Notes on methodology

Whenever possible, quotations found throughout this article have been faithfully transcribed from the original source. The only corrections made have been minor changes in punctuation. As a result, readers may encounter inconsistencies in spelling, etc. My approach has been that, when doubt existed, the original would stand as printed. Certain quotations are quite lengthy. Rather than rewriting or paraphrasing what others have found (and, in the process, claiming it as his own), the author believes that history is better served by repeating their words exactly. Hence the extensive use of quotations from the primary literature (including the original footnotes). In so doing, the danger of misinterpretation is lessened. My own thoughts on the meaning of such quotes follow. This approach allows readers to make up their own minds on the original authors’ intent. [1]

Some may question the need for such extensive historical detail. I include it in an attempt to show the threads of wisdom connecting us with our past. In today’s modern world it is easy to believe that anything worth knowing has resulted from recent study. Such is not the case and I hope that this article can open readers’ eyes to the glories (and excesses) of human tradition and history.

The great enigma: Afghanistan’s ruby/spinel mines

Afghanistan’s ruby/spinel mines are one of the great mysteries of gemology. Historically, rubies and red spinels have been produced from four areas: Burma, Sri Lanka, the Thai/Cambodian border (ruby only; no red spinel) and Afghanistan. While extensive accounts exist regarding the other deposits, in the twentieth century, little has been written about the rubies/spinels of Afghanistan. Indeed, many are totally unaware of the Afghan occurrences.

While the author has visited Afghanistan and has examined many rubies from Jagdalek, he has not personally visited either of the two major deposits described. Thus the following has been assembled from historical sources, with much of the primary research on inclusions in Jagdalek stones coming from the author’s own research.

EARLY HISTORY: 1000–1895 AD

Afghanistan’s ruby/spinel mines were mentioned in the Arabic writings of many early travellers, including Istakhri (951 AD), Ibn Haukal (978 AD), al-Ta’Alibi (961–1038 AD), al-Muqaddasi (ca 10th century), al-Biruni (b. 973; d. ca 1050 AD), Teifaschi (1240 AD), and Ibn Battuta (1325–1354 AD).

Mohammed Ben Mansur, writing in the 12th century, stated during the time of Abbaside (caliphs who ruled from 750 to 1258 AD), a hill at Chatlan was broken open by an earthquake and within a white rock in the fracture was found the ‘Laal-Bedaschan’ (balas ruby). Women of the neighborhood apparently tried to extract dye [2] from the red stones, and failing, threw them away. Later a jeweler recognized their value (Ball, 1931).
Although Marco Polo (ca 1254–1324 AD) apparently did not visit the mines, he passed nearby. In Henry Yule’s definitive version of Marco Polo’s travels is the following (with Yule’s and Henri Cordier’s notes following a translation of Polo’s text):

Polo’s text

Badashan is a Province inhabited by people who worship Mahomet, and have a peculiar language. It forms a very great kingdom, and the royalty is hereditary…

...it is in this province that those fine and valuable gems the Balas Rubies are found. They are got in certain rocks among the mountains, and in the search for them the people dig great caves underground, just as is done by miners for silver. There is but one special mountain that produces them, and it is called Syghinan. The stones are dug on the king’s account, and no one else dares dig in that mountain on pain of forfeiture of life as well as goods; nor may any one carry the stones out of the kingdom. But the king amasses them all, and sends them to other kings when he has tribute to render, or when he desires to offer a friendly present; and such only as he pleases he causes to be sold. Thus he acts in order to keep the Balas at a high value; for if he were to allow everybody to dig, they would extract so many that the world would be glutted with them, and they would cease to bear any value. Hence it is that he allows so few to be taken out, and is so strict in the matter.*

