

## **DACTEG**

Deddfwriaethol  
Amgylcheddol  
Cymdeithasol  
Technolegol  
Economaidd  
Gwleidyddol

Modd o dadansoddi sefyllfa neu datblygiad (2008)  
“Poblogaidd ar gyrsiau Adnoddau Dynol a Rheolaeth.”

# Cynhadledd Bac Cymreig: Ymchwil Prosiect Unigol Welsh Bac Conference: Individual Project Research **2016**

A form of Global Environmental Analysis (2008)  
“Popular on HR and introductory marketing courses”

## **PESTLE**

Political  
Economic  
Social  
Technological  
Legal  
Environmental



Her Dinasyddiaeth Byd Eang

Therapi Genynnau a Chnydau GM

*Yr Athro Deri Tomos, Ysgol Gwyddorau Bioleg, Bangor*

Global Citizenship Challenge

Gene Therapy and GM crops



# Her Dinasyddiaeth ?

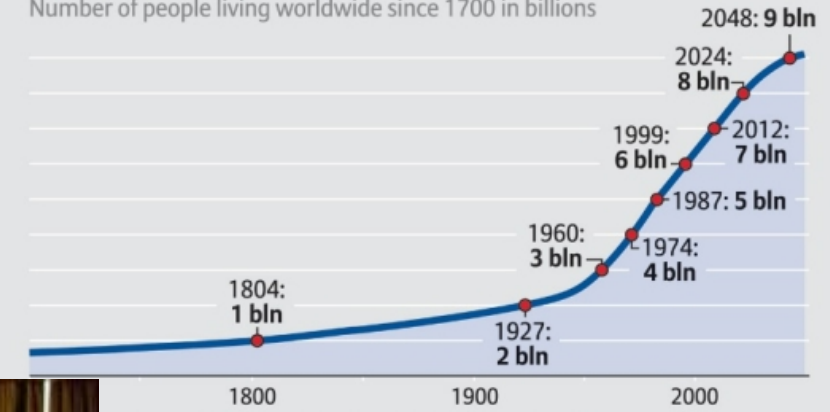
**Poblogaeth y Byd.** 7 biliwn (2015) yn symyd at 9 biliwn (2050)  
(DU 64 miliwn at 80 miliwn 2060\*).

**Disgwyliadau Pobl.** Bywyd mwy esmwyth yn gorfforol.

**Chwilfrydedd Pobl.** Beth yw Bywyd ?

## POPULATION OF THE EARTH

Number of people living worldwide since 1700 in billions



United Nations World Population Prospects, Deutsche Stiftung Weltbevölkerung  
Information please visit: [www.knowledge.allianz.com](http://www.knowledge.allianz.com)



