ASPO

THE ASSOCIATION FOR THE STUDY OF PEAK OIL AND GAS

NEWSLETTER No 30 – JUNE 2003

ASPO is a network of scientists, affiliated with European institutions and universities, having an interest in determining the date and impact of the peak and decline of the world's production of oil and gas, due to resource constraints.

It presently has members in: Austria, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Missions:

1. To evaluate the definition and endowment of the world's oil and gas;

2. To study depletion, taking due account of economics, demand, technology and politics;

3. To raise awareness of the serious consequences for Mankind.

Disclaimer: this Newsletter is compiled for the interest of those concerned and does not necessarily represent the position of ASPO members or the institutions with which they are affiliated

Newsletters on Websites

This newsletter and past issues can be seen on the following websites

http://www.asponews.org

http://www.energiekrise.de (Press the ASPONews icon at the top of the page)

www.isv.uu.se/iwood2002

www.peakoil.net

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The Newsletter's e-mail address is aspoone@eircom.net

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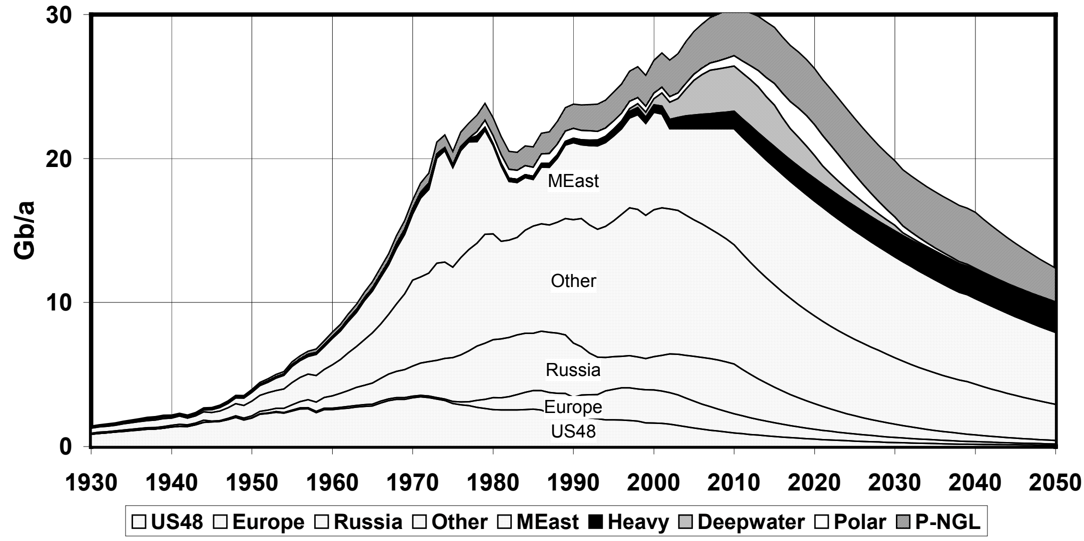
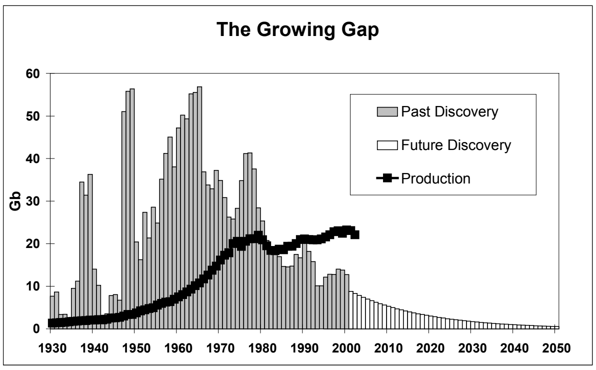


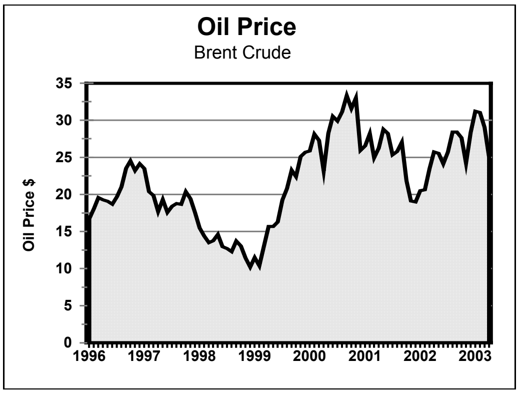
PRODUCTION to 2075

Amount			Gb
Regular Oil			
Past	Future		Total
	Known Fields	New Fields	
896	871	133	1900
All Liquids			
986	1714		2700
Status end 2002			

Base Case Scenario :
Flat average demand for Regular Oil to 2010, when M.East swing role ends. Regular Oil excludes liquids from gas fields and gas plants.

Annual Rate - *Regular Oil*					**Mb/d**
Region	***2005***	***2010***	***2020***	***2050***	***Total***
US-48	3.5	2.6	1.4	0.2	195
Europe	5.1	3.7	1.9	0.3	76
Russia	8.6	9.4	4.9	0.7	200
M.E.Gulf	17	22	22	13	749
Other	26	22	17	8	680
Total	60	60	47	22	1900
Annual Rate - *Non-Regular Oil*					
Heavy etc	2.8	4	5	6	300
Deepwater	5.6	8	4	0	60
Polar	1.2	2	6	0	30
Gas Liquid	8.2	9	11	6	400
TOTAL	78	83	72	33	2700





192. ASPO Meeting in Paris

The **Second International Workshop on Oil Depletion** was held in Paris on May 26 and 27, attracting 120 participants from many countries, and wide media interest. The proceedings will be published in due course, and on the ASPO website: www.peakoil.net

The ASPO management board was confirmed and strengthened. A secretariat in Uppsala, Sweden was appointed to help deal with the work load arising from the growing recognition of ASPO in relation to the critical issue of oil and gas depletion, which is now receiving new attention.

