Arizona’s Metallic Resources Trends and Opportunities 2006

Arizona Department of Mines and Mineral Resources

Mining Summary
2006 Exploration Overview
Additional Information Sources
Arizona Department of Mines and Mineral Resources
The Department promotes the development of Arizona's mineral resources. This is accomplished through technical research, field investigations, compilation of information into a mineral occurrence database, and disseminating information through publications, personal contacts, and seminars.

The Department is a service agency and does not regulate, tax, or require any type of registration. The agency provides assistance that is tailored to meet the diverse needs of the public. The following is a partial list of services that the Department offers:

♦ Maintain a site-specific database of unpublished reports and maps that includes 4,000 mine files and indexes of 10,000 computerized Arizona mineral occurrences.

♦ Maintain an information bank and library of mineral and mining information including a mine map library (hard copy and microfilm), government publications, periodicals, and unpublished master and doctorate theses.

♦ Gather and disseminate information on commodities and markets.

♦ Assist individuals and companies in their dealings with regulatory agencies to facilitate their mining and exploration activity.

♦ Produce publications in the form of mineral reports, annual directories, technical reports, annual mineral industry surveys and information circulars.

♦ Operate the Arizona Mining and Mineral Museum.

Contact Information:
Arizona Department of Mines and Mineral Resources
1502 West Washington
Phoenix, Arizona 85007
602-255-3795
www.admmr.state.az.us
# Table of Contents

**Preface**

**Mining in Arizona**

- Arizona Mineral Production 2004 .......................................................... 1

**Arizona’s Metallic Resources - Trends and Opportunities**

- Porphyry Copper .......................................................................................... 2
- Uranium ....................................................................................................... 4
- Gold ........................................................................................................... 5
- Volcanogenic Massive Sulfides ................................................................... 6
- Metal Exploration Permits On Arizona State Trust Land - 2005 .............. 8
- Mining Claim Distribution on Federal Lands .............................................. 9

**Arizona Department of Mines & Mineral Resources Publication List** .... 10

**Information from Cooperating Arizona Organizations** ........................ 14

- The Impact of the Copper Industry on the Arizona Economy ............... 15
- Exploration Permits and Mining Leases on Arizona State Trust Land . 16
- Arizona Geological Survey Partial Publications Listing ..................... 18
- Arizona Geological Society Publications List ......................................... 20
- Dept. of Mining and Geological Engineering, University of Arizona ...... 21
Mining in Arizona

The Southwest is the United States’ richest storehouse of metals and industrial minerals and is likely to remain so for many years. Arizona ranked first in mineral production in the US in 2005 with a production value of $4.73 billion according to preliminary figures released by the USGS. Arizona leads the Nation in copper and molybdenum production, and ranks in the top five in gemstones, perlite, silver, zeolites, iron oxide, pumice, and sand and gravel. Additionally, Arizona produces, or has produced, zinc, lead, beryllium, vanadium, uranium, tungsten, rare earths, manganese, coal, and at least 18 varieties of industrial minerals.

In 2004, Arizona accounted for 62 percent of the U.S. copper production. The copper industry has a $3.3 billion direct and indirect impact on the Arizona economy. Arizona’s three largest copper producers, Asarco Inc., BHP Copper Inc., and Phelps Dodge also produce significant amounts of molybdenum, gold, and silver as byproducts in the production of copper. Phelps Dodge’s Morenci mine produced 800 million pounds of copper in 2005, has the largest EW plant in the world, and is the world’s fifth largest mine.

Exploration and development increased significantly coincident with the strongly improving metal prices. This was especially true for copper and molybdenum as those commodities hit record prices and also for uranium closing at a many year high. A newly discovered porphyry copper deposit may be the largest copper deposit in North America. Resolution Copper, a joint venture of Rio Tinto and BHP Billiton, owns the deposit that has at least 1 billion tons of mineralization at 1.5 percent copper. Phelps Dodge approved the expenditure of $210 million to build the first commercial scale copper concentration pressure leach direct electrowinning plant at Morenci. Production will begin in 2007 in conjunction with the resumption of concentration. The development of the nearby Safford Project received conditional approval from Phelps Dodge’s board. Expenditures of $500 million are expected to build 2 pits and a leaching complex. When complete in the second half of 2008 the project will produce 250 million pounds of copper a year. Quadra purchased the Carlota copper leach project for $37.5 million in cash and gold. Construction should begin in July 2006.

Although gold takes a backseat to copper production, Arizona has produced over 16 million ounces of gold. American Bonanza Gold Mining recently completed a lengthy surface and underground drilling program that defined a resource of over 330,000 ounces of gold.

**Arizona Mineral Production**

<table>
<thead>
<tr>
<th>Commodity</th>
<th>2003 Value $</th>
<th>2004 Value $</th>
<th>2005 Value $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>$1,350,000,000</td>
<td>$2,130,000,000</td>
<td>na</td>
</tr>
<tr>
<td>Gemstones</td>
<td>1,450,000</td>
<td>1,450,000</td>
<td>na</td>
</tr>
<tr>
<td>Gold (troy oz)</td>
<td>w</td>
<td>w</td>
<td>na</td>
</tr>
<tr>
<td>Molybdenum (lb)</td>
<td>w</td>
<td>w</td>
<td>na</td>
</tr>
<tr>
<td>Sand &amp; gravel</td>
<td>319,000,000</td>
<td>372,000,000</td>
<td>na</td>
</tr>
<tr>
<td>Stone, crushed</td>
<td>57,500,000</td>
<td>52,000,000</td>
<td>na</td>
</tr>
<tr>
<td>Other$^2$</td>
<td>393,300,000</td>
<td>447,100,000</td>
<td>na</td>
</tr>
<tr>
<td>Coal$^3$</td>
<td>315,000,000</td>
<td>312,000,000</td>
<td>290,000,000</td>
</tr>
<tr>
<td>Total</td>
<td>$2,436,350,000</td>
<td>$3,312,000,000</td>
<td>$5,020,000,000</td>
</tr>
</tbody>
</table>

1) USGS preliminary data except as noted
2)Includes cement, clay, lime, gypsum, gold, molybdenum, perlite, silver, salt, dimension stone, zeolites, and iron oxides.
3) ADMMR estimate
4) Unpublished USGS data, subject to change; official preliminary 2004 and final 2003 data will be published in the Arizona Chapter of the USGS Mineral Yearbook, Area Reports: Domestic 2004, volume II.
Porphyry Copper

Description: Arizona hosts an impressive number of economically important porphyry copper deposits. Over 90% of the copper deposits shown in Figure 1 are of, or related to, that style of mineralization. These deposits account for a large portion of the current and historic value of mineral production of Arizona and Arizona’s copper production accounts for approximately 65% of the United States newly mined copper production. Arizona’s output reached an all time annual high in 1997 of 2.7 billion pounds. By-products of mining these porphyry copper deposits have also been significant, accounting for a large percentage of Arizona’s gold, silver and molybdenum production.

