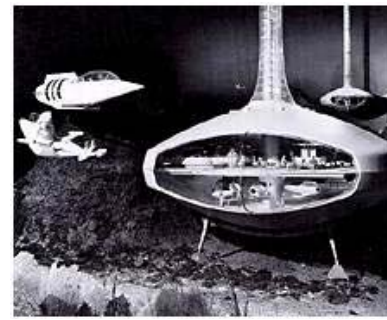
nerdling

Issue #1 March 2002

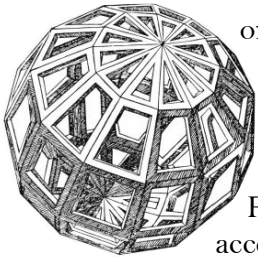
a zine of physics, maths and sci-fi

Welcome to the first edition of **nerdling**: a zine aimed at people who **love** science, people who **hate** it, people who are **studying** it coz they have to, people who have ever watched a doco on **space** and gone 'whoa', **closet nerds**, or people who just thought **'Back to the Future'** was a kickarse movie.

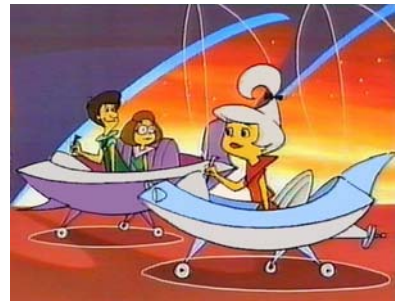
nerdling thinks that people are taking science too seriously nowadays. Sure, science has the potential to create biological weapons, nuclear weapons, conventional weapons, electromagnetic pulse weapons and huge space lasers to shoot you down out of the sky, but it can also be used to make some damn funny b-grade science fiction movies and a whole lot of wacky inventions like the smell-o-vision. Let's face it, people in the real world won't care a rat's about the quantum computer until they can buy one from Harvey Norman. But a lot of them wish some scientist would hurry up and invent that teethbrushing-hairdoing-washing-dressing machine that George Jetson steps into every morning.



nerdling also thinks it's time scientists and mathematicians remembered it's their god-given right to grow mad white hair, wear mismatched clothes and run around the lab shouting 'Great Scott!' in a German accent. Enough of these dud 21st century 'role models' like Paul 'Lego Man Hairstyle' Davies or ABC's Graham 'I Articulate My Words Nicely' Phillips. We want to be given more role models like Bill Murray



off Ghostbusters. Emmett Brown off Back to the Future. The cool Doctor Who with the big scarf. People with prrrrsonality. People who make particle accelerators in their garages and blow all the fuses in their house. That sort of thing.



In any case, there is a shitload of people out there who are getting the science fiction thing right. Sci-fi is meant to be about *ideas*—you know that feeling you get when you read something so original, but yet so true, that you feel somehow you've know it forever anyway? A few of my friends felt like that after they watched the Matrix for the first time. In this issue of **nerdling** you will find a few personal votes for science fiction no self-respecting scientist should miss. But I want your votes, too. Tell me your favourite author, book, short story, pop culture sci-fi hero, physics equation, textbook, whatever. Um, I will even go so far as to say you can tell me your favourite episode of Star Trek. The email address is at the bottom of the page.

nerdling is also after submissions. If you've just worked out a brilliant solution to the four-colour map problem, built an atomic bomb using household items, written a sci-fi story or reviewed one, or just want to gripe about whatever, send it **nerdling**'s way.

The editor

ubernerdling@yahoo.com.au

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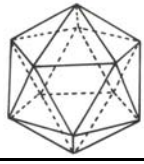
The young nerdling in his natural environment.

