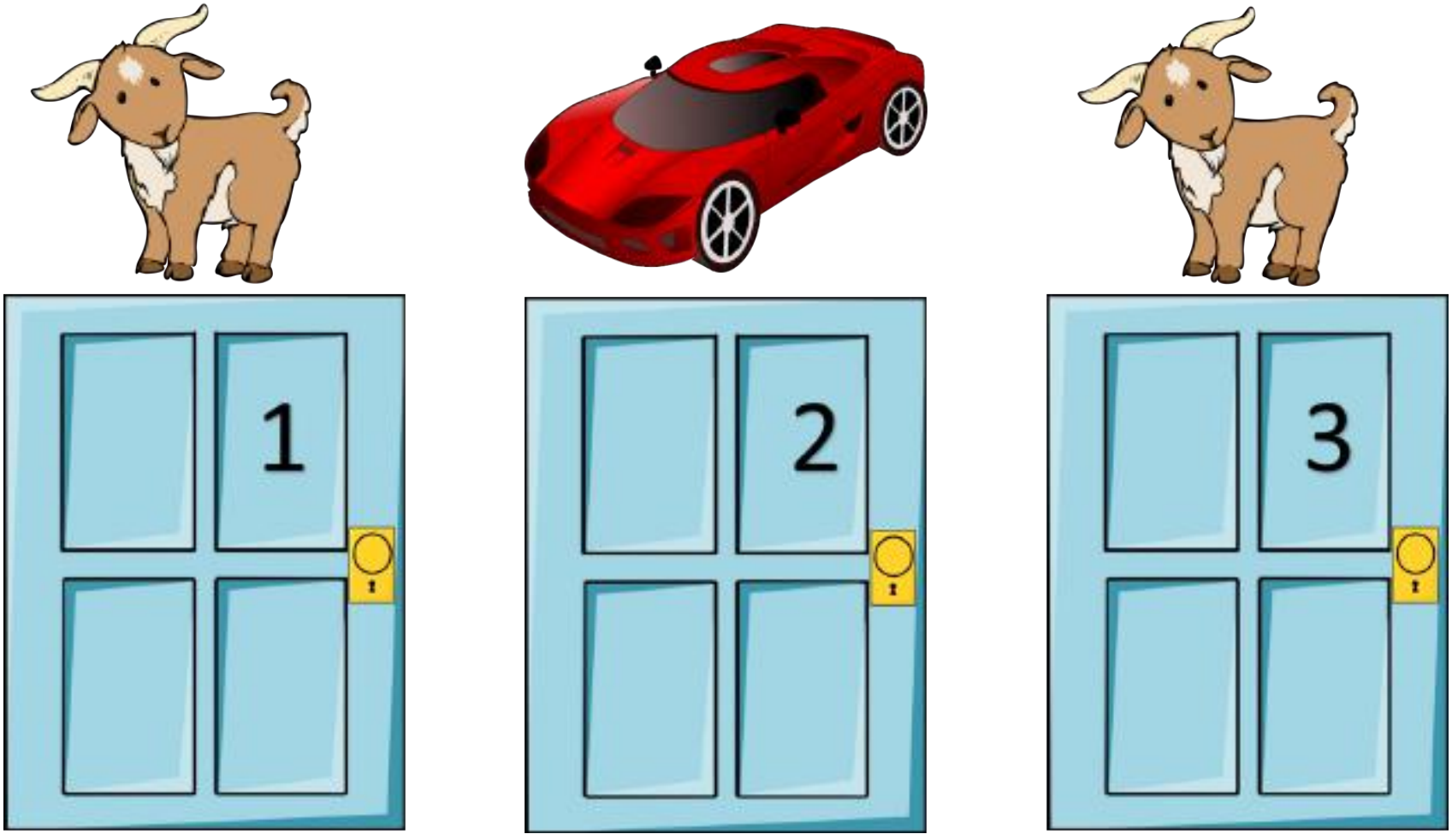
Hen fodelydd ystadegol

Philip Jonathan

Yr Henllys, Rhuthun

Tachwedd 2018

Gafr neu gar?



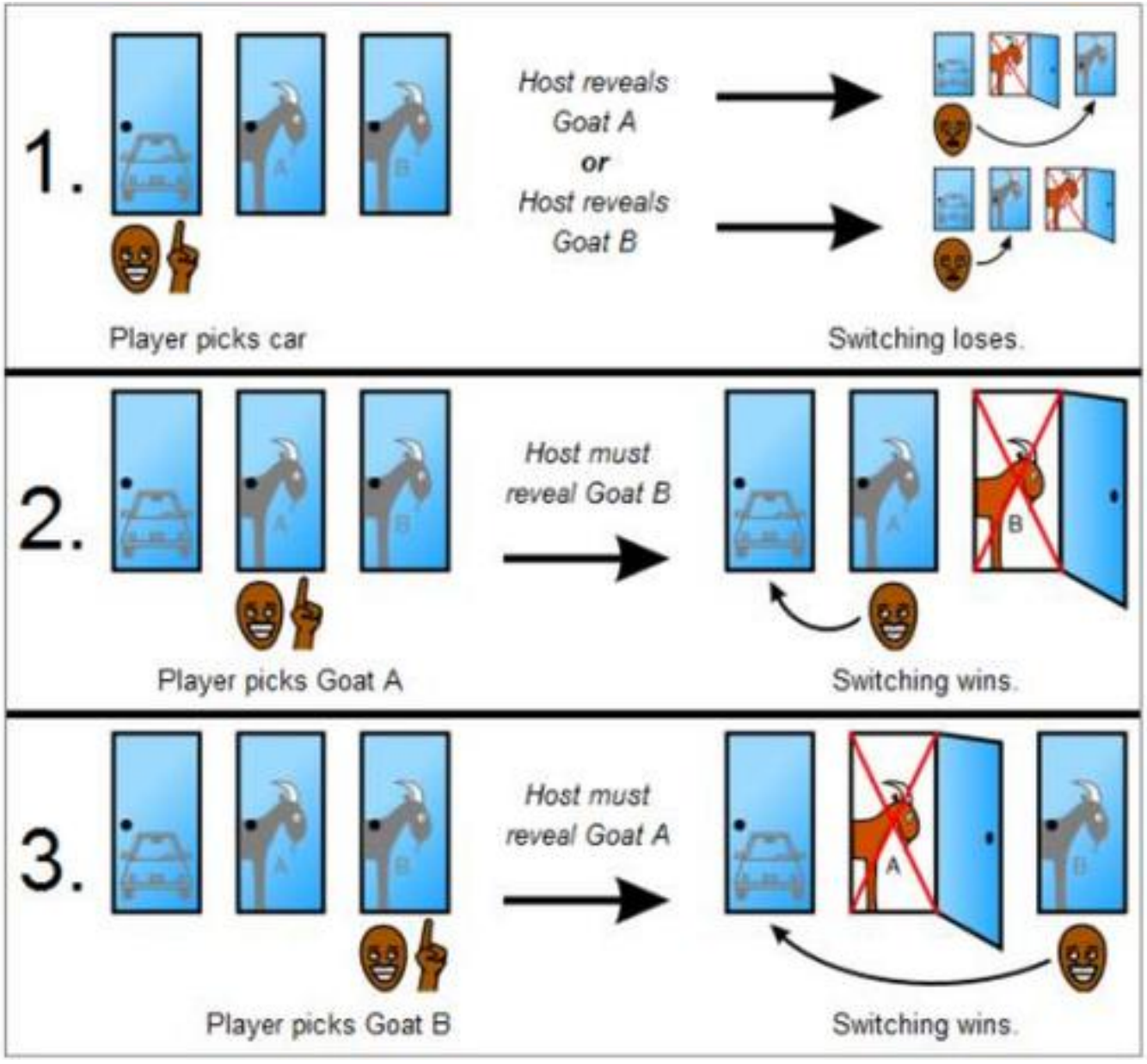
Gafr neu gar?

Dychmygwch ...

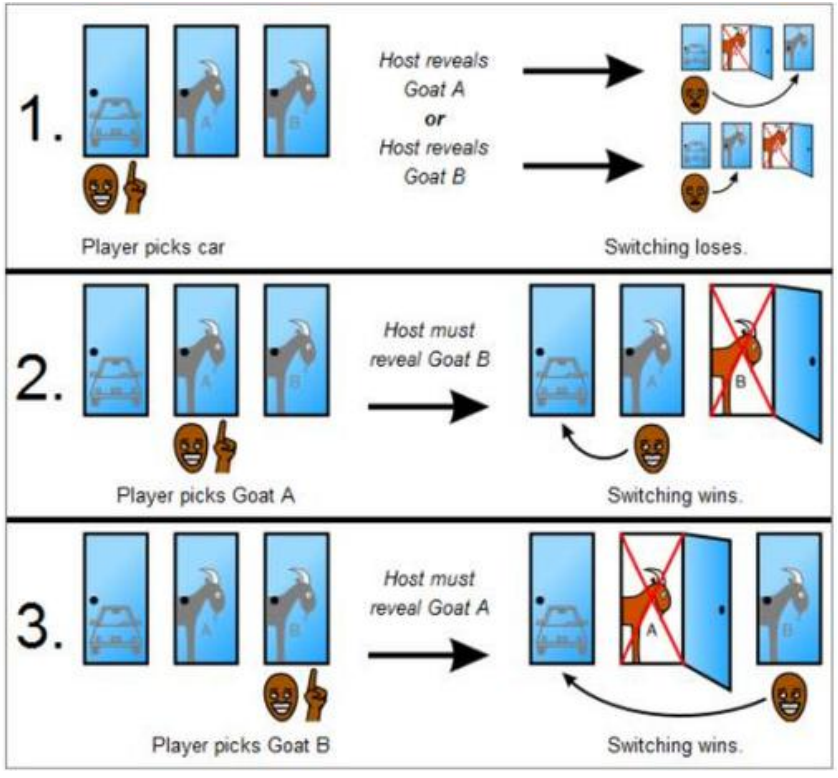
- 'Da chi mewn cwis teledu
- Ma' 'da chi ddewis o dri drws
- Tu ôl i un drws mae 'na gar ffansi (rhywbeth dymunol iawn!); tu ôl i'r ddau drws arall mae 'na afr (neu rhywbeth ych-a-fi!).
- 'Da chi'n dewis drws, ac yn rhoi rhif y drws i'r boi teledu
- Mae'r boi teledu yn agor un o'r ddau drws na ddewisoch sydd â gafr y tu ôl iddo
- Mae'r boi teledu'n gofyn **Ydych chi eisiau newid eich dewis?**

- Be' 'da chi'n gwneud? Ydi e o fantais i chi, i newid eich dewis?

Mae'n ymwneud â thebygolrwydd!



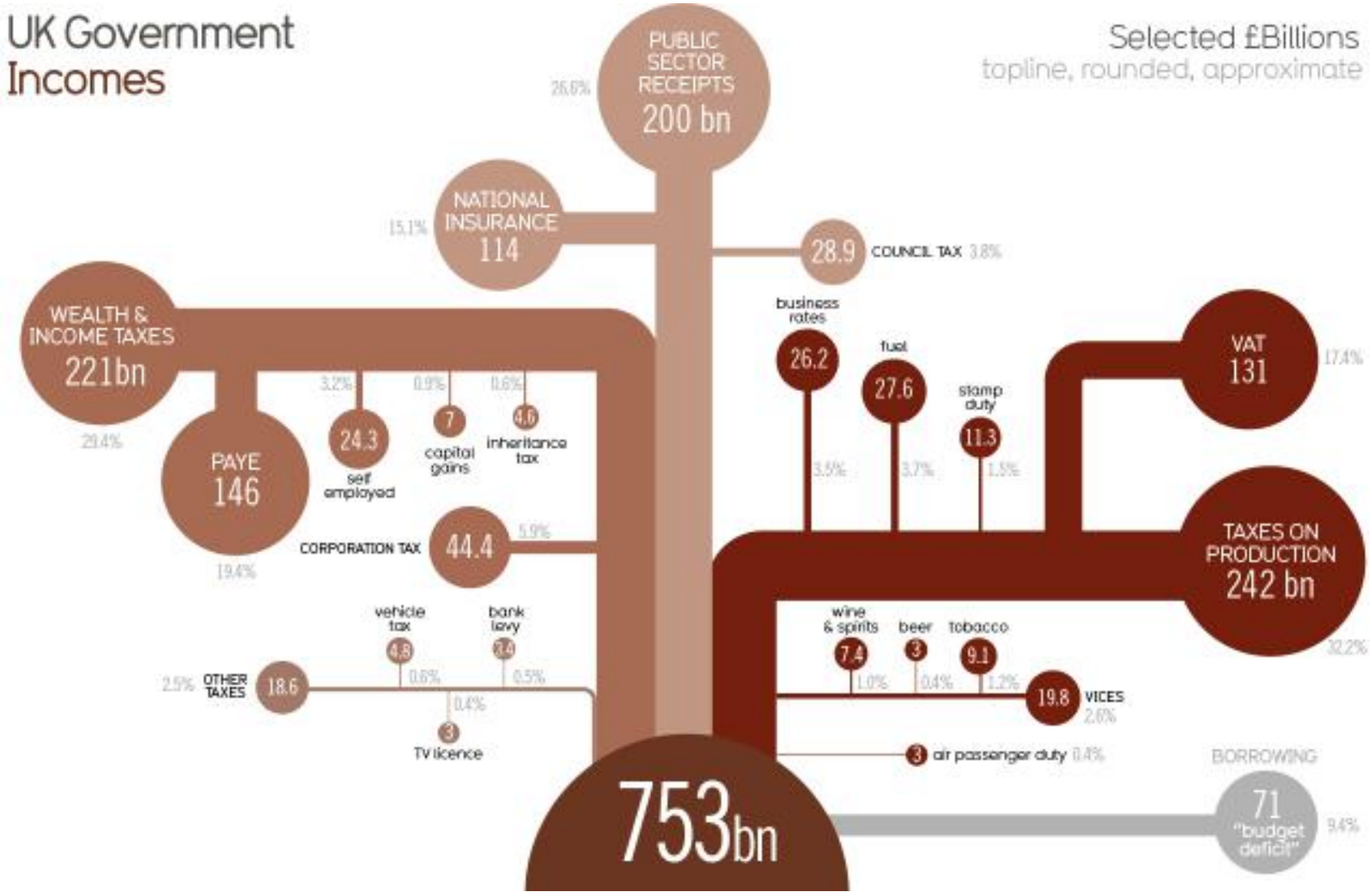
Mae'n ymwneud â thebygolrwydd!



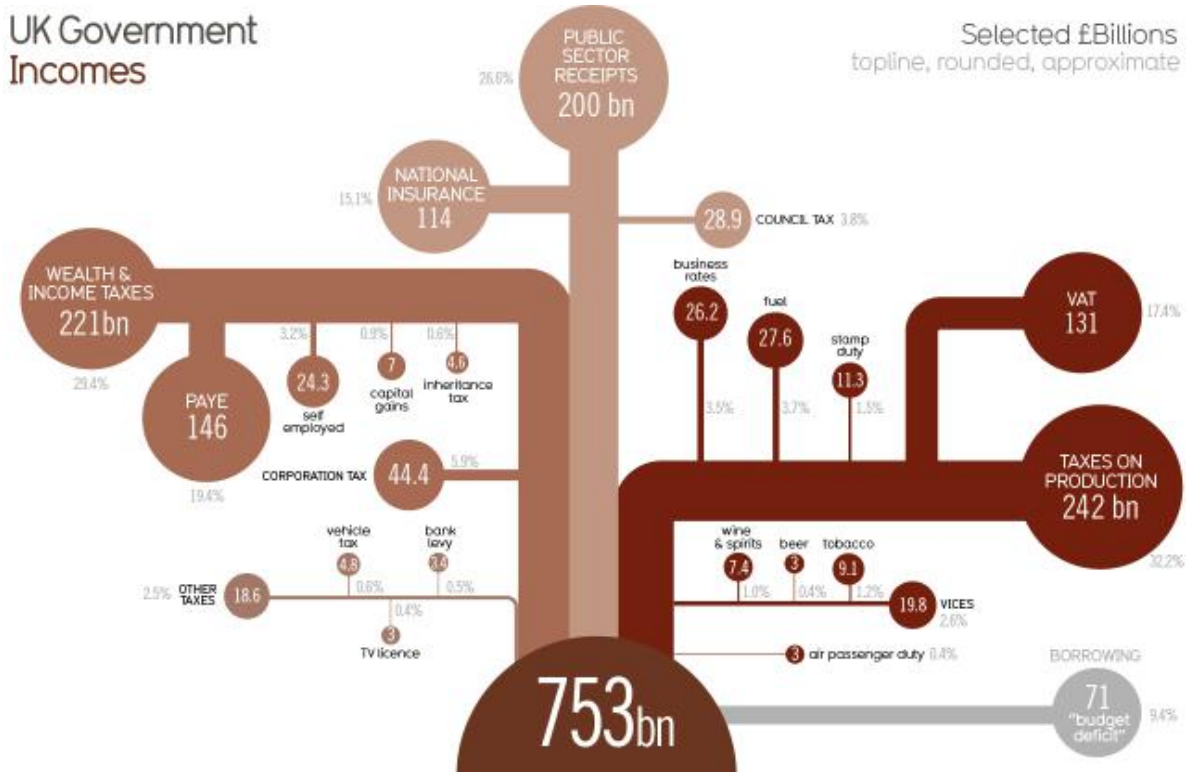
Weithiau, doethach newid meddwl

Gwŷr Brecsit, da chi, sylwch!