General Characteristics: Volumes of literature summarize the characteristics of porphyry copper deposits in general, as well as provide details of many specific Arizona deposits, thus making it unproductive to provide a detailed review here.

History: Deposits with current or recent production include: Morenci, Ray, Sierrita, Bagdad, Mission, Silver Bell, Inspiration, Mineral Park, Pinto Valley, Lakeshore, San Manuel, New Cornelia, Johnson Camp, Twin Buttes, and Copper Queen. Significant deposits awaiting development or redevelopment include: Dos Pobres, San Juan, Lone Star, Helvetia (aka Rosemont), Twin Buttes, New Cornelia, Cochise, Copper Creek, Zonia, and Resolution Copper. Also included are Carlota and Emerald Isle, exotic copper deposits derived from porphyry copper systems.

Prior to the last copper price downturn, development of the Poston Butte and Santa Cruz deposits as in-situ leach operations seemed likely. Now it appears that these deposits may become victim of their high real estate value unless a pioneering mining company comes forward to purchase and develop them.

Figure 1.
Arizona Copper Resources
Az Dept. Mines & Mineral Resources
2002
Highlights of Current Activity: Record copper prices (U.S. $2.23/lb. as of late February 2006) and anticipation of continuing strong demand are driving a resurgence of acquisition, exploration and development activity including the entry of a number of new companies.

Morenci: Phelps Dodge and Sumitomo are investing $241 million to build the first commercial-scale copper concentrate pressure leach direct electrowinning plant. Morenci, Arizona’s largest mine, will resume concentration in 2007 coinciding with completion of the project.

Safford Project: Development of Dos Pobres and San Juan received conditional approval from Phelps Dodge’s board. Expenditures of $550 million are expected to be required to build two open pits and the leaching SX-EW complex. When completed in the second half of 2008 the project is expected to produce 250 million pounds of copper a year for at least 18 years.

Carlota: Quadra Mining acquired the mine, mining equipment, and SX-EW plant for $37.5 million US in cash and gold from Cambior in late 2005. Construction is scheduled to begin in July 2006 with production targeted for late 2007. The deposit has resources of 105 million tons grading 0.45% oxide copper.

Mineral Park: Mercator continued expansion of its SX-EW plant attaining 11 million pounds annual capacity by the end of 2005. The company is conducting a feasibility study evaluating the economics of concentrating not only copper, but also the deposit’s significant quantity of contained molybdenum. Working to achieve that goal, it purchased a 20,000 tpd concentrator from Asarco.

Resolution Copper: This deposit is a surprising discovery in a geologic terrain previously thought to be well understood. It is significant for its large size and high grade, preliminarily reported to be a 1 billion ton deposit grading 1.5% Cu. The property is held by Resolution Copper Co., a 55/45 joint venture of Rio Tinto and BHP-Billiton. Surface drilling resumed in February 2005 and is continuing as of February 2006. Exploration and related expenditures are expected to exceed $100 million. Plans to deepen the No. 9 shaft and other mine development studies are underway. These will address the high rock temperatures and stresses encountered in the 5,000’ deep deposit. Work on a land exchange has begun. That effort includes the introduction of the Southeast Arizona Land Exchange and Conservation Act of 2005 in Congress. Reclamation work at the west plant and Magma mine areas is also underway.

Helvetia Rosemont: Augusta Resources acquired the Rosemont property in June 2005 and has completed a 30,000-foot drill program to produce a NI43-101 compliant resource estimate. The company is currently conducting a pre-feasibility study of a possible 60-80,000 tpd copper molybdenum project.

Copper Creek: Redhawk Resources acquired a large portion of this district consisting of high-level breccia pipes and lower level porphyry copper targets. The company is evaluating reserves previously announced for three pipes by AMT International Mining Corporation to determine exploration and mining plans.

Emerald Isle: St. Genevieve Resources (SGV) acquired this exotic oxide copper deposit with a small “mothballed” SX-EW plant and plans to return it to production.

Monitor: General Minerals optioned this property to Teck Cominco who began a drilling program in November 2005 to test previously identified copper and silver targets.

Dragoon: BHP Billiton optioned this prospect from General Minerals who developed a geophysical target. Drilling to test this buried 1 x 3 km zone began in mid January, 2006.

Others: Additional areas of activity include, but are not limited to the Ajo, Copper Mountain, Kabba, Maynard, Mineral Creek, Pima, Pioneer, Tombstone, Wallapai, Zonia, Soza Canyon, and Markham Wash and Coyote Springs projects in the Safford area.

References
Uranium

Basin and Range Province

 **Tectonostratigraphic Setting:** Felsic middle Miocene volcanism including rhyolite flows and ignimbrites, and airfall debris adjacent to basin contributed to the lacustrine and paludal facies of the host Chapin Wash Fm.

 **Host Rocks:** carbonaceous tuffaceous mudstone of early to late Miocene age

 **Mineralization Age:** early to mid Miocene

 **Mineralizing Solutions:** diagenetic alkaline carbonate lacustrine pore water

 **Resource Estimate:** 30 million pounds U₃O₈. Drilling by the U.S. Department of Energy indicates potential for the basin to host as much as 126 million pounds U₃O₈ at depths up to 3,500 feet.

 **Key Properties:** Date Creek Basin, Anderson Mine, Boomer.

 **History:** First discovered in the mid 1950s with small open pit production. Renewed exploration in the 1970s resulted in major discovery.

 **Current Activity:** Concentric Energy has acquired the Anderson mine and Energy Metals has acquired an adjacent land holding on drilled ground. Both are acquiring and digitizing historic data as well as evaluating various development options. Concentric Energy is gathering baseline environmental data and planning confirmation drilling.

 **Exploration Potential:** Other basins in central and western Arizona are likely to have had similar conditions conducive to concentrating uranium mineralization during Miocene time.

