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# Adits, Caves, Karizi-Qanats, and Tunnels in Afghanistan: An Annotated Bibliography

R. Lee Hadden



Topographic Engineering Center  
US Army Corps of Engineers  
7701 Telegraph Road  
Alexandria, VA 22315-3864

November 2005

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

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<b>14. ABSTRACT</b> This bibliography on the caves, tunnels and other geological information of Afghanistan was begun in September 2001. It brings together selected citations from a variety of different cartographic, geological and speleological resources and specialized library collections. Resources cover publications, reports and maps in Arabic, English, French, German, Italian, Russian and other languages taken from a variety of government or private library and geological information centers. Most of the citations have location information on where these items can be located and either accessed through the World Wide Web, borrowed through inter-library loan or purchased through commercial document delivery services.					
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“Adits, Caves, Karizi-Qanats, and Tunnels  
in Afghanistan: An Annotated Bibliography”

By

R. Lee Hadden

US Army ERDC

Topographic Engineering Center

7701 Telegraph Road

ATTN: CEERD-TO-I (Hadden)

Alexandria, VA. 22315-3864

TEL: (703) 428-9206; FAX: (703) 428-6772, dsn: 364.

Robert.L.Hadden@erdc.usace.army.mil

January 2002

Revised November 2005

This bibliography was put together after a number of reference requests concerning the geology of Afghanistan and caves in Afghanistan were received in the library after September 11, 2001. People wanted to know about the mineral and gem mine entrance (adits) locations, geological structures, natural and man-made caves, tunnels and other places in Afghanistan of interest. These requests came from the media, professional geologists and researchers, spelunkers and caving enthusiasts, hydrologists, and the general public.

This bibliography eventually achieved several goals: the citations would be taken completely from sources openly published or publicly available, and no classified military information or restricted sources would be used; the information sources would come from publicly and commercially available library collections, abstracting services and Internet sites; it should stand on it's own, and give both scientific information in itself and lead library users to further specific information by supplying the information needed for retrieval; it should have information of interest to both professional geologists and geographers, as well as the general public.

Since geologists get much of their information from maps, I have included a number of them in this bibliography. For their convenience, the maps are separated from the journal articles, newspaper accounts and books and placed the map citations and placed at the end of this bibliography.

Many of these citations are copied or taken from the web. The URLs given in this report are all active as of November 2005. However, if the site is no longer active, you can still search for the cached site in an archival web service, or you can contact your agency librarian for further assistance.

Some foreign words used in this bibliography, other than proper names or place names are:

Biospéléologie. This is the study of cave biota. Many of the works on bats, cave fleas, beetles, spiders etc., also describe the cave formation and map the cave locations where the study specimens were collected. Thus, included in this bibliography are a number of citations to biological information from Afghanistan, such as the polyglot series: “Contributions à l'Étude de la Faune d'Afghanistan (Contributions to the study of the fauna of Afghanistan).

Chiroptères. Bats.

Foggar: an Arabic word for an underground irrigation system.

Kariz (aka Karez, Kareez, Kareze, Karèzes, Karaz, Kyareses, etc.): This is an underground system of irrigation in Afghanistan that prevents evaporation of the transported water in an arid atmosphere. The *kariz* carried copious supplies of freshwater from the mountains to waterless plots of land, often many kilometers away. Sometimes as deep as 40 meters, they were constructed underground to prevent the evaporation of the water as it crossed the sun baked steppe. They were carefully engineered to bring the water to the surface at just the point it was required so that pumping was unnecessary.

“Karez is the Pushto term for the man-made underground water system. Qanat is the Arabic term used in Iran and Afghanistan.” Louis Dupree, *Afghanistan*. New Delhi: Rama Publishers, 1980, page 40. Qanat is an ancient, gravity-flow water supply system, or usually covered aqueducts of short distance. The Persian word is *kariz*.

This publication was not intended to be printed on paper. By publishing this bibliography electronically through DTIC, researchers will be able search these citations for place names, secondary authors, and geological or mining keywords.

Because this bibliography covers earth science information from over three centuries, there is wide variety in the standards of transliteration from foreign languages and alphabets. Most of the transliteration has been done under the guidelines of the Anglo-American Cataloging Rules II (AACR II). However, due to the age of some of these citations, and that they cover transliteration from sometimes more than two alphabets, there is considerable inconsistency in the citations given below. Also, there is some divergence on proper names as well. Sample name variations might include: Cabool, Kaboul, Kabul, etc., or Punjwai and Pandjvai.

Some of the specialized library terms used in this bibliography may need some explanation to non-librarians:

DataTimes is a commercial news and abstracting service. The full article described by their citations are available from their document delivery service at: <http://www.datatimes.com/division/>

The David Rumsey Map Collection is a private collection of materials that is available online. See: <http://www.davidrumsey.com/>

Defense Technical Information Center (DTIC). DTIC, 8725 John J. Kingman Road, Ft. Belvoir, VA 22060-6218, <http://www.dtic.mil/>. This is the government's storehouse of military reports and documents.

FAO: Information is taken from the virtual library of the Food and Agriculture Organization of the United Nations. Rome, Italy. See: (<http://www.fao.org>)

GeoBase is a commercial abstracting service and document delivery service, and provides comprehensive bibliographic references to journals in the fields of physical and human geography, geology, mineralogy, ecology and development studies. Further information about GeoBase can be found at:

<http://www.elsevier.com/inca/publications/store/4/2/2/5/9/7/index.htm>.

GeoRef is an indexing service of the American Geological Institute (AGI) ([www.agiweb.org](http://www.agiweb.org)). GeoRef indexes the geologic and earth science literature from around the world. The numbered GeoRef citations are available from the document delivery services of AGI.

ISBN: The ISBN stands for “International Standard Book Number” and is an unique machine-readable identification number, which marks any book and edition with a specific number. For 30 years the ISBN has revolutionized the international book-trade, and 159 countries and territories are officially ISBN members. This allows book sellers, document supply companies and libraries to find specific editions of texts on electronic catalogs. For further information, go to: <http://12.35.238.145/standards/home/index.asp>.

ISSN: the ISSN (International Standard Serial Number) is an eight-digit number which identifies periodical publications as such, including electronic serials. These numbers document supply companies and libraries find specific journals, which often have similar titles, through electronic catalogs for patrons. More than one million ISSN numbers have so far been assigned internationally. Further information can be found at: <http://www.issn.org:8080/pub/>.

Library of Congress (LC). The Library of Congress in Washington includes not only texts, but also materials in their Geography and Map Collection. See: <http://www.loc.gov>

National Library of Agriculture in Greenbelt, MD, has an excellent collection of materials and a friendly staff. See: <http://www.nal.usda.gov/>

The National Library of India has a number of maps and other materials on Afghanistan in their collections. The Library owns a very rich collection of Indian official documents from the days of East India Company to the present day. The collection also includes the documents published by the Government of Great Britain relating to India. At present the division has 490,000 documents. The library also has a rich collection of maps. The collection ranges from 17th century onwards. Indian topographical sheets of earlier days (at scale of one inch, half inch and quarter inch to a mile) and maps of natural resources, population, transport and communication systems, agricultural production, Soil, Vegetation and Geology of India form the major part of the collection. At present the library has 85,000 printed maps, 54 cartographic manuscripts and 280 atlases. See their web site at: <http://www.nlindia.org/>

National Library of Medicine, Bethesda, MD. The National Library of Medicine (NLM) operates the MEDLINE database of Medical literature. <http://www.nlm.nih.gov/>

The National Speleological Society (NSS) Library has the largest and most diverse collection of literature about caves and caving in the United States. The collection is very broad and contains publications printed by the NSS and NSS internal organizations. It also includes books, periodicals, and other literature published by independent publishing companies and other speleological organizations both in the US and other countries. The library catalog and the index to NSS publications provide the tools to locate the information you seek. The NSS Library is located at 2813 Cave Avenue, Huntsville, AL 35810-4431; <http://www.caves.org/>

National Technical Information Service (NTIS). 5285 Port Royal Road Springfield, VA 22161. Phone: 1-800-553-NTIS (6847). This is the government’s storehouse of civilian reports and documents. Further information about NTIS can be found at: <http://www.ntis.gov>

The National Union Catalog (NUC). The NUC is compiled and edited with the cooperation of the Library of Congress and the National Union Catalog Subcommittee of the Resources and Technical Services Division, American Library Association. Coverage includes libraries in the United States and Canada. This multi-volume authority is the

centerpiece for verification of books and other materials printed prior to 1956. Because many major research libraries have not converted major portions of their collections into electronic formats, this source will need to be consulted for years to come.

OCLC is a nonprofit membership organization serving 41,000 libraries in 82 countries and territories around the world. The use of an OCLC number allows libraries across the world to borrow or photocopy specific items from each other electronically. Further information can be found at: <http://oclc.org/home/> .

SA: Speleological Abstracts (*Bulletin Bibliographique Spéléologique*) number, from the International Union of Speleology (UIS), and the British Cave Research Association. To integrate the speleological activities of member countries and those who appreciate speleology around the world, the UIS maintains a Documentation Centre in La Chaux-de-Fonds, in Switzerland, via the Swiss Speleological Society. Since 1970 they have published *Speleological Abstracts* (both in print and CD), reporting on all speleological papers by geographical area, topic, etc. See: <http://www.uis-speleo.org/>

USGS Library indicates the US Geological Survey Library, the largest earth science library system in the world. Further information about the library and their book, report and map collections can be found at: <http://www.usgs.gov/library/> .

Water Resources Abstracts is a comprehensive, multi-database reservoir of essential water information. The complete *Selected Water Resources Abstracts* (SWRA) file is NISC's unique version featuring data published during the years NISC published SWRA exclusively for the U.S. Geological Survey. Further information can be found at: <http://www.nisc.com/factsheets/wra.htm> .

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*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

- A.A. 2001. "Grottes à détruire." *La Lettre de Spéléo-Club du Paris*. No. 199, Novembre 2001: 1. 1 Dessin. Arrêt des activités spéléologiques en Afghanistan. Rappel sur la mission Claude Chabert et Nicky Boullier en 1975. Compte-rendu épuisé pourrait être réédité si demande. In French. (Translation: Account of the speleological activities in Afghanistan. A report of the mission of Claude Chabert and Nicky Boullier in 1975. A complete report can be published on request) SA: 2001-2788.
- Abdullah, Shareq, Chmyriov, V.M. (Chmyrev, V.M.), Stazhilo, Alekseev K.F. (Stazhilo, Alekseyev K. F.), Dronov, V.I., Gannon, P.J., Rossovskiy, L.N., Kafarskiy, A.K. and Malyarov, E.P., 1977. *Mineral Resources of Afghanistan*. Kabul: Republic of Afghanistan, Ministry of Mines and Industries. 419 pages with maps. Map Scale: 1:2,000,000. OCLC: 05864346; GeoRef Number: 1980-031727.  
Summary in Arabic. Subject descriptors: Afghanistan; economic geology; maps; metals; mineral resources; natural gas; nonmetals; petroleum.
- Aellen, V., 1959. "Contributions à l'Étude de la Faune d'Afghanistan (Contributions to the study of the fauna of Afghanistan). 9. Chiroptères. Beitrage zum Studium der Fauna Afghanistan. 9." *Fledermäuse*. Volume 66, 1959, pages 353-386.
- Aellen, V., 1959. "Contribution à l'Étude de la Faune d'Afghanistan. 21. Diptères pupipares parasites de Chiroptères. Dipteren als Fledermausparasiten aus Afghanistan. 21." *Revue Suisse de Zoologie*. Volume 66, pages 565-567.
- The Afghan Campaign. Discussion. 1879. *The Lancet*, Volume 113, Issue 2898, 15 March 1879, Pages 390-391.
- "Afghanistan- Darunta Camp Complex." 2000-2005. GlobalSecurity.org. April 27, 2005. Abstract: "The Al-Badr I base in Jalalabad [34°25'00"N 70°27'00"E] is about 120 kilometers east of Kabul. The Tora Bora base near Jalalabad was rebuilt on the site of a camp first constructed by the US Central Intelligence Agency in the early 1980s. According to one report, bin Ladin's "Abu Khabab" camp is focused on development and training with chemicals, poisons and other toxins. This camp is named after the Egyptian who runs it, Midhat Mursi- who uses the name Abu Khabab. The camp, about eight miles from Jalalabad, is part of a complex of training sites known as Darunta [34°28'00"N 70°22'00"E], after a nearby stone dam. Imagery below, released by the Department of Defense on October 12, 2001, reveals that the Darunta Camp Complex was struck by coalition aircraft. Other sites at the Camp Complex, besides the facility shown were also struck there." See: <http://www.globalsecurity.org/military/world/afghanistan/darunta.htm>
- Afghanistan. 1971. *Official Standard Names Approved by the United States Board on Geographic Names*. Prepared by the Geographic Names Division, US Army Topographic Command, Washington, DC. Updated September 1983, July 1992, by the Defense Mapping Agency. Updated and electronically accessible as the "GeoNet Names Server" at the National Geospatial Intelligence Agency. "The GeoNet Names Server (GNS) provides access to the NGA database of foreign geographic feature names. The database is the official repository of foreign place-name decisions approved by the U.S. Board on Geographic Names (US BGN). Approximately 20,000 of the database's features are updated monthly." See their web site at: <http://www.nga.mil/>  
While not specific to cave names, the gazetteer does have place name headings, designations, lat/long data and area numbers information on tunnels, underground

irrigation canals (kariz), and other named features. English script with transliterated Pashtu and Persian names.

"Afghanistan Caves Make Good Bunkers." December 6, 2001. *Tulsa World*. Tulsa, OK. Page 4. DataTimes Accession No: TUL112601053.

"If Osama bin Laden is hiding in a cave in Afghanistan, as U.S. officials suspect, he has plenty to choose from. The country's varied landscape and geology provide many caves. The area that is now Afghanistan started to take shape hundreds of millions of years ago, when gigantic rocks, propelled by the immense geological forces that continuously rearrange the earth's land forms, slammed into the land mass that is now Asia. Much of the rest of today's Afghanistan was still under water, yet to be formed."

"L'Afghanistan Economique en 1982." 1982. Translated Title: "Afghanistan's Economy in 1982." *Industries et Travaux d'Outre-Mer*. Volume 30; 343, pages 370-376. Moreux et Cie. Paris, France. ISSN: 0019-9362; GeoRef Number: 1984-025818.

Abstract: Economic and financial dossier of Afghanistan with data on the mining industry. Natural gas production was 2.5 billion cubic meters, all exported to the USSR, and will increase by 30% in 1984. Among the projects: the copper mine of Ainak 30 kilometers Southwest of Kabul expected to produce 110 kilotons per year of copper; barite factory of 23 kilotons per year capacity.

Afghanistan Information Bureau. 1958. "Mines." *Afghanistan Development in Brief*. Kabul. Pages 57-61.

Includes rather vague information on various mine and mineral locations. USGS Library: 590(650) Af3a.

Afghanistan Internationale Bibliographie für Speleologie. 1959? This list is not ascribed as to author, place or date of publication.

This is an one-page list of biological papers from rather obscure European caving journals. The list is held by the National Speleological Society (NSS) Library, but not all the references in the bibliography are held by the NSS Library. See their site at: <http://www.caves.org/>

Afzali, H., 1981. "Les Ressources d'Hydrocarbures, de Métaux et de Substances Utiles de l'Afghanistan; Aperçu General." In French. Translated Title: "Afghanistan's Hydrocarbon, Metal and Industrial Mineral Resources; a Broad Overview." *Chronique de la Recherche Minière*. Volume 49; 460, pages 29-51. Centre d'Etudes Géologiques et Minières; Orleans: Bureau de Recherches Géologiques et Minières, Direction des Relations Extérieures. Paris, France. 1981. ISSN: 0182-564X; GeoRef Number: 1982-054014.

Subject descriptors: Afghanistan; coal; economic geology; energy sources; industrial minerals; mineral resources; organic residues; sedimentary rocks.

Anonymous. 2002. "The continuing search for Osama bin Laden." *Maclean's*. Toronto, Canada: May 20, 2002. Vol. 115, Issue 20; page 14. ISSN: 0024-9262.

Abstract: Canadian troops climbed towering cliffs, crawled inside dark and threatening caves and dug up decomposing bodies in an exhausting effort to find the remains of Osama bin Laden. More than 300 Canadians, along with U.S. Special Forces and local Afghan fighters, carried out the three-day sweep across eastern Afghanistan, combing through the terrorist leaders last known bastion for evidence that the al Qaeda chief may have been killed during U.S. bombing last December.

In a graveyard in one river-valley village, the Canadians exhumed the bodies of 23 al-Qaeda fighters. One grave in particular, very long (bin Laden is six-foot-five) and covered with flags and pieces of quartz, raised hopes that the terrorist leader had been found. The corpses, wrapped in shrouds, were pulled out by rope, and tissue samples were taken for possible identification. The bodies were then carefully reburied, but bin Laden's was not among them.

“Antiquated Water Supply Tunnels in Afghanistan.” 2002. *All Things Considered*. National Public Radio. Washington, D.C. March 18, 2002, page 1 (Transcript of a radio broadcast).

“Picture an underground tunnel that brings water from the mother well in the mountains down to a village in the valley about 10 miles away. Without modern equipment, no one could dig a subterranean channel 10 miles long. The (foreign language spoken) was dug by means of a series of access wells about 90 feet apart along a straight line. They permitted the diggers to shimmy down the holes and continue boring the tunnel horizontally. They used native engineering skills to make the wells and the tunnel intersect. Today, when the channel gets clogged with mud, the (foreign language spoken) go to work. This water system is cheap, simple and extraordinarily dangerous to maintain... In past years, the Taliban destroyed (foreign language spoken) networks in the Shomali plains north of Kabul as a way to punish the inhabitants and deny rebel fighters readymade foxholes. Now that the Taliban is gone, humanitarian groups are helping farmers re-excavate the wells and tunnels in order to get the water flowing and make the land productive again. Thankfully no one tried to destroy the (foreign language spoken) of Balahezar. There are enough natural hazards.”

Atlas of Mineral Resources of the Economic and Social Commission for Asia and Pacific (ESCAP) Region: Geology and Mineral Resources of Afghanistan. 1995. Volume 11. UN0561XSP Performer: United Nations, New York. 150p. OCLC: 36435785.

Subject descriptors: Afghanistan; commodities; mineral deposits; geology; maps; foreign economic development; mineral industry. This series shows the distribution of mineral deposits and mining occurrences in the countries of the Asia and Pacific region irrespective of their economic significance and provides information on their contained commodities, reserves, geographic locations, their relation to the geological environment and other characteristics.

Baker, Peter, 2001. “Where the Battlefield is a Maze in Afghan Cliffs, Fighters Face Off, Then Melt Away.” *The Washington Post*, 28 Sept, 2001, page A1. Mr. Baker is reporting from Mount Topak Pompaya, Afghanistan. Abstract: “To see the sangar, or mountain base, on the side of this peak in the Gorbund Gorge about 35 miles northwest of Kabul is to begin to understand how the hardy people here have repelled one aggressor after another over centuries. Even to see the sangar is nearly impossible. From a distance of a few hundred yards, the tiny mud-covered outpost disappears from view, blending into the unforgiving landscape that may confront the United States in any attempt to hunt down suspected terrorist Osama bin Laden. The sangar is one in a chain of 13 such posts in the surrounding peaks of the Gorbund Gorge, with another 17 in the broader region, all controlled by the rebels with a regiment of 350 men. [Abdul Qayum] can point out the other sangars, one by one, but even with his finger indicating their positions, they remain invisible to the

untrained eye. The prospect that bin Laden could be secluded may torment Western military planners, but the rebels expressed confidence they could find him in the mountains. "It's not possible for Osama bin Laden to come here to hide," said [Mohammad Siddig], 40, the commander who has been fighting one foe or another here for 25 years."

Bariand, P., 1972. "Lapis Lazuli from Afghanistan." *Mineral Digest*. Volume 4; Winter issue, Pages 6-14. OCLC: 01757522; GeoRef Number: 1977-001009.

Subject descriptors: Afghanistan; afghanite; deposits; economic geology; framework silicates; gems; history; lazurite; metamorphic rocks; mining geology; occurrence; silicates; sodalite; sulfates; sulfides.

Bariand, P and Pollen, J.F., 1978. "The Gem Pegmatites of Nuristan, Afghanistan." *Mineralogical Record*. Volume 9, number 5, pages 301-308. OCLC: 01757528.

Some discussion of mine sites, although nothing specific.

Bariand, P., Cesbron, F. and R. Giraud, 1968. "Une Nouvelle Espèce Minérale, l'Afghanite de Sar-e-Sang, Badakhshan, Afghanistan; Comparaison avec les Minéraux du Groupe de la Cancrinite." (Translated Title: "A new mineral species, afghanite, from Sar-e-Sang, Badakhshan, Afghanistan; comparison with minerals of the cancrinite group."). *Bulletin de la Société Française de Minéralogie et de Cristallographie*. Volume 91 (1), pages 34-42. ISSN: 0037-9328; GeoRef Number: 1968-016642.

Abstract: Afghanite, a new aluminosilicate of sodium, calcium, and potassium, was discovered in a crystal from the lapis-lazuli mine, Sar-e-Sang... The x-ray powder diagram is similar to those of the minerals of the cancrinite group.

Bashilova, I. I., 1973, "Use of TV Pictures Obtained from Weather Satellites to Study the Geological Structure of the Earth." In: Radionov, B. N. (Boris Nikolaevich), et al., 1974, English translation of "Space Iconics." Washington: National Aeronautics and Space Administration. NASA technical translation; F-798. Translation of "Kosmicheskaya ikonika," Nauka Press, Moscow, 1973. Akademiia nauk SSSR. Institut kosmicheskikh issledovani. Pages 159-162. English edition: OCLC: 1329183. Russian edition: LCCN: 73-331367; OCLC: 2275048.

Baylot, James T. 1992. "Parameters Affecting Loads on Buried Structures Subjected to Localized Blast Effects." [Vicksburg, Miss.: U.S. Army Engineer Waterways Experiment Station. National Technical Information Service. 80 pages. Technical Report; SL-92-9. OCLC: 27660237.

Subject descriptors: soil-structure interaction; military aspects; underground construction - military aspects- testing; Military architecture - testing - computer programs; Combat survivability (military engineering). Notes: "April 1992." Includes bibliographical references. Prepared for Department of the Army, Assistant Secretary of the Army (R&D). Assistant Secretary of the Army (R & D); U.S. Army Engineer Waterways Experiment Station.

Bahmanyar, Mir. 2004. Afghanistan cave complexes 1979-2004: mountain strongholds of the Mujahideen, Taliban and Al Qaeda. Oxford, UK: Osprey Publishing; 2004. 64 pages: photos, some color; 25 cm. OCLC: 58795226; 56654692; 60793045; ISBN: 184176776X.

Subjects: Caves- Afghanistan. Fortification- Afghanistan. Afghanistan- History- 2001- Note(s): Includes bibliographical references and index. "One of the major

problems the Soviet Union faced during its invasion into Afghanistan was the difficulty in expelling the Mujhadeen from the cave and tunnel complexes dug into the sides of mountains. Few reports or other evidence are on hand to accurately describe the reality on the ground.”

Beach, Michael. 2001. “Fortress of Terror.” *The Mercury*. October 23, 2001, pages 1, 7.

“Terrorist leader Osama bin Ladin reported to be hiding in a honeycombed cave system where 5 large connected caves have been used to develop an impenetrable mountain fortress for Taliban resistance fighters in the 2500 m high Torhar mountain ranges near Jalalabad in southern Afghanistan. SA: 2001-2788.

De Beauchamp, P. 1959. “Triclades Paludicoles d’Afghanistan. Contributions à l’Étude de la Faune d’Afghanistan. I.” *Kungliga Fysiografiska Saellskapet i Lund*.

*Foerhandlingar*. Volume 29, number 3, pages 27-43.

Beaumont, Peter, Bonine, Michael E., McLachlan, Keith Stanley, McLachlan, Anne, 1989. *Qanat, Kariz, and Khattara: Traditional Water Systems in the Middle East and North Africa*. London: Middle East Centre, School of Oriental and African Studies, University of London, England: Middle East & North African Studies Press, 305 pages, illustrations, maps. ISBN: 0906559359; OCLC: 32313822.

Notes: Includes bibliographical references and index. Table of Contents: The origin, diffusion, and functioning of the Qanat. A.K.S. Lambton - The Qanat: a means of water provision from groundwater sources. Peter Beaumont - Qanats: field systems and morphology: rectangularity on the Iranian plateau. Michael Bonine - Settlement form and Qanat routes in the Yazd province. Susan Roaf - Qanats and human ecosystems in Iran. Morteza Honari - Qanats and pumped wells: the case of Assad'abad, Hamadan. Eckhart Ehlers with Abbas Saidi - The Qanats of Mahan. Paul W. English - Qanats in the Najafabad Valley. Martin Hartl - The reorganization of a Qanat irrigation system near Estehbanat, Fars. N. O. Kielstra - The Qanats of Qum. A.K.S. Lambton - The origin and evolution of Foggara<sup>1</sup> oases in the Algerian Sahara. Jean Bisson - Khattara and other forms of gravity-fed irrigation in Morocco. George Joffe - Qanats and spring flow tunnels in the Holy Land. Zvi Ron - Aflaj renewal in Araqi: a village case study from Oman. Roderic W. Dutton - The Kariz in the Herat basin, Afghanistan. Keith McLachlan - The Japanese Qanat (Mambo): its technology and origin. Shoko Okazaki.

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Abstract: The Sar-e-Sang deposit is located in the center of the high massif of the Hindu Kush in the province of Badakhchan, northeast Afghanistan. The lapis-lazuli of the Sar-e-Sang mine appears in veins in the thick bank of marble included in a katazonal series injected with pegmatites. The petrographic and mineralogic aspect of the study considers mineral veins composed of lazurite, occurring in the massive form or in crystals, associated with other minerals, in particular, with feldspathoids. A tentative comparison is made with deposits of lazurite in Russia north of Mongolia which are similar in petrogenesis.
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Small pelagic Tentaculites and a scarce microfauna discovered in crystalline limestones confirm the Devonian age previously recognized for part of the metamorphic formations in the southern slope of the Western Hindu Kush, in Afghanistan. Based on these discoveries, the age of metamorphism and Palaeotethyan oceanic crust in the region is rediscussed. There is an abridged English version and English summary.

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See Appendix III.

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Bowersox, Gary W. 2004. The Gem Hunter: True Adventures of an American in Afghanistan. Geovision, Inc. (January 22, 2004). 505 pages. ISBN: 0974732311.

Abstract: This is the story of one man's endeavor to discover precious gems and to lead a life filled with loyal friends and extraordinary adventures. He finds it all in the Hindu Kush region of Afghanistan but not without risking his life. In this book, Gary W. Bowersox spins his tale of discovery -- both introspective and worldwide. Along the way he encounters danger and intrigue and as he builds lasting friendships. This book (complete with 253 photos, maps, and figures) is a must read for anyone interested in Afghanistan, gems, geography, travel, and or U.S., Middle Eastern, or Central and South Asian politics.

Bowersox, Gary W. November 7, 2001. Interview: “Precious Stones Fuel Fight Against Taliban: Gem Expert Helps Northern Alliance Find Gems to Fund Its Battles.” ABC News-Good Morning America. New York, NY.

“Bowersox, president of a private gem wholesale company, has spent much of his life venturing deep into the caves of Afghanistan, risking his life in dangerous terrain in search of treasure. The rubies, emeralds, tourmalines and aquamarines he discovered in the country's rugged terrain can fetch tens of thousands of dollars each on the U.S. wholesale market. Bowersox has also transformed them into dazzling jewelry, often worth more than \$100,000 a piece.”