â darlunio


UK Government Incomes
Selected £Billions
topline, rounded, approximate
PUBLIC SECTOR RECEIPTS 200 bn
26.6%
NATIONAL INSURANCE 114
15.1%
28.9 COUNCIL TAX 3.8%
WEALTH & INCOME TAXES 221bn
29.4%
PAYE 146
19.4%
24.3 self employed
3.2%
7 capital gains
0.9%
4.6 inheritance tax
0.6%
CORPORATION TAX 44.4
5.9%
OTHER TAXES 18.6
2.5%
vehicle tax 4.8
0.6%
bank levy 3.4
0.5%
3 TV licence
0.4%
business rates 26.2
3.5%
fuel 27.6
3.7%
stamp duty 11.3
1.5%
VAT 131
17.4%
TAXES ON PRODUCTION 242 bn
32.2%
wine & spirits 7.4
1.0%
beer 3
0.4%
tobacco 9.1
1.2%
19.8 VICES
2.6%
3 air passenger duty 0.4%
753bn
BORROWING
71 "budget deficit"
9.4%

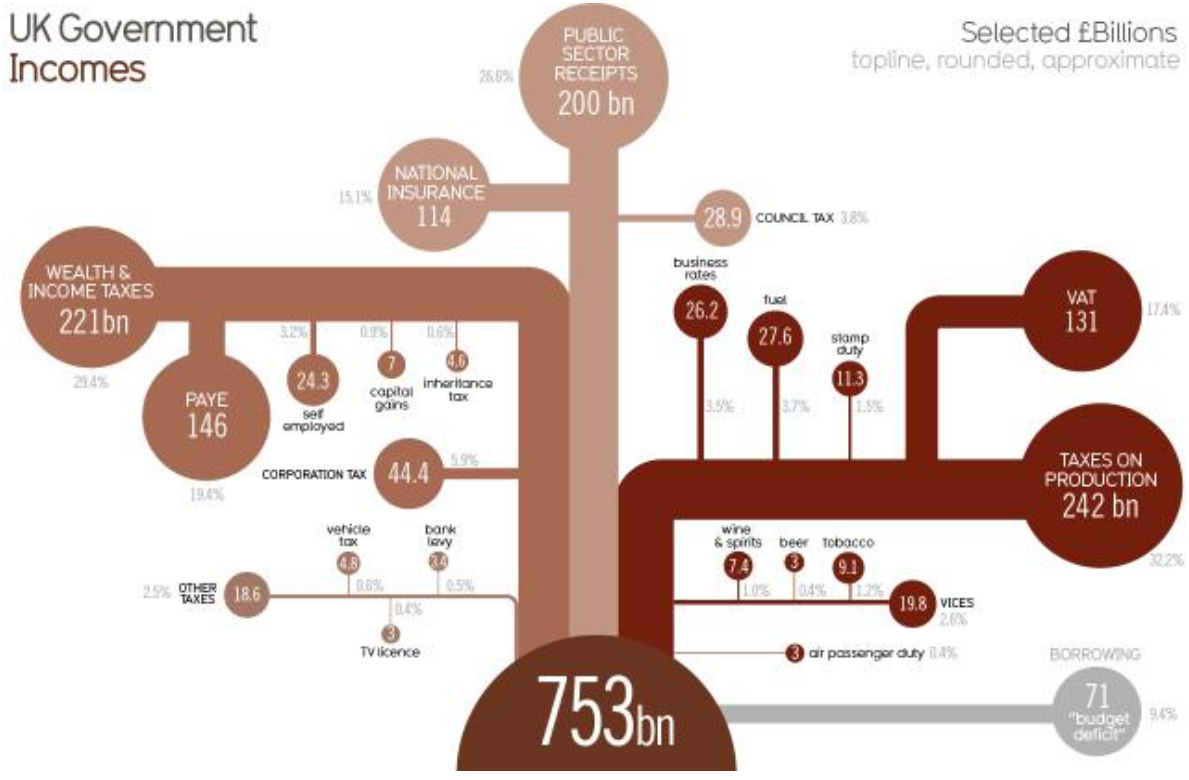
â darlunio



Amazon Apple Facebook Google Microsoft
BP Exxon Shell

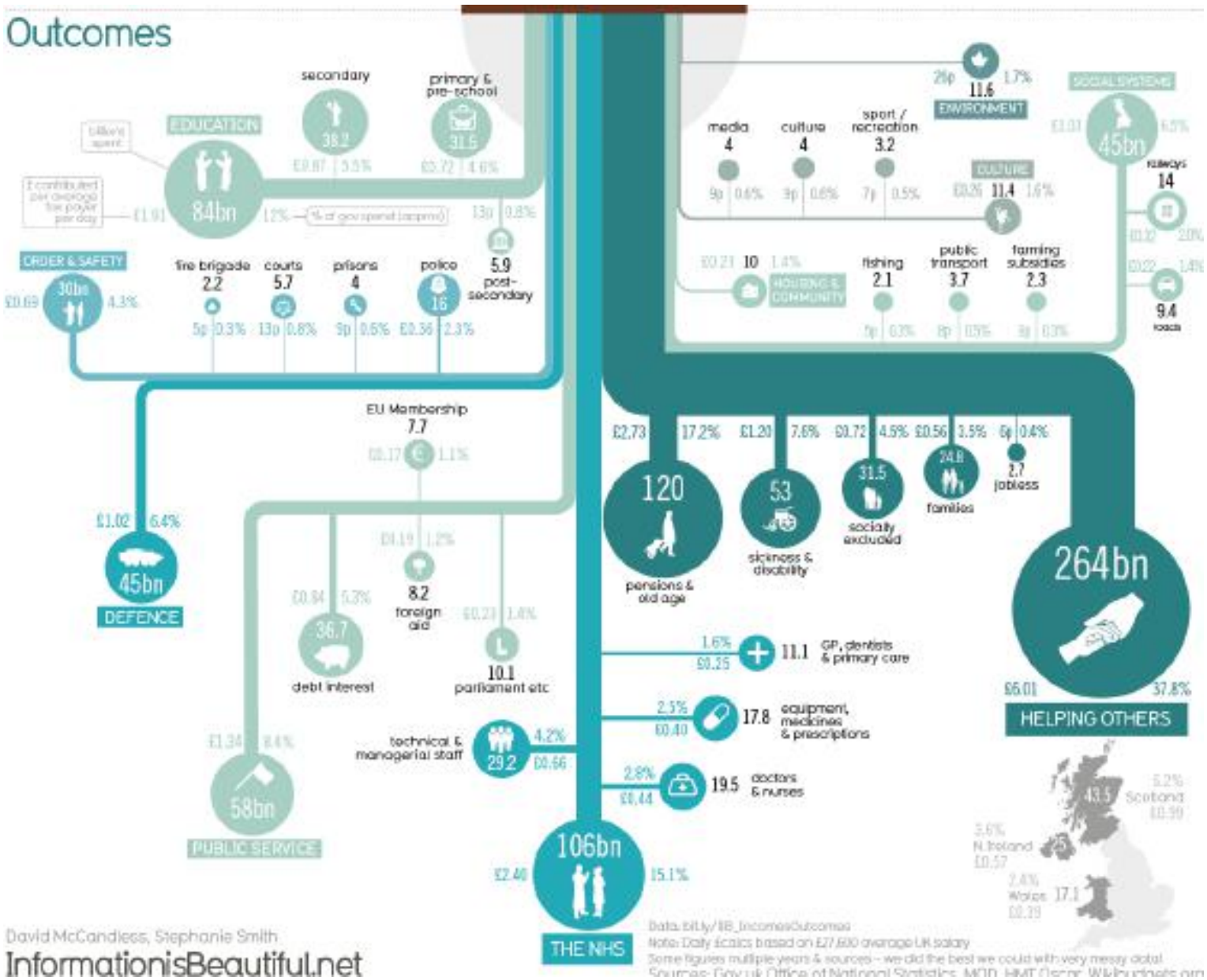
Beth yw maint rhain?

â darlunio

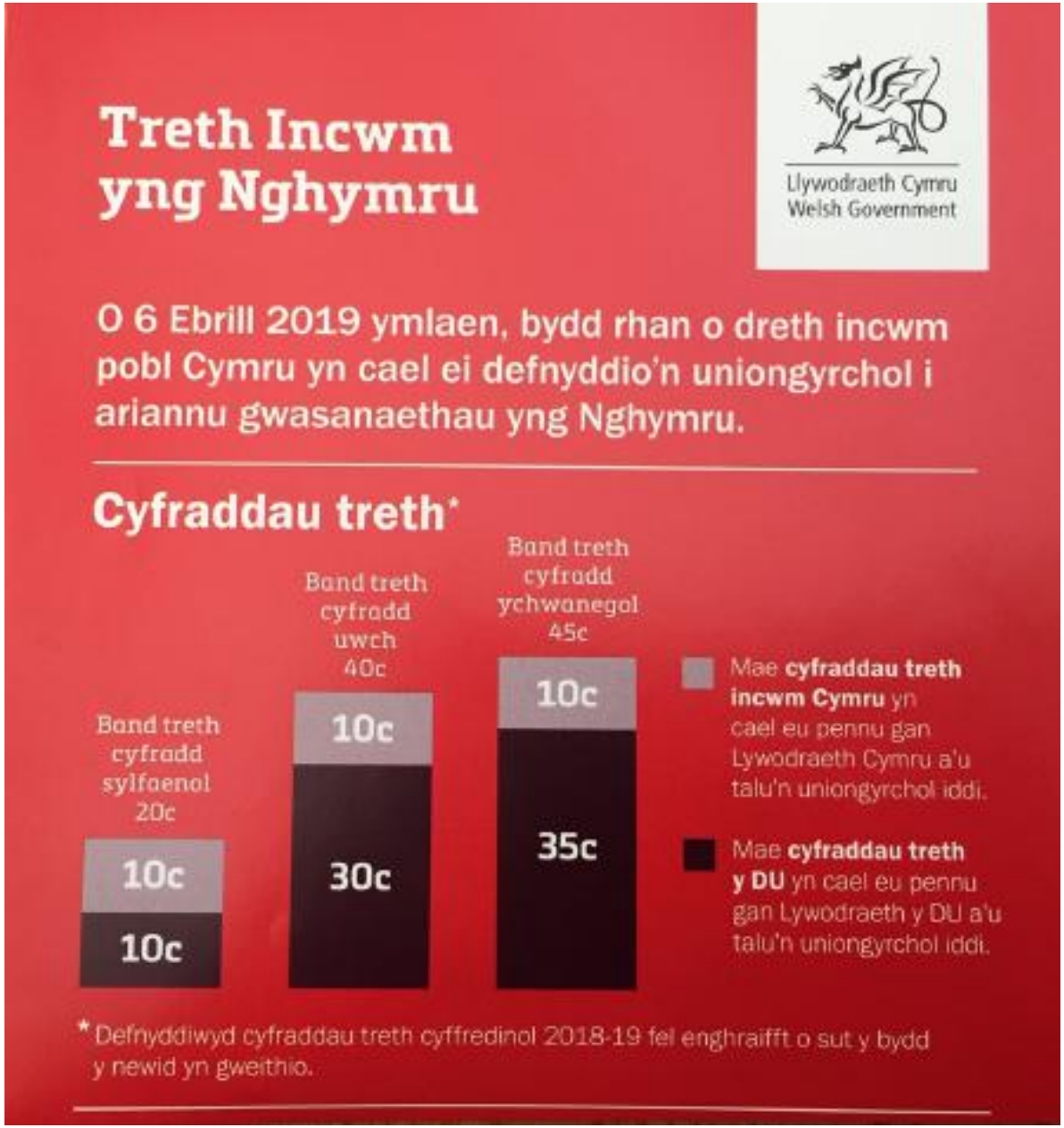


700 (Apple) 600 (Amazon Microsoft Google) 400 (Facebook)
200 (Exxon Shell) 100 (BP)

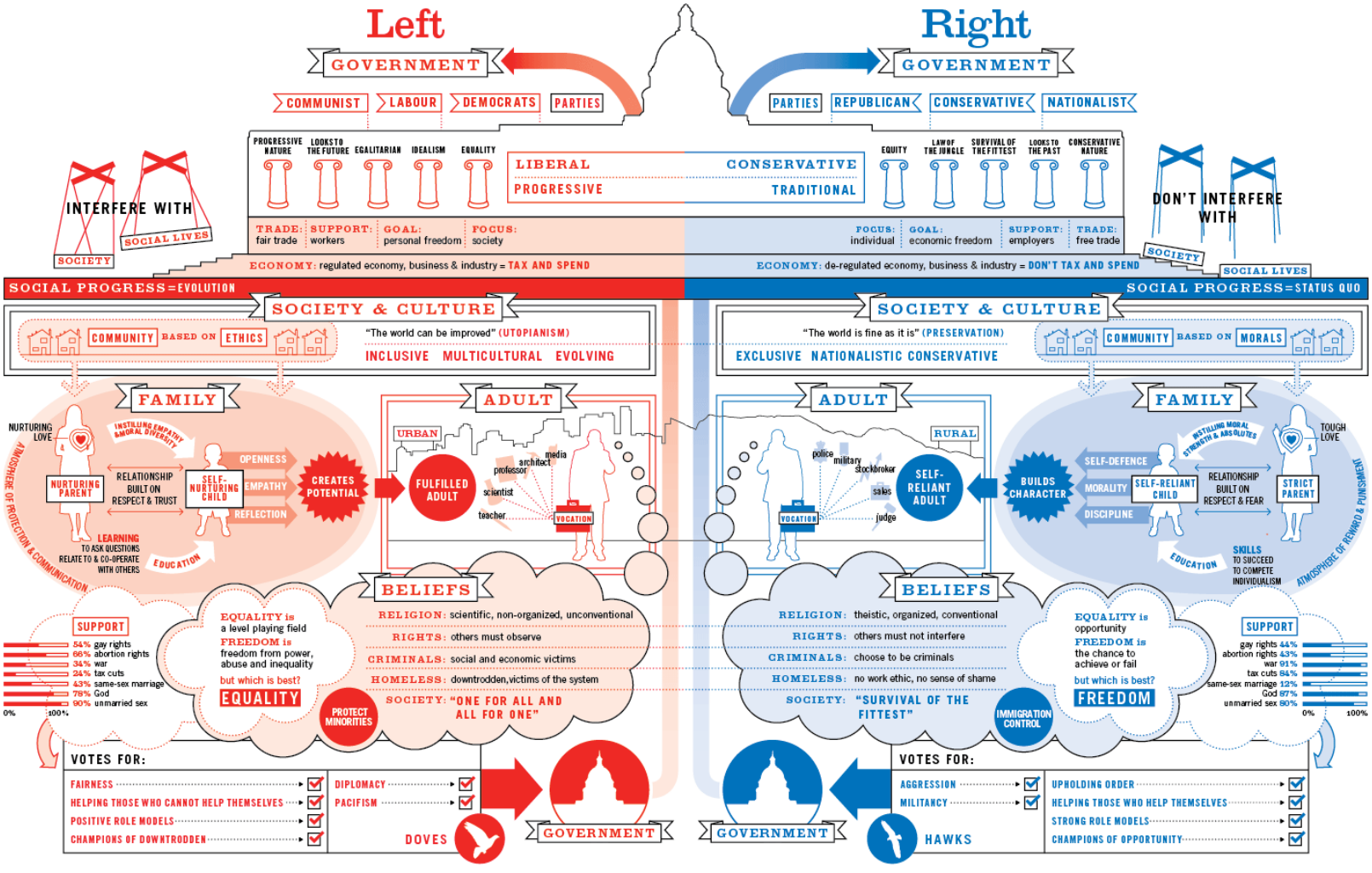
a phenderfynu



a dylanwadu


Treth Incwm yng Nghymru
Llywodraeth Cymru
Welsh Government
O 6 Ebrill 2019 ymlaen, bydd rhan o dreth incwm pobl Cymru yn cael ei defnyddio'n uniongyrchol i ariannu gwasanaethau yng Nghymru.
Cyfraddau treth*
Band treth cyfradd sylfaenol 20c
10c
10c
Band treth cyfradd uwch 40c
10c
30c
Band treth cyfradd ychwanegol 45c
10c
35c
Mae cyfraddau treth incwm Cymru yn cael eu pennu gan Lywodraeth Cymru a'u talu'n uniongyrchol iddi.
Mae cyfraddau treth y DU yn cael eu pennu gan Lywodraeth y DU a'u talu'n uniongyrchol iddi.
* Defnyddiwyd cyfraddau treth cyffredinol 2018-19 fel enghraifft o sut y bydd y newid yn gweithio.

