



We will begin momentarily at 2pm ET



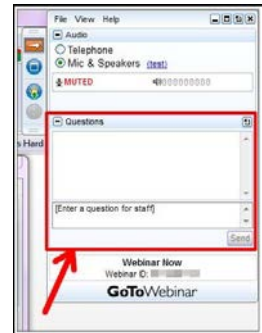
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1

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“Why am I muted?”

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Fan of the Week

Barry LeClair,
High School Science Teacher,
Biology, Chemistry, AP Chemistry, Physical Science,
and Information Technology



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Upcoming ACS Webinars

www.acs.org/acswebinars



Thursday, August 18, 2016

Crystallography as a Drug Design and Delivery Tool

Vincent Stoll, Research Fellow and Associate Director of Structural Biology, Abbvie

Robert Wenslow, Vice President Business Development, Crystal Pharmatech

Andrew Brunskill, Associate Principal Scientist, Merck



Thursday, September 1, 2016

Future Protective Materials for First Responders, Football Players, and Astronauts: Shear Thickening Fluids

Norman Wagner, Chemical & Biomolecular Engineering, University of Delaware & co-founder of STF Technologies LLC

Aaron Forster, Materials Research Engineer, National Institute of Standards and Technology

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Chemophobia: How We Became Afraid of Chemicals and What to Do About It



Darren Griffin
Professor of Genetics,
University of Kent, UK



James Kennedy
Chemistry Teacher and Blogger

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Chemophobia: How We Became Afraid of Chemicals and What to Do About It

James Kennedy
Chemistry Teacher
Haileybury, Australia

12

4:00

13



chemophobia

Irrational fear of compounds perceived as synthetic



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Chemophobia



- Irrational fear of compounds perceived as synthetic
- “Non-clinical phobia”
- Caused and cured by the spread of information
- Chemists are partly responsible for chemophobia
- Prevalent: “chemicals” are a top 10 public concern (UMich, 2008)



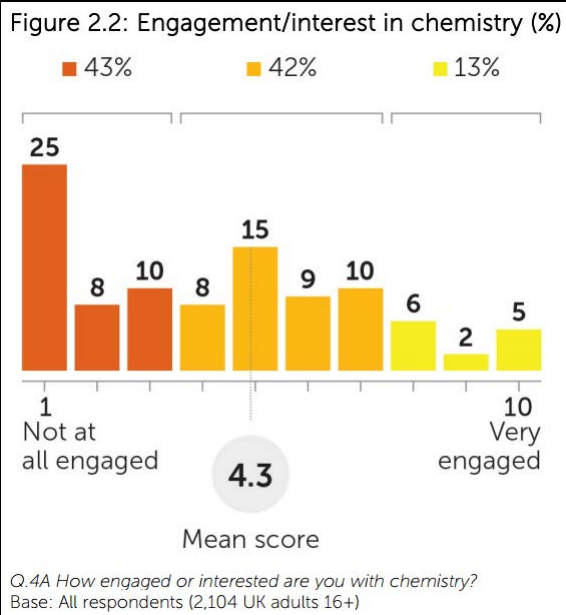
Introduction: Quick overview of the reputation of chemistry, chemicals and chemists



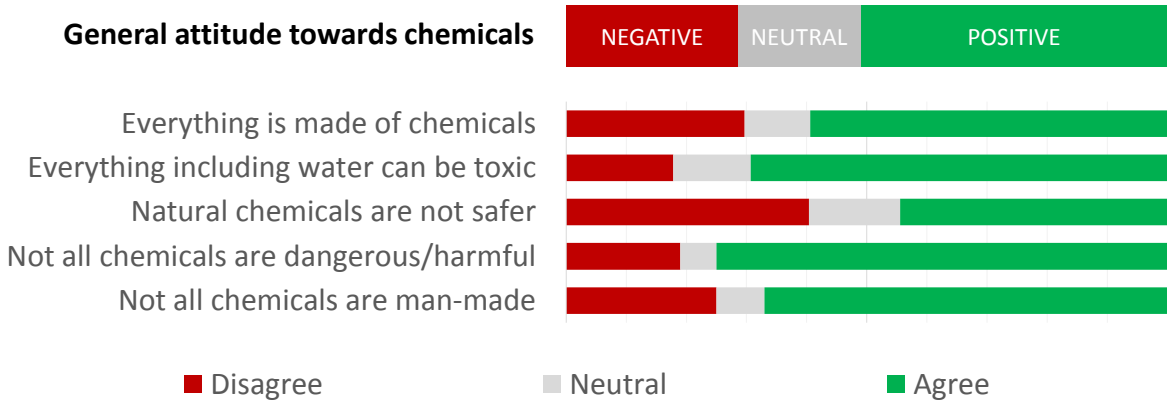
Word Associations: 'Chemistry'



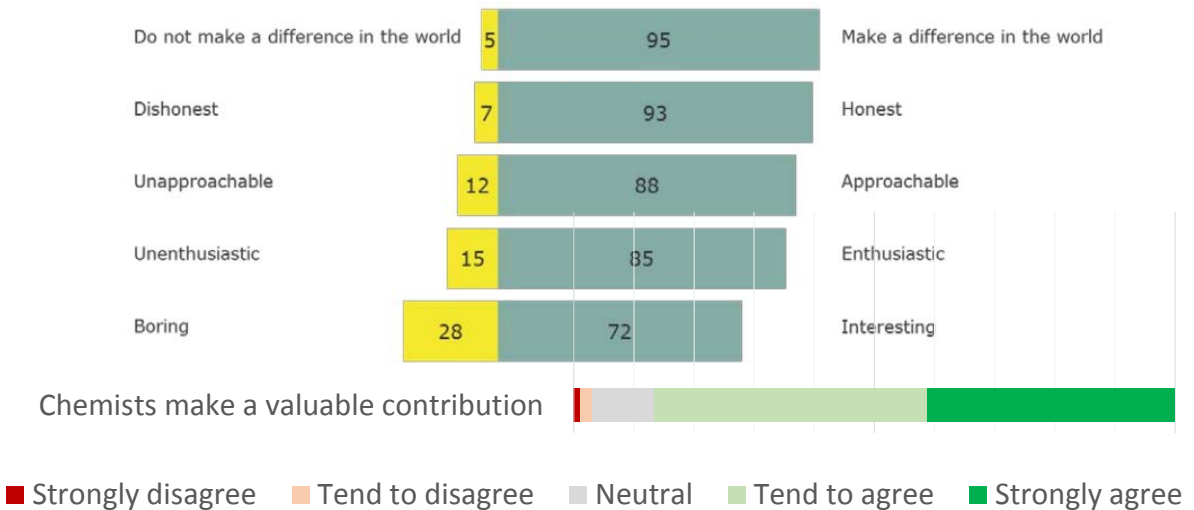
school intimidating
 teacher microscopic
 methodical secretive inaccessible
 serious hard focus labs
 accidents smells elements drugs
 medicine



Attitude towards chemicals is slightly better



Attitude towards chemists is great!



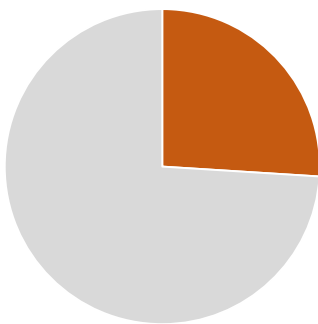
Why improve the reputation of chemistry?

- a healthy democracy needs informed citizens
- science funding relies ultimately on how much people value science
- helps us to realise the importance of our own work

CHEMISTRY

"Nothing in life is to be feared.
It only needs be understood."





26% of US respondents agreed

“It is impossible for recycled water to be treated to a high enough quality that I would want to use it.”

Survey by Paul Rozin *et al.* 2,670 people in several American cities were asked.





“It’s water. Having studied the engineering behind it, I’d happily drink it every day. It’s that safe.” – Bill Gates, 2015

gates
notes



**Purified water extracted from toxic waste
Pure H₂O(l)**



**Purified water extracted from a mountain spring
Pure H₂O(l)**



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Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which would you rather drink?

