

"Tales of an Ex-Elf" – Career Paths for a Petroleum Geologist*

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Abstract

This presentation contains a brief account of what is involved in the search for oil and gas, including a synopsis of the author's 40+ year petroleum industry career. The majority of the talk deals with the variety of what the over 20 roles that a geoscientist can take through a career, from mud logger, through sedimentologist, seismic interpreter, production geologist, manager to independent expert in unitization. What is needed to fulfill those roles and integration with other disciplines in each role are illustrated. Also included is personal experience on maintaining an open mind and the testing of new ideas concluding with how to survive downturns in the oil and gas industry.

AAPG ICE London 2017



Tales of an "Ex-ELF"

Stuart Harker

Good morning Ladies and Gentlemen.

This talk concerns my personal views on research and petroleum industry involvement, illustrated with some anecdotes from my time with ELF the former Essence Liquides et Fluides company, now absorbed into Total. Although I work for Circle Oil, I am also the Advisory Council Representative for the European Region of the AAPG. Thus some of the ideas that I will show you are derived from my experiences in that position.

Click

Here emerging from the flare is the old Elf logo. When Elf took over Occidental in the UK back in 1991, I asked my new French boss what the geometric blue and red logo was meant to represent. He gave me his "you Anglo idiot" Gallic shrug and said "it is a drill bit". To which I naively replied "it's not like any one that I've ever seen". And of course that's where my research proved inadequate. The logo represents an existential drill bit, it's not meant to be realistic. Stupid boy!

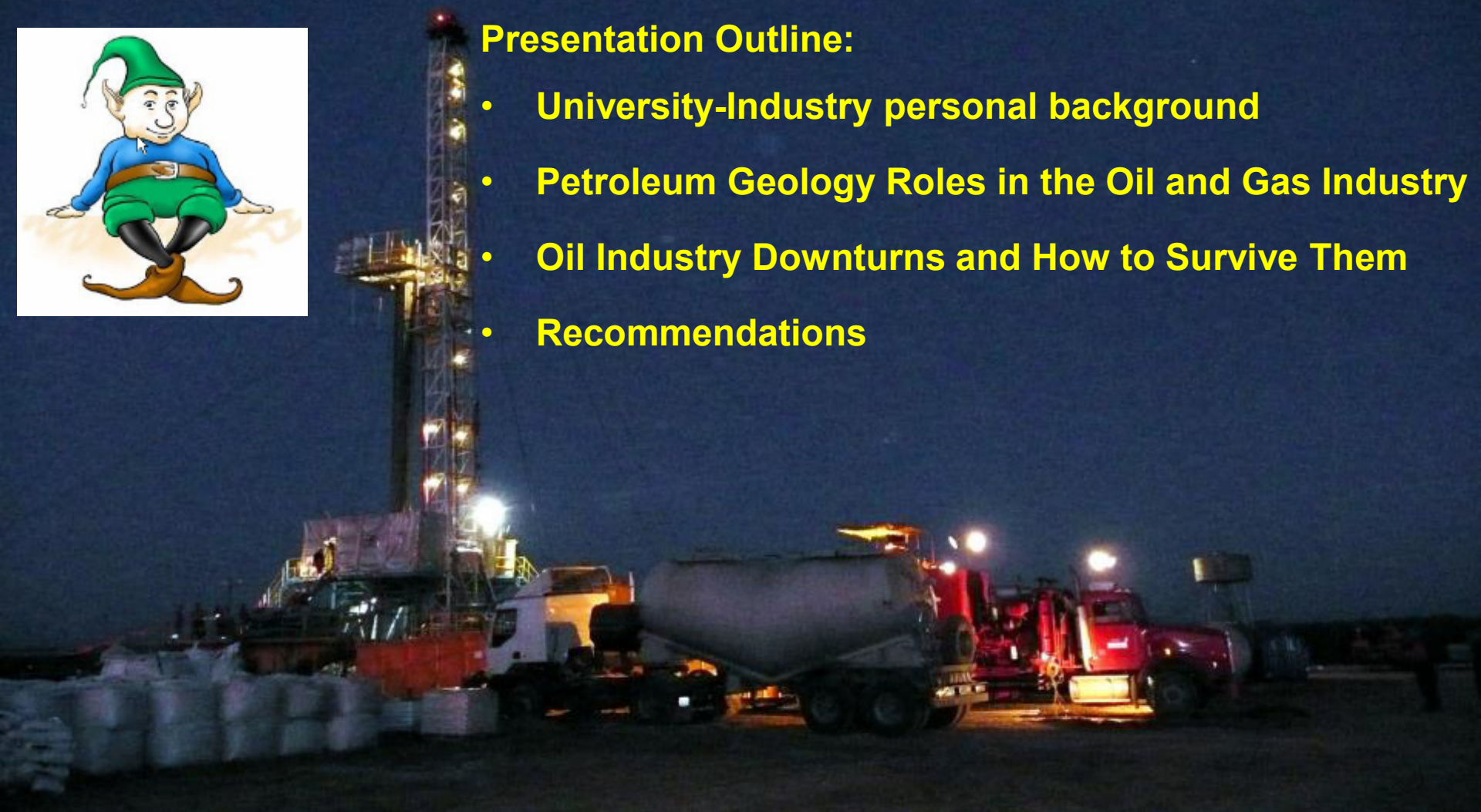
However, when Total took over Elf in 2000, they found that logo, an oversized existential drill bit, hanging over their heads in the canteen of the Pau office, embedded in the ceiling. Quel horreur!