Yule’s annotations

* Yule’s [Yule] have adopted in the text for the name of the country that one of the several forms in the G. Text which comes nearest to the correct name, viz. Badacosian But Balacian also appears both in that and in Pauthier’s text. This represents Balakhsh, a form also sometimes used in the East. Hayton has Balacian, Clavijo Balaxia, the Catalan Map Baldassia. From the form Balaxtsh the Balas Ruby got its name. As Ibn Batuta says: “The Mountains of Badakhshan have given their name to the Badakshi Ruby, vulgarly called Al Balas.” Albertus Magnus says the Balacius is the female of the Carbuncle or Ruby Proper, “and some say it is his house, and hath thereby got the name, quasi Palatum Carbunculi” The Balais or Balas Ruby is, like the Spinel, a kind inferior to the real Ruby of Ava. The author of the Masalak al Absar says the finest Balas ever seen in the Arab countries was one presented to Malek ’Adil Ketboga, at Damascus; it was of a triangular form and weighed 50 drachms. The prices of Balacian Europe in that age may be found in Pegolotti, but the needful problems are hard to solve.

No sapphire in Inde, no Rubie rich of price,
There lacked than, nor Emeraud so grene,
Balas, Turkis, ne thing to my device.
(Chaucer, 'Court of Love.')

L'altra letizia, che m'era già nota,
In che lo Sol percuoto.

Preclara cosa me si fece in vista,
Qual fin balascio in che lo Soł percuotto.
(Paradiso, ix. 67)

Cordier’s annotations

"... d'Ohsin translates a short account of Badakshan by Yakut (+1229), stating that this mountainous country is famed for its precious stones, and especially rubies, called Balaksh.“ [Bretschneider, Med. Res. Ill. p. 66.] – H.C.

The account of the royal monopoly in working the mines, etc., has continued accurate down to our day. When Murad Beg of Kunduz conquered Badakhshan some forty years ago, in disgust at the small produce of the mines, he abandoned working them, and sold nearly all the population into slavery! They continue to remain unworked, unless clandestinely. In 1866 the reigning Mir had one of them opened at the request of Pandit Manphul, but without much result.

The locality of the mines is on the right bank of the Oxus, in the district of Ish Khash and on the borders of Shigian, the Syghinar of the text. (P. Manph.; Wood, 206; N. Ann. des. V. xxvi. 300.)

[The ruby mines are really in the Ghiran country, which extends along both banks of the Oxus. Barshar is one of the deserted villages; the boundary between Ghiran and Shigian is the Kuguz Parin (in Shighai dialect means “holes in the rock”); the Persian equivalent is “Rakfi-i-Sourmakh.” (Cf. Captain Trotter, Forsyth’s Mission, p. 277.) – H.C.]

The famous Moorish traveller, Ibn Battuta (Batuta) (1325–1354 AD), mentioned the following:

People generally attribute the lapsi-stone [lapis lazuli; Arabic lazaward] to Khurasan, but in reality it is imported from the mountains of [the province of] Badakhsh, which has given its name also to the ruby called badalshsh (pronounced by the vulgar balakhsh)...

The famous Moorish traveller, Ibn Battuta (Batuta) (1325–1354 AD), mentioned the following:

People generally attribute the lapsi-stone [lapis lazuli; Arabic lazaward] to Khurasan, but in reality it is imported from the mountains of [the province of] Badakhsh, which has given its name also to the ruby called badalshsh (pronounced by the vulgar balakhsh)...

Dodecahedral Corundum or Spinelle Ruby

Persian: lâl; Hindu: manik? or lâl.

"The mine of this gem was not discovered until after a sudden shock of an earthquake, in Badakshan", had rent asunder a mountain in that country, which exhibited to the astonished spectators a number of sparkling pink gems of the size of eggs. The women of the neighborhood thought them to possess a tender quality, but finding they yielded no coloring matter, they threw them away. Some jewellers, discovering their worth, delivered them to the lapidaries to be worked up, but owing to their softness the workmen could not at first polish them, until they found out the method of doing so with manik-i-shisâ, marcasite or iron pyrites. This gem was first esteemed more than the yaqût, [4] but as its color and hardness were found to be inferior to the latter, it became less prized.”
In a manuscript history of Cashmir and the countries adjacent, by Abdul Qadir Khan, Benares, 1830, is the following description of the manner of extracting rubies from the Badakhshan mines: it professes to be taken from an oral account by Mirza Nazar Baki Beg Khan, a native of Badakhshan, settled at Benares.