- I have a strong preference for the water from toxic waste
- I have a slight preference for the water from toxic waste
- I have no preference
- I have a slight preference for the water from a mountain spring
- I have a strong preference for the water from a mountain spring

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Part 1: Evolutionary origins of chemophobia as an irrational psychological quirk



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Contagion

- Paul Rozin, University of Pennsylvania
- By touching something we find disgusting, a previously neutral or even well-liked item can acquire—permanently—its properties of grossness.



Mark Schaller
University of British Columbia



“behavioural immune system”

“A suite of psychological mechanisms designed to detect the presence of disease-causing parasites in our immediate environment, and to respond to those things in ways that help us to avoid contact with them.”



April 2011 vol. 20 no. 2 99-103

Mark Schaller
University of British Columbia



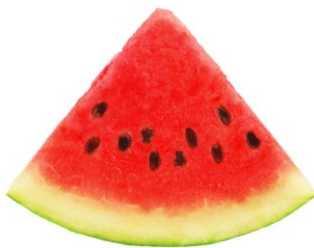
“behavioural immune system”

“...the system responds to an overly general set of superficial cues, which can result in aversive responses to things (including people) that pose no actual threat...” – Mark Schaller



April 2011 vol. 20 no. 2 99-103

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We eat a watermelon
that's gone bad, which
makes us ill

“Eww... I don't like
melon”



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DDT is sprayed excessively

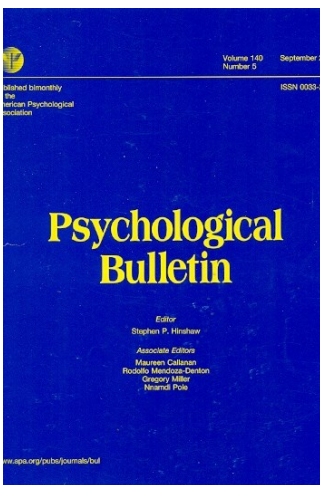


"I don't like artificial chemicals"



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**Megan Oaten
Macquarie University**



2009, Vol 135, No. 2 303-321

1. There is a correspondence between elicitors and disease	Strong	Intermediate
2. Universality of Hypothesis 1 relationship	Moderate	Limited
3. Lawful variation in disgust sensitivity by culture	Weak	Limited
4. Disgust is suppressed in motivational conflicts	Weak	Absent
5. Violation of disease-related cultural norms elicits disgust	Moderate	Limited
6. For an elicitor, its source affects evoked disgust	Moderate	Intermediate
7. Vulnerability to disease, actual or perceived, enhances disgust during		
a. Pregnancy	Moderate	Intermediate
b. Aging	Not supported	Intermediate
c. Perceived threat	Weak	Absent
8. Lawful disease-related individual differences in disgust exist:		
a. Sensitivity is higher in women than in men	Strong	Extensive
b. Higher sensitivity results in fewer infections	Weak	Limited
c. Higher sensitivity results in fewer sexual partners	Weak	Limited
9. High false alarm rates for disgust responses	Moderate	Intermediate
10. Disgust responses are automatic and impenetrable	Weak	Limited
11. Disgust-evoking cues can contaminate other objects	Strong	Extensive
12. The features of disgust-evoking cues are prepared	Weak	Absent
13. More prepared cues are acquired earlier	Weak	Limited
14. Disgust can evoke a preparatory immune response	Weak	Absent



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Some people prefer “chemical-free” products

- People fear parabens, sulfates, formaldehyde, MSG the most
- Labels make irrelevant ‘free from’ claims



moisturiser label



**“sulfate-free”
but it foamed**



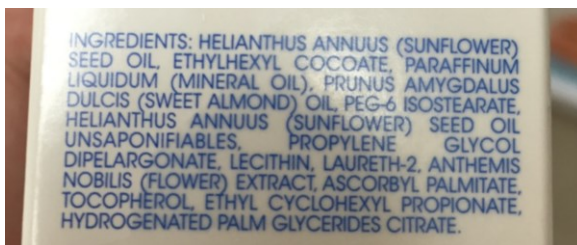
“chemical-free” lip balm



35

Some people prefer “natural” products

- What does natural mean?
 - UK: “Produced by nature”
 - Canada: “Processed only minimally” and “with nothing added or removed”
- Is anything natural?



claims to be “natural”



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Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which of the claims on the front of the bottle are INCORRECT?

- Pure only
- Pure & natural
- Natural & organic
- Organic & pure
- Pure, natural & organic

Part 2: Origins of seven types of modern chemophobia



1: Anti-vaccination (1798)

- Started immediately after the introduction of smallpox vaccine by Edward Jenner in 1798

First arguments

- “Vaccines don’t work”
- “Smallpox vaccine turns you into a cow”
- “Injecting is unchristian”
- “Mandatory injections erode our personal liberties”
- 1802: Anti-vaccination cartoon in newspaper
- 1879: First anti-vaccination society in the US
- 1885: Massive anti-vaccination protest in Leicester, UK





Anti-vaccination cartoon, 1802

Artist's impression of , anti-vaccination demonstration in Leicester, England, 1885



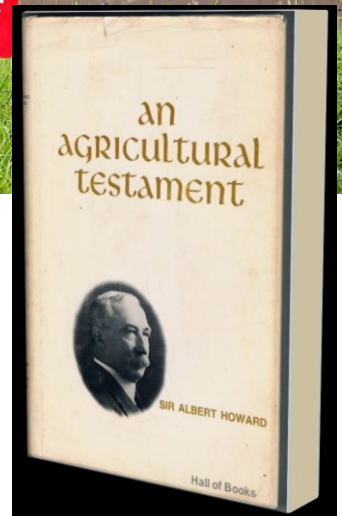
41

2: Organic food (1940)

- Started immediately after the introduction of DDT (1939)

First arguments

- “Mycorrhizal association is being ignored”
- “Health of our soils is being depleted”
- “The use of agricultural chemicals is unsustainable”
- Requires the **misconception** that pesticides are not sprayed onto organic crops... but they are!
 - Spinosad insecticide (irritant)
 - Lime sulphur (corrosive; causes blindness if sprayed in eyes)



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3: Anti fluoridation (1945)

- **Started immediately after Grand Rapids water fluoridation experiment (1945)**
- 60% reduction in tooth decay over 15 years



First arguments

- “Communist plot to damage our health”
- “Goes against libertarian values”



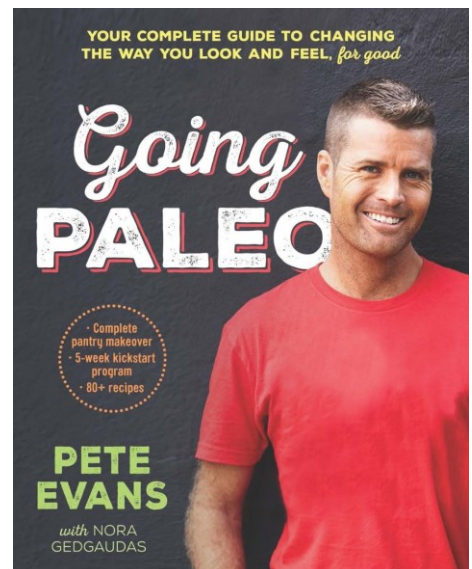
43

4: Paleolithic diet (1985)

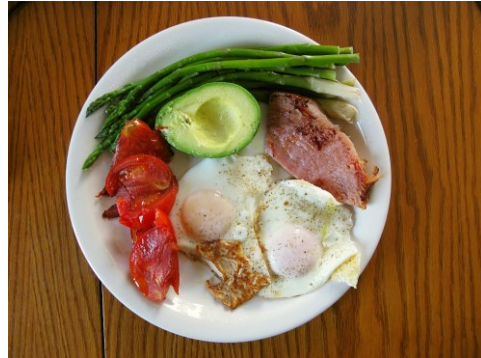
- **Started in 1985 when Eaton & Konner published “Paleolithic Nutrition” paper in NEJM**