Colorado Plateau

 **Major Types:** Solution-collapse breccia pipes, Tabular sandstone. Current interest is restricted to breccia pipes.

 **Tectonostratigraphic Setting:** sandstones, limestones and shales with thick overlying fine grained volcaniclastic facies deposited in intracratonic sedimentary basins.

 **Host Rocks:** Coconino Sandstone, Hermit Shale, Supai Group.

 **Age of Host Rocks:** Pennsylvanian, Permian.

 **Mineralization Age:** Late Triassic.

 **Mineralizing Solutions:** Groundwater.

 **Classic Deposit:** Orphan Mine.

 **Properties:** many hundreds of breccia pipe targets, widespread on Kaibab and Coconino plateaus.

 **Resource Estimate:** vertically elongated individual pipes grading 0.4 - 0.75% U₃O₈. A typical pipe is 300’ in diameter and could be up to 3,000 vertically. During the 1980s 40 million pounds were discovered.

 **Production:** 13 million pounds were produced during the period 1981-1989 from pipes on the Kaibab Plateau. Earlier production totaled 4.25 million pounds.

 **Exploration Potential:** Arizona has excellent potential for development of new uranium resources. If exploration had continued at...
the 1980 rate, experts predicted that by year 2000 over 100 million pounds of new mineralization would have been identified. Instead, low prices greatly limited activity during the last 10 years. Properties with drilling history and known mineralization were offered for sale and/or dropped! Fueled by rising prices interest in breccia pipes on the Coconino and Kaibab plateaus has returned during the last two years as indicated by property acquisition on federal and state lands.

**Current Activity:** International Uranium controls the Arizona One and Pine Nut deposits that are developed and on standby and also holds the partially developed Canyon pipe. Previously, material mined was sent to the company’s processing mill located in southern Utah near Blanding.

In late 2005 Uranium Power Corp. and joint venture partner US Energy Corp were drilling to test stratigraphy to confirm breccia pipe structures. Quaterra Resources acquired claims covering 36 targets and in early 2006 the company began a 15,000-foot drilling program on nine suspected breccia pipes. Quincy Energy entered into an option agreement with Energy Metals covering eight properties and plans 3,000 feet of drilling on the mineralized Rose breccia pipe.

Other companies acquiring previously drilled pipes and suspected pipes as exploration targets include: Standard Uranium – 11 Pipes North and South of Grand Canyon, Energy Metals -Wate and 4½ pipes with identified resources, and 30 other pipes, Liberty Star Gold, Standard Uranium, and Vane Minerals.

**Dripping Springs**

**Description:** Deposits occur in Proterozoic Dripping Springs Quartzite in strata bound diagenetically altered potassium-rich and carbonaceous volcanogenic siltstones. Mineralization occurs in veins and as “paleo”-roll front deposits.

**History:** Uranium production has been from a series of narrow, vertical pitchblende-bearing veins. In the 1970s drilling discovered sizeable deposits containing a geological resources of over 9 million pounds south of the Workman Creek area and also east of the Red Bluff mine area.

**Current Activity:** Cooper Minerals has leased a claim group in the Workman Creek area to Rodinia Minerals. Additional claims have been staked on nearby properties and drilling is planned. Rodinia and joint venture partner Patriot Power have conducted drilling and sampling programs on the Lucky Boy and Mormon Lake (Pennsylvanian sediments) properties also located in Gila county.

**References:**
Descriptive model for solution collapse breccia pipes uranium deposits -

---

**Gold**

**Description:** Arizona’s cumulative gold production exceeds 16 million ounces contributed from 219 metallic mineral districts. Twenty-six of those districts have produced more than 100,000 ounces and 46 have produced more than 10,000
ounces. Gold recovery has been from a wide variety of deposit model types with the most important being epithermal (quartz adularia) veins, the more recently recognized detachment fault-associated deposits, porphyry copper, and volcanogenic massive sulfide. Economic deposits have formed during four widely diverse geologic periods: Proterozoic, Jurassic, Laramide and Mid-Tertiary.

**History:** Recent primary producers include: Copperstone - produced 500,000 oz, McCabe (Gladstone), Verdestone, Congress, and Gold Road, the last to operate, closed in 1998.

**Resources:** A number of deposits with potential to produce a few hundred thousand ounces have been awaiting a period of higher prices for their development to occur. These include: Yarnell, Newsboy, Moss, Mexican Hat, Tiger, Golden Eagle and Copperstone underground.

**Current Activity:** American Bonanza completed a 40,000-meter drill program at the detachment hosted Copperstone deposit and in February 2006 announced NI43-101 compliant resources of 330,000 ounces. Golden Arch conducted trenching and drill programs at its Mildred Peak property. Terraco Gold conducted drilling on geophysical targets with limited success at the Bonanza mine. Galaxy Minerals purchased a pilot mill for its Yellowjacket mine.

**References:**

**Volcanogenic Massive Sulfides**

**Geology:** The volcanogenic massive sulfide occurrences of Arizona formed 1.7 –1.8 b.y. ago. Mines and prospects occur as stratabound accumulations of iron and base-metal sulfides with variable amounts of gold and silver. They are hosted in a thick sequence of submarine volcano-sedimentary strata metamorphosed to greenschist and occasionally amphibolite facies.

**Economic Geology:** Of the 70 known VMS deposits, 48 have reported production. Most mineralization occurs as Cu-Zn with precious metals economically important in many of the deposits. Production totals over 55 million tons and three deposits have yielded over 4 million tons each. The majority of the production is from the Verde district. The United Verde mine is reported to contain over 20 million tons of mineralization grading 6.6% Zn plus copper and precious metals.

**Structure and Distribution:** Most orebodies are highly deformed and exhibit high ratios of plunge to strike length. Larger deposits are described as elliptical lenses, or rod like bodies, that plunge steeply and parallel major or minor fold axes. Ratios of plunge length to strike ratio of 3:1 are common and ratios as high as 8:1 are known. Thus most deposits present only limited exploration targets at the surface. The geographic distribution of favorable host rocks for VMS deposits is wider than that of known occurrences and has potential for hosting undiscovered deposits.