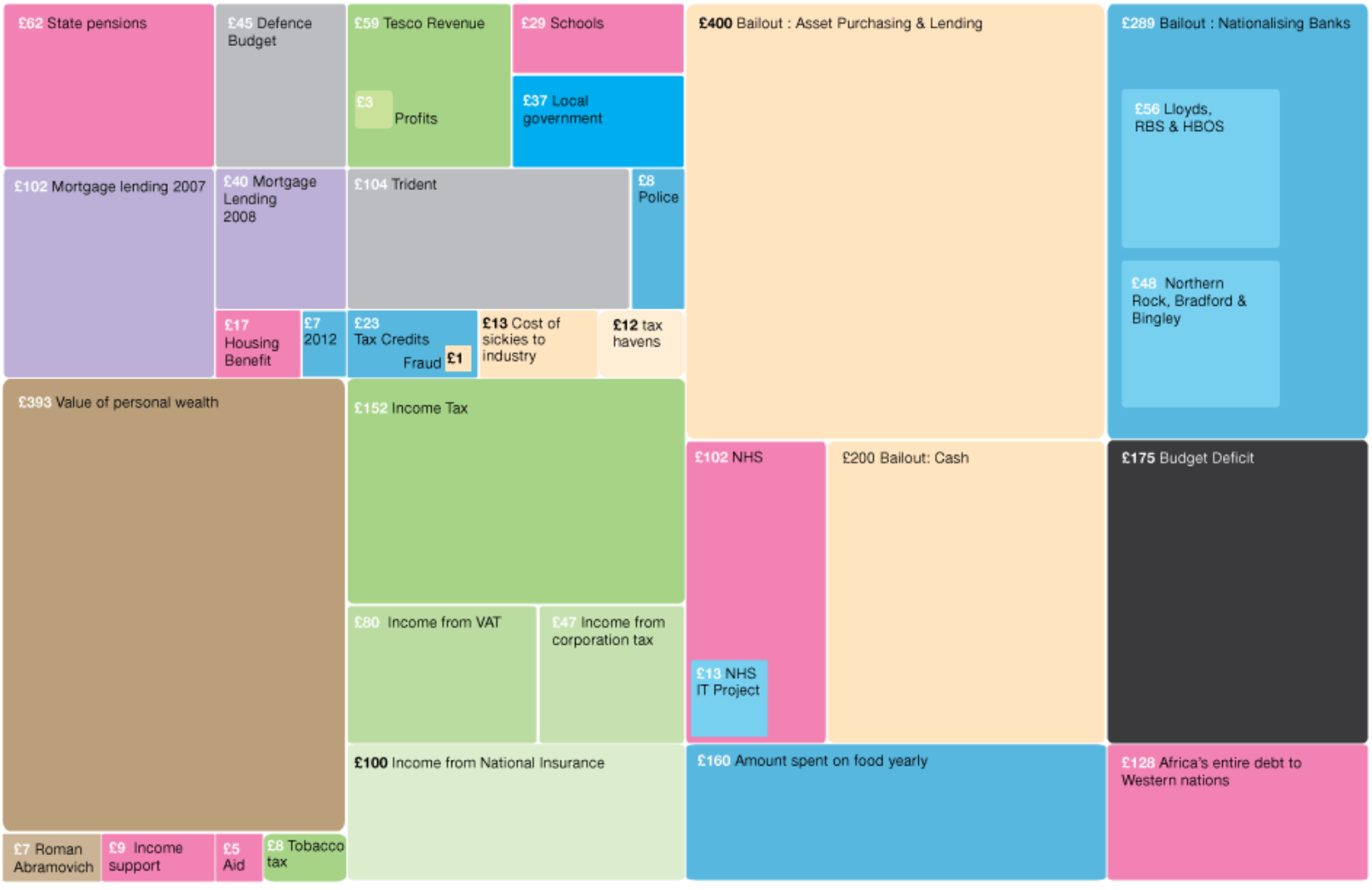
â bod yn ddiduedd



CREATIVE CREDIT
David McCandless & Stefanie Posavec // v1.0 // Oct 09
InformationIsBeautiful.net / ItsBeenReal.co.uk

INEVITABLE CAPITALIST AGENDA
from the new infographic book of visual exploria
The Visual Miscellaneum

a chyfathrebu



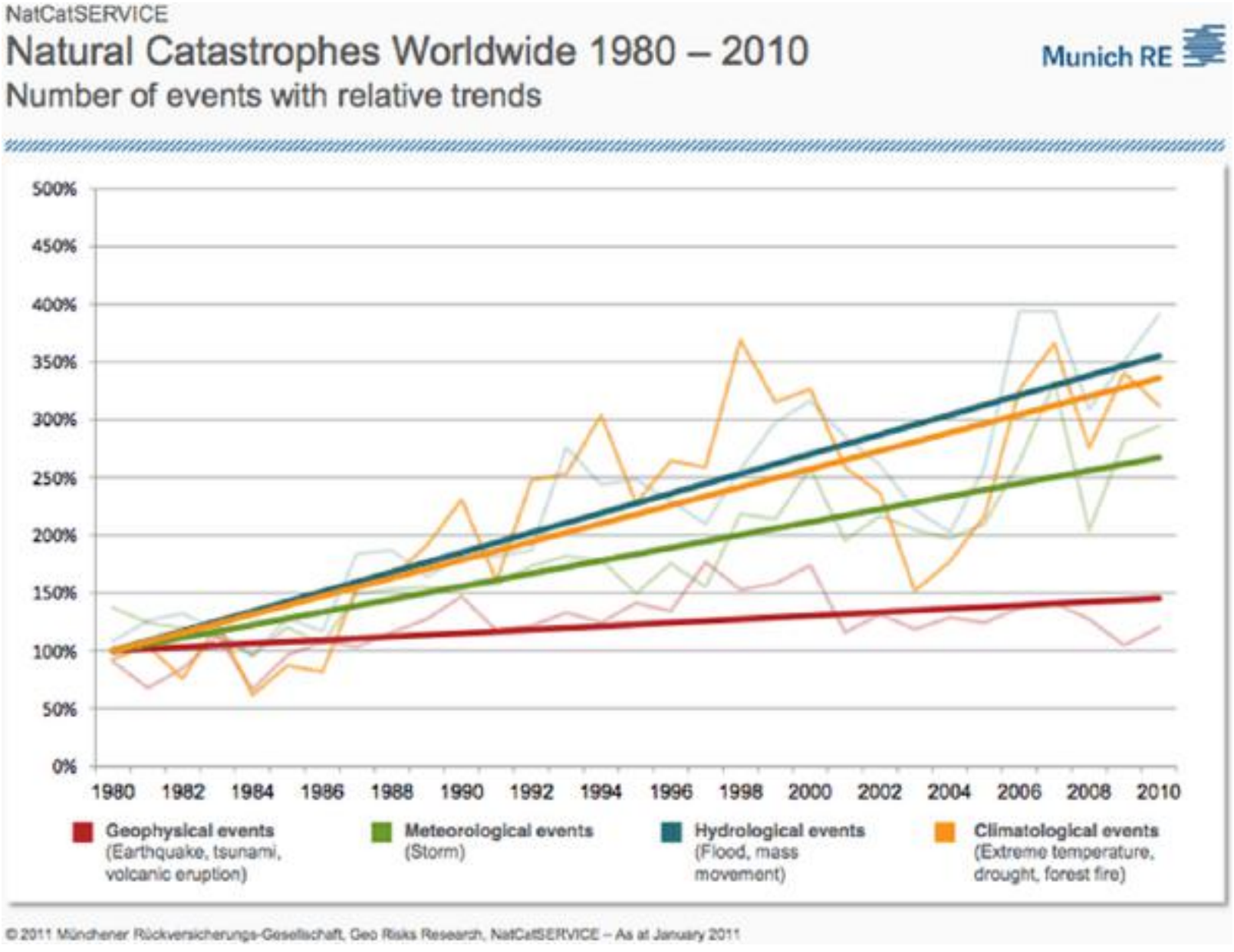
The Billion Pound-O-Gram

Giving Spending Fighting Hoarding Lending Bailing Earning

David McCandless / InformationIsBeautiful.net

Source: UK Treasury, Guardian

â chyfathrebu mwy fyth

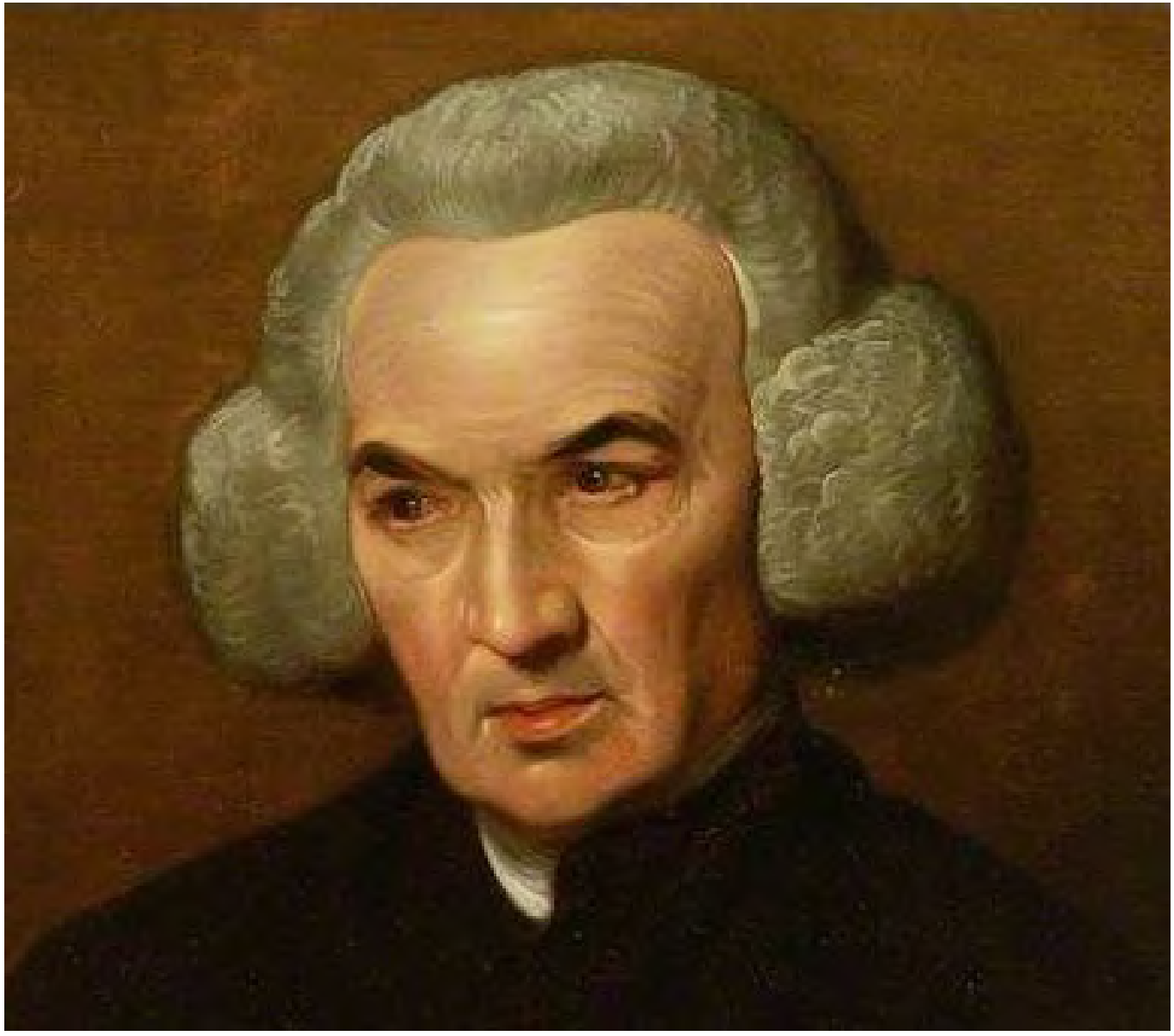


Y sylfaen i'r cwbl yw theorem Bayes

$$p(B|D) = \frac{p(D|B) \times p(B)}{p(D)}$$

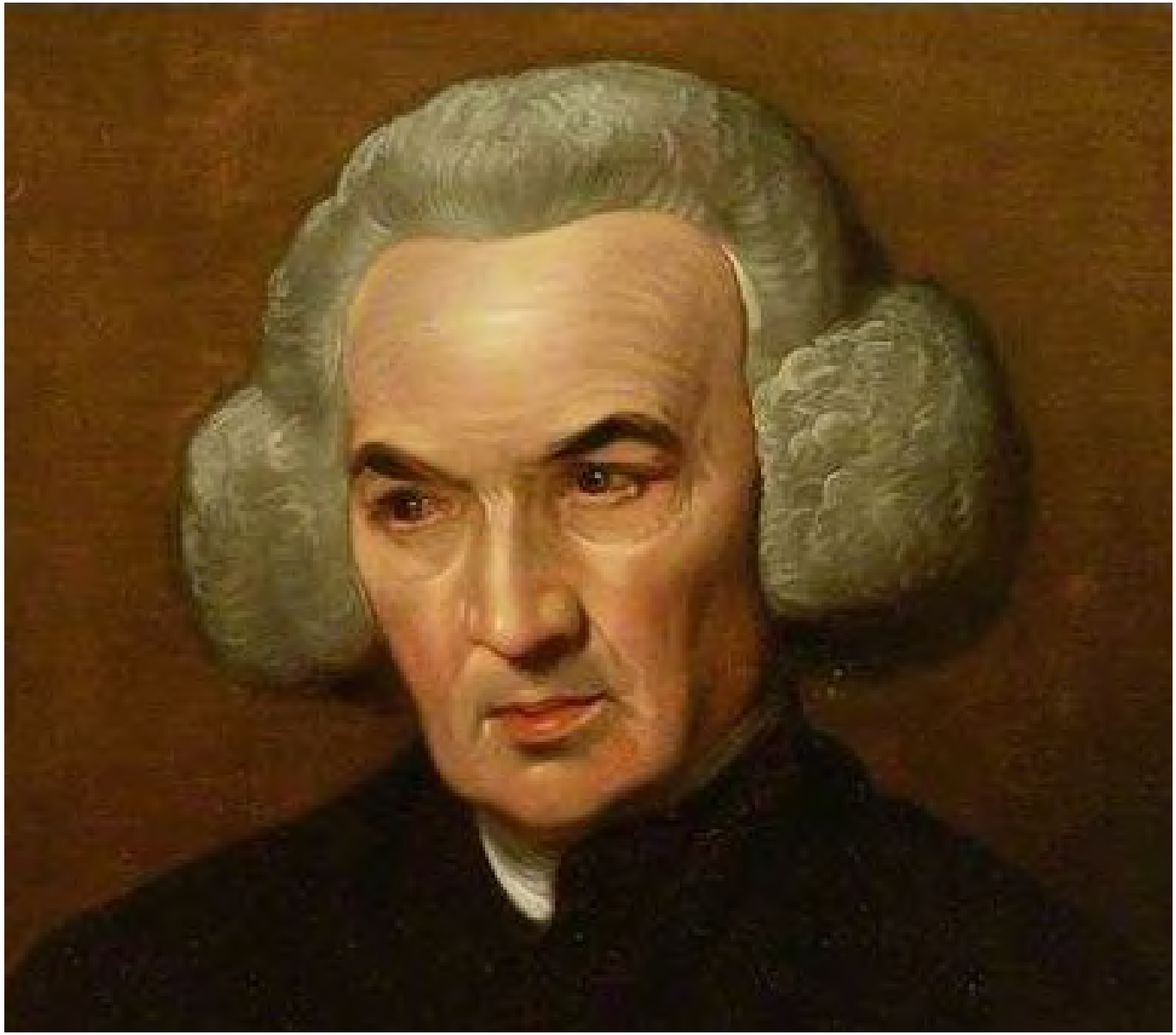
cred ddiweddarach $\propto$ tebygoliaeth y data $\times$ cred gychwynol

Bayes a'r cysylltiad Cymreig



...