Tips For Surviving Your Maths/Physics Degree

#1: How to keep sane during boring lectures

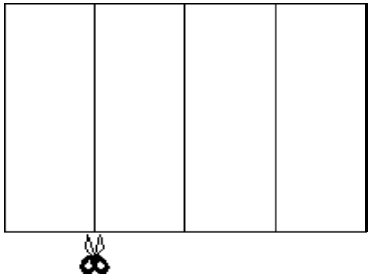
(or:)

Fold an Icosahedron from your Lecture Notes



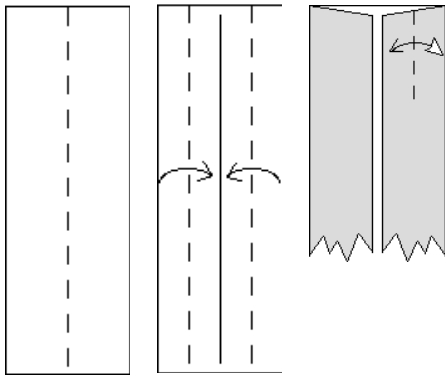
You will need: several sheets of paper; scissors

1. Take one of your A4 lecture notes. Fold it in half widthways, and then in half again. Open it out and cut along the creases.

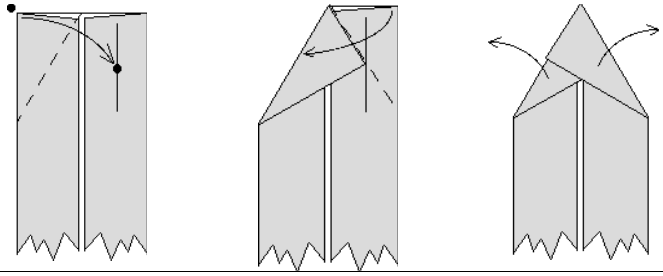


Super nerd factoid: each strip now has the dimensions 1:√2/4. Cool huh.

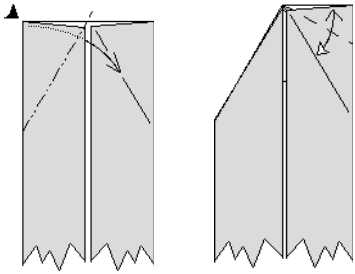
2. Take one of the strips and crease it down the middle. Then fold the sides to the center line. The right-most picture shows a close-up of the top end. Fold the right flap to the side, **only** making a pinch! This crease will be needed for the next step.

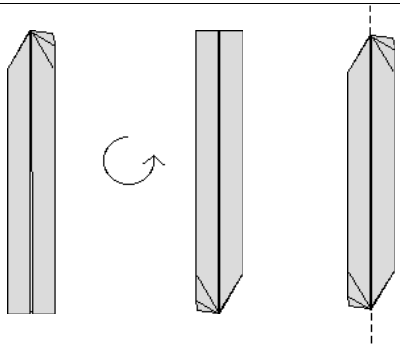


3. Fold the upper-left corner to this crease line, **making sure** that the crease hits the midpoint of the top edge, as shown in the left-most picture. Then fold the upper-right corner over this flap, and unfold these flaps.



4. Now **reverse fold** the upper-left corner, using the crease that we just made. The reversed flap should go inside the model. Then (right-hand picture) fold and unfold the top edge of the right side to the existing crease line.





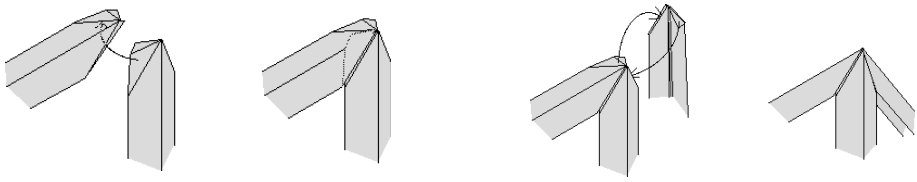
5. One end is now finished. Rotate the model 180 degrees and repeat this process on the other end. Lastly, crease the unit down the middle. You have now completed one unit.