## Citizenship Challenge ?

**World Population.** 7 billion (2015) rising to 9 billion (2050)  
(UK 64 million to 80 million 2060\*).

**Expectations.** Life more physically comfortable.

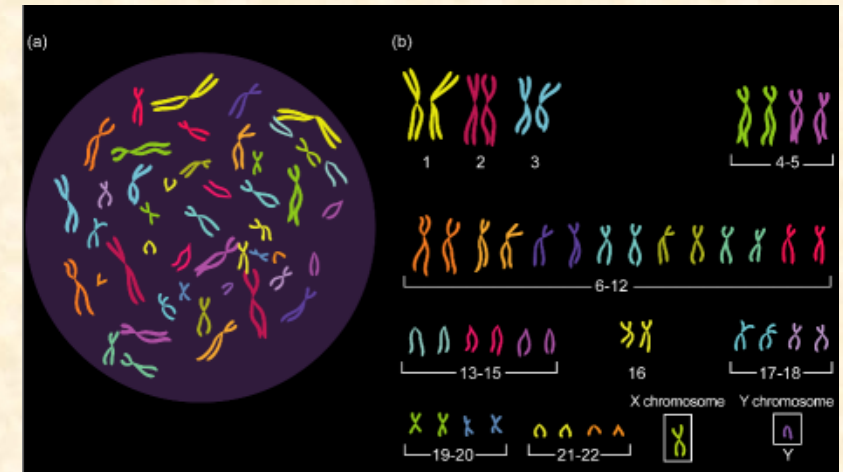
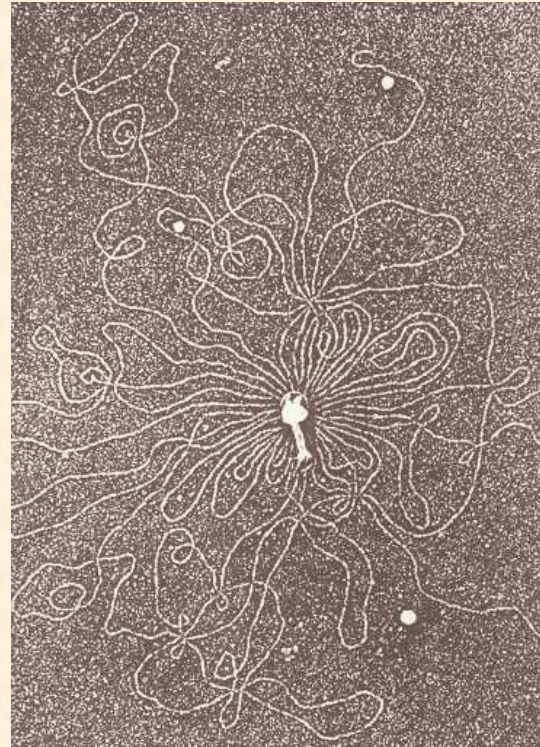
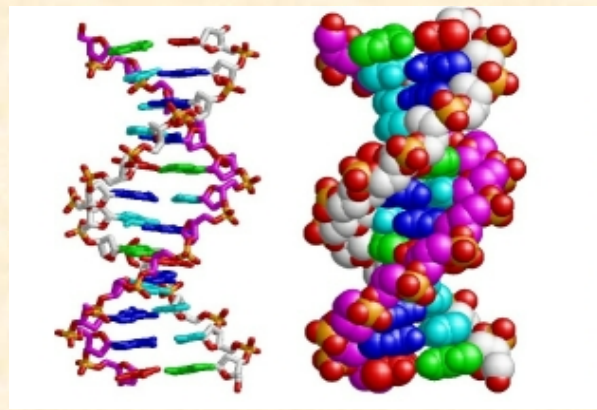
**Curiosity.** What is Life ?

(\*Adroddiad Heneiddio'r UE, 2015)

# Beth yw Bywyd (materol) ?

Cyfres o adweithiau cemegol a ffisegol wedi'i cyflyrru gan gwybodaeth etifeddegol ar ffurf dilyniant DNA.

Avery et al (1944); Crick & Watson (1953)



# What is (material) Life ?

A series of chemical and physical reactions driven by inherited information in the form of a DNA sequence

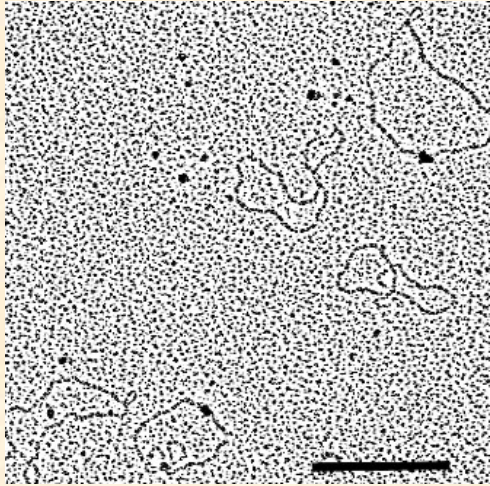
# Beth yw Bywyd (materol) ?