**Current Activity:** Little work is presently occurring in the VMS districts. See Figure 4. Many promising prospects, not limited to the few described here, are available. Phelps Dodge controls the United Verde zinc resource discussed above. Teck Cominico recently completed a multi-year effort there without releasing results. In the Old Dick district Silver Nickel Mining has acquired the Pinafore mine (Cu-Zn) and collected exploration data including drill results from Arizona Explorations Inc.’s. (syndicate of American Barrick, Homestake and Placer Dome) mid-90’s effort. The joint venture of Ivy Minerals and Kaaterskill Exploration has been working on two new exploration targets in the Mayer district where it identified geochemical and VLF-EM anomalies at the Cobre Sud and Cordes Peak prospects.
Ricks Brothers Enterprises controls a copper resource near Mayer with both disseminated and limited massive mineralization and have project data available. Searchlight Exploration’s Treasure King has a 150,000 ton deposit at a grade of 0.06 oz/ton gold proven resource along with four additional areas untested by drilling. The Kay mine has a Cu-Zn resource defined by Exxon and Rayrock with drill data available at ADMMR.

References:
Metal Exploration Permits on Arizona State Trust Lands - 2005

Includes permits up for renewal as well as new permits. Permits given initial approval but not necessarily issued.
Mining Claim Distribution on Federal Lands

21,483 mining claims in 2003
25,616 mining claims in 2004
31,000 mining claims in 2005

Mining claim records are online at:
http://www.blm.gov/lr2000/
LIST OF AVAILABLE PUBLICATIONS
February 2006

ORDERING INSTRUCTIONS
Prepayment is required on all orders. Make checks payable to the Dept. of Mines & Mineral Resources.

POSTAGE and HANDLING
Orders are shipped First Class or Priority Mail. Postage and handling charges are listed below.
If your total order is:

- $0.50 - $5.00, add $1.50
- $5.01 - $10.00, add $3.00
- $10.01 - $20.00, add $4.50
- $20.01 - $30.00, add $5.50
- $30.01 - $40.00, add $6.00
- $40.01 - $50.00, add $6.50
- Over $50.01, add 15% of total

Photocopies of out-of-print publications are available for $0.15 per page (see OFR90-5 and OFR04-21).
* Indicates that the publication is available on the Department website.

DIRECTORIES

D49 Directory of Active Mines in Arizona - 2001/2, K.A. Phillips, N.J. Niemuth, D.R. Bain. The listings are alphabetical, giving company name, address, key personnel, mine name, and location. A separate listing of sand and gravel operations is provided. Includes 1:1,000,000 scale map showing the locations of the active mines and mine offices. 34 p. $6.00

D50 Arizona Mining Consultants, N. J. Niemuth, 2004. A listing of Arizona-registered consultants for the following mining related disciplines: assayers, geological engineers, geologists, geophysical engineers, metallurgical engineers, and mining engineers. 22 p. $3.00 *

SPECIAL REPORTS


MINERAL REPORTS

MR3 Molybdenum Occurrences in Arizona, by C.J. Hicks, 1979. Occurrences are listed by county with a brief description of each. The mineralogy, geology, uses and history of molybdenum are provided. 37 p. $6.00


MR6 Beryl - A Unique Opportunity for the Prospector and Small Mine Operator, by K.A. Phillips, 1986. Describes the mineral beryl, prospecting techniques and its amenability to production by small mine operators. 7 p. $2.00

MR7 Gold Panning in Arizona, by D.R. Bain, 1990. Includes the origin of placer gold in Arizona, prospecting tips, panning instructions, and maps to panning locations. 30 p. $3.00
COUNTY MINE MAP SERIES

<table>
<thead>
<tr>
<th>Number - County</th>
<th>Number of Maps</th>
<th>Index Pages</th>
<th>Mines</th>
<th>Price $</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM-1 - Apache</td>
<td>18</td>
<td>6</td>
<td>353</td>
<td>15.00</td>
</tr>
<tr>
<td>CM-2 - Cochise</td>
<td>9</td>
<td>16</td>
<td>698</td>
<td>10.00</td>
</tr>
<tr>
<td>CM-3 - Coconino</td>
<td>28</td>
<td>11</td>
<td>594</td>
<td>20.00</td>
</tr>
<tr>
<td>CM-4 - Gila</td>
<td>9</td>
<td>19</td>
<td>731</td>
<td>10.00</td>
</tr>
<tr>
<td>CM-5 - Graham/ Greenlee</td>
<td>12</td>
<td>16</td>
<td>516</td>
<td>15.00</td>
</tr>
<tr>
<td>CM-6 - La Paz/ Yuma</td>
<td>15</td>
<td>15</td>
<td>583</td>
<td>15.00</td>
</tr>
<tr>
<td>CM-7 - Maricopa</td>
<td>11</td>
<td>20</td>
<td>915</td>
<td>15.00</td>
</tr>
<tr>
<td>CM-8 - Mohave</td>
<td>20</td>
<td>31</td>
<td>1,411</td>
<td>25.00</td>
</tr>
<tr>
<td>CM-9 - Navajo</td>
<td>17</td>
<td>5</td>
<td>232</td>
<td>15.00</td>
</tr>
<tr>
<td>CM-10 - Pima/ Santa Cruz</td>
<td>14</td>
<td>34</td>
<td>1,487</td>
<td>20.00</td>
</tr>
<tr>
<td>CM-11 - Pinal</td>
<td>9</td>
<td>29</td>
<td>1,024</td>
<td>15.00</td>
</tr>
<tr>
<td>CM-12 - Yavapai</td>
<td>12</td>
<td>46</td>
<td>1,948</td>
<td>20.00</td>
</tr>
</tbody>
</table>

The data in this series was initially compiled from a study done in cooperation with the U. S. Bureau of Mines. The data is computerized and updated on a continuous basis by the Department in a series of county databases known as AzMILS.

The County Mine Map series consists of sets of 20" x 24" maps showing the locations of mines, prospects, quarries, and processing mills and plants. They are plotted on Arizona Department of Transportation base maps (scale 1" = 2 miles) by the Department's Arizona Mineral Industry Location System (AzMILS) number. Each map set includes a geographically sorted mine index that lists AzMILS number, primary mine name, alternate names, a file reference, topographic quadrangle name, township, range, section, quarter section, and up to 7 commodities. Over 10,400 locations cover the entire series of 12 sets for Arizona's 15 counties. Samples of the maps and indexes may be viewed at the Department website.