pto for assembly instructions ⇨

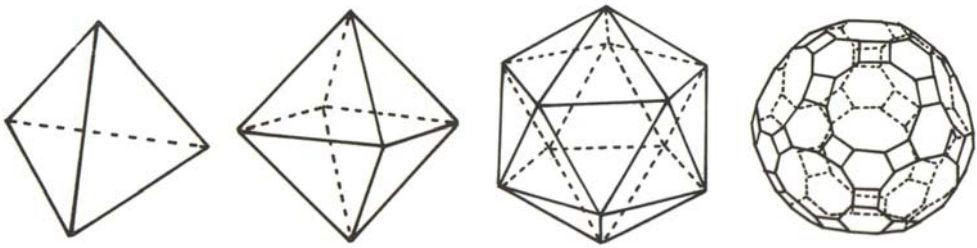
6. How to interlock the bits.

The end of each unit has a flap on one side and a pocket on the other. Insert the flap of one unit into the pocket of another as shown on the left. The second picture shows the result. The x-ray view effect allows you to see exactly how the flap needs to hook around the crease. This makes a strong lock.

An apex can be constructed from 3 (shown on the right), 4 or 5 pieces.



7. See if you can make the following shapes:



tetrahedron (6 units)

octahedron (12 units)

icosahedron (30 units)

rhombitruncated-icosidodecahedron

(Hint: one of the above is not possible using this folding design.)

poem

●

Space being(don't forget to remember)Curved
(and that reminds me who said o yes Frost
Something there is which isn't fond of walls)

an electromagnetic(now I've lost
the)Einstein expanded Newton's law preserved
conTinuum(but we read that beFore)

of Course life being just a Reflex you
know since Everything is Relative or

to sum it All Up god being Dead(not to

mention inTerred)
LONG LIVE that Upwardlooking
Serene Illustrious and Beatific
Lord of Creation,MAN:
at a least crooking
of Whose compassionate digit,earth's most terrific

quadruped swoons into billiardBalls!

e e cummings

The Rimmer and Lister Awards

For Good and Bad Sci-Fi

March 2002

A Lister Award just for trying really hard, goes to the doco on Space hosted by Sam Neill on the ABC the other week. They interview a scientist who is standing next to an ICBM with a h-bomb payload, and he looks orgiastic and says, "In the instant this bomb goes off, the power unleashed would be so great that atoms would fuse together to form many heavier elements. So you see, the h-bomb is actually the most powerful *creative* force on the planet." Yeah.

A Rimmer Award to the new Star Trek series ***Enterprise*** for the totally sucky theme music. Come on, Captain Kirk would have thrown up in his two-minute space noodles if he'd been forced to listen to that sort of drivelling crap. "I've got faith / Faith of the heart" ??? As theme music for a galaxy full of *gagh*-eating Klingons etc? Baaaad choice.

A Lister Award to the publisher Millenium for their lervely sci-fi series ***SF Masterworks*.** It's about time you could walk into a bookshop and see some genuine sci-fi on the shelves, not just all that fantasy crap. Problem: they're about 18 bucks each. I only have $10 in the bank at the moment. Must ration.

A Rimmer Award to a recent episode of ***The Invisible Man*** for this scene:
Hot blonde girl who's meant to have invented quantum computer: 'You know quantum mechanics, right?'
Man: 'Quantum what?'
Girl: Quantum mechanics. It says that space and time are linked together and nothing can travel faster than the speed of light.'

However, in 1897 the General Assembly of Indiana passed a Bill ruling that the value of Pi was four.

quotes

"It had nothing to with science and experiments," he explains. "Both were absolutely personal cases." *- an anonymous Russian cosmonaut , when asked whether anyone had sex during his mission.*

Nature is not so simple for us to be able to put it in order by such elementary concepts as the numbers five and ten.

- Koji Miyazaki making a really insightful point in 'An Adventure in Multidimensional Space'

ONE POINT TWENTY-ONE JIGAWATTS!!
-Christopher Lloyd in *Back to the Future* proving he's not really a scientist in real life.

