REPORT
on the
RUBY AND SAPPHIRE MINES
of
JEGDALEK, AFGHANISTAN
SEPTEMBER 30, 1992
By
GARY BOWERSOX

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This report is written for Commander Anwar Khan from notes taken by Gary Bowersox on his July 1992 trip to Jegdalek, Afghanistan.

Statements made on this report are only as factual as told to the author by the many people interviewed. Any use including reprints of this report or any portion of it, by those other than directed, and authorized in writing by Commander Anwar Khan or Gary Bowersox is strictly forbidden.
EXECUTIVE SUMMARY

This report outlines in detail what GeoVision believes is necessary to advance mining operations in Jegdalek, Afghanistan. GeoVision desires to continue its work on this project. It further desires permission to purchase gem materials from the mines and to sell imported equipment to them in order to pay for the cost of importing technology and training to Jegdalek.

This GeoVision plan does not require any funding from the citizens or government of Afghanistan.

To increase production, provide jobs for returning refugees and mujahideen, funds for village reconstruction, and prevent health problems and mine accidents, geological mining and equipment studies need to be accomplished. Most important this project will provide village people with exciting and challenging work. They need this badly after fourteen years of hardship and war. This project will be people against the land (their land) versus people against people.

GeoVision is ready to continue this program upon written authorization to proceed from Commander Anwar Khan of Jegdalek.

The first step is to establish a program at a mine managed by Jamal Khan. This mine will be the example and training site for a symposium to be held during July 1993. For this reason it is important that Jamal Khan and Engineer Abdul Hakim visit the United States in February 1993 to review the proposed program and equipment. Their recommendation and criticisms can then be incorporated into the project.

Sincerely yours,
GeoVision, Inc.

Gary W. Bowersox
President

Gary W. Bowersox with miners at Jegdalek Ruby Mines.
INTRODUCTION

During the past three years Commander Anwar Khan, Dr. Bonita Chamberlin Bowersox, Mr. Gary Bowersox, and Engineer Abdul Hakim, have been discussing and planning this project. Due to the war this project was delayed many times until July 1992. However, Gary Bowersox and Abdul Hakim were invited to visit the Jegdalek mines by Commander Anwar Khan. In that war conditions still existed they were escorted by Commander Sher Mohammed from Jegdalek.

The following report is the result of the trip. Inshallah, we can now proceed with the project.

It is believed that the Jegdalek ruby and sapphire mines, with the proper managerial and technical guidance, have the potential of becoming one of the largest producers of quality rubies and sapphires in the world. These mines can provide income, that if invested in education, agriculture, and arts and crafts industries, can measurably expedite the time required for the redevelopment of Afghanistan.

Currently GeoVision is developing a program for a cooperative agreement for further geological studies, and mining and marketing of the Jegdalek rubies and sapphires, as is outlines in this report. Included in this program is education and on-the-job training for the Afghan people.

It is proposed that this be an Afghan operated and managed project from the very beginning. Foreigners will only be involved in advising capacities for a limited time.

Success of this project will be measured by the increase of production, provided revenues, and the employment of a great number of Afghan people to include returning refugees. (See figure 1).
AFGHANISTAN: MINERAL AND GEMSTONE GOALS AND OBJECTIVES

RURAL DEVELOPMENT PROGRAMS

HUMAN RESOURCE DEVELOPMENT

- provide tools for self-sufficiency
- training by strengthening existing facilities and long-term programs
- food-for-work, cash-for-work to purchase needs
- new income to returning refugees and rural poor
- foreign exchange for Afghanistan

EDUCATION

- highly viable and exportable cash crop
- revive, create, improve skills
- integrate refugees rapidly as industry is established
- creation of conditions conducive to repatriation
- provide jobs and new employment opportunities

RECONSTRUCTION

- stimulate regional development
- revenue to government

VOLUNTARY REPATRIATION

Obtain optimum benefit for Afghanistan from present and future development of minerals and gemstones

FIGURE 1
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I. ORGANIZATION

A. ADMINISTRATION

Current Situation: Commander Anwar Khan and Mr. Gary Bowersox have initiated this program.

Future Proposal: That Commander Anwar Khan appoint someone in Kabul to coordinate this project with Engineer Abdul Hakim who is the director for Mr. Gary Bowersox and GeoVision in Kabul.

B. STAFFING OF THE PROJECT

Current Situation:

1. Engineer Abdul Hakim has been hired by GeoVision to coordinate the GeoVision program in Afghanistan.
2. During the tour of Jegdalek Mr. Gary and Hakim met Jamal Khan, manager of Wormankai mine. With Commander Anwar Khan’s approval, he will be selected to attend the symposium in the United States in February 1993 in Tucson, Arizona.

Future Proposal: Upon approval of this project GeoVision will procure the services of the following for the July 1993 symposium:

1. A Geologist
2. A Mining Engineer
3. A Mining Equipment Expert
4. A Training Instructor

Upon completion of the symposium a proposal will be prepared to further train the Jegdalek miners in specific functions and as future trainers.

C. GEOLOGICAL SURVEYS

Current Situation: Gary Bowersox and Abdul Hakim visited the Jegdalek Mine during July 1992. They are now in the process of obtaining information on the geological history of the mines. This report is the result of the first survey.

Future Proposal:

1. That Gary Bowersox and Abdul Hakim continue their research.
Right: Open-pit diggings at Jegdalek ruby mine.

Water supply at Jegdalek mines.
The corundum vein runs perpendicular to the stream on both sides.
Right: Mormankai Mine
Most advanced mining operation seen during July 1992 survey.

Left: Mormankai Mine
This is the mine selected for training during the proposed July 1993 symposium.
2. That a symposium be held in the United States to discuss with a Jegdalek miner in more detail the current mining situation and any geological question missed by the first team.

3. Upon approval of this project GeoVision's team will proceed to:
   A. study the mining problems and techniques currently in use;
   B. review the history of the mine;
   C. determine the best recovery methods;
   D. determine the equipment requirements;
   E. evaluate the value of the production;
   F. evaluate the value of the total deposit;
   G. explore for additional veins in the Jegdalek area.

It is proposed that the symposium experts arrive at the mine site three days prior to the symposium to further study the situation. It is also further proposed that they stay at the mine site three days after the symposium to work with specific miner's problems and study any new developments or ideas proposed at the symposium.

II. MINING OPERATIONS

Current Situation:
1. The government of Afghanistan operated the mines until 1978.
2. The mines are now being operated by the local villagers without proper training or equipment.

Future Proposal:
1. That GeoVision provide training to local people and returning mujahideen and refugees in the Jegdalek area.
2. The above training to include drilling, blasting, and supportive mine development.

This program can improve the mental and physical health of the miners, provide additional employment, increase production, income and profits.

A. BLASTING

Current Situation: Dynamite is now being used at the Jegdalek mines.

Future Proposal: That GeoVision teach new gem blasting techniques. These materials and techniques are less dangerous to the miners health and the breakage and destruction of the gem crystals.
Gas powered road drills are being used to remove hard rock (right).

**B. DRILLING**

**Current Situation:** Road drills are now being used at Jegdalek.

**Future Proposal:**

1. GeoVision introduce drills designed for mining operations which are lighter in weight, last longer and are more effective.
2. GeoVision work out a program to make this equipment available to the Afghan miners.

**C. MINE DEVELOPMENT**

**Current Situation:** There appears to be no formal in-mine program, thus:

1. veins will be lost and time wasted;
2. cave–in will occur. This will not only delay work, but endanger the health and lives of the miners.
3. There are no trained miners.

**Future Proposal:**

1. GeoVision work with individual mine operators to review their current operation and assist with making a formal program.
2. Initiate a program to train future Afghan mine engineers.

**D. PRODUCTION**

Current Situation: Production is low and variable in volume.

Future Proposal:
1. that mujahideen and refugees return to Jegdalek to work the mines;
2. that mine ownership be determined;
3. that GeoVision start training and supplying equipment.

Future Result: This should be at least triple production within one year.

**E. WATER AND GASOLINE SUPPLY**

Current Situation: There is no water or gasoline at the mine sites.

Future Proposal:
1. That this situation be studied as soon as possible. If equipment and supplies are needed, such as pumps and hoses, etc., GeoVision needs to know prior to shipment of equipment.
2. Gasoline may have to be delivered from Kabul to the mine site.

**III. MANPOWER**

Current Situation: There is a shortage of manpower to work the mine due to the war.

Future Proposal: That mujahid and refugees be encouraged to return as soon as security improves which may be within the next few months. It is expected that 5,000 to 10,000 people can be employed within the next year. This does not count supportive jobs and businesses.

**IV. EQUIPMENT**

Current Situation: Equipment currently being used at the mines includes hand tools and road drills. The heavy road drill will have a short life expectancy when used on side walls. They are not made for this purpose and will break or wear out in a short period of time.
Moving overburden with crowbar to get to ruby/sapphire vein.

Hand crushing operation to locate rubies and sapphires.
Future Proposal: That GeoVision work out a proposal with the miners to supply the following mining equipment:

1. compressed air powered mining drills and tungsten carbide drill bits. These will be of lighter weight and designed for mining operations.
2. hauling and hoisting equipment. This equipment will greatly expedite production.

V. SECURITY

Current Situation: Mujahideen forces are now serving as a police force. As production increases and equipment and supplies are delivered theft will become a problem.

Future Proposal: That all mine operations or groups of them meet and hire a security force of people from Jegdalek whom they know. This will provide jobs for some of the returning mujahideen who are well-qualified after the long war. In addition, they have the required weapons and training.

VI. MARKETING

Current Situation: Most production is now being taken to Pakistan where it is sold to Pakistani dealers for resale to other foreigners. In many cases Jegdalek miners are not being paid for periods of up to one year.

Gary Bowersox has been selling rough and cut rubies and sapphires in the United States market for twenty-three (23) years.

Future Proposal: GeoVision would like to start purchasing directly from the mine owners. This should provide the local miners with immediate cash and higher profits.

GeoVision does not ask for any exclusive purchase rights. Miners wishing to maintain current buyers may do so.

GeoVision will explain its marketing and grading procedures during the July 1993 symposium.

VII. FINANCING

Current Situation: The only financing available at this time is from the mine operators.