193. Future Oil Supply

The following summarises the main findings of an important paper by Jean Laherrère

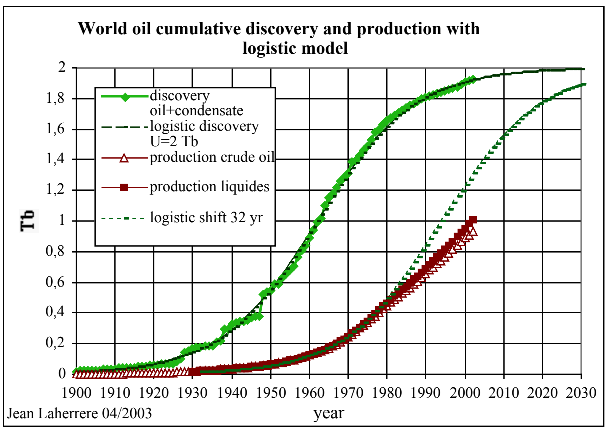
Seminar Center of Energy Conversion , Zurich May 7 2003

"Future of oil supplies"

Jean Laherrère, *Les Pres Haut, 37290 Boussay, France. E-mail: jean.laherrere@wanadoo.fr*

Oil is so important that reporting reserve data – and even production data – has become a political act. The conflict between the so-called pessimists, who are mainly retired petroleum geologists, and the optimists, who are mainly economists, arises from the different data they use. Technical data, which are commonly confidential, differ markedly from published data. For example, several the OPEC countries arbitrarily increased their reported reserves between 1986 and 1990 to increase their production quota, which was partly based on reserves. About 300 Gb of oil reserves were added in this way, although only about 10 Gb were discovered in reality. There is no consensus about reported numbers, nor are there standard definitions of terms, such as oil; gas; *Conventional/Unconventional oil and gas. Reserves* are variously reported as currently *Proved* values or backdated *Mean* values. Reserve reporting practices in the USA differ from those in the rest of the world, being conservative to satisfy bankers and stock exchange rules. The practice in Russia by contrast overstates recovery, as it ignores technical and economic constraints. There is an urgent to need remove these anomalies to secure a standard data-set.

The difficulties faced in forecasting future oil production result mainly from the poor quality of the input data, as extrapolating firm historical trends of discovery and production is fairly straightforward and convincing. Forecasting consumption is another matter as it depends on human behaviour and economic criteria. World oil production reached an earlier peak in 1979 when it was curbed by a fall in demand, not recovering for 15 years. US oil production peaked in 1970, forty years after the peak of discovery. World oil discovery peaked during the 1960s, meaning that the corresponding production peak will likely follow around 2010 at about 90 Mb/d if there is no constraint in demand. The official forecasts from the IEA and the USDOE of 120 Mb/d in respectively 2020 and 2030 are implausibly high in the face of recession, and are virtually impossible in terms of supply. The present R/P Ratio (remaining reserves over annual production quoted in years) is about 40 years, but it is an almost meaningless concept as it ignores the natural decline affecting all oilfields. Apparent improvements in recovery are found on examination to be more an artefact of reporting than a technological dynamic. So-called "*new technology*" is in fact often quite old: horizontal wells and 3D seismic surveys have been around from more than 30 years, and are already in wide use. The main impact of technological progress on conventional oilfields has been to hold production higher for longer and reduce costs, without adding significantly to the reserves themselves. New technology has however affected extra-heavy and deepwater oils, but the extent can already be foreseen.



The ultimate total production of specific fields can be determined by extrapolating decline, whereas the global total may be estimated with the help of creaming curves and fractal distribution plots. The "Hubbert" bell-curve is a useful tool, although in many cases more than one cycle has to be modelled.

Forecasting oil price has to take into account both supply and demand. Supply is constrained by Nature, but demand depends on human behaviour, and may fall with prolonged recession.

One of the key graphs is reproduced above, showing the relationship between discovery and production. The full paper can be seen on www.oilcrisis.com/laherrere/zurich.pdf

194. Dr Bentley makes an urgent plea for governments to study oil depletion

There is a serious and urgent need for the energy community to understand global oil depletion. Many, perhaps most, analysts base their forecasts on the following arguments, giving scant attention to the resource constraints themselves.

(a). Proved Reserves support current production for 40 years (R/P Ratio), ignoring natural peak and decline .
(b). Recent discoveries in the Caspian, deep offshore, etc.
(c). Promising basins that have seen little exploration.
(d). The vast resource of non-conventional oil.
(e). The view that companies keep 30 years of reserves in their inventory; if reserves fall below this, they search for more.
(f). The view that records show large 'reserves growth' in existing fields.
(g). The view that an increase in oil price will:
(i). increase exploration;
(ii). bring on fields, and recovery techniques, currently uneconomic;
(iii). give adequate warning of supply difficulties;
(iv). curb demand.
(h). The view that past forecasts of oil shortage have all been wrong.
(i). The view that gas, and other oil substitutes, will be adequate, when oil supply tightens.
(j). The fact that neither the oil companies, nor the government agencies (IEA, EIA, USGS), are warning of supply difficulties.
(k). The view that in any event, oil (and energy) are commodities, and their supply is best left to the market.

Members of the 'Oil Group' at the University of Reading have looked at these views in varying degrees of detail; and find that the evidence indicates a high probability of severe near-term difficulties in global oil supply. This is because most of the above arguments have strong counter-arguments.

For example:

(a). There are proved oil reserves sufficient to support current rates of production for 40 years . But this takes no account of the production decline that sets in when about half the total recoverable resource has been used. The data are quite clear. Fifty countries are now past their resource-limited oil production peak and are in production decline. They include the U.S., the U.K., and Indonesia; and will soon include Norway, Mexico and China. Already three large regions of the world are at, or past, peak: Europe, Asia-Pacific, and North America (excluding tar sands). Probably the main reason that most analysts discount an imminent decline in global production is the counter-intuitive nature of the peak. It happens while significant discoveries are still occurring, and while there are still ample reserves in the ground. The UK peak in 1999, and US peak in 1971, are typical examples.

(b, c). There have been recent discovery successes. But the overall trend of global oil discovery in new fields has been falling consistently for nearly forty years. This is powerful evidence that what the explorers are saying is correct. Likewise, there are basins that have seen relatively little exploration, but these have generally poor prospects, or lie in very hostile environments.