'I can accept the theory of relativity as little as I can accept the existence of atoms and other such dogmas' – Ernst Mach (1838–1916), professor of physics at the University of Vienna.

The more important fundamental laws and facts of physical science have all been discovered, and these are now so firmly established that the possibility of their ever being supplanted in consequence of new discoveries is exceedingly remote. Our future discoveries must be looked for in the sixth place of decimals.

ALBERT MICHELSON (1899)
American physicist

Back off man, I'm a scientist!
-Bill Murray, *Ghostbusters*

"By the year 2000, people will work no more than four days a week...in an annual working period of 147 days and 218 days off."
-New York Times, date unfortunately unknown

"Before man reaches the moon, mail will be delivered within hours from New York to California, to Britain, to India or Australia by guided missiles." - Postmaster General Arthur E. Summerfield, 1959

D.I.Y. HIGH-ENERGY PHYSICS

nerdling's North America correspondent **Rob Burgess** talks about doing dangerous stuff in your very own garage.

Garage Science Philosophy

I've taken up high voltage experiments as a hobby, having recently lost interest in robotics, pirate radio and vacuum tube radios. Having received my undergraduate degree in physics, I can probably give you a fairly good explanation of how an inductor and even a transformer work, and probably end up talking about how spectacular Maxwell's equations are. However, give me a bunch of resistors and stuff and assemble them with a circuit diagram, it will take me days to figure out what goes where, I will burn myself with the soldering iron, kill some transistor with heat or static, and in the end, nothing will work. But things are different with high voltage stuff, for the following reasons:

- **High voltage stuff is big** - big heavy transformers, big ceramic insulators, big old four gauge bare copper wire. Sure there's a few prissy integrated circuits, but there's also capacitors the size of plates and tanks of water for resistors. There's a 'big science' feel to high voltage experiments, something we've lost in our microelectronic age.
- **High voltage stuff comes from junk** - old neon sign transformers, old TV fly back transformers, bits of PVC pipe, ignition coils from junkyard, and stuff from around the house like old wine bottles, motor oils. I'm not some recycling nut, I just like to be able to make cool things out of things other people would just throw away.
- **High voltage is dangerous** - I admit there's something exciting about insanely intense electric fields setting up in your garage, about having to watch your apparatus from behind a metal screen 10 meters away, to risk your life to see plasma displays that few have ever seen. OK, maybe I'm getting carried away, but there's something to this.

My Jacob's Ladder

Opposite is my Jacob's Ladder. [It's one of those cool things that generates a huge moving spark between two vertical rods—Ed.] It works great and I love to show it off to guests or just watch it late at night. Here's how I did it...

Disclaimer: Every HV article I've seen so far has had some kind of disclaimer, so I don't want to break with tradition. Electricity can kill you. That should do it. Oh,

wait. It can kill your friends, too.

The Jacob's ladder is pretty straightforward, you need:

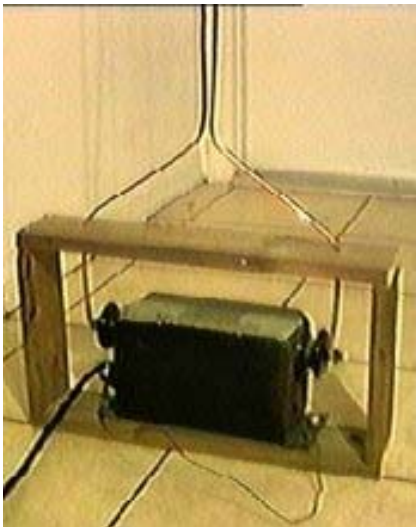
- a neon sign transformer (from a sign shop)
- heavy duty power cord (your favourite hardware store)
- heavy copper wire or copper tubing (I used 4 gauge copper wire, but it's a little bendy, if you're good at bending narrow copper pipes, that's probably the way to go.)
- something to make a box or frame to support the whole thing (of course, not metal), I used scrap wood.