Having collected a party of miners, a spot is pointed out by experienced workmen, where an adit is commenced. The aperture is cut in the rock large enough to admit a man upright: the passage is lighted at intervals by cotton mashools placed in niches; as they proceed with the excavation, the rock is examined until a vein of reddish appearance is discovered, which is recognized as the matrix of the precious gem. This red colored rock or vein is called rag-i-lal, or, the vein of rubies; the miners set to work upon this with much art, following all its ramifications through the parent rock. The first rubies that present themselves are small, and of bad colour: these the miners called piadehs (foot soldiers): further on some larger and of better colour are found, which are called sawars (horse soldiers); the next, as they still progress in improvement, are called amis, bakshis, and vazirs, until at last they come to the king jewel, after finding which, they give up working the vein: and this is always polished and presented to the king. The author proceeds to describe the finest ruby of this kind that had ever fallen under his observation. It belonged to the Oude family, and was carried off by Vizir Ali; he was afterwards employed in recovering it from the latter: it was of the size of a pigeon's egg, and the color very brilliant; weight, about two tolas; there was a flaw in it, and to hide it, the name of Jalal-ud-Din was engraved over the part; hence the jewel was called the lal-i-jalal. A similar ruby to this, but considerably larger, is in the possession of Runjit Singh, and has the names of five emperors engraven upon it.

* The Manafi-ul-ajhar dates this occurrence "350 years ago," but the date of the work is not given: the lal is not mentioned by Zakarya. Since the above was written, Mr. H.H. Wilson has favored me with a sight of another work on jewels, entitled Khwâs-ul-hejjar, translated by himself, in which the lal is treated of under the name of balakoh (Balakhan being synonymous with Badakhshan). This leaves no doubt as to the origin of the word Balas…

James Prinsep and Raja Kailikishen, 1832

The inscriptions mentioned on the ruby owned by Ranjit Singh ("Runjit Sinh") suggest that this was the Timur ruby now in the personal collection of the British monarch (see box).

**Badakhshan ruby/spinel: Myth or reality?**

From the historical record, it is clear that the Badakhshan mines were of great importance during the period from 1100–1900 AD. While it is impossible to speculate about ruby, it is safe to say that, based on the numerous historical accounts, the Badakhshan mines were the source of many of the finest early red spinels in gem collections around the world, such as those in the crown jewels of Iran, the collection in Istanbul’s Topkapi, Russia’s Kremlin and Diamond Fund, and England’s Tower of London.

Unfortunately, in modern times, such mines are largely overlooked. Twentieth-century gemologists persist in the belief that the only source of big red spinels is Burma (Kammerling, Scarratt, et al, 1994). This is not based upon any particular evidence, such as inclusion studies; for these studies do not exist, either for Burmese spinels or for those from Badakhshan.* Instead, it simply rests upon the belief that what is today, has always been.

While evidence for the existence of the Badakhshan mines is not direct, it is substantial. As proof, we have the name balas ruby, which is apparently derived from an ancient word for Badakhshan, we have numerous detailed accounts of the mining, we have spinels with Arabic inscriptions and we have historical names, such as the Timur ruby. Circumstantial? Indeed. But if circumstantial evidence was of no value, the world’s jails would be empty.

*Occasional photos of inclusions in Burmese and Sri Lankan spinel have been published. But since no in situ collecting has been done at the Badakhshan mine, and little in Burma, it is impossible to say whether similar inclusions will be found at each deposit. Remember, ruby silk has been found in rubies from virtually every deposit except Thailand/Cambodia. Similar inclusions are often found in stones from different mines.

