'A Career in Science and Beyond'

University of Southampton, August 2021
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Outline

- My Career in Science from School to here!
- Education Edinburgh, Cambridge, LBS
- Work at BP and as a Consultant
- Skills required then and now
- Some things to do during lockdown…

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About Me
United Kingdom
Man-Made Transuranium Elements
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About Me
SODIUM HYPOCHLORITE
(5% SOLUTION)
WARNING
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Getting a Job - R&D

BP → bp

beyond petroleum

- BP (ICI, Shell, P&G, etc) 'Milk Round'
- Main recruitment for Graduate staff into R&D
  - >50% Group R&D on non-Oil technologies
  - Interview: 'Oh you blew up a lab, no problem…'

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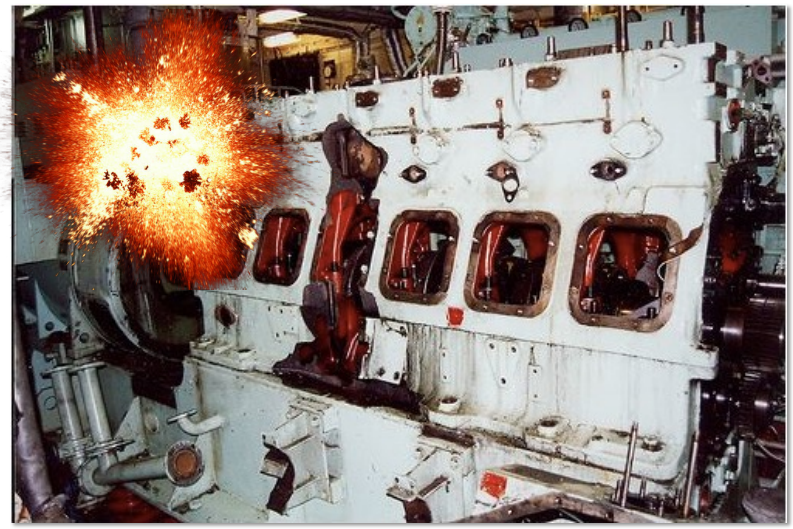
'We are blowing up engines'



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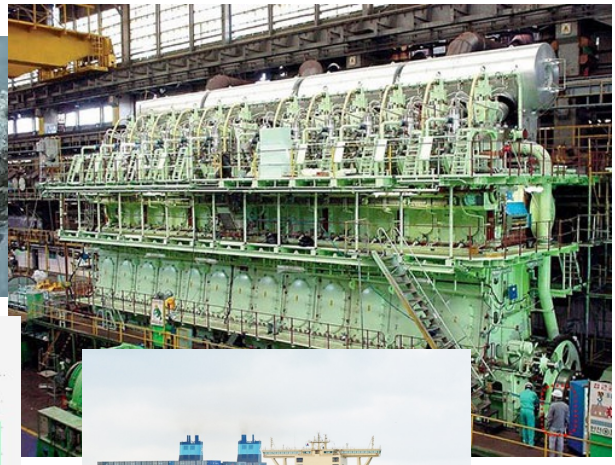
Some really big engines…



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Working in R&D

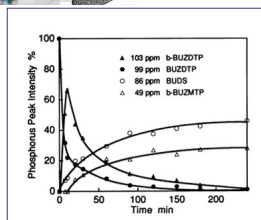


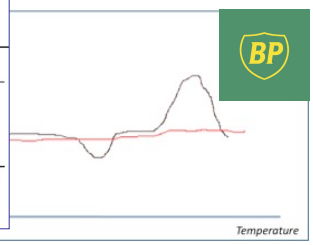
Fig. 2 Time Dependence of Intensities of the Observed ^{31}P NMR Signals during Oxidation Process of

Table 3 Rate Constants and Arrhenius Parameters for the Reaction of ZDTPs with CHP in Benzene Solution[a]

Temperature [°C]	k_1 [M^{-1} s^{-1}] IPZDTP	BUZDTP
0	—	1.02×10^{-3}[b]
10	1.45×10^{-3}	3.83×10^{-3}
20	1.99×10^{-3}	1.92×10^{-2}
34	1.40×10^{-2}	2.92×10^{-2}
50	(4.42×10^{-2})[c]	(0.16)[c]
70	(0.20)[c]	(0.78)[c]
log[A/M^{-1} s^{-1}]	9.96	10.78
E_a [kcal/mol]	16.83	17.20

a) [ZDTPs]/[CHP]=0.05 M/0.10 M. b) In hexane solution. c) Extrapolated.

