



## The Metals of Antiquity

Don Shurtz, Pleasant Oaks Gem and Mineral Club of Dallas

Before looking at the Metals of Antiquity, let's start with some definitions. Antiquity means ancient. It generally refers the times before the Middle Ages of European history. The Middle Ages were from about 500 A.D. to 1350 – 1500 A.D. The definition of Antiquity is rather straightforward when compared to the definition of Metal. The word Metal comes from Latin *metallic* from Greek *metallon* meaning the product of a mine. Dictionary.com defines metal as (a) “any of a number of chemical elements, such as iron or copper, that are often lustrous ductile solids, have basic oxides, form positive ions, and are good conductors of heat and electricity” and (b) “an alloy, such as brass or steel, containing one or more of these elements.” However, if you were a physicist, you would define a metal as any substance capable of conducting electricity at a temperature of absolute zero, otherwise it is a non-metal; however, a chemist would confine the definition of metal to elements only. They would agree that elements capable of conducting electricity would be metals or metalloids, but their distinction of metals and metalloids would vary as they cannot seem to gain a consensus of the boundary between metals and metalloids. The boundary between metals and metalloids, and non-metals, also fluctuates, but about 95 of the 118 known elements are metals or metalloids. If the difference in definitions as used by chemists and physicists were not enough, the astrophysicists will define a metal as all elements in a star heavier than hydrogen and helium. They do not have the distinction that metals must be capable of conducting electricity. So with these crystal clear definitions of metal in hand (pun intended, but at least a vague idea of what a metal should be) let us press on. Give several men a piece of iron, aluminum, copper, brass, or stainless steel and they would all agree that they were holding a piece of metal. Some are alloys, but they are all solid, capable of conducting electricity and heat, ductile or malleable, and lustrous – all characteristics of a metal. Now had them some mercury (of course, they is wearing protective equipment) and ask them if it is a metal. Right off, they will notice that it is not a solid. It is lustrous and can be stretched and formed, but it will immediately try to return to its ball shape due to surface tension. With a little effort, they would find it could conduct electricity and heat. Still, it is not a solid. So is it a metal? If you were to repeat the experiment at minus 50 degrees Fahrenheit, all the results would be the same except that the mercury would now be solid. So is it a metal? Yes, there is no requirement that a metal is solid; a metal can exist as a fluid above its melting point. In the case of mercury, it is a metal and a fluid (melted) at room temperatures.

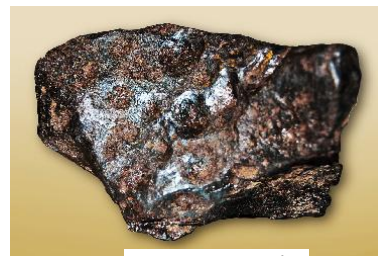


Cinnabar, Mercury Ore  
*Chips and Chatter*

The Metals of Antiquity were those metals known by humans in pre-historic times. The seven Metals of Antiquity are Gold, Silver, Copper, Tin, Lead, Iron, and Mercury, also known as Quicksilver. Five of these metals are sometimes found as native elements: gold, silver, copper, and mercury as natural native elements and iron from meteors. Gold, Silver, and Copper have all been the feature articles of the last three Chips and Chatter so we will not cover them in any detail. All of the Metals of Antiquity are solid at room temperature except mercury. However, mercury has been found in tombs dating to 1600 BC. Mercury was also known to be poisonous; Pliny outlined a method of

purification of mercury using leather as a filter, and noted that it was harmful to humans. The ancients also figured out that mercury would dissolve gold, silver, and copper as their mercury amalgams were used for filigree plating. Perhaps Pliny's method for purification of mercury was also used to concentrate the amalgams for plating.

Iron is the most common of the Metals of Antiquity to be found in the earth's crust (4<sup>th</sup> in occurrence), but was the rarest of the Metals of Antiquity. The melting temperature of iron was too high for the techniques used in ancient times to smelt or melt iron. The iron of antiquity was iron extracted from rare meteorites. It was cold-hammered to shape, but once formed it was the strongest of the metals for spear points, knife blades, and swords.



**Iron Meteorite**



**Galena, Lead Ore**

Lead beads dating back to 6500 BC have been found in Turkey. This implies that lead was being smelted at that time. Galena is abundant in many parts of the world and can be easily smelted into lead. The ore galena was placed in a hot fire, and after the fire burned out and cooled, lead could be collected below the layer of ash. The temperature of the fire roasted the galena (lead sulfide) to form lead oxides that were further broken down into lead and carbon dioxide. Lead was likely the first processed metal. Lead could be used for ornaments, lead "shots" for slings, and was great for adding mass to a club, but was too soft for swords or arrowheads. However, the ancient Romans used lead for their famous aqueduct systems. Lead pipes were formed into 10-meter long sections in about 15 standard diameters. The aqueducts can still be found in England, France, and Italy. In the US, lead was the primary pipe used for plumbing until the 1920s and could still be legally used until the 1980s.