Future Proposal: GeoVision through its sources would like to develop a program for financing equipment with the mine operators. This is to include exchanges of equipment and supplies for gem materials.
Right: Ruby mineralization in calcite–dolomite marble (small center crystal is garnet).

Left: Ruby Production
This is one of several lots of good–sized crystals mined (largest crystal is 174 carats).
VIII. EDUCATION

Current Situation: There is no training programs at the Jegdalek mines. However, on our survey two miners stated that they had previously worked for several years at the Ministry of Mines.

Future Proposal: That GeoVision develop a training program at no cost to the people of Jegdalek. The first phase of this program will be tested at the July 1993 symposium. From this program, future training programs will be developed. Training methods, schedules and topics must be studied.

IX. NON-MINING PROBLEMS

These problems are not directly related to the mining operation, but can be the difference between success and failure. Therefore, they must be taken seriously and solved along with the mining problems.

A. OWNERSHIP

Current Situation: As a new national government is formed in Kabul and changes in local Jegdalek affairs take place, mine ownership will be questioned.

Future Proposal: That local mine owners prepare to solve this problem when it arises. Discussions amongst local miners with Commander and village elders should begin as soon as possible.

B. TRIBAL AND POLITICAL PROBLEMS

Current Situation:
1. There are several tribes in the Jegdalek area.
2. The problems between these tribes are far from settled.
3. These problems also exist with the current national government.

Future Proposal: That miners meet with local chiefs and commanders to assist in solving this problem in the Jegdalek area.
EMERALDS OF THE PANJSHIR VALLEY, AFGHANISTAN

By Gary Bowersox, Lawrence W. Snee, Eugene E. Foord, and Robert R. Seal II

With the withdrawal of Soviet troops from Afghanistan, villagers in the Panjshir Valley are turning their attention to the emerald riches of the nearby Hindu Kush Mountains. Large, dark green crystals have been found in the hundreds of tunnels and shafts dug there. Teams of miners use explosives and drills to remove the limestone that hosts the emerald-bearing quartz and ankerite veins. The gemological properties of Panjshir emeralds are consistent with those of emeralds from other localities; chemically, they are most similar to emeralds from the Muzo mine in Colombia. "Nodules," previously reported only in tourmaline and morganite, have been found in Panjshir emeralds as well. Approximately $10 million in emeralds were produced in 1990; future prospects are excellent.

ABOUT THE AUTHORS
Mr. Bowersox is president of GeoVision, Inc., Honolulu, Hawaii. Drs. Snee and Foord are research geologists with the United States Geological Survey, Denver, Colorado. Dr. Seal is a post-doctoral fellow with the United States Geological Survey, Reston, Virginia.

Acknowledgments: Because of political conditions in Afghanistan, this article could not have been written without the assistance of: Commander Ahmed Shah Masood, his two brothers Ahmed Zia and Yahya; Jan Mohammed, Atiquallah; Haji Mohammed Jun, Mahbullah; Commanders Abdul Mahmood, Mohammed Arab, Abdul Razig, Ghula Mohammed; Abdul Qamuam, Haji Kerimillah Khan, Haji Dasteqier, Abuahmed, Mudwaz, Fazal Khan, and Abdul Kabir. Special thanks to Dr. Bonita Chamberlin Bowersox.


Although "emeralds" have been reported from this region for literally thousands of years, the Panjshir Valley of Afghanistan has produced commercial amounts of emerald only for the last two decades (figure 1). Because of the Soviet occupation of Afghanistan during much of this time, as well as regional political instability, access by Westerners has been limited. In July and August of 1990, however, the senior author visited the Panjshir Valley, collected specimens, and studied the emerald-mining operation.

He found that, although the conflicts in Afghanistan are far from settled, the Mujahideen ("freedom fighters") have shifted their energies from the Soviet troops they once battled to the harsh mountains that promise great riches (figure 2). As challenging as the Soviets were, the Hindu Kush Mountains are even more formidable. Commander Ahmed Shah Masood, known as the "Lion of Panjshir" (Follet, 1986), now governs more than 5,000 villagers mining emeralds in the Panjshir Valley (Commander Abdul Mahmood, pers. comm., 1990; O'Donnell, 1990). As first reported in Bowersox (1985), large (more than 190 ct) crystals have been found in the Panjshir Valley, in colors comparable to the finest emeralds of the Muzo mine in Colombia.

This article describes the Panjshir emeralds, their mining, geology, gemology, production, and marketing. The impact of emeralds from Afghanistan on the future gem market could be considerable (Ward, 1990), as the authors feel that the production potential of this area is excellent.

HISTORY
Most authorities believe that the only true emeralds known during ancient Greek and Roman times were from Egypt (Sinkankas, 1981). However, in his first-century A.D. Natural History, Pliny mentions "smaragdus" from Bactria (Gall, 1959), an area that includes present-day Iran.
Only for the last two decades have fine emeralds been mined commercially in the many deposits that dot the Panjshir Valley of Afghanistan. These cut Afghan emeralds range from 1.04 to 12.49 ct. 

Figure 1. Smaragdus is a Latin term that was used in ancient times to refer to emerald and many other green stones. It is questionable, though, whether any of the smaragdus from Bactria was emerald.

After Pliny, there is a void in the literature on gems of Afghanistan until approximately 1300 A.D., when the report of Marco Polo’s travels of 1265 A.D. first appeared. Marco Polo mentioned silver mines, ruby, and azure (lapis lazuli) from Badakhshan.

Little is known about mining in the Panjshir (also spelled Punjshier) area from the time of Marco Polo until the 1900s. During the last 100 years, geologists from Great Britain, France, Germany, Italy, Japan, Canada, and the United States have produced many reports [see, e.g., Hayden, 1916; Argand, 1924; Bordet and Boutière, 1968; and Chmyriov and Mirzad, 1972] on the geology of Afghanistan, but virtually nothing had been written on the emerald deposits prior to 1976. In the early 1970s, emerald was discovered at what is now called the Buzmal mine, east of Dest-e-Rewat village in the Panjshir Valley [Bariand and Poullen, 1978]. At about the same time, Soviet geologists began a systematic survey of Afghanistan’s gem sources. Although this resulted in a number of publications [Rossovskiy et al., 1976; Abdullah et al., 1977; Rossovskiy, 1981; Chmyriov et al., 1982], the most detailed reports were not released. Following the death in 1973 of President Daoud, political changes hindered geologic work throughout Afghanistan. Nonetheless, in 1977 the names and locations of emerald mines in Panjshir were listed in a report by the United Nations Development Program [Neilson and Gannon, 1977].
The Hindu Kush Mountains are imposing obstacles to travel into and out of the Panjshir Valley. They are known, however, to carry great mineral wealth, including emeralds. Photo by Gary Bowersox.

(1982) also included a discussion of the Afghan emerald deposits. Information from these reports formed the basis for the senior author's 1985 Gems & Gemology article on the Panjshir deposits (Bowersox, 1985).

LOCATION AND ACCESS
The emerald mines are located at elevations between approximately 7,000 and 14,300 ft. (2,135 and 4,270 m) in mountainous terrain on the eastern side of the Panjshir River (figure 3). A dirt road follows the southwest-flowing Panjshir River for 90 mi. (145 km) and provides limited access to the mines. The road begins in the valley's northernmost village of Parian and extends southwestward through the villages of Dest-e-Rewat, Mikeni, and Khenj; Khenj is 70 mi. (113 km) from Kabul. The northernmost emerald deposit is located near the village of Aryu (also spelled Arew). The eastern extent of the emerald deposits is defined by the crest of the mountains east of the Panjshir Valley. Currently, the total area of known emerald deposits is approximately 150 sq. mi. (400 km²)—double the area known in 1985. To the best of the authors' knowledge, Afghanistan has no producing emerald deposits outside the Panjshir Valley.

Because travel from the USSR, China, and Iran to Afghanistan is restricted, the only reasonable option for foreigners to enter the emerald-mining region of Afghanistan is through northern Pakistan. Border crossing, even with the permission of Pakistani authorities (which is not easy to obtain) and the Afghan commanders, is still extremely difficult and dangerous because of the rugged country, tribal rivalries, and the presence of land mines. Then, after crossing the border, one must travel by foot, mule, and horse (figure 4) for 150 mi. (240 km) through fields of land mines and over several mountain passes (some as high as 14,900 ft.) to reach the Panjshir Valley. The senior author needed six days to travel from the Pakistani
border near Chitral to Panjshir in the summer of 1990.

The villages of Khenj [figure 5] and Mikeni are comparable to boom towns in the western United States during the gold-rush days of the mid-19th century. Although there are many shops with items such as tools for mining, wood for house construction, and food supplies, including familiar soft drinks such as Sprite and Pepsi, there is no electricity; candles or oil lamps provide light. The only communication with the outside world is via military radio, which is controlled by the local commander, Abdul Mahmood, and is used only for emergency and military purposes.

Because the mines are located at high elevations and the villages are several thousand feet below them, the miners live in tents at the mine sites from Saturday afternoon until Thursday afternoon of each week. During their two days off, they return to their villages to be with their families and to obtain supplies for the following week. Food is meager and mostly consists of rice, nan [a wheat bread], beans, and tea.

THE MINES AND MINING TECHNIQUES

The Buzmal mine is the oldest and, because the miners continue to use unsafe methods, the most dangerous mine in Panjshir Valley. This "mine" is actually a collection of literally dozens of pits and tunnels that speckle a mountain 10,000-f...
Mule trains are used to carry supplies into the Panjshir Valley from Pakistan. Not only is the path rough and steep in many places as one goes over the mountains, but fields of land mines also pose a constant threat. Photo by Gary Bowersox.

Emeralds From Afghanistan

approximately 3,000 m) high. Each group of miners randomly picks a location for tunneling in the technique of “gophering,” a term that refers to any small, irregular, unsystematic mine working. Each group tunnels into the limestone with drills and dynamite as far as 30 to 50 yards. The direction may be changed abruptly toward the tunnel of another group that has found emerald. Throughout the Panjshir Valley, the miners do not monitor the amount of explosive used (figure 6) or the timing of the explosions. They tend to use too much explosive, which often destroys the emerald crystals. The senior author experienced considerable uneasiness when, in a matter of minutes, six dynamite blasts from the shaft above shook a tunnel through which he was traveling.