Table 4 Rate Constants and Arrhenius Parameters for the



- Fundamental Research - performance related
- Technical Service
  - 'We've run out of hydraulic fluid, can we use gearbox oil instead?'
- Trouble-shooting/problem-solving
  - 'We are being sued - a customer's engine has blown up'

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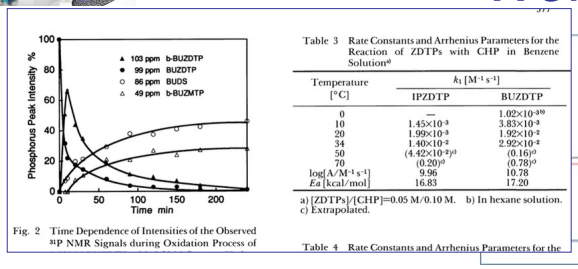
Working in R&D



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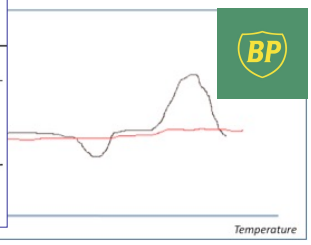

- Fundamental Research - performance related
- Technical Service
  - 'We've run out of hydraulic fluid, can we use gearbox oil instead?'
- Trouble-shooting/problem-solving

Key Skill(s) – problem-solving, curiosity

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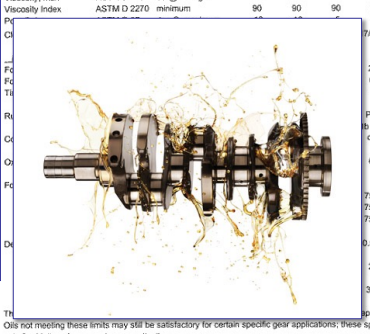
Product Development

Table 1-EP Gear Lube Specification Criteria Sheet

Properties	Standard	Parameters	Limits 2EP	3EP	4EP	5EP	6EP	7EP	8EP	8AEP	9EP
AGMA Grade											
ISO-Viscosity Grade	ASTM D 2422		68	100	150	220	320	460	680	1000	1500
Physical/Chemical											
Viscosity, min	ASTM D 445	cSt@40 deg C	61.2	90	135	198					
Viscosity, max	ASTM D 445	cSt@40 deg C	74.8	110	165	242					
Viscosity Index	ASTM D 2270	minimum	90	90	90	90					
							75/10	75/10	75/10	75/10	75/10
							75/10	75/10	75/10	75/10	75/10
							75/10	75/10	75/10	75/10	75/10
							0.50%	0.50%	0.50%	0.50%	0.50%
							2.0	2.0	2.0	2.0	2.0
							30.0	30.0	30.0	30.0	30.0

Oils not meeting these limits may still be satisfactory for certain specific gear applications; these specifications are meant to provide a universal set of guidelines for general gear applications.



Key Skill(s) – team working, knowledge sharing

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‘A Sticky Situation’

Context-based Learning Exercise for Chemistry Students

Konigsberg in the Mountains

Special Feature: Petra Head

‘She’s a bit of a goer isn’t she?’ Hope Michael, commonly known by his nickname ‘Open Mike’ beams as we get out of his Konigsberg RV1 at Saxon Valley in the Snowy Mountains. We’re now at 6000 ft and the air is noticeably clearer and cooler than at the bottom of the twisty 19 hairpin road up to Michael’s new ski development.