The hard part is finding a good neon sign transformer. Essentially you want an older one and the highest voltage you can get. Apparently some newer ones have some kind of stepping circuit and they don't work very well.

Fortunately my wife is a great shopper and she called ten or so sign shops before she found one that had old ones, and ended up paying around $30. If it was me it would've cost more, but I had heard before that you could get them for 20 bucks, so there you go. I don't know the make of the transformer, it's pretty old. It has a piece of masking tape that says "Good 1/5/71", so it's been around awhile. According to the owner of the sign shop, it puts out 15kV.

After that, I simply used some scrap wood to make a frame to set it in and support the wires, and got a heavy duty electrical cord, and some four gauge bare copper wire to make the electrodes. The wire in front is a ground wire. That's all there is to it. The copper electrodes could probably use a little straightening.

For more info or to email me, you can visit my website at **www.bio.miami.edu/rob.**



theclubsandsocietiespage

the skeptics society

The Australian Skeptics Society's web page (www.skeptics.com.au) states their purpose as 'Investigating pseudo-science and the paranormal from a responsible scientific viewpoint'. If you're a person who loves to hate the horoscopes, who winces to see people pay money for bogus inventions, or if you've just always wondered "How *does* Uri Geller do it?" then the Skeptics may well be for you.

Their web site is well worth a look—but be warned, you will go there for five minutes and end up being there for an hour. Must-sees are the details of their $100,000 challenge (for the first person to demonstrate genuine paranormal powers in a controlled scientific environment), and possibly the best internet puzzle in the whole world, Dr Bob's quiz. You'll also find dozens and dozens of articles about what's rot and what's not: things from astrology to bug zappers are scrutinized and sometimes debunked by the ever-scientific eye of the Skeptics.

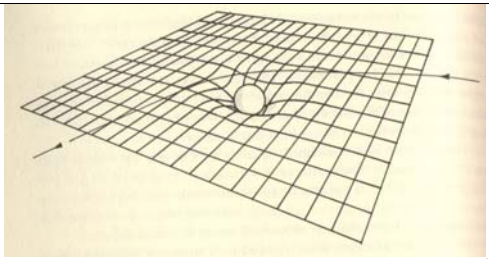
If the web site doesn't satisfy your hunger, head to Newcastle University's Auchmuty library, where you can find (hidden in the bowels of the orange stack: S133.805 1) issues of the magazine *The Skeptic* from 1995 to 1999. These are definitely worth a read—check out the most recent issue for the story of the bug-deterrent device *Pest-Free*, which is a classic tale of a company using pseudoscience to rip off the public in a big, big way. The library also has a copy of *Skeptical* (239 LAYC, in Auchmuty), a book put out by the Canberra branch of the organisation, which lists scientific appraisals of things like the Bermuda Triangle mystery.

Occasionally the Skeptics can go a bit overboard and take it all a bit too seriously—to the point where you feel you have to start defending Santa Claus. But any failings are definitely compensated for by Dr Bob.

nerdling gives the Skeptics a big thumbs up.

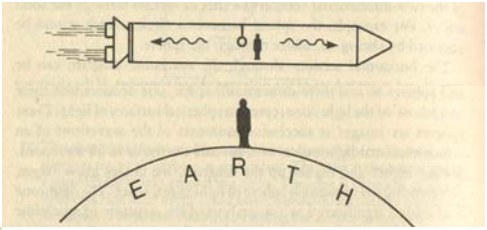
Reader Poll

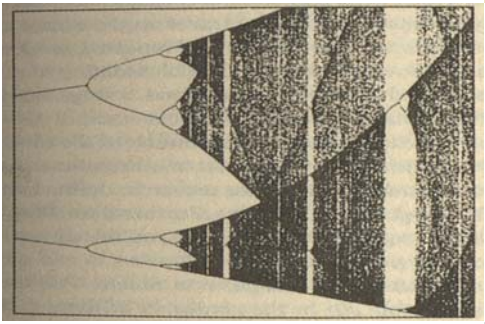
Which clichéd science image are you most sick of?