Bowersox, Gary W., Snee, Lawrence W., Foord, Eugene E. and Seal, Robert R., III, Spring 1991. “Emeralds of the Panjshir Valley, Afghanistan.” *Gems & Gemology*. Volume 27, (1), pages 26-39. (Non-USGS publications with USGS authors) Includes maps of emerald mine entrances, and photos of several mine adits. Bibliography. ISSN: 0016-626X.

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"The United States and Russia have been co-operating since last September on a plan to launch special forces into Afghanistan in a smash-and-grab raid to capture or kill Osama bin Laden. The plan, codenamed Operation Gateway, calls for the insertion of US Delta Force commando teams by long-range "stealth" helicopters from a forward base in Uzbekistan, north of the Hindu Kush cave complex used as the Saudi dissident's headquarters."
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"Moscow has supplied maps of cave complexes in south and east Afghanistan to the CIA to help in the intensifying manhunt for Osama bin Laden and his al Qaeda terror network lieutenants."
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Burnes, Alexander (1805-1841) and John Arrowsmith (1790-1873). 1842. Central Asia Comprising Bokhara, Cabool, Persia, the River Indus, & Countries Eastward of it. London Atlas of Universal Geography. London: J. Arrowsmith, [1844]. Map Scale [ca. 1:4,435,200]; (E430--E 800/N 430--N 230) Category of scale: a Constant ratio linear horizontal scale: 4435200 Coordinates--westernmost longitude: E0430000 Coordinates--easternmost longitude: E0800000 Note(s): Relief shown by hachures. OCLC: 47866727; 35952856. (OCLC: 47837078). Internet access is available at: <http://www.davidrumsey.com>

"Constructed from numerous authentic documents, but principally from the original M.S. surveys of Lieut. Alex. Burnes, F.R.S. to whom this map is most respectfully dedicated ... June 1834." Scanned raster image of original: 1 map: hand colored; 53 x 72 cm. Original in the David Rumsey Collection, scanned by Cartography Associates.

Burnes, Alexander and Dr. Gérard. 1833. "Continuation of the Route of Lieutenant A. Burnes and Dr. Gérard, from Peshawar to Bokhara." *Journal of the Asiatic Society of Bengal*, Volume 2, pages 7-9. OCLC: 1824093.

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Cart, Julie. 2001. Response To Terror; Search For Taliban Leaders; Drawing a Bull's-Eye on Bin Laden's Lair; Geography: John F. Shroder Jr.'s arcane expertise on the caves of Afghanistan is suddenly in acute demand. Los Angeles Times. Los Angeles, Calif. Dec 5, 2001. pg. A.5.

Abstract: Since American military action began in Afghanistan, [John F. Shroder Jr.] has been deluged. The affable scientist spent two decades in Afghanistan, barely escaping after he was accused of being a spy. His trove of precise and detailed maps--of interest only to scholars before the September terrorist attacks--are now the coin of the realm in one of the most remote, least-mapped countries in the world. The satellite photos and detailed locations of bridges, tunnels and oil pipelines are considered so sensitive that the FBI told Shroder to take all such images off the university's Web site. Despite the obscurity of his specialty, it didn't take long for the world to find Shroder. Soon, the 62-year-old professor was all over television, on the radio and in newspapers around the world. Various government agencies either want Shroder to help or warn him to keep quiet. Reporters clamor for interviews. People from around the world e-mailed him, asking where Bin Laden is or sending photographs of caves and tunnels they say will aid in his capture. His recent celebrity has engendered good-natured ribbing from colleagues. The outside of Shroder's office door resembles the front of most American

refrigerators with its blizzard of cartoons, funny photos and yellowed clippings.

There, too, is a mock-up of the magazine *Soldier of Fortune*, displaying a prominent photograph of Shroder making an off-color remark regarding Bin Laden.

Carter, Jon. 2001. "The World Fights Back. Revealed: Bin Laden's Lair; Exclusive Photos From Space Show Astonishing Terror Hq That Troops Will Aim To Wipe Out." *The People*. September 30, 2001. Abstract: "These amazing satellite pictures reveal the secret lair of terror mastermind Osama Bin Laden hidden deep in the mountains of Afghanistan. They show where the evil leader rules over an incredible network of fortified underground bunkers which conceal his fanatical followers as they are trained to unleash violence against America and Britain. Up to 1,500 extremist Islamic recruits at a time have learned their skills with guns, explosives and even biological and chemical weapons in the maze of tunnels deep beneath the barren terrain. The photos - clear enough to pick out recruits marching along a track in single file - show: A COMPLEX of camps covering a quarter of a square mile. Intelligence chiefs think this is where some of the terrorists who attacked US embassies in Africa and an American warship were trained. The area is big enough to contain a dairy farm with 4,000 cattle to feed Bin Laden's recruits; ENTRANCES to a labyrinth of 14 tunnels linking dozens of bunkers built in the 1980s to protect against attacks from the Russians. They contain training centres and probably also massive caches of chemical and conventional weapons. There are many escape exits; GUN emplacements and surface-to-air missile sites dug into the hillsides. There is even a suspected helipad from which Bin Laden may have fled in 1998 when America launched cruise missiles against his bases after the embassy attacks. The complex is one of about 30 boltholes where Bin Laden may be lurking and its camps present a prime target for the SAS, American special forces and Allied jets." See: <http://www.globalsecurity.org/org/news/2001/010930-attack02.htm>

Cartwright, Justin. November 3, 2001. "Saturday Review: Familiar Ground: Much has Changed in the 120 years, since British Forces last Fought in Afghanistan. Nevertheless, finds, Justin Cartwright, there are a number of ominous parallels." *The Guardian* (Guardian Saturday Pages). Page 3. DataTimes Accession Number: GRDN20011103028A43D0.

"The roads to Kandahar, Kabul and Jalalabad are treacherous. The tribes - a profusion of competing and interlocking interests that no one understands - are untrustworthy, although picturesque: the paper's special artist and army officers send in sketches. Riflemen wait in every pass. Some, such as the Beloochees, are "wild-looking with their long hair, loose frocks, and Jewish cast of features". There are caves, many of them dating back to an earlier, Buddhist phase, that are dug miles into the mountains and are completely impenetrable. There are fanatical mullahs urging on the tribes people. The mountains are clad in snow. "The Gurkhas are a hardy race of hillmen, but no Indian native troops could find the severe climate of the Afghanistan highlands quite congenial to them." Horses and guns tumble down into the gorges. Rafts sink. This is the story in the *Illustrated London News* of 1879."

Caspani, E. 1945. "The Cave of the Shadow of the Buddha at Narahara." *Journal of the Asiatic Society of Bengal*. Letters, volume XI, pages 49-52. OCLC: 1824093.

- “The Cave as Canvas: Hidden Images of Worship Along the Silk Road.” A display concerning the caves at Bamiyan and Kucha (Qizil, China) is at the Arthur M. Sackler Gallery, Smithsonian Institution, 1050 Independence Ave. SW, Washington, DC, September 9, 2001 through July 7, 2002.
- ”Cave Hit-List in Hunt for bin Laden.” November 24, 2001. *Belfast News Letter*. Ulster. Page 6. DataTimes Accession No: BFNL2001112402A6C2B6.
- “American forces were yesterday searching for Osama bin Laden with a hit-list of cave networks in Afghanistan where the terrorist leader may be hiding. The list of targets has been drawn up from spy planes, satellites, patrols by special forces and information from Russia's secret service, which is using files dating from the Soviet invasion to aid the American effort.”
- Chabert, Claude and Montserrat Ubach. December 1975. "Campagne de Reconnaissance Spéléologique en Afghanistan." *Grottes et Gouffres*. “du *Bulletin du Spéléo-Club de Paris*.” No. 58, pages 3-17. “Le Président Claude Chabert incite à améliorer la fréquence, la qualité d'édition et à changer de format. Bruno Jasse assure une parution de quatre numéros par an, en moyenne de 35 pages, soit près de 1,000 pages. Mais la quantité d'articles importants entraîne Claude Chabert, en 1975, à lancer les *MEMOIRES* du *SPELEO-CLUB de PARIS* sans périodicité précise, mais ayant pour objectif de traiter d'un seul sujet par numéro. Pendant cette période, six mémoires ont été édités traitant de pays lointains comme le Guatemala ou l'Afghanistan, ou de sujets divers, comme le secourisme souterrain.” (President Claude Chabert intends to improve the frequency, the quality of the editions and to change the format. Bruno Jasse wants publication of four numbers per annum, on an average of 35 pages each, nearly 1,000 pages. But the quantity of important articles involves Claude Chabert, in 1975, with launching the *MEMOIRES* of the *SPELEO-CLUB* of *PARIS*, without precise periodicity, but having an objective to treat only one subject per number. For this period, six memories were published treating remote countries like Guatemala or Afghanistan, or of various subjects, like the underground first aid.)
- Chabert, Claude and Montserrat Ubach. 1978. "Campanya Espeleologica a l'Afghanistan." *Espeleoleg*. Numbers 26/27, pages 385-429. SA: 1974-12228. A French and Spanish expedition to explore the caves of Afghanistan, in the provinces of Parwan and Zarul. Descriptions of the caves Ab Bar Amada (1220 m), Ghar Idjon (326 m), Ghar Bolan Baba (730 m). Descriptions also of the bio-speleology of the caves, with a good bibliography of some 71 references. “Ce pays aux immenses étendues de calcaire métamorphisé sem-Ble offrir peu de possibilités spéléologiques. Il a été prospecté en 1957-1958 par le biospéléologie suédois Knut Lindberg. Il a fait l'objet de deux expéditions, en 1974: Association de Recherches Internationales d'Archéologie et de Spéléologie (Rouen) et en 1975: Spéléo-Club de Paris et Equip de Recerques Espeleogiques de Catalunya (Barcelona). On trouvera dans « Speleologie Afghane », Mémoires du Spéléo-Club de Paris, 1975, 1, la totalité des topographies réalisées dans ce pays et une bibliographie exhaustive. 1 – Ab Bar Amada (massif du Salang, Qalatak, Parwan) 1 220 m Résurgence semi-fossile (alt. 2 240 m) au développement horizontal. Exploré par l'A.R.I.A.S. sur 1 140 m, le développement passé a 1 220 m en 1975. Entrée connue des indigentes. 2 – Bolan Baba (ghar) (massif de Bolan Baba, Qalat, Zabul) 730 m

Connue de habitants (alt. 1 795 m), elle est reconnue sûr 170 m par Lindberg en 1958 et topographie sur 730 m en 1975. C'est aussi la cavité la plus profonde du pays: -33m! 3 - I Dijon (ghar) (massif du Salang, Qalatak, Parwan). 326 m topographie sur 326 en 1975, cette grotte fossile (alt. 2 180m) a de je été parcourue par les Afghans." ("This country extended from metamorphized limestone seems to offer few speleological possibilities. It was prospective customer in 1957-1958 by the Swedish biospeleology Knut Lindberg. It was the subject of two expeditions, in 1974: Association of International Research of Archaeology and Speleology (Rouen) and in 1975: Spéléo-club of Paris and Equip de Recerques Espeleogiques de Catalunya (Barcelona). One will find in "Speleologie Afghan", Mémoires of the Spéléo-Club of Paris, 1975, 1, the totality of topographies produced for this country and an exhaustive bibliography. 1 - Ab Bar Amada (massive of Salang, Qalatak, Parwan) 1 220 m Resurgence semi-fossil (alt. 2 240 m) with the development horizontal. Explored by the A.R.I.A.S. to 1 140 m, the last development have 1 220 m in 1975. Known entry of the poor ones. 2 - Bolan Baba (ghar) (massive of Bolan Baba, Qalat, Zabul) 730 m Known inhabitants (alt. 1 795 m), it are recognized sure 170 m by Lindberg in 1958 and topography out of 730 m in 1975. It is also the deepest cavity of the country: -33m! 3 - I Dijon (ghar) (massive of Salang, Qalatak, Parwan). 326 m topography out of 326 in 1975, this fossil cave (alt. 2 180m) were used by the Afghans.")

Chabert, Claude with the collaboration of Paul Courbon. 1977. "Les Grandes Cavités Mondiales." *Spélunca*. Supplément au n. 2. "Afghanistan." Page 3. OCLC: 2830973.

"Ce pays aux immenses étendues de calcaire métamorphisé semble offrir peu de possibilités spéléologiques. Il a été prospecté en 1957-1958 par le bio spéléologique suédois Knut Lindberg. Il a fait l'objet de deux expéditions, en 1974: Association de Recherches Internationales d'Archéologie et de Spéléologie (Rouen) et en 1975: Spéléo-Club de Paris et Equip de Recerques Espeleogiques de Catalunya (Barcelona). On trouvera dans <<Spéléologie Afghane>>, Mémoires de Spéléo-Club de Paris, 1975, 1, la totalité des topographies réalisées dans ce pays et un bibliographie exhaustive. 1- Ab Bar Amada (massif du Salang, Qalatak, Parwan)-1220m. Résurgence semi-fossile (alt. 2240 m) au développement horizontal. Exploré par l'A.R.I.A.S. sur 1140m, le développement passé à 1220m en 1975. Entrée connue des indigènes. 2- Bolan Baba (massif de Bolan Baba, Zabul) 730m. Connue des habitants (alt. 1795m), elle est reconnue sur 170m par Lindberg en 1958 et topographie sur 730m en 1975. C'est aussi la cavité la plus profonde du pays: - 33m! 3- I Dijon (ghar) (massif du Salang, Qalatak, Parwan) 326m. Topographie sur 326m en 1975, cette grotte fossile (alt. 2180m) a déjà été parcourue par les Afghans."

Charlton, Chris, 2002, "Clearing The Caves." *Soldiers* (US Army). Volume 57, issue 6, June 2002. Pages 16-17.

"Charlton discusses training techniques currently being employed by the US Army to prepare its troops for cave clearing missions. These exercises utilize much of the knowledge that the Army gained during its recent work in Afghanistan."

"Engineer ANCOG instructors developed the instruction because soldiers training at the Engineer School might deploy to Afghanistan, and cave-clearing missions might be among the duties soldiers will perform there for some time, said course

chief 1SG Ronald Cook. The Army's engineers, who usually deploy downrange to locate and eliminate booby traps and mines, need to know how to perform those tasks inside caves, too, Cook said. During a recent three-day exercise, some of the ANCOG students in Class 01-02 traveled to Miller Cave, located at Fort Leonard Wood, to complete the cave-clearing training.”

Coad, Brian W. 1981. “Fishes of Afghanistan, an Annotated Checklist.” *Publications in Zoology*, National Museums of Canada. 26 pages.

This article supposedly has some information on cave fishes from Afghanistan.

Coiffait, H. 1959. “Sur les Catopides du Sud-ouest de l’Asie. Uber Catopiden Sudwestasiens. (Betr. Höhlenfunde in Afghanistan).” *Revue Française D’Entomologie*. Paris. Volume 26, pages 26-38. OCLC: 5730473.

Conolly, Edward Barry. 1840. “Note of Discoveries of Gems from Kandahar.” *Journal of the Asiatic Society of Bengal*. Calcutta. Reprinted in: BBO p. v. 2, no. 3. 10 pages. Master microform held by the New York Public Library. 1 reel. NUC: 87-425951; OCLC: 25242407.

Subject descriptors: Gems. Afghanistan.

Coon, Carleton S., Ralph, Elizabeth K. 1955. “Radiocarbon Dates for Kara Kamar, Afghanistan.” *Science*. Volume 122, number 3176, November 1955, pages 921-922. GeoRef Number: 1958-006486.

Tabulates and briefly discusses radiocarbon dates for material from cave deposits containing upper Paleolithic and mesolithic artifacts in the Kara Kamar rock shelter, north of Haibak, Afghanistan. Subject descriptors: Afghanistan; geologic-time; Kara-Kamar; radiocarbon dates.

Coon, Carleton Stevens. 1957. “Kara Kamar: The Black Belly.” Chapter VI in: *The Seven Caves: Archaeological Explorations in the Middle East*. New York: Knopf. Pages 217-254.

This is an account of an archaeological expedition into Afghanistan in 1954 looking for caves and rock shelters used by upper Paleolithic people. Some cave diagrams and photographs.

Coon, Carleton Stevens, 1904- , 1958, *Die Sieben Höhlen: Eiszeitjäger und Steinzeitbauern zwischen Tanger und Afghanistan = The seven caves; Übersetzung aus dem Amerikanischen von Fred und Jessica Schmitz; mit 36 Abbildungen auf Kunstdrucktafeln und 41 Zeichnungen im Text*. Wiesbaden: F.A. Brockhaus, 1958. 303 pages, [14] leaves of plates: ill.; 24 cm. Language: German. OCLC: 40857581.

Subjects: Caves. Excavations (Archaeology).

Coreman, J. 1960. “Contributions à l’Étude de la Faune d’Afghanistan. 28. Acariens Recueillis dans le Domain Souterrain.” *Bulletin de l’Institut Royal des Sciences Naturelles de Belgique*. Volume 36, number 12, pages 1018.

Corsini, Skip. Winter 1972. “The Qanat Systems.” Term paper for Geography 136, Prof. Dan Lutten, University of California, Berkeley, Typescript. Includes bibliographical references. 8 leaves, illustrations. 28 cm. OCLC: 35753937.

Courbon, Paul. 1979. “Afghanistan.” *Atlas des Grands Gouffres du Monde*. Marseille: Editions Jeanne LaFitte. Fédération Française de Spéléologie, Union Internationale de Spéléologie. Page 55. OCLC: 5777495.

Abstract: “Les chaînes montagneuses du pays sont parmi les plus hautes du monde (Hindou Kouch 7.730) Pourtant, les recherches spéléologiques du Knut Lindbert

(1947 et 1958), puis de deux expéditions, française (ARIAS, 1974) et Franco-Espagnole (S.C. Paris-ERE Catalunya, 1975), n'ont rien donné. Les karsts visités, fortement métamorphisés, ne semblent pas favorables aux grandes cavités. Cavités les plus importantes Ghar Bolan Baba (Zarul) -33m; Ab Bar Amada (Parwan) L-1220m" ("The mountainous chains of the country are among highest of the world (Hindu Kouch 7.730) Important speleological research of Knut Lindbert (1947 and 1958), then of two other expeditions, one French (ARIAS, 1974) and Franco-Spanish (S.C. Paris-ERE Catalunya, 1975), did not give anything. The karsts visited, were strongly metamorphized, do not seem favorable to the large cavities. Most important caves were Ghar Bolan Baba (Zarul) -33m; Ab Bar Amada (Parwan) L-1220m ") Courbon, Paul, Claude Chabert et al. 1986 "Afghanistan." *Atlas Des Grand Cavités de Mondiales*. Publié avec le concours de l'Union Internationale de Spéléologie et de la Fédération Française de Spéléologie. Paris. Page 69.

This is basically a re-hash of what was published in Chabert's publications given above.

Courbon, Paul, Claude Chabert, Peter Bosted and Karen Lindsley. 1989. "Afghanistan." In: *Atlas of the Great Caves of the World*. St. Louis: Cave Books. Page 121. ISBN: 0-939748-21-5.

An English translation of the Atlas Des Grandes Cavités de Mondiales given above.

Cressey G. B. 1958. "Qanats, Karez and Foggars." *Geographical Review*. Volume XLVIII, January (1958), pages 27-40. New York. OCLC: 1570664.

"Kanat or qanat: [this] is underground water channel known as foggar in Libya or kariz in Afghanistan. The principal characteristics are given."

Crossland, Roger, 2005, Morlocks: Adversaries Go Underground. United States Naval Institute. *Proceedings*, April 1, 2005. Volume 131, Issue 4; pages 40-42. ISSN: 0041-798X.

Abstract: We think first in terms of caves-the most primitive form of concealment-when we think of underground enemies. In January 2002, a SEAL platoon "illuminated" the caves of Zhawar Kili in Afghanistan. The complex included 50 natural caves, some "improved" caves and tunnels, and a few above ground structures, and was used by al Qaeda and the Taliban to concentrate and conceal significant resources. During the 1980s, in Afghanistan, the Mujihadeen enlarged irrigation cuts known as karez and employed commercial tunnel-building equipment to foil another air power, the Soviets, and in recent years the Taliban has used the same techniques against the United States.

Cummins, Chip. January 15, 2002. "US Seals Caves in Eastern Afghanistan After Search Ends; Missions to Continue." *Wall Street Journal*, page A18.

"...Defense officials say there are many more cave complexes like the one at Zhawar Kili..." Abstract: U.S. soldiers have concluded an extensive search of underground tunnels and bunkers at a sprawling cave complex in eastern Afghanistan, and U.S. warplanes are bombing entrances to those underground structures to seal them and prevent their further use. Zhawar Kili has been a target of U.S. bombs since air raids over Afghanistan began in October, but interest in it was renewed after U.S. troops and American-backed Afghans were able to search the area more thoroughly earlier this month. U.S. warplanes have flown near-

- continuous missions over the complex ever since, and teams of special-operations soldiers and Marines, aided by local Afghans with knowledge of the geography, began combing through the caves last week. U.S. commanders concentrated on Zhawar Kili after wrapping up a similar search of caves at Tora Bora, another complex of underground hiding places near Jalalabad. The Pentagon had believed Mr. bin Laden, accused by the U.S. of complicity in the Sept. 11 terrorist attacks, had been hiding at Tora Bora before it was overrun by U.S.-backed Afghan fighters.
- Davidson, Keay. October 8, 2001. "Detecting al Qaeda in Caves a Tough Job: Underground Cavity Science Underdeveloped." *The San Francisco Chronicle*. Page A3. DataTimes Accession No: SFCX3206761.
- "Osama bin Laden and his followers may be hiding inside some of the innumerable hidden caves that pockmark Afghanistan's forbidding terrain. But which caves? That question may haunt U.S. troops, for the science of "cave detection" is pretty iffy."
- Dedkov, A. P. 1988. "Geomorphology of the Kabul Basin." *Geomorfologiya* 2 (1988) pages 66-71. Russian. GeoBase Accession No: 0743961.
- "The city of Kabul occupies two intermountain basins within the limits of the Kabul tectonic block which is an Early Alpine geoanticlinal uplift. Principal topographic elements of the region are bordering mountain ridges, Late Pleistocene and Holocene alluvial-lacustrine plains, Pliocene-Pleistocene piedmont plains and Pliocene-Pleistocene inselbergs. Three main tectonic-climatic stages are distinguished in the basins' topographic evolution which began at the Miocene." English summary.
- Dedkov, A. P.; S. A. Dzhoyan and V. Mozherin. 1990. "New Data on Afghan Topography." *Izvestiya - Vsesoyuznogo Geograficheskogo Obshchestva* 122, no.5 (1990) p. 420-424. In Russian. GeoBase Accession No: 0870177.
- "Cartometric research was carried out into the relief of Afghanistan. The research was based on a hypsometric map of Afghanistan on a scale of 1:1000 000 produced by the Afghan Institute of Cartography in 1984. The processing of morphometric data using a BK-0010 mini-computer revealed 11 main types of relief which may be divided into 3 groups: high mountains, medium to low mountains, and plains. The rationalization of the relief will form a basis for the rationalization of climate, river discharge, soils, vegetation and geographical landscape."
- Dixon, V. R. and D. Duba. 1972. "Assessment of Groundwater Recharge in the Upper Tarnak Basin of Afghanistan." In: Proceedings of the 24th Session of the International Geological Congress, Section 11, Hydrogeology; Montreal, Canada, 1972: International Geological Congress Publication, pages 130-138. Water Resources Abstract Number: 7309957.
- Abstract: The physiography, geology, and hydrometeorology of the semiarid upper Tarnak basin of Afghanistan are briefly described. The main aquifers are in the alluvial and colluvial sediments of recent age. Phreatic conditions exist in places, particularly in the fanheads and along the valley flanks, whereas leaky artesian conditions are evident in the middle and lower fans and valley center. Groundwater levels are more than 10 m below the ground surface throughout most of the valley and in places exceed 50 m. Measured permeabilities vary from 6 m/day to more than 170 m/day. Infiltration of runoff from the mountains is by far

the most important source of groundwater recharge. The direct infiltration of precipitation, and infiltration from streams in the valley center, appears to be negligible. Large groundwater withdrawals by means of karez amount to 190 million cu m annually. The amount is equivalent to about 14% of the total precipitation on the basin for an average year, 44% of the precipitation falling on the mountains during the December-April season, and 95% of the latter precipitation minus basin evaporation.

Donnelly, Laurance J., 2004, Geological investigations at a high altitude, remote coal mine on the Northwest Pakistan and Afghanistan frontier, Karakoram Himalaya. *International Journal of Coal Geology*. Volume 60, Issues 2-4 , 3 December 2004, Pages 117-150. ISSN: 0166-5162; OCLC: 06923547.

Subjects: Karakoram Himalaya; Mining; Coal exploration; Geotechnical; Geohazards. Abstract: The Northwest Pakistan and Afghanistan frontier is located one of the most remote, inaccessible, and inhospitable part of the Himalayan orogenic belt. In this region, two of the world's largest and most distinct mountain belts intersect; the Karakoram Himalaya (mainly in Pakistan) and the Hindu Kush (mainly in Afghanistan). Located at high altitude, in a remote part of Northwest Pakistan, close to the border with Afghanistan, tribal villagers began excavating a series of adits into the steep mountain slopes, beneath glaciers, to extract valuable coal and carbonaceous shale resources. These were discovered in 1996, by the villagers, whilst hunting, and may represent some of the highest mine workings in the world. Small-scale mining operations subsequently developed using rudimentary mining methods and the mine became known as the Reshit or Pamir Coal Mine. The coal deposits are sedimentary, highly disturbed and tectonised, having been subjected to multiple phases of orogenic crustal deformation. The coal occurs as discrete lenses, several tens of metres in their lateral dimension, between steeply dipping, overturned and thrust limestone beds of Jurassic age. The coal provided a vital, alternative source of fuel for the villagers since the local, traditional fuel supply was wood, which had become severely depleted, and imports of kerosene from neighboring China and Afghanistan were too expensive. The mining operations experienced severe problems. These included several collapses of mine entrances, the failure of the adits to intersect the coal-bearing zones, the potential threat of geological hazards, mining-induced hazards and harsh high-altitude operating conditions, particularly during the winter months. International aid was provided to assist the villagers and a geological investigation was commissioned to investigate the problems at the mine. The geology of Karakoram Himalaya is relatively poorly understood. Until recently the region was restricted to foreign visitors and large areas of this mountain belt are virtually unmapped. Existing geological and topographic maps are difficult to obtain or are unavailable due to the close proximity of political frontiers, national borders and security reasons. The mineral resource potential of this region is virtually unknown. Few western geologists have visited this area due to its inaccessibility and political constraints, being situated close the frontiers with China, Afghanistan, and the disputed Pakistan and India territory of Kashmir. The Pakistan and Afghanistan border, is once again, now closed to foreign visitors. The objectives of this paper are to document the occurrence of coal and carbonaceous shale, at high altitude, in

the Karakoram Himalaya and to provide details on the geology, geological hazards, reserves and labour-intensive mining operations. These observations and information may provide the basis for future mineral exploration, mining-geology, mining-engineering, feasibility studies and engineering geological investigation in the Karakoram Himalaya.

Donnelly, L. J. et al., 2004, Geological investigations at a high altitude, remote coal mine on the Northwest Pakistan and Afghanistan frontier, Karakoram Himalaya.

*International Journal of Coal Geology*, 2004, 60,(2-4), 117-150.

Drummond, Captain E. E. (Date not given). "On the Mines and Mineral Resources of Northern Afghanistan." *Journal of the Asiatic Society of Bengal*. Volume 10, pages 74-93.

"This author stayed some time in the Logar valley during the First Afghan War, and was thus enabled to examine the copper ore-bearing district of the neighborhood..."

Ducluzaux, Bruno. "La Spéléologie dans l'Himalaya." (Speleology in the Himalayas) *Echo des Vulcains*, (Lyon: Groupe Spéléologie Vulcain, A.S.U.L.), supplement number 50, 80 pages, with location maps, cave plans, 1 cover photo, no bibliography. OCLC: 48989655. SA: 1994-3548; 1994-3550.