Digital Data Files
Complete databases of the AzMILS information for the state are available as dBase IV files on a 3.5" PC-compatible disc. The databases can be sorted on any field or combination of fields, including commodities. Bibliographies include reference information on individual mines. $20.00

OPEN-FILE REPORTS

OFR 89-1 Industrial Minerals in Arizona’s Paint Industry, by K.A. Phillips, 1989. The State's paint manufacturing industry is described emphasizing the wide variety of industrial minerals consumed, their specifications and the quantities used. 13 p. $2.50 *

OFR 89-2 Industrial Minerals in Arizona’s Wallboard Joint Cement Industry, by K. A. Phillips, 1989. The State's wallboard joint cement manufacturing industry is described emphasizing the specifications and quantities of industrial minerals consumed. 9 p. $2.50 *

OFR 89-3 Industrial Minerals in Southern California’s Wallboard Joint Cement Industry, (A Potential for Mineral Development in Arizona), by K.A. Phillips, 1989. The region's wallboard joint cement manufacturing industry is described emphasizing the specifications and quantities of industrial minerals consumed. 12 p. $2.50*

OFR 90-5 Publications of the Department of Mines and Mineral Resources from 1939 to 1990, by D.R. Bain, 1990. 15 p. $2.50 *

OFR 91-6 Industrial Minerals in Arizona’s Cultured Marble Industry, by K.A. Phillips, 1991. The State's cultured marble industry is described emphasizing the specifications and quantities of industrial minerals consumed. 11 p. $2.50

OFR91-8 Pumice and Pumicite in Arizona, by J.M. Hoffer, 1991. Describes over 50 pumice occurrences in Arizona. Includes deposit map, scale 1:1,000,000. 67 p. $10.00

OFR92-10 Copper Oxide Resources, by N.J. Niemuth and K.A. Phillips, 1992. A listing of over 800 Arizona deposits that contain copper oxide. 18 p. $5.00

* Available at www.admmr.state.az.us
OFR93-12 Economic Geology of the Sierra Estrella, Maricopa and Pinal Counties, Arizona, by E.B. Melchiorre, 1993. Includes site descriptions of metallic and nonmetallic resources. 29 p. $2.50

OFR95-13 Listing of the Grover Heinrichs file Collection, compiled by N.J. Niemuth, 1995. 31 p. $3.00

OFR97-15 The Art of Making a Cabochon, by Walter Peck, revisions by Doug Duffy and Shirley Cote, 1997. 15 p. $2.40

OFR01-17 Arizona Copper Reserves, An update of OFR92-11. Reserve and ownership information for 80 major copper properties. The information is continually updated. 85 p. $10.00


OFR02-20 Arizona Mining Scams and Unassayable Ore Projects of the Late 20th Century, by W. Scott Donaldson, 2002. 28 p. $3.00


CIRCULARS

Circulars are 25 cents each.


C3 Platinum in Arizona, by K.A. Phillips, 1980. Answers commonly asked questions about platinum group metals, minerals, and potential in Arizona. *


C7 Services of the Department to Potential Purchasers of Arizona Mineral Commodities, by K.A. Phillips, 1988 *

C9 Titanium, by M.N. Greeley, 1982. Describes titanium, its minerals, geology, and Arizona's potential for the prospector. *


C20 Maps and Books for Arizona Gold and Gold Prospecting, Authors, titles, and publishers' names and addresses are provided. *


C30 Arizona Mining Law Change - 1989, 1990, Explains the changes in lease and claim procedures for State Trust Lands.*


C51 Pertinent Data for New or Prospective Mining Operations in Arizona, by N.J. Niemuth, 1993. Briefly discusses permits and regulatory requirements of state, federal, and county agencies for mining operations. *

C52 Jig Recovery Systems, by H.M. Coggin, 1995. Describes how jigs operate and summarizes various types. *


C59 Mining Scams, by M.N. Greeley, 1995. Discusses common features of mining scams and ways to avoid being a victim of one. *

C63 Reference Material Listing, 1996. Library holdings on mines, mining, and recovery technology. *


C91 Assayers and Assay Offices in Arizona, 2001. List of commercial assay laboratories in Arizona with registered assayers. Includes information on the history of assaying and the assaying process. *

C92 Arizona Rockhound Information, by D. R. Bain. Includes information on mine tours, mineral collecting fee areas, gold panning, and a short bibliography. *

C103 A Historic Review of Mercury Mining in the Phoenix Mountains, Maricopa County, by D.R. Bain, November, 2003. *

C104 Mining Laws and Regulations, Changes and Revisions, 2003, Summarizes recent changes in laws and regulations governing mineral rights acquisition and surface management regulations. *


* Available at www.admmr.state.az.us
**C109 State Agencies Concerned with Mining & Mineral Resources in Arizona, 2005.** Contains names, addresses, and pertinent people at state agencies concerned with mines and mineral resources.*

**C110 Federal Agencies Concerned with Mining in Arizona, 2005.** Contains addresses of Bureau of Land Management, Forest Service offices, and other Federal agencies. *

**C111 County Agencies Concerned with Mining & Mineral Resources in Arizona, 2005.** Includes a listing of addresses, phone numbers, and websites. *

**C112 Arizona Gem Shows, 2005-2006.** Includes date, location, sponsoring group, contact person. *

**C113 Earth Science Clubs, 2005-2006.** Includes rockhound, lapidary, and prospecting organizations. *


**C115 Mining Claim Forms, 2006.** Includes Location Notices for lode and placer claims, Claim Map, Affidavit of Performance of Annual Work, Notice of Non-liability for Labor and Materials Furnished, Notice of Intent to Hold Mining Claims, and Attachment for Additional Claims. *

**MAPS**

All maps are shipped folded. Contact the Department to special order rolled maps or a different scale or media.