Shafts and tunnels blasted into the limestone are usually approximately 4 ft. (1.2 m) wide and 4 to 5 ft. high, but they may be larger (figure 7). They are oval in shape and lack timber support. With the exception of the Khenj mine, there are no generators or compressors to light the hundreds of tunnels or supply air to the miners. For the most part, passageways are poorly lit by lanterns or oil-burning cans. Miners do not wear hard hats, so head injuries are common.

In addition to the blasting, gas- and diesel-powered hand drills are used, often well inside the tunnels, to work the hard limestone (figure 8). The smoke and carbon monoxide gas have made many miners ill, and caused death for a few. Even the local miners realize that these methods are dangerous; they leave the shafts frequently to breathe fresh air. Because the rocks are riddled with fractures, the potential for cave-ins is also great.

Picks or crowbars may be used on some of the loosened wallrock (figure 9) that does not come completely free with blasting or the drill. All of the broken rock is then carried out of the tunnel by wheelbarrow or simply with a large container. Once in daylight, it is quickly examined, as the miners search for signs of emerald. If no “green” is found, the “waste” rock is simply dumped over the side of the mountain (again, see figure 6). Rocks that do contain emerald are stored by the various members of the team at their campsite until they return to the village.

Figure 4. Mule trains are used to carry supplies into the Panjshir Valley from Pakistan. Not only is the path rough and steep in many places as one goes over the mountains, but fields of land mines also pose a constant threat. Photo by Gary Bowersox.

Figure 5. The village of Khenj bustles with activity these days. Emerald mining is now a primary industry in the region, and shops have sprang up to meet the many needs of mining and the miners. Photo by Gary Bowersox.
During colder months (October through May), snow forces the men either to work mines at lower elevations (where the emeralds found are generally of poorer quality) or sort through the waste rock that was dumped from higher-elevation mines during the normal working season. Plans are being developed for improved processing of the waste material.

There are several mining areas in addition to Buzmal, Khanj, and Mikeni: Sahpetaw, Pghanda, Butak, Abal, Sakhulo, Qalat, Zarakhel, Yakhmaw, Derik, Shoboki, Takatsang, Darun Rewat, Aryu, and Puzughur. They are all similar in both the workings and the character of the terrain; many are at the highest elevations. Work at some, however, is further complicated by the thousands of land mines still left in the area. For example, the mountain top near the Mikeni mine is unworked because it is a known land-mine field.

MINING PARTNERSHIPS
A typical mining team in Panjshir consists of eight miners who do not receive salaries but do share equally the profits from the sale of emeralds they find. Because each team requires blasting and mining equipment, they also normally allot three shares to those who provide mining equipment and three to those who provide blasting materials. Therefore, it is common for the income of a mining team to be divided 14 ways. Mining partners do not have to all be from the same village, but only miners from the local village have a voice at the buly of that village. Buly, in the Dari language (the most common in Afghanistan), refers to a meeting where the value of the recently mined emeralds is established, the stones are auctioned, and taxes are paid.

Disputes continually arise over mining rights and shaft ownership; they are normally settled by village elders. In difficult cases, the elders may transfer the dispute to Commander Mahmood and appointed judges located in Bazarat, the headquarters of the Jamiat-e-Islami party of Panjshir Province. Because there is no formal registration or bureau of conveyances for record keeping—and there have been diverse land ownership policies over the last 20 years—resolution of the claims is often very complicated.

REGIONAL GEOLOGY
Just as demographically Afghanistan is a collection of tribes and diverse peoples, geologically it is a collection of crustal plates. These plates amalga-
Diesel-powered drills are also used to remove the hard wallrock. Because the miners wear virtually no protective gear, injuries from falling or flying rock—as well as illness from the carbon monoxide fumes—are common. Photo by Gary Bowersox.

Panjshir Valley is a major fault zone between two of these crustal plates: the ancestral Asian plate to the northwest and the microcontinental fragment known as Cimmeria to the southeast. Panjshir Valley marks the location of the closure of a major ocean basin known as the Paleotethys.

GEOLOGY OF THE PANJSHIR EMERALD DEPOSITS

The emerald deposits lie southeast of the Panjshir fault zone (again, see figure 3). The geology of this part of the Cimmerian microcontinental fragment is not well known, but the rocks are thought to be an extension of those exposed in the southwestern Pamir Range (DeBon et al., 1987). The rocks of eastern Panjshir include abundant intrusions that were emplaced into a metamorphic basement comprising migmatite, gneiss, schist, marble, and amphibolite of presumed Precambrian age. These older crystalline rocks are overlain by a metasedimentary sequence of schist, quartzite, and marble of probable Paleozoic to Mesozoic age (Kafarskiy et al., 1976). Emeralds have been found only on the eastern side of the valley, even though the western side has been searched extensively. Until the geology of the Panjshir area can be mapped, the detailed nature of this fault zone, and the reason for the absence of emeralds to the west of the valley, will remain unknown.

During his trip to Panjshir, the senior author collected samples of host rock from the three emerald-mining areas of Khenj, Buzmal, and Miken. In general, these samples are from a layered metasedimentary sequence of probable Paleozoic age that was metamorphosed to the upper green-schist facies (figure 10). These metamorphic rocks were reportedly intruded by sills and dikes of gabbro, diorite, and quartz porphyry (Kafarskiy et al., 1976). The metasedimentary rocks are hydrothermally altered and are cut by quartz and ankerite (iron carbonate) veins that carry the emeralds (figure 11); pyrite is present in places. Emeralds are also found in silicified shear zones that contain phlogopite, albite, tourmaline, and pyrite.
as well. Some of the highest-quality material is found in veinlet networks that cut metasomatically altered gabbro and metadolomite.

ORIGIN OF THE PANJSHIR EMERALDS

Emerald, which is generally the result of the substitution of a small amount of chromium for aluminum in the beryl crystal structure (Deer et al., 1986), is the product of unusual geologic conditions. Two of the essential elements contained in emerald, chromium [which produces the color] and beryllium, are geochemically incompatible. Beryllium occurs most commonly in late-stage felsic igneous rocks, such as pegmatites. Chromium is found only in significant abundance in "primitive" rocks such as ultramafic igneous rocks that are characteristic of the ocean floor and mantle; in these rocks, however, beryllium is absent. Thus, special circumstances are necessary to bring chromium and beryllium together to form emerald.

More study of the rocks in the Panjshir Valley is needed before we can confidently draw a conclusion on the origin of the emeralds. However, we speculate that it is highly likely that the Panjshir fault zone is a suture between two crustal plates along which pieces of ultramafic rock, derived from the ocean floor that once existed between the two plates, were trapped. These slivers of ultramafic rock are common along similar structures elsewhere in the world (e.g., the Pakistan emerald deposits), and would be ideal sources of chromium. In addition, the numerous intrusive rocks, including quartz porphyries, of northwest Nuristan would be good sources for the beryllium-bearing hydrothermal fluid, which may have acquired chromium as it passed through chromium-rich rock before it altered the host rock of the emerald-bearing veins. Alternatively, Panjshir emeralds may have been formed during regional metamorphism caused by continental collision in a process similar to that described by Grundmann and Morteani (1989) for "classic schist-host deposits." A detailed discussion of the origin of emeralds, including those of Afghanistan, is presented in Schwarz (1987) and Kazmi and Suce (1989).

PHYSICAL AND CHEMICAL PROPERTIES OF PANJSHIR EMERALDS

Appearance. The emerald crystals from Panjshir vary in quality from mine to mine. As was reported to the senior author in 1985, the miners feel that the best material still comes from the Mikani and Darkhjenj (Valley of Khenj) mines, in the southern end of the mining region.

In general, the crystals are transparent to translucent or opaque. They are commonly color zoned, with very pale interiors and darker green exteriors.

Most of the crystals found to date range from 4 to 5 ct. Crystals over 50 ct continue to be found on a somewhat regular basis (figure 12). Crystals over 100 ct, such as the 190-ct emerald pictured in Bowersox (1985), are considered to be rare.

Morphology. The emeralds occur as cuxhedral, prismatic crystals with the following crystal forms:

Figure 10. Emerald mineralization commonly occurs in the quartz and ankerite veins that traverse the sills and dikes intruded into the host limestone. Photo by Gary Bowersox.

Figure 11. The Panjshir emerald crystals are commonly found in quartz (here, from the Buzmal mine). It is not unusual to find literally hundreds of small crystals in a single block. Photo by Gary Bowersox.
basal pinacoid and {1010} first-order prism (common); {1120} second-order prism (rare). First- and second-order dipyramids were not observed on the crystals examined.

Gemological Properties. Examination of nine crystals ranging up to 10 ct revealed conchoidal fracture, vitreous luster, specific gravity of 2.68–2.74 (determined on whole crystals using a Westphal balance), and indistinct (0001) cleavage.

The samples tested proved to be uniaxial negative, in some cases slightly biaxial (2E approaches 6°) because of internal strain. The refractive indices (determined on crushed crystal fragments) of one light green crystal (S.G. = 2.73) were \( n_e = 1.582 \) and \( n_o = 1.588 \); the R.I.'s of one medium green crystal (S.G. = 2.70) were \( n_e = 1.574 \) and \( n_o = 1.580 \). These values, measured in index oils in sodium light, were representative of the nine crystals tested. All stones were distinctly dichroic: \( n_o = \) pale yellowish green, \( n_e = \) pale bluish green.

The crystals did not react to either long- or short-wave U.V. radiation. They appeared light red to reddish orange under the Chelsea color filter.