Career Paths for a Petroleum Geologist



Presentation Outline:

- University-Industry personal background
- Petroleum Geology Roles in the Oil and Gas Industry
- Oil Industry Downturns and How to Survive Them
- Recommendations



University-Industry Personal Background - 1

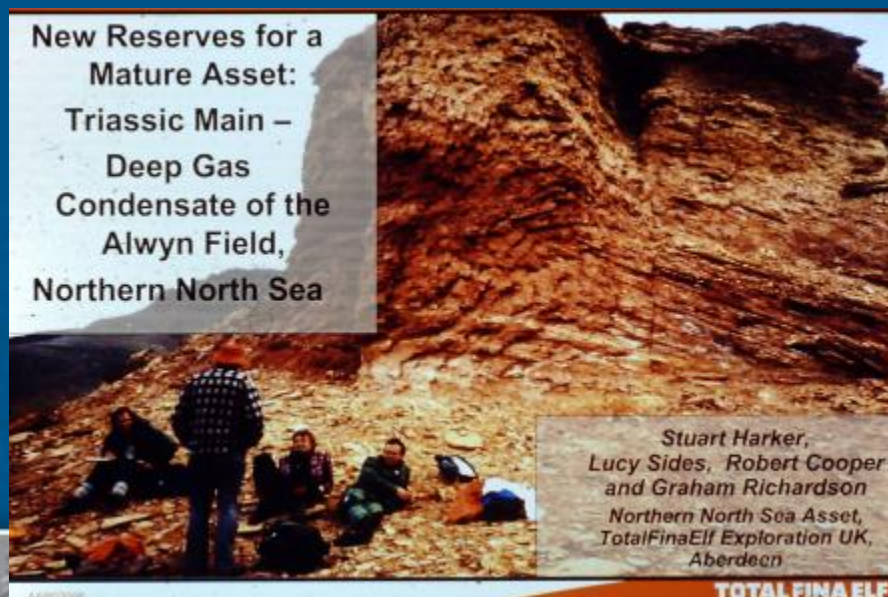
- ❖ University ~ 8 years BSc-MSc-PhD
- ❖ But had summer oil company jobs in Calgary
- ❖ Disenamoured with politics of academia - industry excitement
- ❖ Joined the real world:
 - Texaco, Calgary 1973 – Palynology/stratigraphy/field mapping/wellsite
 - Aramco, Saudi Arabia 1978 secondment – Palynology/stratigraphy/wellsite
 - Murphy, Canada 1980 – Exploration, but NEP deterred foreign investment
 - Occidental, California 1981 – Global Exploration G+G and wellsite
 - Transfer to UK Production Dept. 1985, then Exploration 1989



University-Industry Personal Background - 2

- ELF take over 1991, then Production 1994, Exploration 1996 + Management
- Elf Paris, 1998 Prospect Police
- Total, Aberdeen 2000 Production and Exploration + Management
- Aberdeen Academic Part Time 2002-2006 MSc teaching
- Consulting, Aberdeen 2004-2007 Global Exploration and Production
- Circle Oil, UK 2008-2015 Global Exploration and Production + Management
- Heriot-Watt Uni and Part Time Consulting, 2015 into the future

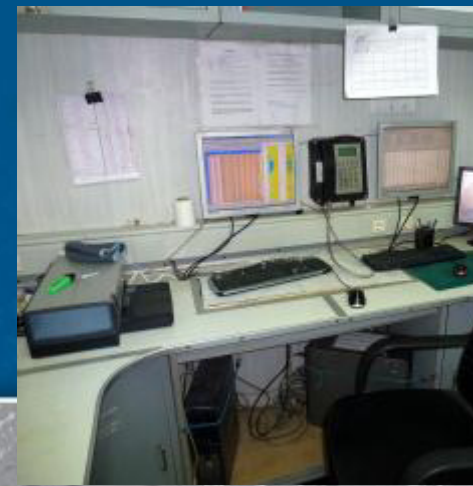
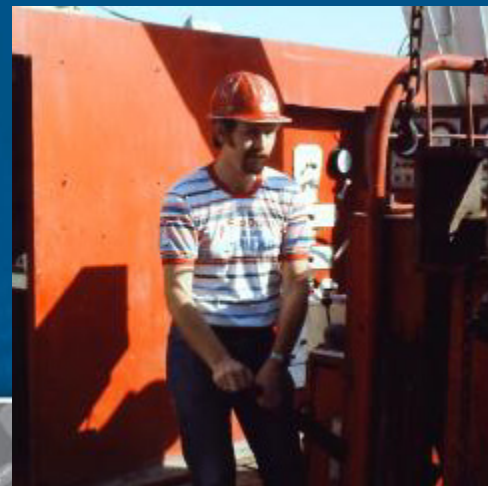
5+ Industry Jobs: Biostratigraphy; Wellsite; Explo Geo; Production Geo; Management



Geoscientist Jobs in the Petroleum Industry 1-2

Mud Logging to Well Site Geologist:

- BSc Geology
- At the sharp end of drilling the well and involved in decision making at the well site
- Monitoring and reporting all lithologies, gas and oil shows, drilling parameters (ROP, mud weight, etc.)
- Mud Loggers catch cuttings samples, prepare , examine, report and box them up for storage
- Mud Loggers catch and clean core, preserve samples (wax bath or in fluids in jars) and box them up for storage
- Wellsite Geologists liaise with head office, drillers and mud loggers to call formation tops, coring points, TD of wells, etc.
- Wellsite Geologists responsible for overseeing wireline and LWD logging, including formation pressures.
- Shift work, but varied locations and some people spend their whole careers at rig sites
- Employers – oil companies and consultancies