First arguments

- “[Modern western diets] contribute to heart disease, hypertension, diabetes & cancer”
- “Our bodies haven’t evolved to eat farmed foods”
- Fad diet based on what humans might have eaten 10,000 to 40,000 years ago
- Meat, fish, vegetables, fruit; no farmed foods
- Direct response to growing nutritional concerns in the 1980s



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5: Anti-GMO (1987)



- **Started in 1987 when the first genetically-modified organism to be introduced to the environment was destroyed by protesters**
- Anti-corporate bias
- Anti-gene-patenting



46

6: “Chemtrails” (1996)

- **Started in 1996 after the US Air Force published “Weather as a Force Multiplier: Owning the Weather in 2025”**

First arguments

- “Climate control”
- “Chemical weapon testing”
- “Radar mapping”
- “Drugging the population”
- Fragmented group with varied beliefs and almost no evidence



Chemophobic movements are immediate and reactionary responses to external stimuli

Movement	Origin	Stimulus	Time lag
Chemical-free	(ancient)	Innate biophilia	n/a
Anti-vaccination	1798	Vaccinations	<4 years
Organic foods	1940	DDT	<1 year
Anti-fluoridation	1945	Fluoridation	<1 year
Paleolithic diet	1985	Declining nutrition	<2 years
Anti-GMO	1987	GMOs	<6 months
Chemtrails	1996	Research paper	<6 months

Conclusion

- **Haters emerge on day one**
- **Their arguments evolve**



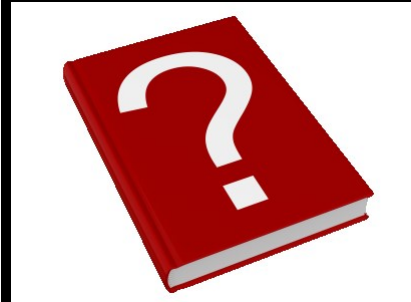
- Chemical-free
 1. Anti-vaccinations
 2. Organic foods
 3. Anti-fluoridation
 4. Paleolithic diet
 5. Anti-GMO
 6. Chemtrails

Uninformed and not actively interested



Part 3: Events that amplified chemophobia even further





1962



1969

+



1972

51

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which of these had the greatest influence in sparking the modern environmental movement?

- Rachel Carson's *Silent Spring*, 1962
- Apollo missions, 1961-1972
- Industrial disasters (e.g. Times Beach, Bhopal), 1960s-80s
- Fall of the Berlin Wall, 1989
- Social media, late 2000s onwards

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Published in 1962

By Rachel Carson, a marine biologist

Worked for US Fish & Wildlife Service (USFWS)



“[Chemicals are] the sinister and little-recognised partners of radiation... entering into living organisms passing from one to another in a chain of poisoning and death”



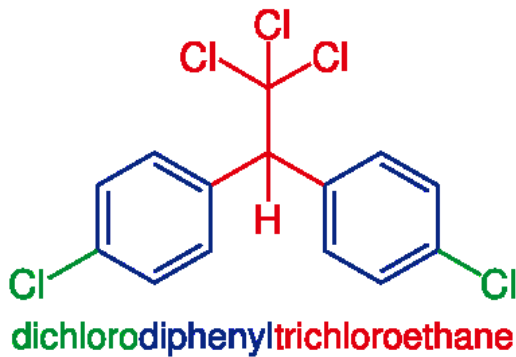
DDT was sprayed liberally on farms, people, beaches, houses, suburbs



DDT was sprayed liberally on farms, people, beaches, houses, suburbs



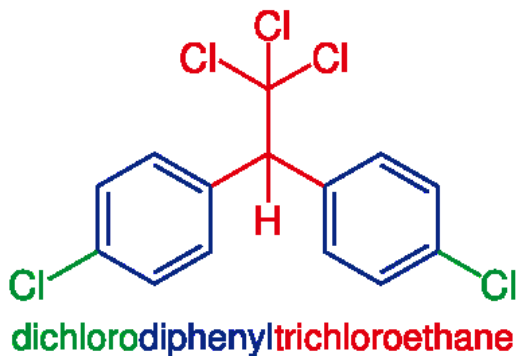
Dichlorodiphenyltrichloroethane (DDT)



- Synthetic insecticide
- Developed in 1939
- DDT destroys hundreds of types of insects at once
- Eliminates malaria and lice **very effectively**
- Inventor Paul Müller was awarded a Nobel Prize in Medicine in 1948

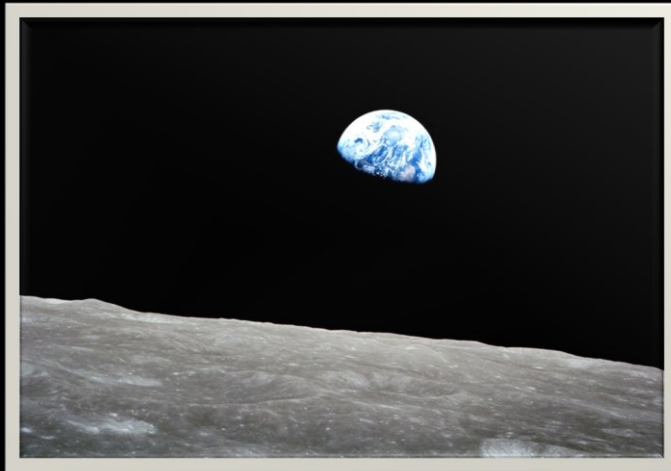


Dichlorodiphenyltrichloroethane (DDT)



- **DDT bioaccumulates**
- Neither metabolised nor excreted
- DDT is a lipophile (binds to lipids)
- Highly stable compound
- 8-year half life in animals
- Mixed evidence regarding health effects in humans
- *Silent Spring* made people afraid of chemicals – especially artificial chemicals like DDT





NASA image AS8-14-2383
"Earthrise"
Apollo 8 mission
December 24, 1968

59



NASA image AS17-148-22727
"The Blue Marble"
Apollo 17 mission
December 7, 1972

60



**Neil deGrasse Tyson
"Space as Culture" speech**



**Photographs of the Earth in its natural
state amplified our innate biophilia**

**We discovered our planet's natural
beauty for the first time**



**Bastion of the modernist movement
Pruitt-Igoe urban housing project, 1954
St. Louis, Missouri, USA**

63



**Demolition of Pruitt-Igoe signalled the beginning of postmodernism
1971-72, St. Louis, Missouri, USA**

64

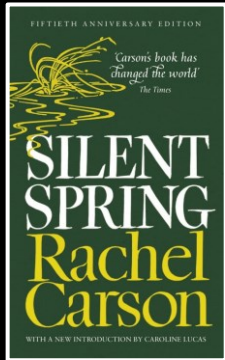
Modernism (pre-1972)	Postmodernism (post-1972)
Objective reality exists	All reality is merely a social construct
Statements of historians and scientists are either true or false	There is no 'truth' – my version of the truth can be as true as yours
Humanity is becoming smarter, more prosperous, more humane	Technological achievements are not progress, they're regress – they enable us to torture and oppress (note WW2)
Logic applies universally	Logic is a social construct with no metaphysical authority
Language reflects reality	Even if there was a 'truth', there'd be no way to express it



Postmodernism devalued science & experts

- With the internet, anyone can have an opinion
- “The cult of the amateur” has emerged
- Experts are no longer automatically trusted
- Scientific truth is just one opinion
- All parties—no matter how absurd or unproven their 'facts' and claims—should be treated equally





1962

Made us fear chemicals – especially artificial chemicals

+



1969

Amplified our innate biophilia – made us love our natural world

+



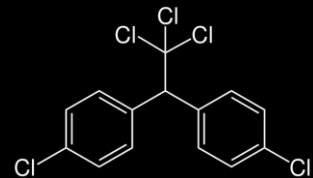
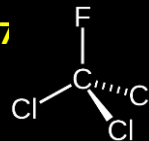
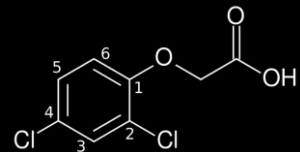
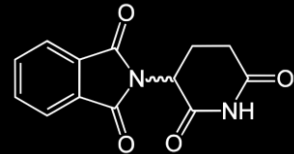
1972