I wonder about taking coaches up here but Michael is laughing at me. ‘No we’ve blasted a nice wide highway through the Forest on the other side of the hill for them. We’re going to keep this road as it is and only let cars on it. We’re trying to get a minimum speed limit on it to encourage sports cars to come this way. After all you have black runs on the pistes so why not a black run access route?’ I can’t quite decide whether he’s joking, but having been a passenger in the drive up I’m I think he’s probably serious.

The Supercar screamed as we hurtled up the private road, that Michael has been sharing with a few motoring friends. He claims not to have raced but does admit to ‘comparing times now and then, just to see’

‘They have some nice motors but nothing to touch this one with a hybrid twin turbo, KERS, and all the F1 stuff.’ Is it completely standard I wonder? My last drive in a Konigsberg didn’t seem quite as raucous and elemental as this one.

Michael looks a little evasive for a second before admitting ‘We’ve touched nothing much really, just taken a few electrical things out of circuit, heaters (well we’re in Australia) and all that sat-nav stuff. Doesn’t really change the performance just helps the KERS recharge quicker’

‘Anyway, fancy taking the wheel on the way down?’

Fastest Gear Magazine Australia

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Technical Sales

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Technical Sales

Key Skills: technical & financial awareness, patience, persistence, negotiation

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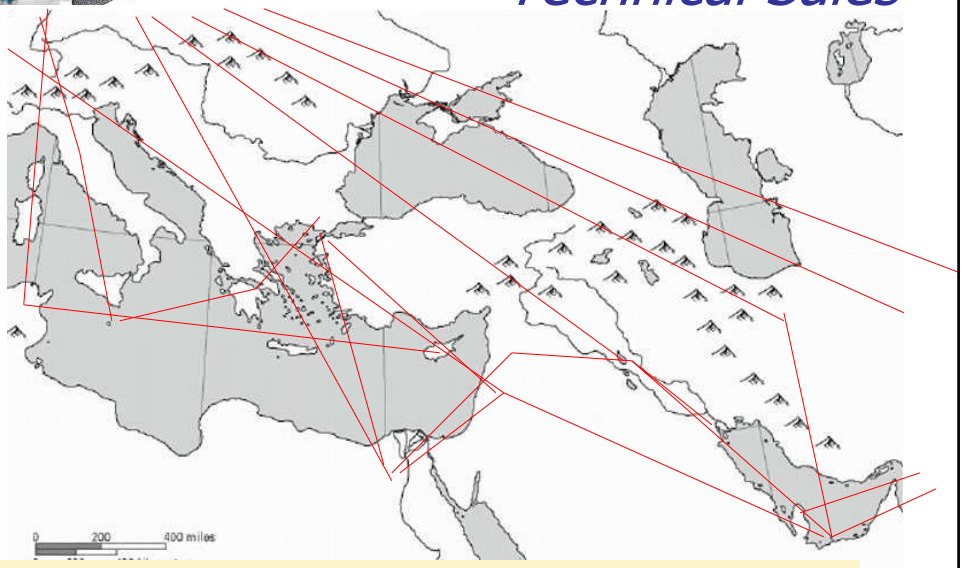
Technical Sales



Key Skills: persistence, willingness to fly a lot

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Technology Management - HSE

Key Skill(s) – attention to detail, working with people

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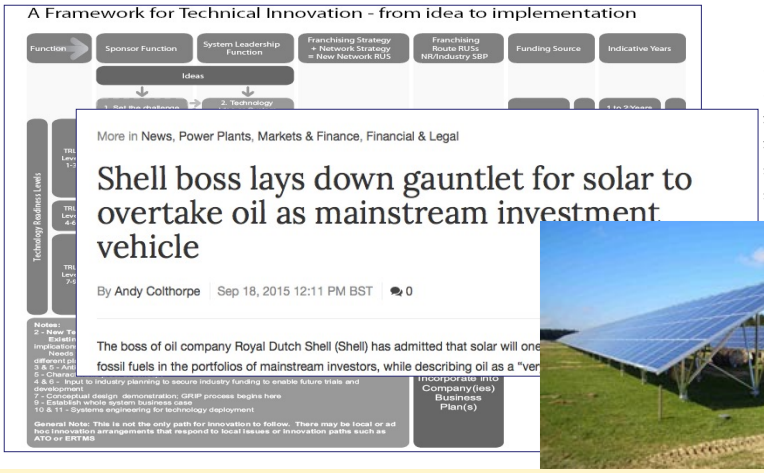
Technology Strategy and Planning