**M84-1 Arizona Mineral Potential Map, by K. A. Phillips, 1984.** Scale 1:1,000,000. Map showing areas favorable for future discovery and development of mineral deposits for land use planning considerations. **$2.50**

**MM-17 Metallocenic Provinces of Arizona, by P.F. O'Hara, N. J. Niemuth, and G. Ryberg, 1989.** Scale 1:1,000,000, Preliminary edition showing 49 metallogenic provinces in Arizona. Blackline **$2.50**

**MA-49 Active Mines in Arizona, 2001-2.** By K. Phillips, N. Niemuth, D. Bain, 2002. Scale 1:1,000,000. Shows the locations of the active mines (excluding sand and gravel), plants, and mine offices. (Also included in the Directory of Active Mines.) **$2.50**

**MO2-2 Map of Arizona Copper Resources, by N.J. Niemuth, 2002.** Scale 1:3,000,000. Provides names and locations of principal deposits. Order OFR 1-17 for details of the deposits. **$5.00** *

See also: County Mine Map Series

---

**REPRINTED MAPS AND REPORTS**


**Stone in Arizona, by R. Townsend, 1962.** Information on occurrences of stone in Arizona and production techniques. Originally prepared by the Arizona Development Board. 50 p. Photocopy. **$8.00**

**OTHER NON-ADMMR PUBLICATIONS**

**Principal Deposits of Strategic and Critical Minerals in Arizona, 1992.** Published by the U.S. Bureau of Mines. A comprehensive review of Arizona's mineral commodities and infrastructure. 334 p. **$8.00**

Digital Reprint-1 CD-ROM. Text in pdf format, plates in jpg and pdf format. CD includes both titles below. **$20.00.**

**Ore Deposits of the Jerome and Bradshaw Mountain Quadrangles, Arizona, by W. Lindgren, 1926, U.S. Geological Survey Bulletin 782, 192 p., 2 plates, scale 1:125,000. OCR processed.**

**Reconnaissance of Iron Resources in Arizona, by C.M. Harrer, 1964, U.S. Bureau of Mines IC 8236, 204 p. OCR processed.**

**MINERAL EDUCATION KIT**

A boxed set of 40+ rock and mineral samples including a collection of Arizona's commonly mined minerals, seven of the Mohs's scale of hardness minerals, and examples of sedimentary, igneous, and metamorphic rocks. Includes a 55-page booklet. **$40.00, plus $8.50 postage.**

* Available at [www.admmr.state.az.us](http://www.admmr.state.az.us)
In addition to the Department of Mines and Mineral Resources, many other Arizona agencies and organizations cooperate to encourage and support Arizona’s mining industry. The Department wishes to thank the following organizations for providing information for PDAC 2006.

- **Arizona Department of Commerce**
- **Arizona Geological Society**
- **Arizona Geological Survey**
- **Arizona Mining Association**
- **BLM Arizona**
- **State Land Department - Mineral Section**
- **University of Arizona, Institute for Mineral Resources**
THE IMPACT OF THE COPPER INDUSTRY ON THE ARIZONA ECONOMY

♦ In 2004, the Arizona copper industry had a combined direct and indirect impact on the Arizona economy of:

$3.316 Billion

♦ including combined direct and indirect contributions of:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.048 Billion</td>
<td>in personal income, equivalent to 18,000 jobs for Arizonans</td>
</tr>
<tr>
<td>$2.073 Billion</td>
<td>in business income, and</td>
</tr>
<tr>
<td>$194 Million</td>
<td>in state and local government revenues</td>
</tr>
</tbody>
</table>

♦ as a result of the circulation (and multiplication) of the copper industry’s total direct impact of

$1.296 Billion

♦ that included direct payments of:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$64.493 Million</td>
<td>to the State and its local governments in taxes and fees,</td>
</tr>
<tr>
<td>$788.153 Million</td>
<td>to other Arizona businesses for products and services, and</td>
</tr>
<tr>
<td>$443.340 Million</td>
<td>in personal income for Arizonans, including wages and salaries for the industry’s employees</td>
</tr>
</tbody>
</table>

♦ who labored to produce:

803,518 tons of copper and other minerals with a total value of

$2.603 Billion

Compiled by WEAC for the Arizona Mining Association

141 E. Palm Lane #100
Phoenix, AZ 85004
602-266-4416
www.azcu.org
The Minerals Section of the Arizona State Land Department (ASLD) is responsible for mining/mineral activities on State Trust land. Its primary obligation is to maximize revenues for the Trust from the disposition and management of mineral commodities while considering the long-term best interest of the Trust. Arizona’s public schools are the primary State Trust beneficiary.

Mineral commodities are classified into three separate categories:
- **Hard Rock Minerals** refer primarily to base and precious metals as well as industrial minerals that are unique and distinct.
- **Common Variety Minerals**, also referred to as salable minerals or mineral materials, include construction and landscaping materials (cinders, sand, gravel, boulders, loose rock and common clay) and minerals of similar occurrence commonly used as aggregate, riprap, ballast, borrow or fill.
- **Energy Minerals** (also leaseable) refer primarily to oil, gas, and geothermal resources.

The right to explore for and produce mineral commodities on State Trust land is accomplished by obtaining one of the following mineral-related permit / leases:
- Mineral Exploration Permit
- Mineral Lease
- Common Variety Mineral Lease / Sale
- Oil and Gas Lease

Details for each mineral category can be obtained from ASLD’s Minerals Section.

### Mineral Exploration Permits

A mineral exploration permit is permission from ASLD to prospect and explore for minerals on State Trust land. Exploration is any activity conducted for the purpose of determining the existence of a valuable mineral deposit, such as: geologic mapping, drilling, geochemical sampling, and geophysical surveys.

Prior to exploration, the Plan of Operations must be approved.
- The permitting process for an exploration permit takes a minimum of sixty (60) days.
- If the application is approved, the initial rent is $2 per acre. If renewed, no additional rents are due for the second year. Rents are set at $1 per acre for years 3 thru 5.
- Work expenditure requirements are:
  - $10 per acre for years 1-2; and
  - $20 per acre for years 3-5.

The permit is valid for one year from the due date of the rental and bond. If renewal requirements are met, the permit can be renewed annually for up to five years. If discovery of a valuable mineral deposit is made, the permittee must apply for a mineral lease before actual mining activities can begin.
Oil and Gas Leases
The oil and gas lease is for the exploration and/or production of oil and gas resources. *All drilling must be approved by the Oil and Gas Commission* (through the Arizona Geological Survey) as well as the ASLD.

The permitting process for an oil and gas lease takes a minimum of one (1) month.

- Leases are issued for a primary term of 5 years. A secondary term of 5-years may be requested prior to the expiration of the first term for a maximum of ten (10) years, or so long thereafter as production continues.
- Annual rents are payable in advance at $1 per acre for the primary term, and $2 per acre if extended for a secondary term.
- Royalties: 12.5% of the value for all products sold or removed from the lease.