(d). There are large resources of non-conventional oil. But questions of technology, cost, investment requirement, and pollution constraints (including CO2) will limit the rate they come on-stream. The degree that non-conventional oil can replace declining conventional oil is a key un-resolved issue

(e). The idea that companies seek to keep only 30 years' of reserves in their inventory is almost certainly not the case. The view is probably driven by the extraordinary difference between Proved Reserves, as reported for financial purposes and Proved plus Probable Reserves, as determined on technical evidence, that has confused the entire oil depletion debate. This confusion is still reflected in publications from agencies like the IEA and the USGS.

(f). Even to-day, the IEA, EIA, NPD, USGS and many other authorities take encouragement from the large apparent 'reserves growth' in existing fields. In the case of Europe, it is easy to show that, once again, this is often due to confusing proved reserves with (proved plus probable).Real technological improvements occur, but analysis of all the larger UK fields, and analysis by the NPD of classes of Norwegian fields, indicates that most of 'reserves growth' is in the reporting, and is not due to technical gain.

(g). It is true that an increase in price will increase exploration, bring on currently uneconomic fields and enhanced recovery techniques, help warn of coming supply difficulties, and curb demand. But: (i). For most regions of the world the 'creaming curves' (plots of cumulative discovery vs. time) are now nearly flat; in most places added exploration will find little new oil. (ii). Analysis of many individual fields shows that the scope to increased recovery factors is minimal;. Certainly some countries show low recovery factors that greater application of existing technology might raise, but questions of access, and rate, need to be addressed.

(iii). Adequate warning of supply shortage due to the price signal is a question that needs deeper analysis: - The U.S. peak in 1971 led to the first oil shock. A price warning signal was there, but not large, and widely overlooked. Production outside the Middle East in the 1980s and 1990s, due to oil nationalisation, masked a general price signal that would otherwise have indicated the gradual move to more difficult oil. With oil

discovery costs, and production costs, falling in some mature basins, the fundamental ability of oil price to signal an underlying supply trend may be weak. (iv). One thing certain about oil price is that, if high enough, it curbs demand. But reduced demand is not a comfortable solution for a world looking to raise its standard of living from, in part, increased energy use.
(h). Past oil forecasts based on just Proved reserves were wrong, not surprisingly. Past forecasts made over the last 30 years, based on estimates of the world's original endowment of conventional oil, have been consistent, and look correct.
(i). Gas (until gas itself peaks about 2020), and other resources (coal, biofuels, etc.) can substitute for oil. The questions relate to investment, cost, pollution and rate.
(j). It is true that generally neither the oil companies nor the major government agencies are warning of supply difficulties, though there have been exceptions (e.g., the IEA in 1998, and ExxonMobil 2000.) The reasons are that the oil companies are mostly no longer doing medium-term modelling; while the government agencies, again mostly, do not have the remit, nor sometimes the expertise or industry datasets, to do detailed supply modelling. A recent exception is Germany's BGR, that finds the peak date of global conventional oil to be around 2015.
(k). Finally, the view that oil and energy are commodities best left to the market has some validity. Companies have talented people, access to capital, and react swiftly and well to problems that fall within their financial focus. Unfortunately, global hydrocarbon depletion is currently well outside this focus. And with the global oil peak date predicted in the 2010 to 2015 range; and the non-OPEC peak considerably sooner, the amount of time left to face up to diminishing oil supplies is frighteningly short.

195. Falling US Gas Supply starts to worry the Chemical Industry

(Reference contributed by Hugh Sharman)

Bayer Calls For Reliable Supply Of Natural Gas In North America

CCN Matthews - *May 1, 2003*

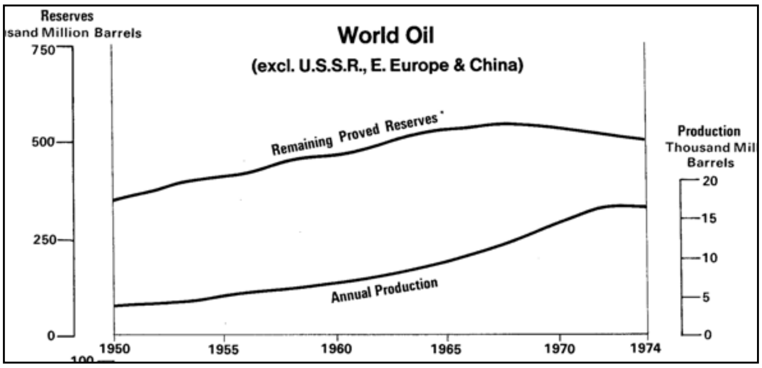
PITTSBURGH, PENNSYLVANIA, May 1, 2003 (CCNMatthews via COMTEX) -- Bayer Corporation (NYSE:BAY) is urging the U.S. Congress and the Administration to lift restrictions on natural gas production in the Gulf of Mexico and the Outer Continental shelf and encourage natural gas supplies from Canada, the corporation announced today. Unprecedented leaps in natural gas prices ushered in by diminishing supplies and rising demand threaten the U.S. chemical industry and economy, Bayer maintains. "The U.S. chemical industry uses 11 percent of all natural gas in the U.S. as feedstock material and to run its plants," explained Attila Molnar, Bayer Corporation President and Chief Executive Officer. "Yet at the same time, demand for this clean-burning fuel is rising and supply is diminishing, leading to uncertainty, shortages and soaring natural gas prices," he said. "We need a reliable supply of natural gas at globally competitive prices. Natural gas prices should presently be between $2.50 and $3.50 per million cubic feet to keep the U.S. chemical industry competitive in worldwide markets," Molnar said. "This year, it has sold for as much as $30 per million cubic feet -- six times the price of just three years ago. According to American Chemistry Council calculations, that's equivalent to paying $16 for a gallon of milk, more than $9 for a gallon of gas or nearly $13 for a pound of beef," he added. Bayer is also calling for legislation that would promote conservation incentives for utilities and government agencies, incentives to use cleaner and more energy-efficient co-generation facilities, and increased use of renewable energy sources. To improve increasingly unsatisfactory profit margins, Bayer is continually exploring energy conservation at its plants, ways to increase supply chain efficiencies and new pricing strategies, according to Ian Paterson, Head of the Bayer Polymers Americas Region and President and CEO of Bayer Polymers LLC. "In the polymers industry, the clear trend is toward commodities -- products that are manufactured in large quantities and primarily sold on the basis of price and supply chain excellence," Paterson said. "To assure long-term competitiveness for American industry in general and the polymers industry in particular, the U.S. urgently needs a robust energy policy -- one that encourages the best use of energy resources and strengthens the energy infrastructure through expansion of North America's vast natural gas resources," he said. Headquartered in Pittsburgh, Bayer Corporation had sales of $9.5 billion in 2002. The company employs 21,600 people. It is a member of the worldwide Bayer Group, a $32 billion international health care and chemicals group based in Leverkusen, Germany. Bayer's five operating companies -- CropScience, Chemicals, HealthCare, Polymers and Pharmaceuticals -- produce a broad range of products that help diagnose and treat diseases, purify water, preserve local landmarks, protect crops, advance automobile safety and durability and improve people's lives. The Bayer Group has nearly 122,600 employees. Its stock is a component of the DAX and is listed on the New York Stock Exchange (ticker symbol: BAY). For 2002, the group recorded sales of EUR 29.6 billion and a group net profit of EUR 1.1 billion. Capital expenditures totaled EUR 2.4 billion, and EUR 2.6 billion was invested in research and development. This news release contains forward-looking statements based on current assumptions and forecasts made by Bayer Group management. Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in our public reports filed with the Frankfurt Stock Exchange and with the U.S.