In 1836, Captain John Wood began an epic journey to trace the headwaters of the Oxus river. He did attempt to visit the ruby mines in Badakhshan, but due to inclement weather was unsuccessful. The following is his account:

The ruby mines are within twenty miles of Ish-kashm, in a district called Gharan, which word signifies caves or mines, and on the right bank of the river Oxus. They face the stream, and their entrance is said to be 1,200 feet [367 m] above its level. The formation of the mountain is either red sandstone or limestone largely impregnated with magnesia. The mines are easily worked, the operation being more like digging a hole in sand, than quarrying rocks…

The galleries are described as being numerous, and running directly in from the river. The labourers are greatly inured to water filtering into the mine from above, and by the smoke from their lamps, for which there is no exit. Wherever a seam or whitish bluish is discovered, the miners set to work; and when a ruby is found it is always encased in a round nodule of considerable size. The mines have not been worked since Badakhshan fell into the hands of the Kunduz chief, who, irritated, it is supposed, at the small profit they yielded, marched the inhabitants of the district, then numbering about five hundred families, to Kunduz, and disposed of them in the slave market. The inhabitants of Gharan were Rajizies, or Shiah Mohamendans, and so are the few families which still remain there.

John Wood, 1841, A Journey to the Source of the River Oxus

A mention of the Badakhshan mines was made by Pandit Manphul, in a report dated 1867. His report is important for, unlike most others, he seems to have examined actual specimens. Manphul said:

The Ruby Mines are situated in Ishkashim, bordering on Shgitram… The Ruby mines have not been worked for the last twenty years and upwards. They were then given up in consequence of the labour spent on them not having been sufficiently rewarded; whether the mines had been exhausted, or whether the workers were unskilful, or managed to steal the more precious stones, is not certain. The present Mir, who had one of the mines worked last year (a.d. 1866), at my request, made over to me some of the best specimens brought to him. They are not the best of their kinds, unless the one encased in a nodule turn out to be so. The Mir, depreciating the skill of the present workers, who are natives of the country, and, according to an established usage, labour for nothing, is anxious to secure the services of competent miners… It is believed that the mines are still stealthily worked by the people living near them, with, or without the countenance and connivance of the servants of the Mir charged with their management. The mines are known to have yielded rubies of six different colours, viz. red, green, white, yellow, violet, and rosy. The specimens with me are white, violet, and rosy.

The ruby (lal) has given Badakhshan a lasting celebrity in the world of Oriental poetry.

The Soharmakhi* also comes out of the Ruby Mines.

* [Query, corundum?]
Badakhshan. – The balas ruby mines of Badakhshan are situated on the banks of the Shighnan, a tributary of the Oxus. They have been known for very many centuries, and the name balas is derived from Badakhshan, another form of writing the name of the country or from Balkh the capital town.**

This may possibly be the origin of the common mistake made in English works on precious stones, namely, that these mines are situated in Bactrianchina...[1]


Valentine Ball, 1881

Bauer (1904) describes both the Jagdalek and Badakhshan deposits. Of the latter, Bauer said:

The ruby mines of Badakhshan were famous in olden times, and they supplied some of the vast store of treasure amassed by the Great Mogul. They are situated in Shignan, on the bend of the Oxus river, which is directed to the south-west, in latitude about 37° N. and longitude 71° 5' E. They lie between the upper course of the Oxus and its right tributary the Turk, near Gharan, a place the name of which is said to signify "mine," sixteen miles (26 km) below the town of Barskhar, in the lower, not the higher, mountain ranges.

It is possible that the rubies and spinels which have recently come into the market through Tashkent, and which, according to the merchants, were mined in the Tian-Shan Mountains, are in reality from these same mines. There is no reliable information as to the existence of ruby mines in the Tian-Shan Mountains or in Tibet, so that the 2000-carat ruby recently received by Streeter, and said to come from Tibet, may also have been found in these mines on the Oxus.