Inclusions. Polished sections of Panjshir emeralds were examined under a petrographic microscope and found to contain numerous primary, three-and other multiphase inclusions that are characterized by three distinct morphologies and crystallographic orientations. The three morphologies are chemically similar and define growth zones within the emeralds. The first group, tubular inclusions oriented parallel to the c-axis, range up to 1000 \( \mu m \times 100 \mu m \). The second group, tabular inclusions that formed perpendicular to the c-axis, typically are less than 250 \( \mu m \) in maximum dimension. The final group consists of subhedral, equant inclusions that occur at the intersection of zones defined by the first and second groups. These latter inclusions are typically less than 150 \( \mu m \) in diameter. The multiphase inclusions contain up to eight daughter minerals, an \( H_2O \)-dominated brine, and, in some, \( CO_2 \)–liquid and gas (figure 13). The most abundant solid displays a cubic habit, suggestive of halite [NaCl]. A second isotropic phase of lower refractive index, probably sylvite [KCl], is the next most abundant daughter mineral and forms equant, subhedral grains. Most of these multiphase inclusions also contain up to two additional isotropic daughters and one or two highly birefringent, subhedral to euhedral rhombic phases (carbonates). Noted, too, in some inclusions are minute grains of other unidentified anisotropic solids. The total solids may comprise over 50% of the volume of the multiphase inclusion. Also common are oblique fractures that contain pseudosecondary multiphase inclusions similar to those described above. In addition, several samples contain numerous two-phase [\( H_2O \)-liquid and gas] inclusions of secondary or pseudosecondary origins that are oriented along oblique fractures.
Figure 13. Multiphase fluid inclusions are common in Afghan emeralds. The larger inclusion here contains four isotropic and four anisotropic daughter minerals, brine (L), CO2—liquid (CL) and vapor (V). The inclined cubic habit of the largest isotropic phase is suggestive of halite (lh). The lower refractive index isotropic mineral may be sylvite (ls). The identity of the other isotropic daughters (I) is unknown. The large rhombic daughter is probably a carbonate (Ac). The identity of the three smaller anisotropic minerals (A) is unknown. The CO2 liquid forms a barely visible crescent between the vapor bubble and brine. The smaller inclusion contains two isotropic and two anisotropic daughter minerals in addition to brine and vapor. The length of the large inclusion is 200 μm. Photomicrograph by Robert R. Seal II; magnified 200 x.

John Koivula, of GIA Santa Monica, also examined several rough crystals with a gemological microscope. In these crystals, he observed a number of solid inclusions, particularly limonite, beryl, what appeared to be pyrite, rhombohedra of a carbonate (figure 14), and feldspar [J. Koivula, pers. comm., 1991].

In general, the fluid inclusions and associated daughter minerals of Panjshir emeralds distinguish these stones from Pakistani and Colombian emeralds [Snee et al., 1989]. The fluid inclusions of Pakistani emeralds are much simpler than those of emeralds from Panjshir, containing only brine and CO2 vapor [Seal, 1989]. In addition, the fluid inclusions in Panjshir emeralds have a greater variety of daughter minerals than fluid inclusions in Colombian emeralds, which typically contain only halite, in addition to brine and CO2 liquid and vapor [Roedder, 1963].

Chemical Analysis. The chemical composition of emeralds from Panjshir (table 1) falls within the known range for natural emeralds [Snee et al, 1989]. However, Afghan emeralds seem to be most similar chemically to Colombian (Muzo) emeralds. In contrast, they can be distinguished chemically from Pakistan emeralds by the higher aluminum and lower magnesium content of the Panjshir stones [Hammarstrom, 1989; Snee et al., 1989].

Surface Etching and 'Nodules' in Panjshir Emeralds. The surface texture of rough Panjshir emeralds ranges from smooth and lustrous to rough and dull (figure 15). The latter results from a natural chemical etching process. In addition, some Panjshir emeralds contain "nodules" (round, marble-shaped bodies) within the larger crystals (figure 16).

Etched surfaces are commonly found on pegmatite gem minerals [e.g., morganite, tourmaline, kunzite, topaz, etc.]. Nodules are characteristic of
<table>
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<th>Analysis 3</th>
<th>Analysis 4</th>
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*Analyses 1, 2, and 3 are microprobe data from Hammarstrom (1989). Analysis 4 is an average of instrumental neutron activation analysis and induction—coupled argon plasma—atomic emission spectrometry data from Snee et al. (1989). na = not analyzed for.

* Theoretical amount of BeO computed for analyses 1, 2, and 3 assuming 3.00 Be cations per formula unit, since Al and Si can substitute in the Be site in the beryl structure; this assumption may not be valid. BeO for analysis 4 was directly determined.

*Weight loss was determined by heating one half of the emerald crystal from room temperature to 1400°C in a thermogravimetric analyzer and measuring the weight difference; the other half of the crystal was used for the microprobe analysis.

Some gem-quality crystals of tourmaline (elbaite) found in "pockets" in granitic pegmatites (e.g., Sinekaks, 1955) and have been described in zoned aquamarine-morganite crystals (Kampf and Francis, 1989). Like the nodules in these pegmatitic gem materials, the rounded bodies in Panjshir emeralds are typically cleaner than nonnodular emeralds from this locality. In the case of pegmatites, the origins of both the solution (fluid) that caused the etching and the nodules have been extensively studied (e.g., Foord et al., 1986, and references cited therein). The etching of pegmatite minerals may occur because of chemical instability during late-stage pocket evolution. Feldspar, tourmaline, beryl, and other minerals become unstable because of changing fluid conditions, resulting in partial or complete dissolution. The phenomenon of "pocket-rupture" is believed to produce the nodules in pegmatite gem crystals. Compositional differences between growth zones generate differential internal stresses within the gem crystal. The exterior "skin" on the crystal grew after pocket-rupture and is the binding agent that holds the "fractured" crystal together.

Although the conditions of formation for the Panjshir emeralds are undoubtedly substantially different from those of pegmatite pockets, we believe that a somewhat analogous situation caused the etched crystal surfaces and the nodules. Fluid inclusion, chemical, and isotopic evidence on emeralds from other localities (e.g., Muzo, Chivor, Pakistan, Zimbabwe) indicate that emeralds may have formed during two or more distinct periods of crystal growth (Kazmi and Snee, 1989). The fluid from which the initial growth of emerald took place at Panjshir contained less chromium and was of moderate salinity. With continued crystallization, the chromium content of the fluid grew after pocket-rupture and is the binding agent that holds the "fractured" crystal together.

Figure 15. Panjshir emerald crystals, like this 43.47-ct crystal from the Khenj mine, are often etched. Photo by Robert Weldon.
Figure 16. This 36-ct rough emerald from Panjshir contained a large nodule from which several stones, including a particularly fine one at 8.79 ct, were cut. The nodular material is usually much cleaner than the average crystal. Photo by Gary Bowersox.

increased, as is evidenced by the darker green rims or exterior parts of the emerald crystals. Although not yet observed in Panjshir emeralds, reversals of this zoning pattern [i.e., Cr-richer cores and Cr-poorer rims] are known in emeralds from other localities. A later and distinctly separate fluid from which other minerals (e.g., quartz and/or calcite but not emerald) grew, had a lower salinity and was formed at different temperatures. It is likely that the etching of the emeralds occurred either during the hiatus between the two periods of emerald growth or when the second fluid was introduced.

The origin of the emerald nodules is more difficult to explain. However, we do know that the distinct and sharp compositional zonation with respect to chromium, magnesium, sodium, and iron contents in emerald generates differential stresses within the crystals just as pocket-rupture does in the case of pegmatite minerals. We are not aware of nodules in emeralds from other localities, but they should exist.

MARKETING AND ENHANCEMENT
In general, Panjshir emeralds are mined and marketed in what is basically a free-enterprise system. No government control is exerted except that all emeralds must be brought to one of the three villages nearest the discovery site: Khenj, Mikeni, or Dest-e-Rewat. Each village has a scheduled meeting, or boly, of emerald miners and businessmen on Monday and Thursday of each week. During this meeting, chaired by the local commander, the production is evaluated and a tax of

15% of the value is collected. This tax is paid to the Jamiat-e-Islami party to be used for reconstruction of the war-devastated area. After the tax is paid, the emeralds can be retained by the miners or sold via auction to any interested parties in the village. The emeralds are then normally transported to Pakistan for further distribution into the world market, or they may be sold through a newly organized Panjshir emerald syndicate. Afghan emeralds are now being set in jewelry worldwide (figure 17).

A common practice in Pakistan (as elsewhere) is to heat emeralds in one of several oils with a refractive index similar to emerald to reduce the visibility of inclusions. Emeralds that have been treated recently will usually leave oil spots on the parcel paper. Oiling can also be detected with magnification and, in some cases, by a chalky yellowish green fluorescence to long-wave ultraviolet radiation evident in the fractures (see, e.g., Kammérbring et al., 1990). Recently, GIA's John Koivula, discovered a dyed crystal in a parcel of Panjshir emeralds purchased by the senior author in Pakistan; this is the first discovery of an Afghan stone treated with dye. Cut stones—usually fashioned in Pakistan or Bangkok—are also available in Pakistan. One must be careful, however, because
several synthetic emeralds have been detected mixed with natural emeralds in sale lots of cut stones.

Cutting
The Panjshir crystals, many of which are large, commonly show complex primary growth and fracture patterns that include outer layers or skins, color variations, complex zoning patterns, and/or etched surfaces. Normally the best color is located near the outer surface of the crystal—a characteristic common to many emeralds. Some parts of the crystals are too dark (overcolored); this is particularly common in emerald crystals from the Khenj mine. In contrast, emerald crystals from the northernmost mining areas (Buzmal, Darun, Darik, and Aryu) tend to be lighter. When faceting lighter-colored emeralds, the cutter must carefully control pavilion angles to limit the amount of light that escapes; this method darkens the color of the cut emerald. In addition, a proper orientation of the table must be maintained to prevent an overemphasis of blue or yellow tones. Panjshir emeralds polish comparably to emeralds from Colombia.

Production
No formal records of emerald production for Panjshir exist; however, from tax reports, Commander Masood estimates that approximately US$8 million of rough emerald was produced in 1990 (Tony Davis, pers. comm., 1990). Prior to this report, the senior author had independently derived a figure for 1990 production of $10 to $12 million from discussions with miners and dealers at the 1990 symposium on Afghan gems and minerals held at Chitral, Pakistan, and from sale lots of emeralds seen in Afghanistan and Pakistan [see, e.g., figures 12 and 18]. This compares with an estimated production of only $2 million for 1989. With additional miners, improved training and equipment, and development of known mines, production should increase even more dramatically in the future.

Although, as with all gem materials, prices for the Panjshir emeralds vary depending on the quality of the individual stone, an 8.79-ct stone cut from the nodular 36-ct crystal shown in figure 16 was sold by the late Eli Livian in 1987 for US$165,000 ($19,000 per carat; figure 19). The largest fine stone cut to date is approximately 15 ct.