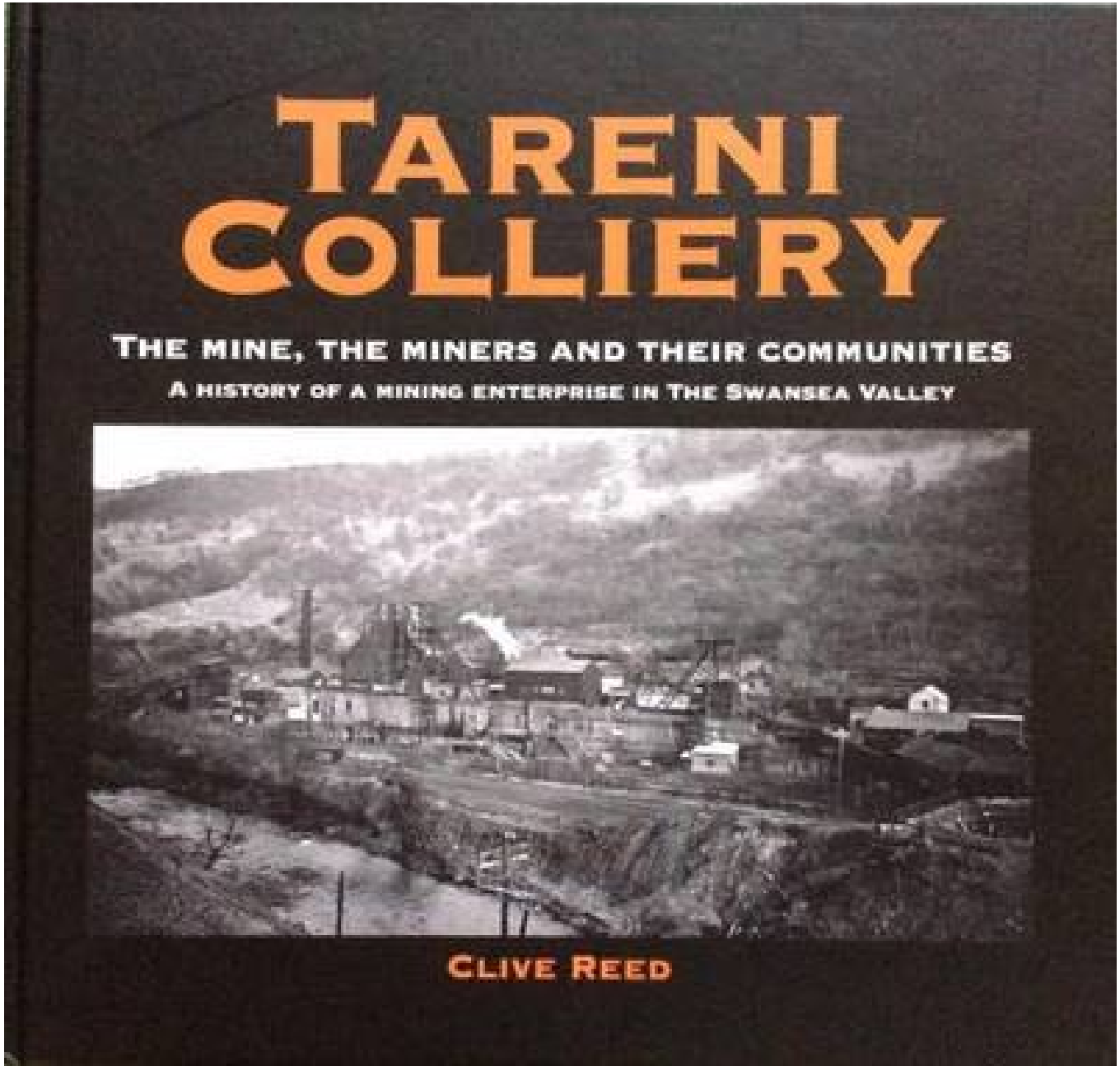
Bayes a'r cysylltiad Cymreig



Richard Price (1723 – 1791)

Rwyn wreiddiol o Odre'r Graig yng Nghwm Tawe

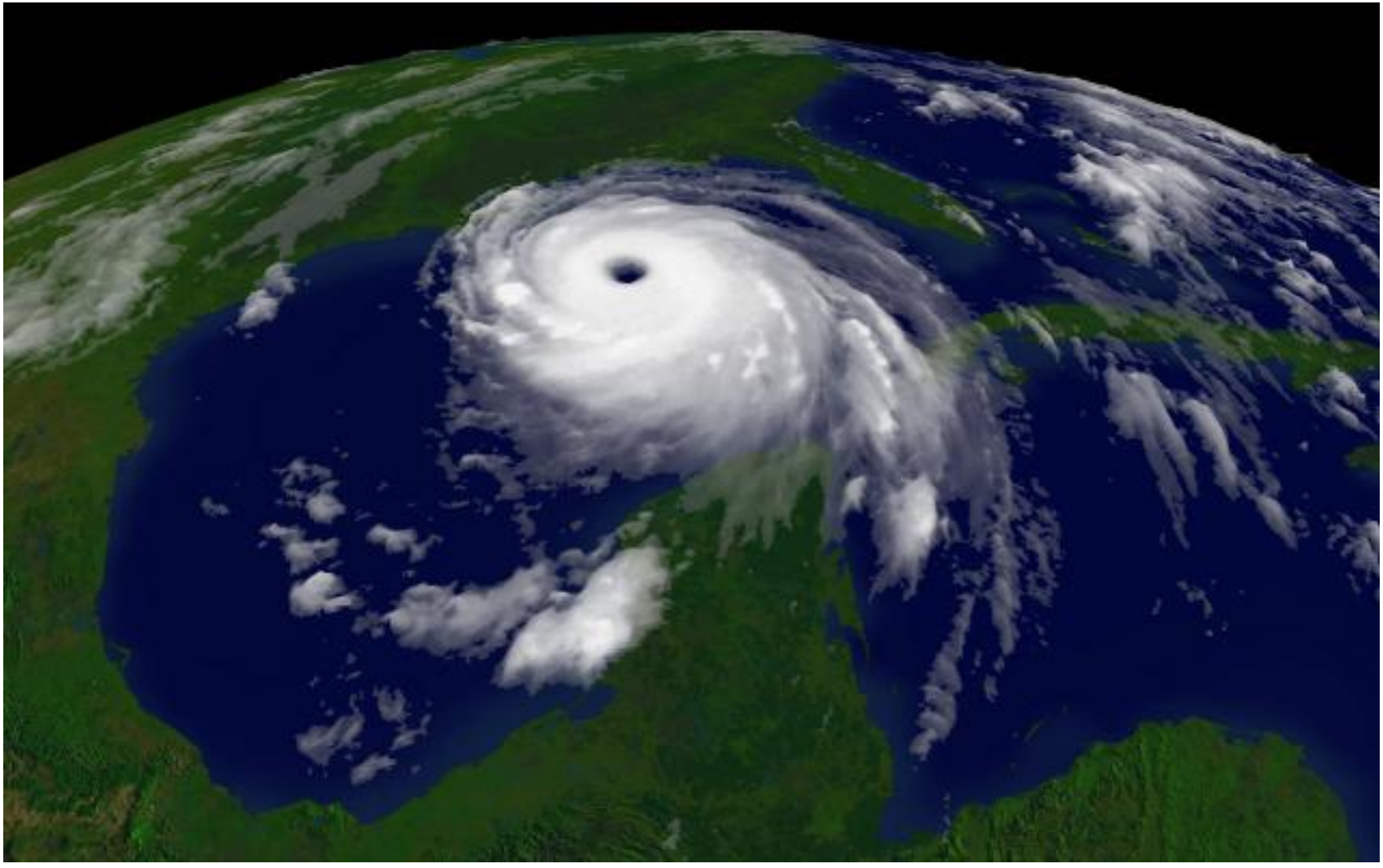
Godre'r Graig



Godre'r Graig

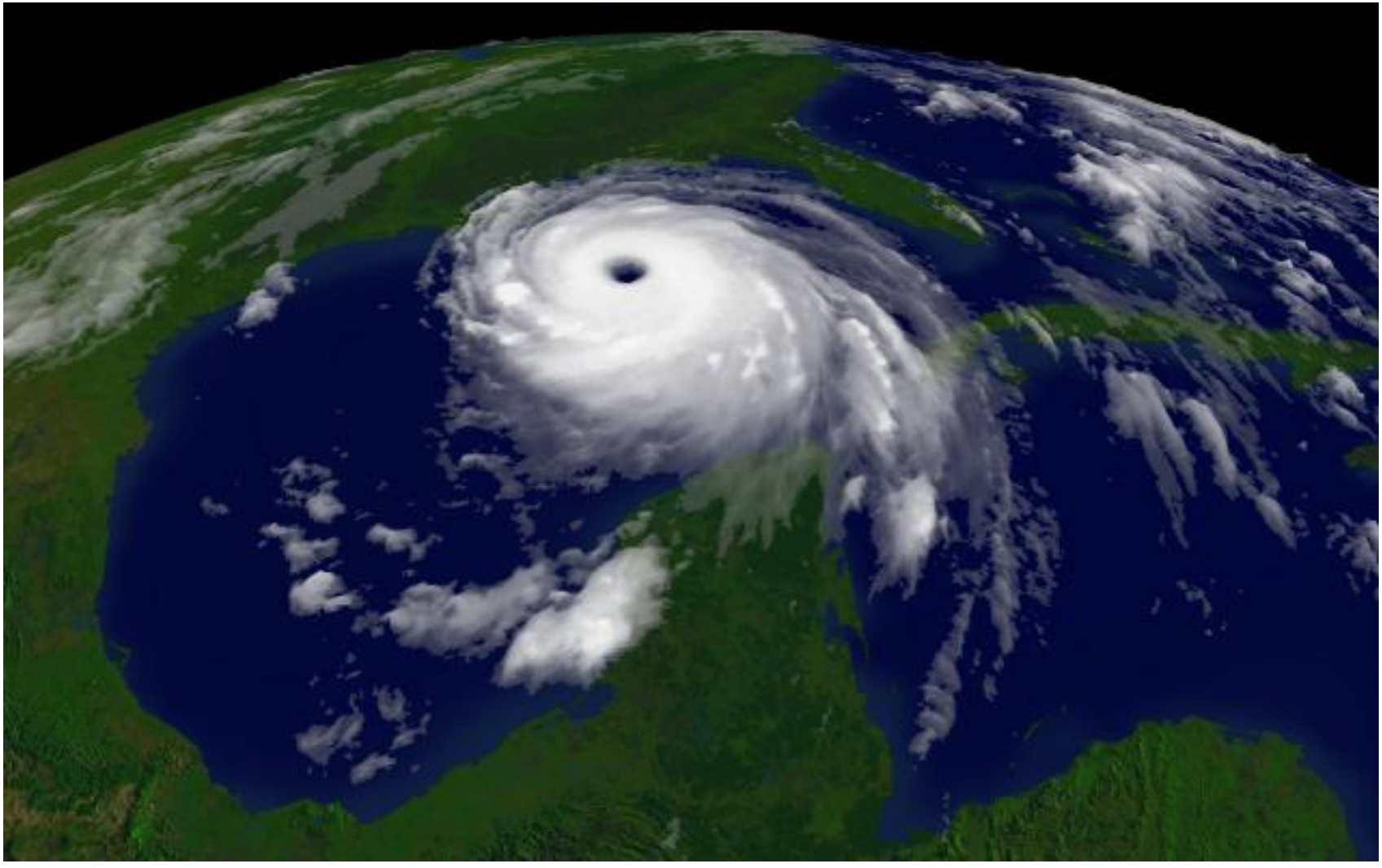
Astudiais yn Abertawe

a chwympo mewn cariad â ffiseg

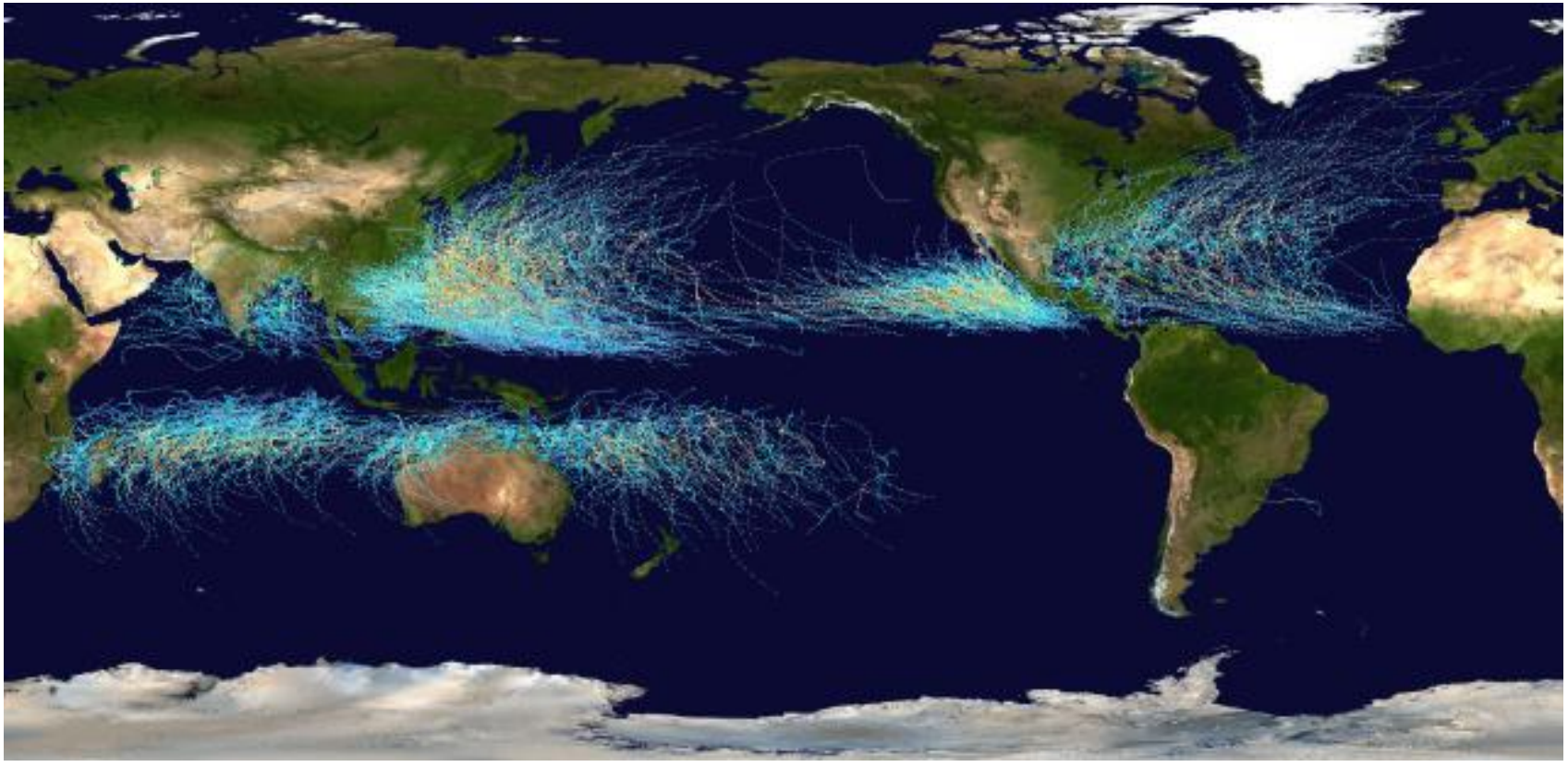


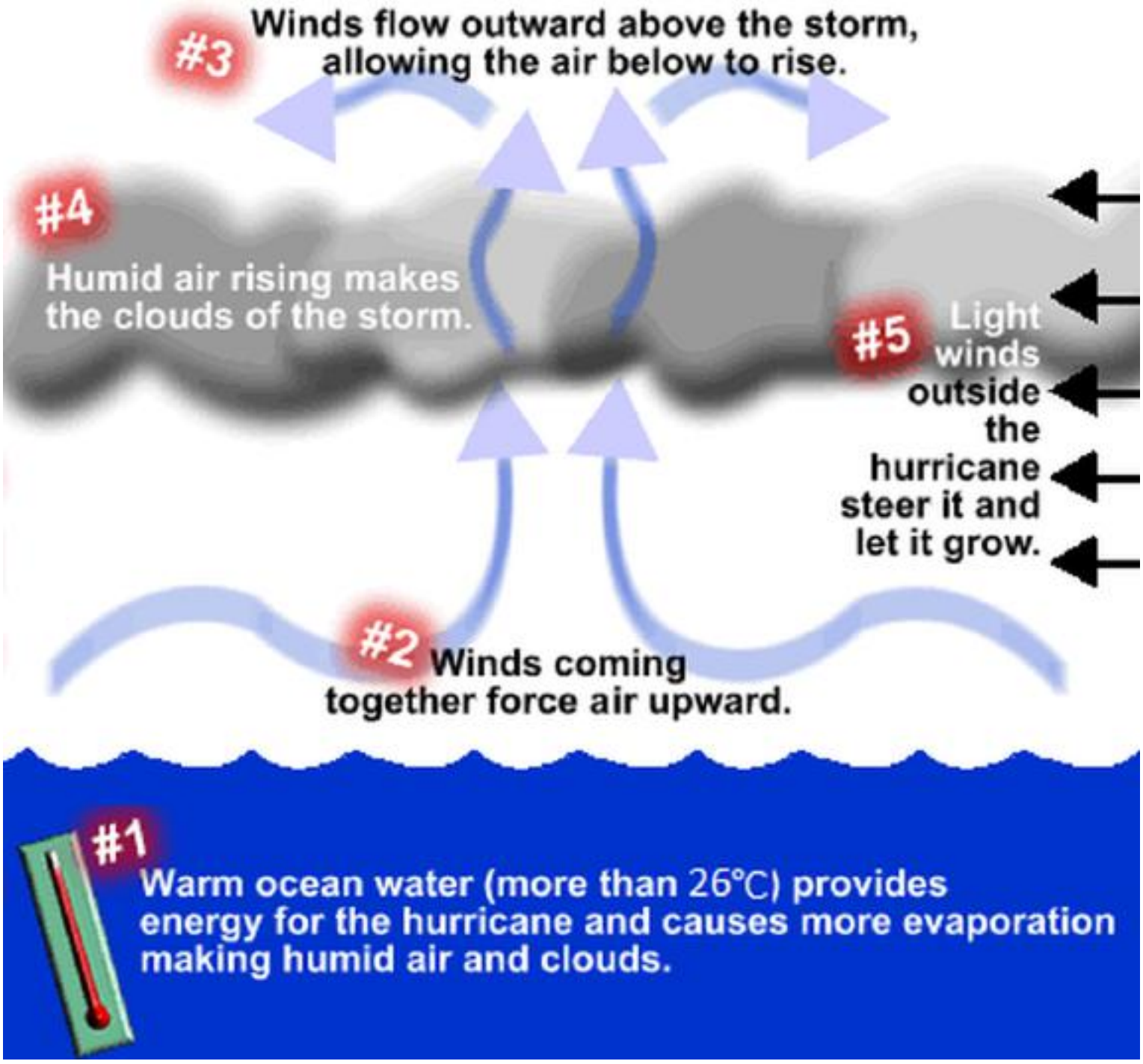
...