Max Bauer, 1904, Precious Stones

There is little mention of the Badakhshan mines after Bauer, possibly because they lie on the border of, or inside, Tajikistan, a region of the former USSR little visited by foreigners. Barthoux (1933) discussed the mines, stating that they lay near the village of Siz, in the area of Gharan, on the right bank of the Oxus. He reported that huge, translucent, purplish pink octahedrons ("rubis balais") over 20 cm in size were extracted at that locality. Almandine garnet was said to occur on the left bank. Barthoux also stated that a more important occurrence of ruby was at Jagdalek ("Djagdalik"). The larger pieces were mostly massive, but smaller pieces showed traces of "p" (1011), a (0001), d (1120) and e (2243). They were found with spinel and most were pink in color. Also occurring with the rubies were hematite, chondrodite, phlogopite, fuchsite, rutile, spheine, hematite and pyrite (Barthoux, 1933; trans. for the author by Oliver Galibert, June 3, 1994).

After Barthoux, discussion of Afghan rubies was restricted to the Jagdalek mines. During the Soviet occupation, mining of all Afghan gem and mineral deposits was controlled by the state (Boa, 1987). However, since many mines lay in inaccessible areas, such mining became an important source of income for the rebels. With the Soviet pullout, modern exploration and exploitation might become possible, thus increasing the output from Afghanistan.

OTHER AFGHANISTAN LOCALITIES

Streeter (1892) did mention a ruby of 10.5 cts brought to England from mines at Gandamak, about 20 miles (32 km) from Jagdalek. Due to the proximity of these localities, it is possible that the stone actually came from Jagdalek. Griesbach (1892) reported rubies 20 miles (32 km) west of Tategan in a coarse, micaceous marble.

Gary Bowersox reported that gem-quality ruby had been found northeast of Kabul (Koivula, 1987). No further details are available. Ghaghi has also been reported as a source of ruby. About 1986, American dealer Dudley Blauwet purchased a large, euhedral yellow sapphire crystal said to have originated from Dharipiche, Kunar Province, northeastern Afghanistan (pers. comm., Sept. 19, 1994).

Tajikistan

In the late 1980s, large reddish spinels were reported from the Pamir mountains of what is now Tajikistan. One 532-ct rough yielded cut gems of 146.43 and 27.81 cts (Barcroft, 1990). It is not known if the mine that produced these specimens is the same as the Badakhshan mine described above (Peter Bancroft, pers. comm., June, 1994). Ruby was also reported in eastern Tajikistan, near the border with China, in the early 1980s (Bank and Henn, 1990; Henn et al., 1990). The mine is said to be located at Turakuloma, some 40 km northwest of Murgab, at 4500 m above sea level, in a mineralized zone of marbles. However, this deposit is far from the Afghan border.

Summary

The above accounts clearly describe two separate mines for ruby and/or spinel. One, located at Jagdalek (spelled variously, "Jagdalak" or "Jagdike"), 51.5 km (32 miles) east of Kabul, and another further north in Badakhshan, on the banks of the Shighnan, a tributary of the Oxus (Amu Darya), near Gharan, just north of Ishkâsham. According to Alexander Fersman (1946-47), noted Russian mineralogist/gemologist, "From the mines at the mouth of the Kuga-Lial River, the East for a thousand years has been getting its red stones – bright rubies and pinkish-red spinels, called 'balas.'"[2] Gary Bowersox has
told the author that the Afghan name of the Badakhshan mine is Kūh-i-la'[the place of ruby/spinel] (pers. comm., July 1, 1994). Undoubtedly the localities described by Fersman and Bowersox are identical.

Political difficulties and rugged terrain make Afghanistan a difficult country to explore, and Tajikistan is no better. Until someone manages to visit the Badakhshan mines, and lives to tell the tale, we must be content with mere speculation.