A symbol of our ebbing trust for experts and scientists – postmodernism is born

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Events that fuelled chemophobia even further

- Thalidomide **banned in 1961**
- Minamata Bay disaster, Japan **1968**
- Smoking and tobacco companies' cover-up **1950s-70s**
- Agent Orange **used from 1961-71**
- Times Beach disaster, Missouri **1970s**
- DDT **banned 1972**
- Ozone depletion due to CFCs **discovered 1974**
- Love Canal disaster, New York **1976**
- Bhopal disaster, India **1984**
- Chernobyl disaster **1986**



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TV Documentaries

BIOLOGY	CHEMISTRY	PHYSICS
Life Planet Earth Blue Planet How Earth Made Us Wonders of Life Your Inner Fish Inside the Human Body First Life <i>and so many more...</i>	Chemistry – A Volatile History <i>...that's it.</i>	Wonders of the Solar System Wonders of the Universe Human Universe Wonders of Life Cosmos How the Universe Works Can We Make a Star on Earth? Journey to the Edge of the Univ. <i>and so many more...</i>



Our

- Chem
- BBC
- Prob
- Episo
 - 1
 - 2
 - 3
 - ...

**TRY:
HISTORY**

Jim Al-Khalili
Professor of Theoretical Physics

Chalkboard equations:

$$\nabla \times \underline{E} = -\frac{\partial \underline{B}}{\partial t} \quad \nabla \times \underline{B} / \mu_0 = \underline{C} \frac{\partial \underline{E}}{\partial t}$$

$$\nabla \cdot \underline{E} = 0 \quad \nabla \cdot \underline{B} = 0$$

$$\nabla \times (\nabla \times \underline{E}) = -\frac{\partial}{\partial t} (\nabla \times \underline{E}) = -\frac{\partial}{\partial t} (\mu_0 \underline{C} \frac{\partial \underline{E}}{\partial t})$$

$$-\nabla^2 \underline{E} + \nabla(\nabla \cdot \underline{E}) = -\mu_0 \underline{C} \frac{\partial^2 \underline{E}}{\partial t^2}$$

$$\nabla^2 \underline{E} - \mu_0 \underline{C} \frac{\partial^2 \underline{E}}{\partial t^2} = 0$$

$$Speed = \frac{1}{\sqrt{\mu_0 \underline{C}}} = 3 \times 10^8 \text{ m/s}$$

Part 4: Current efforts to fight chemophobia



Current efforts to fight chemophobia

- *“Chemicals are everywhere”*
- *“The dose makes the poison”*
- *“Natural isn’t always safe”*
- *“Natural/artificial is a construct”*
- They’re all **reactionary**



“Chemicals are everywhere”



INGREDIENTS INCLUDE:

- Carotene
- Tocopherol
- Riboflavin
- Nicotinamide
- Pantothenic acid

All ingredients naturally found in apples.



Solutions for the Growing World



“Chemicals are everywhere”

Food is chemicals

Green Tea

Ingredients: water, catechin, epicatechin 3-gallate, caffeine, epicatechin, epigallocatechin gallate, epigallocatechin, flavanols, glycosides, chlorogenic acid, coumarylquinic acid, theogallin, theanine, theobromine, theophylline, quercetin, kaempferol, myricetin

Design credit: Millaray Strang, "Green Tea" April 2004
via Flickr, Creative Commons Attribution

Food is chemicals

Olive Oil

Ingredients: triacylglycerols, diacylglycerols, hydroxytyrosol, tyrosol, chlorophyll, carotenoids, tocopherols, phyloquinone, oleic acid, linoleic acid, palmitic acid, stearic acid, linolenic acid, glycerol, phosphatides, sterols

Design credit: Adam Bix, "Olive Oil" July 21, 2007
via Wikipedia, Creative Commons Attribution

“MRW”



CONVENTIONAL STRAWBERRY



ORGANIC STRAWBERRY



Ingredients: Captan, Pyraclostrobin, Boscalid, Tetrahydrophthalimide, Myclobutanil, Pyrimethanil, Fludioxonil, Bifenthrin, Malathion, Fenhexamid, Cyprodinil, Carbendazim, Malaoxon, Azoxystrobin, Methomyl, Quinoxifen, Fenpropathrin, Acetamiprid, Propiconazole, Bifenoxate, Thiamectoxam, Spinosad A, Methoxyfenozide, Triflumizole, Dichlorvos, Hexythiazox, Metalaxyl, Propiconazole II, Thiabendazole, Spinosad D, Imidacloprid, Endosulfan sulfate, Propiconazole I, Iprodione, Piperonyl butoxide, Endosulfan II, Chlorpyrifos, Carbaryl, Pyriproxyfen, Endosulfan I, 1-Naphthol, Acephate, Clothianidin, Azinphos methyl, Naled, Cyhalothrin, Dieldrin, Folpet, Tebuconazole, Fenbuconazole, Propargite, Dimethoate, Heptachlor epoxide, Diazinon

Ingredients: Strawberry



“The dose makes the poison”

APPLE SEEDS



CONTAIN AMYGDALIN
~0.6g/kg of seeds

PEARS



CONTAIN FORMALDEHYDE
~0.06g/kg

POTATOES



CONTAIN SOLANIN
~0.2g/kg
(higher in green potatoes)

COURGETTES



CONTAIN CUCURBITACIN E
Variable
(higher in bitter courgettes)

ALL OF THE FOOD ITEMS ABOVE CONTAIN NATURAL CHEMICALS THAT ARE TOXIC TO HUMANS. HOWEVER, THEY ARE USUALLY PRESENT IN VERY SMALL AMOUNTS, FAR BELOW THE HARMFUL DOSE.

JUST BECAUSE A CHEMICAL IS PRESENT, DOES NOT MEAN THAT IT IS HARMFUL IN THE *AMOUNT* PRESENT.

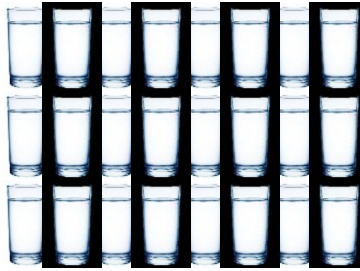
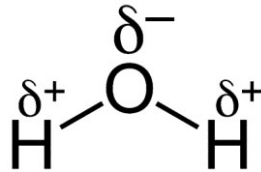


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“The dose makes the poison”

- Dihydrogen monoxide
- LD₅₀ is about 6 litres
- Chi Tau ‘hazing ritual’, 2005
 - 1 dead, 2 comatose
- KDND radio ‘Wee for a Wii’ competition
 - 1 death
- [Na⁺]↓↓
- Brain swelling



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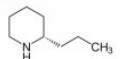
“Natural isn’t always safe”

Natural isn't always safer...



This plant is hemlock. It contains a deadly neurotoxin coniine.

Everything contains chemicals.
Some synthetic chemicals are unsafe.
Some natural chemicals are unsafe.



... Promote safe ingredients.