Cyfres o adweithiau cemegol a ffisegol wedi'i cyflyrru gan gwybodaeth etifeddegol ar ffurf dilyniant DNA.

**Darllen / Read:** ('60au '70au) - Firws  $\phi$ X 174 – 1977;  
Bacteriwm – 1995; dyn – 2003

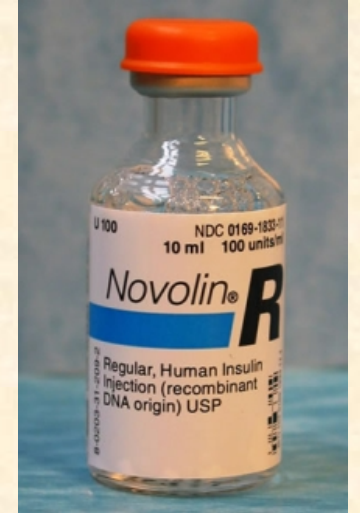


# DNA



**Ysgrifennu a golygu /  
Write and Edit :**

Somatostatin – 1977;  
Inswlin – 1978;  
Ice minws - 1987



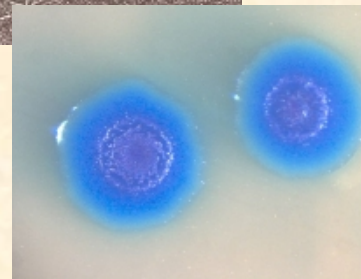
Craig Venter. Mai 2010.

## Bywyd synthetig

## Synthetic Life

# What is (material) Life ?

A series of chemical and physical reactions driven by inherited information in the form of a DNA sequence



## Y Bagloriaeth:

- Technolegau Newydd.
- Cynhyrchion moesegol ac eco-gyfeillgar.
- (Newyn).

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol  
Ffactorau Gwleidyddol, Economaidd, Cymdeithasol,  
Technolegol, Cyfreithiol, Amgylcheddol (**DACTEG**).

Popeth yn berffaith a  
ddigynnwrf ?



Everything hunky dory ?

Y dechnoleg mewn meddygaeth

Milfeddygaeth ac Amaethyddiaeth Anifeiliaid

Cnydau GM

The technology in medicine

Vetinary medicine and animal husbandry

GM Crops

## The Baccalaureate:

- New Technologies.
- Ethical and eco-friendly products
- (Hunger).

Facts, Factors, Different Views and Perspectives  
Political factors, Economic, Social, Technological, Legal,  
Environmental (**PESTLE**)

# Y dechnoleg mewn meddygaeth

## Gwneud pethau

Inswlin. Hormôn Tyfu, IL-2, Taxol, Interferon.

Brechiadau:

Hepatitis B (1991). Antibodïau Monoclonaid. Cancr. Ebola.

*Yn 2002 dirwywyd ProdiGene, cwmni fferyllol o College Station, Texas, \$3 miliwn pan fu bron i gyflenwad o ffa soia cael ei llygru a corn wedi'i addasu ar gyfer brechiadau diabetes yn Nebraska ac Iowa.*

# The Technology in Medicine

## Making things

Insulin, Growth hormone, IL-2, Taxol, Interferon

Vaccinations:

Hepatitis B (1991). Monoclonal antibodies. Cancer. Ebola.

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol



*In 2002 ProdiGene, a pharmaceutical company of College Station, Texas, was fined \$ 3 million when, in Nebraska and Iowa, they almost contaminated a supply of soybeans with corn that had been modified to make diabetes vaccinations .*

Facts, Factors, Different Views and Perspectives

# Y dechnoleg mewn meddygaeth

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol

## Therapi Genynnau



Plentyn “swigen” (SCID). Gwella 9 allan o 11.  
*Ond un yn marw o Liwcemia (2002)*

“Bubble” child (SCID). 9 of 11 were cured.  
*But one died of leukaemia (2002)*



Irfon Williams  
(Daily Post  
10/9/15)

Cetuximab (Ilygoden / dynol)  
(mouse / human)

# The Technology in Medicine

## Gene therapy

Facts, Factors, Different Views and Perspectives



**Therapi Genynnau** —————> **Golygu Genynnau**

Symud DNA o un creadur i un arall

Mireinio'r dechnoleg ?