Securities and Exchange Commission (including our Form 20-F). The company assumes no liability whatsoever to update these forward-looking statements or to conform them to future events or developments

197. A book on oil and Iraq

A book entitled *La Guerra del Petrolio – La posta in gioco in Iraq e dietro l'asse del male* by Michele Paolini has been published by Berti in Italy.

197. Peak Discovery



Glancing through old issues of the BP Statistical Review, it was surprising to come across this plot in the 1974 Edition, showing peak discovery for the world outside the Communist bloc in the 1960s. The graph carries a small footnote with the key words "Reserves backdated to year of discovery". So evidently at that time, the company did make and publish serious studies of depletion. Later issues of the same publication failed to backdate, thereby successfully misleading most analysts to think that more oil was being discovered than was the case.

ExxonMobil last year published another graph (similar to that on p.2 above*) showing the same date for peak discovery, also backdating reserve revisions. This information is of transcendental importance, because peak discovery has to be followed by peak production…..and after peak comes decline. As Roger Bentley has pointed out, many of the earlier studies of depletion were perfectly sound, even if later ignored and misrepresented.

*****(*Please Note: the graph in previous newsletters contained a clerical error, which has been corrected)*

198. The petro-euro challenge to the petro-dollar

(Reference contributed by J.H.Laherrère)

http://www.atimes.com/atimes/Southeast_Asia/ED01Ae04.html

Apr 1, 2003 JAKARTA - Echoing a wider move away from the US dollar, the Indonesian government and the central bank, Bank Indonesia, may begin to use the euro in export-import transactions and foreign-exchange reserves.

The statement was made by Finance Minister Boediono, Bank Indonesia governor Syahril Sabirin and senior deputy governor Anwar Nasution here on the weekend in connection with state oil company Pertamina's plan to use the euro in its trade transactions.

"The US dollar is now still dominating trade. It is possible to use [the] euro when it replaces the dollar's position," the minister said.

Boediono said that if the US dollar continues to weaken compared with other foreign currencies including the euro, users of the greenback may seek more stable currencies. (Asia Pulse/Antara)

The following comes from the current Mbendi Newsletter, which is aimed primarily at African readers. The Times of London (May 9th) also carries a report that the President of Malaysia is instructing the national company to trade oil in euros, following an earlier move by Indonesia reported above. The pound sterling has slumped to a three year low against the euro.

Mbendi Newsletter

Our newsletters aim to keep you posted on what is happening, as well as to raise issues of potential strategic importance. Over the past few months, we have noted an increasing incidence of articles speculating on the the potentially dire implications for the US economy of oil producers pricing their oil in Euros rather than US$. While we have no way of knowing whether this is simply academic theory or the smoke above a fire, we believe it's an issue executives would do well to keep on their radar screens.

With the Iraq war so fresh in our minds, it is easy to couple this speculation with the fact that Iraq sold its crude in Euros, many producing countries, particularly in the Middle East, are unhappy with US action on Iraq and there are all the differences between the US and Europe over Iraq. We suggest putting these to one side and looking at the bigger picture which is not simply one of economic revenge for US action in Iraq.

Although it's a fairly new currency, the Euro is already one of the most widely used currencies around. Once the enlarged EU is in place, the size of population using the Euro could be larger than the population of the USA. Already one can see intense economic jockeying between the US and Europe on everything from bananas to genetically modified food to steel dumping to today's dispute over corporate tax breaks. It is only natural that this competition will also evidence itself in competition between the currencies to become the standard currency for world business.

Turning back to the energy front, the energy systems of producers such as Russia and Algeria are becoming increasingly integrated with those of the greater Europe. Iran and Libya both face US sanctions but have fairly normal business relations with European countries and companies. There is therefore a compelling logic for these transactions to be denominated in Euros, particularly by Europeans wanting to eliminate currency risk from the other business risks they run and by producers wishing to price in a strengthening currency.

As far as Africa is concerned, it's not just the oil producing countries that need to watch this. Contracts for gold, platinum, coal and other commodities are traditionally denominated in US$; this could change, specially where the buyer is based in Europe. And then, of course, there is the potential for African countries to put their weight behind one currency or the other in exchange for aid or trade concessions.

The key is to understand the implications of the range of scenarios, from the US$ remaining dominant to the Euro usurping its place. Then keep a watchful eye on any developments indicating where in the range of outcomes the final result will emerge. And, of course, understand how each outcome could affect your business and plan for each contingency.

199. Country Assessment - Egypt

EGYPT

Egypt covers an area of about one million square kilometres of barren desert, cut by the Nile Valley. The Red Sea and Gulf of Suez separate it from Arabia, while the Mediterranean washes its northern shore. It has common frontiers with Libya to the west and the Sudan to the south. Its population of 66 million is the second largest in Africa, being exceeded only by Nigeria.

