



# Diamonds

by E.P. Gush\*

Diamonds, an enigma in a mineral resource sense.

Chemically, diamonds are no more than carbon crystals in a cubic system—formed one might add under conditions of great pressure and temperature. They have certain physical properties which are fairly unique. They are very hard, they have a high refractive index, they luminesce, some of them fluoresce, they have a high specific gravity, they don't wet and they are a good conductor of heat. In a way, a rather clinical set of qualities. Of course, these qualities are what give diamonds their use and their beauty.

It is on the emotional side that they get complex and stir memories of legends, of beauty, of wealth and romance, of war, happiness, bad luck and curses. It is on the emotional side that the value of a diamond is established, if such a thing is possible. Diamonds are extremely varied, there are more than 5000 categories into which they are sorted, so there is room at each point across the spectrum for their individualities to emerge, and accordingly their attractiveness to each buyer is unique.

Historically, diamonds have been around for many years. The earliest references date perhaps from 1200 BC in the Book of Exodus. It seems the most important early source was in India in the river gravels of the Golconda region near Hyderabad. This was around the 12th century B.C. Then, after a very long period, Brazil in the 1700's produced some alluvial diamonds in the Minas Gerais region. After this came South Africa in the middle of the 19th century, firstly in 1866 in Hopetown when the 21 carat Eureka stone was found by a child on the banks of the Orange River. Then the 83 carat Star of Africa was picked up by a Griqua shepherd boy in 1869 and, as you know, in 1870 the first of the pipes at Jagersfontein, Dutoitspan and Bultfontein were found. 1871 saw the discovery of the De Beer and Kimberley pipes on the farm of the De Beer brothers and for the next ten years chaos reigned. You will be familiar with the famous photographs of the early diggings in the Big Hole, the crazy spider webs of wire ropes and the small claim blocks being mined at different rates. It was over this period that Cecil Rhodes and Barney Barnato

fought their epic battle to acquire control of the diamond fields—membership of the Kimberley Club for Barnato, plus a large cheque, finally swung the day in favour of Rhodes. De Beers Consolidated Mines as a company was formed in March 1888 and owned the De Beers mine, and the Kimberley mine, and controlled Bultfontein and Dutoitspan mines.

Even in those days, marketing was a problem and shortly after this consolidation the market slumped, which gave rise to the first single channel marketing system in 1890 known as the London Diamond Syndicate. Premier mine was discovered in 1902 and, very importantly, in 1908 diamonds were discovered on the Skeleton Coast at Luderitz. This was followed by the discovery by Merensky, a legend in his time, of the fabled deposits at Alexander Bay and Oranjemund. Finsch mine was discovered in 1961, the Botswana discoveries were first made in 1967 at Orapa and then in 1974 at Jwa Neng. Venetia followed in 1980. During this time, of course, diamonds were produced from other areas such as Zaire in 1906, Angola in 1912, Ghana in 1920 and Sierra Leone in 1930. Williamsons, a mine of great lore in Tanzania, was discovered by a penniless Canadian geologist, Dr John Williamson, in 1940. Williamsons was a pipe of staggering dimensions, 361 acres in size, highly enriched on surface but diminishing rapidly in size and grade with depth. The Russian pipes in Sakha were found by a lady geologist in 1954 through 1969 and Australia, not to be left out, produced the Argyle pipe in 1969. Now we have Arkhangel'sk in Russia with some five or six pipes and of course the great diamond rush in the North West Territories. Diamond discoveries, as history has shown, have always been fickle, and deposits which seemed to promise great wealth and riches turned out to be a great disappointment, while those which seemed to be rather pedestrian have produced some of the most magnificent gems in the world.

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The famous diamonds are surrounded by myth and legend, fact and fiction, and make fascinating reading. These are spread throughout the world in the hands of people who are happy and unhappy, rich and subsequently poor, appreciative of their beauty or merely ostentatious in their display.

There have been famous stones like the Hope diamond—a sapphire-like dark blue, reputedly found in Golconda in the middle of the 17th Century, which had a curse on the owner 'for ever and ever' and no question but that the various owners and wearers have felt that curse. It now rests in the Smithsonian. The Eureka diamond found by the Griqua shepherd boy was transformed into a marvellous 18 carat stone and was finally reacquired by De Beers and presented to the Speaker of the House of Assembly as a gift to the people of South Africa. The Premier Mine, a marginal mine at best, has produced a number of the most magnificent stones ever found. The staggering 3106 carat Cullinan diamond found in 1905, the famous 426 carat Niarchos gem in 1954, the 240 carat Taylor Burton stone in 1966, the 354 carat Premier Rose in 1978 and, in 1988, the 599 carat Centenary stone, amongst many more of superb quality. The Centenary diamond cut to 274 carats over three years now lies in the vaults at 17 Charterhouse Street, waiting to be sold. The list of wonderful diamonds found, polished, re-polished, sold, stolen, traded, and taken as bounty during wars is endless and absorbing.