Characteristics of Afghanistan ruby (Jagdalek)

Nothing exists in the literature regarding the gemological characteristics of rubies or spinels from Badakhshan, primarily because no twentieth-century eyewitness accounts exist of the mines. In addition, gemological descriptions of the important specimens of history, such as the Timur ruby and the Black Prince's ruby, have never been published.

The situation at Jagdalek is somewhat better. Material has filtered out throughout the 1980s. In the early part of that decade, the author acquired a number of faceted and rough specimens from Jagdalek. The following is based on his first-hand studies, supplemented by those of Bowersox (1985), Barthoux (1933), Beesley (1986), Brückl (1937) and Themelis (1988).

Occurrence

Afzali (1981) has reported the Jagdalek mine to lie in Kabul province at 34° 26' N, 69° 49' E. For those who read German, the most complete description of the mine is that of Brückl (1937). The rubies are said to occur embedded in a regionally-metamorphosed marble cut by granitic intrusions of Oligocene age.

Table 1: Properties of Jagdalek (Afghanistan) ruby

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color range/phenomena</td>
<td>• Near colorless to a deep red, often slightly purplish, strongly fluorescent. Violet stones are seen on occasion.</td>
</tr>
<tr>
<td>Geologic formation</td>
<td>• Ruby is found embedded in a regionally metamorphosed marble cut by granitic intrusions of Oligocene age.</td>
</tr>
<tr>
<td>Crystal habit</td>
<td>• Most crystals are hexagonal prisms (short or long) with development of rhombohedron and pinacoid faces. Spindle-shaped bipyramids are also sometimes seen.</td>
</tr>
<tr>
<td>RI &amp; Birefringence</td>
<td>( n_{\text{RI}} = 1.762; n_{\text{OMEG}} = 1.770 ) Bire. = 0.008</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>~4.00</td>
</tr>
<tr>
<td>Spectra</td>
<td>Visible region (similar to rubies from other localities).</td>
</tr>
<tr>
<td>Fluorescence</td>
<td>UV: Strong red to red-orange fluorescence (LW stronger than SW).</td>
</tr>
<tr>
<td>Other features</td>
<td>May be dyed or heat treated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inclusion types</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solids</td>
<td>• Calcite; rhombs</td>
</tr>
<tr>
<td></td>
<td>• Phlogopite mica; books</td>
</tr>
<tr>
<td></td>
<td>• Rutile; prisms and knee-shaped twins</td>
</tr>
<tr>
<td></td>
<td>• Garnet</td>
</tr>
<tr>
<td></td>
<td>• Chondrodite</td>
</tr>
<tr>
<td></td>
<td>• Apatite</td>
</tr>
<tr>
<td></td>
<td>• Pyrite</td>
</tr>
<tr>
<td></td>
<td>• Spinel</td>
</tr>
<tr>
<td></td>
<td>• Graphite</td>
</tr>
<tr>
<td></td>
<td>• Hornblende</td>
</tr>
<tr>
<td></td>
<td>• Dolomite</td>
</tr>
</tbody>
</table>

| Cavities (liquids/gases/solids) | Primary negative crystals. |
|                                 | Secondary healed fractures are common. They occur in a variety of patterns and thicknesses. |
|                                 | Iron oxide stains are common in cracks (these may be removed during heat treatment). |

| Growth zoning | • Straight, angular growth zoning parallel to the faces along which it formed; irregular ‘treacle’-like swarts in other directions. Distinctive are the blue color zones intermingled in most stones, similar to Vietnamese rubies. Growth zoning is extremely sharp and prominent. |

| Twin development | • Growth twins of unknown orientation. |
|                  | • Polysynthetic glide twinning on the rhombohedron. |

| Exsolved solids | Dense zoned clouds of (often, but not always) tiny particles (probably rutile), parallel to the hexagonal prism (3 directions at 60°120°) in the basal plane. |
|                | • Boehmite, long white needles along intersecting rhomboedral twin planes (3 directions, 2 in one plane, at 86.1 and 93.9°). |

Color range

Rubies from Jagdalek are only rarely encountered in faceting quality, but when clean can be magnificent. In terms of color, Jagdalek rubies resemble most the gems of Vietnam, Burma and Sri Lanka, being strongly fluorescent and often of a slightly pinkish or raspberry-red hue similar to rubellite tourmaline. A small percentage are of violet hue.