Beth mae e'n ei gwneud ?

Pam bod e'n gwahanol ?

[GM embryos 'essential', says report](#) (BBC. Medi 10 2015)

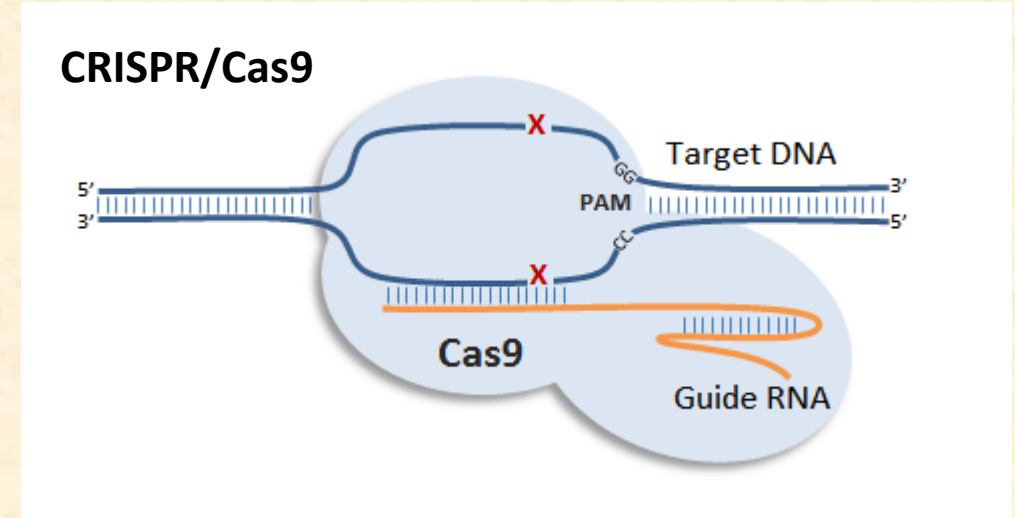
Moving DNA from one creature to another

Improved technology ?

**Gene therapy** —————> **Gene editing**

What does it do ?

Why is it different ?



[https://www.mirusbio.com/assets/figures/rna\\_programmed\\_dna\\_cleavage\\_by\\_crispr\\_cas9.png](https://www.mirusbio.com/assets/figures/rna_programmed_dna_cleavage_by_crispr_cas9.png)

Facts, Factors, Different Views and Perspectives

Y ddadl dechnegol: Dim DNA estron yn goroesi.

A ddylid ei gwneud ar embryo's ddynol ?

A ddylid ei ddefnyddio ar pobl ?



The technical argument: No foreign DNA survives

Should this be allowed with human embryos ?

Should it be allowed on adults ?

# Milfeddygaeth ac

## Amaethyddiaeth Anifeiliaid



### CRISPR/Cas9

Cyrn  
Lloi (godro) gwryw  
Wyau cywinon gwryw.

Gwartheg: gwrthiant i TB  
leir a moch: gwrthiant i'r ffliw

Horns  
Male (milk) cattle  
Male chicken eggs

Cattle: TB resistance  
Chicken & Pigs: Flu resistance

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol

Dolly y "clôn". Pam ?  
Meddyginiaethau ?  
Llefrith "iachach" ?



Why Dolly the clone ?  
Treatments ?  
"Healthier" milk ?