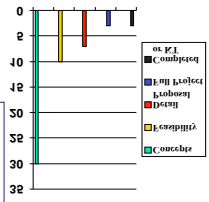


More in News, Power Plants, Markets & Finance, Financial & Legal

Shell boss lays down gauntlet for solar to overtake oil as mainstream investment vehicle

By Andy Colthorpe | Sep 18, 2015 12:11 PM BST | 0

The boss of oil company Royal Dutch Shell (Shell) has admitted that solar will one
fossil fuels in the portfolios of mainstream investors, while describing oil as a "ver



Key Skill(s) – analytical, influencing

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Changing Career – Leaving BP

- BP starts to 'de-layer'
- BP research on non-oil projects closes down
  - Partly thanks to my Post-Project Appraisals…
- BP Lubricants business in Europe effectively sold to Mobil and Castrol
- Leave 'voluntarily' and spend year at London Business School
  - First taste of Working from Home

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Changing Career – Leaving BP

- London Business School experience is good
  - Very Hard Work, great classmates

- Finish Masters and there is a recession ☹
  - 250+ job applications in 2-3 years

Remembering the recession: 'The 1990s experience changed my view of the world'

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Business Development

- 'Selling Slovenia to Slough'

Key Skill(s) – curiosity, communication, persistence, commercial awareness

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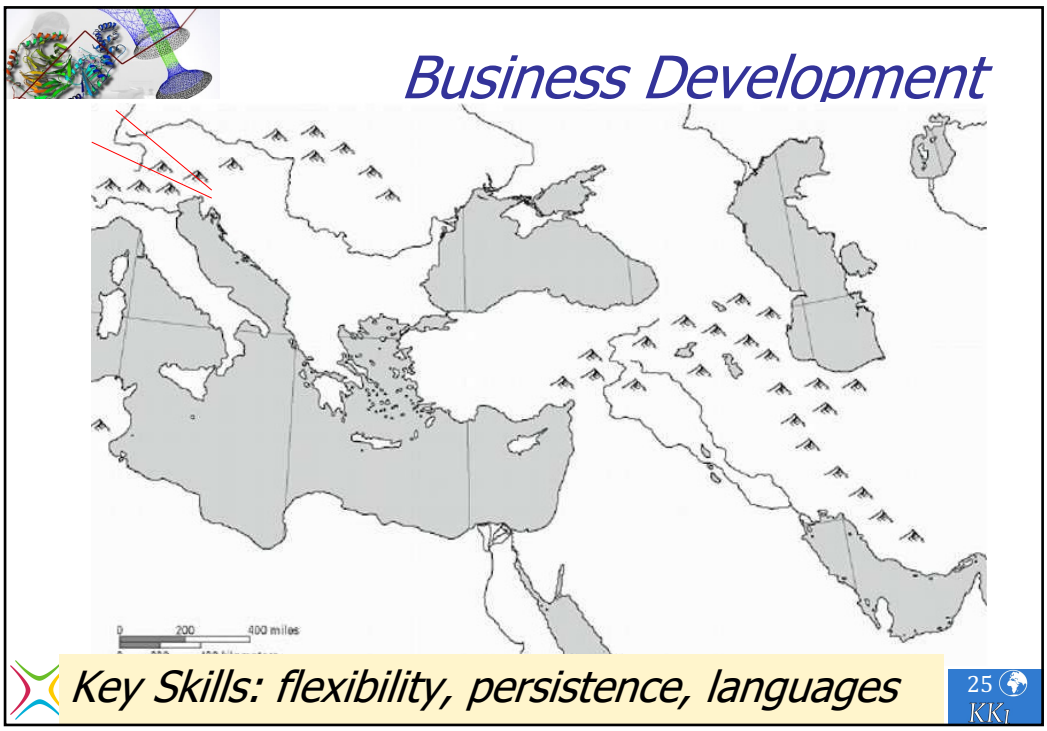
Business Development
0 200 400 miles
Key Skills: flexibility, persistence, languages
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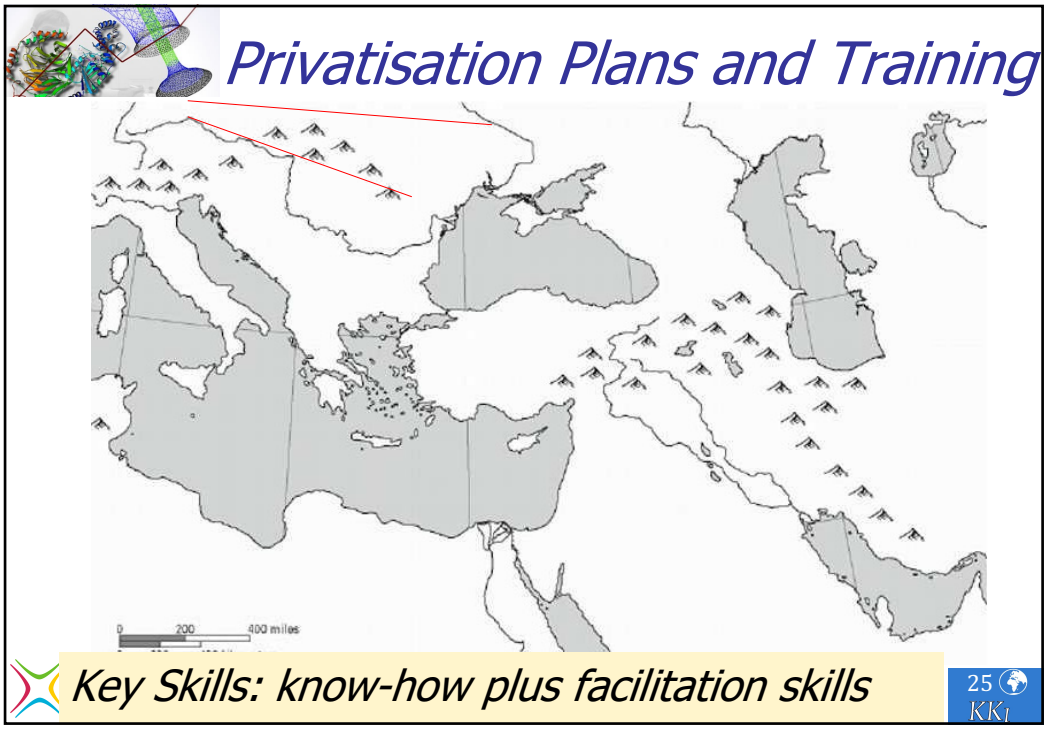
Privatisation Plans and Training
0 200 400 miles
Key Skills: know-how plus facilitation skills
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Privatisation Plans and Training

Key Skills: avoiding car crashes

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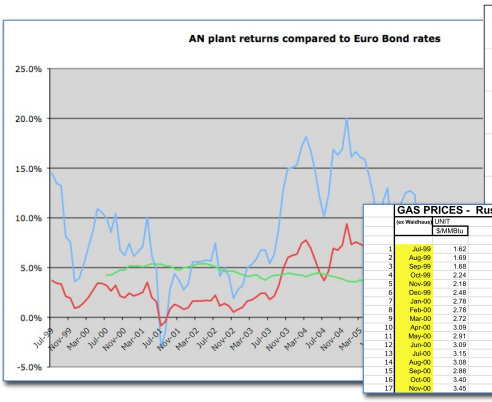
Technico-economic Studies



Ammonium nitrate: new plant investment

- Location not specified: could be EU, North Africa, CIS
- Typical project configuration
  - 2,400 tpd fertilizer ammonium nitrate (792,000 tpy at 330d/y)
  - Ammonia (1,000 tpd) and nitric acid (1,800 tpd) plants
  - No surplus ammonia or nitric acid
  - Similar to Abu Qir plant configuration (Egypt, 1991)
- Total project cost of US$600 million (basis November 2007)