Geoscientist Jobs in the Petroleum Industry 3-4

Wireline and LWD Logging

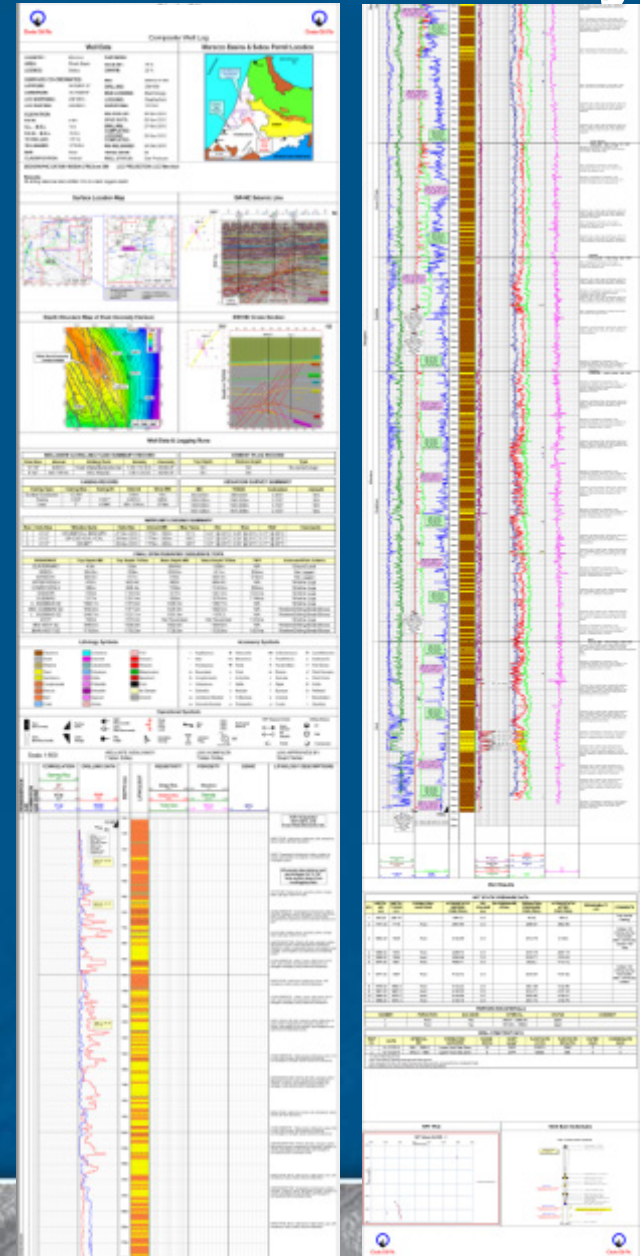
- BSc Geology , Electrical Engineering, Physics
- At the sharp end of drilling the well and involved in decision making at the well site
- Responsible for logging tool assembly, running and maintenance
- Liaison with mud engineer, driller, wellsite geologist and wireline operators
- Responsible for producing valid logs and transmitting them to home base
- Shift work, but varied locations and some people spend their whole careers at rig sites
- Upward mobility – sales engineers – management
- Employers – Well Logging companies



Geoscientist Jobs in the Petroleum Industry 5

Operations Geology

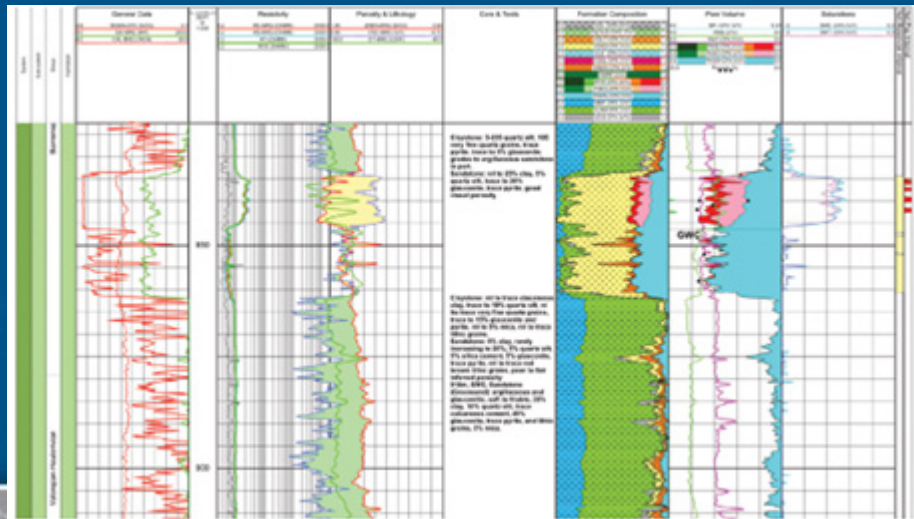
- BSc Geology plus wellsite experience
- Office based but with occasional rig site visits
- Responsible for coordination with G+G well proposal team and drillers to produce well proposal
- Monitor, adjust and report on well progress and findings during drilling
- Liaison with mudloggers, drillers, wellsite geologists, petrophysicists, geophysicists, biostratigraphers, geochemists, testing engineers, mud and cementing engineers and Wireline/LWD engineers
- Prediction of formation pressures and well control monitoring and adjustments while drilling
- Produce Final Well Report and Composite Log
- Employers – oil companies and consultancies



Geoscientist Jobs in the Petroleum Industry 6

Petrophysics

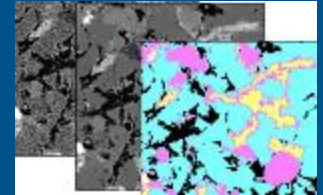
- BSc Geology, Electrical Engineering, Physics plus wellsite experience
- Office based but with occasional rig site visits
- Responsible for well logging requirements and petrophysical analyses
- Liaison with mudloggers, drillers, wellsite geologists, sedimentologists, wireline and LWD engineers
- Produce log analyses (CPI) for wells and conduct petrophysical studies on groups of wells and fields
- Specialist interpretation for Image Logs – integration with sedimentology and structural geology
- Employers – oil companies and consultancies



Geoscientist Jobs in the Petroleum Industry 7-8

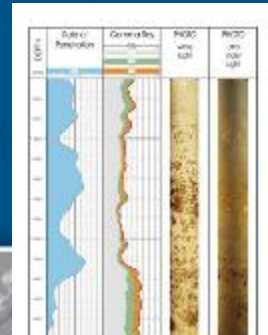
Sedimentology

- BSc-MSc-PhD Geology, plus wellsite experience
- Office, core and cuttings examination based but with occasional rig site visits
- Involves specialist sample preparation and microscope work
- Responsible for interpretation of reservoir quality and distribution from rock samples and well logs
- Produce lithology logs and interpretation reports for wells on reservoir sections
- Employers – specialist contractors