The fertile Nile Valley has been a focus of population for more than four millennia, being the site early civilisations marked by the famous Pyramids. Alexander the Great conquered Egypt in 332 BC, founding Alexandria, the second largest city and a centre of early learning at the mouth of the Nile. Egypt became a Roman colony in 32 BC, following the Battle of Actium, although its celebrated Queen, Cleopatra, succeeded in endearing herself to the Roman conqueror. In 642, the country was taken by Arabs, who introduced Islam and their language, founding Cairo, the present capital, in 973. Saladin overthrew a previous Shi'ite dynasty in 1171, restoring the Sunni faith. The country was in turn invaded by Ottoman Turks in 1517 who operated a fairly delegated administration, entrusted to the surviving Mameluke leaders despite their military defeat. Napoleon led a short-lived French invasion in 1798, before Muhammed Ali, an Ottoman ruler of Albanian origin, established a new strong government that embarked on foreign conquests, including what is now Saudi Arabia and Syria.

British interest in Eqypt stemmed from the Suez Canal, which was built by the French in 1869, providing a strategic short cut to India and the East. An additional interest was the production of cotton by which to supply the textile mills of Lancashire. Rivalry with France for control of Eqypt ended in 1904 when France withdrew in exchange for British recognition of its claims to Morocco.

Britain occupied Egypt when Turkey entered the First World War on the German side, declaring it to be a Protectorate. There were various moves to independence in the inter-war years with the establishment of puppet regimes. The country remained under British control during the Second World War, and in 1942 the first decisive success of the Allies was achieved at the Battle of El-Alamein. British influence dwindled after the war leaving the country more or less independent under its somewhat ineffectual King Farouk.

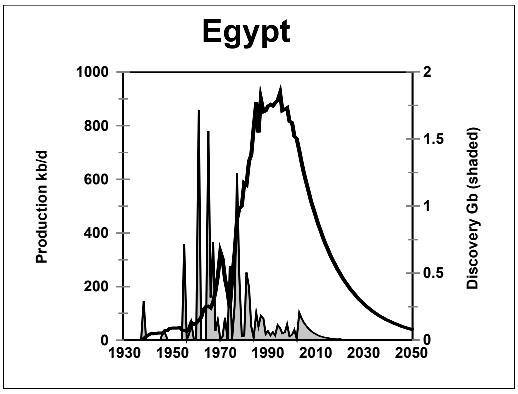
In 1948, Egypt, together with Syria, Jordan and Iraq, launched an attack to protect Palestine which was threatened by the creation of the State of Israel, but was roundly defeated. This setback indirectly led a group of Army officers under Col. Nasser to take control of government in 1952, declaring a republic one year later. Nasser was resolved to build the Aswan Dam on the Nile to control irrigation and provide hydroelectricity, and in 1956, having failed to secure international finance, decided to nationalise the Suez Canal and use its royalties to fund the project. Israel took this opportunity to strike in what might have been a contrived attack that gave Britain and France a pretext to send in a military force to protect the canal. But they were ignominiously made to withdraw under US and Russian pressure. Col. Nasser emerged as an imaginative leader of the Arab world, combining with Syria in 1958 to form the United Arab Republic, which was however dissolved three years later by Syria. The continuing perceived threat by Israel led to various interventions and alliances over the ensuing years, culminating in the Six-Day War in 1967 when Israel launched a pre-emptive strike. As many as 10 000 Egyptians were killed in the hostilities, and a dismayed Nasser resigned, to die three years later.

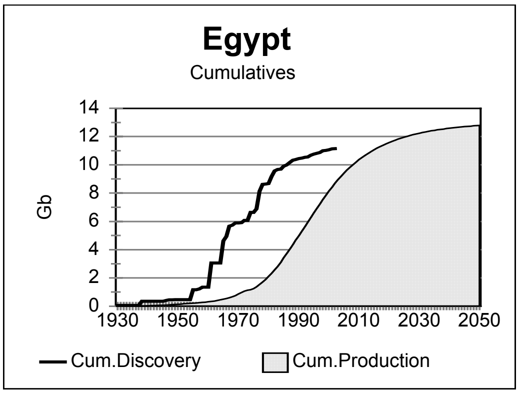
EGYPT		*Regular Oil*
Rates Mb/d		
Consumption	2002	0.55
per person b/a		2.9
Production	2002	0.27
	Forecast 2010	0.17
	Forecast 2020	0.09
Discovery 5-yr average Gb		0.05
Amounts Gb		
Past Production		8.7
Reported *Proved Reserves**		3.7
Future Production		4.3
	From Known Fields	3.5
	From New Fields	0.8
Past and Future Production		13
Current Depletion Rate		5.9%
Depletion Midpoint Date		2007
Peak Discovery Date		1965
Peak Production Date		1995

*Oil & Gas Journal

He was succeeded by President Sadat, who, with Syria, launched the so-called Yom-Kippur War in 1973 as a surprise attack on Israel. Although not a total military victory, it did bring Israel to the conference table. The Oil Shock of 1974 was a related event, as several Arab countries tried to counter US support for Israel by briefly restricting exports. It led to a certain more even-handed US policy under President Carter, who now began to court friendship with Egypt, making substantial "aid" payments. However the failure to resolve the plight of the Palestinians led to simmering unrest, which resulted in the assassination of Sadat in 1981 by a group of activists opposed to conciliation. The present President, Hosni Mobarak, took over, and has pursued a moderate policy, concentrating on economic development. The exploding population has however offset any real economic progress. There remains, accordingly, an undercurrent of deep frustration by those seeking to restore Arab confidence and self-esteem, which may erupt at any time, having been encouraged by the recent Anglo-American invasion of Iraq. The pressures are likely to grow as economic conditions deteriorate in the face of rising oil imports and likely higher oil prices.