GAS PRICES - Russian UK AN Prices

	(ex Wardhaven)	UNIT $/MMBtu	(Converted to $/tonne	(Capital costs ($m)	CEPCI Index		Annual cap at Colum	Capital cost ROS	Percent of ROCE	Percent of (Zero Depreciation)	Implied Risk Premium AN Price	Mean	S.Dev	Risk Prem.
1	Jul-99	1.62	138.50	430.28	378		Jul-99	30.7%	11.2%		Jul-99	138.5		
2	Aug-99	1.69	138.15	430.60			Aug-99	29.7%	10.8%		Aug-99	138.2		
3	Sep-99	1.68	137.19	430.92			Sep-99	29.6%	10.6%		Sep-99	137.2		
4	Oct-99	2.24	141.72	431.24			Oct-99	23.9%	8.8%		Oct-99	141.7		
5	Nov-99	2.18	138.76	431.57			Nov-99	23.8%	8.5%		Nov-99	138.8		
6	Dec-99	2.48	137.97	431.89	390.6		Dec-99	19.8%	7.0%		Dec-99	138.0		
7	Jan-00	2.78	147.55	432.21			Jan-00	19.1%	7.2%		Jan-00	147.6		
8	Feb-00	2.78	151.18	432.53			Feb-00	20.1%	7.8%		Feb-00	151.2		
9	Mar-00	2.72	153.98	432.86			Mar-00	21.5%	8.4%		Mar-00	154.0		
10	Apr-00	3.09	170.24	433.18			Apr-00	21.8%	9.4%		Apr-00	170.2		
11	May-00	2.91	171.71	433.50	Plant		May-00	23.9%	10.3%		May-00	171.7		
12	Jun-00	3.09	176.48	433.83	1%		Jun-00	23.2%	10.2%		Jun-00	176.5		
13	Jul-00	3.15	176.48	434.15	Inflation		Jul-00	22.6%	9.9%		Jul-00	176.5	165.5	19.2	16%
14	Aug-00	3.08	169.77	434.47			Aug-00	21.7%	9.1%		Aug-00	169.8	166.2	18.5	16%
15	Sep-00	2.88	169.34	434.80			Sep-00	23.5%	9.8%		Sep-00	169.3	167.0	17.6	15%
16	Oct-00	3.40	174.15	435.12			Oct-00	19.5%	8.3%		Oct-00	174.1	168.0	16.6	14%
17	Nov-00	3.45	174.02	435.45			Nov-00	19.0%	8.0%		Nov-00	174.0	168.9	15.7	13%

- Trade Bodies, Governments, NGOs

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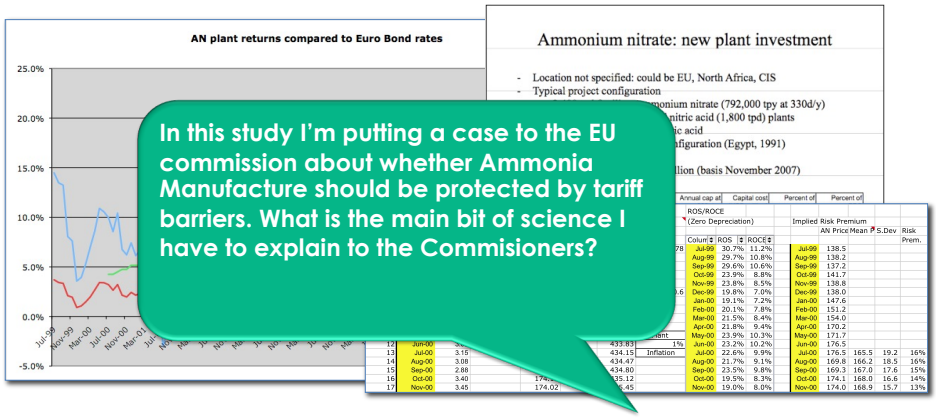
Technico-economic Studies