Core Analysis

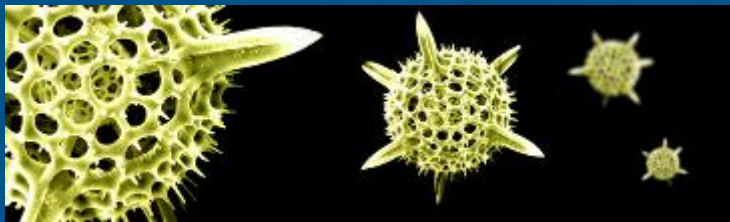
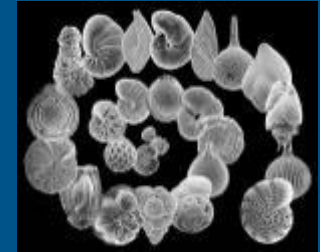
- BSc-MSc-PhD Geology, plus wellsite experience
- Laboratory based, specialist sample preparation
- Responsible for interpretation of reservoir
- Responsible for core handling and sampling for poro-perm and special core analysis
- Produce interpretation reports for wells on core derived properties
- Employers – specialist contractors



Geoscientist Jobs in the Petroleum Industry 9

Biostratigraphy

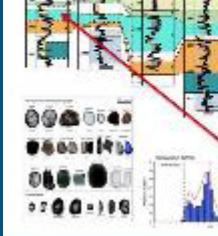
- BSc-MSc-PhD Geology, plus wellsite experience
- Office based but with occasional well site work
- 3 main types, all involving specialist sample preparation and microscope work:
 - Microplaeontology,
 - Palynology,
 - Nannofossils
- Responsible for interpretation of stratigraphic ages and depositional environments
- Produce interpretation reports for wells as hot shots for rapid decision making plus end of well detailed studies and correlation projects.
- Employers – specialist contractors

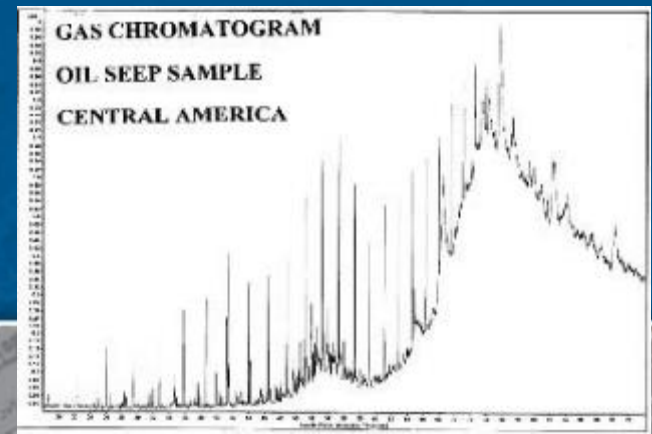
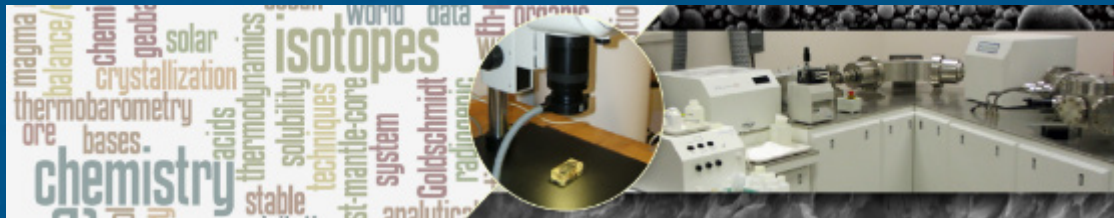
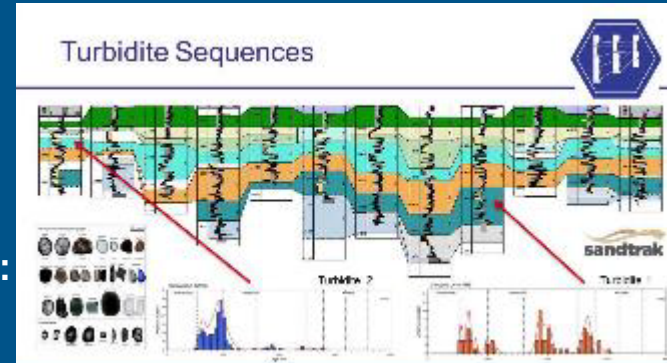


Geoscientist Jobs in the Petroleum Industry

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Geochemistry – Petroleum System Analysis