Summary
Emerald mining in the Panjshir Valley of Afghanistan is thriving. The best emeralds from Panjshir compete with emeralds from any other source today. Like deposits from some other areas, the Afghan emeralds apparently formed in a continental suture zone. The gemological properties of Panjshir emeralds are consistent with those from other localities. Chemically, Panjshir emeralds are similar to those from Muzo, Colombia. However, this same chemistry, together with their distinc-
tive inclusions, distinguishes them from emeralds from the relatively close Pakistani deposits. The nodules that have been found in some Punjshir emeralds are uncommon in emeralds in general. Punjshir emeralds are now available world-wide. Some crystals are extremely large, and production of rough in 1990 was valued at approximately $10 million. As postwar conditions improve, production should increase. Future prospects appear to be excellent.

REFERENCES


A STATUS REPORT ON GEMSTONES FROM AFGHANISTAN

By Gary W. Bowersox

Although Afghanistan has historically been well known for its lapis lazuli deposits, significant amounts of fine emerald, tourmaline, kunzite, and some rubies are now emerging from that embattled nation. Emeralds come primarily from the Panjshir Valley, northeast of Kabul. Large amounts of green, blue, and pink tourmaline, as well as considerable quantities of kunzite and some aquamarine, have been taken from the pegmatites of the Nuristan region, east of Panjshir. Smaller quantities of fine ruby have been found in the Sorobi region, between Jalalabad and Kabul. The occurrence, mining, and distribution of these gem materials are summarized, as are their gemological properties. Lesser amounts of garnet, amethyst, spinel, and morganite have also been located. The prospects for future production of emeralds and pegmatite gems, in particular, are excellent.

ABOUT THE AUTHOR
Mr. Bowersox is president of Gem Industries, Inc., in Honolulu, Hawaii; he has been buying and cutting Afghan gem materials for over 12 years. Acknowledgments: The author particularly wishes to thank the following people for providing information used in this article: Aisha Rind, Badshah, Maula Mohammad Bieg, Haji Gulam Haider, Haji Mohamuddin, Fazal Uddin, and V. Prokofiev. Dr. James Shigley and John Koivula, of the GIA Research Department, contributed information to the sections on geology and gemological properties. ©1986 Gemological Institute of America

A

lthough the political situation in Afghanistan continues to be very unstable, Afghan miners remove many thousands of carats of fine gems each year from that country. In addition to the historically famous deposits of lapis lazuli, significant quantities of emerald, tourmaline, and kunzite, among other gem materials, have emerged from the Hindu Kush region of Afghanistan within the last few years. Small amounts of fine ruby are also being mined. Most of these gem materials are of very high quality (figure 1). While much has been written about the lapis lazuli from Sar-e-Sang (e.g., Wyart et al., 1981), relatively little has been published about these other gems. To help fill some of the gaps in our knowledge of this area, this article presents a current status report on several Afghan gem materials—emerald, tourmaline, kunzite, and ruby—including the locations of the mines, mining methods, gemological properties, and some production figures.

THE HINDU KUSH GEM-PRODUCING AREAS

The mines that have recently produced gem material are for the most part in the northeastern portion of the country, north and east of Kabul, the capital of Afghanistan (figure 2). Emeralds have been found primarily in the Panjshir Valley.* Pegmatite gems—tourmaline, kunzite, and aquamarine—have been found in the Nuristan region, crossing the provinces of Laghman and Konar. Rubies have been found in the southern portion of the Sorobi district, in Kabul Province.

The topography of the region is dominated by the towering Hindu Kush mountain range (figure 3). These mountains form the western end of the Himalayas, which stretch eastward across northern Pakistan and India. The Hindu Kush range is one of the most rugged areas of the world, with mountains reaching up to 6,000 m (19,500 ft.) separated by narrow, steep river valleys. The road network
is limited, and many areas in this part of Afghanistan are inaccessible except by foot. This, combined with a climate that ranges from extremely cold winters to hot, dry summers, contributes to the inhospitability of the region.

Despite their remoteness, both the Hindu Kush range and the adjacent Karakoram range in neighboring Pakistan have been the sites of spectacular finds of gemstones during the last 15 years.

In addition to earlier descriptions of Panjshir emeralds [Neilson and Gannon, 1977] and pegmatite gemstones from Nuristan [Bariand and Poul len, 1978], important discoveries of tourmaline, beryl, corundum, and other gemstones have been made in Pakistan in the Gilgit area [Kazni et al., 1985], in the Swat and Hunza valleys northeast of Peshawar [Gübelin, 1982], and in Kashmir [Atkinson and Kothavala, 1983]. These areas of Afghanistan and Pakistan are located in one of the most geologically dynamic regions of the world—at the juncture along which the Indo-Pakistan and Asian crustal plates collided to give rise to the Himalayas. The geology of this region is quite complex, and it has been investigated in detail only recently [for further information, see Weipert et al., 1970; Lapparent, 1972; Fuchs et al., 1974; and Wolfart and Wittekindt, 1980]. These
investigations indicate that the Hindu Kush area represents the western end of a succession of important gem-producing regions that stretch all along the Himalayas through Afghanistan, Pakistan, India, Nepal, and into Burma. Rossovskiy and Konovalenko (1976) have suggested that these separate regions are in fact part of a much larger "South Asian" gem pegmatite belt whose formation can be linked to the sequence of orogenic events that resulted in the formation of the Himalaya range.

Although gem beryl was found during the archeological excavation of an ancient Greek city in northwestern Badakhshan, organized mining of beryl, tourmaline, kunzite, and ruby in Afghanistan dates only from the early 1970s (Dunn, 1974; Bariand and Poullen, 1978). Ostensibly the mines are under government jurisdiction, but most active mining and selling is done by independent miners, usually local tribesmen. Because of the volatility of the current political situation in Afghanistan, the gem-mining areas around Kabul and Jalalabad are virtually inaccessible to foreign gem buyers. Once mined, the uncut crystals of
Fjgllrc 3. Thl' (nnnid<ll'/c Hindu Kush mmrntains prnvide a harsh environment for gem mining, and many remote gem localitics are inaccessible except by many miles of travel by foot. The Hindu Kush range fomts the western end of the Himalayas and stretches from central Afghanistan to the northern tip of Pakistan. The severe climate in these mountain regions further restricts gem mining. Photo © Mike Zens.

Emerald, tourmaline, spodumene, etc., are smuggled across the border into Pakistan, primarily into tribal Agency areas such as Bajaur (surrounding Peshawar), where most of the trade in Afghan gems is conducted. To enter Afghanistan, or even to travel along the frontier Agency areas of northern Pakistan, one must have special permission from both the government and the local tribal leaders. Such passes are nearly impossible to obtain, and even then there is no guarantee of safety.

This report describes some of the gem materials currently originating in Afghanistan. It is based largely on the author's many years of experience dealing with Afghan gemstones, his previous travels within the country to purchase gemstones, and his recent (September 1985) discussions in Pakistan with several prominent Afghan miners.

THE PANJSHIR EMERALDS

Several thousand carats of fine-quality emeralds, some of which are very similar in color and quality to those from the famous Muzo mine of Colombia, have emerged from Afghanistan in recent years (figure 4). The emerald-mining area of the Panjshir Valley is located approximately 110 (air) km (70 mi.) northeast of Kabul (again, see figure 2). The Panjshir River, a tributary of the Kabul River, bisects a portion of the Hindu Kush mountain range. The emerald-mining district lies along the southern slopes of the Hindu Kush, south of the Panjshir


Access, Geology, and Mining. Although travel in this area is extremely dangerous at the present time, access to Panjshir from Kabul is fairly straightforward. Travel north by field vehicle 58 km to Charikar. From Charikar, travel 14 km north to Jable-os-Seraj, then 35 km northeast along the north side of the Panjshir River to Rokha, then another 29 km to Senya, and—for the last 19 km—by a poor dirt road to where it ends at the village of Buzmal (Neilson and Gannon, 1977). The Panjshir Valley is densely populated. The emeralds occur at an elevation of 3,000–4,000 m, requiring that the miners walk several hours up the rough slopes (30°–40° angle) as there are no horse or mule trails.

The Panjshir emerald locality has been actively mined only during the last 10 years, with the greatest activity since the early 1980s, although the deposit reportedly was found by Russian geologists in 1970 (Bariand and Poullen, 1978). Within this district, the emeralds occur along small replacement or fracture-filling veins. According to Neilson and Gannon (1977), the veins cut through host rocks consisting of metamorphosed limestones, calcareous slates, phyllites, and micaceous schists of Silurian-Devonian age (400 million years). The veins themselves consist mainly of quartz and albite, and are apparently related in origin to a local igneous intrusive rock described as a quartz-feldspar porphyry. When followed in an exposure, these veins vary in thickness up to 15 cm. Emerald mineralization along and within the veins is distributed sporadically, but is often associated with pyrite, which the miners use as an indication of the emerald. The emerald is believed to be of hydrothermal origin, and apparently resulted from a chemical reaction between solutions traveling along the veins and the enclosing host rocks. According to Mr. Haji Mohamuddin, one of the discoverers of the Buzmal mine, approximately 1,000 workers are mining emeralds throughout the valley; 100 men regularly work Buzmal.

Dynamite is used first to identify where in the host rock the emerald crystals are most likely to be found. The bombings that frequently occur in this area occasionally perform the same function. Using picks and shovels, the miners dig in pits as shallow as one meter and as deep as several meters to extract the individual crystals or specimens. In spite of the extreme weather conditions, the mines are worked virtually all year, the political situation permitting.

This parcel of 87 Afghan emeralds weighs a total of 140.9 ct and displays the range of colors found in the Panjshir material. Stones courtesy of Gem Industries, Inc. Photo by G. W. Bowersox.
Description of the Material. In general, the Panjshir emeralds are a rich dark green (figure 5). The finest stones are similar in color to the fine emeralds found at the Muzo mine in Colombia. The local miners claim that the Panjshir emeralds of the best color and quality come from the Mikeni and Darkhenj mines.