a) the 'imagine the sun is a ball sitting on a rubber sheet' analogy for general relativistic effects

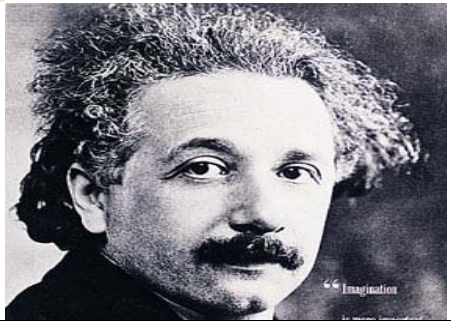
b) the 'Anne is on earth, Betty is in a rocket' analogy for special relativity





c) bifurcation diagrams (also includes any sort of fractals, especially the Mandelbrot set)

d) any picture of Einstein



Send your vote to: **ubernerdling@yahoo.com.au**

DUBIOUS SCIENCE OF THE MONTH

Astrology: The Science of the "Clueless Ancient Beings"

The following text is an annotated but unedited extract from the website 'Astronomy: The Ultimate Original Science' (http://www.the-ultimate.com/space/astro.htm). The passage is an introduction to the work of Jim D'Amato, said to give 'the most accurate weekly Astrology predictions anywhere'. Wow.

By choosing this text as 'Dubious Science of the Month', **nerdling** is not intending to imply that this is representative of astrologers as a whole. But we do intend to imply that big words (and big letters) can often be used to pray on people's gullibility and insecurities. If you read the passage and feel outraged, get in touch with like-minded people at the Skeptics Society (see the Clubs and Societies page elsewhere in this zine). But if you read it and laugh your head off: **nerdling** has found a kindred spirit.

ASTROLOGY dates from the first Human Consciousness.

ASTROLOGY is the original science.

ASTROLOGY is also the ultimate organizational tool.

Astrology developed because clueless ANCIENT beings needed a way or a scheme to better understand their surroundings. They also needed someway or something to give them insight about their FUTURE. What these ancients developed to help solve these dilemmas was a set of mathematical formula's, a system.

This Original Science, ASTROLOGY, beget all of the following; ASTRONOMY, GEOMETRY, MATHEMATICS and WEATHER PREDICTING; to name just a few of the world's current scientific disciplines.

No doubt,...Upon evolving awareness and/or consciousness, the first things Earth's early inhabitants noticed were: Days and Nights, then the phases of the MOON, also they had to see the SEASONS and the endless HEAVENS.

To those early humanoid beings living on planet Earth, Solar Eclipses must have been utterly terrifying. What could possibly cause the SUN [all light] to disappear at high-noon of a day and all of a sudden there be total darkness, night again? GOD

Then an hour or so later it's day again because the SUN comes back out. WHAT or WHO did that? A very powerful GOD?

ASTROLOGY has the answer and it's not GOD.

Lunar Eclipses must have been a little less terrifying and totally lightness New MOON night's only mildly scary to our ancient ancestors.

All Ancient civilizations studied "these" planetary and solar system events; i.e., Days and Nights, the phases of the MOON, the SEASONS , the HEAVENS AND ECLIPSES! All ancient cultures studied pure mathematical Astrology and drew-up Horoscopes.

PLUS THERE WERE 5 HEAVENLY MYSTERIES

There are 5 very mysterious "lights" [god-stars] in the night sky. This information is the oldest and most sacred of all ancient Gospels or Legends. Astrology was and is "Sacred Geometry". These 5 "living" God-STARS at times moved backward against the "night sky" [which was all the other stars in the background]. Sometimes 1 or even 2 of these God-STARS seemed to actually follow the SUN; when they would be seen daily just before Sunrise or after Sunset, then seem to totally disappear for months. Many ancient civilizations called these particular "living" God-STARS names like RA or Apollo. Some times a very sacred "red" God-STAR appeared near the SUN and/or with it just before Sunrise or after Sunset. Seeing the "red" GOD-STAR near the SUN meant war was coming to some ancients that studied ASTROLOGY.