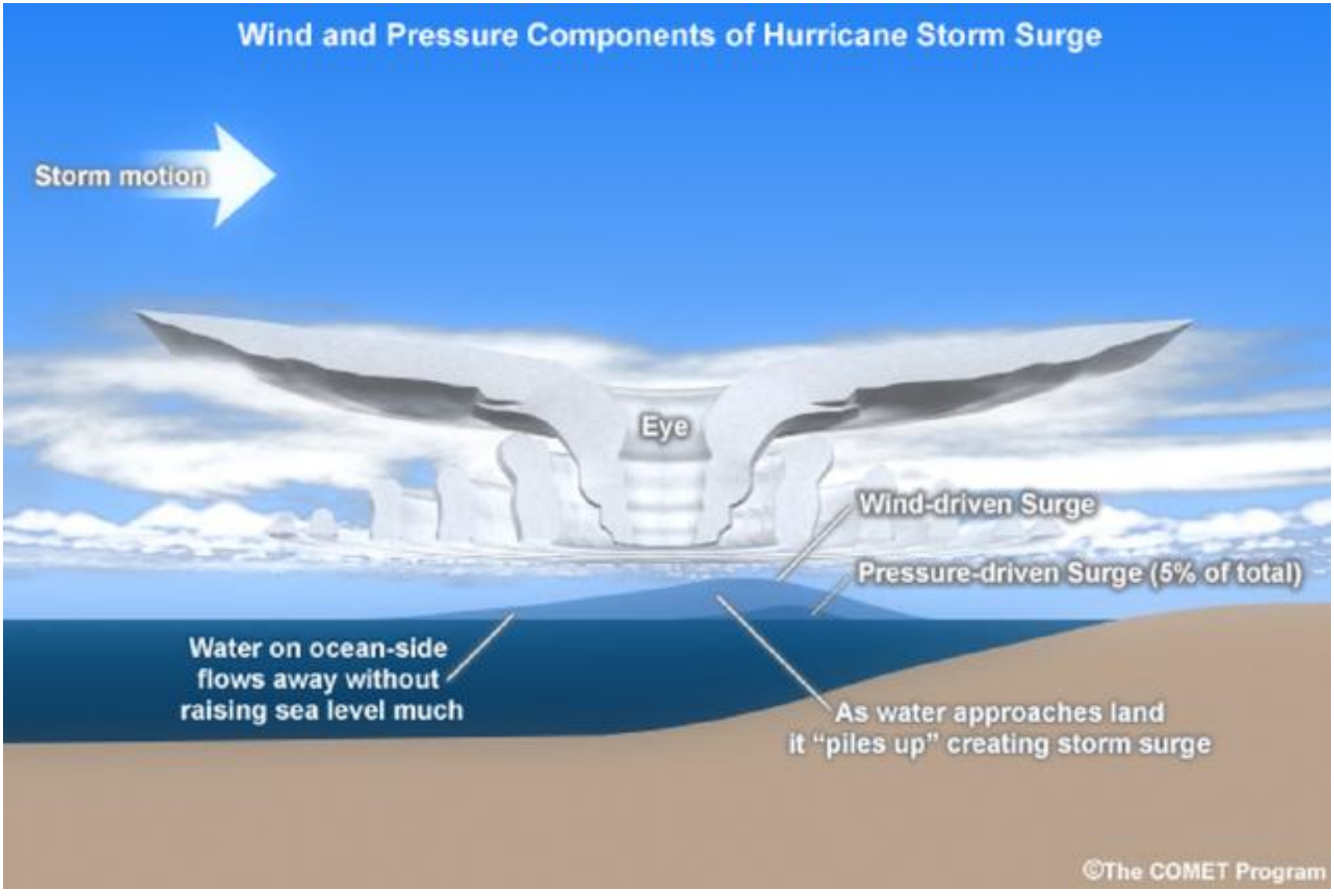
a chwympo mewn cariad â ffiseg

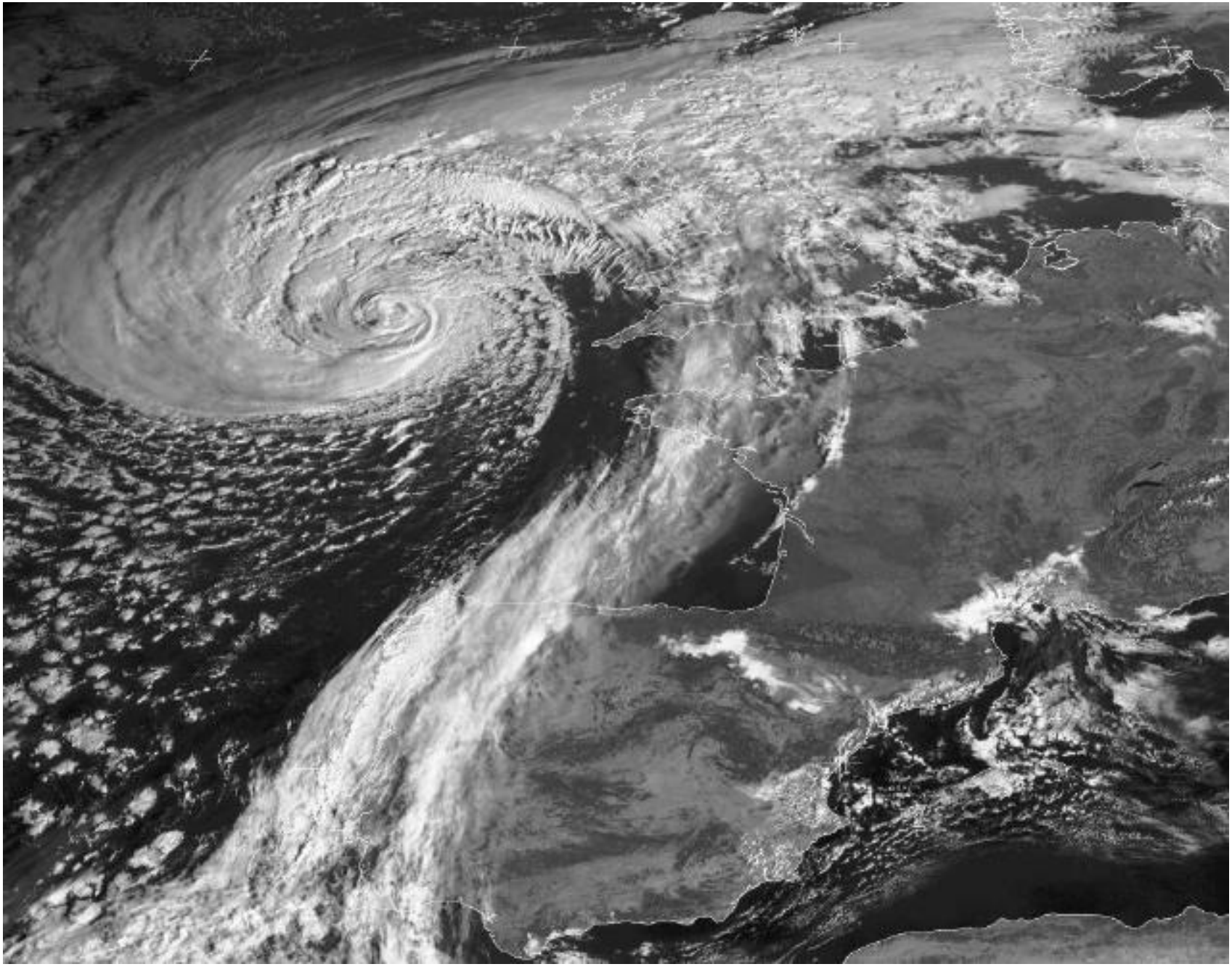


Corwynt Katrina (2005)




#3
Winds flow outward above the storm, allowing the air below to rise.
#4
Humid air rising makes the clouds of the storm.
#5
Light winds outside the hurricane steer it and let it grow.
#2
Winds coming together force air upward.
#1
Warm ocean water (more than 26°C) provides energy for the hurricane and causes more evaporation making humid air and clouds.


Wind and Pressure Components of Hurricane Storm Surge
Storm motion
Eye
Wind-driven Surge
Pressure-driven Surge (5% of total)
Water on ocean-side
flows away without
raising sea level much
As water approaches land
it "piles up" creating storm surge
©The COMET Program



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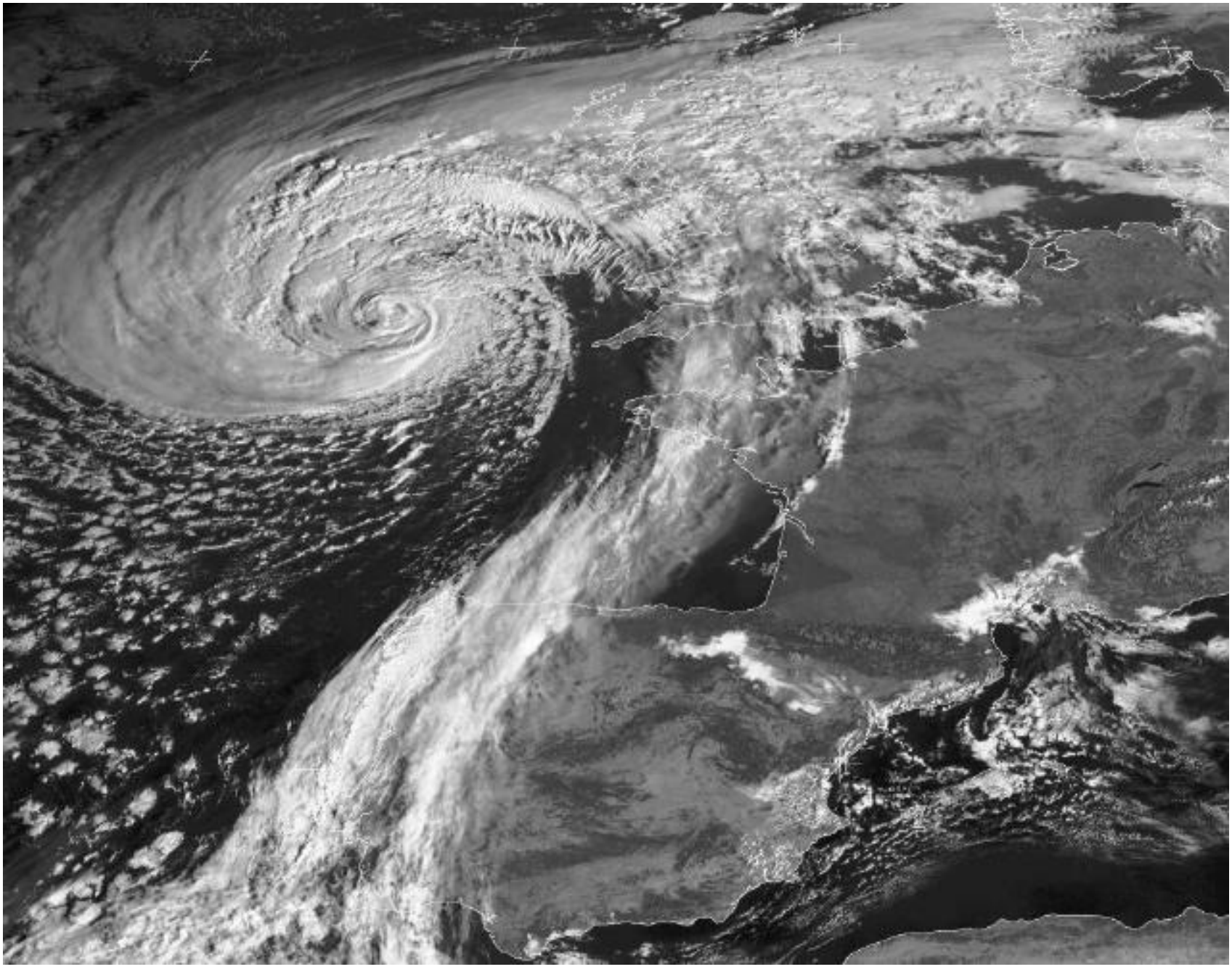


Storom Ophelia (2017)

a datrys problemau fel priodas

Dychmygwch

- 'Da chi'n ddyn sengl yn edrych am wraig
- 'Da chi'n mynd i gwrdd â 100 o ferched cymwys ar hap dros nifer fawr o flynyddoedd
- Byddwch chi'n hoffi rhai'n well nag eraill, ac yn hoffi un fwyaf oll!
- Mae'n rhaid i chi benderfynu'n syth pan 'da chi'n cwrdd â merch, os taw hi **yw'r un**
- 'Da chi ddim eisiau aros am byth i briodi, wrth rheswm!

- Sawl merch dylsech chi gwrdd â nhw cyn penderfynu?

- Cynigion?

Y problem briodas

- Mae'r ateb yn esiampl o reol stopio optimaidd, un o gonglfeini maes a elwir yn ymchwil gweithredol, a dyma fe ateb
- Dylsech chi aros tan i chi gwrdd â $100/e \approx 37$ o ferched a chofio o'r rheini pa un oedd orau (dywedwn ni taw Carys oedd enw hon)
- Wedyn dylsech chi ddal i gwrdd â merched, a dewis fel gwraig y ferch gyntaf 'da chi'n cwrdd â hi sy'n well na Carys
- Fel hyn, mae gyda chi'r tebygolrwydd uchaf o gwrdd â'r gorau o'r 100, a'r tebygolrwydd hwnw yw $1/e \approx 0.37$
- Mae $e \approx 2.72$ yn gysonyn mathemategol sylfaenol

Hafaliad prydferthaf mathemateg

$$e^{i\pi} + 1 = 0$$

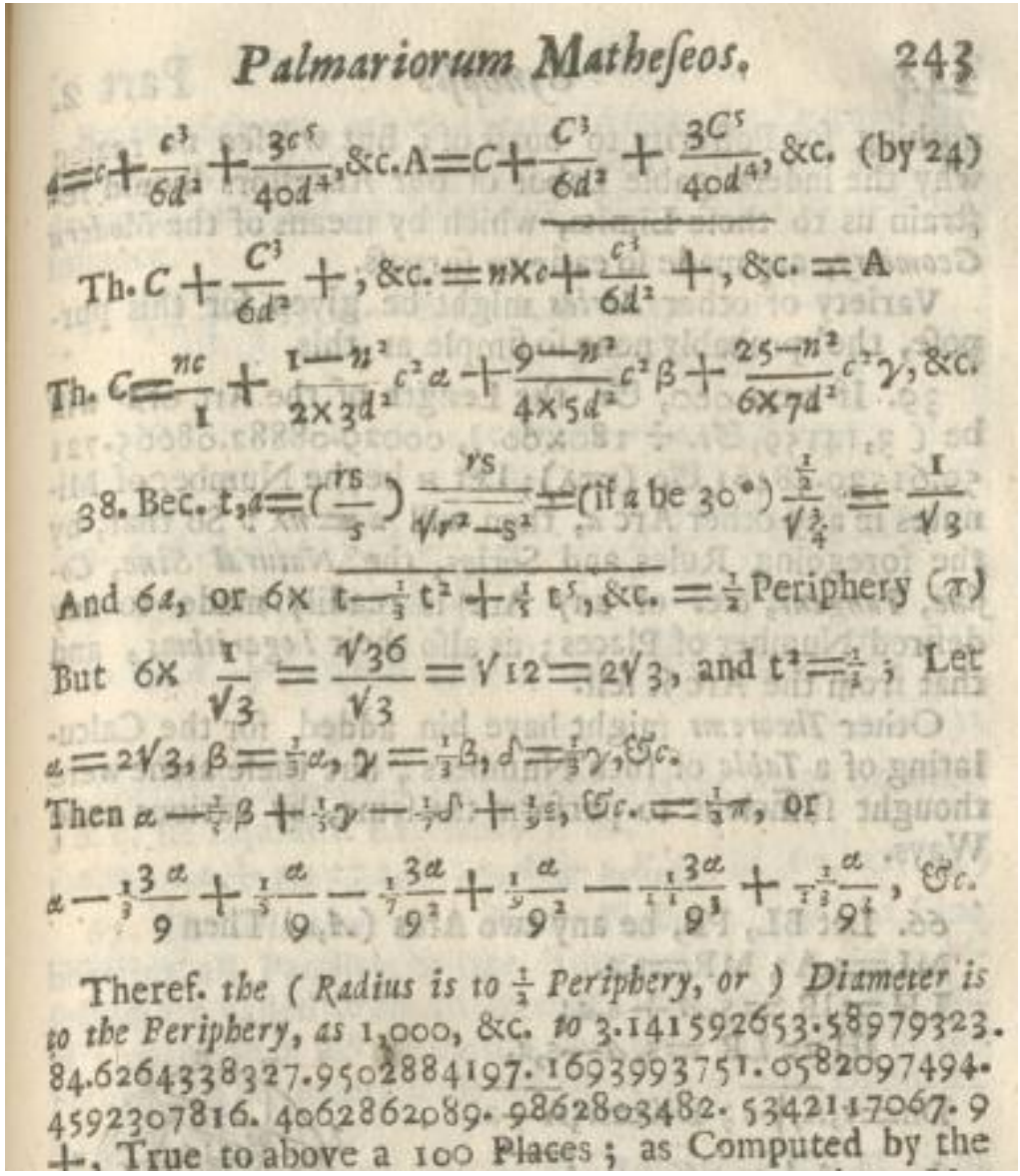
π a'r cysylltiad Cymreig

...

π a'r cysylltiad Cymreig

William Jones (1675 – 1749)

π a'r cysylltiad Cymreig



Palmariorum Matheſeos. 243

$A = c + \frac{c^3}{6d^2} + \frac{3c^5}{40d^4}$, &c. $A = C + \frac{C^3}{6d^2} + \frac{3C^5}{40d^4}$, &c. (by 24)

Th. $C + \frac{C^3}{6d^2} +$, &c. $= nc + \frac{c^3}{6d^2} +$, &c. $= A$

Th. $C = \frac{nc}{1} + \frac{1-n^2}{2\times 3d^2}c^2\alpha + \frac{9-n^2}{4\times 5d^2}c^2\beta + \frac{25-n^2}{6\times 7d^2}c^2\gamma$, &c.