Applicable State Laws
ARIZONA REVISED STATUTES
Title 27: Minerals, Oil and Gas
Title 37: Public Lands
Title 41: State Government

A.R.S. § 41-844 requires parties in charge of ground disturbing projects on State [Trust] land to promptly report the discovery of any archaeological, paleontological or historic site or object to the director of the Arizona State Museum.

ARIZONA ADMINISTRATIVE CODE
Title 12: Natural Resources, Chapter 5

General Requirements
APPLICATION FEE
There is a non-refundable filing fee of $100 per application.

OTHER FEES
Rental fees are required on all agreements. Royalties are paid on all recovered mineral products. Additional fees, such as appraisal or administrative fees, may also be required.

REQUIRED MAPS
A USGS topographic map showing lease boundaries, access routes, roads, utilities, etc., must be submitted with the application. Other detailed maps, related to your operation will be required in a Mineral Development Report.

MINERAL DEVELOPMENT REPORT (MDR)
All mining-related operations require a detailed MDR which includes: 1) geologic assessment, 2) economic feasibility, 3) environmental assessment, 4) mine operations plan, and 5) reclamation and closure plans. Detailed requirements for the MDR are available upon request.

OTHER NECESSARY DOCUMENTS
Exploration permits require a plan of operations. Aerial photos, contour maps and registered surveys may also be required. Surveys of cultural resources, native plants, wildlife, and endangered species are required components.

RECLAMATION BOND
The *minimum* bond required is $3,000. The actual bond amount is based upon the type of operation and the degree of disturbance.

INDEMNITY INSURANCE
Indemnity insurance will be required for most operations.

OTHER PERMITTING REQUIREMENTS
The applicant is responsible for determining permitting requirements from other regulatory agencies and to be in compliance.

For More Information:
Arizona State Land Department
MINERALS SECTION
1616 West Adams Street
Phoenix, Arizona 85007
602-542-4628
fax 602-542-3507
www.land.state.az.us

Arizona Mine Inspector
602-542-5971
www.asmi.state.az.us

Arizona State Museum
520-621-4011
www.statemuseum.arizona.edu

Bureau of Land Management
Land and Mineral Records
602-417-9528
www.blm.gov

U.S. Geological Survey
520-670-6671 ex. 221
www.usgs.gov

Other Useful Contacts:
Arizona Department of Mines & Mineral Resources
602-255-3791
www.admmr.state.az.us

Arizona Geological Survey
520-770-3500
www.azgs.state.az.us
### ARIZONA GEOLOGICAL SURVEY

**Partial list of Mineral and Energy Resource Publications**


---

### Metallic Mineral Resources


**Map 18**—Metallic Mineral Districts of Arizona, by Stanley B. Keith, D.E. Gest, and Ed DeWitt, 1983, scale 1:1,000,000. [also included in Bulletin 194]...

**Digital Information Series 3**—Database Files describing Mineralized Sites in the State of Arizona, v. 1.0, Data structure and editing by S.M. Richard, 1996, 3 diskettes, 22 p. DBase and Access 95 formats. Can be used in a GIS application...

**Digital Information Series 21**—Database for Mineral Districts in the State of Arizona, S.M. Richard, editor, 2002, 1 CD-ROM. MS Access database, ESRI shapefiles...

---

### Indexes of Mining Properties

**Bulletin 187**—Index of Mining Properties in Cochise County, Arizona, by Stanton B. Keith, 1973, 98 p...

**Bulletin 189**—Index of Mining Properties in Pima County, Arizona, by Stanton B. Keith, 1974, 156 p...

**Bulletin 191**—Index of Mining Properties in Santa Cruz County, Arizona, by Stanton B. Keith, 1975 (reprinted 1990), 94 p...

**Bulletin 192**—Index of Mining Properties in Yuma County, Arizona [includes La Paz County], by Stanton B. Keith, 1978, 185 p...


---

### Bibliographies

**Circular 24**—Bibliography for Metallic Mineral Districts in Cochise, Graham, and Greenlee Counties, Arizona, by Lorraine Schnabel and J.W. Welty, 1986, 38 p...

**Circular 25**—Bibliography for Metallic Mineral Districts in La Paz, Mohave, and Yuma Counties, Arizona, by Lorraine Schnabel and J.W. Welty, 1986, 45 p...


**Circular 27**—Bibliography for Metallic Mineral Districts in Gila, Maricopa, Pinal, and Yavapai Counties, Arizona, by J.W. Welty, Ed DeWitt, and Lorraine Schnabel, 1989, 81 p...

**Circular 28**—Bibliography for Metallic Mineral Districts in Apache, Coconino, and Navajo Counties, Arizona, by J.W. Welty and W.L. Chenoweth, 1989, 47 p...

**OFR-88-22**—Additions to Bibliographies for Metallic Mineral Districts in Cochise, Graham, Greenlee, La Paz, Mohave, Pima, Santa Cruz, and Yuma Counties, Arizona, by J.W. Welty, 1988, 32 p...

---

### Industrial Minerals

**Circular 30**—Arizona has Salt!, by S.L. Rauzi, 2001, 40 p...

Energy Resources


**Circular 29**—Arizona has Oil & Gas Potential!, by S.L. Rauzi, 2001, 40 p….$10.00

**Map 15-2**—Geothermal Resources of Arizona, by J.C. Witcher, Claudia Stone, and W.R. Hahman, Sr., 1982, scale 1:500,000….$5.00

Geologic Maps

**Map 17**—Index of Published Geologic Maps of Arizona, 1903-1982, by R.B. Scarborough and M.L. Coney, 1982, scale 1:1,000,000, 6 sheets. [See also M-31] All 6 sheets….$8.00

**Map 31**—Index of Published Geologic Maps of Arizona: 1982 to mid-1993, by R.C. Harris, R.A. Trapp, T.G. McGarvin, and J.E. Spencer, 1994, 45 p., scale 1:1,000,000, 3 sheets. Text and sheets….$8.00

**Map 33**—Arizona Geologic Highway Map, 1998, scale 1:1,000,000. Available as a folded map only….$10.00

**Map 35**—Geologic Map of Arizona, by S.M. Richard, S.J. Reynolds, J.E. Spencer, and P.A. Pearthree, compilers, 2000, scale 1:1,000,000. (For rolled map, add $1.00 for mailing tube. Rolled maps cannot be delivered to P.O. Box)….$5.00

**Digital Geologic Map 01**—Digital geologic map and cross sections of the Clifton-Morenci area, Greenlee County, Arizona, v. 1.0, compiled by C.A. Ferguson and M.S. Enders, 2000, 1 CD-ROM….$15.00