The value of a diamond is indeterminate. Its utility value results from its use in cutting and grinding, drilling and polishing. Unfortunately there are far too many diamonds for this purpose and in fact the best diamonds for such industrial uses are artificially made in very large presses. These synthetic diamonds seem to do a better job in this regard and are available like any other manufactured product—based on supply/ demand and cost/revenue parameters. The industrial diamond business is small relative to the gem business and includes high tech chemical vapour deposition of diamond plates for use in opto-electronic devices and laser systems.

So, in the main, a diamond's value is derived from its beauty and its rarity—it is always difficult to place a precise and absolute value on such qualities. This of course applies to the polished product and tracing that value back to the rough is even more difficult. One has to look at the colour, the clarity, the size and the shape of a diamond as the most obvious parameters. Then diamonds, in addition, have a grain, and internal planes and flaws which need to be carefully taken into account to determine how the polished stone would fit into or emerge from its rough form. One slip, one accident, and one would have a very costly mistake on your hands.

Thus, we have a high-value product in very small, easily transportable, easily stolen, easily smuggled parcels, and the value of such a product depends on the best and the worst of human nature. On the bad side greed, covetousness, ostentation, fear, poverty and power.

Fortunately there are also some good aspects of human nature, such as beauty, love, marriage, desire to pass things on as heirlooms and, of course, pride of cutting and setting a beautiful stone.

Going through the diamond process there are a number of unusual features, starting with exploration which does require some different techniques from normal exploration based on an understanding of the product. It is not quite as simple as gold or base metals. The host rock for diamonds in primary deposits is kimberlite. Without kimberlite there are no diamonds. But as people are now beginning to realise, particularly in Canada, not all kimberlites contain diamonds and certainly not all diamondiferous kimberlites will be mines. The ratios, it is worth remembering, are 4,000 kimberlites discovered to date, 200 of which are diamondiferous and only 20 have proved to be mines. First of all, the indicator minerals which are now very much buzz words such as garnets, diopsides, and spinels are important, and vary in terms of their importance. The pipes themselves could be magnetic or non-magnetic, and often are covered by considerable depths of sand or overburden. The second unusual feature in exploration is the very sparse and discrete distribution of value in the rock. A grade of 50 CPHT would translate into one part per ten million or, putting it another way, if on average there are three stones per carat, then 50 CPHT would mean possibly four one-third of a carat stones in a cubic metre of kimberlite. To the extent there are the odd large stones, there would be a number of barren cubic metres as well. Then there are diamonds and diamonds, both in terms of size and in terms of quality and the value goes up geometrically with both. The information currently being spewed out about micro/macro diamond content is, on its own, not meaningful. Putting this all together in a useful and realistic way requires some very astute and advanced geostatistical analyses to determine the probability of occurrence of stones within the host rock according to certain size distribution curves which can be established. So, as has recently been established in Canada, the initial discovery of a kimberlite is a very long way from the proving up of a mine.

Then the mining, which is relatively straightforward and no more difficult than the mining of other minerals and certainly much easier than our deep level gold mining. There are the primary deposits or kimberlite pipes which are generally mined by open pit methods and when these have reached their economic limits can be mined by underground bulk extraction methods. There are the secondary deposits which appear in river systems such as Angola, West Africa and other parts of the world. Then there are the alluvials in a marine situation such as Namibia and the west coast of South Africa. These marine deposits are mined by vast earth-moving operations on the onshore terraces and by very sophisticated mining and extraction ships under the sea. It is one of the most hostile coasts and seas in the world which adds to the problems of marine mining. Again, a critical feature of marine mining is establishing the distribution of diamonds on the sea floor.