In geological terms, there are three main productive basins, of which by far the largest is the Gulf of Suez, where oil is trapped beneath Miocene salt, providing an excellent seal. Although now a very mature province, modern technology has improved the mapping of the sub-salt plays, which may possibly lead to a few more modest finds. Another basin lies in the El Alemein area of western Egypt, where Jurassic source rocks have charged Cretaceous reservoirs in easterly trending rifts. The third basin is the Nile Delta, which is a primarily a gas province. The Mediterranean shelf is narrow and steep, and is unlikely to offer more than at best a modest deepwater potential.





Exploration commenced in the 1920s when a number of small onshore discoveries were made, and it was not until the opening of the Gulf of Suez in the 1960s that the country=s potential was realised. Amoco took a dominant position, working closely with the state oil company, to bring in the El Morgan Field in 1965 with over a billion barrels of ultimate recovery. It was followed by the July, Belayim and Ramadan fields that just attain giant status. About 1400 wildcats have been drilled. Peak drilling was in 1985 when as many as 56 wildcats were drilled, but after a second lower peak in the mid 1990s, current annual drilling rate has fallen to about 25 wildcats a year. In short, exploration is at a mature stage, with the larger fields being well into decline. Exploration drilling is expected to draw to a close around 2020.

The Nile Delta offers substantial gas reserves of about 50 Tcf, and some further potential. Gas consumption has doubled over the past ten years to reach about 0.7 Tcf/a. Along with related Condensate and Natural Gas Liquids from gas plants, it will be an increasingly important source of energy for the population centres of Cairo and Alexandria.

The country will become a net importer of oil within about five years as domestic production continues to fall. But it is blessed with a high level of solar radiation, which could help provide for its energy needs as its oil and gas deplete over the next few decades.

200. Oil from Turkeys – a small step in the right direction

(Reference contributed by J.Bigelow)

As natural oil declines, synthetic oils will inevitable assume a greater importance in the future.

DISCOVER Vol. 24 No. 5 (May 2003)
http://discover.com/may_03/gthere.html?article=featoil.html

In an industrial park in Philadelphia sits a new machine that can change almost anything into oil..."This is a solution to three of the biggest problems facing mankind," says Brian Appel, chairman and CEO of Changing World Technologies, the company that built this pilot plant and has just completed its first industrial-size installation in Missouri. "This process can deal with the world's waste. It can supplement our dwindling supplies of oil.

"The potential is unbelievable," says Michael Roberts, a senior chemical engineer for the Gas Technology Institute, an energy research group. "You're not only cleaning up waste; you're talking about distributed generation of oil all over the world.".

Referring to U.S. dependence on oil from the volatile Middle East, R. James Woolsey, former CIA director and an adviser to Changing World Technologies, says, "This technology offers a beginning of a way away from this.". "We will be able to make oil for $8 to $12 a barrel," says Paul Baskis, the inventor of the process. Thermal depolymerization, Appel says, has proved to be 85 percent energy efficient for complex feedstocks, such as turkey offal: "That means for every 100 Btus in the feedstock, we use only 15 Btus to run the process." He contends the efficiency is even better for relatively dry raw materials, such as plastics. This Philadelphia pilot plant can handle only seven tons of waste a day, but 1,054 miles to the west, in Carthage, Missouri, about 100 yards from one of ConAgra Foods' massive Butterball Turkey plants, sits the company's first commercial-scale thermal depolymerization plant. The $20 million facility, scheduled to go online any day, is expected to digest more than 200 tons of turkey-processing waste every 24 hours. "We've got a lot of confidence in this," Buffett says. "I represent ConAgra's investment. We wouldn't be doing this if we didn't anticipate success." Buffett isn't alone. Appel has lined up federal grant money to help build demonstration plants to process chicken offal and manure in Alabama and crop residuals and grease in Nevada. Also in the works are plants to process turkey waste and manure in Colorado and pork and cheese waste in Italy. He says the first generation of depolymerization centers will be up and running in 2005. .."

201. Oil Peak and Immigration

A new study *Immigration - The Wrong Answer for Social Security* by John Attarian points out that the Social Security system of America will be increasingly unable to meet the demands made upon it by an ageing population. The solution proposed by flat earth economists has been to admit more immigrants to provide a better balance between contributing workers and beneficiaries. The author dismisses this approach, drawing attention to the ASPO assessment of the coming peaks of oil and gas production. He argues that the last thing America needs is more people in the face of a declining economy caused by collapsing energy supply. He further anticipates growing tensions between different immigrant groups, who retain their homeland identity, as well as between them and the descendants of earlier settlers, foreseeing even the disintegration of the country. America is not alone in facing these tensions.

202. UK Survival in the 21st Century

This subject is addressed in a very sensible way in the Busby Report in www: after-oil.co.uk., drawing attention to the imminent peak of oil production and its impact. It stresses the absurdity of government policy, which allowed the export of precious oil and gas resources, mortgaging the country’s future.

203. Where are the astrologers?

Mediaeval astrologers found ways to explain epochs of stress and uncertainty when the world seemed to go to pieces with wars, poor harvests and violent storms. One wonders what planetary juxtaposition was responsible for the current epoch of tension, comprising the events of September 11th; a brief outbreak of anthrax in the United States; an invasion of Afghanistan; an invasion of Iraq; and the outbreak of SARS in the China and Toronto, which is an incurable cocktail of mumps and measles. Some ask if the juxtaposition was entirely planetary. It is curious too that an exceptional number of micro-biologists have reportedly met untimely deaths in several countries.

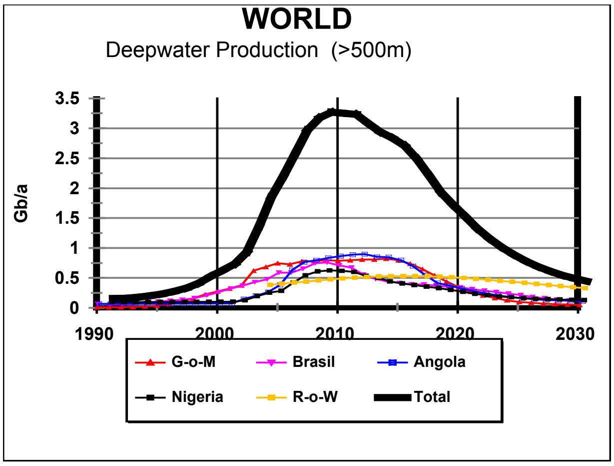
204. Spanish Edition of the Newsletter

A welcome proposal to establish a Spanish language edition of the Newsletter for eventual inclusion on a new website has been agreed. It will have particular relevance for Latin America and may lead to better resource information from that continent.