Samuel J. Lord

sam@everydayscientist.com

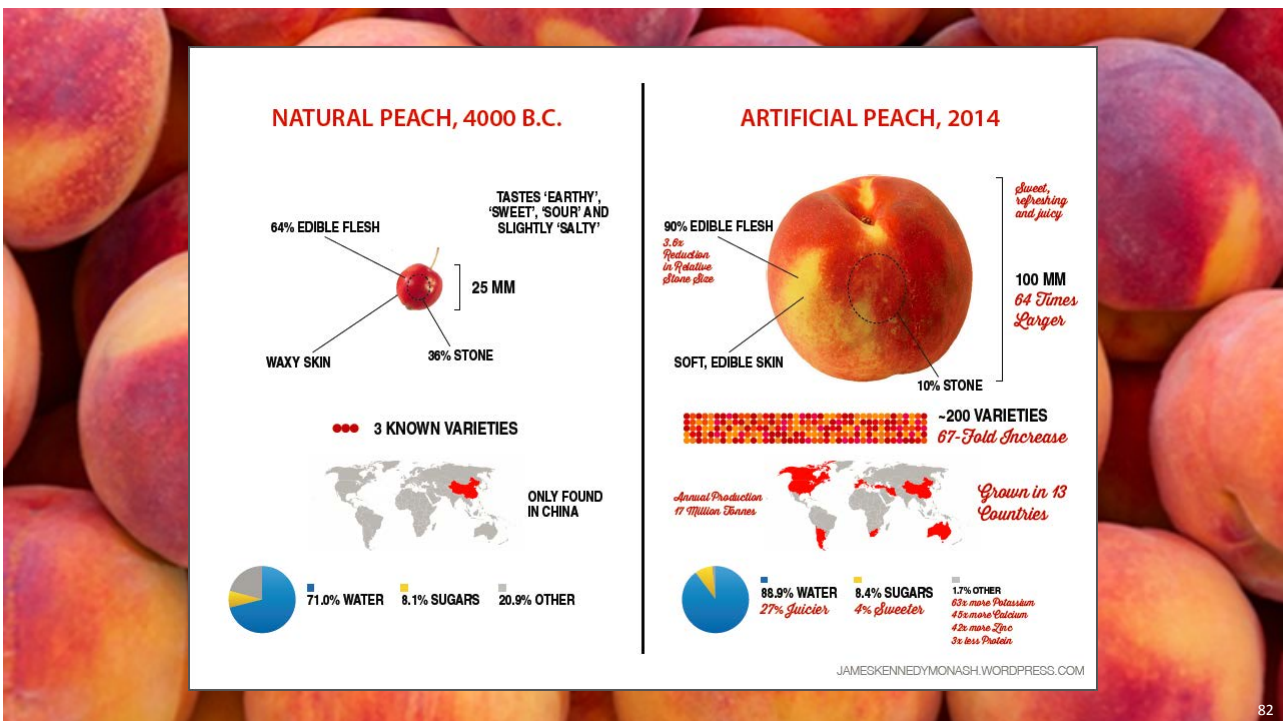
80

Natural/artificial is a construct

- Blur the boundaries between natural and artificial
- This erodes the core belief upon which chemophobia relies



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82

NATURAL "CORN", 7000 B.C.


PEEL IT BY HAMMERING REPEATEDLY WITH A HARD OBJECT

TASTES LIKE VERY DRY, RAW POTATO


19 MM

5-10 VERY HARD KERNELS


8 KNOWN VARIETIES




ONLY FOUND IN CENTRAL AMERICA



75.0% WATER



1.9% SUGARS



23.1% OTHER
MOSTLY STARCH

ARTIFICIAL CORN, 2014

STEAM COOKS IN MINUTES

Sweet, refreshing and juicy

190 MM

EASY TO PEEL
No Hammer Required!


~1000 Times Larger

AVAILABLE IN FIVE COLOURS:


- WHITE
- YELLOW
- ORANGE
- DEEP PURPLE
- BLACK

~200 VARIETIES
25-Fold Increase


Annual Production: *700 Million Tonnes*




Grown in 69 Countries



73.2% WATER
2% Less Juicy



6.6% SUGARS
3.5x Sweeter



20.2% OTHER
Still Rich in Starch!

JAMESKENNEDYMONASH.WORDPRESS.COM

NATURAL "WATERMELON" ~3000 B.C.

OPEN WITH A HAMMER OR SHARP OBJECT


EXTREMELY BITTER TASTE
(SOME VARIETIES ARE BITTER-SWEET)

CAUSES INFLAMMATION


18 SEEDS, VERY RICH IN FAT
THEY TASTE NUTTY AND EXTREMELY BITTER

50 MM


6 KNOWN VARIETIES




FOUND IN NAMIBIA & BOTSWANA



80.0% WATER



1.9% SUGARS



18.1% OTHER
MOSTLY STARCH AND FAT

ARTIFICIAL WATERMELON, 2014

DIFFERENT SHAPES AVAILABLE:

- SPHERICAL
- SPHEROID
- ROUNDED INTO ANY SHAPE

Reduces Inflammation!

Sweetness!

OPEN BY DROPPING FROM ONE METRE
No Hammer Required!


Deliciously sweet & so juicy that it sometimes explodes when ripe

AVAILABLE IN FOUR COLOURS:


- CREAM
- YELLOW
- LIME GREEN
- RED

~1200 VARIETIES
200-Fold Increase


Annual Production: *90 Million Tonnes*




Grown in 15 Countries
Most are grown in China



91.5% WATER
14% Juicier



6.2% SUGARS
3.3x Sweeter

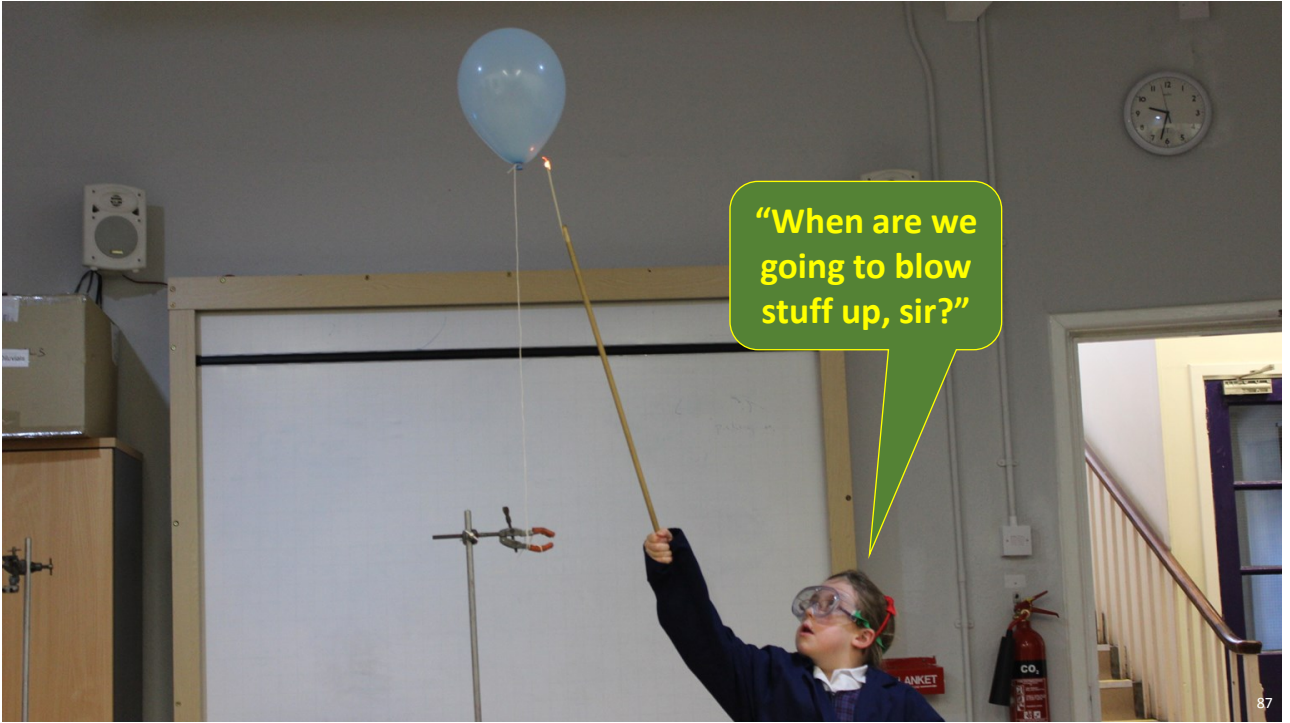


2.3% OTHER
Virtually Fat-Free and Starch-Free
35x more Vitamin C

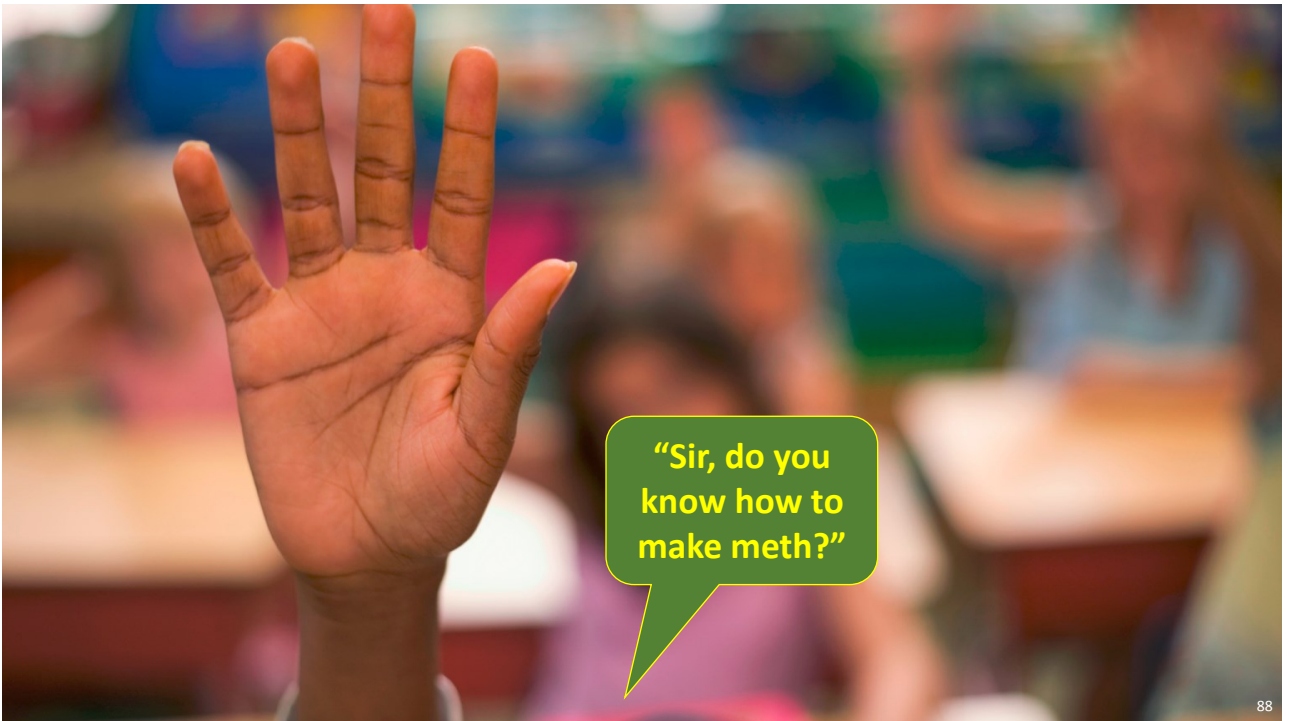
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Part 5: How children are introduced to chemistry





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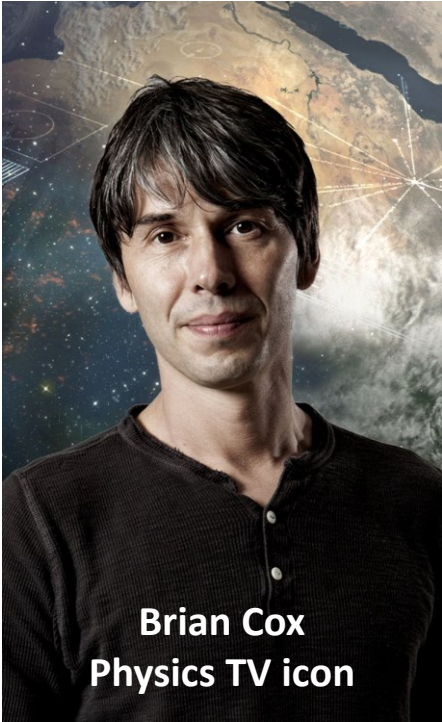
88

meth-	甲	1
eth-	乙	2
prop-	丙	3
but-	丁	4

"Sir, is that the Chinese character for meth?"

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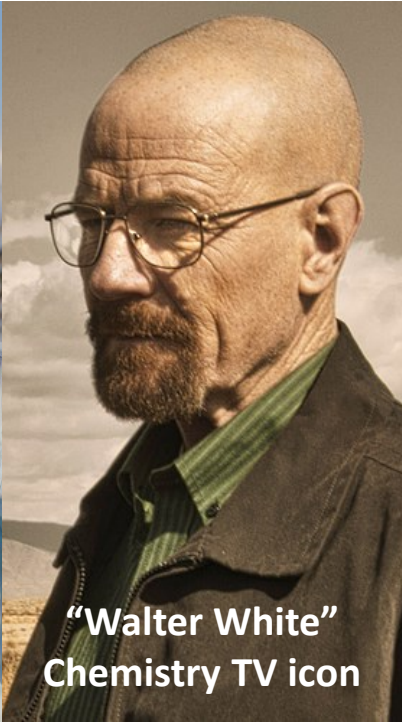




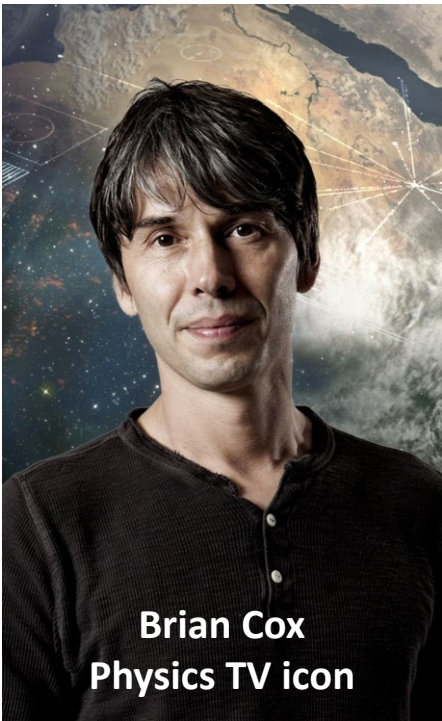
Brian Cox
Physics TV icon



David Attenborough
Biology TV icon



“Walter White”
Chemistry TV icon



Brian Cox
Physics TV icon



David Attenborough
Biology TV icon

?

Part 6: Homework



Part 6: Homework

devote
5%
of your time to outreach



Myths about outreach

chemistry outreach is NOT...

- “about giving back to the community”
- “charitable”
- “dumbed down”

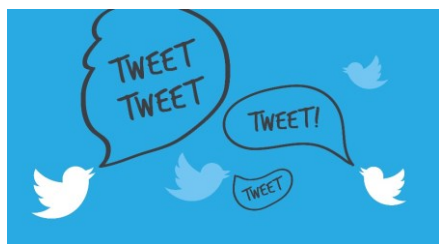
chemistry outreach is the lifeblood of our industry

- a healthy democracy needs informed citizens
- science funding relies ultimately on how much people value science
- helps us to realise the importance of our own work



How to use that 5% ‘outreach time’

1. Tweet about your work
2. Give your ‘talk’ in local schools
 - Explain what you do as a chemist
3. Join your university’s ‘expert line’ for media commentary
4. Write articles for your school/university magazine
5. Participate in science festivals
6. Participate in your workplace’s YouTube channel
7. Write a book







How to speak to the public about chemicals

WHAT TO SAY

- Be passionate & positive!
- Make links between chemistry and things they care about
- Keep it simple
- Talk about your job as a chemist
- Talk about yourself
- Show them you're human, too!
- Address the **neutral 60%**

WHAT NOT TO SAY

- "Chemicals are everywhere"
- "Everything's made of chemicals"
- Don't patronise them
- Don't address natural/artificial divide unless asked
- Don't expect evidence to change their minds
- Ignore the **negative 20%**



Oxford English dictionary

chemical (noun)

a distinct compound or substance, especially one which has been artificially prepared or purified

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Abandon the word “chemical” as a noun

- Acid
- Solvent
- Metal
- Powder
- Crystal
- Molecule
- Compound
- Element
- Atoms
- Liquid
- Extract
- Gas
- Alloy
- Polymer
- Fibre
- Pigment
- Gel
- Solution



Abandon the word “chemophobia”

WHAT TO SAY

- Tell stories
- Emphasise how chemistry can help towards things we are passionate about
- Make chemistry relevant, modern, interesting and all about **molecules**
- Don't start with the elements of the periodic table

WHAT NOT TO SAY

- “Chemophobia”
- “Fighting ignorance”
- “Mythbusting”
- “Debunking”
- Do not attempt the ‘deficit model’
 - “Let me show you why you're wrong”



Focus on what people care about!