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On the recovery front, diamonds do have some rather unusual physical features, most of which are used in the recovery process. For example, diamonds are heavy and a heavy media separation plant is an effective concentrating mechanism. Likewise, diamonds do not wet and so grease belts are used. Some diamonds fluoresce, which makes it easy for X-ray sorters to be used. On the other hand, the physical qualities could be a handicap, such as their brittleness and unless care is taken, stones can be crushed during the recovery process. The normal parameters such as finer grinding for greater liberation do not necessarily apply. As the value of a diamond goes up geometrically with size, so the destruction of diamonds in the recovery plant can be expensive. It has been said that the Cullinan stone was the largest fragment of four from an original stone—but as it was found in the pit sidewall, the engineers can't be blamed.

Security deserves a special mention. An exact mineral balance or ore reserve reconciliation is not possible, so that plant efficiencies, or theft are not easy to determine. Diamonds from each pipe or each area do, however, have distinguishing characteristics and by monitoring the marketplace one can get a reasonable idea of the number of stones that appear in the markets illegally. There are of course major differences in the security aspects of the primary deposits or pipes where the concentration is very low, and the secondary deposits or alluvial where the concentration in pockets on the bed rock can be very high. In the latter case bedrock security becomes a major issue and most of you will have heard about the development of very large industrial vacuum cleaners to suck up the gravels into secure containers as a means of controlling and containing theft in this area. Of course once the concentration process starts, so the susceptibility to theft increases until the final process of handling and sorting where the potential is high. To prevent this requires an integrated approach involving all disciplines. It is far better in our experience to make sure that the temptation is removed by making access to diamonds very difficult. There is the sensitive issue of personnel X-rays and here we have, in our laboratories, developed a very low dosage machine, well within the ICRP requirements, as a method of prevention and deterrence on our mines. There is also the contentious issue of trapping and we do assist the police from time to time under very specific, controlled circumstances, to trap people engaged in illicit trading of diamonds. The loss of revenue to a country as a result of these activities can be most severe as was the case in Angola in 1992 when the diggers and various syndicates moved in and took over. It would appear that only some US\$ 200m out of possibly as much as US\$ 750m of diamond revenue flowed through the formal channels, the rest was syphoned out of Angola leaving no benefit either to the fiscus or the foreign exchange of the country.

The most unique feature in the diamond business is the marketing. After all, diamonds are a luxury product with no utilitarian value on the gem front. There is a long pipeline from producer through to final consumer of diamond jewellery. This pipeline is very dependent on trust between the participants at each stage and a confidence that the system will continue to operate in a stable way. The individual processes thus requires dexterity, accuracy, artistry, effective retail marketing and promotional flair. The final product has to be set in creative and artistic jewellery. The inelasticity of demand for diamonds is a well known feature and was demonstrated clearly in the collapse of the market in 1888 and 1930 when Cecil Rhodes and Sir Ernest Oppenheimer had to move in with considerable determination and courage to bring the situation under control. Each of these periods was followed by a tightening up of the disciplines required to make the system work. The essential features for the successful operation of the Central Selling Organisation (CSO) were clearly enunciated by Julian Ogilvie Thompson in his latest Chairman's statement :

'First, the principle that all major producers voluntarily subscribe to sales through one channel; secondly, agreement with each producer on a pro-rata share, or quota, of total CSO sales; thirdly, the extensive financial resources of the De Beers/Centenary group; fourthly, the CSO's ability, acquired through long experience, intimate knowledge of the market and its close working contacts with the cutting centres, to maintain a balanced price structure for the more than 5000 categories into which gem diamonds are sorted and valued for sale at the sights; and fifthly, its commitment, on behalf of the whole industry, to promote diamond jewellery through a substantial, worldwide—and widely acclaimed—advertising programme.'

However, no single channel marketing system or producer cartel could fly in the face of a long term market imbalance. It cannot maintain stability if there is a significant excess of supply over an extended period. What it can do and what it does do is play a significant role in promoting, creating and enhancing demand in the long term. The results of this are very clear if one looks at the increase in diamond sales over the past ten years from US\$ 1,6 billion to US\$ 4,3 billion. In the short term, it could, and again does, smooth out the fluctuations between supply and demand and does maintain the balance in the market-place. To do this requires an understanding of the system and the disciplines by the various participants and a preparedness to accept the disciplines required. On De Beers' side it requires a strong balance sheet, a longer term perspective and a close communication with all involved. The CSO is an essential part of this process, whereby its skilled sorters, some 1000 in total, are able to categorise each stone into the more than 5000 categories, whereby their experts are able to judge what the market needs and then to supply the market with its requirements. Procedures are well established to monitor the market to prevent speculative bubbles emerging as they have tended to do from time to time.