Gem-quality crystals over 10 ct are common. In fact, a lot of 10 crystals weighing a total of 374.5 ct was recently recovered from the Buzmal mine. The largest of these crystals weighed 190.5 ct (figure 6). Overall, the Panjshir material is larger and cleaner than emeralds found in the Swat [see Gübelin, 1982] and Gilgit regions of Pakistan.

Gemological Properties. A study of the few crystals and cut stones made available for this purpose showed the physical and optical properties to be quite normal for emerald: refractive indices, 1.578 and 1.585 (±0.005), S.G., 2.71 (±0.02); inert to ultraviolet radiation; and a typical spectrum with sharp lines at 682, 679, 660, 646, 635, 612, 477, and 472 nm, and a broad absorption band between 560 and 600 nm. When the crystals were viewed with the microscope, two- and three-phase inclusions, growth zones, and fracturing were visible. It is interesting to note that the refractive indices and specific gravity of this material are somewhat lower than those for emeralds from the nearby Swat Valley in Pakistan [Gübelin, 1982].

Distribution and Production. Most of the Panjshir emeralds are transported year round in rough form to refugee camps in northern Pakistan. The trip takes approximately 20 days; all travel is by foot. The border area is particularly dangerous because explosive devices have been scattered throughout. From these camps the stones are purchased by Pakistan buyers from Karachi or by the very few Western buyers who travel to the area.

During the three weeks the author was on the Afghanistan border in September 1985, he viewed
approximately 4,000 carats of cuttable gem-quality emeralds from Panjshir. According to the miners with whom he spoke, production of emerald continues on a regular basis despite the war, and prospects for the future seem excellent in terms of the emerald resources available.

Emeralds have also been reported from Budel, in Nagarhar Province, south of Jalalabad (Afzali, 1981). The crystals appear to be relatively small (1–2 cm maximum); little else has been published on this locality.

TOURMALINE AND SPODUMENE FROM THE NURISTAN REGION

Literally hundreds of thousands of carats of good, gem-quality tourmaline and fine kunzite have emerged from the Kolum district of the Nuristan region northeast of Kabul since active mining began there in the early 1970s. This area is also known for its production of fine aquamarine (Bariand and Poullen, 1978; Sinkankas, 1981); however, because the author has had little experience with this material, and has not seen much recently, it is not covered in detail here.

The tourmalines and kunzites are found in pockets within the pegmatites that dot the Nuristan region (figure 2). The most active mines currently are Mawi and Suraj. In addition, Nilaw and Korgal have historically been important (Bariand and Poullen, 1978; Rossovskiy et al., 1976; Rossovskiy et al., 1978; Rossovskiy, 1981). A number of separate pegmatite localities are known, but the most important gem producers seem to be those north of the village of Nuristan at Nilaw, Suraj, Mawi, and Korgal.

The pegmatites vary greatly in size and shape—in veins or lenses up to 40 m thick and up to several kilometers long. The pegmatites range from simple unzoned bodies to those that have complex internal zonation, but the latter group appear to be the more important gem sources. Major minerals include quartz, albite, microcline, schorl tourmaline, muscovite, and lepidolite, along with various minor phases. Crystals of gem tourmaline, spodumene, and beryl occur in cavities up to 50 cm across that are distributed along the central portion of the pegmatite. These crystals are quite remarkable in terms of their size, crystal perfection, and diversity of color. For example, Rossovskiy (1981) describes tabular, gemmy crystals of spodumene up to 45 cm long and “pencil” crystals of gem tourmaline up to 20 cm, both in a wide variety of colors.

For the most part, the crystals are found in soft, powdered clay that fills pockets within quartz-rich zones in the pegmatite. While the kunzite and tourmaline crystals usually occur in close proximity (within a few meters) of each other, only occasionally are the two gem minerals found in the same pocket. Because both are, for the most part, found in situ in the primary pegmatite, the crystals are usually well formed and complete.

Approximately 500 miners work the Nuristan region on a daily basis. To penetrate the hard pegmatite, they commonly use large drills. The gem-bearing areas of the pegmatite are usually encountered between 11 and 20 m below the surface. When they reach a pegmatite pocket, the miners remove the gem crystals by hand, using only a few small tools to scrape away the encasing clay. As with the emerald mines in Panjshir, the Nuristan miners usually work year round, in spite of the severe weather conditions that commonly plague the area.

Description of the Material and Gemological Properties. Tourmaline. Gem tourmaline from Nuristan occurs in an astonishing array of colors—various shades of pink (figure 7), green (figure 8), blue (see figure 1), and multicolored.
Paranj and Postillen [1978] describe the intense shades of blue and green tourmaline as the most valued. The cuttable crystals, which range up to 15 cm in length and 4 cm in width, also represent magnificent mineral specimens in themselves. For the most part, these crystals are well formed, often clean and free of inclusions and fractures, and, at the time they are purchased for cutting, are free of matrix. Color zoning perpendicular to the length of the crystal varies from sharp color transitions to a smooth grading of one color into another. Most of the crystals examined in this study were not color zoned.

Some data have been published on the Nuristan tourmalines. Leekebusch [1978] reported chemical compositions of these tourmalines, which are elbaites, and related the color zoning in individual crystals to variations in chemistry. Dunn [1974] examined a range of tourmalines from this area, in particular the colorless crystals, or achroites. For pale to deeply colored crystals, he reported refractive indices of 1.617 and 1.639 (+0.003) with no particular correlation of these values with color. For the achroites, the indices were 1.615 and 1.633. The specific gravity ranged from 3.02 to 3.07.

Examination of a parcel of green, blue green, and blue tourmalines revealed refractive indices of 1.619 and 1.639 and specific gravity values of 3.01-3.09. The crystals displayed grayish blue to greenish blue pleochroism. They were inert to

Figure 7. This 200 ct carved tabellite exemplifies some of the finest tourmaline produced by the Nuristan region. The pendant was carved by Hung Wa Lee. Photo © Harold o'Erica Van Pelt.

Figure 8. The intense green of this 12.25 ct cut tourmaline and accompanying 13 x 19 mm gem quality crystal is one of the exceptional colors typical of the best Afghan material. These specimens are also representative of the high clarity frequently encountered in Nuristan tourmalines. Stones courtesy of Afghan Gems, San Francisco, CA. Photo © Harold o'Erica Van Pelt.
The Nuristan region also produces some of the finest kunzite crystals ever found, as can be seen from the 1243.7-gram crystal depicted here with a 45.07-ct pear-shaped gem cut from similar rough. The crystal displays its most intense color as viewed here along the c-axis. Stones courtesy of Gem Industries, Inc. Photo © Harold V and Erica Van Pelt.

Spodumene. The spodumene crystals from the Nuristan region are among the finest examples of this mineral ever found (figure 9). Many details on the pegmatitic deposits of spodumene are given in Rossovskiy et al. (1978) and Bariand and Poullen (1978). The transparent, gem-quality spodumene crystals from Nuristan come in a wide range of colors—purple and pink (figure 10), as well as blue, green, and yellow. Some of these crystals are up to one meter in length. In general, they are well formed, with large, flat crystal faces, relatively sharp edges, a tabular shape, and are often twinned. As with tourmaline, the spodumene crystals are free of any attached minerals at the time they are sold to gem buyers. As is typical of spodumene, which is pleochroic, the crystals from this area display different hues when viewed in different orientations, with the strongest color for light passing parallel to the long direction (c-axis) of the crystal. Dunn (1974) describes some of the crystals as color zoned, but the crystals examined for this paper were more or less of uniform color.

From the study of a parcel of light pink spodumene crystal fragments and several additional faceted stones, refractive indices of 1.659 and 1.677 (±0.003) and specific-gravity values of approximately 3.20 (±0.02) were found. These fragments were pleochroic from brownish pink to pink. No features were visible in the hand spectro­scope. When exposed to long-wave ultraviolet radiation, the fragments displayed a strong orangy long- and short-wave ultraviolet radiation, except for some of the color-zoned crystals that were weakly fluorescent with a chalky bluish color under short-wave at the pale end of the crystal. Two-phase inclusions, fractures, and color zoning were visible with the microscope. In the hand spectro­scope, bands at 495, 490 and 440 nm were present in the blue crystals, with an additional band at 540 nm present when the stone being exam­ined was oriented perpendicular to the c-axis. The spectra displayed total absorption above 598 nm. The most distinctive feature of these tourma­lines is their attractive blue to green color.

Figure 9. The Nuristan region also produces some of the finest kunzite crystals ever found, as can be seen from the 1243.7-gram crystal depicted here with a 45.07-ct pear-shaped gem cut from similar rough. The crystal displays its most intense color as viewed here along the c-axis. Stones courtesy of Gem Industries, Inc. Photo © Harold V and Erica Van Pelt.

Figure 10. These three marquise-cut kunzites exhibit the variety of natural hues that are found in the Nuristan material. Counterclockwise from the top, these gems weigh 290.87, 58.52, and 40.88 ct, respectively. The stones are courtesy of Meredith Mills, Casper, WY. Photo © Harold V and Erica Van Pelt.
pink fluorescence. When exposed to short-wave ultraviolet radiation, they exhibited a strong bluish pink fluorescence with a red phosphorescence that lasted for about one minute. When viewed with the microscope, the spodumene fragments revealed three-phase inclusions, growth tubes, and cleavages, and displayed twinning. In general, these properties are identical to those reported for Afghanistan spodumene by Dunn (1974) and Rossoyskiy (1981).

Most spodumene exhibits the property of tenebrescence, which involves a reversible darkening and lightening of its color with changes in conditions (Claffy, 1953). Pure spodumene is colorless; the various colors (pink, purple, green, yellow) are due to the presence of trace elements such as manganese and iron. Manganese substitutes for silicon, and iron for aluminum, in the spodumene crystal structure. According to Hassan and Fahib (1978) and Nassau (1983), a darkening of the color of spodumene to pink or purple (kunzite) can be brought about by exposure to a source of high-energy radiation (gamma or X-rays) that removes an electron from the manganese and changes its oxidation state from $2^+\rightarrow 3^+$. Further irradiation produces a coupled oxidation-reduction reaction involving both iron and manganese to turn the pink spodumene green.

$$\text{Mn}^{2+} + \text{Fe}^{3+} \xrightarrow{\text{radiation}} \text{Mn}^{4+} + \text{Fe}^{2+}$$

These radiation-induced color changes are thermally unstable, and the color-change sequence described above can be reversed by exposure to daylight, ultraviolet radiation, or moderate heat of a few hundred degrees Celsius. The exact color-decoloration behavior of spodumene, and the relative persistence of radiation-induced colors, will vary depending on the nature of the trace elements and the crystallographic structure of the spodumene of the stones in question. Because it is colored by chromium, which in spodumene is not susceptible to oxidation or reduction, hiddenite does not exhibit changes in coloration under similar conditions.