## Vetinary medicine and animal management

Facts, Factors, Different Views and Perspectives

# Cnydau GM

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol

Ice Minus. 1987 (AGS) **Protestiadau.**  
Flavr Savr. (Tomato - parhad) 1994. (Calgene)  
Bt. (Tatws – gwrth pla) 1995  
Roundup Ready. (Soya – gwrth chwyn) 1996 (Monsanto)  
Reis Aur. Fitamin A. (2000)



Y Pab Ffrancis.  
Enciclical ar Ecoleg. Mehefin 2015



Ice Minus. 1987 (AGS)  
Flavr Savr. (Tomato - fresh) 1994. (Calgene)  
Bt. (Potato – pest resistance) 1995  
Roundup Ready. (Soya – herbicide resist)  
1996 (Monsanto)  
Golden Rice. Vitamin A. (2000)



Pope Francis.  
Enciclical on Ecology. June 2015

# GM Crops

Facts, Factors, Different Views and Perspectives

Bt yn effeithio ar “natur”.

Effeithiau etifeddol – ee gwithsefyll chwynladdwr

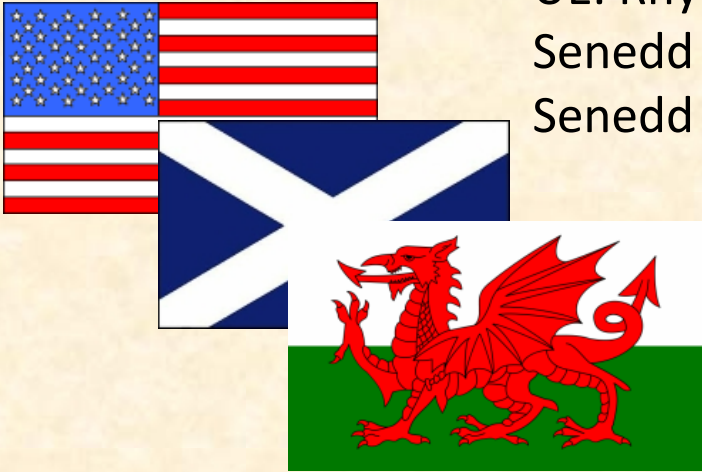
Alergedd

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol



**Ymateb y gwleidyddion**

UDA – agweddau gwahanol i CRISPR  
UE. Rhyddhau llywodraethau unigol. Ionawr 2015.  
Senedd yr Alban. Ban ar dyfu cynydau GM. Awst 2015.  
Senedd Cymru. Datganiad tebyg 10 Medi 2015



**The politician’s response**

USA – different response to CRISPR  
EU. Release individual governments. January 2015  
Scottish Parliament. Ban on growing GM crops. August 2015  
Welsh Assembly. Similar statement Sept 2015

Bt interfering with “nature”

Inherited effects – eg herbicide resistance

Allergies

Facts, Factors, Different Views and Perspectives

Ffeithiau, Ffactorau, Barn a Safbwyntiau Gwahanol

Ffactorau Gwleidyddol, Economaidd, Cymdeithasol, Technolegol, Cyfreithiol, Amgylcheddol (DACTEG)

Ystyried y dyfodol yn awr (neu gohirio) ?

Oes modd gwybod beth fydd y gofynion (ee mwy o fwyd) ?

Pwy sydd i benderfynnu ?

Masnach rydd ?

Llywodraeth pa lefel ?

Y cyfryngau ?

Crefyddau a chredoau ?

Facts, Factors, Different Views and Perspectives

Political factors, Economic, Social, Technological, Legal, Environmental (PESTLE)

Consider the future now (or deferred)?

No way of knowing what the requirements will be (eg more food)?

Who decides ?

Free market ?

Government – at what level ?

The Media ?

Religion and beliefs ?

Oes modd i bawb fod yn hapus ?

Cytuno ar y ffordd ymlaen ?



Can everybody be happy ?

Agree on a way ahead ?

DACTEG: <https://www.youtube.com/watch?v=iLcw7PN4Fy8>

PESTLE: <http://www.cipd.co.uk/hr-resources/factsheets/pestle-analysis.aspx#>