Or purchase as three color, paper maps, scale 1:24,000 (order as DGM-01, S)….$35.50


Or purchase as one color map, scale 1:24,000 (order as DGM-31, S)….$18.00

Publication Ordering Information

You may purchase publications at the AZGS office or by mail. Address mail orders to AZGS Publications, 416 W. Congress St., Suite 100, Tucson, AZ 85701 (see www.azgs.az.gov for additional information, or call 520 770-3500 if you have questions). Orders are shipped by UPS, which requires a street address for delivery. All mail orders must be prepaid by a check or money order payable in U.S. dollars to the Arizona Geological Survey or by Master Card or Visa. Do not send cash. Add 7.6% sales tax to the publication cost for orders purchased or mailed in Arizona. Order by publication number and add the following shipping and handling charges to your order:

<table>
<thead>
<tr>
<th>SHIPPING AND HANDLING CHARGES</th>
<th>In the United States</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $2.00</td>
<td>add $2.50</td>
<td></td>
</tr>
<tr>
<td>$2.01 to $10.00, add $6.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$10.01 to $20.00, add $7.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$20.01 to $30.00, add $8.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$30.01 to $40.00, add $9.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$40.01 to $50.00, add $11.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$50.01 to $100.00, add $13.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$100.01 to $200.00, add $17.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than $200.01, call</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other countries, request price quotation

Shipping and handling charges include insurance.

For rolled maps, add $1.00 for a mailing tube.
Purpose of the Society
is the promotion and encouragement of interest in
the science of geology of the state of Arizona. To
this end the Society holds monthly meetings,
sponsors field trips, and publishes field trip guides
and the Digest at irregular intervals. The Society
has produced a distinguished publication series,
see listing below. AGS was founded in 1948.

Membership
in the Society is open to all who are
professionally interested in the geology of the
State of Arizona.
Dues: $15 for 1-year membership
$30 for 2-year membership,
$40 for 3-year membership,
full-time student - free

Ores and Orogenesis 2007 - Circum-Pacific
Tectonics, Geologic Evolution, and Ore Deposits.
A symposium in honor of William R. Dickinson.
Location: Tucson, Arizona, 24-30 September, 2007

Arizona Geological Society Publications - partial listing
The Arizona Geological Society’s publications are sold over the counter and by mail through the
Arizona Geological Survey. For shipping costs contact Arizona Geological Survey, 416 W. Congress
#100, Tucson, AZ 85701, (520)-770-5350, Maricella.Moreno@azgs.az.gov

GEOLOGIC HIGHWAY MAP OF ARIZONA, edited by R.J. Kamilli and S.M. Richard, scale 1:1,000,000, 1
sheet, 26" x 48", folded to 5" x 9", text and maps both sides, 1998, $10.00

Digest 20: PORPHYRY COPPER DEPOSITS OF THE AMERICAN CORDILLERA, edited by F.W. Pierce
and J.G. Bolm. 656p., 43 papers, hardbound, 1995, $75.00

332 p., 25 papers, softbound, 1991, $35.00

Digest 18: MESOZOIC ROCKS OF S. ARIZONA AND ADJACENT AREAS, edited by W. R. Dickinson &
M. A. Klute. 400 p., 28 papers, softbound, 1987, $17.00

Digest 17: GEOLOGIC EVOLUTION OF ARIZONA, edited by J. P. Jenney & S. J. Reynolds. 866 p., 35
papers, hardbound, 1989, 1 plate - Arizona Geologic Map 1988 scale 1:1MM by Reynolds. $60.00
Includes chapters on Precambrian, Laramide, and Mid Tertiary metalliferous ore deposits, uranium, petroleum,
and industrial minerals.

Digest 16: FRONTIERS IN GEOLOGY AND ORE DEPOSITS OF ARIZONA AND THE SOUTHWEST,

Digest 15: GOLD AND SILVER DEPOSITS OF THE BASIN AND RANGE PROVINCE, WESTERN U.S.,
edited by Joe Wilkins, Jr.. 233 p., 19 papers, hardbound, 1984, $17.00

Digest 14: RELATIONS OF TECTONICS TO ORE DEPOSITS IN THE SOUTHERN CORDILLERA,

Digest 10: TECTONICS OF ARIZONA, edited by J. C. Wilt & J. P. Jenney. 430 p., 19 papers, 4 maps,
softbound, 1976, $14.00
Degrees and Research Programs
On-line MEng
Joint MEng-MBA
Residential MS and PhD Programs
Department of Mining & Geological Engineering

www.mge.arizona.edu

Natural Resources — People — Environment

Why Study Mining and Geological Engineering?

The MGE Department does mining......and more. We are one of the leading centers for mineral resources engineering research ranging from geomechanics to information technology to health and safety. You might be surprised to learn that many of our graduate students do not have an undergraduate degree in an engineering field. The breadth of research we do accommodates students from a wide variety of technical fields, health fields, and business backgrounds.

Why Study at Arizona?

The UA is a Research I university and a member of the elite American Association of Universities, the highest designations for quality research in the United States. We are a member of the CRC-Mining based in Brisbane Australia. Our faculty are at the cutting edge of their respective research fields. Our certificate program is pending approval and is planned to be 15 units in focused areas such as geomechanics, information technology, health and safety, and mineral processing. The courses will be offered on-line.

What Courses Can I Take?

You can choose from a wide variety of courses within the MGE Department and many other departments ranging from industrial hygiene to applied anthropology to geosciences to planetary sciences.

What Research Can I Do?

Faculty members have many exciting research projects ranging from economic indicators for sustainable development to automated imaging of fractures and particle size and many more.

Admissions

For MS, PhD and MPH
http://grad.arizona.edu/applynow.php

For MEng
http://triuniv.engr.arizona.edu/

Application Materials:
GRE for MS and PhD, TOEFL for non-English speakers, application, 3 letters of recommendation, resume, statement of interest; no GRE for MEng if other requirements met; must have 3.0 undergraduate GPA

December 1 deadline for international students
February 1 deadline for domestic students

Mines & Metallurgy Room 229
1235 E. James E. Rogers Way
P.O. Box 210012
The University of Arizona
Tucson, AZ 85721-0012
Phone: 520 621-6063
Fax: 520 621 8330
Email: mgedept@email.arizona.edu