Detailed reports of the "Nepal 92" and the "Himalaya 92" (Shikar Mountain and Naini Tal vicinity) expeditions. The "...backbone of the publication is a compilation of odds and ends concerning caves and karsts of the Himalaya and its adjoining areas, based on publications of the French geological expeditions."

La Spéléologie dans L'Himalaya. Description par état L'Afghanistan. L'Afghanistan possède de grandes étendues calcaires. La grotte de Ab Bar Amada est une émergence semi-fossile (alt. 2240 m, dév. 1220 m) - massif de Salan - province de Parwan. Dans la vallée de Salan, une résurgence de plus de 1 m<sup>3</sup>/s et de nombreuses grottes fossiles ont été reconnues par le S. C. de Paris.

Abstract: Ghar Bolan Baba (alt. 1795 m, dév. 730 m) se situe dans la deuxième région karstique connue du pays: la province de Zarul. Cette grotte est belle (concrétionnements, excentriques) et chaude (18 à 22,5°C). Elle est fréquentée par des hindous comme lieu de culte. Comme en Inde et au Népal, ils colorent les stalagmites en rouge et en jaune. Seulement deux expéditions spéléologiques ont prospecté l'Afghanistan: ARIAS (1974) et S. C. Paris (1975). Le pays serait donc intéressant à revoir: les émergences ont sûrement un bassin d'alimentation à prospecter et les montagnes de l'Hindou Kush culminent à plus de 7000m. (Translation: Speleology in the Himalayas. Description of each state in Afghanistan. Afghanistan has great extents limestones. The cave of Ab Bar Amada is an emergence semi-fossil (alt. 2240 m, Dev.. 1220 m) - massive of Salan - province of Parwan. In the valley of Salan, a resurgence of more than 1 m<sup>3</sup>/s and many fossil caves were recognized by Speleo-Club of Paris. Ghar Bolan Baba (alt. 1795 m, Dev.. 730 m) are in the second known karstic area of the country: the province of Zarul. This cave is beautiful (concretion formations, eccentrics) and warm (18 with 22,5°C). It is used by the Hindus as a place of worship.

As in India and in Nepal, they colour the stalagmites in red and yellow. Only two speleological expeditions prospected Afghanistan: ARIAS (1974) and S. C Paris (1975). The country would be thus interesting to re-examine: cave emergences have surely a reservoir to prospect and the mountains of the Hindu Kush culminate with more 7000m.)

Dupree, Louis; Lattman, Laurence H.; Davis, Richard S. 1970. "Ghar-i-Mordeh Gusfand (Cave of the Dead Sheep); a new Mousterian Locality in North Afghanistan." *Science*. Volume 167, number 3925, pages 1610-1612. GeoRef Number: 1981-060274.

Archeological site, rock shelter, cave fill deposits (gravels and loess), artifacts. Subject descriptors: Afghanistan; artifacts; caves; Cenozoic; Ghar-i-Mordeh-Gusfand; Paleolithic; Quaternary; Stone age; stratigraphy.

Dupree, Louis. 1972. "Introduction; Outline of Work by Season." In: Prehistoric Research in Afghanistan (1959-1966). *Transactions of the American Philosophical Society*. 62, Part 4; 4, Pages 5-13. Volume 62, Part 4. American Philosophical Society. Philadelphia, PA, United States.

Archaeological studies in caves of Afghanistan. Subject descriptors: Afghanistan; archaeology; caves; Cenozoic; geomorphology; Quaternary; solution features; stratigraphy. GeoRef Number: 1972-025338

Dupree, Louis, 1964. "Prehistoric Archeological Surveys and Excavations in Afghanistan: 1959-1960. *Science*. Volume 146, number 3644, October 1964, pages 638-640.

Dupree, Louis. 1972. "Prehistoric Research in Afghanistan (1959-1966)." *Transactions of the American Philosophical Society*. 62, Part 4; 4, 1972. Volume 62, Part 4, 84 pages. American Philosophical Society. Philadelphia, PA, United States. GeoRef Number: 1972-025337.

A compilation of papers; those within scope of this Bibliography cited separately under the individual authors, references included at end of text. Subject descriptors: Afghanistan; archaeology; caves; Cenozoic; geomorphology; Quaternary; solution features; stratigraphy.

Dupree, Louis. 1956. "Shamshir Ghar." *Arts Asiatique*. Volume III, pages 195-206.

Dupree, Louis. 1958. "Shamshir Ghar: An Historic Cave Site in Kandahar Province, Afghanistan." *Anthropological Papers of the American Museum of Natural History*. Volume 46, part 2. OCLC: 1610861.

Based in part on Dr. Dupree's thesis from Harvard University.

English, Paul Ward. No date given. "Qanats and Lifeworlds in Iranian Plateau Villages." *Yale F & ES Bulletin*. Accessed on the web on November 21, 2001. 19 pages.

"To the east of Iran, where they are generally known by the Persian word *kariz*, qanats came into use in Afghanistan..." See:

<http://www.yale.edu/environment/publications/bulletin/103pdfs/103english.pdf>

Feiste, Carolanne Sacry. 2002. "NAVAIR's Tunnel Warfare Center Offers Timely Training." *Navy NewsStand*. Story Number: NNS020724-30. Release Date: 7/24/2002. NAVAIR Program Support Public Affairs Office.

Abstract: CHINA LAKE, Calif.: Last month U.S. and coalition forces were cautiously combing the mountainsides of Afghanistan in Operation Mountain Lion, checking caves and tunnels for booby traps, tunnel stability, air stability (methane gases), weapons and munitions and enemy hideouts. The ongoing war in Afghanistan prompted a search for a stateside location for tunnel-warfare training. That search has resulted in the establishment of a Joint Tunnel Warfare capability at the Naval Air Systems Command facility at China Lake, Calif. See:

[http://www.navy.mil/search/display.asp?story\\_id=2790](http://www.navy.mil/search/display.asp?story_id=2790)

Filkins, Dexter, 2002, G.I.'s Search Afghan Caves, Finding Trove of Material. *New York Times*. (Late Edition (East Coast)). New York, N.Y. April 7, 2002. page 1.20.

Abstract: The search of the caves appeared to represent a new phase in the American operation in Afghanistan. After the end of the large American operation last month in the Shah-i-Kot Valley, where hundreds of Taliban and Al Qaeda fighters were thought to have been killed, American troops appear to be moving toward smaller operations against targets that are more dispersed. The caves, many of them fortified during the American-backed war against the Soviet Union in the 1980's, lie just a few miles from the border with Pakistan, where hundreds of Taliban and Al Qaeda fighters are believed to have fled in the past few months. The caves lie in a region called Zhwara, about 30 miles from the Shah-i-Kot Valley, from which many Taliban and Al Qaeda fighters were thought to have escaped. So far, Pakistan is off-limits to American troops, and American and Afghan officials worry that the fugitive fighters appear to be planning guerrilla attacks from their Pakistani sanctuaries. Although Pakistani officials insist that the 12,000 soldiers they have deployed in the border region are keeping a lookout for Taliban and Al Qaeda fighters, there have been persistent reports that these fighters are regrouping in the largely ungoverned area.

Finlan, Alastair. 2003. "Warfare by other means: special forces, terrorism and grand strategy." *Small Wars & Insurgencies*, March 2003, vol. 14, no. 1, pages 92-108. ISSN: 0959-2318; OCLC: 21769758.

Abstract: This contribution looks at the role of Special Forces in anti-terrorist operations with particular emphasis on the British Special Air Service. It argues that Special Forces have played a pivotal role in such operations since the era of Palestinian terrorism in the early 1970s. The essay looks at the operations in Afghanistan leading to the overthrow of the Taliban in 2001 and shows that the seven Special Forces involved there proved crucial to the success of the limited ground forces. In particular they served a valuable force multiplier by acting as a nexus between the regional warlords and the use of air power as well as mobile strike units against fortified Al Qaeda and Taliban positions. In the latter instance their success was mixed, involving attacks on difficult cave hideouts, though overall it can be concluded that Special Forces have demonstrated their capacity in fighting unconventional warfare against mobile and transnational terrorist groupings.

Fisher, David. December 1, 2001. "Army Trains for Combat in a New Kind of Battlefield: Afghan Caves." *Seattle Post-Intelligencer*. See the site accessed on December 5, 2001 at: <http://globalsecurity.org/org/news/2001/011201-attack02.htm>

- “Most of Afghanistan's ancient caves are too small to hide a significant force for long, and the rock that was excavated to create bigger bunker complexes, such as Tora Bora in the 1980s, is easily spotted by satellites and flying drones.”
- Fleischman, John I. Winter 1972. “Qanants [sic], Kanats and Foggaras.” Term paper for Geography 136, Prof. Dan Luten, University of California, Berkeley, 14 leaves; p., 28 cm. Typescript (photocopy). Includes bibliographical references. Other Titles: Qanats, karizi and foggaras. OCLC: 35754133.
- Ford, Gregory J., March 2004, “Lessons Learned from Afghanistan: A Battalion S2's Perspective.” *Military Intelligence Professional Bulletin*. Volume 30, Issue 1), page 19. LCCN: 99-28084; OCLC: 32678974.
- “After the extraction, we refitted and prepared for the next mission, Operation MOUNTAIN LION--a mission to clear caves within Zhawar Kili. Parts of this mission had been conducted on two previous occasions; however, enemy activity was observed in the area again around the caves... Operation MOUNTAIN LION was also interesting because of the amount of contact we had with the average Afghan militia member. We spent our time during this operation under the constant eye of the local Afghans. They were very cooperative and the militia assisted us in the clearance of the caves and villages in the area...”
- Ford, Jonathan. AH 1375. “From Herat to Kabul, Retracing Robert Bryon’s Road to Oxiana.” *Mardom Nama-e Bakhter* (Afghan Scientific Research Journal): On the History, Culture, Life Style, Environment and Nature in the Cultural Territories of Ancient Bactria, Focused on Afghanistan.” First issue, March 1997. The date is given according to Muslim (Hijrah) calendar (AH 1375). Text is in Pushto (Afghani), and in Arabic script. See their website accessed on December 28, 2001 at: <http://afghanmagazine.com/bakhter/> OCLC: 37973355; 44205384.
- Formoli, Nassir A., 1983, “Status Report: Democratic Republic of Afghanistan.” In: Hydrogeological Mapping in Asia and the Pacific Region. Proceedings of the ESCAP-RMRDC Workshop, Bandung, 1983. *International Contributions to Hydrogeology*. Volume 7. Pages 59-60. ISBN: 3-922705-11-1.
- “A hydrogeological map of the whole country at a scale of 1:1,000,000 has been completed; in addition, some maps of special regions have been produced in a scale of 1:500,000 but these maps are not in great detail and serve as preliminary maps for the areas. In some of the provincial centers, the hydrogeological maps have been completed at the scale of 1:25,000 with rather more detail. For the compilation of these maps we make use of hydrological data and maps, logs from dug pits, boreholes and deep exploration wells for investigating hydrogeological parameters, analyses of water samples, geophysical investigations and data from inventories of the area.”
- Foucher, A. 1924. “De Kaboul à Bactres.” *La Géographie*. Vol. XLII, pages 147-161. In French.
- Mention is made of caves of the Hindu Kush, near Madar and Roui. M. Foucher headed a French archaeological mission to Afghanistan in the early 20<sup>th</sup> century in the Bamiyan caves and Hadda sites.
- Foucher, A. 1924. “Notes sur les Antiquités Bouddhiques de Haibak (Turkestan, Afghan).” *Journal Asiatique*, Paris, volume 205. OCLC: 6837149.

Francis, Peter, Jr. 1982. "Gem Olivine from Afghanistan." *Lapidary Journal*. Volume 36, number 9, pages 1596-1597. ISSN: 0023-8457; GeoRef Number: 1983-015975.

Subject descriptors: Afghanistan; collecting; economic geology; Galeh-Chah; Galicha; gems; Helmund Desert; mineralogy; minerals; mining; nesosilicates; occurrence; olivine; orthosilicates.

Fulghum, David A., 2003, What a Blast- After years of focusing on small bombs, Air Force planners have renewed interest in large, precision-guided weapons. *Aviation Week & Space Technology*. New York: Nov 17, 2003. Volume 159, Issue 20; page 68. ISSN: 0005-2175.

Abstract: Testing of a precision-guided, 10-ton glide bomb designed to maneuver into narrow valleys to attack the well-hidden entrances of caves and tunnels with a massive blast wave will resume next month. The GBU-43/B Massive Ordnance Air Blast (MOAB) weapon was rushed into service early in the year for the conflicts in Iraq and Afghanistan. Beginning Nov. 19, it will be the subject of a new series of three tests on design improvements. Since its initial deployment, US Air Force planners have been considering the development of larger versions of MOAB with alternative warheads for use by the heavy bomber force, particularly the stealthy B-2. The precision glide bomb was ordered built and tested 10 months ago to be dropped from MC-130 special operations aircraft. It was quickly fielded, but reached operational units too late to be used. With the bomb's current H-6 fill of aluminum, RDX and TNT, its primary targets are caves and tunnels. The weapon is designed to send a destructive shock wave deep into underground structures, say Air Force officials. The 21,700-lb., all-weather MOAB carries a warhead weighing 18,700 lb. that is triggered by two nose-mounted fuses. "Whether [the tunnel] has doors or not, we want to penetrate the entrance and have a massive blast wave effect down the tunnel for significant distances," a senior Air Force official said.

Fulghum, David A. and Robert Wall. December 3, 2001. "Heavy Bomber Attacks Dominate Afghan War: New Real-Time Targeting, Plus Long Endurance, has Recast the Bomber Fleet as a Full-Time Battlefield Menace." *Aviation Week & Space Technology*. ISSN: 0005-2175.

"While the Northrop Grumman B-2 has not been a player since the first week of the conflict, there is at least a plan to send it back to Afghanistan, this time not as a bomber but to use its high-resolution synthetic aperture radar (SAR) for tracking down and pinpointing small targets such as cave entrances."

Fulghum, David A. and Robert Wall. October 15, 2001. "U.S. Stalks Taliban with New Air Scheme." *Aviation Week & Space Technology*. Volume 155, no. 16, pages 32-35. ISSN: 0005-2175; Periodicals Abstract Number: 84944895. Their website was accessed on December 20, 2001.

"A key to the "closed loop, C4I" operation is keeping an Air Force general in the air over Afghanistan, giving him the authority to launch weapons against Taliban or Al Qaeda senior personnel once they move from their caves."

Furon, Raymond. No date given. "Géologie du Plateau Iranien (Perse-Afghanistan-Beloutchistan)." (Geology of the Iranian plateau) *Mémoires du Muséum National d'Histoire Naturelle*. NS, VII (fasc. 2), pages 177-414. OCLC: 5316699.

No caves are mentioned by name.

- Furon, Raymond. 1951. *L'Iran: Perse et Afghanistan*. Paris: Payot. 336 pages. In French. Description and travel. OCLC: 39235248.
- Gall, Carlotta, 2002, British Report a Taliban-Qaeda Arms Cache. *New York Times*. (Late Edition (East Coast)). New York, N.Y. May 10, 2002. page A.14. ISSN: 0362-4331.
- Abstract: The discovery coincided with a visit to Kabul by Chancellor Gerhard Schröder of Germany, who told Hamid Karzai, the interim Afghan leader, that German troops now in the capital could stay past June. Brig. Roger Lane, commander of the British task force in Afghanistan, said the discovery in the Paktika caves- truckloads of anti-aircraft and anti-tank weapons- vindicated the operation, which has been aimed at clearing Al Qaeda and the Taliban from an 80-square-mile area in southeastern Afghanistan. "With the presence we have mustered here in Kabul, we feel we have reached the limit of our capabilities and therefore we do not see ourselves in a position to expand our area of operations beyond Kabul," Mr. Schroder said. His government has taken a leading role in trying to stabilize Afghanistan.
- Ganss, Ortwin. 1964. "Zur Geologischen Geschichte der Belutschistan-Indus-Geosynklinale (Der Versuch einer Gesamtschau des südoafghanisch-pakistanischen Raumes)." (Translation: "to the geological history of the Belutschistan Indus geosyncline (the attempt of an entire schau of the area pseudo-afghanistan of Pakistan)."  
*Geologisches Jahrbuch*, Bd. 82, pages 203-242; includes two maps, one in color. Bundesanstalt für Bodenforschung. OCLC: 11162007.
- Subject descriptors: Geology- Pakistan, Northern; Geology- Afghanistan, Eastern.
- Garamone, Jim. 2002. "Global Terror Group Primer." Washington: *Navy NewsStand*. 2/14/2002. Story Number: NNS020214-01.
- Abstract: ...In addition to detaining several suspected al Qaeda and Taliban members, SEALs also found a large cache of munitions in numerous caves and above-ground structures. The SEALs destroyed more than 50 caves and 60 structures by using on-ground explosives and air strikes. Navy special operations forces are conducting missions in Afghanistan in support of Operation Enduring Freedom. See: [http://www.navy.mil/search/display.asp?story\\_id=871](http://www.navy.mil/search/display.asp?story_id=871)
- "Geological Structure of the Hajigak Deposit and It's Commercial Value." 1967. Geological and Mineral Survey of Afghanistan. Typescript report. USGS Library.
- "Geological Structure of the Zarkashan Gold Deposit." 1967. Geological and Mineral Survey of Afghanistan. USGS Library.
- Abstract: The Zarkashan and Anguri deposit area was one of the centers of gold mining in ancient times. The large ancient workings, stone mills for ore crushing testify to it. The flourishing period of gold mining fell on 10-13 centuries of A.D.; after invasion of the Mongolians in 1221 metal mining was stopped and mines abandoned. In the fund there is an information (V. Young and Said Abdulakhad-Khan, 1947) that ancient copper mines exist at the Ordo-Kotal (Anguri) area."
- Geology and Mineral Resources of Afghanistan. 1973. Kabul: The Department. 105 pages, plates. OCLC: 17062072.
- Geology and Mineral Resources of Afghanistan. 1983. Ministry of Mines and Industries. Republic of Afghanistan. Kabul, Afghanistan. 109 pages and maps. GeoRef Number: 1987-053515.

- Subject descriptors: Afghanistan; Alpine Orogeny; economic geology; Hercynian Orogeny; maps; metallogenic maps; mineral resources; Phanerozoic; Precambrian; tectonic maps. Map Scale: 1:2,500,000. Reference includes data from PASCAL, Institute de l'Information Scientifique et Technique, Vandoeuvre-les-Nancy, France.
- Glantz, David and Lester W. Grau. August 1996. *The Bear Went Over the Mountain: Soviet Combat Tactics in Afghanistan*. National Defense University Press. Translated and edited by Lt. Col. Lester W. Grau, National Defense University, Ft. Leavenworth, KS. Second printing. DTIC: ADA316729. Available online at: <http://www.dtic.mil/>
- Includes several accounts of fighting around the Salang Tunnel.
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- Goblot, Henri. 1992. "Qanat: Fanni Bara-yi Dastyabi Bih Ab." Publication: [Mashhad]: *Mu'avanat-i Farhangi-i Astan-i Quds-I Razavi*. 372 pages, illustrations. Language: Persian. Title on added title page: *Les Qanats*. Includes bibliographical references (p. [327]-354) and index. Other Titles: *Les Qanats*. Persian; *Qanats*. Responsibility: Hanri Gublu; tarjumah-'i Abu al-Hasan Sarv Qad Muqaddam, Husayn Papuli Yazdi. OCLC: 30469005.
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- Abstract: The leverage that technology offers depends on the circumstances which shape combat such as the theater, the opponent, and the objective. Guerrilla war, a test of national will, and the ability to endure negates many of the advantages of technology. The Russian Army, and its predecessor--the Soviet Army--fought the most recent, large-scale counter-insurgencies pitting technologically advanced mechanized forces against dedicated guerrillas. The Russians are publishing many of their lessons learned now. Although some of these have no direct application to the United States Army, others do, and military professionals need to be aware of how other militaries attempt to solve contemporary problems. The Soviet Army invaded Afghanistan on Christmas Eve 1979 with TO&E divisions equipped and

trained to fight conventional, maneuver warfare on rolling plains. They came to replace an ineffective communist leader, not to fight an insurgency. They planned to stabilize the situation, occupy garrisons, and assist the Afghanistan government while the Afghan government forces fought the guerrilla resistance. Soon, however, mission creep set in, and Soviet forces were locked in a counterinsurgency fight in rugged mountains and desert--a fight for which they were neither equipped nor trained. The technologically superior Soviet Ground Forces were trained to rely heavily on massed artillery, firing normative fires to shatter the defenses of a stationary enemy prior to the attack. The mujahideen guerrilla did not accommodate the Soviet gunners by occupying linear defenses or staying in place. Throughout the war, the Soviet Army continued to rely on artillery and close air support as a substitute for ground maneuver and close combat. The Soviet 40th Army needed lots of light infantry, but chose instead to expend massive firepower to save soldiers' lives and to compensate for their lack of infantry. It was an expensive, indiscriminate, and ineffective policy.

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craters. These are "kyareses" (the singular form is "kyares"). The kyareses are a typical feature of the Afghan landscape, serving as an ancient but effective irrigation and water-supply system. Some of the kyareses are several hundred years old. They were created to prevent water from evaporating under the country's ferocious sun and heat. There is similar construction at Masada, Israel, where a unique combination of channels and cisterns carved from the rocky peaks supplied and protected the water needed to defend that facility against the Romans. In Afghanistan, however, the kyareses first served as shelters and later as fortified positions."

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Abstract: *Ornithodoros (Alectorobius) coniceps* (Canestrini 1890), which was briefly described from adult specimens from St. Mark's Cathedral, Venice, Italy, has been a confusing taxon. We describe and illustrate the adult and immature stages from St. Mark's Cathedral (topotypes) and elsewhere, list criteria to distinguish this species from others in the *O. (A.) capensis* complex, and provide data for 36 collections, chiefly from nest sites of wild and domestic pigeons in humid, rocky situations, and from a nest of the pallid swift, in Italy, France, Egypt, Kenya, Israel, Jordan, Afghanistan, Ukrainia, and Turkmenia... Humans bitten by *O. (A.) coniceps* in buildings or caves may suffer from pain, edema, chills, and fever. Baku virus (Reoviridae) has been isolated from this tick in Uzbekistan, but most reports of other viruses and infectious agents are clouded by probable

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Kelso, Paul. November 2, 2001. "Ancient Water Trenches Give Taliban Ideal Defences." *The Guardian*. Accessed on November 21, 2001 at:

<http://www.guardian.co.uk/waronterror/story/0,1361,585412,00.html>

"Largely invisible at ground level, the karez allow troops to move quickly and safely from position to position, mounting swift surprise attacks and moving on before the enemy has time to respond. Up to 10 feet deep and equally wide in places, the karez also provide vital supply lines and food storage facilities. Many have been fortified to augment the caves in which Osama bin Laden and his retinue are thought to be hiding."

Kennedy, Harold, 2002, Navy sets up new facility for tunnel-warfare training. *National Defense*, Arlington, VA. November 1, 2002, Volume 87, Issue 588; page 40. ISSN: 0092-1491.

Abstract: Tunnels, caves and bunkers buried deep beneath the desert surface have emerged as significant challenges for U.S. air and ground forces fighting in Afghanistan and preparing for a possible attack against Iraq's Saddam Hussein. To

find better ways to locate and destroy such facilities, the Naval Air Systems Command-NavAir for short-has established a Tunnel Warfare Center at its Weapons Division in China Lake, Calif. The center was set up in October of 2001, as the United States began attacking terrorist forces in Afghanistan, said Cmdr. (Sel.) Bill Manofsky, the military deputy for the Weapons and Targets Department at China Lake. Manofsky, a Navy reservist who volunteered for active duty after 9/11, proposed the establishment of the facility after noting the importance of the enemy's underground defenses in Afghanistan. "Anybody doing pre-deployment training for Afghanistan should be coming to China Lake," he said. "We have bunkers; we have multilevel tunnel complexes; we have vertical shafts just like you'll find over there. Some of them look exactly like Afghan aqueducts."

Kennedy, Harold, 2002, Navy seeks to hurry technology to fleet. *National Defense*. Arlington, Va: Dec 2002. Volume 87, Issue 589; page 25 et seq., 3 pages. ISSN: 0092-1491.

Abstract: When U.S. combat troops in Afghanistan needed a weapon to reach deep down into caves and tunnels to destroy al Qaeda hideouts, Navy researchers speeded up their efforts to develop thermobaric explosives. Thermobarics are fuel-rich explosives that quickly burn oxygen from the target, essentially sucking the air from confined caves and tunnels. The Navy had "been working on that technology for years," said Navy Capt. Richard V. Kikla, deputy director for industrial and corporate programs for the Office of Naval Research, in Arlington, Va. But 9/11 added a new sense of urgency to the project, he told National Defense. In response to the attacks, the Navy joined with the Air Force, Defense Threat Reduction Agency and Energy Department to develop and test a laser-guided, 2,000-pound bomb thermobaric explosive within 60 days. They delivered it, in mid-December, to the Afghan theater, where it was used to devastating effect in Operation Anaconda, according to Rear Adm. Jay M. Cohen, chief of naval research. "Such speed was possible because the science was done before the need became urgent," he told a Senate hearing.

Khan, M. F. K. and M. Nawaz. 1995. "Karez Irrigation in Pakistan." *GeoJournal*. Volume 37, number 1, pages 91-100. ISSN: 0343-2521. Author affiliation: Karachi University, Geography Department, Karachi 32, Pakistan. Water Resources Abstract Number: 3801399.

Abstract: "Karez is an indigenous method of irrigation in which groundwater is tapped by a tunnel. After running for some distance the tunnel comes out in the open and the water is conducted to the command area. Karez irrigation is practiced in 22 countries from China to Chile including Pakistan. In Pakistan it is confined to the province of Balochistan which has a tribal society. Karez is an old and stable irrigation system of Pakistan. It is a community enterprise managed by tribal tradition and run by social control. Spacing of the karez, their types, life, length, discharge, land development and allocation, water distribution and management are important aspects of karez irrigation which have been discussed in this paper. Differences in karez maintenance and management produced by differences in tradition and customs of various tribes inhabiting Balochistan are brought out. Furthermore recent changes in Karez irrigation caused by changes in the socio-economic conditions are also analyzed."