38. Bec. $t, s = \left(\frac{rs}{s}\right) \frac{rs}{\sqrt{r^2 - s^2}} =$ (if α be 30°) $\frac{\frac{1}{2}}{\sqrt{\frac{3}{4}}} = \frac{1}{\sqrt{3}}$

And 6α, or $6\times t - \frac{1}{3}t^3 + \frac{1}{5}t^5$, &c. $=$ ½ Periphery (π)

But $6\times \frac{1}{\sqrt{3}} = \frac{\sqrt{36}}{\sqrt{3}} = \sqrt{12} = 2\sqrt{3}$, and $t^2 = \frac{1}{3}$; Let

$\alpha = 2\sqrt{3}$, $\beta = \frac{1}{3}\alpha$, $\gamma = \frac{1}{3}\beta$, $\delta = \frac{1}{3}\gamma$, &c.

Then $\alpha - \frac{1}{3}\beta + \frac{1}{5}\gamma - \frac{1}{7}\delta + \frac{1}{9}\varepsilon$, &c. $= \frac{1}{2}\pi$, or

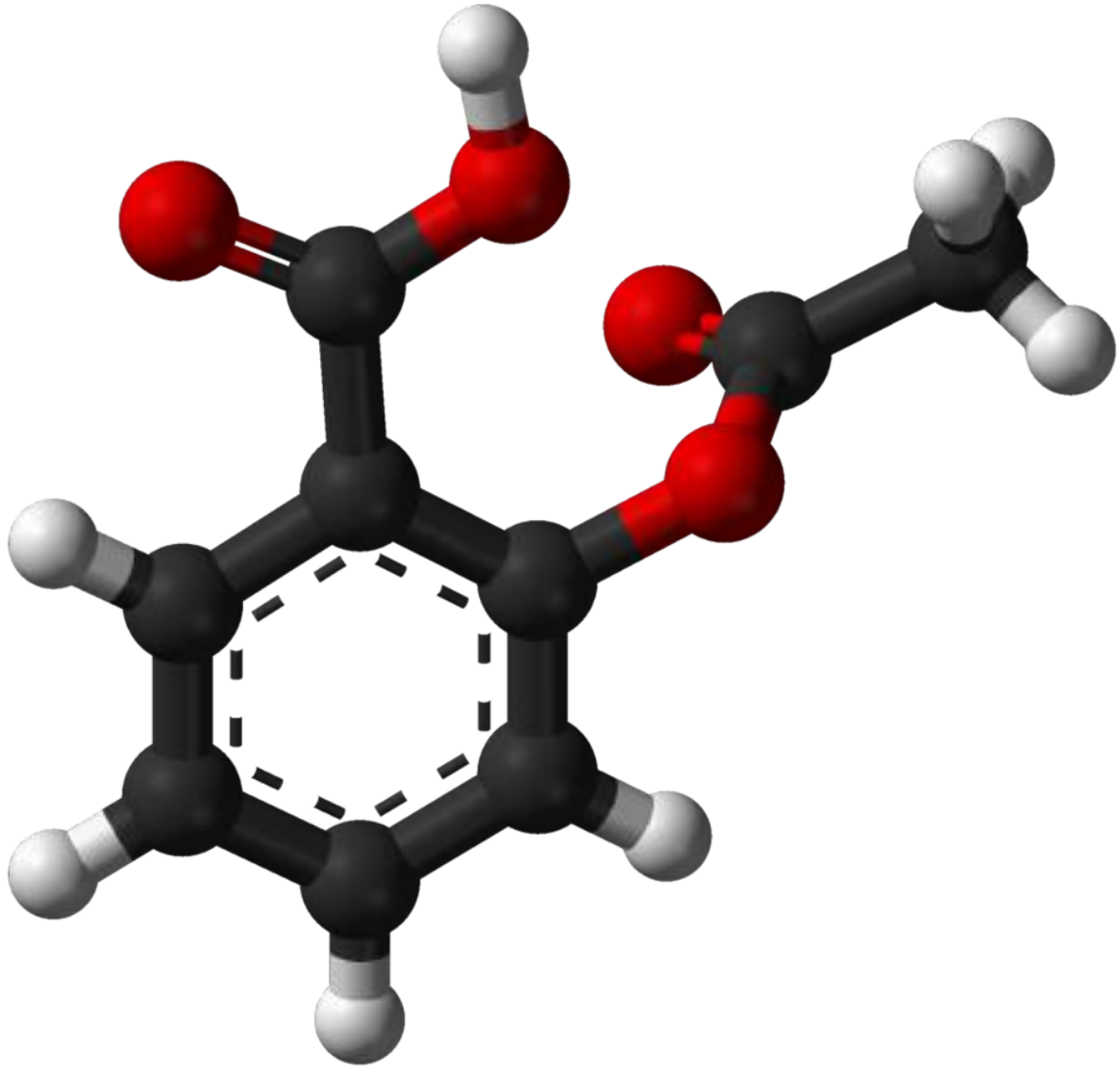
$\alpha - \frac{1}{3}\frac{3\alpha}{9} + \frac{1}{5}\frac{\alpha}{9} - \frac{1}{7}\frac{3\alpha}{9^2} + \frac{1}{9}\frac{\alpha}{9^2} - \frac{1}{11}\frac{3\alpha}{9^3} + \frac{1}{13}\frac{\alpha}{9^3}$, &c.

Theref. *the (Radius is to ½ Periphery, or) Diameter is to the Periphery, as* 1,000, &c. *to* 3.141592653.58979323. 84.6264338327.9502884197. 1693993751. 0582097494. 4592307816. 4062862089. 9862803482. 5342117067. 9 +. True to above a 100 Places; as Computed by the

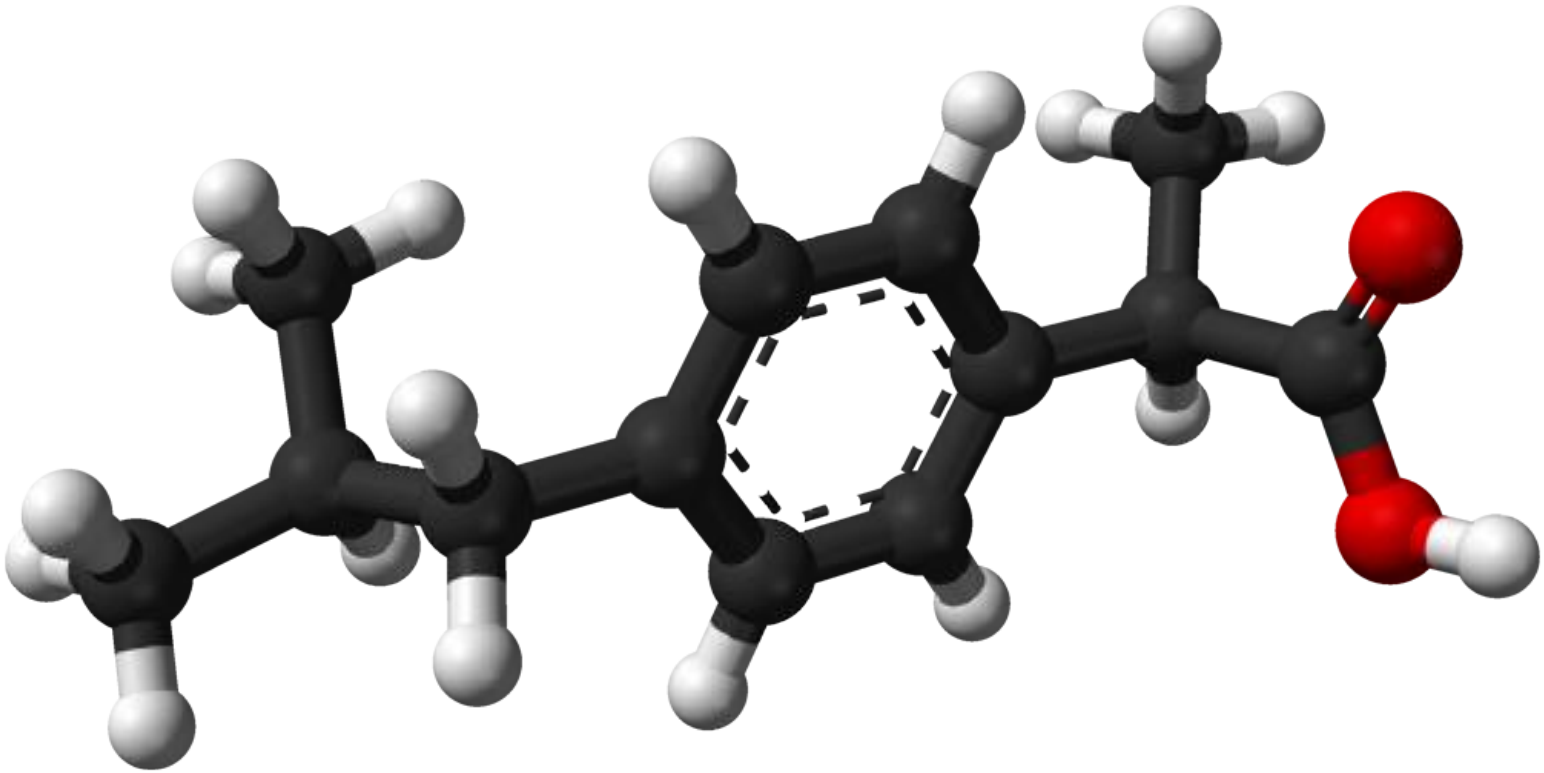
Synopsis Palmariorum Matheseos

Dwi'n gweithio i Shell a Phrifysgol Caerhirfryn

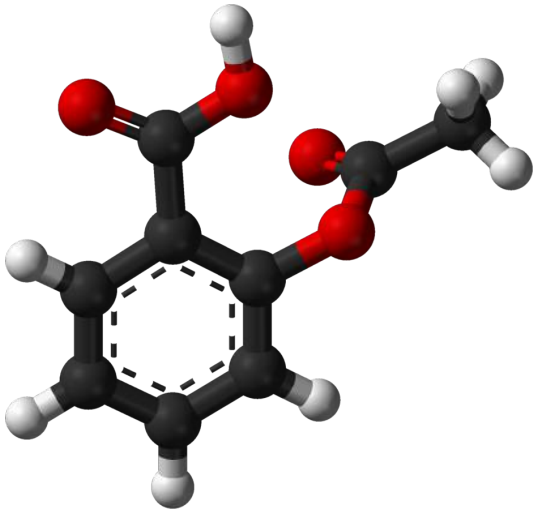
Dechreuais yn helpu modelwyr molecylaidd



Pa un sydd orau?



Eich dewis chi!



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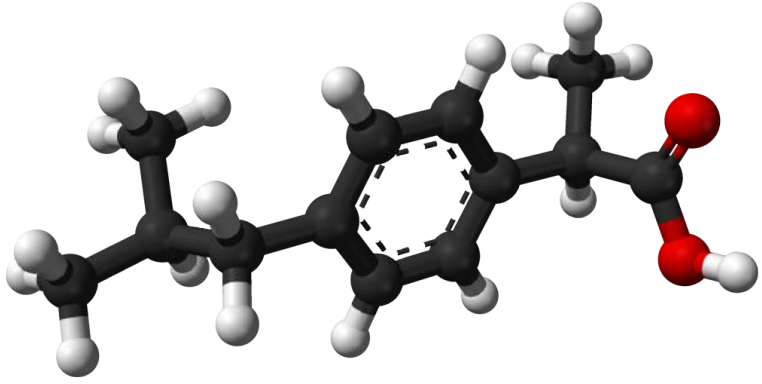
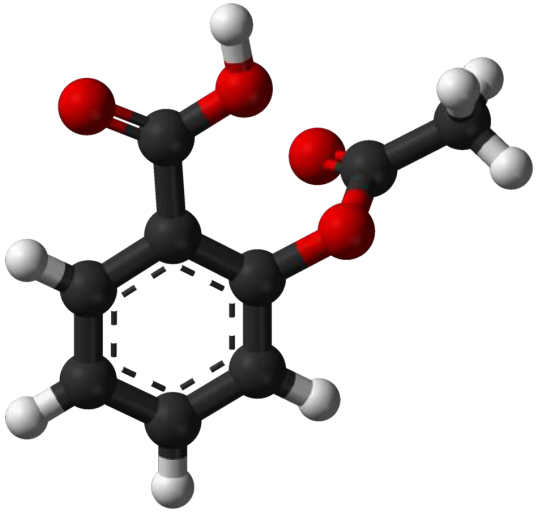
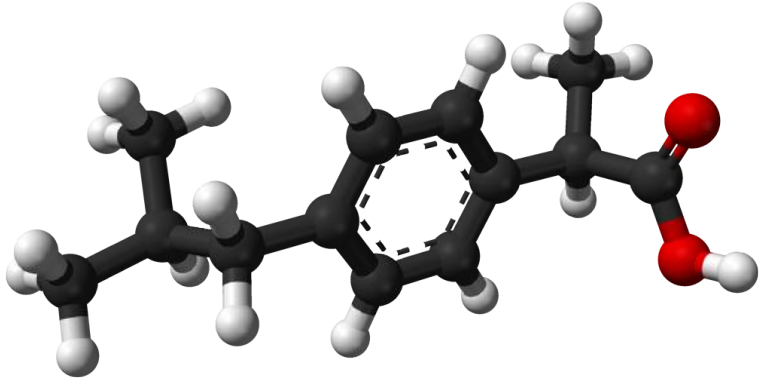


...

Eich dewis chi!

