carrying out everything in Latin, a code that excluded everyone else— particularly women.

The first bad step was that education was restricted to the clergy— and of course, the clergy was restricted to men. Barred from being able to learn directly, women had to hang around informal discussion groups to learn.

Then of course, the rules were changed again. The church started carrying out everything in Latin, which was basically a code that excluded everyone else— particularly women, who had no way of gaining an education in the language. Still, interested women found ways of educating themselves by being tutored by fathers or husbands.

And then in the 13th century, this final avenue was taken away when the clergy were forbidden from marrying. It wasn't until the renaissance in the 17th century that the ancient philosophies of scientific learning were rediscovered, and women started in dribs and drabs to once more participate in astronomy— the light was finally seen at the end of the Dark Ages.



Around 1600, women were still not allowed to study at any institution, so most female astronomers at that time were taught by husbands, fathers or brothers. This was the case with **Sophie Brahe**, the sister of the famous astronomer Tycho (the guy who had a fake nose made of silver after getting his real one cut off in a duel), who helped her brother make observations and catalogue data in his observatory Uraniborg. It was also the case with **Maria Cunitz**, who is sometimes known as the second Hypatia in recognition of the work she did in astronomy and teaching. Maria was educated by her father and went on to pursue a passion for astronomy. Her main work was constructing a set of tables for calculating the positions of planets, which were eventually published in the book *Urania Propitia* (1650). This book also served as an introductory text to astronomy which was written to be easily understandable by the everyday person. However, few people could accept the strange notion of a woman writing a text, and refused to believe it was her own work. In later editions of the book, her husband had to insert a preface confirming that Maria had indeed written it, and that he had had no part.

Few people could accept the strange notion of a woman writing a text... her husband had to insert a preface confirming that Maria had indeed authored it.

Elisabetha Koopman (1647-1693) learned about astronomy from her husband Johannes Hevelius, whom she married when she was 16. She worked as her husband's assistant in their observatory for ten years, during which time she compiled a star catalogue. After he died, she carried on with the work alone, and ended up publishing the largest catalogue to that date. Another successful female astronomer, taught by her father, was **Maria Eimmart** (1676–1707) who was an expert at making accurate astronomical drawings. In the 1690s she produced 250 detailed drawings of the phases of the moon, which were crucial in constructing lunar maps.

In contrast to both Kirch and Tycho Brahe, the careers of both of which were launched by discoveries of comets, credit was ultimately denied to Winkelmann because she was a woman.

Maria Winkelmann (1670–1720) was one of the most outstanding female astronomers in the 17th century, but her story also shows the prejudices which still existed. Like Cunitz and Hypatia, she was educated by her father. She received additional tutoring from a local astronomer, and also eventually married an astronomer. When her husband Gottfried Kirch was appointed to the position of astronomer to the Berlin Academy of Sciences, she worked constantly at his side in the observatory for the ten years until his death. One of the tasks she was in charge of, was producing the official calendar of the German lands. One night at the observatory, scanning the skies through a telescope, she discovered an object which she iden-

tified as a comet – a rare and exciting phenomenon at that time. She woke her husband, who sent a telegram informing the King of the news. Of course, all credit was given not to Winkelmann but to her husband—and what’s more, only after several years did he own up and acknowledge that it was actually his wife’s discovery! In contrast to both Kirch and Tycho Brahe, the careers of both of which were launched by discoveries of comets, credit was ultimately denied to Winkelmann because she was a woman.

After her husband died, Winkelmann wasn’t even offered the vacant position of academy astronomer, even though she had effectively been working in the position for the previous decade. She was not even allowed to continue on as the calendar maker. The academy secretary Johann Jablonski wrote: “Already during her husband’s lifetime the society was burdened with ridicule because its calendar was prepared by a woman. If she were now to be kept on in such a capacity, mouths would gape even wider.”

Cases such as Winkelmann’s show us that even though women were not allowed to gain formal educations, they still managed to learn through their fathers or husbands, and made several significant contributions to astronomy. As science writer Margaret Wertheim puts it, “for if Ginger Rogers had to do everything Fred Astaire did but backward and in high heels, these women had to do everything their male colleagues did but they may as well have been doing it backwards, in high heels, blindfolded, and up a steep slope.”

Nicole calculated the return of Halley’s Comet, and figured out how the gravitational effects of the planets would influence its path.