- Kiper, Richard L., September 2002, "Caves and Graves: The 19th SF Group." *Special Warfare*. Volume 15, (3), pages 30-31. OCLC: 19478662.  
Abstract: "On April 25, the 2nd Battalion, 19th SF Group, ordered the team to Bagram, where the 3rd SF Group assigned it the mission of supporting cave searches in the Tora Bora region. The team then came under the tactical control of Task Force Rakkasan, from the 101st Airborne Division. Specifically, the team was to reconnoiter potential helicopter landing zones, or HLZs, determine the level of enemy activity, and observe possible cave sites."
- De Laessoë, F. and M. G. Talbot. 1886. "Discovery of Caves on the Murghab." *Journal of the Royal Asiatic Society*. New Series. Volume 18, pages 92-102. ISSN: 0035-869X; OCLC: 1764574. "Darunta: On the hill of Pheel-Khana tope on the left bank of the Kabul river, are many ruins of temples and stupas, while by the riverside are found some remarkable caves."
- Leith, William, 2002, Military geology in a changing world. *Geotimes*. Alexandria, VA. February 2002. Volume 47, Issue 2; page 24. ISSN: 0016-8556.  
Abstract: Geology has become particularly important in the search for Taliban and Al Qaeda forces in Afghanistan, where the US Geological Survey estimates there are more than 10,000 caves, both natural and manmade. Leith discusses the technological changes in military geology.
- Lindberg, Knut. 1959. "Cycloides (Crustacés Copépodes). Contribution à l'Étude de la Faune d'Afghanistan. 13." *Kungliga Fysiografiska Sällskapet i Lund*. N. F. Volume 71, number 11, pages 3-26. Shellfish.
- Lindberg, Knut. 1960. "Cycloides (Crustacés Copépodes). Part II. Contribution à l'Étude de la Faune d'Afghanistan. 34." *Kungliga Fysiografiska Sällskapet i Lund*. N.F. 1960. Volume 71, number 11, 1959, pages 3-16.
- Lindberg, Knut. 1958. "Notes sùr les Grottes d'Afghanistan et Aperçu de leur Faune." (Translation: Notes on the caves of Afghanistan and their fauna) *Actes du Deuxième Congrès International de Spéléologie*. 5-12 October, 1958. Pages 109-143. OCLC: 7279604.  
"Notes on the caves of Afghanistan and their fauna."
- Lindberg, Knut. 1949. "Observations au Sujet des Quelques Grottes Asiatiques." (Translation: Observations on the subject of several Asian caves) *Annales de Spéléologie*. Volume IV, pages 33-47. OCLC: 2129325.
- Lindberg, Knut. 1969. "Recherches Bio-Spéléologiques en Afghanistan." *Lunds Universitets Årsskrift*. N. F. Avd. 2, Bd. 57, Nr. 1. *Kungliga Fysiografiska Sällskapet i Lund. Handlingar*. N. F. Bd. 72, Nr. 1. 39 pages. OCLC: 23391792.  
Includes descriptions and entrance information for 66 caves throughout Afghanistan, and the cave biology found within.
- Lindberg, Knut. 1960. "Revue des Recherches bio Spéléologiques en Asie Moyen et dans le Sud du Continent Asiatique." (Translation: Review of the bio-speleological research in central Asia and the southern Asian continent) *Rassegna Speleologica Italiana*. Volume 12, number 2, pages 1-8. OCLC: 33289216.
- Lips, Bernard. 1997. "La Spéléologie Française- Afghanistan." *Spelunca Mémoires*, no. 23, page 176. No. Special XIIo Congrès. UIS de Spéléologie: la Chaux-de-Fonds. Suisse: Contributions a la Spéléologie. Peu de clubs francais ont pu prospector ce

pays encore récemment en guerre: resultants. "Spelunca" is the quarterly magazine of the Fédération Française de Spéléologie. SA: 1997-4639.

Liska, M. 1979. "Les Lacs de Bandeamir, Parc National d'Afghanistan." *Slovensky Kras*. Volume 17, 1979, pages 163-169. In the Slovakian language. SA: 1980-15487.

Lord, P. B. 1838. "Some Account of a Visit to the Plain of Koh-I-Damam, etc." *Journal of the Royal Asiatic Society of Bengal*. Volume VII, pages 521-537. ISSN: 0035-869X; OCLC: 1764574.

Includes notes about a lead mine near "Feringal," and mention of a natural cave near Talagud, exact location unknown.

Lumpkin, John J. 2001. "Caves Make Perfect Hide-outs." The Associated Press.

Thursday, November 15, 2001. Accessed on November 19, 2001, from:

<http://globalsecurity.org/org/news/2001/011115-attack01.htm> .

Lumpkin, John J. 2001. "Looking for Terrorists' Afghan Caves: U.S. Steps up Efforts to Target Underground Complexes." Associated Press. November 1, 2001.

"The gray mountains of Afghanistan are honeycombed with thousands of natural caverns, most made by water coursing over limestone. But many are manmade. One kind of tunnel, called a karez, is the foundation of an ancient irrigation system used to channel underground water to settlements."

McClymonds, Neal E. 1972. "Shallow Ground Water in the Zamin Dawar Area, Helmand Province, Afghanistan." US Geological Survey, *Open-File Report*, January 1972. 103 pages, 2 folded maps in pocket, in color, showing karez routes and entrances. OCLC: 3133446.

Abstract: "Groundwater conditions are evaluated in the Zamin Dawar area which lies between Kajakai reservoir and Musa Qala Rud (river) in south-central Afghanistan, about 90 km northeast of Lashkar Gah. The area comprises two mainstream drainage areas: that of Gulmesh Mandeh (ephemeral stream) to the east which includes mostly plains with low hills on the east and north slopes and a high limestone scarp on the west slope; and Baghni Rud to the west which drains a mountainous area to the north and spreads onto a large alluvial fan with distributaries leading both to Helmand Rud to the southeast and Musa Qala Rud to the west. During the investigation in 1971, data showed that the karez yield a total of about 20,000 ac-ft of water per year. The springs on the plains yield about 3,000 ac-ft and the wells about 300 ac-ft per year. The inventoried springs in Baghni valley yield about 6,500 ac-ft per year, and supply about 70% of the total water used in the valley. The total amount of water used in the Zamin Dawar area in 1971 was about 32,000 ac-ft (40 million cu m). This amount of water was used to irrigate about 10,000 jiribs (approximately 5,000 acres or 2,000 hectares) of cultivated land and served a population of about 40,000 people."

McWethy, John. 2002. "Soldiers Undercover: Inside the Tora Bora Caves with US Special Forces; They are America's Least Visible Soldiers- and the Most Unconventional." ABC News. January 9, 2002.

"U.S. troops have found eight caves in the area. In all, they contained a quarter of a million rounds of ammunition, untouched by the heavy bombing. If the ammunition survived, bin Laden may have as well."

Maire, R. 1978. "Les Karsts d'Altitude du Moyen-Orient" Translated Title: High Karsts in the Mideast. In: *Actes du 6e Congrès National de Spéléologie*. Translated Title:

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

Proceedings of the Sixth National Congress of Speleology. R. Gidon (editor); Salathe, D (editor); Masson, D (editor) Supplement to "*Stalactite*". Volume 10, pages 123-130. 1978. Société Suisse de Spéléologie. Neuchâtel, Switzerland. 1978. Société Suisse de Spéléologie et Commission de Spéléologie S.H.S.N. 6e Congrès National de Spéléologie. Porrentruy, Switzerland. Sept. 16-18, 1978. In French and German. OCLC: 7596706.

Subject descriptors: Afghanistan; Bolkar-Daglari; dolines; Elburz; geomorphology; karst; Kuh-e-Ghali; Malatya Daglari; Nemrut Dag; Pontic Mountains. GeoRef Number: 1982-030331

Marshack, Alexander. 1972. "Aq Kupruk; Art and Symbol." *Transactions of the American Philosophical Society*. 62; 4, Pages 66-72. GeoRef Number: 1972-025341.

Subject descriptors: Afghanistan; Aq-Kupruk; archaeology; art-mobilier; artifacts; caves; Cenozoic; fossil-man; geomorphology; Quaternary; solution-features; stratigraphy.

Martin, Lorna. 2001. "Warrens Where Death Greets the Unwary." *The Herald*. October 12, 2001. Page 4. DataTimes Accession No: HRLD20011012026F1377

"America is facing a similar type of hazard in Afghanistan as it did when it was confronted with trying to fight a battle in the tunnels of Cu Chi, the Vietcong's underground fortress dug beneath the jungles of South Vietnam. Criss-crossed by mountain ranges which contain tens of thousands of caves, Afghanistan provides limitless hideouts."

Marvel, Bill. 2001. "Afghanistan's "Hidden Caves" a Myth, Experts Say." *The Dallas Morning New*. October 16, 2001. Accessed on December 3, 2001 at: [http://news.nationalgeographic.com/news/2001/10/1016\\_afghancaves.html](http://news.nationalgeographic.com/news/2001/10/1016_afghancaves.html)

"Even finding the underground cavities presents a difficult technical challenge, said Mats Lagmanson, a geophysicist and president of Texas-based Advanced Geosciences Inc. All three techniques that geologists use require that the searchers and their equipment be on the ground near the cavity. Lagmanson's company has used electrical resistivity to find a previously unknown cavern, Sting Cave, north of Austin, Texas. In this method, he said, an electrical current is injected into the ground and its resistance measured at several points. He likens it to a CT scan. Researchers also measure the gravity at ground level, looking for tiny variations. A lessening of gravity may indicate a large underground void. The third method, ground-penetrating radar, has been used to locate underground archaeological sites. "It's beautiful when it works," Lagmanson said. But it works best at shallow depths and certain kinds of soils block the signal. "

Masson, Charles. 1842. "Account of the Progress of Bactro-Indian Numismatic and Antiquarian Discovery, and Observations on the Edifices, Called Topes." Chapter 1. *Ariana Antiqua*. 452 pages, 22 leaves of plates of illustrations and maps, part folded. London: East India Company. OCLC: 3029306, 695014 (1971 reprint)

Masson, Charles. 1971. "Memoir on the Topes and Sepulchral Monuments of Afghanistan." Chapter 2. *Ariana Antiqua*. London: East India Company. 1842. OCLC: 3029306; 695014 (1971 reprint)

Masson, Charles. 1836. "Notes on the Antiquities of Bamián." *Journal of the Asiatic Society of Bengal*. Volume 5. Pages 707-720. USGS Library.

Masters, Marshall. 2001. "Are We Ready to Smoke bin Laden out with Thermobaric Bombs?" *YOWUSA.COM*. October 3, 2001.

Includes information on using fuel-air mixture (thermobaric) bombs in cave complexes.

Medler, James. 2005. "Afghan Heroin: Terrain, Tradition, and Turmoil." *Orbis*. Volume 49, Issue 2, Spring 2005, Pages 275-291.

Abstract: "The overall state of Afghanistan's physical infrastructure was rudimentary at best even before the recent decades of conflict. It was only upon completion of the Salang tunnel in 1964 that overland travel between Kabul and the north became possible during the winter season. The primary national thoroughfare is the Ring Road—which runs from Torghundi in the northwest, south to Herat, southeast to Kandahar, and north to Kabul and Mazar-i-Sharif—and its spurs...."

Middleton, John R. and Tony Waltham. 1987. "Afghanistan." In: *The Underground Atlas*. NY: St. Martin's Press. Page 25.

A one paragraph summation of caves: "As befits a nation sitting astride the join of the Iranian plateau and the Himalayan ranges, Afghanistan has a landscape of desolation and grandeur. Karst rocks are responsible for little of this design, and limestone is known only on the high tablelands to the north of the Bamiyan valley, on the massif of Salang (Parwan) and on the lower desert massif of Bolan (Zabul). Current knowledge is limited, and extensive cave development does not seem likely. The longest system is the Ab Bar Amada (Parwan) with 1,220m of passages explored by a French team."

Middleton, John R. 1982. "Central Asia." *Caving in the Rockies*. Volume 24, number 1, pages 3-11. National Speleological Society, Colorado Grotto. Denver, CO, United States. GeoRef Number: 1955-001163.

Subject descriptors: Afghanistan; caves; geomorphology; solution features.

"Mineral Resources in Afghanistan. Final report." 1992. PB93180529XSP. Performer: Nathan Associates, Inc. and Berger (Louis) International, Inc., Arlington, VA. Agency for International Development, Islamabad, Pakistan. Office of the A.I.D. Representative for Afghanistan Affairs. Date on report cover: "Feb 92." 106 pages.

Subject descriptors: Mineral economics; history; exploitation; gold; cesium; cadmium; economic development; foreign aid; marketing; investments. mining; mineral deposits; geophysical exploration; Afghanistan; strategic planning; gems; natural resources and earth sciences; mineral industries; business and economics. "Despite Afghanistan's wide variety of mineral resources and long history of small-scale mining of gems, gold, copper, and coal, it was not until the 1950's that the country's mineral resources were subject to systematic exploration. The report documents the past and present status of these resources and examines alternative strategies for their exploitation. Chapter 2 provides a brief history of minerals exploration, exploitation, and planning in Afghanistan, including the roles of Great Britain, France, Germany, the Soviet bloc, and the United States in Afghanistan's mineral sector; mineral policy in the five national plans during the years 1962-83; and sector assessments conducted by the World Bank (1978) and the U.S. Department of Energy (1989). Chapter 3 discusses three strategies for developing the country's mineral and hydrocarbon resources. (1) a national orientation focusing on domestic needs; (2) a regional strategy that would consider markets in countries

close to Afghanistan; and (3) an international strategy that would place Afghan resources on the international market.”

Miyaji, Akira, 2002, Bamiyan, harukanari: ushinawareta Bukkyo bijutsu no sekai. Tokyo: Nihon Hoso Shuppan Kyokai. 273 pages: illustration (some color); 18 cm. In Japanese. Includes bibliographical references (pages 265-268). OCLC: 49858850; ISBN: 4140019336.

Subjects: Art, Buddhist- Afghanistan- Bamian Region. Art- Afghanistan- Bamian Region. Cave temples, Buddhist- Afghanistan- Bamian Region. Bamian Region (Afghanistan)- Antiquities. Japanese language.

Mirzad, Said Hashim, No date given. Metallogeny of Afghanistan. [S.l.: s.n., 19--] Notes: Title from caption. Handwritten above title: By eng. Said Hashim Mirzad, Pres. of Mines and Geology. Subjects: Mines and mineral resources- Afghanistan. Ore deposits- Afghanistan. Imprint: 19 leaves; 33 cm. OCLC: 56433108.

Mizuno, Seiichi (ed). 1966. Basawaru to Jerabado- Kaburu: Afughanisutan tonanbu ni okeru bukkyo sekkutsu to buthsuto no chosa 1965. Translated title: “Basawal and Jelalabad-Kabul: Buddhist Cave Temples and Topes in South-East Afghanistan Surveyed Mainly in 1965.” Kyoto University: Iran Afuganisutan Pakisutan Gakujutsu Chosa Hokoku. Title pages and explanatory notes for the illustrations in Japanese and English. Text in Japanese, summary in English. OCLC: 29340434.

Mizuno, Seiichi (ed). 1963. “Haibaku to kashumiru-Sumasuto: Afuganisutan to Pakisutan ni okeru sekkutsu ji-in no chosa 1960.” Translated title: “Haibak and Kashmir-Smast Buddhist Cave-temples in Afghanistan and Pakistan Surveyed in 1960.” Kyoto University: Publications of the Kyoto University Scientific Mission to [the] Iranian Plateau and Hindu Kush, 1962. Title pages and explanatory notes for the illustrations in Japanese and English. Text in Japanese, summary in English. OCLC: 39977957; 29340465; 29058566; 23026621.

Cave plans, maps and illustrations.

Mizuno, Seiichi (ed). 1967. “Hazaru-Sumu to Furu-hana: Afuganisutan ni okeru sekkutsu iseki no chosa 1962.” Translated title: “Hazar-Sum and Fīl-Khāna Cave-Sites in Afghanistan Surveyed in 1962.” Kyoto University: Publications of the Kyoto University Scientific Mission to [the] Iranian Plateau and Hindu Kush. In Japanese and English, with added title page- “Hazar-Sum and Fil-Khana; cave-sites in Afghanistan surveyed in 1962.” Kyoto Daigaku ... Iran, Afuganisutan, Pakisutan Gakujutsu Chosatai ... Dai 3-ji chosa. Bibliography on pages 53-54. OCLC: 23205667.

Moniz, Dave, 2001, Winter's cold may help military track Taliban; Sensors on jets, copters detect heat from caves. *USA TODAY*, November 5, 2001.

Abstract: U.S. forces plan to use an array of high-tech heat sensors to locate and rout Taliban troops from their hideouts during the cold weather. A senior military official knowledgeable about thermal sensors says U.S. forces will need to combine on-the-ground intelligence, satellite photographs and airborne thermal technologies to locate Taliban caves and bunkers. He says the process is difficult but doable. Dave Rockwell, a military analyst at the Teal Group in Fairfax, Va., says it's unclear whether the Taliban has attempted to modify caves, tunnels or other underground buildings to mask heat. "We don't know what level their sophistication is in camouflaging the thermal signatures," he says.

- Montgomerie, Thomas George (1830-1878). 1874. Routes in the Western-Himalayas, Kashmir, &c.: with Additions from Major C. E. Bates' Gazetteer and other Sources. Dehra Doon [sic] Printed at the Office of the Superintendent Grand Trigonometrical Survey of India. 34 pages. *Miscellaneous Papers of India, Afghanistan*. Volume 4, number 8. OCLC: 29128968.
- Mroczkowski, M. 1959. "Zweiter Beitrag zur Kenntnis der Dermestiden von Afghanistan, nebst Beschreibung einer neuen Art (Coleoptera). (Translation: Second contribution to the knowledge of dermestids of Afghanistan, together with a description of a new kind of beetle) Contribution à l'Étude de la Faune Afghanistan. 11." *Kungliga Fysiografiska Sällskapet i Lund. Foerhandlingar*. Volume 29, number 11, pages 99-101. USGS Library.
- Mroczkowski, M. 1960. "Dritter Beitrag zur Kenntnis der Dermestiden von Afghanistan. (Coleoptera). (Translation: Third contribution to the knowledge of dermestids of Afghanistan, together with a description of a new kind of beetle) Contribution à l'Étude de la Faune Afghanistan. 18." *Kungliga Fysiografiska Sällskapet i Lund. Foerhandlingar*. Volume 30, number 7, pages 51-55. USGS Library.
- Nakazawa, Jiro. 1960. "Notes From the Geological Survey and the Prospecting Work of Mineral Research in Afghanistan." *Kozan Chishitsu* (Mining Geology). Volume 10, number 41, pages 175-183. Nihon Shigen Chishitsu Gakkai - Society of Resource Geologists of Japan. Tokyo, Japan. Japanese language. ISSN: 0026-5209; GeoRef Number: 1960-003430.
- Subject descriptors: Afghanistan; economic geology; mineral exploration.
- "Nakhostin Atlas Gography: Jahan va Afghanistan." 1965. Tehran; Moassesseh Gographiaee va Cartography Sahab. Edition: Chap 2. Description: 1 volume, unpagged, with illustrations and maps (chiefly folded). Language: Persian. Notes: Added cover in English: Sahab World Atlas. 2d ed. [Teheran] Edited and published by Geographic & Drafting Institute, 1965. Other Titles: Sahab World Atlas. Mu'assasah-i Jughrafiya'i va Kartografi-i Sahab. OCLC: 15064966.
- National Atlas of the Democratic Republic of Afghanistan. 1985. Edited by the Przedsiębiorstwo Eksportu Geodezji i Kartografii GEOKART and the Afghan Geodesy and Cartography Head Office, Kabul, Afghanistan; Idarah-i 'Umumi-I Jiyudizi va Kartografi. [Warsaw]: Organization for Surveying & Cartography GEOKART, Poland. Notes: Bibliography: pages xii-xiv. Includes index.
- Includes various large scale maps showing some karezi, cave and tunnel information. ISBN: 8300023275; OCLC: 16937261.
- National Geographic Society. 2001, 2002. "National Geographic: Afghanistan - Maps, News, Photos, More." 2001, 2002. Other Titles: "Understanding Afghanistan: Land in Crisis"; "Afghanistan: Land in Crisis." OCLC: 48646075. Access: <http://www.nationalgeographic.com/landincrisis/>
- Abstract: Maps and news on the crisis in Afghanistan-with maps of attacks, Northern Alliance and Taliban territories, refugee camps, caves, ethnic groups, and terrain.
- Navvabi, Ghulam Husayn, 1963, Salang. [Kabul]: Da Matbu'ato Wizarat, da Afkaro da Tanwir Riyasat, 1963. 56 pages, [48] leaves of plates: illustrations, portraits; 21 cm. Language: Persian. OCLC: 33857270; 35035696; LCCN: 95-969525. Subjects: Salang Tunnel (Afghanistan). Tunnels- Afghanistan. Civil engineering-

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

Afghanistan. Note(s): Title from cover. Responsibility: mu`allif, Ghulam Husayn Navvabi.

Tunnels and tunneling in Afghanistan during the 20<sup>th</sup> century.

*Navy NewsStand*. "Eye on the Fleet Photo Gallery." Photo Number: 020114-N-8242C-004 Eastern Afghanistan (Jan. 14, 2002).

Abstract: During a search and destroy mission, U.S. Navy SEALs discover a large cache of munitions in one of more than 50 caves explored in the Zhawar Kili area. Used by al-Qaida and Taliban forces, the caves and above-ground complexes were subsequently destroyed through air strikes called in by the SEALs. Navy special operations forces are conducting missions in Afghanistan in support of Operation Enduring Freedom. U.S. Navy photo. (released). And: 040627-M-8096M-012 Oruzgan Province, Afghanistan (June 27, 2004) - U.S. Marines assigned to Battalion Landing Team, 1st Battalion, 6th Marines, with ground combat element of the 22nd Marine Expeditionary Unit (MEU) (Special Operations Capable), approach a cave to search for hidden weapons caches. The 22nd MEU was deployed to Afghanistan in support of Operation Enduring Freedom (OEF). U.S. Marine Corps photo by Gunnery Sgt. Keith A. Milks (released). See: <http://www.news.navy.mil>

Nemenz, H. 1960. "Contribution à l'Étude de la Faune d'Afghanistan. 18. Argasidae." *Entomologisk Tidskrift*. Volume 81, numbers 1-2, pages 45-47. OCLC: 1030570.

Nguyen, H.V., Lang, J., Elbez, G., Lalou, C. and Lucas, G., 1973. Existence d'un déséquilibre élevé entre les isotopes de l'uranium. Influence sur la datation des travertines de Bamian (Afghanistan Central) par la méthode  $^{230}\text{Th}/^{234}\text{U}$ . (Translation: Existence of a high disequilibrium in the isotopes of uranium. Influence on the dating of the travertines of Bamian (Afghanistan Central) by the method  $^{230}\text{Th}/^{234}\text{U}$ ). *Comptes Rendus Hebdomadaires des Seances de l'Academie* **276**, pp. 2233-2236. USGS Library.

Noel, E. 1944. "Qanats." *Royal Central Asian Society Journal*, volume 31, pages 191-202. Variation: Human relations area files. MA1. Iran; 50. Microfiche. New Haven, Conn. [197-?]. OCLC: 37341878.

O'Connor, Michael. 2001. "Afghan Caves Hold More than bin Laden, A UNO Professor Says Copper and Iron Deposits Can be Mined and, Help the War-Torn Country Get Back on Its Feet." *Omaha World-Herald*. November 22, 2001. Page 1B. DataTimes Accession No: OMHA1199252

"A geologist at the University of Nebraska at Omaha said Wednesday that he has been contacted by companies interested in setting up mining operations in mineral-rich Afghanistan when the rebuilding of the war-ravaged country begins. Jack Shroder said Afghanistan's copper and iron deposits are drawing interest from U.S. companies."

Omodeo, P. 1959. "Contribution à l'Étude de la Faune d'Afghanistan. 5. Oligocheti dell'Afghanistan. (Betr. Auch Höhlenfunde)." *Bollottino di Zoologia* (Torino). Volume 26, pages 1-20.

Oosterbaan, R. J. 1984. "Modern Interferences in Traditional Water Resources in Baluchistan." *Water International*. Volume 9, number. 3, pages 106-111, September 1984. Water Resources Abstracts Number: 8503705.

Abstract: “Baluchistan, a province of Pakistan, is a mountainous region with little rainfall and no other major source of water. Nevertheless, the small amounts of rainfall, surface runoff, and groundwater are used to produce crops and to supply drinking water to man and beast. Water harvesting, diversion weirs, gravity drains and open wells are part of the traditional water-use system. The traditional water use system is balanced, but modern developments are tending to upset this balance by redistributing the water resources. Islamic water laws attach no property rights to water resources; the laws only attach rights to the use of water by those who have constructed works to produce the water. Therefore, the builders of a diversion weir or a karez, and their heirs, have exclusive rights to the water produced by these works. But if a new dam is built upstream of their works, the same law applies to the builders of this new dam. The fact that this new dam reduces the downstream quantities of water constitutes no legal problem. Modern water resources developments are thus allowed to interfere with existing traditional systems. Careful hydrological investigations before and after the introduction of new water management can reveal the negative side effects of various plans.”

Orris, Greta J. and James D. Bliss. 2002. Mines and Mineral Occurrences of Afghanistan. Menlo Park, CA: U.S. Geological Survey. *Open-File Report* 02-110. Microsoft Excel 98 spreadsheet. See the site at: <http://geopubs.wr.usgs.gov/open-file/of02-110/>.

This dataset was compiled due to interest in Afghanistan and anticipated continuing interest as post-war aid and reconstruction begin. This dataset contains latitudes, longitudes, commodity, and limited geologic data for metallic and nonmetallic mines, deposits, and mineral occurrences of Afghanistan. The data in this compilation were derived from published literature and data files of members of the USGS National Industrial Minerals project. This dataset consists of one table with 17 fields and over 1000 sites. This dataset consists of one Excel 98 spreadsheet file. Data fields include location, deposit, commodity, and geologic data for mineral deposits, mines and occurrences. G.J. Orris and J.D. Bliss compiled the data on Afghanistan mineral resources from previously published compilations, other published sources, and project files. Locations were taken from published sources; no effort was made to determine the correctness of these data beyond a preliminary review to be sure they plot in the correct country and reconciliation of duplicate and conflicting data where possible. Most of the latitudes-longitudes are believed to be within 5 minutes of their true locations, but other locations may be highly inaccurate. Much of the data dates from the Russian occupation of Afghanistan, although the published sources had more recent dates.

Perkins, Dexter, Jr. 1972. “The Fauna of the Aq Kupruk Caves; a Brief Note.” In: Prehistoric Research in Afghanistan (1959-1966). *Transactions of the American Philosophical Society*. Volume 62, Part 4, 73 pages. American Philosophical Society. Philadelphia, PA, United States. GeoRef Number: 1972-025341.

Quaternary mammals in the stratigraphic level, Afghanistan. Subject descriptors: Afghanistan; Cenozoic; Chordata; faunal studies; Mammalia; paleontology; Tetrapoda; Vertebrata.

Peterson, Dean F. 1970. “Water in the Deserts.” Presented at an International Conference, 'Arid Lands in a Changing World,' held in Tucson, Arizona, June 1968. In: *Arid*

*Lands In Transition*. Dregne, Harold E. (Ed), pages 15-30, Publication No 90, AAAS. Water Resources Abstract Number: 7108134.

Abstract: "In assessing the impact of man's exploding technology in dealing with desert water problems, desert water sources are briefly reviewed and methods of their utilization discussed. River types occurring in deserts ranged from low temporary to high perennial flows, in many areas, variously exploited by man for millennia. Groundwater is always an important water source of varying quality and such supplies may range from recently recharged reservoirs to the mining of fossil sources. Deserts are fragile ecosystems. Man's social structure is strongly influenced by his degree of adaptation, but this leads to the problem that the more he conquers his desert, the less the adaptation required but the greater the ensuing ecological disruption. In food gathering and hunting societies, which either directly or indirectly harvest the scant desert vegetation, social units are small wide-ranging ones having no major impact on desert ecology. Grazing societies, whether pastoral nomad or cowboy and shepherd, also range over wide areas, but may wreak great ecological destruction through mismanaged overgrazing. Where scattered oases occur, an oasis agriculture may develop. This type of agriculture may be sustained by tapping groundwater supplies or by the creation of irrigation canals (such as Afghanistan's qanats). Modern technology has given rise to large-scale irrigation schemes involving local supplies or inter-basin transfers. The problems arising from these schemes, particularly water-logging and salinity, are discussed. It is maintained that alternatives must include adaptation as well as exploitation, including population control."

- Petkovski, T. 1960. "Contribution à l'Étude de la Faune d'Afghanistan. 33. Harpactidae." *Fragmenta Balcan*. Volume 3, number 8, pages 65-75.
- Petrovitz, R. 1960. "Scarabeidae (Col.) Contribution à l'Étude de la Faune d'Afghanistan. 12. (Betr. Höhlenfunde)." *Kunliga Fysiografiska Saellskapets i Lund. Foerhandlingar*. Volume 29, number 12, pages 103-111.
- Pias, J., 1976, Formations superficielles et sols d'Afghanistan. In French. (Translation: Superficial formations and soils of Afghanistan) In: *Travaux et Documents de l'ORSTOM* (France), no. 55. Office de la Recherche Scientifique et Technique d'Outre-Mer (ORSTOM); Centre National de la Recherche Scientifique, Paris, France, 315 p. OCLC: 16320351.
- Subjects: Geomorphology; Soil Types; Climate; Vegetation; Geology; Sedimentation; Soil; Calcareous Soils; Saline Soils; Soil Genesis; Cartography. ISBN 2-7099-0415-2.