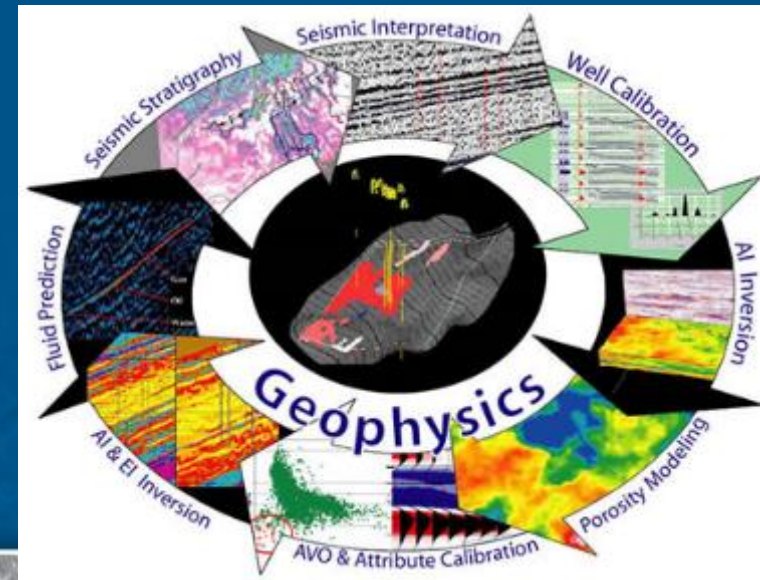
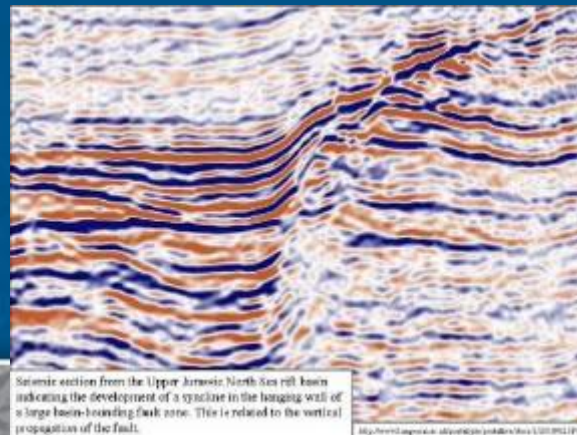
- **BSc-MSc-PhD Geology**
 - **Office-Laboratory based**
 - **Involves specialist sample preparation and microscope work:**
 - **Vitrinite Reflectance – Spore colour etc.**
 - **RockEval,**
 - **Gas Chromatography,**
 - **Chemostratigraphy**
 - **Responsible for interpretation of source rock studies (organic) and**
 - **Changes in rock chemistry (inorganic) for correlation/stratigraphy studies**
 - **Produce interpretation reports for wells and basins.**
 - **Employers – large E and P companies and specialist contractors**
- 
- A collage of geological data visualizations. It includes stratigraphic columns with various colored layers, a core sample image, and a histogram showing frequency distribution. A red line is drawn across the top right of the collage.



Geoscientist Jobs in the Petroleum Industry 12-15

Geophysics

- BSc-MSc-PhD Geology/Geophysics/Physics/Maths
- Office-field based for Gravity-Magnetics, Resistivity, Remote Sensing (satellite imagery) and Seismic:
- Involves Acquisition, Processing, Interpretation and Specialist Studies (e.g. Inversion)
- Responsible for seismic attribute, structural and stratigraphic studies at variable scales
- Prospect generation, well location and acreage evaluation together with geologists
- Sequence stratigraphy with geologists, sedimentologists and biostratigraphers
- Produce project reports and maps.
- Employers – oil companies and specialist contractors

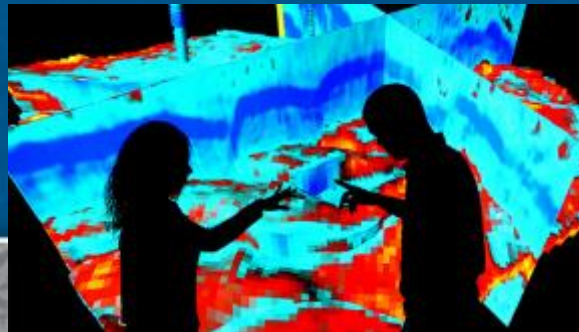
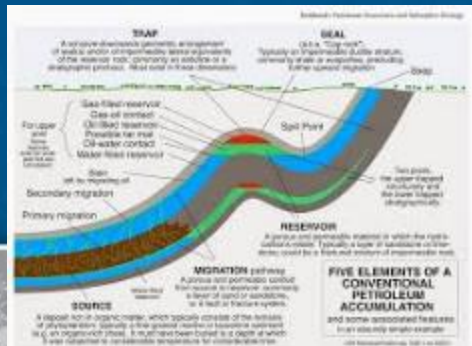


Geoscientist Jobs in the Petroleum Industry

16-20

Geology

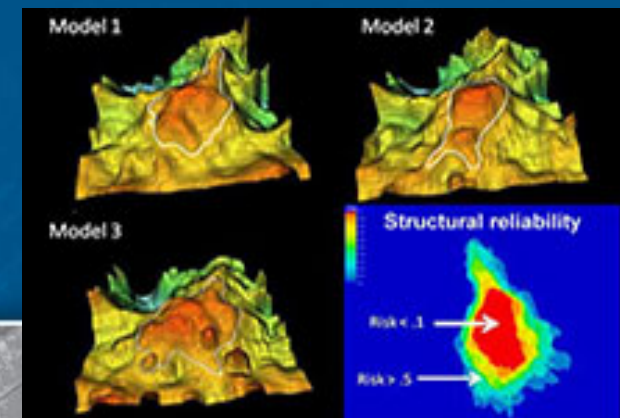
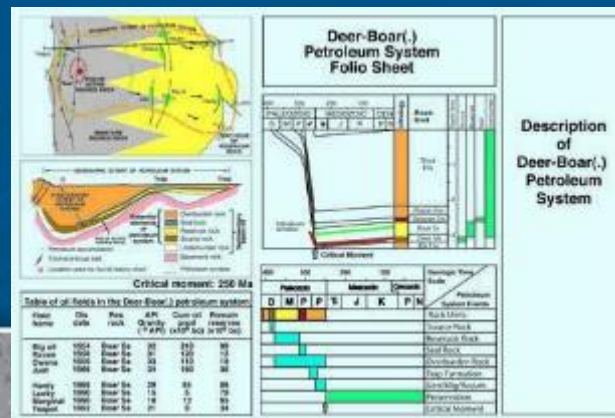
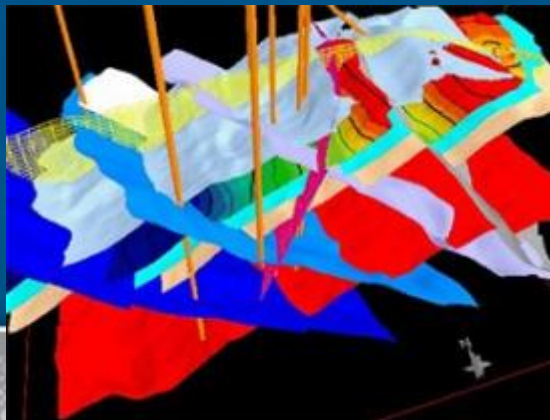
- BSc-MSc-PhD Geology
- Office-field based
- Involves integration of and liaison with all geoscience disciplines including field mapping and remote sensing
- Responsible for structural and stratigraphic studies at variable scales
- Responsible for volumetric determinations and risking
- Prospect generation, acreage evaluation and well location definition together with geophysicists, including sequence stratigraphy
- Produce project reports, sections and maps.
- 2 main types:
 - Exploration – basin modelling to prospect generation
 - Production – development wells, reservoir modelling, integration with reservoir engineering and production monitoring.
- Employers – oil companies and specialist contractors