Tin processing dates back to about 1800 BC, but it was unknowingly being used much earlier. Bronze is formed by the alloying of copper with tin or arsenic. Bronze was being made by 3500 BC by smelting copper with unknown concentrations of tin and / or arsenic making a harder form of copper - bronze. Bronze was almost immediately being used for swords, knives, spearheads and arrowheads. The Bronze Age started in Europe about 3500 BC and several hundred years later in Asia. The first intentional bronze to be made by alloying copper with tin was about 1800 BC. Tin was being made from Cassiterite, a tin oxide. It could be smelted in much the same manner as lead – by simply placing broken up cassiterite on a hot, open fire and then removing the tin from under the ash layer after the fire cooled, or the cassiterite could be added to the copper ores and smelted together.. In addition to being used for bronze, tin was also alloyed with lead to form pewter by 1200 BC.



**Cassiterite, Tin Ore**

Some of the characteristics and lore of the Metals of Antiquity are shown in the following table. It should not be a surprise that with seven Metals of Antiquity, seven days of the week, and seven known heavenly bodies (moon, sun, and planets [not including the Earth]) that someone would to associate them together. Of course, for good measure they tossed in some of the ancient “Gods”. These associations are also shown in the table.

Metal	Chemical Symbol	Heavenly Body	Ancient “God”	Day of Week	How Common in Earth’s Crust	Melting Temp.	Mohs Hardness	Where produced (top 3 locations)
<b>Gold</b>	Au (Aurum)	Sun	Apollo	Sunday	72nd, (1.1 ppb)	1947 °F	2.5 – 3.0	China, Australia, Brazil
<b>Silver</b>	Ag (Argentum)	Moon	Diane	Monday	65th, (70 ppb)	1763 °F	2.5 – 3.0	Mexico, China, Peru
<b>Copper</b>	Cu (Cuprum)	Venus	Venus	Friday	26th, (50 ppm)	1984 °F	2.5 – 3.0	Chili, Peru, China
<b>Lead</b>	Pb (Plumbum)	Saturn	Saturn	Saturday	37th, (14 ppm)	621 °F	1.5	Australia, United States, China
<b>Tin</b>	Sn (Stannum)	Jupiter	Jupiter (Jove)	Thursday	49th, (2.2 ppb)	449 °F	1.5	China, Indonesia, Peru
<b>Iron</b>	Fe (Ferrum)	Mars	Mars	Tuesday	4th , 50,500 ppm	2800 °F	4.0	Australia, Brazil, China,
<b>Mercury</b>	Hg (hydrargyrum)	Mercury	Mercury	Wednesday	66th, (50 ppb)	-38 °F	1.5 if solid	Spain, Yugoslavia, United States

References:

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- Philadelphia Museum of Art, Finishing Techniques in Metalwork, [www.philamuseum.org](http://www.philamuseum.org)
- Nova Data Testing, Metals of Antiquity, [www.novadataesting.com](http://www.novadataesting.com)
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Pictures

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## Shows and Activities – Upcoming Show and Activity Dates

- Nov 8-10, Humble, TX, Houston G&MS, Humble Civic Center, <https://hgms.org>
- **Nov 23-24, Mesquite, TX, Dallas G&MS, Mesquite Rodeo Center Exhibition Hall, [dallasgemandmineral.org](http://dallasgemandmineral.org)**
- Dec 14-15, Leeville, LA, DeRidder G&MS, West LA Forestry Fairgrounds, <https://www.rockngemswla.com/>
- Jan 18-19, Fredericksburg, TX, Fredericksburg Rockhounds, Lady Bird Johnson Park, [hcgms20@gmail.com](mailto:hcgms20@gmail.com)
- Jan 24-26, Tyler, TX, East Texas G&MS, Tyler Rose Garden Center, [mlkilanski@yahoo.com](mailto:mlkilanski@yahoo.com)

Ref:

- July - August SCFMS News
- SCFMS Local Shows, [www.scfms.net](http://www.scfms.net)
- Rock & Gem Show Dates, <https://www.rockngem.com/ShowDatesFiles/ShowDatesDisplayAll.php?ShowState=ALL>