- Pinsker, Lisa M. 2002. "Geology adventures in Afghanistan." *Geotimes*. February 2002. (Web Feature). Abstract: The article describes a geologist, Jack Shroder, working in Afghanistan before the Soviet invasion. See: [http://www.agiweb.org/geotimes/feb02/Feature\\_Shroderside.html](http://www.agiweb.org/geotimes/feb02/Feature_Shroderside.html)



- Pinsker, Lisa M. 2002. "Large earthquake hits Afghanistan." *GeoTimes*. (Web Extra). Monday March 4, 2002, last updated on March 5. Abstract: "A major earthquake of magnitude 7.3 occurred in the Hindu Kush region of Afghanistan approximately 150 miles north-northeast of Kabul at about 7:08 a.m. Eastern

Standard Time yesterday, March 3, 2002, according to early USGS reports. The intermediate-depth quake shook South Asia, from Afghanistan and Pakistan to northern India. The epicenter was in the remote province of Samangan, where a rock slide flattened 100 homes. At least 100 people are dead and hundreds more homeless. This earthquake is the strongest to hit the region since a magnitude 7.2 quake on Dec. 30, 1983, which killed 14 people in Pakistan and 12 in Afghanistan. A magnitude 6.9 quake based in the same region on May 30, 1998, killed more than 5,000 people.” See: <http://www.geotimes.org/mar02/WebExtra0304.html>

Popol, Sultan Achmed and S. W. Tromp. 1954. “The Stratigraphy and Main Features of Afghanistan.” *Koninklijke Nederlandse Akademie Van Wetenschnappen*. No. 3, pages 370-394.

No caves are mentioned by name.

Postnikov, Alexei V., 2000, Исторические права” соседних государств и география Памира как аргументы в “Большой Игре” Британии и России, 1869-1896 гг. (Historical rights of "adjacent states and the geography of the Pamirs as arguments in" to large game "Britain and Russia, 1869-1896.” *Acta Slavica Iaponica*. No.17. (2000).

“This work has an excellent bibliography of topographic maps and materials that until recently have been restricted in Russian, Tashkent and Chinese libraries and archives.”

Proffitt, Joe, 2005, Cultural and biological survey of caves at Fort Leonard Wood, Missouri, assessing the suitability of caves for military training. Center for Environmental Management of Military Lands (CEMML). *Federal Facilities Environmental Journal*. January 20, 2005. Volume 15, Issue 4, Pages 43–53. OCLC: 20943851.

Abstract: Current international military activities, especially in Afghanistan, have accelerated the need for military training activities in caves. Currently, military training in caves is not permitted on Fort Leonard Wood due to incomplete, partial, or outdated cultural and biological inventories; lack of adequate mapping; and other safety issues. This project is the initial phase of a multiyear Legacy project to establish a strategy, plan, and priority list for managing cave resources from a military training, biological, geophysical, cultural, and historical resources standpoint. The project will also help natural resource managers establish cave policy for installations that will facilitate management for natural, cultural, military training, and recreation resource issues as increased regulation and pressure is put on cave ecosystems. This Legacy project developed and field-tested a program for inventorying and monitoring caves. The project identified a number of caves that can be utilized as training sites. Over reliance on previous cave surveys, the Native American Graves Protection and Repatriation Act (NAGPRA) consultation and notification process when human remains were discovered, and the availability of experts to classify invertebrate cave life caused the project to take much more time than expected. A final technical report is being completed, and a how-to brochure for other installations was completed in August 2004.

Rahman, M., 1981, Southern Asia — Geography of Contrast: Ecology of Karez irrigation: a case of Pakistan. *GeoJournal*. January 1981, Volume 5, Number 1, pages: 7–15. ISSN: 0343-2521.

Abstract Though hard to construct, difficult to maintain, and yet limited in scope, the karez irrigation system has been an integral part of agricultural landscape in Baluchistan province of Pakistan for the last 2500 years, if not earlier. The irrigation system is well adjusted with the social and political institutions in Baluchistan and synchronizes with the local economies. Archaeology indicates that the idea of karez irrigation originated in the Indus Valley Civilization of Pakistan, while philology, method of construction, migration of karez technocrats support the view that the technology was introduced from Afghanistan and not from Iran as is generally accepted. An attempt has been made in this paper to examine the ecology of karez irrigation in Pakistan in terms of its nature, origin, diffusion and persistence including the recent changes in the system wherein tunnels are being replaced by cement pipes and Delay Action Dams. The delay action dams are being introduced to augment the subsurface water supply. The tube-wells and modern electric-powered pumps are impinging on the karezes and may ultimately destroy the fragile ecosystem of Baluchistan, including the age-old karez irrigation system.

Rashid, Ahmed. 2001. "Osama Bin Laden: How the U.S. Helped Midwife a Terrorist." *The Public I*. September 13, 2001.

Abstract: "In 1986, he helped build the Khost tunnel complex, which the CIA was funding as a major arms storage depot, training facility and medical center for the Mujaheddin, deep under the mountains close to the Pakistan border. For the first time in Khost he set up his own training camp for Arab Afghans, who now increasingly saw this lanky, wealthy and charismatic Saudi as their leader."

Rathjens Jun, C. 1957. "Geomorphologische Beobachtungen an Kalkgesteinen in Afghanistan." Hermann Lautensach-Festschrift. *Stuttgarter Geographische Studien*. Volume 69, pages 276-288. USGS Library.

Some observations of the Shamshir Ghar Cave are made.

Ratnesar, Romesh. 2001. "Into the Fray." *Time*. October 29, 2001, pages 22 et seq.

Abstract: "According to US Intelligence, chasing the Taliban and al-Qaeda will likely draw special forces commandoes into combat in the warren of fortified underground tunnels and facilities scattered all over Afghanistan, from the Taliban strongholds Kandahar and Kabul in the east to Herat, near the country's western border with Iran. Many of the tunnels and bunkers were dug during the Afghan war with the Soviet Union but have been upgraded since a US cruise missile strike against al-Qaeda in 1998. US soldiers have the military technology, such as night-vision goggles and breathing devices, to operate in the underground labyrinth, and US bombers have pounded the network..."

Raza, Syed H. 1983. "Geo-Electrical Investigations for Locating Buried Karez Channels in Satellite town, Baluchistan, Pakistan." *GeoPhysics*. Volume 63. Geological Society of Pakistan. Records of the Geological Survey of Pakistan and GSP. OCLC: 15339976.

Revkin, Andrew C., 2001, U.S. Making Weapons to Blast Underground Hide-Outs. *New York Times*. (Late Edition (East Coast)). New York, N.Y. Dec 3, 2001, page B4.

Abstract: A major goal, according to Pentagon documents, is to assemble by 2004 a small arsenal of weapons that can- with potent precision blasts- destroy subterranean complexes in North Korea that may harbor nuclear weapons or the missiles that carry them. The new weapons work builds on research that began in a

flurry of improvisation after Iraq invaded Kuwait in August 1990. Indeed, many of the weapons being used now on tunnels and caves in Afghanistan had their genesis at that time, most notably the laser-guided GBU-28 bomb, created to plunge as much as 100 feet into the earth to destroy command bunkers. The Pentagon is preparing precision weapons to destroy underground targets. These could include Iraqi and North Korean caches of nuclear, biological or chemical weapons, or hideouts for terrorists in Afghanistan.

Revkin, Andrew C., 2001, New Sensors Report, 'I Know They're in There, I Can See Them Breathing'. *New York Times*, November 22, 2001.

Abstract: Scanners developed by the government can detect extremely weak magnetic fields generated by metal equipment stashed in a tunnel up to 100 feet underground. Similar equipment can pick up faint fields from wiring, such as the cables providing lighting to tunnel networks used by Al Qaeda. The sensing methods have been developed as part of a shift by the Defense Department toward locating distant targets quickly, so American forces get the first shot. Using the element of surprise would make it less necessary to harden the defenses for troops in the field, said Dr. A. Fenner Milton, the director of the Army's Night Vision and Electronic Sensors Directorate, in a presentation last year at a conference for military contractors at Fort Belvoir, Va. The goal, he said, is to "substitute information for armor." As cold weather settles in across Afghanistan, the thermal imaging devices used by American forces to spot targets should prove even more effective. The sensors detect temperature contrasts, so the warmth released from a tunnel entrance or a person will appear more prominent against the colder backdrop. The device is now routinely carried on planes, helicopters and tanks, as well as being mounted on rifles.

Rice, Karen. 2002. "Gem Resources of Afghanistan." *Bulletin of the New York Mineralogical Club*. Volume 116, number 1, January 2002. Pages 7-9. OCLC: 07541550.

An overview of some of the mineral areas of Afghanistan with some mine descriptions.

Richter, Paul. 2001. "Hundreds of U.S. Troops to Search Al Qaeda Caves in Afghanistan: Forces with Special Equipment will dig through the Rubble. The Operation is Expected to Involve Risky Tactics." *Los Angeles Times*. December 21, 2001.

Abstract: "Although the Afghan war has featured an impressive array of high-tech gear, the cave search will probably involve some of the same risky tactics that U.S. infantrymen used against Vietnamese "tunnel rats" in the 1960s and '70s and Japanese defenders in Okinawa in 1945. Once the entrance to a cave is open, U.S. forces will want to send in a "little wiry guy with a flashlight, a pistol"- and a lot of guts, said retired Army Col. Richard J. Dunn, who was a combat engineer."

Ritter, Karl (1779-1859). 1832. "Kaboulistan et Kafiristan [sic]." In: *Die Erkunde im Verhältniss zur Natur und zur Geschichte des Menschen, oder, Allgemeine vergleichende Geographie: Als Sichere Grundlage des Studiums und Unterrichts in Physikalischen und Historischen Wissenschaften. Die Erkunde von Asien*. Berlin: G. Reimer. In nine volumes. Volume 5, Chapter 2, pages 195-320. OCLC: 28857516.

Description: A complete bibliography on Afghanistan geology up until 1832. Various editions re-printed in French (“Géographie des Pays de l’Asie qui se Trouvent en Relation Immediate avec la Russie”) and Russian (translated into Russian by V.V. Grigor’ev, St. Petersburg, 1867). The Russian copy has a gruesome story between pages 969-972, about 700 people who took refuge from Genghis Khan in a cave near Rui, and were sealed in so they all starved to death. The location of the cave was only known to an old mullah who led the party to the secret entrance.

Robbins, Carla Anne. 2001. “Technology, Intelligence, Time Needed to Uproot al Qaeda.” *Wall Street Journal*, December 10, 2001. Page A20.

Abstract: U.S. officials offer some hints of how they are conducting the search, though they won't talk about all the details. But based on conversations with government and outside experts, here is a look at how the cave hunt likely is progressing: Intelligence gathering: U.S. officials say human intelligence may be the most critical tool. U.S. special-operations forces in Afghanistan have been interviewing anti-Taliban fighters and local residents for information on the cave complexes and who may be hiding inside. U.S. intelligence agencies likely have considerable information already from their days of financing the Afghan rebels. And Russian officials say they already have given Washington maps of several rebel complexes and the broader tunnel-irrigation systems dating from their occupation. Searching from above: Once the search has been narrowed with intelligence, U.S. spy satellites, planes and unmanned drones would closely monitor the area. An Army expert says roads and trails are being traced through the rugged terrain; experts also are looking for older signs of excavation that might indicate cave entrances. Thermal sensors mounted on airplanes and drones can detect heat from cave entrances and ventilation shafts. In times of low pressure, "caves breathe out. If it's cold enough outside they can give off steam," Mr. Crawford says. Airplanes also can carry magnetic and electromagnetic sensors to look for machinery underground, including generators, but their range is limited and they can be confused by metal in rocks and other anomalies. Searching from the ground: Airplanes or helicopters already may have scattered small sensors on the ground to sniff out cooking fires or listen for movements. But getting forces close enough to use high-tech gear to map complexes will be much harder. Al Qaeda fighters in heavily fortified bunkers near Tora Bora have been shooting at anti-Taliban forces attempting to work their way up the mountains. Even if U.S. forces could get close enough, the rugged terrain would make it difficult to use many cave-finding technologies, including Mr. Crawford's microgravity and electrical-resistivity techniques, which require minute corrections for elevation as well as hours to gather information and many more to process it. Magnetic and electromagnetic monitoring from the ground may be more effective than from the air. But one military expert said ground-penetrating radar, pulled along by hand or behind a truck, may be the most useful real-time technology: Signals are sent into the ground, and upon return are analyzed for voids below and equipment inside. But again, there are real limits on the range even if a transmitter is on the ground.

Robertson (Lieutenant William Robert) and Peach (Lieutenant Edmund). 1893-1894. *Routes from Russian Territory in Central Asia towards Afghanistan and India.*

Section I. – The Pamir Line of Advance. Part I. Short Military Report on the Ferghana Province, Kashgar, the Pamirs, and Upper Oxus Afghan Provinces, being the Country traversed by Routes in Part II. Part II. Includes all Routes leading from the Chimkend-Kuldja Postal Road to the Hindu Kush between the Dorah and the Karakorum Passes. Section II. – The Kabil Line of Advance. Part I. Military Report on Russian Turkistan and the Khanat of Bokhara, being the Country traversed by the Routes in Part II. Part II. Routes leading from the Kazalinsk-Chimkend Postal Road on to the Oxus between Charjui and Kala-i-Khum. Compiled in the Intelligence Branch of the Quarter Master General's Department in India by —. 4to. The first with two large folding maps designated "Confidential" in end-pocket, the second with two large folding maps and a table of troop concentrations. vii, 93 pages, [xii], 125pp. + viii pp. Index. Government Central Printing Office, Simla, 1893–4. Robertson, who was later to rise to Field-Marshal, gives a good sense of the purpose of these instruments of the Great Game in his autobiography, *From Private to Field-Marshal*. When he began working at the North-West Frontier Section of the Intelligence Branch, it had recently been reorganized under the aegis of General Sir Henry Brackenbury the Military Member of the Viceroy's Council. Formerly "there was no good information available as regards much of the vast area for which the North-West Frontier section was responsible... By initiating new and extended reconnaissances, and introducing a better method of recording and compiling the information received, our stock of intelligence gradually improved both in quantity and quality... When I returned to Simla in July 1893 [after a period of leave in England] affairs in Afghanistan and on the North-West Frontier generally were still in a very unsettled state, and in particular the activities of Russia in the Pamirs were feared ... to constitute a threat on India..." [pp. 55–6]. In 1894 Roberts was himself sent "to reconnoitre various routes in the vicinity of the Pamirs..." [*ibid.* p. 57] The two volumes here consist of a mass of material collected by the Branch from various sources, officers in the field, regional gazetteers, and other authorities published and unpublished. The intention was to publish three volumes simultaneously (research has shown that Section III was published), but Section I was rushed out due to "the increasing interest centering on the Pamir region." The purpose was very clearly to predict the difficulties to be encountered by the Russians should they make their much anticipated move on Afghanistan and the rate at which they might proceed. Robertson comments in *From Private...* that such were the variables – "the attitude of the Afghans, who were constantly fighting amongst themselves and about who the only sure thing was that they would pillage and murder both belligerents indiscriminately ... the feasibility of our collecting together within given periods of time hundreds of thousands of camels for transport purposes ... and the rate at which railways could be constructed across the 500 miles of mountainous country lying between the Russian and British frontiers." [*ibid.* pp. 135] – that when asked to make such predictions at a later date he felt obliged to comment that his statement was "practically worthless." Both volumes bear labels on the upper boards designating them as "Secret" and the print run details reveal that only ten copies of each were printed. Considerable research has failed to turn up any other copies of any of three volumes in institutional collections worldwide. There is, however, an interesting story which attaches to the copies which would be

expected to be in the Records of the India Office. All three volumes were apparently held by them until they were destroyed during a re-organization in 1911, since which they have only had the opportunity of replacing Part I. Genuinely of the utmost rarity.

- Roewer, C. Fr. 1960. "Contribution à l'Étude de la Faune d'Afghanistan. 23. Solifugae und Opiliones. Meddelanden fran Göteborgs Musei Zoologiska Avdelning. 130." *Göteborgs Kungliga Vetenskaps och Vitter Hets-Samhallets Handlingar. Ser. B*, Volume 8, number 7, pages 3-53.
- Rohde, David. 2001. "Cave Redoubts Are Formidable, Rebel Leader Says: A Nation Challenged." *New York Times*. Nov 8, 2001. Page 6. ISSN: 0362-4331.  
"Talking about the tunnels and caves that line the walls of the Panjshir Valley, Gen. Abdul Hafiz of the Northern Alliance sounds like a proud father. "They are resistant to bomb attack," he said today. "No bomb or missile can destroy these caves." Abstract: He referred to four man-made caves on the military depot he runs here and to dozens of others that line the valley, the mountain stronghold of the anti-Taliban forces. Built to store ammunition, the caves here are similar to those in southern Afghanistan, where Osama bin Laden and the Taliban leadership are believed to be hiding. General [Abdul Hafiz] said that the mujahedeen built an extensive network of tunnels around the Taliban stronghold of Kandahar in the 1980's and that the Taliban have likely expanded them. All that was needed, he said, was heavy equipment, explosives and cash. "It's easy for the Taliban," he said. "They can bring in equipment from Pakistan and Osama bin Laden has many dollars." A Taliban jet last tried to bomb the cave three months ago, but missed, he said. The bomb hit the ridge high above it. General Hafiz ordered his soldiers to build a mud brick wall in front of the entrance to protect the ammunition from bomb shrapnel. In other raids, Taliban forces have bombed the top of the mountain in an effort to get the cave to collapse. Those failed too, he said, because the tunnel is "very deep" and strong.
- Roosevelt, Ann, 2004, iRobot To Develop FCS Small Unmanned Ground Vehicle. 2004. *Defense Daily*, Apr 13, 2004. Vol. 222, Issue 9; page 1. ISSN: 0889-0404.  
Abstract: iRobot developed the rugged, mobile PackBot, originally supported by the Defense Advanced Research Projects Agency (DARPA), which trundled into action in Afghanistan in 2002 and continues work there and in Iraq today, searching and examining caves, tunnels, buildings and equipment that could be potential explosives. The PackBot has a variety of payloads, and more are being examined. The SUGV will be a portable, reconnaissance and tactical robot that can enter and secure areas either too dangerous or inaccessible for soldiers. It will act as the soldier's eyes and ears, and provide real-time intelligence. Delivery is scheduled in 2008, Dyer said, and there's been some integration investment and "shifting of money to the left to make sure we get the design jump started and to be able to get to advanced prototypes as early as possible." The SUGV will be part of the Army FCS program, managed by Boeing [BA]-Science Applications International Corp. (SAIC), that is to be fielded by the end of the decade.
- Rosset, L. F. 1954. "Afghanistan 'Bord de Mer'" *Afghanistan*. No. 2, pages 27-35.
- Ruffo, S. "Due Nouve Specie di Anfipodi delle Acque Sotteranee dell'Afghanistan. Zwei neue Amphipodenarten aus unterirdischen Wässern Afghanistans. (Translation:

Two new species of Amphipoden from underground water in Afghanistan) (Betr. Höhlenfunde) (Studi sui Crostacei anfipodi LIII).” *Memorie del Museo Civico de Storia Naturale*. Verona. Volume 6, 1957-1958, pages 389-403.

“Two new species of subterranean Amphipods from Afghanistan.”

Saba, D. AH 1375. “A Brief Look at the Mineral Resources of Afghanistan and Their Setting.” *Mardom Nama-e Bakhter* (Afghan Scientific Research Journal): On the History, Culture, Life Style, Environment and Nature in the Cultural Territories of Ancient Bactria Focused on Afghanistan.” First issue, March 1997. Date given according to Muslim (Hijrah) calendar (AH 1375). Text in Pushto (Afghani), in Arabic script. See their website accessed on December 28, 2001 at: <http://afghanmagazine.com/bakhter/> .

Safdari, N. 1991. “The Geological Development of Afghanistan During the Triassic.” *Vestnik - Moskovskogo Universiteta, Seriya Geologiya*. Volume 3, pages 21-32. In Russian. GeoBase Accession No: 0906533

“Triassic deposits are known in almost all the zones of Afghanistan and they are represented by volcanogenic-terrigenous, carbonate and terrigenous formations. The territory of Afghanistan consists of various blocks of Gondwana and Eurasian origin. The Hari-Rud suture zone forms the boundary between these blocks. The formation of the region during the Mesozoic is examined on the basis of formation analysis and palinspastic reconstructions. (P.Cooke- USGS).”

Sajjadi, Mansur Seyyed. 1982. Qanat "Kariz": Tarikhchah, Sakhtuman va Chigunagi-i Gustarish-i an dar Jahan . Publication: Tihran: Anjuman-i Farhangi-i Italiya, 183 pages, 29 pages of plates, illustrations, maps, plans, etc. Language: Persian. Series: Daftarha-yi Baksh-i Bastanshinasi-i Anjuman-I Farhangi-i Italiya; shumarah-'i. OCLC: 33995565

Sajjadi, Mansur Seyyed. 1982. Qanat/Kariz: Storia, Tecnica Costruttiva ed Evoluzione. (Translation: Irrigation tunnels: history, technical construction and evolution) Teheran: Istituto Italiano di Cultura, Sezione Archeologica. Quaderni della Sezione Archeologica dell'Istituto Italiano di Cultura, number 1. 172 pages. In Italian. OCLC: 16466780

Sammel, Edward A. 1971. “Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan.” Washington, DC: USGS. *Open File Report*. December 1971.

Includes information on “kareezes” and a “Map of the Kandahar Area, Afghanistan, showing Locations of Wells, Karezes and Canals.”

Scerrato, Umberto. 1960. “A Short Note on Some Recently Discovered Buddhist Grottoes near Bamiyan, Afghanistan.” In: *East and West*. New Series. Volume XI, pages 94-120.

Scarborough, Rowan. 2001. “Caves Pose Unusual Challenge for Army; Hideouts Could be Terrorists' Tombs.” *Washington Times*. Oct 11, 2001. Page A1. ISSN: 0732-8494.

"A favorite Soviet tactic was to pour diesel fuel into these qanats and ignite it in an effort to eliminate them as hiding places," says a report on Afghanistan by Maps.com. Afghanistan's rugged topography, numerous caves and massive system of qanats are likely to continue to play a role in military intervention by outsiders."

- Schindler, J. Stephen. 2002. "Afghanistan: Geology in a Troubled Land." *GeoTimes*. February 2002. (Web Feature). Volume 47, number 2, pages 15-18. Abstract: "Geologic maps could delineate carbonate lithologies expected to contain karst with natural cave formations; but the number of citations in the literature for significantly large natural caves in Afghanistan is low. Is this inventory low because of tectonic instability, a persistently dry climate, or a lack of exploration? Manmade caves are apparently abundant in Afghanistan; many are ancient. Caves were dug for habitation, for religious shrines, mineral extraction and as irrigation tunnels known as karez. Because of the lack of detailed geologic maps of Afghanistan, identifying the lithology at a specific tunnel can be difficult. This problem also holds true for many other regions around the world. Fortunately, remote satellite imagery, particularly hyperspectral imagery, can reveal valuable clues to a specific lithology in an arid region. The tunnels at Tora Bora, which have become well known in recent months, are in a category all their own. The area surrounding Tora Bora is known as the Kohe Sofaid, or also as the Spinghar mountain range. The dominant lithology is metamorphic gneiss and schist. The tunnels were initially developed during the Russian invasion by the Afghan mujahedin and apparently expanded in recent years by Al Qaeda. With his engineering background and financing, Osama bin Laden used hard-rock mining techniques to expand and enhance the large tunnels. Many smaller tunnels in the area were also developed using less sophisticated techniques and appear to be preferentially dug in softer rocks, such as schist, and others that are highly fractured. Complete destruction of the larger tunnels will be difficult if they are located in gneiss or other crystalline rocks. Collapsing the entrance may be the most that can be accomplished in these more massive rocks. However, a tunnel in softer rock, such as a clastic sediment, may be more easily destroyed." See: [http://www.agiweb.org/geotimes/feb02/feature\\_afghan.html](http://www.agiweb.org/geotimes/feb02/feature_afghan.html)
- Schlachter, Barry. 2001. "Caves Slowly Being Cleared Out." *Miami Herald*. Miami, Florida. December 7, 2001.  
"Some of the caves abandoned by al Qaeda at Tora Bora were large enough to conceal a tank. Many were interconnected, but none of those captured so far has the sophisticated ventilation and electrical power system that the cave and tunnel network is said to possess. Some commanders said those might be farther up the mountain."
- Schrader, Esther. 2001. "Response to Terror; U.S. Forces Set to Battle 'Myth' of Cave Fighters." *The Los Angeles Times*. Oct 26, 2001. Page A1. ISSN: 0458-3035.  
"Defense officials acknowledge that there are hundreds, if not thousands, of caves, tunnels, aqueducts and bunkers in the mountains and deserts of Afghanistan, the legacy of centuries of warfare and of an ancient farming technique that relies on underground water supplies."
- Schmidt, Eric and Steven Lee Myers. 2001. "U.S. Escalating Efforts to Bomb Taliban Caves." *New York Times*. Nov 6, 2001. Page 1. ISSN: 0362-4331.  
"A Pentagon official said Russia, whose forces spent a decade fighting in Afghanistan, had specifically helped identify caves, tunnels and other command centers that had been used by Afghan forces."

- Schmitz, H. 1959. "Contribution à l'Étude de la Faune d'Afghanistan. 19. Phoridae." *Broteria: Serie Ciencias Naturais*. Volume 28, Numer 55, pages 119-130.
- Schuler, L. 1959. "Quelques Peryphus (Bembidiini) peu Connus ou Couveaux (Col. Trechidae). Contribution à l'Étude de la Faune d'Afghanistan 14. Einige wenig bekannte oder neue Käfer der Gattung Peryphus. (A new kind of beetle) (Betr. Höhlenfunde)." *Bulletin de la Societe Entomologique de France*. Volume 64, pages 117-118.
- Scripps Howard News Service. 2001. "Finding bin Laden an Enormous Task." *The Cincinnati Post*. October 9, 2001. Page 8A. DataTimes Accession No: CINP20011010026B9357.  
Abstract: "Where is Osama bin Laden, the most-wanted man on Earth? Is he hiding in one of thousands of caves that pock Afghanistan's hundreds of rugged mountains? Is he hunkered down in a reinforced bunker in the Taliban stronghold of Kandahar, in the southern reaches of the Texas-sized country? Or has he fled to Pakistan or Somalia or Chechnya?"
- Seshadri, G. R. 1999. "Afghanistan." *Mining Annual Review*. 1999; Pages 170. Mining Journal. London, United Kingdom. ISSN: 0076-8995; GeoRef Number: 2001-000332.  
Subject descriptors: Afghanistan; coal; companies; copper ores; metal ores; mineral economics; mineral exploration; mineral resources; mining; petroleum; production; reserves; review; sedimentary rocks; uranium ores.
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“Moscow- Maj. Gen. Alexander Popov was prepared for the high mountains, bitter winter cold and blistering summer heat. But when the Soviet army crossed into Afghanistan in 1979, he didn't know the caves would be so deep, the tunnels so long or the Afghans so clever at hiding in the daunting terrain that defied so many invaders in the past. Popov and other former Soviet officers say top flight intelligence will be key to whatever operation the United States and its allies might undertake against Afghanistan, where Osama bin Laden... is believed to be hiding.”