Geoscientist Jobs in the Petroleum Industry 21

Geoscience Computer Applications:

- BSc-MSc-PhD in Geoscience, Computer Technology, Physics, Engineering
- Office based
- Database construction and manipulation
- Seismic interpretation Software – horizon picking, mapping, attribute analysis, AVO, etc.
- Log analysis
- Cross section and correlation section construction
- Geological and engineering mapping
- 3D modelling, Petroleum System, Play Fairway and Basin Analysis
- Volumetrics and Uncertainty Analysis
- Employers - Large E and P Companies or Software Service Companies

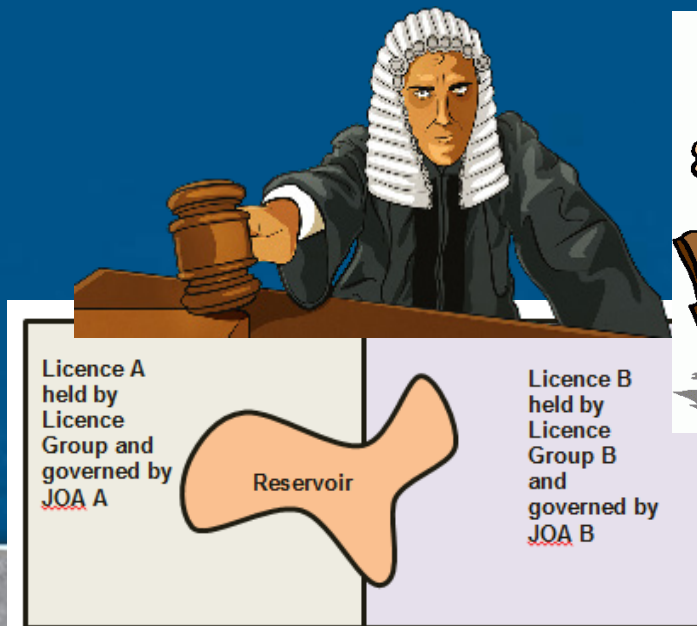


Geoscientist Jobs in the Petroleum Industry

22-26

Geoscience later career alternatives – all need considerable experience in industry before entering these disciplines:

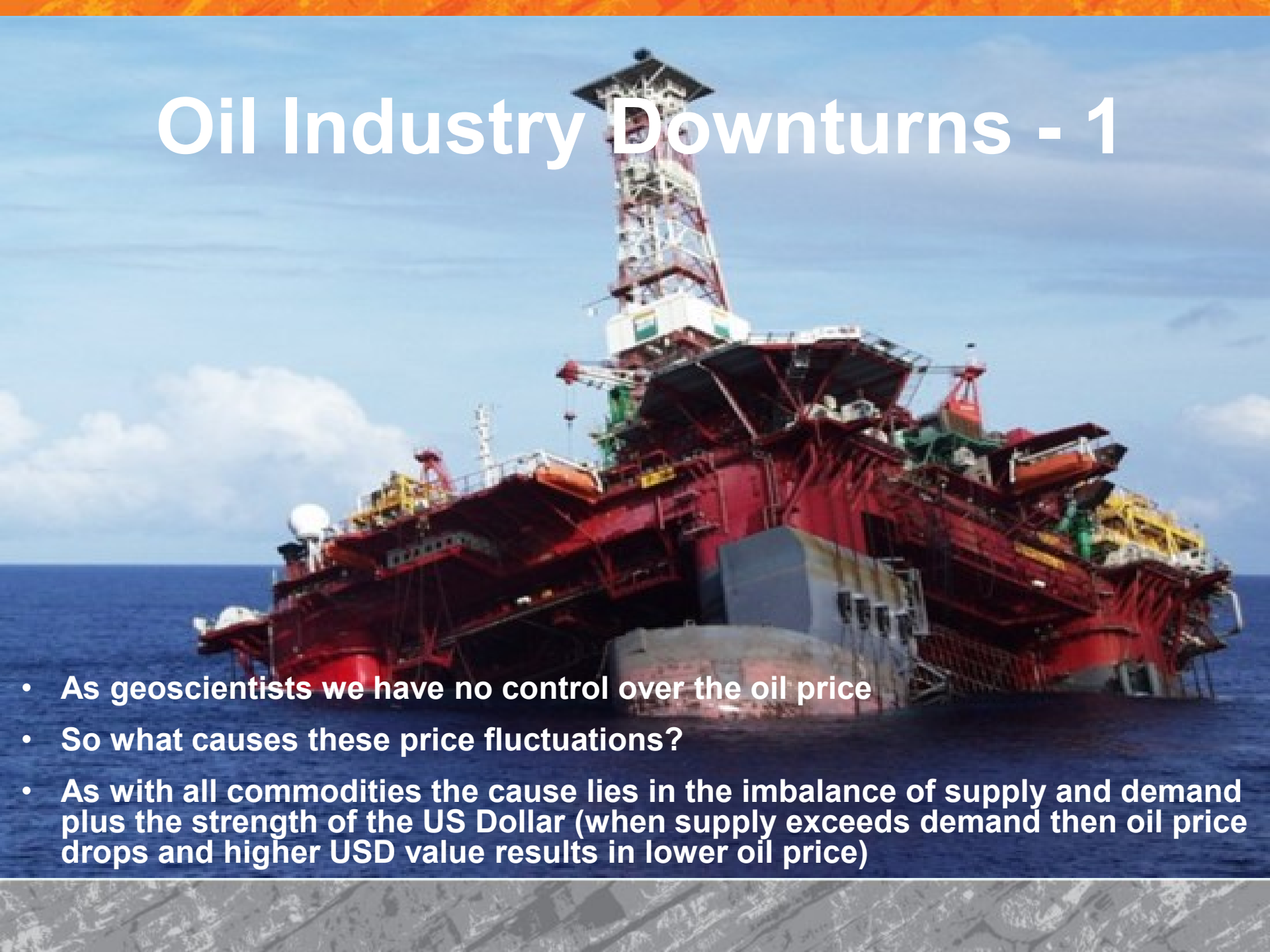
- Employed in large companies or independent consultants
- Economics and Negotiating – “wheeling and dealing” \$\$\$\$\$\$
- Scouting, External Activity Reporting
- Management
- Independent Expert (consultant) - Unitisation