HOW DID THESE EVENTS HAPPEN?

Today we know these 5 mysterious God-STARS are, "JUST"?, other planets in our own" [Astrology's-own] solar system. The Planets are; MERCURY, VENUS, MARS, JUPITER AND SATURN. These Planets are the only 5 planets that are visible from EARTH without a telescope. That means they can be seen by everybody. The brightest one is VENUS and the red one is MARS and Astrology was correct in using them for guidance.

The great mystery, why these GOD-STAR, PLANETS "seemed" to move backward is something called RETROGRADE motion. RETROGRADE motion is the "appearance of backward motion" against the star background. In the sciences of Astrology and its off-shoot Astronomy, RETROGRADE motion is "NOT" really the backward motion of a planet, just the appearance of same.

Appearances can be deceiving, ASTROLOGY is keenly aware of this fact.

RETROGRADE motion by definition happens because the planets in our solar system all have different periods, i.e. the time it takes them to revolve around the SUN. The Moon and Sun do not perform retrograde motion in ASTROLOGY or Astronomy.

HUMANS call a complete revolution of EARTH around the SUN a "year". An EARTH "year" is nothing more or less than the 360 degree circumnavigation of our home planet around "our" SUN. Actually planetary orbits are elliptical not circular. The inner planets, Mercury and Venus, move around the SUN faster than EARTH. The outer planets, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, "Y" and "Z", all move slower in their orbits around the SUN than EARTH. "Z" planet probably takes 900-1000 years to revolve around the SUN.

When EARTH passes an outer planet or When EARTH is passed by an inner planet, that heavenly body, Planet-star, "seems" to be moving backward against the other stars when it's being viewed from EARTH.

Sometimes when MERCURY and/or VENUS are near the SUN, they seem to rise or set with it [the SUN]; as well as sometimes moving backward, then forward, then backward again, in relation to the SUN as it's rising or setting.

ASTROLOGY Signs {12} are exactly 30 degrees of arc in that 360 degree circle.

ASTROLOGY uses all 12 planets in the Solar System, even the two as yet undiscovered ones. ASTROLOGY is EARTH centered.

ASTROLOGY is Geocentric geometry. ASTROLOGY considers the Sun and Moon to be planets. Ancient scientists, sages, medicine people, psychics, wise men and women, soothsayers, and spiritual leaders developed a MATHEMATICAL & GEOMETRIC system to help them explain their surroundings and deal with movements of the SUN, MOON, PLANETS, HEAVENS, people and of course, LIFE.

ASTROLOGY is set of abstract mathematical equations, therefore a duodecimal based mathematical system. ASTROLOGY, the 12 based number system, still functions very reliably today, ten's of thousands of years after it, ASTROLOGY, was developed.

ASTROLOGY has always worked. ASTROLOGY has been used by ancient cultures these many thousands of years because ASTROLOGY accurately predicted many things. ASTROLOGY is still used by many people Today, because ASTROLOGY still can accurately predict the "FUTURE".

THIS ANCIENT PURE ABSTRACT MATHEMATICAL FORMULA, the 12 based, duodecimal number system IS/WAS, ALWAYS HAS BEEN CALLED ASTROLOGY.

ASTROLOGY IS PURE MATHEMATICS

The Art of Scienc

Abstract, Introduction, Results, yadda yadda yadda. Writing a scientific report no
and write your next lab report as a play—Galileo did. Check out b

2000
TODAY

4.5 HERMITIAN OPERATORS

The average of an observable A for a system in the state $\psi(x, t)$ is given by (3.32). In Dirac notation this equation appears as (in one dimension)

$$\langle A \rangle = \int \psi^*(x, t)\hat{A}\psi(x, t)\, dx = \langle \psi | \hat{A}\psi \rangle \tag{4.47}$$

Since t is a fixed parameter in this equation, we may conclude that the formula gives the expectation of A at the time t.