205. Deepwater Production

New information on forecast production from current deepwater fields has been received, suggesting that some of the previously reported reserves may have to be downgraded. The position remains fairly obscure, with confusion even as to the names of the fields in the Gulf of Mexico. But for what it is worth, the new data have been used to update the model. New fields comprise anticipated production from new discovery as well as from certain discoveries awaiting development. The estimates cannot be other than very approximate on the basis of present information.

Unit:Gb	Current Fields	New Fields	Total
Angola	5.6	7.5	13
Brasil	8.2	4	12
Nigeria	3.1	3	6
Gulf of Mexico			15.5
US	5.5	5	
Mexico		5	
Rest of World	2.9	10	13
Total	27	33	60



Some promising deepwater reefs have been identified off the Indian sub-continent offering a new play, provided satisfactory source rocks are present. If confirmed, it would contribute to the potential of the "Rest of the World".

206. Hubbert Peak: No Magic in the Midpoint

The following is an abridged version of a paper by Ugo Bardi to appear in *Energy Policy*

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The use of Hubbert's model to predict the evolution of crude oil extraction at the planetary level is well known. A feature of this kind of modelling is that depletion is gradual. The "production peak" is therefore the main event in the future history of oil extraction, a point which will mark the epochal change from cheap oil to expensive oil. According to Hubbert, the production peak takes place at "midpoint", when half of the ultimate recoverable resources (URR) have been consumed. Several estimates indicate that we are close to having extracted one trillion barrels of "conventional" crude oil out of an original endowment of double that amount. Hence the production peak could take place within the first decade of the 21st century or not much later.

However, it is not obvious that Hubbert's model, successful for describing several cases of local resource depletion, can be automatically considered appropriate for describing the global case. The present study aims at determining what are the conditions that may lead to symmetric or asymmetric production curves. By means of a stochastic simulation, it turns out that there is no magic in the "midpoint" of the production curve: the production curve may be asymmetric and in particular skewed forwards. This possible shift of the peak away from midpoint has obviously important consequences in the future scenarios of fossil fuel depletion. If the post-peak downward slope turns out to be much sharper than expected, the result could be an unpleasant shock for the economy, to put it mildly.

The model developed here is inspired mainly by a study by D.B. Reynolds [3] which is based on the concept of Robinson Crusoe surviving in a deserted island on hardtack tins left from previous shipwrecks. Assuming that he found no other food, the tins meet the definition of a non renewable resource. Depending on the total amount of hardtack and on his ability to find it, Crusoe may survive for only a short time or die of old age with still plenty of resources left. Unlike Reynolds's model, the simulation developed here assumes population growth in the island (let's say that Crusoe's companion, Friday, was a girl).

The model was implemented using a stochastic (or "Monte Carlo") calculation. In the simulation we assume the a starting number of islanders and an initial endowment of tins, or "resource units". For each cycle of the simulation the islanders perform a number of search attempts. If an islander finds hardtack he stores it as his own property. In each cycle, each islander has a chance to reproduce, generating another islander who inherits half of the father's hardtack. In every cycle, the islanders also have to consume some of their hardtack reserves as food. An islander dies in the simulation when his reserves of hardtack are depleted. As the simulation progresses and the amount of hardtack dwindles, all the islanders must eventually die off.

These are the basic features of the model, which can be subsequently modified to take into account more details and variations. The main variants considered here are as follows:

1. Fixed time search: The islanders perform a fixed number of searches in each cycle, accumulating all the hardtack they find. This is the "basic" model described above.

2. Optimal amount search: In each cycle the islanders continue to search until they collect an amount of hardtack that they judge optimal for their needs. The maximum number of searches is any case finite.

3. Technology factors: The probability of success in the search improves with the success of previous searches. In other words, islanders learn better search strategies.

In the “fixed cost” model, islanders keep expending the same amount of effort (time or money) in their search regardless of the results. As the simulation runs on, the amount of hardtack they collect gradually dwindles and eventually falls to zero. This way of searching may appear rather unintelligent, but it actually describes a perfectly reasonable strategy to keep constant the flux of the resource in a case where there is a chance to switch to another source: let’s say hardtack coming from another island. This feature may be explicitly simulated in the model by providing islanders with a constant flux of “extra-island” hardtack. Therefore, this model can be seen as describing the case of resource depletion in a specific area, as for instance the case of the US production declining and the supply source moving to the Middle East. Switching to other producers, prices remain approximately constant, and from the viewpoint of users, there is no depletion at all.

In the second case of an optimal amount search, the islanders still try to maintain constant the flux of resources but in this case they increase their efforts as the supply declines and, as a consequence, hardtack tins become more expensive. This model is closer to the “global” case, in which there is no other source than the one being exploited. Since the search time available to islanders is in any case limited, hardtack tins become more expensive as the simulation progresses, so that eventually the islanders will be no more able to afford them.

The "technology" case is something that affects the search probability taking into account the capability of islanders to learn more efficient search and/or extraction strategies. Here, the parameter was assumed to be simply a multiplying factor of the probability that starts as equal to one and increases proportionally to the total amount of found hardtack.

The results of the simulations are in general in agreement with what one would intuitively expect. In all calculations, we have an initial nearly exponential growth of hardtack (oil) production and of the island population. Both are followed by a subsequent decline and the final death of all the islanders. The model produced nearly symmetrical production curves under the hypothesis of a “constant cost” of the resource. This condition approximates with that of a market where customers switch to remote producers when local production dwindles because of depletion. If the model was modified taking into account “extra-island” hardtack, the shape of the production curve does not substantially change although, of course, the population increases exponentially. Typical results for this model are shown in fig. 1. The calculated production curves are never exactly symmetric but always slightly skewed forward. Nevertheless the asymmetry is small. The fitting of the simulated production curve with a Gaussian function is good, as shown in fig. 2, just as experimental production curves can be well fitted with a Gaussian curve. The model does therefore qualitatively reproduce the historical trends, for instance the bell shaped production curve of oil production in the US lower-48 states, for assumptions which are consistent with the real market situation.