### VISIT AN AREA CLUB

[Arlington Gem & Mineral Club](#), meets the 1st Tuesday of each month at 7:30 pm, 1408 Gibbins, Arlington, TX  
[Cowtown Gem, Mineral, & Glass Club](#), meets the 2<sup>nd</sup> Tuesday at 7:00 pm, CERA 3300 Bryant Irvin Rd. Fort Worth  
[Dallas Bead Society](#), meets 1<sup>st</sup> Saturday of each month at 10:00 am at The Point at CC Young, 4847 W. Lawther Dr., Dallas, TX  
[Dallas Gem & Mineral Society](#) meets the 3<sup>rd</sup> Tuesday of each month at 7 pm, American Legion, 10205 Plano Rd, Dallas (next to their shop)  
[Dallas Paleontological Society](#), meets 2<sup>nd</sup> Wed. of each month at 7:00 pm, Brookhaven College, Building H, 3939 Valley View Lane, 75244  
[Fort Worth Gem & Mineral Club](#), meets 4<sup>th</sup> Tuesday of each month at 7:30 pm, 3545 Bryan Avenue, Ft. Worth  
[Oak Cliff Gem & Min Soc.](#), meets the 4<sup>th</sup> Tuesday of each month at 7:30 pm, Unitarian Universalist Church, 3839 W. Keist Blvd, Dallas,  
[Pleasant Oaks Gem & Mineral Club](#), meets the 1<sup>st</sup> Thur. of each month at 7:30 pm, Garland Women's Activities Bldg., 713 Austin, Garland  
[Wild West Bead Society](#), meets 3<sup>rd</sup> Tuesday of each month at 6:30, Wild Beads, 2833 Galleria Dr., Arlington, TX

## Bench Tips from Brad Smith

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### TAPERED REAMERS

A tool you don't see often these days is a tapered reamer. They're particularly useful for making an irregular hole round or for enlarging a hole to an exact diameter. For example, the small set in the yellow pouch is for holes in the range of 0.3mm to 2.5mm. They are great for sizing a tube to fit a hinge pin. Other times when I'm drilling a hole for riveting sheet metal and can't find the exact size drill, I simply drill the holes with a slightly smaller bit and enlarge them with a reamer until the wire just fits.

For larger hole sizes in sheet metal up to 14 gage, I really like the reamer with the black handle. It makes quick work of sizing holes from about 3mm to 12mm. You can find them in well-equipped hardware stores.

You may never use the large diameter reamers, but when sawing out some rings from 4mm thick sheet, I found they worked well for rounding and sizing the hole.

### TESTING FOR SILVER

Often you need to identify some of those unknown "silvery" pieces in the bottom of the toolbox or some piece of old jewelry. Is it silver or something else?

Of course, if you need to know exactly what you have, it's best to send your metals off for refining. But inexpensive silver testing solutions can be used to help distinguish higher silver content alloys from alloys that have the same appearance but with little to no silver content, like German Silver or Nickel.

I purchased a half-ounce bottle of JSP Silver Testing Solution #GT41. It's not a rigorous analytic test, but it lets

you know if you're on the right track. And it's inexpensive. Mine was only \$3.00.

With a fresh solution you have an instant reaction after applying it to the metal being tested. The procedure is simple - as you apply a small drop, look for a color change. Note that the acid will leave a slight mark, so choose a spot that is out of the way or will be easy to polish.

If you suspect the object is silver plated, you should file a little notch somewhere inconspicuous to expose what metal is below the surface. Otherwise, all you test will be the surface plating.

Here's the reaction I got when testing various materials:

- |                         |                           |
|-------------------------|---------------------------|
| • Fine silver           | Red/Orange                |
| • Sterling silver       | Brick Red                 |
| • 80% silver 20% copper | Dark red changing to gray |
| • Brass                 | Yellow changing to blue   |
| • Nickel                | Gray-green                |
| • Copper                | Yellow changing to blue   |
| • Steel                 | Black                     |
| • Stainless Steel       | No color change           |

Caution - If you do any of this testing, know that you are handling a reasonably strong acid. The GT41 label says it includes nitric acid and potassium dichromate.

Wear safety glasses.

Do not get any testing solution on your skin.

Use a solution of baking soda and water to neutralize the acid.

Wash and clean up well when you're done.