Style: very structured, written (mostly) in the third person passive tense.
Advantages: an efficient way of recording lots and lots of complicated information. No unnecessary words. Precise language.
Disadvantages: Incredibly, painfully boring to read. Total lack of examples as to how it is relevant to the everyday world—you have to work that bit out for yourself. Gives the impression that no-one has discovered it, instead the science has just materialised out of nowhere. If you're not paying enough attention, you can read over a totally amazing, paradigm-shifting discovery without even realising it. Makes your friends think you must be really boring. Has the effect of making the most earth-shattering information sound like a dentist's drill.

1898
CURIE

We believe therefore that the substance which we have removed from pitchblende contains a metal not yet reported close to bismuth in its analytical properties. If the existence of this new metal is confirmed, we propose to call it polonium from the name of the country of origin of one of us.

M. Demarçay has been kind enough to examine the spectrum of the substance which we studied. He was not able to distinguish any characteristic line apart from those ascribable to impurities.

Style: Still very highly structured, can be considered modern except for the use of the first person, and the occasional acknowledgement of friends in the body of the text.
Advantages: concise, yet actually admits that real people made the discoveries.
Disadvantages: there's an art to not making it sound like you're boasting.

e: Report Writing

owadays is more of a formula than an art. Maybe you should break with tradition below for how scientific writing has changed throughout the ages.

1638
GALILEO

SAGR. My brain already reels. My mind, like a cloud momentarily illuminated by a lightning-flash, is for an instant filled with an unusual light, which now beckons to me and which now suddenly mingles and obscures strange, crude ideas. From what you have said it appears to me impossible to build two similar structures of the same material, but of different sizes and have them proportionately strong; and if this were so, it would not be possible to find two single poles made of the same wood which shall be alike in strength and resistance but unlike in size.

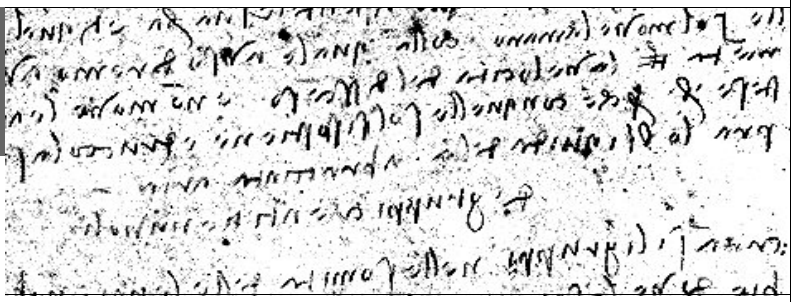
SALV. So it is, Sagredo.

Style: Galileo's "Dialogues concerning Two New Sciences" was a PLAY. Three guys get together to chat about physics, and in between presenting Galileo's discoveries and proofs, they express disbelief, doubt, confusion, patience, awe, excitement.

Advantages: humanises the science. Tonnes of practical examples given so you end up really understanding it thoroughly. Occasionally good for a laugh (cf. above passage). The dumb characters ask all the questions you're too afraid to ask in lectures.

Disadvantages: turns a single physics paper into a novel-length play. Non-linear structure, i.e. lots of digressions. Patience needed for occasional wordiness (cf. above passage).

1490
LEONARDO



Style: da Vinci wrote all his notes in left-handed mirror writing and often employed codes and ciphers to disguise his ideas further. Constantly refers to the fears of other people stealing or plagiarising his ideas.

Advantages: heaps of pictures, pictures are good. Esp. by da Vinci. The whole paranoia/ code thing makes for a good story.

Disadvantages: No-one can understand it. Good ideas lost forever. The fact that no-one realised what his uncollated notes were about, meant that they lay undiscovered for two centuries afterwards. Probably not a good way to report on your discoveries, all in all.

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