WHAT TO SAY

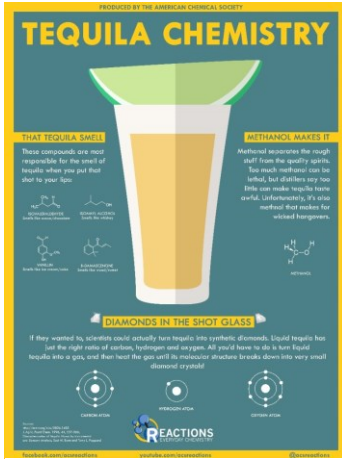
- **Chemistry of things around us**
 - Food
 - Perfumes
 - Building materials
- **Cutting-edge research that helps:**
 - Climate
 - Environment
 - Clean/cheap energy

WHAT NOT TO SAY

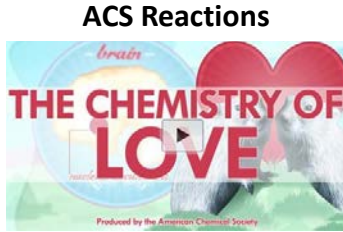
- **Elements**
 - Reminds people of school
 - We seldom encounter substances in their elemental state anyway
- **Don't just focus on history**
 - Creates the idea that chemistry has ‘expired’ and has nothing new to offer



Great examples of chemistry outreach



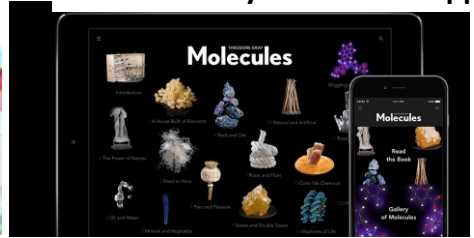
ACS Reactions



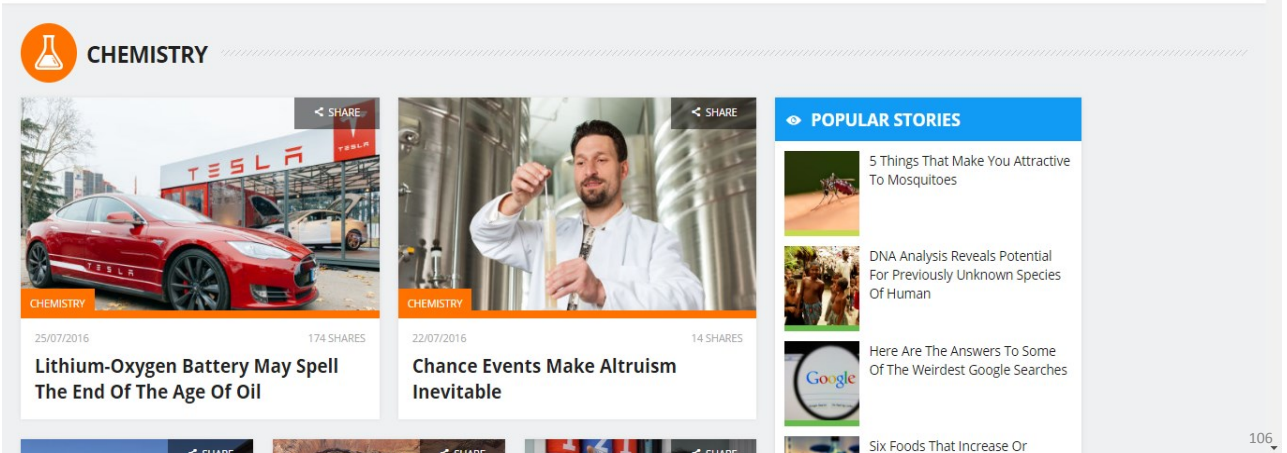
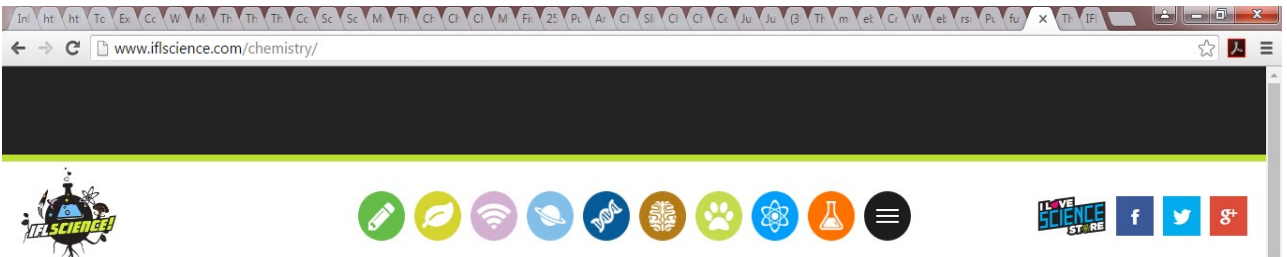
Periodic Videos

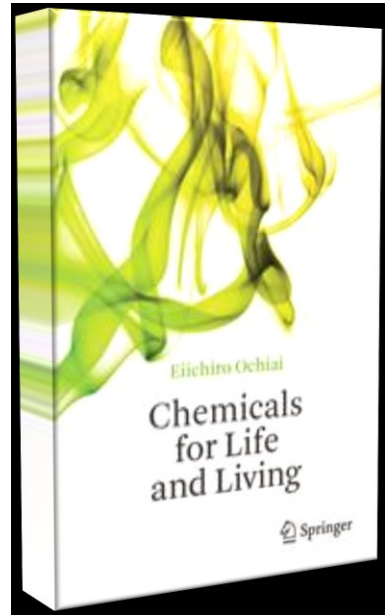
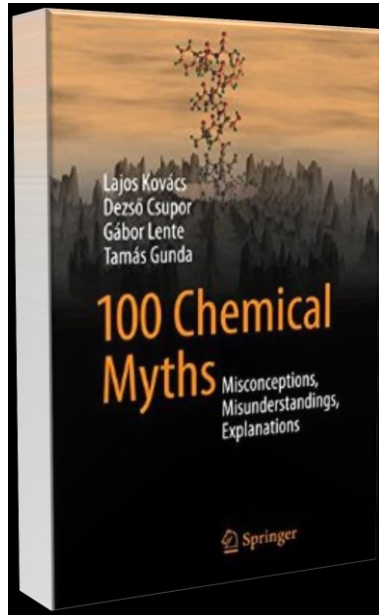
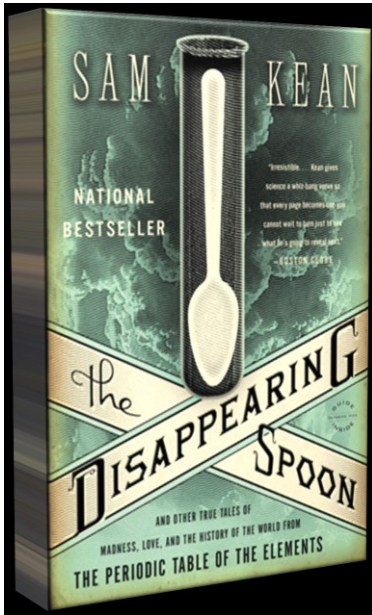