Solid inclusions

Various types have been found in Afghan rubies. Common are colorless blocks displaying rhombohedral cleavage, most likely of calcite. Inclusions of calcite are not surprising, considering the fact that Jagdalek rubies are found in a marble matrix, just as in Burma. Transparent plates and books of hexagonal outline are also seen. Due to their anisotropic character between crossed polars and prominent basal cleavage, they are most likely mica.

Other plate-like inclusions consist of irregular distorted shingles which are opaque and black or slightly gold in color. These also display a somewhat micaceous appearance. Additional solid inclusions seen were rounded colorless grains of low relief and, in one specimen, corroded blocks of a yellow color. Several specimens examined by the author contained deep red-orange prisms of square outline and submetallic luster. Some were knee-shaped twins with obvious reentrant angles, indicating rutile.

Famous balas rubies: Blood-red souvenirs of conquest

Among the most storied stones of history are the large balas rubies found in museums and private collections throughout the world. The Diamond Fund in Russia has a number of

...
Both primary and secondary liquid inclusions are seen, the latter being responsible for the lack of clarity which most of these rubies display. Irregular, liquid-filled cavities with jagged edges (much like those in Colombian emeralds) are also found. However, the cavities of the Jagdalek rubies are somewhat thicker. The fingerprints and feathers which fill these stones often show a ragged appearance, as well, with coarse tubes that can easily be confused with the flux inclusions in flux-grown synthetic rubies.

### Growth zoning
Color zoning in Jagdalek rubies is extremely sharp and narrow, forming in the typical hexagonal pattern when viewed parallel to the c axis. The most distinctive feature of Jagdalek rubies is the small spots or zones of a sapphire-blue color. At times, these blue zones may be hexagonal in outline while in other cases they consist of narrow bands, but all show a sharp division between red and blue. Similar blue zoning is seen in Vietnamese rubies and in Burmese rubies from Mong Hsu.

### Twin development
Rhombohedral polysynthetic twin lamellae are seen in most specimens, inevitably accompanied by long white boehmite needles meeting at 86.1°/93.9°.

### Exsolved inclusions
While exsolved rutile needles have not been found, clouds of tiny exsolved particles of what may be rutile have been seen. The lack of true silk means that star rubies are not produced. Cabochons may show a silvery sheen, though, from reflection off the particles. Exsolved boehmite needles are common at the junctions of intersecting rhombohedral twin lamellae.

### Acknowledgments
The author would like to give thanks to those who have assisted with this article. First, to Bob Frey, a prince of a man, who has gone above and beyond the call of duty in both editing and helping the author locate obscure references. May all his dreams come true. Secondly, to Paul Picus, of rapier wit and red pen, whose advice has been a constant source of joy. And finally, to Gary Bowesworx, American-born, but doubtless an Afghan in a previous lifetime.

### References

Further Reading

Ball, V. (1894) [Engraved spinel ruby]. Athenaum, No. 3454, 6th January, not seen.


Bairand, P. (1879) The Wonderful World of Precious Stones in their Natural State. London, Abbey Library, 112 pp., RWHL.


Lapidge, M. (1983) Annotated Bibliography. Lapis lazuli, also from Badakshan, was an important source of pigment in ancient times (viz. ultramarine, which is made by crushing lapis). Thus

Further Reading

Ball, V. (1894) [Engraved spinel ruby]. Athenaum, No. 3454, 6th January, not seen.