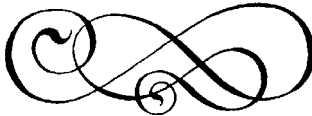
Thankfully, the slope became less steep in the 18th and 19th centuries. **Nicole de la Briere Lepaute** (1723–1788) worked with the mathematician Alexis Clairaut, and calculated the return of Halley’s Comet, taking into account the gravitational effects of planets in the solar system. She also published an article about the impending solar eclipse in 1764, presenting her calculations as well as a map of the eclipse’s extent in fifteen-minute intervals across Europe.

The most notable female astronomer of this era, however, was **Caroline Herschel** (1750–1848), the sister of William Herschel, the man who discovered Uranus. She followed her brother wherever his astronomy took him, and took on routine jobs for him such as polishing lenses and copying data. Soon, though, she started taking observations of her own, and after her brother bought her a telescope as a present, she developed an expert knowledge of the heavens, and discovered eight comets and three nebulae. For this, she was presented with a Gold Medal from the

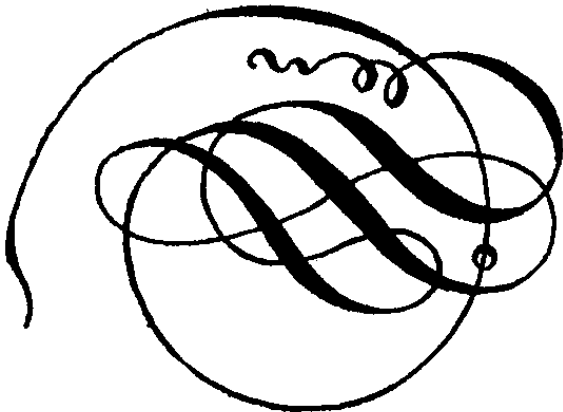
“Already during her husband’s lifetime the society was burdened with ridicule because its calendar was prepared by a woman. If she were now to be kept on in such a capacity, mouths would gape even wider.”

Royal Astronomical Society in 1828. James South, who presented the award, acknowledged Caroline's contribution to her brother's success when he remarked that "she it was who arranged everything in a systematic order; and she it was who helped him to obtain an imperishable name." At last a female astronomer was rewarded with formal recognition of her work.

There are many notable female astronomers of the early 20th century, including **Cecelia Helena Payne-Gaposchkin** (1900–1979), the first astronomer to measure, amongst other things, the chemical makeup of a star by analysing its light. She joined the Harvard University Observatory in 1923, at a time when women at universities were still oddities, and went on to gain recognition of the sort that Winkelmann, 200 years earlier, could only have dreamed of. The Harvard team of **Williamina Fleming** and **Antonia Maury**, and **Annie Jump Cannon** also did amazing work: together they produced the *Henry Draper Catalogue*, one of the most well-known contributions by women to early 20th century astronomy. Published between 1918 and 1924, the catalogue listed and classified 225,300 individual stars.



Nowadays women who want to study astronomy have it a lot easier than ever before. Many are achieving great recognition— and there's even role models on TV, from Ellie Arroway in *Contact* to kickarse astrophysics chicks zappin' aliens and saving the universe on *Star Trek*. But so saying, is everything really perfectly rosy and equal? Are we *there* yet? What about the Spacelab II researcher whose three-month-old baby was accused of spying when she took it with her on a visit of a research laboratory in Washington? What about the women who, as recently as 1990, spoke up about 'a consistent failure to appoint women to permanent research leader posts'? Why *does* Seven of Nine have to wear a catsuit in the Voyager astrophysics lab? And why does all this matter anyway? Read Part III in the next issue of **nerdling**, for the conclusion to the tale of Women in Astronomy.



These Scientific Journals Actually Exist

There's a journal for just about anything. There's a journal for parapsychology and a journal for parasitology. There's one for Peace Science and one for Police science. There's journals on Sex, journals on Drugs, journals on Rock & Roll. Journals on things you have never heard of before and other things you can't pronounce anyway. There's even one journal that exists to make fun of all the other journals. See if you can pick it from the list of classic journals below, assembled for your browsing pleasure.