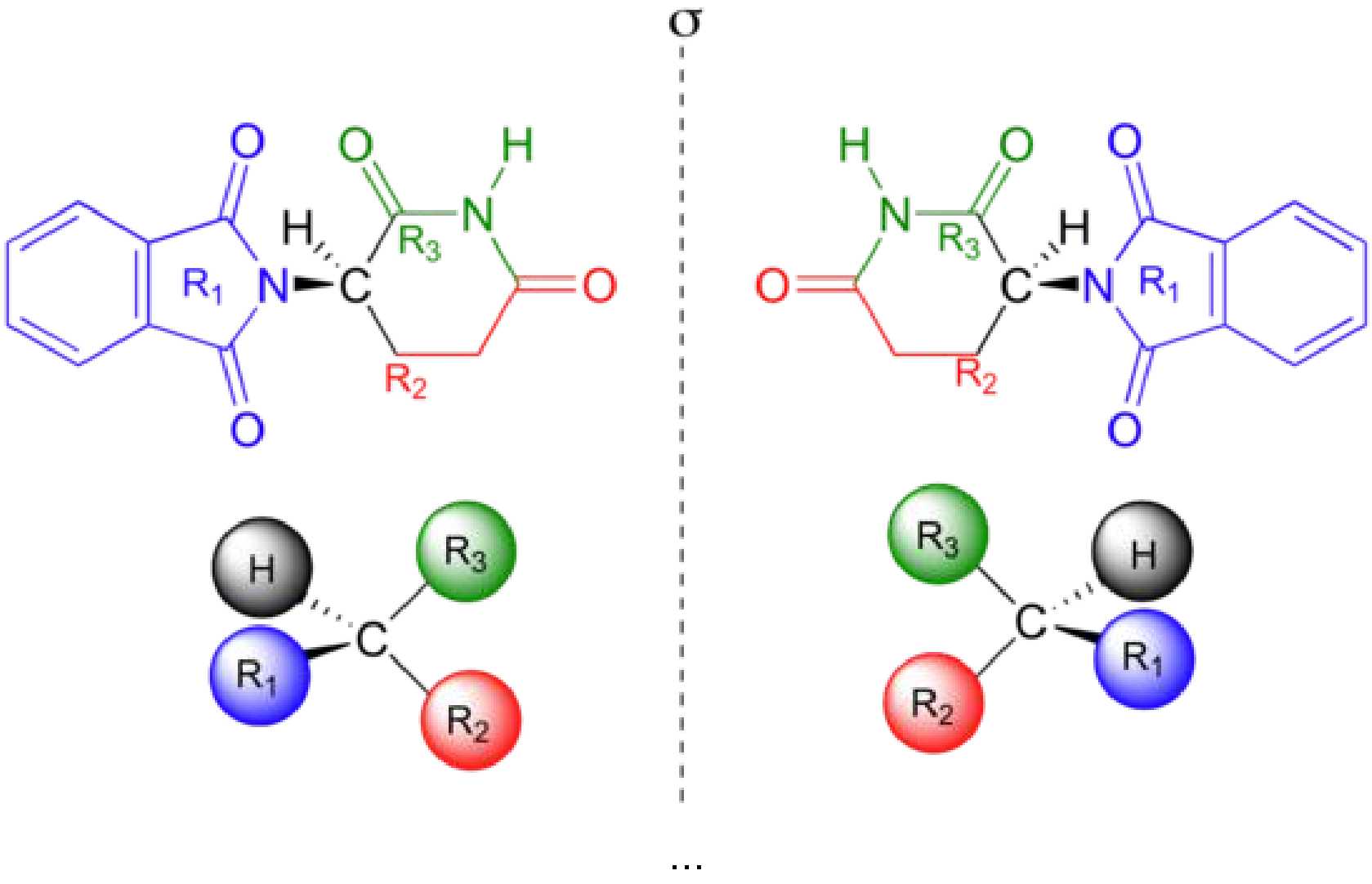


Aspirin

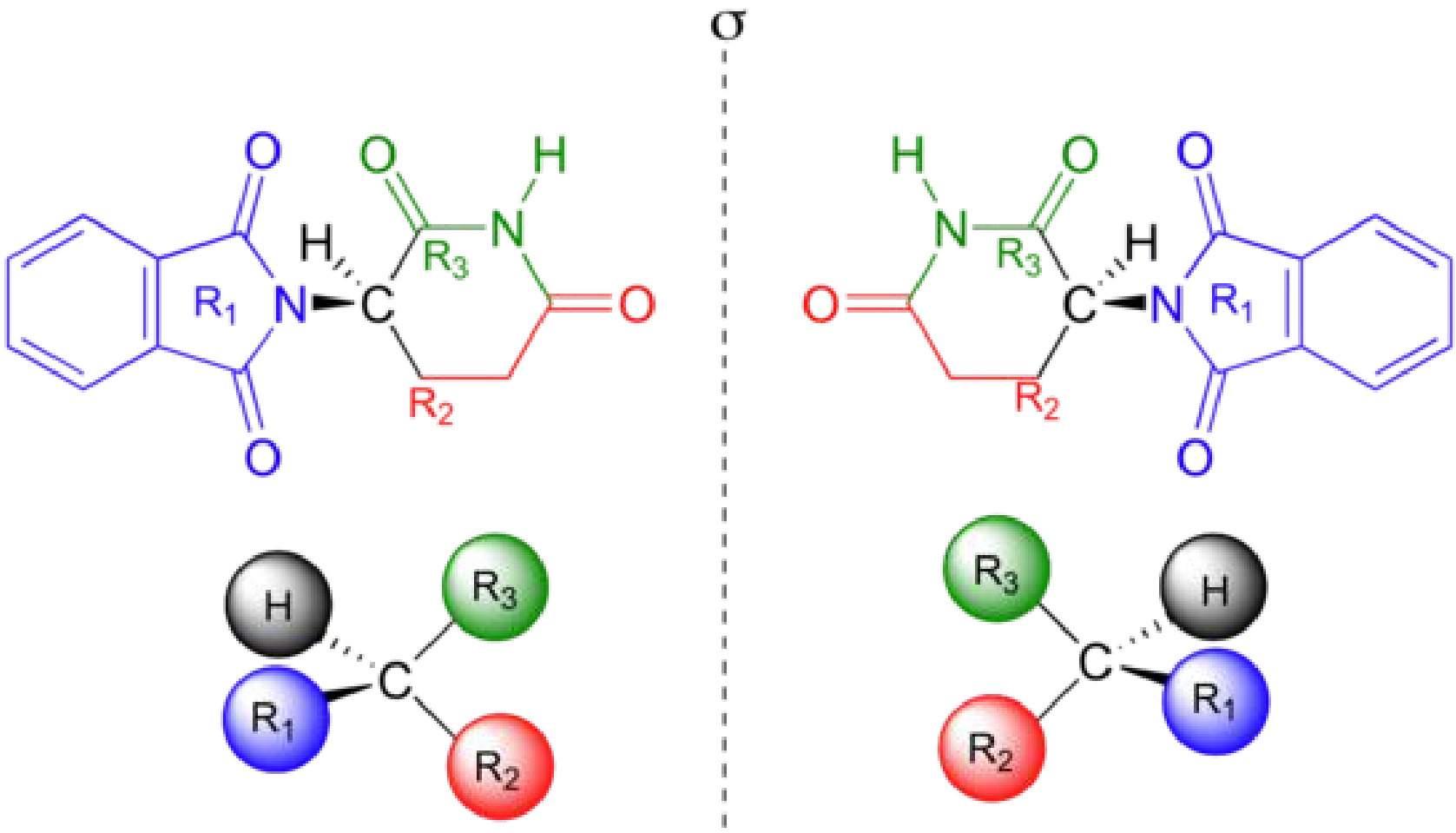


Ibuprofen

Pa un sydd orau?



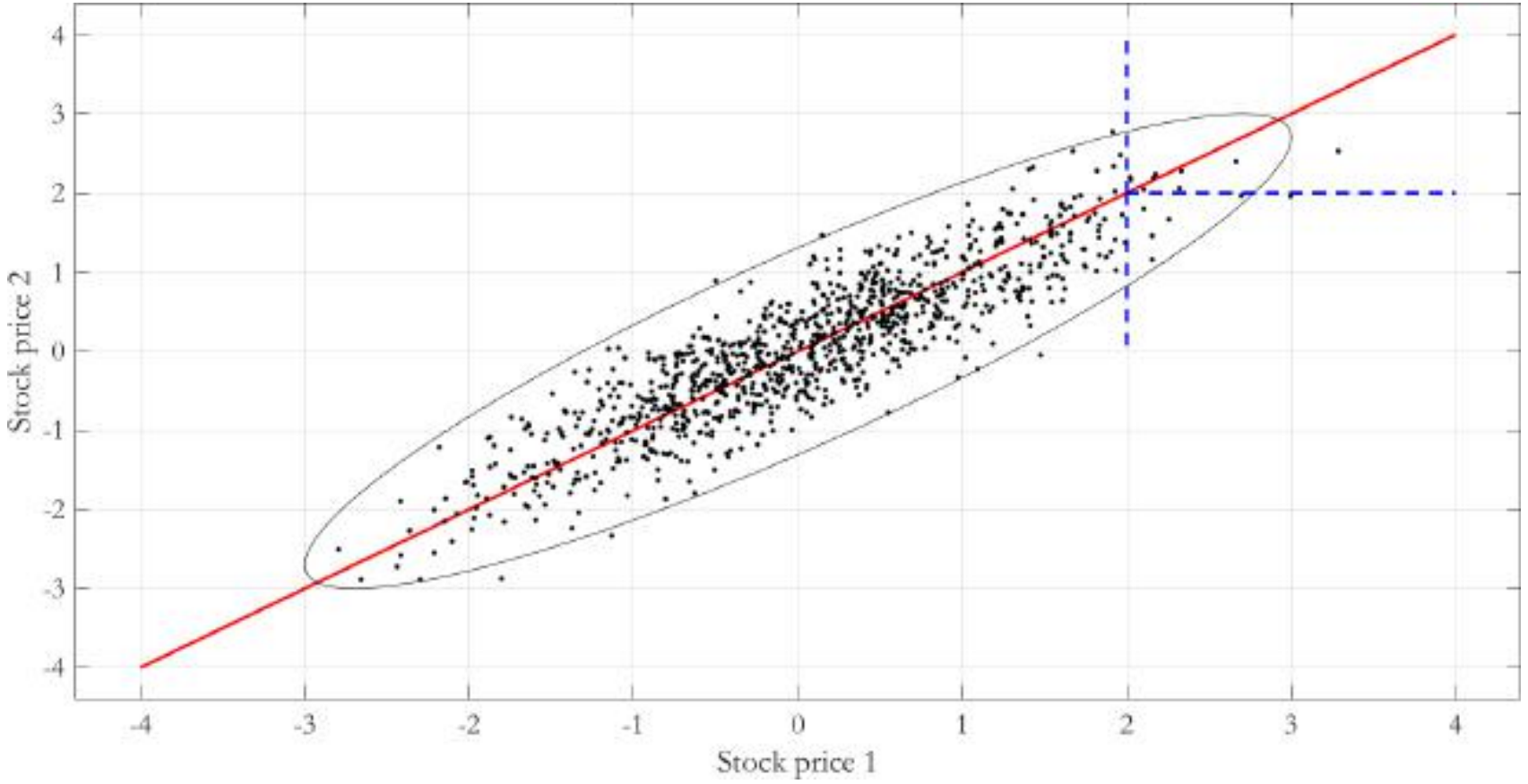
Pa un sydd orau?



R-thalidomide
(yn gwella salwch bore'r fam)

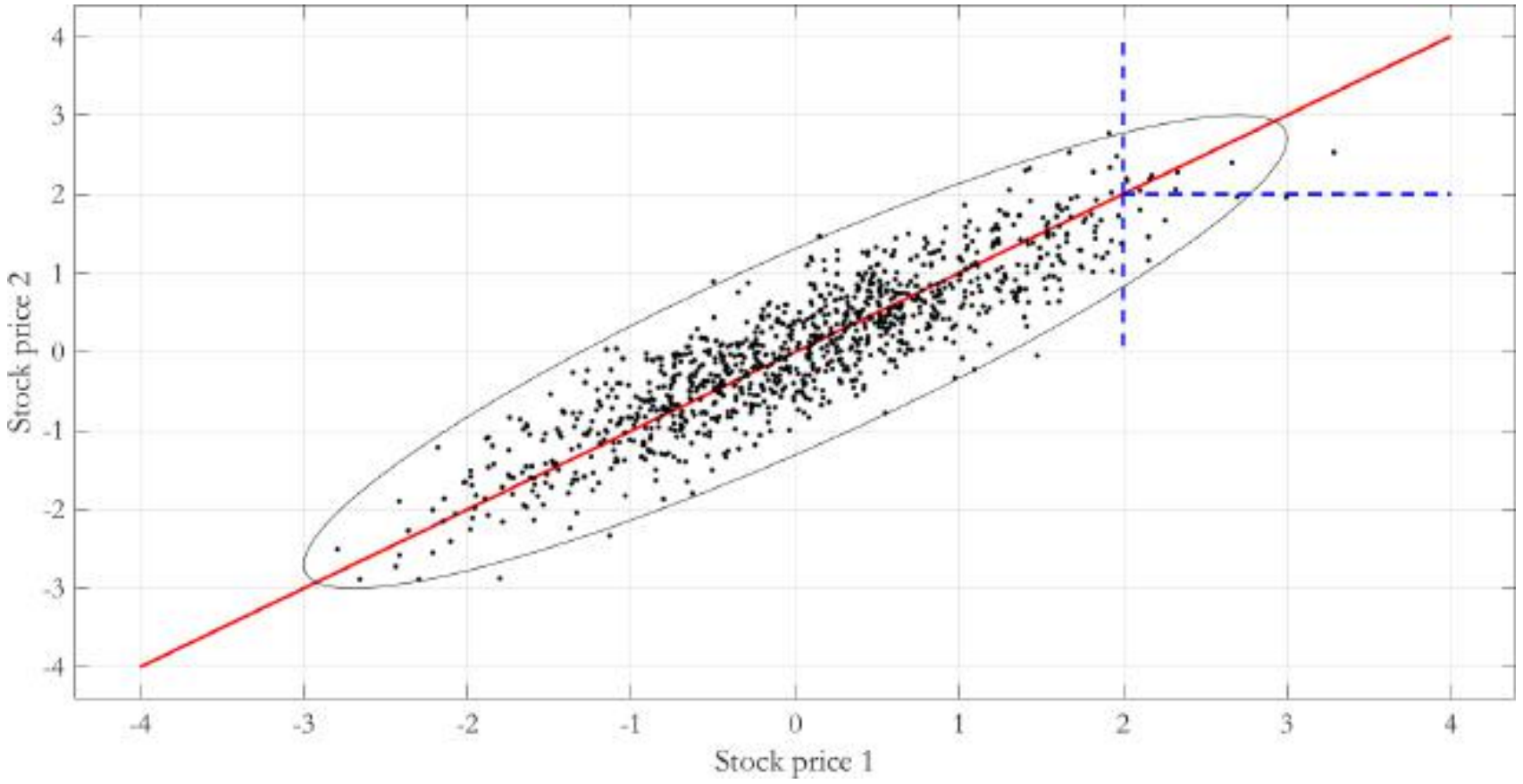
S-thalidomide
(mwtagen i'r ffetws)

Rwyn fodelydd ystadegol



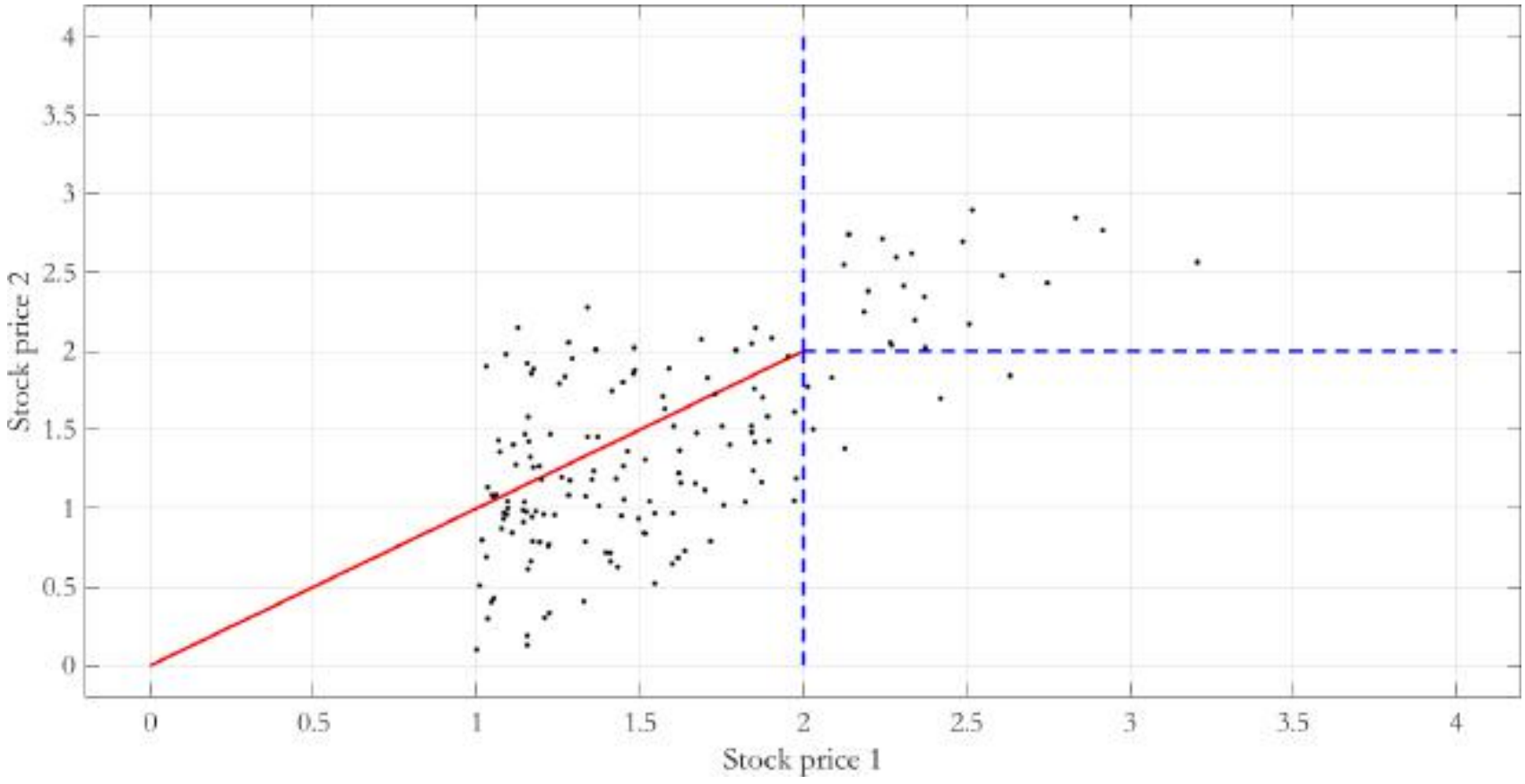
Beth yw'r siawns for pris stoc 2 yn uwch na phris stoc 1, pan fydd pris stoc 1 yn uchel iawn? Cynigion?

Cynigion?

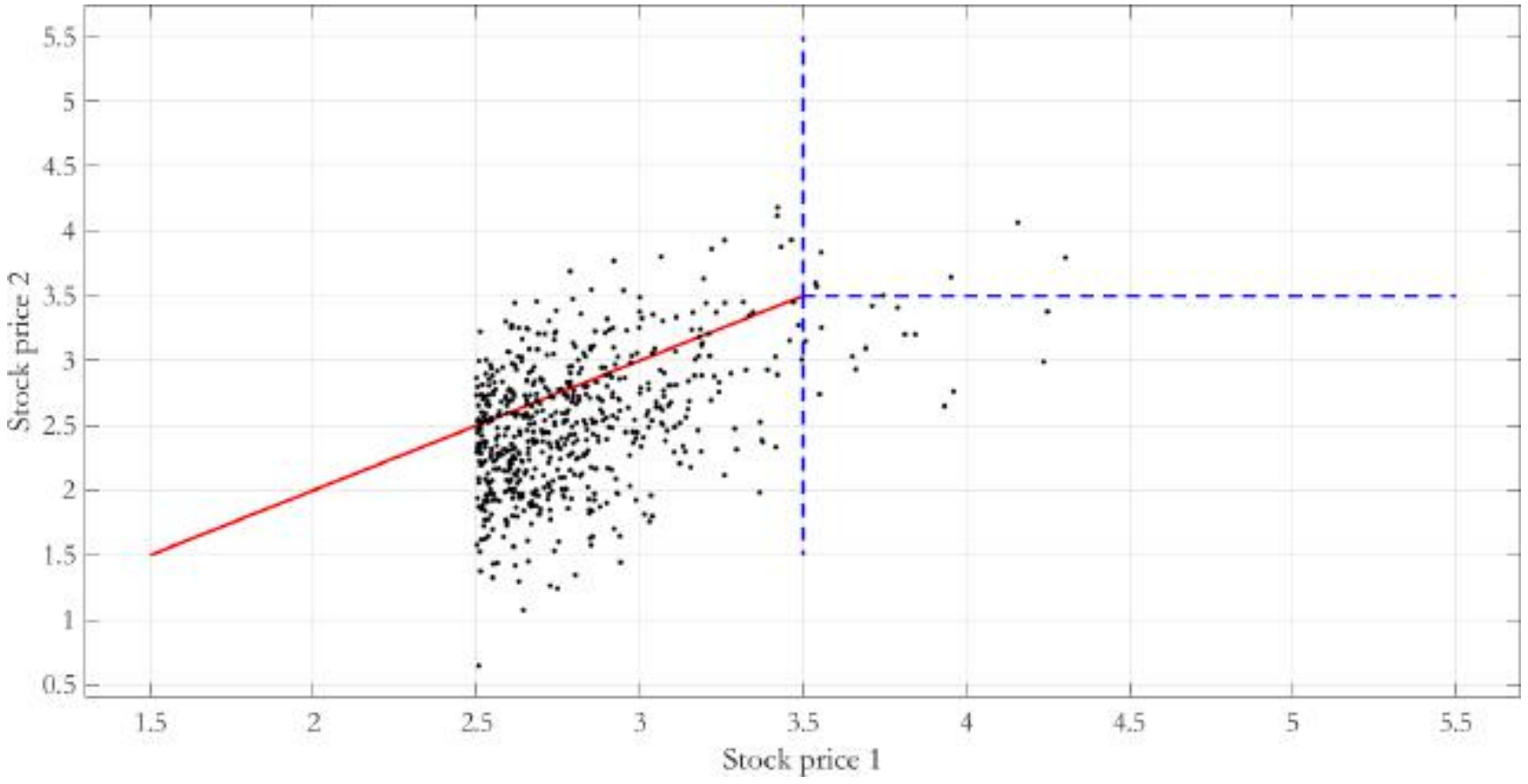


Hwyrach, tu fewn i'r elips, mae'r tebygolrwydd fod pris 2 yn uwch na phris 1 tua 0.5? Hyny yw, yn fathemategol $P(P2 > x|P1 > x) = 0.5$?