Bairand, P. (1879) The Wonderful World of Precious Stones in their Natural State. London, Abbey Library, 112 pp., RWHL.


Markham, C.R. (1895) Narrative of the Embassy of Ruy Gonzalez de Clavijo to the Court of Timour, at Samarcand, A.D. 1403-6. London, Hakluyt Society, see pp. 163; RWHL.


Street, E.W. (1892) Precious Stones and Gems. 5th edition, London, Bell, 355 pp., RWHL.


Footnotes

1. All footnotes attached to quotations are those of the original authors, and are indicated with symbols (”, **”). My own footnotes are at the bottom of the page and are numbered. – RWHL [ return to article ]

2. Lapis lazuli, also from Badakshan, was an important source of pigment in ancient times (viz. ultramarine, which is made by crushing lapis). Thus
the actions of these women are understandable. However, corundum and spinel, unlike lapis, are colored by impurities. Thus their streak, and their color when crushed, is colorless. [return to article]

3. The information was extracted from three books, of different eras: 1, the Ajāb-ul-makhlukát o Gharāib-ul-moujūdát, an ancient Persian work on natural history, written by Zakarya, a native of Kufa, date unknown; 2, the Aqul-i-ashreh, a work on science, by Mahomed of Berar, An. Hej. 1084 (AD 1673); and 3, the Jawāhir-nāme, a modern anonymous compilation, containing much useful matter in a condensed form: it was probably written at one of the native courts, either Delhi or Hyderabad, since it mentions the opening of [then] recent mines in India (Prinsep and Kalikishen, 1832). [return to article]

4. Yaqut is a Persian-Arabic term for corundum. Ancient Arab mineralogists placed all colors of ruby-sapphire under yaqut (Prinsep, 1832). [return to article]

5. Tamerlane is an English corruption of Timur i leng (‘Timur the lame’), as Timur was crippled in battle when about 27 years old (Collins, 1968). [return to article]

6. Lal is the Persian word for balas ruby. In Chinese, it is la (Bretschneider, 1887). [return to article]

7. RWHL = References contained in the personal library of Richard W. Hughes
* = References of particular merit [return to References]

---

Title photo: Gary Bowersox
This page is http://www.ruby-sapphire.com/afghanistan-ruby-spinel.htm v. 1.0
Page last updated 7 March, 2013

Black spinel is usually mined along with ruby and sapphire, which is why they share so many similar properties. Spinel is most commonly found and mined in Cambodia, Burma, Sri Lanka, and Thailand. Although traces of Spinel have been found across Brazil, Afghanistan, Madagascar, Nepal and Nigeria. How valuable is black spinel? The black spinel stone, although rare, is not considered as valuable to the jewellery trade as you may think. Although Spinel is often mistaken for rubies and sapphires, it is possible to distinguish these from other gemstones just by the look of the stone. Black spinel is highly reflective and does not feature the same metallic overtone that many other stones do. Ruby mines are situated near the village of Warzqanj which is situated in the direction of Kharukhan while going from Badakhshan at three days’ journey. It is a part of an emperor’s domain, the capital of which is Shakasim, which is close to the mines producing this stone. The approach to the mines via this route is easier, and it passes between Shakkasmi and Shakan. This is why the governor of Wakhan keeps the most precious jewels for himself, and precious jewels pass this way clandestinely. Jewels weighing beyond a certain size are prohibited from being carried outside the mine, and only st The Badakhshan mines were of great importance as early as 1000 - 1900 AD, and one of the earliest references to them occurs in the diary of Marco Polo (1254 - 1324 AD). He wrote the following of the spinel mines: *Badashan is a province inhabited by people who worship Mahommet, and have a peculiar language. It forms a very great kingdom, and the royalty is hereditary It is in this province that those fine and valuable gems the Balas Rubies are found The stones are dug on the king's account, and no one else dares dig in that mountain on pain of forfeiture of life as well as good