Joint operating agreement (“JOA”)



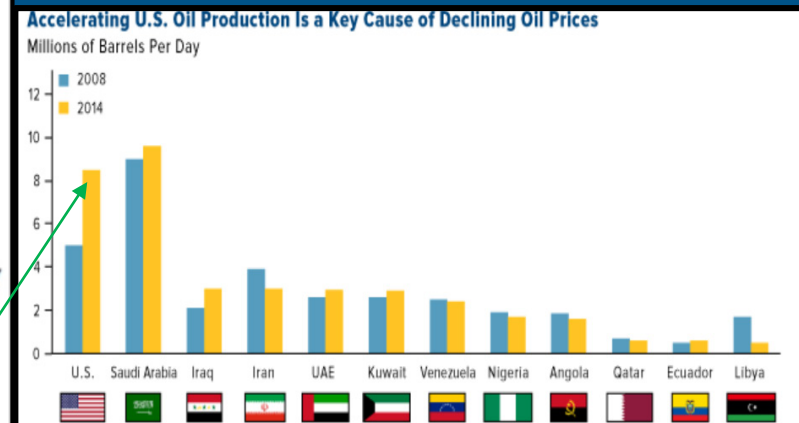
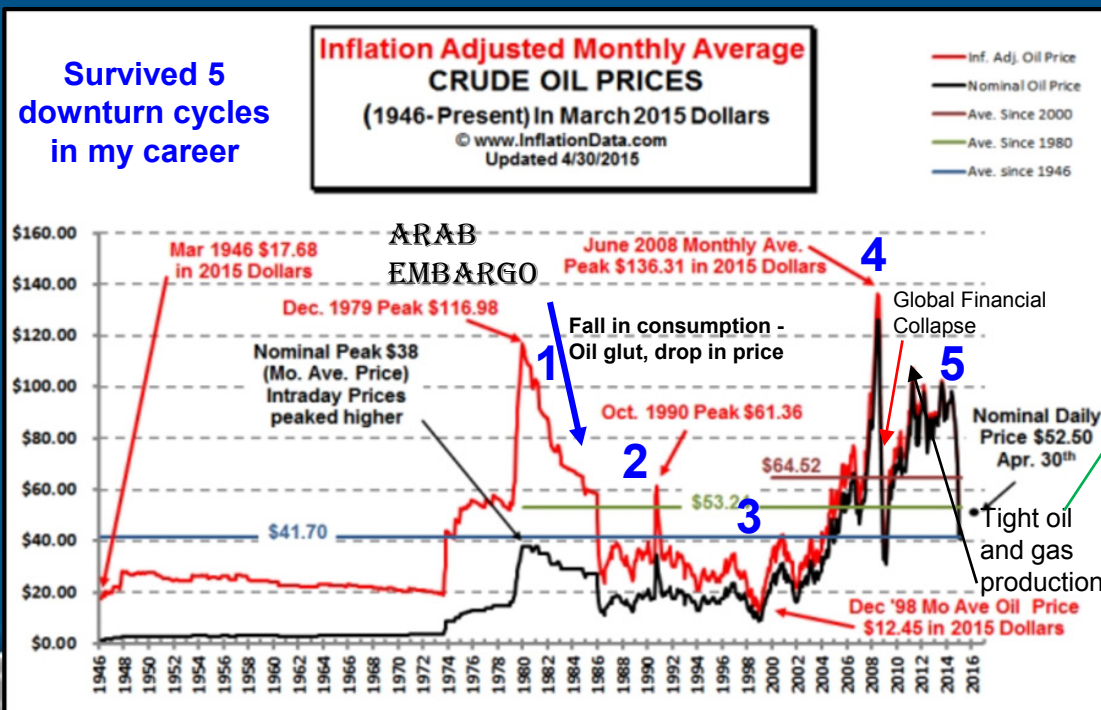
Oil Industry Downturns - 1

- 
- As geoscientists we have no control over the oil price
 - So what causes these price fluctuations?
 - As with all commodities the cause lies in the imbalance of supply and demand plus the strength of the US Dollar (when supply exceeds demand then oil price drops and higher USD value results in lower oil price)

Oil Industry Downturns - 2

MANY FACTORS INVOLVED IN CONTROL OF OIL SUPPLY, DEMAND AND PRICE

- OPEC oil output and USA Dollar
- Disasters and Unrest in Middle East and elsewhere
- Increased output from Non-OPEC e.g. USA shale oil
- Downturn in demand, lower GDP growth e.g. China