In the “global” case, we assume that consumers of the resource have no possibility to switching to another sources. In this case, in order to maintain supply, the islanders must step up their search effort, i.e. they must be willing to pay more per resource unit. This model is defined as the "optimal amount search". It leads to a more asymmetric curve than the case described above, with the decline sharper than the growth. A graphical comparison of the two models is shown in fig. 3. In this case the fraction of recovered resource increases, but this increased recovery must be paid with a more rapid decline after the peak.

The parameters that simulate technological improvements can be introduced in both search strategies described above. The main results follow robust trends, which can be summarized as follows:

1. A “bell shaped” curve of production of a mineral resource is always obtained except for very specific assumptions. However, the curve is not necessarily symmetric.

2. There is no magic in the “midpoint” of the production of a mineral resource. Depending on the search and/or extraction strategies, it may be asymmetric with the peak shifted forward in time and with a decline much more rapid than the growth.

3. The results reported by Reynolds are confirmed: prices and costs can falsely signal decreasing scarcity. Only near the maximum of production, do prices start to rise rapidly as an effect of scarcity. If “technology” is taken into account, prices may actually fall before the production peak is reached.

4. In no case, except for very special assumptions, the simulations produced total recovery of the mineral resource. In other words, as pointed out by Houthakker [5], there may be no such thing as “exhaustion” of a mineral resource. Rather, at some point it will become too expensive to be worth extracting. This may be, of course, a problem if it is a crucial primary resource such as crude oil

5. Increased efforts or improved technologies increase the amount of resource recovered, but this increased recovery must be paid for with a more abrupt fall after the peak.

These results indicate that, as already known, Hubbert’s model is a good approximation. However, it may not be enough for an accurate prediction of crude oil production when considering global (or planetary) crude oil production. In this case the model would need to be modified taking into account a new parameter: the “skewness” of the bell-shaped curve. Of course, adding a further parameter increases the complexity of the theory and therefore makes quantitative forecasting more difficult. Nevertheless the conclusions derived from such a model may be qualitatively relevant. Literature estimates based on Hubbert's model indicate that the worldwide peaking of conventional crude oil production could take place in roughly a decade from now [6-9] or little more. The results of the present work do not change the URR estimates on which these predictions are based. However, they indicate that in some conditions peaking may be delayed and the growth of production may be sustained beyond the "midpoint" of resource consumption. This delay in peaking, however, may be paid by a more rapid decline after the peak, something, which might be a dramatic shock for the economy.

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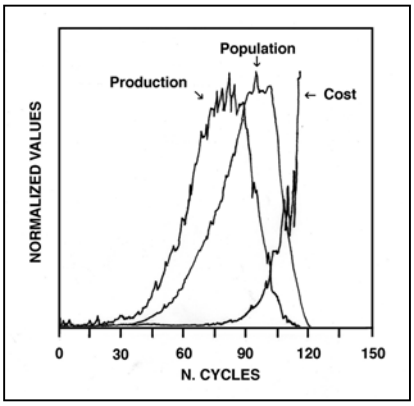

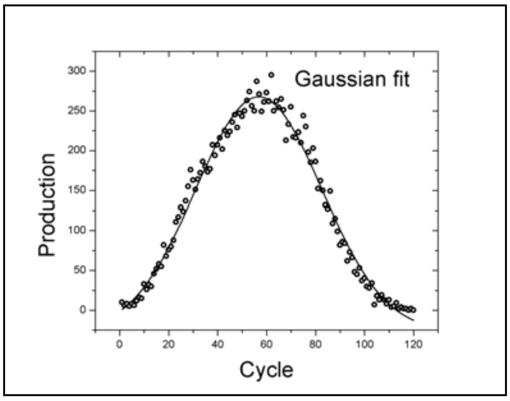

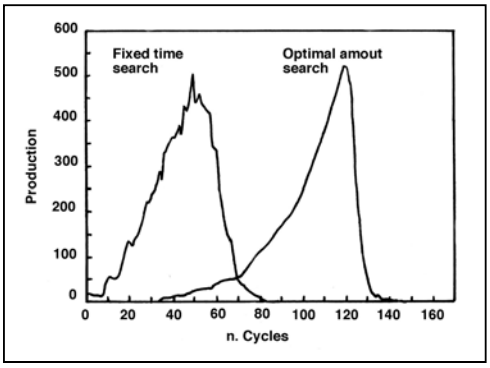

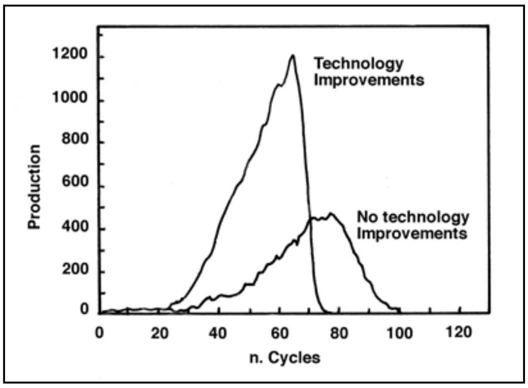

FIGURE CAPTIONS

Figure 1.(top left) Typical production, population, and cost curves for the "fixed time search" search model described in the text. In this case the production curve is nearly symmetrical, as in Hubbert's model.

Figure 2.(top right) Fitting of the results of a "fixed time search" simulation with a Gaussian function.

Figure 3.(bottom laft) Comparison of the "fixed time search" or "optimal amount search" strategies. The leftmost curve (fixed time) is the nearly symmetrical "Hubbert-like" curve calculated as described in the text, assuming that islanders search at random the island for a fixed time and accumulate all the hardtack they find. The other curve (optimal amount) assumes that they stop searching after they have accumulated an optimal number of hardtack tins.

Fig. 4 comparison of the "fixed time" search strategy with and without the parameter that assumes a linear progressive increase in the capability of the islanders to find hardtack by technological improvements.

The Newsletter very much welcomes contributions from ASPO members and other readers, who wish to draw attention to items of interest or the progress of their own research.

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