When mined, spodumene emerges from the ground with a blue-violet or green color. This suggests that the crystals have been exposed to some natural source of radiation that produced these colors by the mechanism described above. According to the miners, leaving the crystals in the sun for several days, often after having boiled them in water, is sufficient to turn the material to an attractive purple or pink color. Fade tests were conducted to document the thermal stability of the purple kunzite, and determined that heating crystal fragments to temperatures of $400^\circ\text{C}$ for six hours was adequate to entirely bleach the pink color. Exposure of several pieces from a single pink crystal to direct sunlight produced fading to virtually colorless within several days (less than a week). As described above, the pink color can be restored by re-irradiation.

Distribution and Production. The mined crystals of tourmaline and spodumene are carried on the backs of the miners, who usually travel by foot approximately 560–640 km (350–400 mi.) over rough mountain terrain and through a border area dotted with land mines to reach Pakistan. The author purchased most of his material from miners whose primary trading area is the Bajaur Agency.

The Nuristan region has produced hundreds of thousands of carats of gem-quality tourmaline since 1980. The author estimates that approximately 2,000 kg of fine kunzite are being mined each year.

JEGDALEK RUBY

Although very little mining is being conducted at the current time because the area is so volatile politically, a number of fine rubies have been mined from the southern portion of the Sorobi district (again, see figure 2). Local miners refer to the main deposit as the Jegdalek mine. Although little research has been done on the geology of the ruby-producing area and the occurrence of the rubies, it is known that they are usually found in silt in marble cut by granitic intrusions of Oligocene age (Afzali, 1981). The crystals range in color from a light purple-red to a deep "pigeon's blood" red (figure 11). The best-quality stones are similar to those found at Mogok, in Burma. The author has seen fair-quality faceted stones as large as 10 ct, although top-quality rubies from this area rarely exceed 5 ct.

While current supplies appear to be small—the author saw fewer than 100 ct of gem-quality material during his most recent visit—communications from the miners indicate that the reserves are significant. Larger amounts of this material will most likely be available once the political situation in the area stabilizes.

Gemological Properties. Examination of a small number of cut stones and crystal fragments of ruby
produced the following properties of a typical stone: refractive indices, 1.762 and 1.770; specific gravity, approximately 4.00; moderate to strong fluorescence to long- and short-wave ultraviolet radiation; and purplish red to orangy-red pleochroism. In the hand spectroscope, absorption bands were visible at 469, 473, 660, 668, 693, and 694 nm, and a broad band from 520 to 560 nm. Under the microscope, fractures, small unidentified crystals, and needles thought to be boehmite were generally abundant. Some twinning was also noted. The most interesting feature was a strong blue color zoning present in some of the rubies (figure 12).

OTHER GEM MATERIALS FROM AFGHANISTAN

Much has been written about lapis lazuli from Afghanistan (e.g., Wyart et al., 1981). In recent years, however, the production and supply of lapis from Badakhshan has been greater than ever before, and many examples of superb material can be seen in gem markets worldwide (figure 13). In 1981, reserves of 1,300 tons were estimated (Afzali, 1981).

A single deposit of garnets has been found at Pachighram, in Nangarhar Province. Well-formed crystals of dark red almandine occur in Proterozoic schists. The garnet-bearing schists cover an area approximately 160–240 km wide and 800–1,100 km long (Afzali, 1981). However, the author has not seen any Afghan garnet for sale in the Pakistan trading centers during the last three years.

Small quantities of aquamarine are currently being mined in the area of Gur Salak, in Konar Province. The rough material occurs in pegmatites as well-formed crystals up to 2 cm thick and 7.5 cm long (1 × 3 in.). The crystals range in color from light blue to dark blue as well as various intensities of blue-green (figure 14).

The author observed a few morganite crystals during his most recent trip. These crystals, which ranged in color from pink to brownish pink to peach, were reported by Afghan miners to come from the mine at Mawi, in the Nuristan region. Spinel has historically been reported from Badakhshan, northeast of the lapis mines (Scalisi and Cook, 1983), but little spinel has been seen in recent years. A 1970s edition of Afghan Development in Brief, published by the Afghan government, reported that amethyst had been found in both Badakhshan and Kandar. The author has not, however, seen any of this material in the local gemstone market.

CONCLUSION

Significant quantities of a variety of high-quality gem materials are now emerging from northeastern Afghanistan. More material than ever before

Figure 12. Unusual zones of strong blue color can be observed in some rubies from the legdalek mine. Dark-field illumination. Magnified 35×. Photo by John Koivula.
Figure 13. The fine lapis lazuli currently coming from Afghanistan is well represented by the 16-mm-wide-cuff bracelet and 17-mm bead necklace with carved lapis and diamond pendant-clasp (35-mm diameter) illustrated here. Photo © Harold & Erica Van Pelt.

Figure 14. This 5.7-cm-high crystal cluster, accompanied by a 7.58-ct faceted stone, is representative of the fine aquamarine that is also being mined in the Nushistan region of Afghanistan. Specimen courtesy of William Larson, Palo, CA; cut stone courtesy of the Los Angeles County Museum of Natural History. Photo © Harold & Erica Van Pelt.
has reached cutting centers in Thailand, Hong Kong, Germany, Brazil, and the U.S. While the present hostilities and war-like conditions in Afghanistan have made mining and subsequent transportation of the gem materials difficult, the need for capital appears to have stimulated mining operations to their greatest heights in many years. For example, greater amounts of fine-quality lapis lazuli are available now than at any time in recent decades. The reserves of tourmaline and spodumene, in particular—and to a lesser extent also emerald—appear to be good. Political conditions permitting, Afghanistan should continue to supply significant quantities of these gem materials for several years to come.

REFERENCES


Mr. Gary W. Bowersox  
President  
GeoVision, Inc.  
P.O. Box 89646  
Honolulu, HI 96830  
U.S.A.

Date: 29 December 1992

Dear Mr. Gary

This letter is your authorization to proceed with the program outlined in your September 30, 1992 report on the ruby and sapphire mines of Jegdalek, Afghanistan.

I look forward to working with you and your staff on this report.

Best regards,

Anwar Khan  
Commander Jegdalek
Mr. Gary W. Bowersox  
President  
GeoVision, Inc.  
P.O. Box 89646  
Honolulu, HI 96830  
U.S.A.  

Date: 29 December 1992

Dear Mr. Gary

I would like to assure you that we will take all necessary steps to make sure and effective your gem mines survey program in Jegdaleg are during July 1993 which we had discussed in our meetings during July 1992 and you have outlined in your September 1992 report on the ruby and sapphire mines of Jegdaleg, Afghanistan.

I look forward to working with you and your staff on this project.

Best regards,

Sher Mohammed Khan

Commander Habib area
Jegdaleg, Afghanistan

Approved by:
Anwar Khan

Jegdaleg, Afghanistan
Mr. Gary W. Bowersox  
President  
GeoVision, Inc.  
P.O. Box 89646  
Honolulu, HI 96830  
U.S.A.  

Date: 29 December 1992

Dear Mr. Gary,

This letter is your authorization to use Wermankai mine site during your July 1993 Symposium program that we discussed in our meeting during your July 1992 visit to Jegdalek ruby and sapphire mines.

I would like to assure you that we will take all necessary steps to make save and effective your program in Jegdalek area.

I look forward to working with you and your staff on this report.

Best regards,

Jamal Khan  

Wermankai Mine site  
Mines of Afghanistan
من بهترین بانک‌های خانگی در کشور می‌باشد. با این حال، همه از این بانک‌ها به خصوصیت خاصی برخوردار هستند که باعث پیشرفت و کاهش نیازمندی از خدمات خود رخ می‌دهد. همچنین، هر یک از این بانک‌ها به دنبال تحقق اهداف خاصی هستند که باعث افزایش ارزش و حمایت از کاربران می‌شود. 

دولت ایران به دنبال ایجاد شرایط مناسب برای رونق ساختاری خدمات مالی است. با داشتن سیاست‌های مناسب و جذابیت‌های جدید، بانک‌ها می‌توانند خدمات مالی خود را به بهترین شکل ممکن تدوین کنند. 

در نهایت، بانک‌های خانگی در کشور به عنوان یکی از حوزه‌های مهم و حائز اهمیت رونق و شتابی برای اقتصاد کشور می‌باشند. با توجه به نقش و اثرات این بانک‌ها، باید به آنها توجه و حمایت بیشتری داد.
لا يمكنني قراءة النص العربي من الصورة المقدمة.
د: تولید

حالت فعلي: تولید پایین بوده و در حجم متفاوت قرار دارد، پیشنهاد آینده: امکانپذیر است که در آینده به سه راهکار می‌تواند بازده می‌شود.

کار گذشته: دو مالیکیت آنها بايد تعیین گردد. جویزیون ترینکی و وارد نمودن ماشین‌ها و شرایط را تغییر نماید.

نتایج بعدی: در یک سال حداقل تولید سه‌چند افزایش خواهد یافت.

ه: تهیه آب و پترول

حالت فعلي: آب و پترول در ساحه معدن موجود نمی‌باشد.

پیشنهاد آینده: این موضوع به سرعت هرچه ممکن مطالعه کرده و اگر به پمپ و سایر وسایل ضرورت پاشید بايد یک جویزیون قابل افسردگی سایر وسایل اطلاع داده شود.

پیشنهاد آینده: امکان است از کابل به ساحه معدن انتقال داده شود.

20. نیروی بشری

حالت فعلي: به عنوان یک کمپونه در نیروی بشری که بايد در معدن کار نماید محسوس است.

پیشنهاد آینده: در صورت بهتر شدن امکان ممکن در چند ماه آینده بايد مجانبندقند و مهاجرین به

عوام به منطقه‌نشیبی کردن. در سال آینده ممکن است در حدود 2000 تنگ در ساحه معدن کار نمایدند.