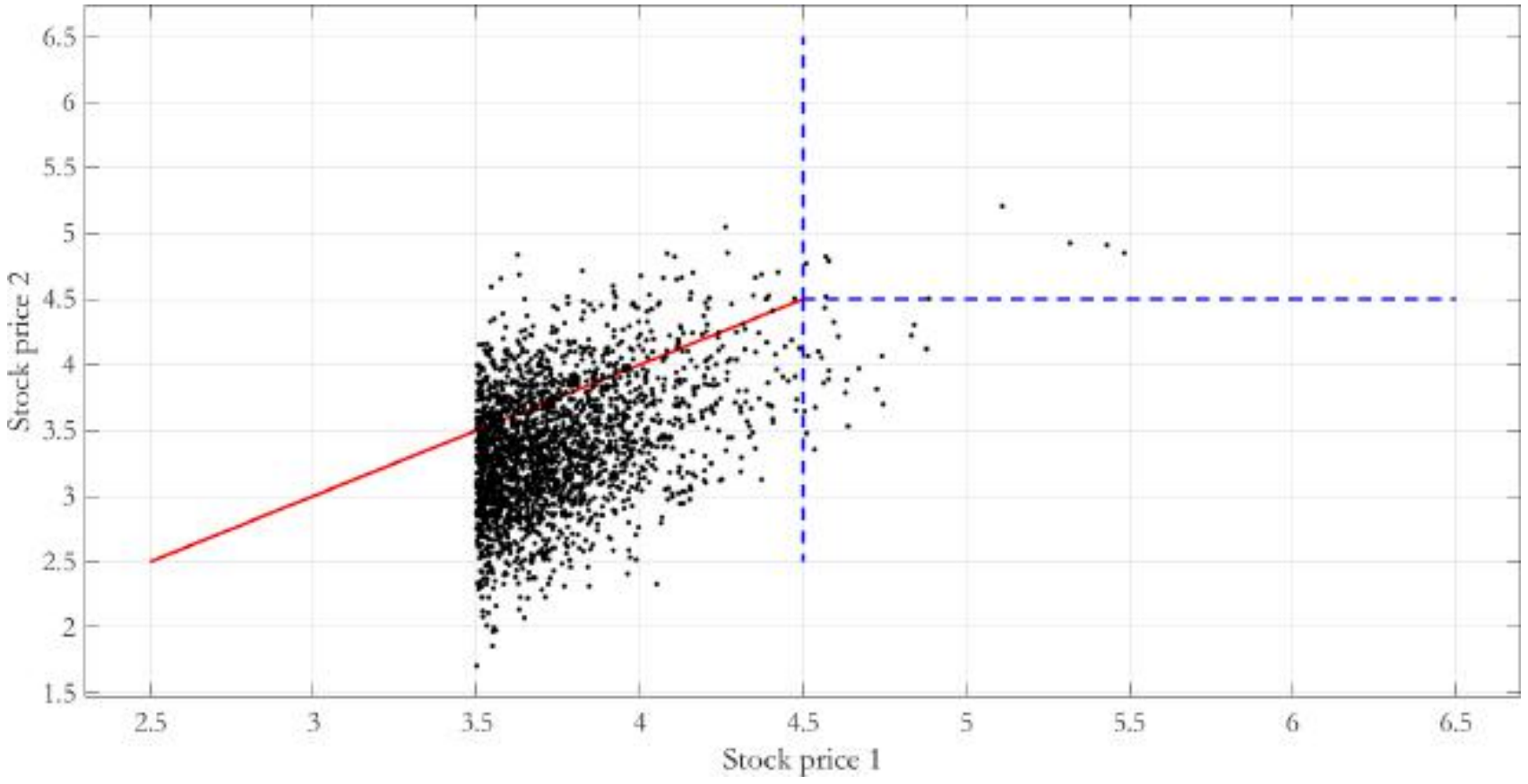
Pris 1 > 2



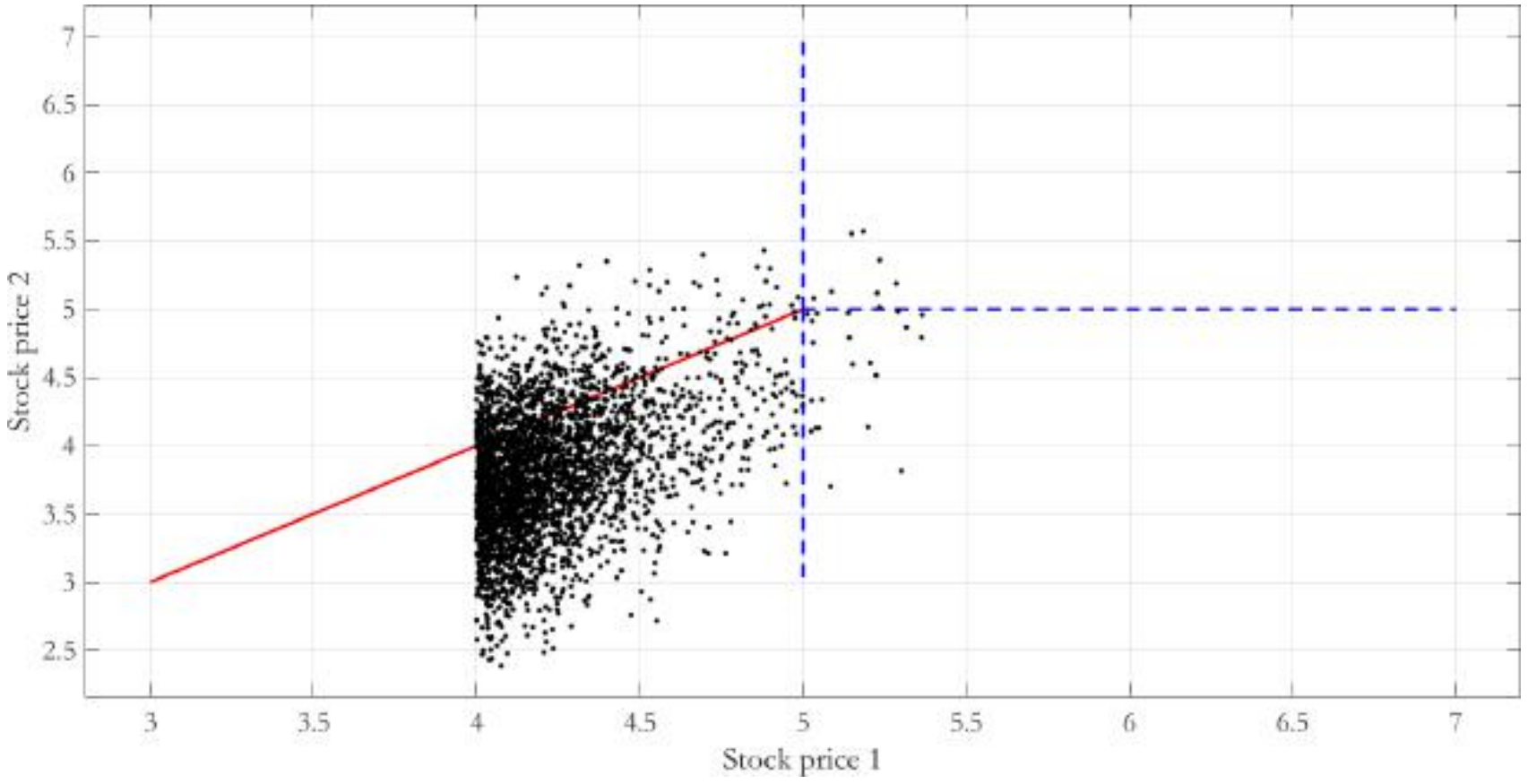
Pris 1 $>$ 3.5


Stock price 2
Stock price 1
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
1.5
2
2.5
3
3.5
4
4.5
5
5.5

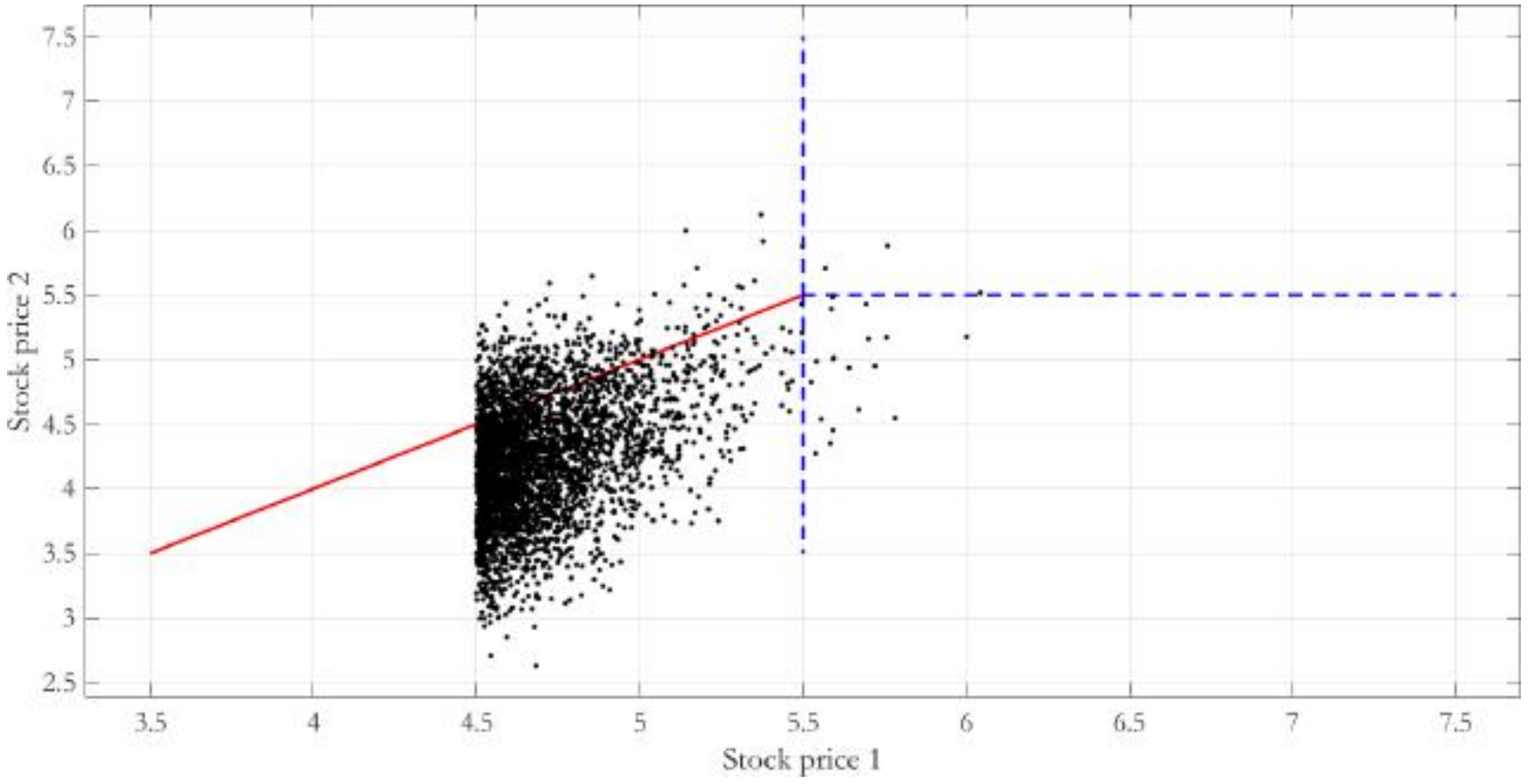
Pris 1 $>$ 4.5


6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
Stock price 2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
Stock price 1

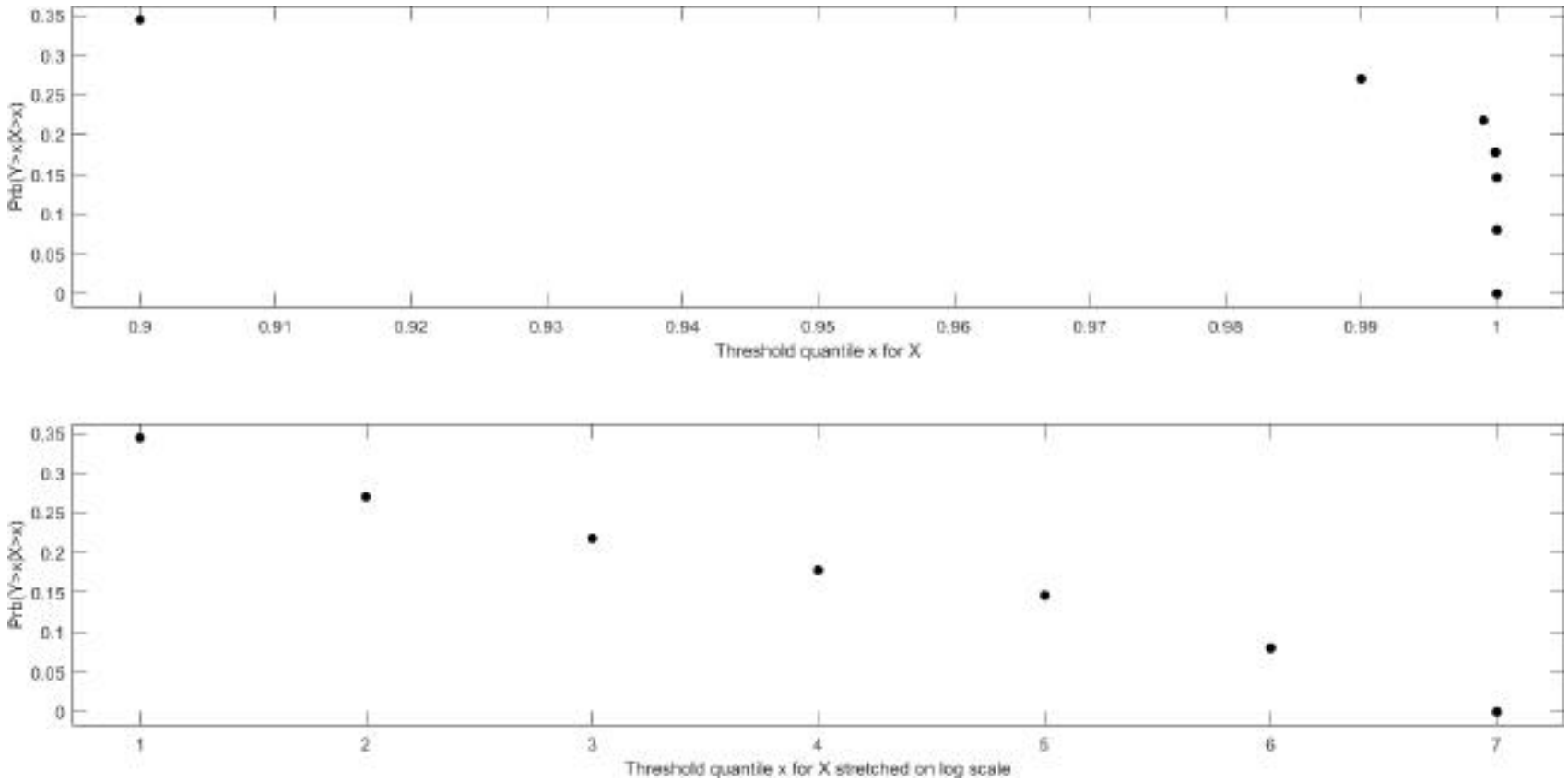
Pris 1 > 5


Stock price 2
Stock price 1
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7

Pris 1 $>$ 5.5


7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
Stock price 2
3.5
4
4.5
5
5.5
6
6.5
7
7.5
Stock price 1

Felly?



Pan fod Pris 1 yn andros o uchel, mae Pris 1 yn tueddu fod yn uwch na Phris 2 (er bod y tebygolrwydd tua 0.5 am brisau cymhedrol).

Hyny yw, yn fathemategol $P(P2 > x|P1 > x) = 0$ pan mae x yn fawr!

Mae canlyniadau fel hyn â goblygiadau mawr ym myd modelu arianol.

ac ym myd peirianeg ac eigioneg

Mae'n fywyd diddorol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ond does unman yn debyg i ...