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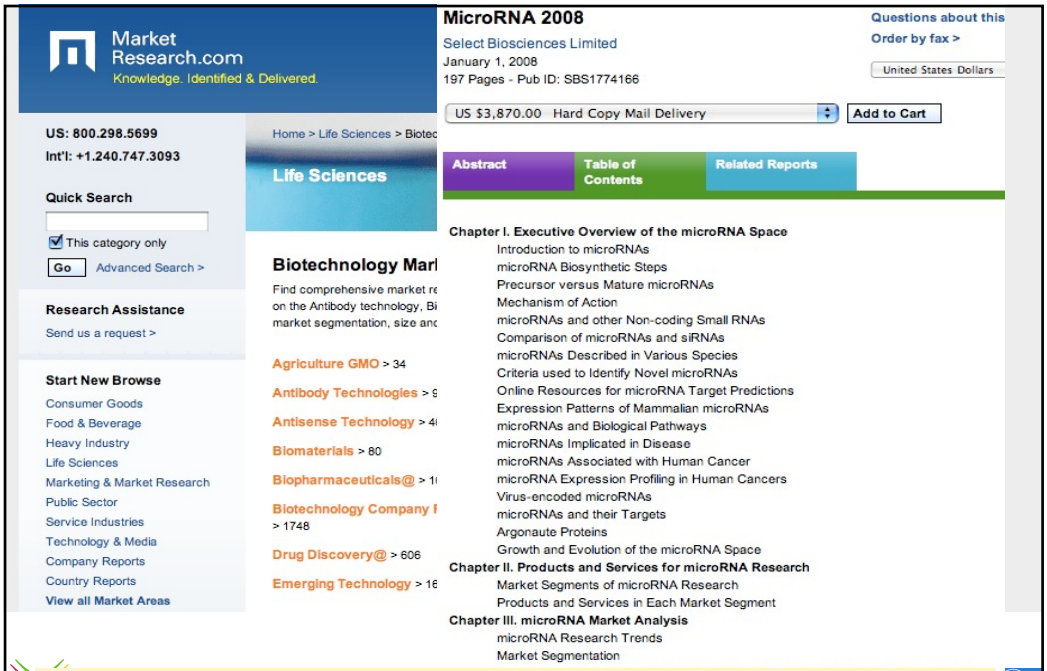

Key Skill(s) – curiosity, communication, commercial awareness

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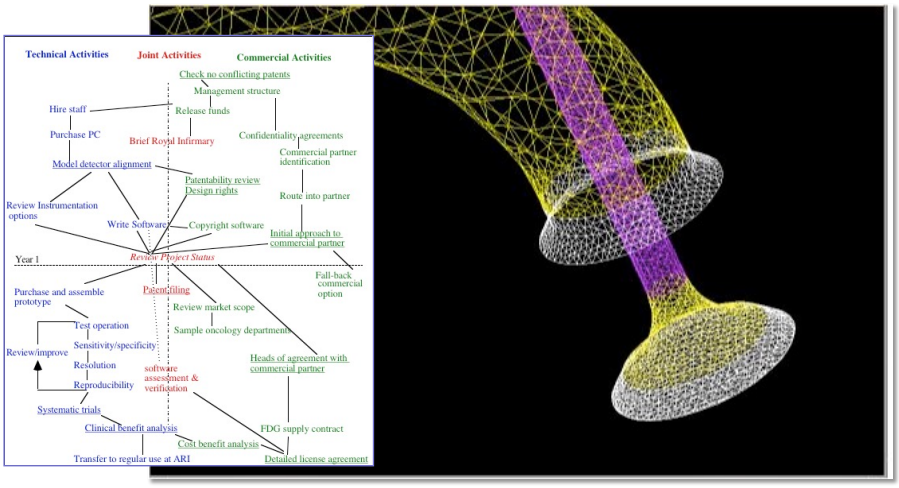
Project Management



Key Skill(s) – problem-solving, team-working, communication

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Policy Work

CIA Chemical Industries Association

ROYAL SOCIETY OF CHEMISTRY

Key Skill(s) – problem-solving, team-working, communication

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Facilitation Work

Key Skill(s) – problem-solving, team-working, communication

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University Commercial Office

Key Skill(s) – commercial awareness, team-working, communication, patience, and attention to detail

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Science Advisor to City Think-tank…

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Science Advisor to City Think-tank…

- Carbon 'Burn it all' study – 'stranded assets'
  - https://www.zyen.com/research/research/sustainability/carbon-burn-it-all/

Carbon - Burn It All?!