4. وسایل

حالت فعلي: وسایل که فعال در ساحه معدن وجود دارد وسایل دستی و برمه‌های سرک سازی

می‌باشد. برمه‌های سرک سازی سنگین بوده و طول عمر پندارنی در کار های عمودی را

ندازنده‌ی آنها برای کار روزه سرک طراحی شده است. یا منشکند و یا اینکه زود از کار می‌افتند.

پیشنهاد آینده: جویزیون با معادن‌های قابلیت روزی‌کنکاری که تحت آن وسایل دیل زا

پیامد کار خواهد کرد.

1. برمه‌های کمپرسوری برای معدن‌کنی با پل های تکمیل‌شده را پیامد. این برمه‌ها دارای وزن

کم‌تر بوده و برای معدن‌کنی طراحی شده‌اند.

2. وسایل برای بالانسون و پیامد کشیدن مواد، این وسایل در سرعت بخشیدن استخراج کمک عمده

ای می‌نمایند.

5. امینیت

حالت فعلي: نیروی های مجاورین فعال مسؤولیت امینیت منظمه را بدوش دارند. هر گاه وسایل

زیاد شود و تولید توسط پیدا کدنمایی به مشکلات روبرو خواهد شد.

پیشنهاد آینده: تمام معدن‌کنی ها و کروپ های معدن‌کنی مردم شناخته شده خود را برای امینیت شان

از شوید منطقه‌ها کدنمایی است. که این بانک پیدا شدن کار و مصرفیت برای یک عده از
2. ارزش مجموعی ذخایر این معدن را ارزیابی نمایید.

پیشنهاد می‌شود که متنصیف سپیسوزیم مدت سه روز قبل از شروع سپیسوزیم غرفه مطالعات بیشتر در سازه جدید آورد نشود و سه روز بعد از ختم سپیسوزیم در مصداق معادن باقی کم‌انتی تا بتوانند با معدن‌پیش‌های مشخص و پروپلر های شان کار نموده و در مورد پیشنهادات و اکتشافات جدید که در طول سپیسوزیم بوجود آمده مطالعه نمایند.

۳. عوامل معدنکنی

حالات فعلی: ۱- دولت افغانستان تا سال ۱۳۷۵ معدن را در اختیار داشته است. ۲- فعالیت معادن تحت استفاده می‌باشد. ۳- کمیابی جیوگیزان یک آموزش مناسب را برای مردم محل و مهاجرین و منابع فرآیند فراهم نمی‌نماید. ۴- آموزشی که در ساخت کنکلی تهیه می‌شود محتوی انجام می‌باشد و مبتکل کننده از نقطه نظر جسمانی و روحی برای کم‌کار معدن‌پیش‌های مفید تمام شود. بعث ایجاد امکانات کار بیشتر شده و سطح تولید را بالا برده و عوامل و منافع آنها را از دیدگاه می‌پیشیند.

الف: انجام دادن: حالات: در حال فعلی دیپانگ در ساخت کنکلی استفاده می‌شود. پیشنهاد آینده: جیوگیژن طراحی های جدید انجام‌و ویژن‌سازی مواد جدید و طرح‌های جدید برای کم‌کار معدن‌پیش‌های مفید تمام شود. بعث ایجاد امکانات کار بیشتر شده و سطح تولید را بالا برده و عوامل و منافع آنها را از دیدگاه می‌پیشیند.

ب: برهم کاری:

حالات فعلی: برهم‌های سرک فعالیت معادن استفاده می‌شود. پیشنهاد آینده: ۱- جیوگیژن یک نوع برهم‌های جدید یا معرفی مینمایید که ویژن آن سنسر بوده و دوام آن بیشتر و مصرف تمام می‌شود. ۲- جیوگیژن چپ برهم‌های پیشکش. مینمایید که در نظر آینده برهم‌ها به دسترس معدن‌پیش‌های افغانی قرار گرفته می‌توانند.

ج: اکتشاف معدن:

حالات فعلی: ۱- کنکلی معلوم می‌شود هیچ کدام پروگرام مشخص معدنکنی وجود ندارد. ۲- معدنکنی که به مشاهده بی‌سردی باعث می‌شود در کار و باعث خطرنشین‌یابی کارکنان شود می‌تواند. ۳- هیچ معدن‌پیش‌آموزش دیده به وجود نخواهد آمد.

پیشنهاد آینده: جیوگیژن با هر معدن‌پیش‌های صورت اندردادیده کار مینمایید تا حالات فعلی کارآفرین آنها را از نظر کشش‌گیری و غرفه‌بندی یک پروگرام معین برای آنها کمک نماید. ۲- ابتنکار تربیته نمودن یک نفر انجیرین افغانی معادن را در آینده در نظر گیرد.

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10. نقاشی از قوماندان انور خان
AFGHANISTAN:
MINERAL AND GEMSTONE GOALS AND OBJECTIVES

Figure 1
خلاصه اجرات

این راپور تفصیل نظریات کمپیوتر جیویژن غرب بهبود و پیشرفت کار و عمليات معدن کنی در چکسلوفکا افغانستان میباشد. جیویژن خواهان ادامه کار خویش بلافاصله پروژه میباشد. همچنین خواهان اجازه خردداری احیار قیمتی از معدن که ها و وارد نمودن سامان و وسایل تکنیکی در مقابل قیمت همین احیار قیمتی و تربیه نمودن کارگران معدن چکسلوفکا افغانستان میباشد.

این پلان جیویژن خواهان کدام بوده و کمک از جانب مردم و یا دولت افغانستان نمیباشد.

به حنفی بلند برد سطح تولید، تهیه امکانات کار برای عودت کندگان و مذاکره و به خاطر جلوگیری مداخلات دلخراش و مشکلات مالی کارگران، باید مطالعات جیوپویکی و معادن شناسی و فرهنگی و تحقیق را فراهم کند. همیشه از همه که این پروژه برای مردم محل کار دلچسب و تفکری را فراهم میسازد. زیرا مردم بعد از کشتاردن چهارده سال دشواری های جنگ به این دلیل یک کار ضرورت دارند. در این پروژه مردم در مقابل زمین روانر وکی دارند نه اینکه مردم در مقابل ها گروهی دکری از مردم.

چیزی هایی حاضر به ادامه این پروژه به اساس اجازه تحریمی از جانب قومودان انور خان آخر عمویی جبهات چکسلوفکا میباشد.

اولین کام دریب راه ایجاد یک پروگرام کار در معدن که جمال خان بالایی آن کار مینامید میباشد. این معدن، معدن نمونه و محل آموزش (تربیتی) برای سبزواری ماه چهل و سه ۱۳۹۲ خواف بود. به همین دلیل لازم میافت تا در ماه فروردین ۱۳۹۳ جمال خان و انجمن حکم از ایلاکت متحد بایستید نمایید، تا بتوانند در مورد پروگرام پیشنهاد شده و سامان و وسایل تکنیکی ابراز نظر نمایند.

پیشنهادات و انتقادات آنها در پروژه در نظر گرفته شده.

با تشکر

[نام]
کییرا بانو ساکی
رئیس کمپیوتر جیویژن
رابیور - این رابیور برای قوم‌ماندان انور خان از روزی یادداشت‌های که توسط کیری باور ساکس در هنگام مسافرت‌های انجام‌شده در ماه جولای ۱۳۴۴ به جگدل افغانستان تهیه شده، تحریر یافتگه است. تمام بیانات که درین رابیور تهیه گردیده به اساس حقایق‌های نهایی صبخته‌ای با مردم منطقه موردها، کلتیکی تحریر شده است.

هر نوع استفاده یا چاپ مجدد قسمی یا کلی این رابیور بدون اجازه تحریری قوم‌ماندان انور خان یا کیری باور ساکس جدا ممنوع می‌باشد.

ماتین‌دا

این پروژه از مدت سال کشیده شده باین طرفان قوم‌ماندان انور خان، بونیتامبرای لین باور ساکس، کیری باور ساکس و انجیری علی‌الحکیم تحت بحث و پلان قرار داشته است. باید جنگه‌ها این پروژه ای جولای ۱۳۴۴ معطل قرار گرفت، با وجودی که قوم‌ماندان انور خان از کیری باور ساکس و انجیری حکم دعوت به عمل آورده‌اند. از معاونین جگدل دیدن نمایید. در حالیکه جنگ‌های آرام هم ادامه داشت کیری باور ساکس و انجیری حکم به همراه و محفظت قوم‌ماندان شیرمحمد خان از جگدل دیدن نمودند. رابیور دیل نتایج این سفر بوده و انشاء الله اکنون میتوانیم این پروژه را آدامه بدهیم.

ماهای این عقیده مستند که به انجام درست و وسایل تکنیکی بهتر معدن یاقوت و یاقوت کبود جگدل کنکان یاقوت و یاقوت کبود پر ارزش در سطح جهانی قرار بکاریم. این معاونین میتوانند چنان موادی را تهیه نمایند که اگر در ساخه تعلیم و تربیه، زراعت، زراعة‌ها و صنعت از آن استفاده شود به اندمازه قابل ملاحظه جریان رشد اکتشاف افغانستان را سرعت خواهد بخشید.

در حال حاضر جیوئلوژیک پرورپه از میکارد و توافق دولاتی روی مطالعات بیشتر جیوئلوژیک و مطالعات در عرصه معدن کلی، مارکینگیا بازاریابی دانه‌های یاقوت و یاقوت کبود (صغير) جکدل افغانستان را اکتشاف می‌دهد. درین پروژه تعلیم به اساس آموزش در هنگام کار در نظر کردن که است. پیشنهاد میکرد که این پروژه به چوب‌های کامل افغانستان بوده‌اند از شروع آن توسط افغانستان انجام و اداره کرده‌اند. خارجی‌ها و افغانستان، به جفت‌بندی و مشترکه دهندگان مؤقتی در آن دخیل خواهند بود. مؤقتی این پروژه به اساس ازدیاد در سطح تولید، عایدات بست آمد و استفاده زیاد کارگران افغانی به خصوص مهاجرین وعوتد کننده اندمازه شده میتواند (به شکل اولی مراقبه شود).