Theodore Gray's books and apps



Outreach programs





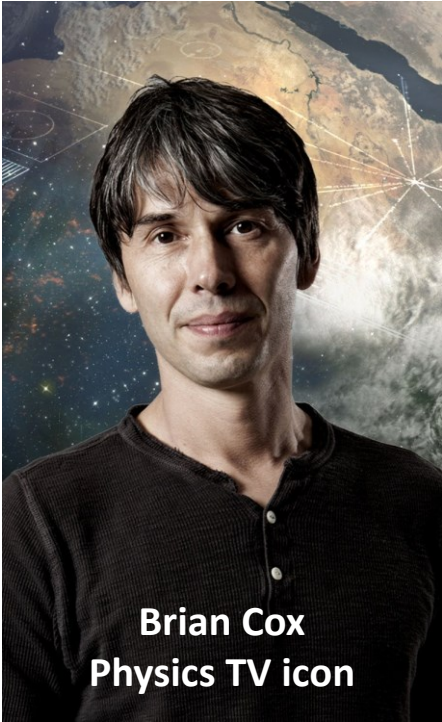
...and several more

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Finally...
The ultimate cure



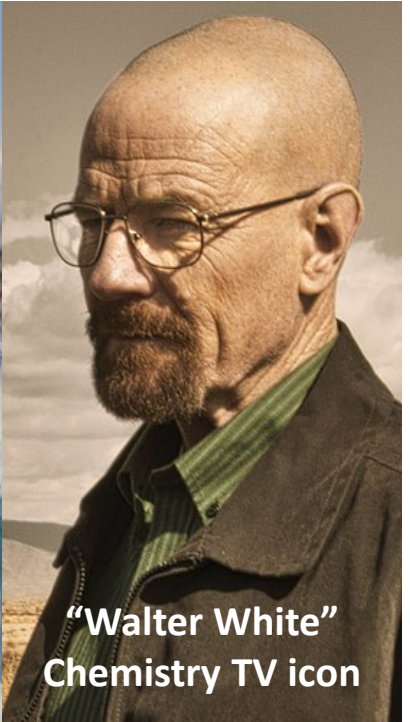
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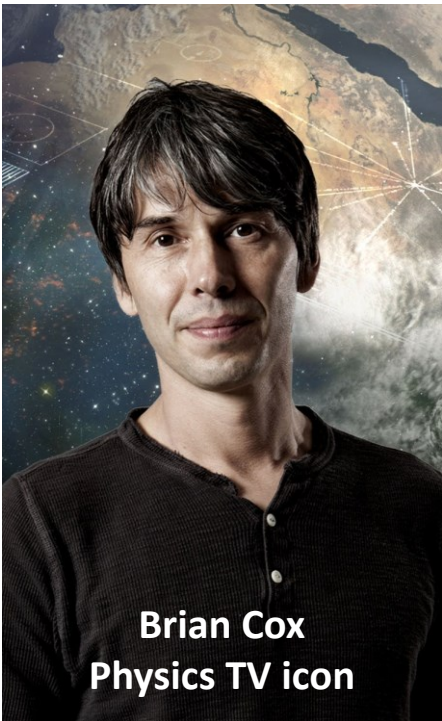
Brian Cox
Physics TV icon



David Attenborough
Biology TV icon



“Walter White”
Chemistry TV icon



Brian Cox
Physics TV icon



David Attenborough
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?

**Positive
Inspirational
Chemist**

The ultimate cure

- We need factual, big-budget TV documentaries about chemistry
- We need a benevolent chemistry TV personality to counteract Walter White
- Focus on **modern chemistry**
- Focus on **molecules**
- Communicate through **human stories**
 - **Deep local cultural roots**
- Aim for mainstream TV
- **Creative inspiration**
 - "A Bite of China"
 - spent \$5m per series



The ultimate cure

- Episode list
 1. **Celebration** – food, cooking, wine, party drugs, f'works
 2. **Curing ailments** - medications old & new
 3. **Keeping food fresh** – preservatives, packaging, ripening
 4. **Gifts from nature** – natural compounds inc. crude oil
 5. **Seduction** – perfumes, cosmetics, aphrodisiacs
 6. **Pilgrimage** - transportation, fuels, roads, dynamite
 7. **Poison** – chemical weapons, misused drugs, toxins removed by chemical means, decaffeination, pest ctrl.
 8. **Vibrancy** – pigments, bleach, Sistine Chapel
 9. **Beauty** – clothing, furnishings, skincare, landscape materials, space missions & photos of Earth
 10. **Protection** – glass, Kevlar, condoms, iodine, immunisations, preservatives, superhydrophobics
 11. **Saying hello** – paper, pens, iPhones, smoke signals
 12. **Purity** – cleaning, religious rituals, water purification, purification of medicines, haircare, electroplating/refining



The end Thank you



Most common poisons

CHILDREN

	No.	%
Cosmetics & Personal Care Products	150,530	14.0
Cleaning Substances	118,207	11.0
Analgesics	100,399	9.3
Foreign Bodies/Toys/Miscellaneous	72,099	6.7
Topical Preparations	62,053	5.8
→ Vitamins	48,214	4.5
Antihistamines	45,915	4.3
Pesticides	35,152	3.3
GI preparations	28,460	2.7
→ Plants	27,941	2.6

ADULTS

	No.	%
Analgesics	133,864	11.9
Sedative/Hypnotics/Antipsychotics	117,682	10.4
Antidepressants	75,622	6.7
Cardiovascular Drugs	68,579	6.1
Cleaning Substances (Household)	64,217	5.7
→ Alcohols	51,344	4.6
Anticonvulsants	41,738	3.7
Pesticides	39,968	3.5
→ Bites and Envenomations	36,944	3.3
Antihistamines	34,804	3.1

Poison.org; National Poison Data System (2014)

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Most common poisons

FATALITIES ONLY	No.	%
Analgesics	133	19.2
Fumes/Gases/Vapors	86	12.4
Cold and Cough Preparations	49	7.1
Antihistamines	38	5.5
Hydrocarbons	29	4.2
Sedative/Hypnotics/Antipsychotic	29	4.2
Cleaning Substances (Household)	28	4.0
Antidepressants	26	3.8
Cardiovascular Drugs	23	3.3
➔ Alcohols	19	2.7
Stimulants and Street Drugs	18	2.6
Batteries	17	2.5
Pesticides	17	2.5

Poison.org; National Poison
Data System (2014)

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Chemistry can help to solve all 10 public health concerns

- Alcohol-related harms
- Food safety
- Healthcare-associated infections
- Heart disease and stroke
- HIV
- Motor vehicle injury
- Nutrition, physical activity and obesity
- Prescription drug overdose
- Teen pregnancy
- Tobacco use

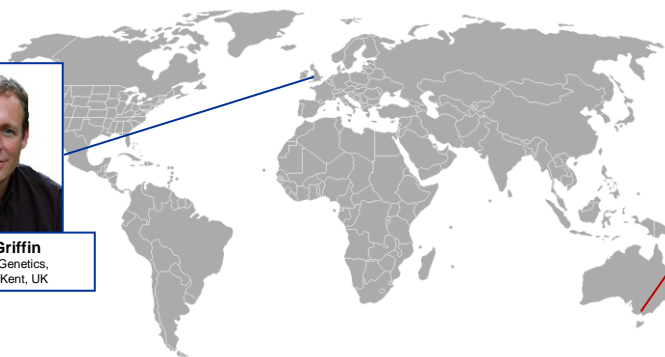
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Chemophobia: How We Became Afraid of Chemicals and What to Do About It



Darren Griffin
Professor of Genetics,
University of Kent, UK



James Kennedy
Chemistry Teacher and Blogger

Slides available now! Recordings will be available to ACS members after a few weeks

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Crystallography as a Drug Design and Delivery Tool

Vincent Stoll, Research Fellow and Associate Director of Structural Biology, Abbvie

Robert Wenslow, Vice President Business Development, Crystal Pharmatech

Andrew Brunskill, Associate Principal Scientist, Merck



Thursday, September 1, 2016

Future Protective Materials for First Responders, Football Players, and Astronauts: Shear Thickening Fluids

Norman Wagner, Chemical & Biomolecular Engineering, University of Delaware & co-founder of STF Technologies LLC

Aaron Forster, Materials Research Engineer, National Institute of Standards and Technology

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