"***What happens if we burn it all?***" (i.e., burn all known reserves on balance sheets) is the question Michael Mainelli and Jan-Peter Onstwedder asked the BP and London Accord teams back in 2006, based on the concern that finance was not valuing carbon properly. Z/Yen's Dr Kevin Parker (ex BP chemist) pulled together the spreadsheet "Global Warming", for the total ppm results of burning current known reserves. Jan-Peter Onstwedder had a look from the point of view of the head of risk at BP. BP's research team did their own digging and both sides effectively came up with the same numbers.

	Current CO2 (ppm)	370
Amount if all oil burnt		619
	Plus tar sands	629
	Plus coal	946
	Plus Gas	1222

Figure 1 - CO2 levels caused by burning known fossil fuel reserves

- Government 'green performance bonds'
  - https://www.zyen.com/research/research/sustainability/policy-performance-bonds/

Index-linked Carbon Bonds: Gilty Green Government

By Professor Michael Mainelli, Jan-Peter Onstwedder, Kevin Parker, William Fischer
Published by Z/Yen Group Limited (April 2009).

The idea was first formally presented by Dr Kevin Parker of Z/Yen at the World Bank Government Borrowers' Forum in Ljubljana in May 2009. The same idea can be used for index-linked forestry bonds on forestry cover, etc. Since first mooted by Long Finance in 2008 & 2009, the private sector began issuing these bonds, tying interest rates inversely to performance against the achievement of environmental, social, or governance goals (our touchstone, as opposed to saying the proceeds will be used for ESG purposes), in 2017. The terms "sustainability-linked finance" or "positive incentive loan" are sometimes used:

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These days...
I turn students ...
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These days...
... into successful entrepreneurs
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Some KKI Clients
Freelance, Home-based Working for 25 years
500+ assignments across the UK and beyond
Trained 3000+ people
University of Glasgow
Newcastle University
The University of York
Nottingham
Leicester
Cranfield
Cardiff University
Bristol
Bath
Southampton
Exeter
Kent
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Doing research is a great start to your career…
vitae
What do research staff do next?
2016
Careers of researchers who move into occupations beyond academia
Challenges, career motivations and use of competencies
Advice for research staff on making successful transitions to other occupations
https://www.vitae.ac.uk/impact-and-evaluation/what-do-researchers-do/WDRSDN
CRAC
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Some Things you might do…

- Investigate/research some careers
  - Read Vitae booklet: 'What do Researchers do next'
  - Talk to University Careers Office (Highland Battery tests or similar?)
  - Look up the Belbin team roles test and figure out what you are
- Do an informational interview with a friend/relative or contact
  - Start building a work contact group
- Find some voluntary work that will build your team skills
  - 'What did you do in the shutdown?'
  - 'Look for work not a job'
- Enter the 3MT or YES competitions
- Organise a Science in the Real World Quiz
  - http://www.kkitech.com/ScienceQuiz.pdf
- Get outside as much for at least 30 mins every day

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Advice from Career Consultant

- 'When you're out of Work, get fit'
  - 'It really shows when you get the job interview'
  - (Cycled from Clapham to Baker Street every day)

- 'Look for Work, not a job'
  - Lots of people have 'bits of work' that need doing but don't necessarily want a full-time employee

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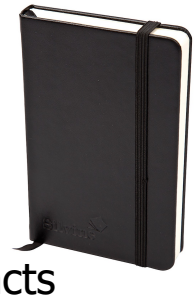
Things that helped me Work from Home

- 'Journey to Work'
  - School run, or just 'walk round the block'
- Set up as good an 'office space' as you can
- Put work clothes on at home
- Have 'to-do' lists



- Regularly 'Touch Base' with contacts
  - Use the phone!

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A Career in Science and Beyond

THE END

QUESTIONS?

- TAKE LOTS OF EXERCISE
  - be and look healthy

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