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Description: Consists of a Powerpoint presentation of images, with caption text and soundtrack, from the photo archives of the American Institute of Indian Studies. Subjects: Bamian Region (Afghanistan)- Antiquities- Pictorial works. Afghanistan- Antiquities- Pictorial works. Art, Buddhist- Afghanistan- Bamian Region- Pictorial works. Sculpture, Buddhist- Afghanistan- Bamian Region- Pictorial works. Art- Afghanistan- Bamian Region- Pictorial works. Cave temples, Buddhist- Afghanistan- Bamian Region- Pictorial works. Mural painting and decoration, Buddhist- Afghanistan- Bamian Region- Pictorial works.

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Abstract: Sterilization equipment and techniques available to forward surgical units in modern conflicts past and present are sophisticated and generally taken for granted. Underground surgical units operating in rural Afghanistan must function without electricity or petroleum-powered generators and, with few exceptions, are unable to use sterilization equipment that produces intense heat for prolonged periods. We discuss the equipment and techniques developed for use by the IMC to sterilize surgical instruments, gowns, gloves, rubber goods, and sutures in the 42 clinics operating in resistance-held Afghanistan. These techniques may have application to other similar primitive conditions.

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- Simpson, W. 1882. "The Buddhist Caves of Afghanistan." *Journal of the Royal Asiatic Society of Great Britain and Ireland*. Volume 14, part 3, pages 319-331. Five pages of plates, plans, maps, includes bibliographical references. OCLC: 34504334.  
"During the Second Afghan War (1878-80) William Simpson, a British War Correspondent, explored the cave-shrines and stupas at Jelalabad. He published his discoveries, (with several sketches), in the journal of the *Royal Asiatic Society*, 1882, and the other periodicals. "Basawal. In the bank immediately facing Daka, is a rock hill named Koh-be-Doulut, where more than 100 caves are found."
- Simpson, W. 1884. "On the Identification of Nagarahara, with References to the Travels of Hiouen-Tsang." *Journal of the Royal Asiatic Society*. New Series, volume 13, page 184 et seq. ISSN: 0035-869X; OCLC: 1764574.  
Abstract: "During the second half of the 19<sup>th</sup> century, W. Simpson joined the troops commanded by General S. Brown, and in 1878, entered Jelalabad from Peshawar via the Kyber Pass. Armed with considerable prior knowledge of India, he explored all the sites between December 20 and April 12, and excavated some of them. At the Fīl-Khāna caves, the stupa then still remarkably well preserved was excavated by C. Masson, and some of the caves surveyed. Afterward, Simpson surveyed the stupa ruins and almost all the caves."
- Skeen, General Sir Andrew, 1932, 1944, 1978, *Passing it On: Short Talks on Tribal Fighting on the North-West Frontier of India*. With a Foreword by His Excellency General Sir Philip W. Chetwode. Second Edition. [viii], 136 pages. Aldershot: Gale & Polden, Ltd., 1932. LCCN: 44-26590; OCLC: 11723307, 5907466 or 13512984.  
Abstract: Invaluable study by the onetime Chief of General Staff India, based on his experiences in the Third Afghan War and Waziristan; "Training of British officers, NCOs and men was facilitated by the publication of a new unofficial textbook in 1932 ... specifically directed at junior officers of the British service "as he is less likely in his wider range of service to be trained for the local problem which all officers in India have to keep in mind." *Passing it On...* provided a detailed source of clear and comprehensive information in an easily readable form regarding the trans-border Pathan tribes, tactics and administration in hill warfare, based on the author's extensive experience. It assumed an authoritative position, running to three editions, and was widely read in Britain and India.
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"Spéléologie Afghane" *Mémoires du Muséum National d'Histoire Naturelle de Spéléo-Club de Paris*. No. 1, 1975. 38 pages. NSS.  
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"Whereas the U.S. Army in 1863 had no specific method for adversaries hiding in caves, we certainly have weaponry today that can do the trick," Winschel said.

"Someone said Bin Laden should pick out his favorite cave, because it might be his final resting place."

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Abstract: The al Qaeda and Taliban built a stronghold in Ginger Valley and left a string of ammunition caches when they fled. US Army operations that involved blowing up enemy caves and destroying ammunition caches are discussed.

Stein, Aurel. 1915, 1916. "Archaeological Survey in North-eastern Afghanistan." Text and 15 manuscript maps, scales vary. Title devised by cataloger. Relief shown as contours and shows: tracks, sketch plans of ruined forts and archaeological sites. Coverage: Northeastern Afghanistan. Survey made under the direction of Sir Aurel Stein. OCLC: 48597623.

Stoev, Pavel and Henrik Enghoff, 2005, A new cave dwelling millipede of the genus *Bollmania* Silvestri, 1896 from Yunnan, China, with remarks on the reduction of the second female legpair (Diplopoda: Callipodida: Caspiopetalidae). *Journal of Natural History*. Volume 39, Number 21, pages: 1875-1891.

Abstract: *Bollmania beroni* sp. n., described from a cave in Jianshui County, Yunnan, China is the first true troglo- and hygrophilic species in the genus. The new locality extends the range of *Bollmania* towards SE and SW of the only other Chinese record. Notes are given on *B. orientalis* (Silvestri, 1895), *B. nodifrons* Lohmander, 1933 and *B. oblonga* Golovatch, 1979, based on new material from Turkmenistan and Tajikistan, and on two unnamed, probably new species from Afghanistan. An updated key to the eight described species is presented. Original observations and illustrations of second female legs in various callipodid genera are presented, along with a literature review of this character, which has so far received little attention from taxonomists.

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Abstract: "The Russians have made a singular discovery in Central Asia. In Turkestan, on the right bank of the Amou Dairi [sic], in a chain of rocky hills near the Bokharan town of Karki, are a number of large caves, which upon examination were found to lead to an underground city, built apparently long before the Christian era..."

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"When Lord Dufferin appointed the Russo-Afghan Boundary Delimitation Commission in 1885, Capt. the Honorable M. G. Talbot together with Capt.

- Maitland, made complete as well as reliable descriptions of the Bamiyan Caves, subsequently published with sketches in the *Royal Asiatic Journal* [sic] of 1886.”
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- Tietze, Emil. 1879. “Die Mineralreichthümer Persiens.” (Translation: The mineral rich Persians) *Jahrbuch Der Kaiserlich - Königlichen Geologischen Reichsanstalt* (Austria). Band 29, Heft 4. Pages 565-658. OCLC: 10905055  
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Abstract: Population, roads, topography, soils hydrology, vegetation and climate for 128 sections of the country, taken from Russian maps and other resources.
- ”Tora Bora or Bust: Today's Battlefield may Become Tomorrow's Tourist Hotspot.” 2001. *The Times*. London. December 12, 2001.  
Abstract: “Yet those already eagerly planning a visit to fabled Tora Bora- long rumored to be an underground complex of chambers, halls and sophisticated equipment- should take heed of one more rumor. Tora Bora’s accommodation, it turns out, is not all it was cracked up to be. The reality is no more than a shambles of bombed-out caves, linked by shallow trenches and the occasional tunnel.”
- Thompson, Keith. July 2003. “Salang Tunnel Vital Link to Afghan Infrastructure” Washington, DC: *DefendAmerica News*: US Department of Defense News about the War on Terrorism.  
Abstract: According to a report by the United States Agency for International Development, one of the organizations funding the reconstruction, transportation of cargo from northern Afghanistan to Kabul is about 10 hours with the tunnel and about 72 hours without it. The nearest bypass around the tunnel is through the Shibar pass, said Maj. Mark Cerda, chief of the Roads, Bridges and Tunnels Cell.  
See: <http://www.defendamerica.gov/articles/jul2003/a072303a.html>
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- Tuomikoski, R. 1959. “Sciariden (Dipt.) aus Afghanistan, gesammelt von Dr. K. Lindberg. Contribution à l'Étude de la Faune d'Afghanistan. 6.” *Annales Entomologici Fennici*. Volume XXV, number 3, pages 163-180.
- Ulmishek, Gregory F. 2004. Petroleum geology and resources of the Amu-Darya basin, Turkmenistan, Uzbekistan, Afghanistan, and Iran. USGS Bulletin 2201-H. 38 pages.  
Abstract: The Amu-Darya basin is a highly productive petroleum province in Turkmenistan and Uzbekistan (former Soviet Union), extending southwestward into Iran and southeastward into Afghanistan. The basin underlies deserts and semideserts north of the high ridges of the Kopet-Dag and Bande-Turkestan Mountains. On the northwest, the basin boundary crosses the crest of the Karakum

regional structural high, and on the north the basin is bounded by the shallow basement of the Kyzylkum high. On the east, the Amu-Darya basin is separated by the buried southeast spur of the Gissar Range from the Afghan-Tajik basin, which is deformed into a series of north-south-trending synclinoria and anticlinoria. The separation of the two basins occurred during the Neogene Alpine orogeny; earlier, they were parts of a single sedimentary province. The basement of the Amu-Darya basin is a Hercynian accreted terrane composed of deformed and commonly metamorphosed Paleozoic rocks. These rocks are overlain by rift grabens filled with Upper Permian-Triassic rocks that are strongly compacted and diagenetically altered. This taphrogenic sequence, also considered to be a part of the economic basement, is overlain by thick Lower to Middle Jurassic, largely continental, coal-bearing rocks. The overlying Callovian-Oxfordian rocks are primarily carbonates. A deep-water basin surrounded by shallow shelves with reefs along their margins was formed during this time and reached its maximum topographic expression in the late Oxfordian. In Kimmeridgian-Tithonian time, the basin was filled with thick evaporites of the Gaurdak Formation. The Cretaceous-Paleogene sequence is composed chiefly of marine clastic rocks with carbonate intervals prominent in the Valanginian, Barremian, Maastrichtian, and Paleocene stratigraphic units. In Neogene time, the Alpine orogeny on the basin periphery resulted in deposition of continental clastics, initiation of new and rejuvenation of old faults, and formation of most structural traps. A single total petroleum system is identified in the Amu-Darya basin. The system is primarily gas prone. Discovered gas reserves are listed by Petroconsultants (1996) at about 230 trillion cubic feet, but recent discoveries and recent reserve estimates in older fields should increase this number by 40 to 50 trillion cubic feet. Reserves of liquid hydrocarbons (oil and condensate) are comparatively small, less than 2 billion barrels. Most of the gas reserves are concentrated in two stratigraphic intervals, Upper Jurassic carbonates and Neocomian clastics, each of which contains about one-half of the reserves. Reserves of other stratigraphic units—from Middle Jurassic to Paleogene in age—are relatively small. Source rocks for the gas are the Lower to Middle Jurassic clastics and coal and Oxfordian basinal black shales in the east-central part of the basin. The latter is probably responsible for the oil legs and much of the condensate in gas pools. Throughout most of the basin both source-rock units are presently in the gas-window zone. Traps are structural, paleogeomorphic, and stratigraphic, as well as a combination of these types. The giant Dauletabad field is in a combination trap with an essential hydrodynamic component. Four assessment units were identified in the total petroleum system. One unit in the northeastern, northern, and northwestern marginal areas of the basin and another in the southern marginal area are characterized by wide vertical distribution of hydrocarbon pools in Middle Jurassic to Paleocene rocks and the absence of the salt of the Gaurdak Formation. The other two assessment units are stratigraphically stacked; they occupy the central area of the basin and are separated by the regional undeformed salt seal of the Gaurdak Formation. The largest part of undiscovered hydrocarbon resources of the Amu-Darya basin is expected in older of these assessment units. The mean value of total assessed resources of the Amu-Darya basin is estimated at 164 trillion cubic feet of

gas and about 4 billion barrels of petroleum liquids, most of which is condensate.

See: <http://pubs.usgs.gov/bul/2201/H/>

US Geological Survey, US Agency for International Development. 2005. Assessing the Coal Resources of Afghanistan. Prepared under the auspices of the U.S. Agency for International Development. Published 2005. Online only. Version 1. The USGS Afghanistan Project.

Summary: Afghanistan has moderate to potentially abundant coal resources. Much of the coal is relatively deep or currently inaccessible, however, and the scale of development has been limited. Indigenous coal has been used in Afghanistan for small industry (notably in the manufacturing of cement and textiles, and in food processing), and as a primary source of household fuel in both raw and briquetted forms. Electrical generation from coal has occurred only on a temporary basis when coal was used as a substitute fuel for generation by natural gas. The main factors limiting the more widespread use of coal in the past appear to have been the rugged terrain of the country, the lack of a transportation network to deliver coal, and the absence of an industrial infrastructure to utilize the coal. In addition, the geology of Afghan coal is poorly understood, and much of the known coal occurs in structurally deformed areas where exploitation can be difficult. The U.S. Geological Survey (USGS) is conducting a cooperative coal resource assessment of Afghanistan with the Afghan Ministry of Mines and Industries (MMI). The assessment is one component of a much larger program that the USGS is conducting in Afghanistan under the auspices of the U.S. Agency for International Development (USAID). “Small artisanal mine in the Ahandara District of the Baghlan Province. These small “dog holes” are hand driven. They typically have no roof support, which often results in fatal accidents. The coal is subjected to widespread oxidation that can damage adjacent unmined resources. These small mines are difficult to manage in terms of government royalty accounting and environmental effects (note spoil pile). Adits are estimated to be slightly less than 2 m high.” USGS Fact Sheet 2005-3073. See:

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В интернете появились реальные снимки основных лагерей бен Ладена (On the Internet appeared the real photographs of the basic camps of Osama ben Laden). 2001. Selected satellite photos of the Tora-Bora cave complex in Afghanistan. See further information at their site accessed on December 5, 2001:

[http://www.uaportal.com/cgi\\_bin/news.cgi?lang=r&news=2442](http://www.uaportal.com/cgi_bin/news.cgi?lang=r&news=2442)

Abstract: “In the photographs is indicated the precise arrangement of camps ' Al - Badr I ' and ' Tora Bora ' - the fixed points of the base of the controlled area of Ben laden’s mujahadeen. It is worthwhile to note that the second base of terrorist - ' Tora Bora ' - was built with American special services even in the beginning of the 1980s. At the same time, as it reports Lenta.ru with the reference on The Boston Globe, to spy satellites were not able to reveal ' terrorist himself ' with the aid of the orbital video camera. Despite the fact that American servicemen assert that the

satellites are very good and capable of distinguishing objects with sizes into several feet, they cannot reveal one concrete person.”

Varkovetsky M. B., 1970, Afghanistan - Hari Rud basin, engineering geology. In English. FAO 1970 - UNDP/SF Project Afg/10, *Survey of Irrigation Possibilities in the Hari Rud and Upper Kabul River Basins* 40 P., 6 Tab. FAO Accession No: 109985, Report No: AGL-UNDP/SF AFG/10 , Job No: A1555 , Fiche No: 09985.

Subjects: Watersheds; Geology; Hydraulic Engineering; Soil Structure; Hydrogeology; Laboratory Experimentation; Construction Materials; Hari River. FAO.

Verardi, Giovanni; Paparatti, Elio; Inaba, Minoru, 2004, Buddhist caves of Jaghuri and Qarabagh-e Ghazni, Afghanistan. Roma: IsIAO, Casalini Libri Otto Harrassowitz (CASA HARR). 118 pages, cxvi pages of plates: illustration, maps; 30 cm. *Reports and memoirs*; new series, v. 2. Includes bibliographical references (pages 109-112) and index. OCLC: 55652373; ISBN: 8885320228.

Subjects: Cave temples, Buddhist- Afghanistan - History. Buddhism- Afghanistan- History.

Vergano, Dan. 2001. “Ferretting Out al-Qaida’s Caves.” *USA Today*. November 27, 2001, page 6D.

Abstract: “Finding underground passages will be a substantial challenge, geophysicists say, even though the area they’re searching is limited (Afghanistan is a little smaller than Texas). There are two types of techniques for finding underground spaces, experts say: ground-based or airborne. Ground-based techniques are much more effective because they place the sensing device closer to the target. But they are also more time-consuming and vulnerable to ambush, says geophysicist Brian Spies of the Australian Nuclear Science Technology Organization...” Abstract: “They may have to look hard. Afghanistan's caves have served as hideouts for guerrilla forces for centuries. In the mountains, extensive limestone formations hide long, twisting subterranean passages. On the southern plains, where Taliban forces now are concentrated, ancient karez irrigation tunnels stretch for miles carrying water to farms. The tunnels, punctured by wells about every 300 feet, have long served as hiding places for men and arms. To find cave entrances, spelunkers might pour harmless dye into a mountain stream that disappears underground, searching from a helicopter for where the color emerges farther downhill to lead them to an entrance. Or they might blow smoke into a cave entrance, watching to see where it emerges, to find new caves. Another technique is to look for sources of radon, a radioactive gas released underground, as a giveaway of entrances. [Alan Witten] says the most valuable cave-finding means in Afghanistan will be people, civilians or former mujahedin, with knowledge of the caves used for hiding from Soviet troops during the 1980s and subsequent tunnel construction. Just using human knowledge to narrow the location of a tunnel can speed things greatly, Witten says.”

Vicary, Major N. 1892. “On the Geology of the Upper Punjab and Peshawar.” *Calcutta Journal of Natural History*, Volume 7, page 385; *Quarterly Journal of the Geological Society*, Volume 2, page 260; and Volume 7, pages 38-46 (publication dates not given, but are prior to 1892). USGS Library.

“The Buddhist caves in the Khaibar are excavated in Pliocene rocks...”

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Abstract: "The BLU-109 "bunker busters" being dropped by the... jets have tips that allow them to penetrate deep into rock or concrete before exploding. The Afghan forces known as mujaheddin, or holy warriors, made extensive use of the network of caves, ancient aqueducts and tunnels during their resistance to the Soviet occupation of Afghanistan in the 1980s, and U.S. officials say they are being used again."
- Volin, Melden Earl. 1950. "Chromite Deposits in the Logar Valley, Kabul Province, Afghanistan." Washington: US Bureau of Mines. July 1, 1950. 58 pages, maps. OCLC: 11752929.  
Abstract: "Chromite deposits occurring as lenses, pods, and irregular bodies in serpentinized ultramafic rocks of the Logar valley, northeast Afghanistan, are described in some detail."
- Wallace, John and Yolanda Wallace. 1969. "Caving in Afghanistan." *NSS News*. Volume 27, number 9, pages 121-123. National Speleological Association.  
Description of Table Rock cave, some 60 miles north of Kabul.
- Walt, Vivienne, 2001, Uranium reportedly found in tunnel complex; Official: Men discovered substance in jars, bottles: [FINAL Edition]. *USA TODAY*, December 24, 2001.  
Abstract: In Washington, one U.S. official said some depleted uranium was found in Afghanistan recently, but that the material did not appear to be dangerous and that it isn't clear whether Sunday's claim involves the same discovery. Other high-ranking U.S. officials said Sunday that they knew of no discoveries of any radioactive materials anywhere in Afghanistan. Haji Gullalai, interim intelligence chief for Kandahar province, says his troops uncovered the tunnels Dec. 5, discovered the suspicious substances- stored in jars and bottles and placed in sealed boxes- and then alerted U.S. forces. The tunnels are at the edge of an air base controlled by U.S. forces.
- Watson, Paul. 2001. "Response to Terror; In the Battle Zone, Highland Soldiers Face Two Enemies; Afghanistan: For Northern Alliance Troops Positioned near the Salang Tunnel, the Taliban and the Winter Cold are Deadly Foes." *The Los Angeles Times*. November 9, 2001 Page A1. ISSN: 0458-3035.  
"...The former Soviet Union built the 1.6-mile-long tunnel, reportedly the highest in the world at 11,034 feet, as an aid project that was officially opened in November 1964."
- Watters, Thomas (1840-1901); Davids, Thomas W. Rhys (1843-1922); Bushell, Stephen W. (1844-1908); Smith, Vincent Arthur (1848-1920). 1904, 1905. On Yuan Chwang's Travels in India, 629-645 A.D. London, Royal Asiatic Society. Two volumes, 2 folded maps. *Oriental Translation Fund*; new series, volumes 14-15. OCLC: 5327274.  
Description: With "two maps and an itinerary by Vincent A. Smith". "Yuan Chwang's Travels in India" by Thomas Watters; ed., after his death by T. W. Rhys Davids and S. W. Bushell.
- Wax, Naomi, 2001, Notes From Underground. *New York Times*, November 25, Late Edition (East Coast).

Abstract: That may help explain the derision that the Taliban's cave-lurking incites. But Mr. bin Laden probably perceives metaphor as being on his side. After all, the Prophet Muhammad had his first revelation in a cave on Mount Hira in the 7<sup>th</sup> century. Later, when his life was threatened by the ruling party of Mecca, Muhammad took refuge in a cave. Jews and Christians have also retreated to caves in times of persecution. The Prophet Elijah (revered by Muslims and Jews), encountered the Divine while hiding in a cave on Mount Carmel. A Christian legend (recast in the Koran) tells of the "sleepers of Ephesus," who refused to worship idols and took refuge in a cave, where they slept for 300 years. The principle book of Jewish mysticism, the Zohar, was written during Rabbi Shimon bar Yohai's 13-year refuge from the Romans in a Galilee cave. Whether Mr. bin Laden is living like the Cyclops or Calypso- both denizens of Odyssean caves (his primitive, hers plush)- his quarters have so far shielded him from American air attacks. But the womblike protection of caves is only part of the story: they can also be tombs. Mythology, literature, psychology and even religion often conjure caves as places of death, darkness, confusion and evil. The Islamic hell is located deep underground, according to some traditions, as it is in Christianity. Hades ruled over a host of doomed souls in the Greek underworld, whose gates were guarded by the grotesque three-headed dog Cerberus. Dragons, monsters, trolls and witches are all traditionally portrayed as denizens of the deep. Mark Twain's Injun Joe hid out in a cave, and Shakespeare's Caliban was "deservedly confined into . . . rock" because of his savagery. And although (according to early tradition) Jesus was born in a cave, he was also tempted by the devil in one. He was buried in a cave, as well, before he ascended.

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- Wettstein, O. 1960. "Contribution à l'Étude de la Faune d'Afghanistan. 3. Lacertilia." *Zoologischer Anzeiger*. Volume CLXV, numbers (1-2), pages 58-63.
- Whitney, John William. 1984. *The Geology and Geomorphology of the Helmand Basin, Afghanistan*. Ph. D. Thesis, Johns Hopkins University, Baltimore, MD. 221 pages. Microfiche; OCLC: 48233916.
- Wiebe D. 1981. "Verkehrsausbau und Wirtschaftsentwicklung in Afghanistan. (Transportation and Economic Development in Afghanistan)." *Afghanistan Journal*. Volume 8, no. 2 (1981) p. 43-54. GeoBase Accession No: 0039361.
- Abstract: "For centuries, important caravan routes have crossed Afghanistan. Now, a national 'ring-road' linking Kabul, with Kandahar, Herat, and Mazar-e-Sharif, has been superimposed on the traditional routes. Most of this ring-road is now asphalted, as are 5 offshoots to frontier crossing points. But it was built with a primarily military/strategic rather than developmental purpose - especially in view of the absence of railways. Outlines the country's road pattern and its effect on the economy to date. It examines the links between transportation and both regional development and the system of central places. Six regions are identified for analysis (despite data shortages) though rationalization for planning is still in its infancy in Afghanistan with its socio-cultural contrasts and barriers. As an example of the

influence of the ring-road there is a special focus on an eastern (Spandan to Kandahar) section where socio-economic changes are studied in 15 settlements. Such places appears to be 'gateways' for innovations to their local hinterlands - specially in the encouragement of market-oriented agriculture. B.W.Beeley.”

Wilson, H. H. ed. 1841-1842. *Travels in the Himalayan Provinces of Hindustan and the Panjab [sic]; in Ladakh and Kashmir; in Peshawar, Kabul, Kunduz and Bokhara, from 1819 to 1825 by William Moorcroft (1767-1825) and George Trebeck.* London: John Murray. 1841-1842. “Moorcroft's travels in the Himalayan provinces, &c.” Prepared for the press, from original journals & correspondence by Horace Hayman Wilson. “Published under the authority of the Asiatic Society of Calcutta.” OCLC: 9206530; 45578744; 26490473.

Wilson, Jim, 2002, Robot tunnel rats in Afghanistan. *Popular Mechanics*, December 1, 2002. New York: Volume 179, Issue 12; page 25. ISSN: 0032-4558.

Abstract: Transferring technology from the lab to the battlefield, American forces have added robots to the hunt for terrorists. Four robots-nicknamed Hermes, Professor, Thing and Fester-earned their stripes this summer by helping the U.S. Army's 82nd Airborne Division search cave and tunnel complexes surrounding Qiqay, Afghanistan. The 42-pound tread-driven warriors are adaptations of PackBot, a sort of robot scout developed by the Defense Advanced Research Projects Agency. Initially, the 3-ft.-long x 1-ft.-tall robots were envisioned for reconnaissance duty in war-torn cities. Their video cameras and ability to navigate narrow passages and avoid obstructions make them the perfect tunnel rats. Hermes and his buddies are operated using a remote-control unit that is worn like a flak jacket. Pleased with the little robots' performance on recon missions, the Army plans to give each one a 12-gauge shotgun or a grenade launcher. In World War I, tanks ended the stalemate of trench warfare. PackBots might have a similar effect by defeating armies that hide in caves.

Wiseman, Paul. 2001. “Afghan Caves Thwart Invaders.” *USA Today*. November 6, 2001.

Abstract: “Consider the Zhawar complex in Paktia province. In 1986, the compound withstood 57 days of bombardment before the mujahedin finally abandoned it. The advancing Soviets were astonished by what they found inside. Mujahedin rebels had built an underground mosque with an ornate brick façade; a hospital with an ultrasound machine; a grease pit occupied by a T-34 tank; a library stocked with books in English and Farsi; a subterranean hotel furnished with comfy chairs and plush carpets. The compound had 41 spacious caves and tunnels the length of six football fields.” The Soviets often dealt brutally with rebels hiding in caves, using flame-throwers among other things. In 1982, Soviet troops found Afghans hiding in a karez in Logar Province, in eastern Afghanistan. Wearing gas masks, the Soviets poured gasoline, diesel fuel and an incendiary white powder into the tunnel and set it alight, incinerating 105 men, women and children, [Ali Jalali] and military analyst Lester Grau wrote in a history of the mujahedin-Soviet war. At first, the mujahedin would often open fire at Soviets trying to enter their caves. But the Soviets and their Afghan allies developed a special weapon that would lob four or five grenades at a time into the caves, the colonel says. After that, he recalls, the rebels usually surrendered when cornered underground.

Wolfe, Frank, 2002, Marine Cobra Attack Helos To Be Launch Platform For Thermobaric Hellfire. *Defense Daily*. Potomac, VA. Apr 15, 2002. Vol. 214, Issue 11; page 1. ISSN: 0889-0404.

Abstract: The Marine Corps AH-1W Cobra attack helicopters by Bell Helicopter Textron (TXT) are the slated launch platform for thermobaric Hellfire II weapons, a spokesman for the Defense Threat Reduction Agency (DTRA) said Friday. Last month, the BLU-118B thermobaric weapon was used for the first time against a key enemy cave complex in Afghanistan (Defense Daily, March 5). Ten BLU-118B bombs were shipped last winter for possible use in Afghanistan after tests showed the weapons' effectiveness in causing extreme blast overpressure in mountain cave and tunnel complexes (Defense Daily, Jan. 9).

Wolfe, Frank, 2002, Thermobaric Weapons Shipped For Possible Use In Operation Enduring Freedom. 2002. *Defense Daily*, January 9, 2002. Page 1. ISSN: 0889-0404.