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Then the promotional front, which has produced some remarkable results. It was in 1938 that H.F. Oppenheimer first visited the USA to examine the possibility of consumer advertising for diamonds and De Beers advertising campaign commenced in 1939 through N W Ayer, the New York advertising agency. The main medium was the Readers Digest, and in 1948 Francis Geraghty, a copy writer at Ayer, coined the famous slogan 'A diamond is forever'. The rest, as they say, is history, but not quite. Once this focus had been established, then the individual programmes commenced. The most successful of these has been the Rites of Passage, whereby the first diamond gift is made to the teenager in the form of a tennis bracelet, then of course a diamond engagement ring followed by the wedding band which now very much contains a diamond as opposed to the gold band some years ago and, more importantly, after 10 years of marriage a large stone to commemorate this occasion and, after 25 years, an even larger one. Naturally on the occasion of your Diamond Anniversary, you would have to look to Premier to do justice to your wife. The self purchase programme for women has been a great success as well, particularly as women are becoming increasingly involved in business and, hence, wealthy in their own right. The emphasis is to encourage people once having been bitten by the diamond bug to continue to buy these items of beauty. Major new markets have been established such as Japan where, in 1970 only 7 per cent of girls getting engaged wore diamond engagement rings, whereas today it is over 70 per cent. Currently America absorbs roughly one-third of the world's diamond jewellery, Japan a third and the rest of the world the remaining one-third. Each country has to be treated totally separately as there is a different culture of purchase in each part of the world. The promotional programmes are therefore expensive—we currently spend US\$180 million around the world—but certainly they appear to have worked. We are very pleased that during the recent severe recession in the world the retail sales of diamond jewellery has remained firm and with an economic recovery on the horizon we see an improvement or a growth emerging. Furthermore, there are new markets which are clearly waiting to be tapped such as China, India and even Russia. Promotion is generic for diamonds and diamond jewellery and so to the extent that there are producers who do not sell through the Central Selling Organisation, there is an unfair burden on those who do. This is an issue that needs to be addressed.

Finally, it is worth touching on three areas that have been in the press recently.

Firstly, Angola. You will remember there was a major flood of Angolan diamonds onto the market in 1993 from the uncontrolled diggings by garimpeiros in the riverbed systems in the Cuango valley. This, as I have mentioned before, resulted in huge outflows and almost no benefit to the Angolan economy. Unfortunately, the war in Angola continues and the Cuango valley was taken by UNITA some months ago. Those diggers were then removed. Government has retaken the area, and so, to that extent, the situation is now very much under control. Furthermore, Angola has passed a new Diamond Law which contains some very sensible legislation to control the diamond sector. Thus, when peace comes to Angola, there is an excellent chance that the diamond industry there can be rehabilitated in a controlled fashion to flourish in the interests of the country and the world diamond sector.

Then there is Canada. The rush in the North West Territories has been of gigantic proportions, overwhelming even the Californian gold rush and the Klondike. Vast amounts of money have been raised and spent and vast speculation has taken place on the Stock Exchange. Of the three major discoveries so far, only one, i.e. the BHP Diamet discovery, looks as though it may become a mine. The Kennecott DHK pipe has, after a US\$ 15 million bulk sample proved very disappointing. Likewise, the Mill City/Tanqueray pipe has, after mini bulk sampling, also shown a very low diamond content. However, the Slave Craton is a large area and there will no doubt be further discoveries. It is worth remembering the ratios I mentioned before as there seems to be no reason why this should not apply in Canada as they have elsewhere. One feature of Canada which seems unusual is that the pipes appear to be small and certainly do not have the size of pipes elsewhere in the world. However the rush is settling down and a period of consolidation lies ahead.

Finally, Russia. The Russian contract with the CSO expires in 1995. There are considerable problems emerging from this contract and it is quite clear that Russian diamonds are being sold outside of the contractual arrangement. It seems that current production at the Sakha Mines is running well below their peak production in the late 1980's. It also seems that Russia has a large stockpile of diamonds—how large is not clear. It is clear that Russia's hard currency requirements at present are severe. Given all these factors, it is certainly not in the interests of Russia to destabilise the market and they have publicly committed themselves to maintaining stability. I have no doubt that the teams from each side currently meeting will be able to bring this problem to a satisfactory conclusion.

Diamonds will remain in demand, they will continue to provide countries and companies with wealth and consumers with articles of beauty. The single channel marketing system has worked well in the past and there is no reason why it should not provide that stability in the future. ♦