Adhesives Age	Journal of Happiness Studies
Advances in Biology of Skin	Journal of Hard Materials
Advances in Mental Retardation	Journal of Health Care for the Poor and Underserved
Advances in Taxation	Journal of Irreproducible Results
Annals of Leisure Research	Journal of Laboratory Animals
Apparent Places of the Fundamental Stars	Journal of Lie Theory
Applied Clay Science	Journal of Light Metals
Applied Soft Computing	Journal of Moral Education
Archaeoastronomy	Journal of Nursing Jocularly
Archives Of Otolaryngology	Journal of Opinion
Australian Concrete Construction	Journal of Peasant Studies
Computers and Fluids	Journal of Popular Culture
European Journal of Pain	Journal of Psychosomatic Research
Gut	Journal of Recreational Mathematics
Heart Failure Reviews	Journal of Sex Research
International Journal of Intensive Short-Term Dynamic Psychotherapy	Journal of the History of Ideas
Journal of Altered States of Consciousness	Journal of the Less Common Metals
Journal of Applied Recreation Research	Journal of the New Alchemists
Journal of Band Research	Journal Of The Reticuloendothelial Society
Journal of Black Psychology	Journal of the Society for Gynaecological Investigation
Journal of Cereal Science	Reproduction in Domestic Animals
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Featured Sci-Fi Book of the Month: Italo Calvino's *Cosmicomics*

It's closer to poetry and mythology than your average sci-fi by William Gibson or Isaac Asimov. But it does just what a classic work of science fiction ought to do—and that's to start in the realm of scientific fact and, by extrapolation, take us to a place that fills our heads with ideas and makes us question our preconceptions about the universe. And this collection of short stories has something else going for it: it's refreshingly original and as easy to digest as a big mug of honey milk.

The premises of Calvino's stories are left murky at best (for example, the existence of the main character Qwfwq throughout the history of the universe, from the pre-big-bang singularity to a metropolitan train station) but this is calculated to add the myth-like richness and undercurrent of wry humour. And along the way, Qwfwq explores the repercussions of general and special relativity, the concept of the deterministic universe, the theories of the expanding and steady-state universes and more.

And despite all that, it's worth reading just to find out Calvino's explanation for how a noodle-dough-kneading woman called Mrs Ph(i)nk₀ was responsible for the Big Bang. Read it; it'll be good for you.

At one time, according to Sir George H. Darwin, the Moon was very close to the Earth. Then the tides gradually pushed her far away: the tides that the Moon herself causes in the Earth's waters, where the Earth slowly loses energy.

How well I know!—old Qwfwq cried,—the rest of you can't remember, but I can. We had her on top of us all the time, that enormous Moon: when she was full—nights as bright as day, but with a butter-colored light—it looked as if she were going to crush us; when she was new, she rolled around the sky like a black umbrella blown by the wind; and when she was waxing, she came forward with her horns so low she seemed about to stick into the peak of a promontory and get caught there. But the whole business of the Moon's phases worked in a different way then: because the distances from the Sun were different, and the orbits, and the angle of something or other, I forget what; as for eclipses, with Earth and Moon stuck together the way they were, why, we had eclipses every minute: naturally, those two big monsters managed to put each other in the shade constantly, first one, then the other.

Orbit? Oh, elliptical, of course: for a while it would huddle against us and then it would take flight for a while. The tides, when the Moon swung closer, rose so high nobody could hold them back. There were nights when the Moon was full and very, very low, and the tide was so high that the Moon missed a ducking in the sea by a hair's-breadth; well, let's say a few yards anyway. Climb up on the Moon? Of course we did. All you had to do was row out to it in a boat and, when you were underneath, prop a ladder against her and scramble up.

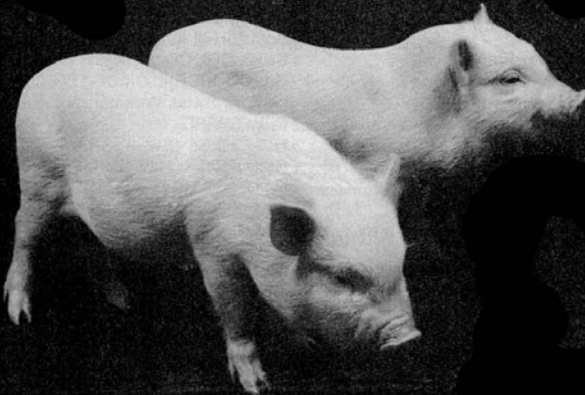
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No laboratory animals were experimented upon
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