Abstract: A test of the warhead on Dec. 14 used a GBU-24 against a mock tunnel target at the Nevada Test Site. A Boeing F-15E from the 53rd Test Wing at Nellis AFB, Nev., fired the weapon. DoD acquisition chief Pete Aldridge said last month that there was a clear need for the weapon in Afghanistan and that the December test of the munition, equipped with a delayed fuse, resulted in a "significant growth in overpressure and temperature in the tunnel" (Defense Daily, Dec. 21). A stock of 10 BLU-118B thermobaric weapons has been shipped for possible use in Operation Enduring Freedom, the Air Force said yesterday. Developed in an accelerated Advanced Concept Technology Demonstration by the Defense Threat Reduction Agency (DTRA), in conjunction with the Navy and Department of Energy, the weapons use a fuel-rich explosive that releases energy over a longer period of time than standard explosives. The BLU-118B carries the same penetrator body as the BLU-109 and is applicable to the Raytheon (RTN) GBU-24 2,000-pound laser-guided and Boeing (BA) GBU-15 optically-guided bombs and the Boeing AGM-130. A test of the warhead on Dec. 14 used a GBU-24 against a mock tunnel target at the Nevada Test Site. A Boeing F-15E from the 53rd Test Wing at Nellis AFB, Nev., fired the weapon. DoD acquisition chief Pete Aldridge said last month that there was a clear need for the weapon in Afghanistan and that the December test of the munition, equipped with a delayed fuse, resulted in a "significant growth in overpressure and temperature in the tunnel" (Defense Daily, Dec. 21). The test on Dec. 14 was the culmination of a two-month "accelerated effort to produce a weapon with improved lethality against underground facilities," according to DoD. "Because you get a longer burn time, you get more pressure, which makes it a more effective weapon in confined spaces," said Air Force Capt. Joe Della Vedova, a service spokesman.

Wong, Kung Ping (1919- ) and staff. 1977. "Afghanistan." In: Far East and South Asia. Washington: US Bureau of Mines. *Mineral Perspectives*. Number 1. May 1977. Pages 10-11. USGS Library.

Abstract: Map of locations are given for barite, coal, lapis lazuli, marble, gas, salt, talc, etc. and discussion of mineral explorations and transportation issues.

Wood, John (1811-1871). 1841. Personal Narrative of a Journey to the Source of the River Oxus, by Route of the Indus, Kabul, and Badakhshan, Performed Under the

Sanction of the Supreme Government of India, in the Years 1836, 1837, and 1838, by Lieutenant John Wood of the East India Company's Navy. London: John Murray. 1841. 421 pages and maps. OCLC: 9450498.

Description: Includes some description of lapis-lazuli (Kokcha Valley), iron ("The ore he uses comes from the mines of Arganjika, in the neighborhood of the village of Khyrabad") and ruby mines ("The ruby mines are within twenty miles of Ish-kashm, in a village 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 about 1,200 feet above its level. The formation of the mountains is either red sandstone or limestone, largely impregnated with magnesia.") found in Chapters 17 and 19.

Wyart, Jean; Bariand, Pierre; Filippi, Jean. 1971. "Lapis Lazuli of Sar-E-Sang (Badakshan, Afghanistan)." Translated from: *Revue de Geographie Physique et Geologie Dynamique*. Volume 14, No. 4, pages 443-448 (1972). Also published in: *Gems and Gemology*. Volume 17, number 4, pages 184-190. 1981. ISSN: 0016-626X; GeoRef Number: 1982-063372. ERA citation 10:007554.

Subject descriptors: Afghanistan; silicate minerals; geologic deposits; mineral resources; mineralogy; petrogenesis; sodium silicates ERDA/580300; Translations; Lapis lazuli; Lazurite. "The lapis lazuli deposit of Sar-e-Sang, in Badakshan, Afghanistan, has furnished the raw material for precious objects manufactured since the earliest civilizations. The mine, which is located in the Hindu Kush Mountains, is always difficult to reach, and is open for only a few months during the summer. The lenses mined are included in very hard cipolins in which calcite and dolomite are intimately associated with silicates such as diopside, scapolite, and forsterite. Pyrite is always present. These minerals, with calcite, occur in varying quantities along with the pure mineral, lazurite, in the lapis lazuli, whose color varies with the amount of impurities it contains. Well formed crystals with the dominant (110) form are rare. An explanation of the genesis of lapis lazuli is proposed. 17 references, 1 figure."

Wynne, A. B. Date not given. "A Geological Reconnaissance from the Indus at Kushalgarb to the Kuram, at Thal on the Afghan Frontier." *Records of the Geological Survey of India*. Volume 10, page 128 and volume 12, page 100 et seq. Dates not given. USGS Library.

"Yaka Ta Khom Zinc-Lead Deposits: Dahla District, Kandahar Province, Afghanistan." 1945? No place of publication given. 5 maps and 1 diagram on 6 sheets; sheets 60 x 85 cm. or smaller. OCLC: 33829025.

Contents: Figure 2: Location map of Yaka Ta Khom zinc-lead deposits, Dahla district, Kandahar Province, Afghanistan. Figure 3: Map of Afghanistan and part of Pakistan, showing transportation routes. Figure 8: Map of Yaka Ta Khom zinc-lead deposits, showing topography, geology, and samples. Dalha district, Kahdarhar Province, Afghanistan. Figure 9: Map of Yaka Ta Khom zinc-lead deposits, showing topography, geology, and samples. Dalha district, Kahdarhar Province, Afghanistan. Figure 10: Map of Yaka Ta Khom zinc-lead deposits, showing topography, geology, and samples. Dalha district, Kahdarhar Province, Afghanistan. Figure 11: Vertical sections through diamond drill holes, Yaka Ta Khom zinc-lead deposits, Dahla district, Kandahar Province, Afghanistan. Subject

descriptors: Mines and mineral resources of the Dahla district (Afghanistan)- Maps; Zinc mines and mining of the Dahla district (Afghanistan)- Maps; Lead mines and mining of the Dahla district (Afghanistan)- Maps. Scales vary on each sheet. Relief shown on some maps.

Yate, Major Charles Edward. 1888. Northern Afghanistan or, Letters from the Afghan Boundary Commission. Edinburgh, London, W. Blackwood & Sons. 430 pages, with folded maps in pocket. OCLC: 1068069; 23789723; 4949452

Yate, Major Charles Edward. 1887. "Notes on the City of Hirat." Calcutta, India: Asiatic Society. *Journal of the Asiatic Society of Bengal*. Volume 56, part 1, number 2 (1887), p. 84-106. (OCLC)1824093; 32047780.

Zagros, Hindu Kush, Himalaya, geodynamic evolution (English) Gupta, H.K. (ed.) Delany, F.M. (ed.) In: *Geodynamics Series* (USA), v. 3. American Geophysical Union, Washington, DC (USA); Geological Society of America, Boulder, CO, 1981, 323 p. ISBN 0-87590-507-2.

Subjects: Geology; Geophysics; Seismology; Iran Islamic Republic; Afghanistan; Pakistan.

Zeigler, John M. 1958. "Geological Study of the Shamshir Ghar Cave, Southern Afghanistan, and Report of Terraces along Panjshir Valley near Kabul." *Journal of Geology*. 66 (1), 1958, pages 16-27. GeoRef Number: 1970-017785.

Abstract: "Shamshir Ghar cave in southern Afghanistan near Kandahar has had only a short history of occupancy. The cavern formed inside the mountain probably in the Miocene but was opened approximately two thousand years ago. Sediments in the cave preserve a surprisingly good historical sequence of the cave's history. Loess, which blankets higher terraces near Gulbahar, north of Kabul, make it possible to date the well-preserved terraces as Wisconsin and post-Wisconsin. The terraces are representatives of vast quantities of rock which were removed during mountain glaciation of the Panjshir valley. The age of archeological sites in the loess blanket or in the terraces should be related to this general framework of geological history." Subject descriptors: Afghanistan; caves; Cenozoic; geology; Panjshir valley; quaternary; Shamshir Ghar cave; terraces."

Zeller, Tom, 2001, Worm Warfare. *New York Times*. (Late Edition (East Coast)). New York, N.Y.: Nov 25, 2001, page 4.6.

Abstract: Just what that might mean for those American forces attempting to root out terrorist and Taliban elements in Afghanistan is an open question. Finding every nook and cranny in the porous landscape is difficult enough, and bunker-busting bombs dropped from high-flying aircraft may do well against hideouts near the surface. But the Soviet experience in Afghanistan shows that deeper facilities require a more personal touch: they took to yelling into shafts and, in the absence of surrender, tossing in a couple of grenades. The Vietnamese became famous for their astute use of underground tunnels and caves. One U.S. army brochure attempted to characterize the various types of tunnel entrances- or holes- created by the Viet Cong, so that troops could sniff them out. (Sources: Cappadocia diagram: The Odyssey World Trek for Service and Education; Maginot Line: from The Dallas Morning News, Sunday, Oct. 22, 1939, Southern Methodist University Digital Library; Vietnam tunnels: U.S. Army brochure Hole Huntin', by Maj. Ben G. Crosby).

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

Zestovski, P. 1949. "Esquisses d'Architecture Afghane. Hérat." *Afghanistan*. No. 3, pages 1-25.

Illustration of the cave "Dahan-ghar," facing page 6.

Zestovski, P. 1948. "Esquisses Architecturales de l'Afghanistan. Vallée de Bamiyan." *Afghanistan*. No. 2, 1948, pages 39-62.

There is an engraving of the face of the cave "Tchehel Sotoun" on page 61, which is named after the famous 17<sup>th</sup> century palace in Isfahan, Iran.

### **Useful Maps of Afghanistan**

- Abdullah, Shareq; Chmyriov, V. M. (Chmyrev, V. M.); Stazhilo, Alekseev K. F. (Stazhilo, Alekseyev K. F.); Dronov, V. I.; Gannon, P. J.; Rossovskiy, L. N.; Kafarskiy, A. K. and Malyarov, E. P. 1977. "Mineral Resources of Afghanistan." Kabul: Republic of Afghanistan, Ministry of Mines and Industries. 419 pages with maps. Map Scale: 1:2,000,000. Summary in Arabic. OCLC: 05864346; GeoRef Number: 1980-031727.
- Subject descriptors: Afghanistan; economic geology; maps; metals; mineral resources; natural gas; nonmetals; petroleum.
- Abdullah, Shareq. 1976. "Afghanistan [Faults]." Kabul. No place of publication. Scale is 1:10,000,000. 1 sheet in color. USGS Library: Map Collection.
- Abdullah, Shareq. 1976. "Tectonic Map of Afghanistan." Kabul: Geological Survey of Afghanistan. 1 sheet, black and white, scale: 1:4,900,000. USGS Library.
- "Afghanistan." 1942. Great Britain. War Office General Staff. Geographical Section. London; War Office. 1st ed. Description: color maps 38 x 46 cm. Scale 1:253,440. OCLC: 9987462.
- Notes: Topographic. "3919." Compiled and published originally under the direction of the Surveyor-General of India, 1921, and revised to 1940. Heliographed by O.S.O., 1942. Reprinted by the U.S. Army Map Service, 1942 (AMS U511). Four classes of railroads, three classes of roads and paths, international and administrative boundaries are shown. Contour intervals 250 feet with elevations in spot heights. Water features shown in blue. Ground cover is extensively symbolized. Military grid. Marginal diagrams: Administrative index. Index to sheets. Index to numbering. Compilation index. Grid reference. Index map on separate sheet, 24 x 36 cm.
- "Afghanistan." 1871. Surveyor General, Geological Survey of India. Compiled from all available sources in the Quartermaster General's Office, Simla. Scale, 1 inch=16 miles, in two sheets of 44 x 30 inches, colored. (Skeleton edition, without hills).
- "Afghanistan 1:100,000." 1960. Fairchild Aerial Surveys, Inc. Kabul: The Ministry. Maps: photocopies; 38 x 45 cm. In both English and Dari. Topographic map. Scale 1:100,000; Transverse Mercator projection; (E 600--E 750/N 380--N 290). OCLC: 48075313.
- Notes: Relief shown by contours, hachures, landform drawings, and spot heights on some sheets. Aerial photography dated Oct. 1957-. "1960 magnetic declination ..." Universal transverse Mercator grid. Includes glossary, index map to adjoining sheets, and administrative boundary diagram. Compiled by Fairchild Aerial Surveys, Los Angeles, Calif., U.S.A., by stereo-photogrammetric methods; executed for the Ministry of Mines and Industries, Royal Government of Afghanistan. Afghanistan; Vizarat-i Ma'adin va Sana'i'.
- "Afghanistan 1:200,000." 1941. Germany. Heer. Abteilung für Kriegskarten- und Vermessungswesen. [Berlin]: des General Stabs des Heeres, Abteilung für Kriegskarten und Vermessungswesen, No. 1. Sonderausgabe Sept. 1941. Description: maps in color; 58 x 100 cm. or smaller. German language. Topographic. Scale 1:200,000. A Constant ratio linear horizontal scale. Relief shown by shading and spot heights. Sheets include index to adjoining sheets.

Military geography map prepared by the Nazis in case of an invasion of Afghanistan. US Archives; OCLC: 38460826.

"Afghanistan 1:250,000." 1968. Fairchild Aerial Surveys, Inc. Kabul: The Ministry. Includes maps, photocopies; 45 x 37 cm. Topographic map; Scale 1:250,000; Transverse Mercator projection; (E 600- E 750/N 380- N 290). Category of scale: a Constant ratio linear horizontal scale: 100000. Coordinates-westernmost longitude: E0600000; easternmost longitude: E0750000. OCLC: 48075318.

Notes: Relief shown by contours, hachures, landform drawings, and spot heights on some sheets. Aerial photography dated 1957. On some sheets: Printed by Afghan Cartographic Institute, 1968 or 1969. Universal Transverse Mercator grid. Includes glossary, index map to adjoining sheets, and administrative boundary diagram. Compiled by Fairchild Aerial Surveys, Inc., Los Angeles, Calif., U.S.A., by stereophotogrammetric methods in 1967; executed for the Ministry of Mines and Industries, Royal Government of Afghanistan [sic]. Afghanistan; Vizarat-i Ma'adin va Sana'i'; Da Afghanistan Kartografi Mu'assasah

"Afghanistan: Terrain & Transportation." 1969? United States Aeronautical Chart Service. Washington, D.C.: BASE: World Aeronautical Charts. Description: 1 map in color; 52 x 51 cm. Map Info: Topographic. Scale 1:1,000,000. OCLC: 38525876.

Notes: Relief indicated by hachures and spot heights. Shows boundaries, highways and roads, railways, rivers and water features and other details. Shows Afghanistan terrain and transportation.

"Afghanistan & United Nations Special Fund Land & Water Resources Survey." 1965. Food and Agriculture Organization of the United Nations. Rome: Food and Agriculture Organization of the United Nations. 1965. Description: 38 maps: mostly in color, on sheets 50 x 63 cm., or smaller+ key map. Map Info: Scales vary. OCLC: 37843300.

Notes: Title varies. From v.4 of the *Report on Survey of Land and Water Resources: Afghanistan*, published by the FAO in 1965. Afghanistan and United Nations Special Fund land and water resources survey; Report on survey of land and water resources: Afghanistan. United Nations Special Fund.

Afghanistan & United Nations Special Fund Land & Water Resources Survey. 1961-1962. Food and Agriculture Organization of the United Nations. FAO-UNSF Project Co-Operative, Ministry of Agriculture, Government of Afghanistan. Land Classification Maps. Compiled from uncontrolled air photographs. Land Classification Map of the Jilga Valley; IV-2 Ghorband, Panjshir and Shakar-Dara Valley; IV-5 Part of the Logar Valley; IV-8 The Kabul Valley; IV-11 The Ghazni Valley; as District; IV-20 The Land Classification Map of the Ab-I-Istada-Dilya Area; IV-21 The Ab-I-Istada-Dilya Area; IV-23 Waza Khwa Area; IV-26 Land Use Map of Farah Valley; IV-29 Qal'eh-I-Kah Area; IV-32 Adraskand (Shindand) Basin; IV-34 The Lower Hari-Rud Valley; IV-37 Upper Hari-Rud Valley. FAO. USGS Library.

"Afghanistan, Political, Physical [sic], Road & Distances; Some Important Historical Monuments." 1963. Mu'assasah-i Jughrafiya'i va Kartografi-i Sahab. Tehran, Iran: Sahab Geographical and Drafting Institute. 1st. ed. 1960; 2<sup>nd</sup> edition, 1963. Description: 1 map in color; 48 x 54 cm., folded to 18 x 12 cm. Language: English;

Title and legend in Persian and English. Map Info: Scale 1:2,000,000. OCLC: 38460824; 38301173; 38437907.

Notes: Relief shown by contours. Includes illustrations and an inset of Wakhan and Pamir. Naqshah-i rahnama-yi kishvar-i Afghanistan; Afghanistan, political, physical [sic], road & distances.

"Afghanistan, Iran: Farah & Herat Provinces." 1941, 1945. *Survey of India*. Calcutta: Survey of India. One map, in color; 45 x 65 cm. Scale 1:253,440, 4 miles to 1 inch. "Provisional GSGS 3919 (Survey of India)." "Survey of India Interim edition, 1941-AMS 1, 1945." "Reproduced under the direction of the Chief of Engineers by the Army Map Service, U.S. Army, Washington, D.C., 1945,... published under the direction of Colonel E. O. Wheeler, M. C. Officiating Surveyor General of India. OCLC: 28557841.

"Afghanistan, Northern. Map of the Seat of War, 1878-1880." 1881? Third edition. Compiled by the Surveyor General's Office, Calcutta, principally from surveys and reconnaissances by officers of the Survey of India. Scale is one inch equals four miles, 34 x 26 inches.

"Afghanistan (Part of Southern), with the Adjoining Portions of Baluchistan, Embracing the Country from Sibi and Dadur to Quetta and via Kandahar Girishk- the Peshin and Toba Plateaus- the Route from Kandahar to Ghazni and Portions of the Thal Chotiali Route and the Marri Country." 1878, 1879 and 1880. Compiled by the Surveyor General's Office, Calcutta, from surveys and reconnaissances mostly by the survey of India attached to the Southern Afghanistan Field Force. Scale is one inch = 4 miles in four sections; size of each section is 42 x 31 inches.

"Archæological Map of Afghanistan." 1968. *Afghanistan*. Vizarat-I Ittila'at va Kultur. Kabul: Ministry of Information and Culture. Description: 1 map in color; 42 x 58 cm. Afghanistan Antiquities. Map Info: Scale [ca. 1:2,400,000]. OCLC: 12031650.

Notes: Relief shown by shading. Pictorial map. "Printed by the Afghan Cartographic Institute." Da Afghanistan Kartografi Mu'assasah.

Burnes, Alexander (1805-1841) and John Arrowsmith (1790-1873). 1844. "Central Asia Comprising Bokhara, Cabool [sic], Persia, the River Indus, & Countries Eastward of it. London Atlas of Universal Geography." London: J. Arrowsmith, [1844], 1842. 29. (OCLC: 47837078). Map Scale [ca. 1:4,435,200]; (E430--E 800/N 430--N 230) Category of scale: a Constant ratio linear horizontal scale: 4435200 Coordinates--westernmost longitude: E0430000 Coordinates--easternmost longitude: E0800000 Note(s): Relief shown by hachures. Scanned raster image of original: one map, hand colored; 53 x 72 cm. Original in the David Rumsey Collection, scanned by Cartography Associates. OCLC: 47866727; 35952856. Internet access at: <http://www.davidrumsey.com/>

"Constructed from numerous authentic documents, but principally from the original M.S. surveys of Lieut. Alex. Burnes, F.R.S. to whom this map is most respectfully dedicated ... June 1834."

"Carte Géologique de l'Afghanistan: Geological Map." 1985? Mu'assasah-i Jughrafiya'-i va Kartografi-i Sahab. Publication: Tehran, Iran: The Institute. Year: ? 1950, 1985. Description: one map in color; 42 x 55 cm. Series: Map; no. 248. Map Info: Scale 1:2,500,000. OCLC: 14523327.

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

- Notes: legend in Arabic, Persian and English. Responsibility: projection, cartography, lithography and printing by Sahab Geographic and Drafting Institute.
- Chmyrev, V. M. 1972. "Map of Mineral Resources of Afghanistan: Scale 1:1,000,000." Afghanistan: Department of Geology and Mines. One map on four sheets, photocopy. USGS Library: M(655)4 1972.
- Coulter, Henry "Hank" W. "Hank's first action was to prepare a geological map of Afghanistan based on all available sources. On this map he pinpointed the regions where the limestone formations were just right for caves that could have been inhabited by Pleistocene hunters. Thus, before we had our visas we knew exactly where we wanted to go..." Coon. Seven Caves. Pages 217-218. This map location is presently unknown.
- Dedkov A.P.; Dzhoyn S.A. and Mozherin V. 1990. "New Data on Afghan Topography." *Izvestiya - Vsesoyuznogo Geograficheskogo Obshchestva*. Volume 122, no.5 (1990) p. 420-424. Russian. GeoBase Accession No: 0870177.
- "Cartometric research was carried out into the relief of Afghanistan. The research was based on a hypsometric map of Afghanistan on a scale of 1:1000 000 produced by the Afghan Institute of Cartography in 1984. The processing of morphometric data using a BK-0010 mini-computer revealed 11 main types of relief which may be divided into 3 groups: high mountains, medium to low mountains, and plains. The rationalization of the relief will form a basis for the rationalization of climate, river discharge, soils, vegetation and geographical landscape. (P.Cooke-USGS)
- Desio, Ardito, Martina, Ercole, and Pasquare, Giorgio. 1964. "Geological Map of Central Badakhshan (Afghanistan)" Milano; Institute of Geology, University of Milan. Description: map in color; 64 x 98 cm. Scale 1:150,000. Language: English. OCLC: 5476428.
- Notes: Relief shown by contours. Includes "Tectonic position of Central Badakhshan," 1:2,000,000, "Geographical Sketch Map," and "Index to Topographical Maps on the Scale of 1:50,000 of the Survey of Afghanistan." Ardito Desio, Ercole Martina, Griorgio Pasquare. Ardito Desio's expedition to Hindu Kush (1961). Drawn by S. Tomaini.
- Dimarzio, Cathleen M. 1977. "Satellite-image Mosaic of Afghanistan." Omaha: University of Nebraska, Department of Geography and Geology. Map is 61 x 76 cm, scale is 1:2,000,000. OCLC: 03752741.
- Dronov, V. I., et al., compilers. 1973. Tectonic Map of Central and South-western Afghanistan. Kabul: No place of publication given. 1 sheet, black and white, scale: 1:1,500,000. USGS Library.
- "Economical Map of Afghanistan." 1967. Da Afghanistan Kartografi Mu'assasah. Kabul: The Afghan Cartographic Institute. Description: 1 map: color; 48 x 64 cm. OCLC: 26188761.
- Notes: Scale not given. "Ordered by the Ministry of Information and Culture."

- Furon, Raymond. 1941. "Carte Géologique et Structurale du Plateau Iranien au 1:5,000,000." Paris: Editions du Museum. One map in color; 37 x 54 cm., pliée 25 x 17 cm. + ouvrage (p. 177-414 : ill.; 27 cm.) French language. 1:5,000,000; (E 44000'-E68000'/N 40000'-N24000'). A Constant ratio linear horizontal scale. Relief représenté par des points cotés. In: "*Mémoires du Museum National d'Histoire Naturelle, nouvelle série*, tome VII, fasc. 2: "Géologie du Plateau Iranien (Perse-Afghanistan-Béloutchistan) par Raymond Furon." Muséum National d'Histoire Naturelle (France). OCLC: 38445571.
- Ganss, Ortwin. 1964. "Geologische Übersichtskarte von Südostafghanistan und den Angrenzenden Gebieten von West-Pakistan." (Translation: General geological map of Southeastern Afghanistan and adjacent areas of Pakistan) Hannover: Bundesanstalt für Bodenforschung. Description: 1 map in color; 71 x 71 cm. Language: German. Map Info: Scale 1:500,000; (E660--E69040/N320--N290) Also: "Geologisch-tectonische Übersicht von Süost-Afghanistan und Pakistan." OCLC: 11162007.  
Subject descriptors: Geology of Northern Pakistan, Maps; and Geology of Eastern Afghanistan, Maps. Notes: Produced to accompany the author's article "Zur Geologischen Geschichte der Belutschistan-Indus-Geosynklinale (Der Versuch einer Gesamtschau des südoafghanisch-pakistanischen Raumes)." In: *Geologisches Jahrbuch*, Bd. 82, pages 203-242. 1964. Bearbeited: O. Ganss, 1963. Bundesanstalt für Bodenforschung.
- "General Map of the Kandahar District, Afghanistan." 1882. Surveyor General of India, Calcutta, and Dehra Dún. "Double Elephant" folio map.
- "Geological Map of Afghanistan. 1972. Editors-in-chief: V. M. Chmyriov and S. H. Mirzed [sic]. Kabul: Cartographic Institute. Afghanistan Department of Geology and mines. At head of title: V/O Technoexport." USSR. Scale: 1:1,000,000. USGS Library: Map Collection.
- "Geology and Mineral Resources of Afghanistan." 1983. Ministry of Mines and Industries. Republic of Afghanistan. Kabul, Afghanistan. 109 pages, maps. GeoRef Number: 1987-053515.  
Subject descriptors: Afghanistan; Alpine Orogeny; economic geology; Hercynian Orogeny; metallogenic maps; mineral resources; Phanerozoic; Precambrian; tectonic maps. Map Scale: 1:2,500,000. Reference includes data from PASCAL, Institut de l'Information Scientifique et Technique, Vandoeuvre-les-Nancy, France.
- German Geological Mission to Afghanistan. 1964. "Geological Map of Afghanistan. Central and Eastern Part." Hannover: Geological Survey of the Federal Republic of Germany (*Bundesanstalt für Bodenforschung*). Kabul: Afghanistan Geological and Mineralogical Survey. 1 sheet in color, scale: 1:1,000,000. USGS Library.
- Humlum, Johannes. 1948. "Oaselandskab ved Pirzada, Afghanistan. Paysage d'Oasis Près de Pirzada." (Translation: Landscape of an oasis near Pirzada). Aarhus; Danmark, Geografisk Institut. One color map; 110 x 77 cm. folded in cover; 30 x 20 cm. Scale 1:2,100. Language: Danish. Koshk-e Nakhvod River, Afghanistan. OCLC: 5570151.  
Notes: Relief shown by shading, contours, and spot heights. "Opmaalt... 1948." Originally contained in Humlum's report "*La Géographie de l'Afghanistan*." Inset: "Oversigtskort over Afghanistan."