Downturns and the Future

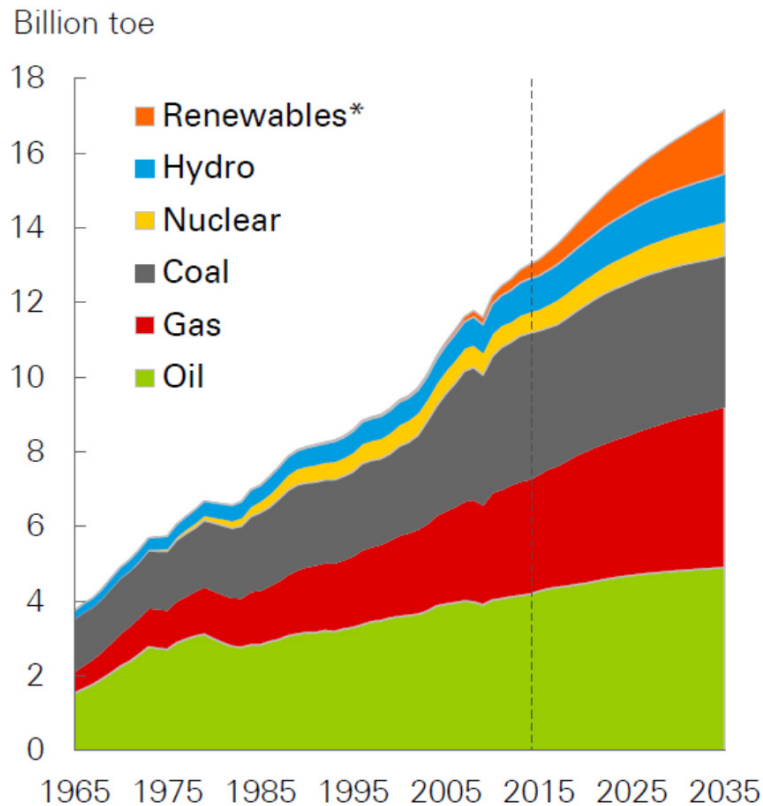
Attitudes for companies and individuals:

- There has been a succession of downturns for the past 40 years. Oil is a commodity and the continuing demand in growing economies will ensure a price rise eventually. But when???
- Oil companies commonly have a herding instinct. This is not always wise and companies that have capital to take advantage of low oil prices and the resultant lower costs can explore cheaply and buy properties for a future profitability when the price goes up again.
- **SHORT TERM PAIN FOR LONG TERM GAIN**
- But companies should not over borrow to finance such ventures – debt financing can be a company killer
- Remain flexible and have alternate or fallback options – failure is a learning experience for companies and individuals
- Oil and gas are not just used for fuel but extensively for plastics and other products such as petrochemicals, fertilisers, etc.
- ***THE FUTURE REMAINS BRIGHT FOR OIL AND GAS***

Global Energy Demand

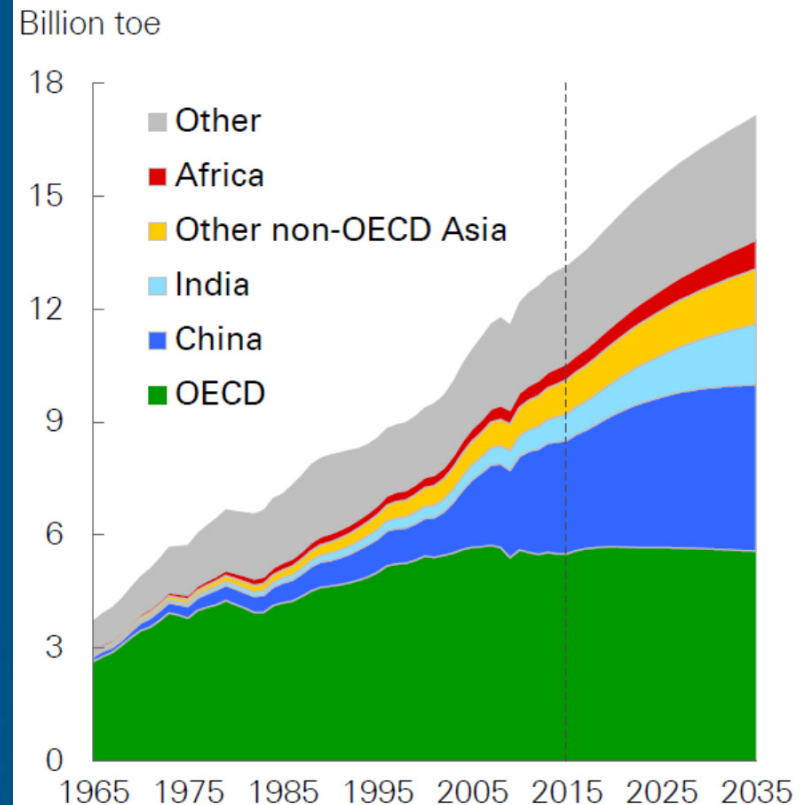
PETROLEUM DEMAND STILL INCREASING THOUGH AT A SLOWER RATE

Primary energy consumption by fuel



2017 Energy Outlook

Energy consumption by region



© BP p.l.c. 2017

How to Survive Downturns - 1

Essentials for individuals to demonstrate:

- Strong earth science background (master's degree preferred)
- Ease of communication abilities across varied disciplines
- Willing to work in multi-discipline teams (both teamwork and leadership skills)
- Start job search early, before graduation or redundancy
- Prepare professional quality CV, get it reviewed by mentors and get interview practise
- Research companies and institutions – use of internal and external contacts
- Participation in societies and their events (PESGB, AAPG, EAGE, GSL, SEG, etc.)

How to Survive Downturns - 2

Recommendations for individuals:

- Don't get stressed out, maintain a positive attitude and keep trying
- Oil Industry layoffs are a historical fact and will continue to be a hazard - learn from the experience
- If you leave the oil industry then it will be more difficult to get back in
- As one door closes another will open – have confidence in your abilities and remain flexible and willing to travel
- Develop and maintain a good network of colleagues and mentors in the oil industry – try for internships to gain experience
- Develop your expertise in subjects that interest you and are valuable in the oil industry. Production continues during downturns and such skills can make the difference for employment
- Be prepared to go for a job that is less than you are qualified for, or has a lower salary - the experience will pay off

What sort of a career path do you take?

- *What topics are you really interested in? Select which ones and show expertise*
- *Talk to your mentors and industry people*
- *What opportunities are available and where?*
- *Be flexible and prepared for change*
- *Define your personal choice and go for it!*

All the Best

Stuart Harker