- Johnston, Alexander Keith (1804-1871). "Persia and Afghanistan." Title varies: "The Royal Atlas of Modern Geography: Exhibiting, in a Series of Entirely Original and Authentic Maps, the Present Condition of Geographical Discovery and Research in the Several Countries, Empires, and States of the World: With a Special Index to Each Map." "Keith Johnston's Royal Atlas of Modern Geography." "Keith Johnston's General Atlas." "General Atlas." 1861? 1870? 1879? 1885? From: Keith Johnston's General Atlas, sheet 32. London: Edward Stanford "Sole agent by appointment for the Ordnance and Geological Survey maps, agent for the Admiralty charts, the Indian Government maps, etc." Boundaries hand colored; hydrography printed in blue. Relief shown by hachures. Scales: Natural scale, 1:4,311,000 – 68 miles to an inch. "Heights in English feet; submarine telegraph lines shown... railways, names referring to ancient geography." (E 44°-E 72°; N 42°-N 22°). USGS Library: Kunz Collection. Also: Scanned raster image of the original: 1 map: colored; 43 x 57 cm. Original in the David Rumsey Collection; scanned by Cartography Associates. OCLC: 50903783; 50911651; 19927188.
- "Kabul." 1967. Da Afghanistan Kartografi Mu'assasah. English. One map in color; 38 x 43 cm. Kabul: The Institute. 1967. Description: 1 map in color; 38 x 43 cm. Map Info: Topographic. Scale 1:20,000. OCLC: 41384164.  
Notes: Relief shown by contours and spot heights. "Prepared March 1967." Includes indexes to ministries, embassies, consulates, legations, hotels, restaurants, cafes, and points of interest. Responsibility: Afghan Cartographic Institute.
- "Kabul/Afgh. Phasen der Stadtentwicklung (Phases of Urban Development)." 1967. Bonn, Germany: Geographisches Institut der Universität Bonn. Description: 1 map in color; 53 x 66 cm. Language: German; Legend in German and English. Map Info: Scale 1:25,000; Land use. OCLC: 37657380.  
Note(s): Relief shown by form lines and spot heights. Shows land use before 1940, then between 1940-1960, and after 1960; and "extension commenced during the period of the survey [1967]." Includes inset. "Beilage I zu Erdkunde XXVI, 1 Beitrag Hahn." Entwurf: H. Hahn.
- "Kandahar City and Environs." June 1882. Surveyor General of India, Calcutta and Dehra Dún. Two sheets of "double elephant" size folios. In color. Scale is one and one-twelfth inch equals one mile.
- Kiepert, Heinrich (1818-1899). 1878. "Iran, Östliche Hälfte enthaltend Afghanistan, Balutschistan, und die Özbeghischen Khanate am Oxus, nach Englischen und Russischen Originalkarten und Reiseberichten." Translation: Map of Iran, with the eastern half containing Afghanistan, Balutschistan, and the Oezbeghi Khanate at the Oxus, compiled from English and Russian original maps and the reports on a reconnaissance). Berlin: Dietrich Reimer. October 1878. Topographic map; 1 map: color; 63 x 46 cm. Scale [ca. 1:3,000,000] (E 60°--E 75°/N 40°--N 30°). OCLC: 41313962
- Kolchanov, V. P., 1966, Tectonic Map of Afghanistan. Kabul: no place of publication given. 1 sheet, photoprint, scale: 1:7,000,000. USGS Library.
- Kolchanov, V. P., 1966, Tectonic Map of Afghanistan. Kabul: no place of publication given. 1 sheet, ozalid, scale: 1:2,600,000. USGS Library.
- Map of Afghanistan & Surrounding Area. 2001. Oxford, England: Oxford Cartographers and Gizi Map Co. Folded Map, Scale 1:3000000. Languages: English, French,

- German & Greek. ISBN: 9630083167. A new map of Afghanistan with topographic shading and place name index.
- “Map of Mineral Deposits and Occurrences of Ferrous Metals and Fuel Minerals of Afghanistan.” 1976. Author and place of publication unknown. Insert map: “Scheme of major tectonic regions of Afghanistan.” A collection of maps: “Ferrous Metals and Fuel Minerals”; “Mineral and Fresh-Water Springs of Afghanistan”; “Nonferrous Metals”; “Nonmetallic Minerals”; “Rare and Precious Metals”; “Tin, Tungsten, Molybdenum and Bismuth.” Scale: 1:2,000,000. USGS Library; OCLC: 36988947.
- ”Map Showing Geology, Oil and Gas Fields and Geological Provinces of South Asia [computer file].” 1997, 1999. USGS Open File Report No. 97-470C, Version 2. November 1999. ISBN: 0607936215. See the site at: <http://purl.access.gpo.gov/GPO/LPS2700>.
- Minnessier, G., 1973, “Geological Map of Afghanistan.” Kabul: Geological Survey of Afghanistan. 15 sheets, in color, scale: 1:100,000. Altamur, Awzangani, Baraki Barak, Dawlat Khan, Dpbanday, Gardez, Koh-E-Sultan Saheb, Naghlu, Pul-E-Alam, Ramak, Saydkaram, Spin Jumat, Tchakhur, Tizin, Zarghunshahr. USGS Library.
- “North-Western Trans-Frontier.” 1880-1909. Survey of India. [Dehra Dun]: Survey of India. 1880-1909. 94 maps. Scale 1:126,720. A Constant ratio linear horizontal scale. Relief shown as contours and heights. Shows: international and administrative boundaries of Pakistan and Afghanistan, railways, roads, camel and caravan routes, caravanserais, canals, etc. OCLC: 48596512.
- ”Physical Map of Afghanistan.” 1968. Da Afghanistan Kartografi Mu’assasah. Kabul; Afghan Cartographic Institute. 1st ed. Description: map in color; 63 x 70 cm. Scale 1:2,000,000. OCLC: 5683774.
- Notes: "Elevations are shown in meters." "Transverse Mercator projection." In both English and Pushto.
- ”Roads of Afghanistan.” 1942. United States. Office of Coordinator of Information. Cartographic Section. Publication: [Washington, D.C.]: The Section. Description: 1 map; 18 x 25 cm. Language: English. Map Info: Scale [ca. 1:6,250,000]. OCLC: 24543989.
- Note(s): "March 17, 1942." Shows truck and wagon roads and caravan trails. Stamped on verso: Office of Strategic Services, Geography Division, Map Information Section. Originally issued as a "restricted" map. Restriction on use no longer in effect. "Map no. 373." Responsibility: drawn in the Cartographic Section, Geog. Div., C.O.I.
- ”Rui Chaf.” 1941. Corp Author: Germany. Heer. Abteilung für Kriegskarten- und Vermessungswesen. [Berlin]: des General Stabs des Heeres, Abteilung für Kriegskarten und Vermessungswesen, No. 1. Sonderausgabe. Sept. 1941. Description: One map in color; 56 x 69 cm. Language: German. Series: Afghanistan 1:200 000; I-41-NW-3. Rui Chaf Region (Iran). Map Info: Scale 1:200,000. Category of scale- a Constant ratio linear horizontal scale: 200000. Coordinates-westernmost longitude: E0600000; Coordinates-easternmost longitude: E0613000. OCLC: 27951187

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

Note(s): Relief indicated by hachures and spot heights. Includes 2 key maps.  
Hergestellt im Auftrag des General Stabs des Heeres, Abteilung für Kriegskarten  
und Vermessungswesen.

“Scheme of Arrangement of the Main Mineral Deposits and Occurrences of  
Afghanistan.” No date given. 1 sheet, scale: 1:2,500,000. Shows locations of mining  
sites. USGS Library.

Slavin, Vladimir Il'ich and S. H. Mirzad'. 1968. “Tectonic Map of Afghanistan.” No  
place of publication given. Description: map 110 x 151 cm. on 2 sheets,  
monochrome, 114 x 84 cm. Scale 1:1,000,000. Language: English. OCLC:  
5569771.

Notes: Photocopy. "Compiled according to the materials of the Department of  
Geology and Mines of the Ministry of Mines and Industries of Afghanistan."  
Editors: V. I. Slavin, S. H. Mirzad.

Stein, Aurel. 1915, 1916. “Archaeological Survey in North-eastern Afghanistan.” Text  
and 15 manuscript maps, scales vary. Title devised by cataloguer. Relief shown as  
contours and shows: tracks, sketch plans of ruined forts and archaeological sites.  
Coverage: Northeastern Afghanistan. “Survey made under the direction of Sir Aurel  
Stein.” OCLC: 48597623.

Straub, Sam J. 1968. “Gazetteer of Mineral Occurrences Names and Locations,  
Afghanistan.” St. Maurice-Helmkamp-Musser. Publication: Santa Cruz, CA.  
Description: map on sheet; 122 x 82 cm. Scale 1:4,800; 1" = 400'. University of  
California, Santa Cruz- Maps. Notes: Photocopy; blue line print. Relief shown by  
contours. Accompanied by: Compiled by Sam J. Straub, Dec. 10, 1968. OCLC:  
5495759.

“Sulaiman Mountains.” 1946. United States. Army Map Service. Washington, D.C.: The  
Service. Fifth edition. AMS-3. One topographic map, in color; 49 x 63 cm. In  
English and French. Series: Asia 1:1,000,000; NH-42. International map of the  
world. Sulaiman Range (Pakistan and Afghanistan). Category of scale: a Constant  
ratio linear horizontal scale. A.M.S. 1301 (G.S.G.S. 2555) Fifth Survey of India  
edition, 1945-AMS 3, 1946. OCLC: 38840113.

“Relief shown by contours, form lines and spot heights. Shows boundaries,  
highways and roads, railways, rivers and water features and other details. "Heights  
in metres and feet." Army Map Service, US Army Corps of Engineers, War  
Department, 100124. "British Crown copyright reserved." "Reproduced with the  
permission of the Controller of His Britannic Majesty's Stationery Office."  
Compiled and drawn by the Survey of India; printed by the Army Map Service,  
Corps of Engineers.”

Sweetwood, Charles W. 1968. “Important Mineral Occurrences of Afghanistan.” Mineral  
and Petroleum Attaché, American Consulate, Kabul. 1 sheet, ozalid. 3 sheets  
Gazetteer attached. OCLC: 23601715; OCLC: 05679011.

The copy is sometimes an unclear photocopy report, describing various named  
mines in Afghanistan, with a 1:2,000,000 map that is also on file.

“The Territories ... of the Khan of Kelat, of Baluchistan with the Adjacent Portions of  
Sind, the Punjab, Afghanistan, Persia.” 1877. Dehra Dun: Survey of India. Two  
map sheets. Scale is 1:1,014,760; conic projection. Category of scale: a Constant  
ratio linear horizontal scale. Relief is shown as shading. The maps show

international and administrative boundaries, railways, roads, etc. Date of information is 1876. OCLC: 48603617.

United States. Army Map Service. Washington, D.C.: Army Map Service, U.S. Army. This is a series of topographic maps of Afghanistan made during World War II and afterwards, based on maps originally drawn by the Survey of India. Scales vary. 1:253,440. 1 in. = 4 miles. See the individually titled items:

“Afghanistan.” 1968. United States. Army Map Service. Washington, D.C., Edition: Ed. 1-AMS. Description: maps in color; 56 x 54 cm. Scale 1:50,000. OCLC: 5484563.

Notes: Standard map series designation: Series U711. "Transverse Mercator projection." "Vertical datum: Kronshtadt datum. Horizontal datum: Herat north." Relief shown by contours, spot heights, hachures, and shading on some sheets. "Compiled in 1964 from Afghanistan, 1:100,000, sheets ..., printed 1960." Some sheets include glossary, index to adjoining sheets, and boundary map. Other Titles: Series U711.

“Ahmad Wal.” 1st ed. 1942, 1915. One map in color; 72 x 46 cm. Ahmad Wal Region (Afghanistan). Reprinted October 1942; compiled and published originally under the direction of the Surveyor-General of India, 1915." OCLC: 29629551.

"International no. H-41R (no. 34G)." "Afghanistan, Baluchistan." "Kandahar Province, Chagai District & Kalat State." "Mean grid north, in this sheet, is 10 21' west of true north; magnetic declination about 20 0' east in 1936." Afghanistan, Baluchistan. Kandahar Province, Chagai District & Kalat state.

“Bala Murghab.” 1960. Edition 1-AMS. Description: 1 map in color; 45 x 55 cm. Series: Western Siberia 1:250,000; NI 41-3. Herat (Afghanistan : Province). Murgab River (Afghanistan and Turkmenistan). Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 63000'00"--E 64030'00"/N 36000'00"--N 35000'00"). OCLC: 44476013.

Notes: "Contour interval 50 meters; Relief partially shown by form lines." Relief shown pictorially, and by contours, form lines, and spot heights. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1952..." "Blue numbered lines indicate the 10,000 yard India zone I grid, Everest spheroid." Includes location diagram, and glossary. Standard map series designation: Series N502. Margin title: Bala Murghab, Afghanistan; U.S.S.R.; Series N502. Prepared by the Army Map Service (AMVG), Corps of Engineers, U.S. Army.

“Bukhara.” 1965. United States. Army Map Service. Washington, D.C.: The Service. Ed. 4-AMS. Description: 1 map in color; 45 x 55 cm. In English and languages of the areas represented. Series: World 1:1,000,000; sheet NJ-41; Variation: International map of the World 1:1,000,000; sheet NJ-41. Map Info: Topographic. Scale 1:1,000,000. 1 mm. = 1 km. or 1 in. = 15.78 mi.; Lambert conformal conic projection standard parallels N 36040' and N 39020'; (E 600--E 660/N 400--N 360). OCLC: 35091394.

Notes: Heights in meters. Relief indicated by altitude tints, form lines, pictorial relief, and spot heights. Shows boundaries, highways and roads, railways, airports, rivers and water features and other details. Map overprinted with 100,000 meter universal transverse Mercator grid. Standard map series designation: Series 1301. Includes index to adjoining sheets, boundaries diagram, reliability diagram, glossary and metric conversion table. Margin title: Bukhara, U.S.S.R.; Afghanistan; Iran; Series 1301.

Prepared by the Army Map Service, Corps of Engineers, U.S. Army.

“Chagai Region.” 1942, 1916. 1st edition. One map in color; 66 x 51 cm. Chagai Region (Afghanistan). OCLC: 29629714.

"International no. H-41Q (no. 34C)." "Afghanistan, Baluchistan."

"Kandahar Province, Chagai District." "Mean grid north, in this sheet, is 10 53' west of true north; magnetic declination about 20 0' east in 1936."

Afghanistan, Baluchistan.; Kandahar Province, Chagai District.

“Fort Sandeman.” 1959. Ed. 1-AMS (1st print., 10-59). Description: 1 map in color; 45 x 57 cm. Series: India and Pakistan 1:250,000; NH 42-3; Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 69000'00"--E 70030'00"/N 32000'00"--N 31000'00"). OCLC: 44390247.

Notes: “Contour interval 500 feet with supplementary contours at 250 foot intervals. Relief partially shown by form lines." Relief shown pictorially, and by contours, spot heights, and form lines. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1955..."

"Blue numbered lines indicate the 10,000 yard India zone 1 grid, Everest spheroid." Includes location diagram, reliability diagram, and glossary.

Standard map series designation: Series U502. Margin title: Fort Sandeman, Pakistan; Afghanistan; Series U502. Prepared by the Army Map Service (SNPE), Corps of Engineers, U.S. Army.

“Herat.” 1961. United States. Army Map Service. Washington, D.C.: The Service. Ed. 4-AMS. Description: 1 map in color; 45 x 56 cm. Series: Asia 1:1,000,000; sheet NI-41; GSGS; 4646; Variation: International map of the World 1:1,000,000. Asia; Sheet NI-41.; GSGS (Series); 4646. Map Info: Topographic. Scale 1:1,000,000. 1 mm. = 1 km. or 1 in. = 15.78 mi.; modified polyconic projection of the International map of the World; (E 600--E 660/N 360--N 320). OCLC: 35641011.

Notes: Relief indicated by contours and spot heights. "British Crown copyright reserved." Standard map series designation: Series 1301. Legend and index to adjoining sheets in margin. Series 1301; Margin title: Herat, Asia. Printed by Army Map Service, Corps of Engineers.

“Joint Operations Graphic (Ground) [Afghanistan]. Herat, Afghanistan.” 1968. United States. Army Map Service. Washington, D.C.: The Service. Ed. 1. Description: one map in color; 46 x 57 cm., on sheet 56 x 73 cm. Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 61029'53"--E 63000'00"/N 35000'00"--N 34000'00"). OCLC: 34736532.

Note(s): "Compiled in 1967 from best available source materials. "Relief shown by contours, shading, and spot heights. "Contour interval 100 meters with supplementary contours at 50 meter intervals." Cultural features shown

by symbols. Includes map location diagram and glossary. Standard map series designation: Series 1501; NI 41-6. "9-68 printed by Army Map Service, Corps of Engineers." Herat, Afghanistan. Series 1501. Prepared under the direction of the Defense Intelligence Agency and published by the Army Map Service, Corps of Engineers. United States. Defense Intelligence Agency.

"Kalat." 1942, 1919. 1st ed. 1 map in color; 66 x 46 cm. Kalat Region of Afghanistan. Scale 1:253,440. 1 in. = 4 miles; (E 660/E 670--N 300/N 290) OCLC: 29629628.

"Reprint November 1942; compiled and published originally under the direction of the Surveyor-General of India, 1919. Relief shown by contours, form lines and spot heights. "No. H-42.M (I. & A.C. no. 34K)" "Afghanistan, Baluchistan." "Kandahar Province, Chagai & Quetta-Pishin and Kalat State." "Mean grid north, in this sheet, is 00 48' west of true north; magnetic declination about 20 0' east in 1931." Afghanistan, Baluchistan. Kandahar Province, Chagai & Quetta-Pishin Districts and Kalat State.

"Kandahar." 1951. United States. Army Map Service. Washington, D.C.: The Service. Reprinted by AMS, 1951 from a 4th Ed. GSGS map, dated 1945. Description: One map in color; 45 x 58 cm. In English and French. Series: HIND 5000; World (Asia) 1:1,000,000; Sheet NH 41; Variation: Great Britain. War Office. General Staff. Geographical Section. Hind; 5000; International Map of the World 1:1,000,000.; Asia; sheet NH 41. Map Information: Topographic. Scale 1:1,000,000. 1 mm. = 1 km. or 1 in. = 15.78 mi.; International (polyconic) projection; (E 600—E 660/N 320--N 280). OCLC: 36203399; 35640864.

Notes: "Heights in meters and feet." Relief indicated by contours, spot heights, and pictorial relief. Shows boundaries, highways and roads, railways, rivers and water features, and other details. Originally published by the Survey of India, prior to the separation of Pakistan. The 1945 GSGS map, upon which this AMS map is based, was a reprint of the earlier map. "Fourth HIND edition." "Gradient tints and isogonic data deleted by AMS, 1951." Includes index to adjoining sheets, reliability diagram, and metric conversion table. Standard map series designation: Series 1301 (HIND 5000) Margin title: Kandahar, Southwest Asia; Series 1301. Survey of India.

"Kohat." 1959. Ed. 1-AMS (1st print., 9-59). Description: one map in color; 45 x 57 cm. Series: India and Pakistan 1:250,000; NI 42-12; Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 70030'00"--E 72000'00"/N 34000'00"--N 33000'00"). OCLC: 44391288.

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

Notes: "Contour interval 200 feet; relief partially shown by form lines." "Relief shown pictorially, and by contours, and spot heights. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1955..." "Blue numbered lines indicate the 10,000 yard India zone 1 grid, Everest spheroid." Includes location diagram, reliability diagram, and glossary. Map on verso: Peshawar, Pakistan and vicinity. Scale 1:25,000 (approx.). Standard map series designation: Series U502. Margin title: Kohat, Pakistan; Afghanistan; Map on verso: Peshawar, Pakistan and vicinity; Series U502. Prepared by the Army Map Service (LU), Corps of Engineers, U.S. Army.

"Kushka." 1954. Ed. 1-AMS (1st print., 10-54). Description: 1 map in color; 45 x 53 cm. Series: Western Siberia 1:250,000; NI41-2. Herat (Afghanistan : Province). Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 61030'00"--E 63000'00"/N 36000'00"--N 35000'00"). OCLC: 44475596.

Notes: "Contour interval 50 meters with supplementary contours at 25 meter intervals. Relief partially shown by form lines." Relief shown pictorially, and by contours, shading, and spot heights. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1952..." "Black numbered lines indicate the 10,000 yard India zone I grid, Everest spheroid." Includes location diagram, reliability diagram, and glossary. Standard map series designation: AMS series N502. Margin title: Kushka, U.S.S.R.; Afghanistan; AMS series N502; Series N502. Prepared by the Army Map Service (AMVG), Corps of Engineers, U.S. Army.

"Mastuj." 1942 1923. 1st ed. 1 map in color; 71 x 46 cm. Mastuj Region (Pakistan) "Grid O; no. J-43S; (I. & A.C. no. 42D)" "Afghanistan, Gilgit Agency, N.W. Frontier Province, U.S.S.R." "Kataghan & Badakhshan Province. Political Districts. Dir, Swat & Chitral Agency. Tajik S.S.R." "Mean grid north, in this sheet, is 20 52' east of true north; magnetic declination about 30 0' east in 1936." Afghanistan, Gilgit Agency, N.W. Frontier Province, U.S.S.R.; Kataghan & Badakhshan Province. OCLC: 29629663.

Mirzad, S. H.; V. P. Kolchanov, and O. A. Manucharyants. 1966. "Geology and Usefull [sic] Minerals of Afghanistan." Kabul: Ministry of Mines and Geology. One map, photocopied, scales vary, 1:3,500,000. 45 x 63 cm. 1 sheet, blue line print; patterns show generalized geology, symbols show commodities and mining areas. OCLC: 5683007.

"Multan." United States. Army Map Service. Washington, D.C.: The Service. Ed. 6-AMS. 1965. Description: 1 map in color; 45 x 59 cm. Series: World (Asia) 1:1,000,000; NH 42; Variation: International map of the World 1:1,000,000. Asia; Sheet NH 42. Map Information: Topographic. Scale 1:1,000,000; Lambert conformal conic projection Standard parallels N 28040' and N 31020'; (E 66000'--E 72000'/N 32000'--N 28000'). OCLC: 36196887.

Note(s): "Heights are in meters and are referred to mean sea level." Relief shown by gradient tints, spot heights, and pictorial relief. Shows boundaries,

highways and roads, railroads, airports, rivers and water features, snow line, and other details. Map overprinted with 100,000 meter India zone 1 grid, Everest spheroid. Compiled in 1964. Includes index to adjoining sheets, index to boundaries, reliability diagram, and glossary. Standard map series designation: Series 1301. "Stock no. 1301XNH42." Margin title: Multan, Pakistan; Afghanistan; India; Series 1301. Prepared by Army Map Service (LU), Corps of Engineers, U.S. Army.

"Qamruddin Karez." 1959. Ed. 1-AMS (1st print., 10-59). Description: 1 map in color; 45 x 57 cm. Series: India and Pakistan 1:250,000; NH 42-2. Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 67030'00"--E 69000'00"/N 32000'00"--N 31000'00"). OCLC: 44390226.

Notes: "Contour interval 500 feet with supplementary contours at 250 foot intervals. Relief partially shown by form lines." Relief shown pictorially, and by contours, spot heights, and form lines. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1955..." "Blue numbered lines indicate the 10,000 yard India zone 1 grid, Everest spheroid." Includes location diagram, reliability diagram, and glossary. Standard map series designation: Series U502. Margin title: Qamruddin Karez, Pakistan; Afghanistan; Prepared by the Army Map Service (SNPE), Corps of Engineers, U.S. Army.

"Quetta." 1959. Ed. 1-AMS (1st print., 10-59). Description: 1 map in color; 45 x 57 cm. Series: India and Pakistan 1:250,000; NH 42-5; Quetta (Pakistan). Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 66000'00"--E 67030'00"/N 31000'00"--N 30000'00"). OCLC: 44390426.

Notes: "Contour interval 500 feet with Supplementary contours at 250 foot intervals; relief partially shown by form lines." Relief shown pictorially and by spot heights. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1955..." "Blue numbered lines indicate the 10,000 yard India zone 1 grid, Everest spheroid." Includes location diagram, reliability diagram, and glossary. On verso: Quetta and vicinity. Scale 1:25,000 (approximate). Standard map series designation: Series U502. Margin title: Quetta, Pakistan; Afghanistan; Quetta and vicinity; Series U502 Prepared by the Army Map Service (SNPE), Corps of Engineers, U.S. Army.

"Spin Baldak." 1959. United States. Army Map Service. Washington: The Service. Edition 1-AMS (1st print., 10-59). Description: 1 map in color; 45 x 57 cm. Series: India and Pakistan 1:250,000; NH 42-1; Map Info: Topographic. Scale 1:250,000; Transverse Mercator projection; (E 66000'00"--E 67030'00"/N 32000'00"--N 31000'00"). OCLC: 44390189.

*Adits, Caves, Karizi-Qanats, and Tunnels In Afghanistan*

Notes: "Contour interval 200 feet. Relief partially shown by form lines." Relief shown pictorially, and by contours, spot heights, and form lines. Shows boundaries, roads, trails, rivers and water features, and other details. "Compiled in 1955..." "Blue numbered lines indicate the 10,000 yard India zone 1 grid, Everest spheroid." Includes location diagram, reliability diagram, and glossary. Standard map series designation: Series U502. Margin title: Spin Baldak, Afghanistan; Pakistan; Series U502. Prepared by the Army Map Service (SNPE), Corps of Engineers, U.S. Army.

"Sufu." 1967. United States. Army Map Service. Washington, D.C.: printed by the Army Map Service. Ed. 5-AMS. Description: one map in color; 45 x 55 cm. Series: World (Asia) 1:1,000,000; sheet NJ 43; Variation: International map of the World 1:1,000,000.; Asia; sheet NJ 43. Map Info: Topographic. Scale 1:1,000,000. 1 in. = 15.78 mi.; Lambert conformal conic projection standard parallels 36040' and 39020'; (E 720--E 780/N 400--N 360). OCLC: 35238553.

Notes: "Elevations are in meters and are referred to mean sea level." Relief indicated by altitude tints, spot heights, and pictorial relief. Shows boundaries, highways and roads, railways, airports, rivers and water features, and other details. Map compiled in 1966 using various maps from a variety of sources. Includes index to adjoining sheets, reliability diagram, boundaries diagram, glossary, and metric conversion table. Standard map series designation: Series 1301. Margin title: Sufu (Kashgar), Southwest Asia; Series 1301. Prepared by the Army Map Service, Corps of Engineers, U.S. Army.

- Sweetwood, Charles W., compiler. 1968. *Afghanistan: Important Mineral Occurrences*. Mr. Sweetwood was the Minerals and Petroleum Attaché to the American Embassy in Kabul. Shows locations of different mineral localities and mines. USGS Library.
- "Tabas Region of Iran." 1945. One map in color; 66 x 46 cm. Series: Astan; no. 9. (E 600/E 610--N 330/N 320). "AMS 1; no. 29D; International no. I-41S." "Afghanistan, Iran, Farah & Herat Provinces." OCLC: 29765737.
- "Yasin." 1942, 1923. 1<sup>st</sup> edition. One map in color; 71 x 46 cm. Yasin Region (Jammu and Kashmir, India). "Reprint October 1942; compiled and published originally under the direction of the Surveyor-General of India, 1923 and revised to 1941." "Grid O; no. J-43T; (I. & H.C. no. 42H)" "Afghanistan, Gilgit Agency, N.W. Frontier Province." "Kataghan & Badakhshan Province. Political Districts. Dir, Swat & Chitral Agency." "Mean grid north, in this sheet, is 30 30' east of true north; magnetic declination about 30 0' east in 1936." Afghanistan, Gilgit Agency, N.W. Frontier Province; Kataghan Badakhshan Province. Political Districts. Dir, Swat, & Chitral Agency. OCLC: 29629518.
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"Yaka Ta Khom Zinc-Lead Deposits: Dahla District, Kandahar Province, Afghanistan." 1945? No place of publication given. Five maps and 1 diagram on 6 sheets; sheets 60 x 85 cm. or smaller.

Contents: Figure 2: Location map of Yaka Ta Khom zinc-lead deposits, Dahla district, Kandahar Province, Afghanistan. Figure 3: Map of Afghanistan and part of Pakistan, showing transportation routes. Figure 8: Map of Yaka Ta Khom zinc-lead deposits, showing topography, geology, and samples. Dalha district, Kahdarhar Province, Afghanistan. Figure 9: Map of Yaka Ta Khom zinc-lead deposits, showing topography, geology, and samples. Dalha district, Kahdarhar Province, Afghanistan. Figure 10: Map of Yaka Ta Khom zinc-lead deposits, showing topography, geology, and samples. Dalha district, Kahdarhar Province, Afghanistan. Figure 11: Vertical sections through diamond drill holes, Yaka Ta Khom zinc-lead deposits, Dahla district, Kandahar Province, Afghanistan. Subject descriptors: Mines and mineral resources- Dahla district (Afghanistan)- Maps; Zinc mines and mining- Dahla district (Afghanistan)- Maps; Lead mines and mining -- Dahla district (Afghanistan)- Maps. Scales vary. Relief shown on some maps.  
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