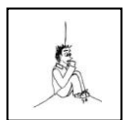
### Work Smarter & Be More Productive With Brad's "How To" Jewelry Books

[Amazon.com/author/bradfordsmith](https://www.amazon.com/author/bradfordsmith)



### Editor's Corner, Ten Chips and Chatter per Year

Don Shurtz, Editor



When you look at the Minutes, you will note that a motion was passed to reduce the number of Chips and Chatter to ten per year. The rationale was that we have a party and/or dinner in July and December, there is no club business discussed at these meetings, so there is no need to publish minutes in January and August. However, the club will send out a meeting reminder for the January and August meetings by email and by mail to those receiving hard copies of the Chips and Chatter.

## PRESIDENT'S MESSAGE

Ling Shurtz, POGMC President

IGEM was a good show. We found that IGEM will not be holding a show in Dallas in January. At our November meeting, we will install the officers for 2019-2020. We will also be discussing the December meeting activities.

## CLUB OFFICERS FOR 2019

President: Ling Shurtz  
1st VP, Programs: Carolyn Grady  
2nd VP, Field Trips: Open  
Secretary: Lee Elms  
Treasurer: Del Grady  
Editor: Don Shurtz  
E-mail: don.shurtz@gmail.com,  
L.SHURTZ@gmail.com

## MEETING MINTUES

September 5, 2019

POGMC President Ling Shurtz called the October 3, 2019 club meeting to order at 7:40 pm.

**Ling led the Pledge of Allegiance to the Flag**

**Quorum:** We have a quorum

**Sunshine Report:**

- Butch was dehydrated
- Cheryl has knee replacement surgery

**Visitors:** There were no visitors

**Minutes:** We discussed the minutes of the September 2019 meetings as printed in the October 2019 Chips and Chatter. Carolyn made a motion to accept the minutes. Ling seconded the motion. The motion passed.

**Treasurer's Report:** Del Grady gave Treasurer's Reports for September. Carolyn made a motion to accept the Treasurer's Reports. Don seconded the motion. The motion passed.

**Old Business:**

- IGEM show Oct 11 – 13. Plan for set up at noon on Wednesday, October 9
- Tickets available on front desk

**New Business:**

- **Nominating Committee Report:** The following slate of officer for 2019-2020 is proposed: President – Ling Shurtz; 1<sup>st</sup> Vice President: Carolyn Grady; Secretary: Lee Elms; Treasurer: Del Grady; Editor: Don Shurtz. There were no Nominations from the floor. The slate of officers proposed by the nominating committee was accepted by acclamation.
- Don made a motion that the Chips and Chatter be published monthly except for January and August. After discussion, the motion was seconded by Carolyn. The motion passed.

*Chips and Chatter*

Pleasant Oaks Gem and Mineral Club of Dallas, TX

Area shows:

- Oct 4-6, Albuquerque, NM, Jay Pen Expo, NM State Fairgrounds
- **Oct 5-6, Fort Worth, TX, Rock Fest, Cowtown Gem, Mineral & Glass, 3300 Bryant Irving Rd**
- Oct 11-12, Mt. Ida, AR, 32<sup>nd</sup> Annual World Championship Quartz Digging Contest, Mt. Ida area Chamber of Commerce, Montgomery Cty Fairgrounds
- Oct 11-13, New Orleans, LA, Louisiana G&MS
- **Oct 11-13, Dallas, TX, International Gem and Jewelry Show (IGEM), Market Hall**
- Oct 12-13, Temple, TX, Tri-City G&MS, Mayborn Civic and Commerce Center
- Oct 18-20, Austin, TX, Austin G&MS, Palmer Events Center
- Oct 18-20, Houston, TX, IGEM, NRG Center
- Oct 26-27, Oklahoma City, OK, Oklahoma M&GS, State Fair Park
- Nov 2-3, Amarillo, TX, Golden Spread G&MS, Amarillo Civic Center
- Nov 2-3, Round Rock, TX, Paleo Society of Austin, Old Settler's Hall 3300 E. Palm Valley Blvd.
- Nov 2-3, Midland, TX, Midland G&MS, Bush Convention Center, 105 N. Main St., Midland
- Nov 8-10, Humble, TX, Houston G&MS, Humble Civic Center
- **Nov 23-24, Mesquite, TX, Dallas G&MS, Mesquite Rodeo Center Exhibition Hall**
- Dec 14-15, Leeville, LA, DeRidder G&MS

Note: Contact information in Chips and Chatter

**Break**

**Presentation:** No presentation

Ling adjourned the meeting at 8:45 pm.

## MEETING

The next meeting will be November 7, 2019 at the Garland Activities Building. We will view the video, Metal Smithing. The subsequent meeting will be December 5 – stand by for details and possible location modification.

## VISITORS ARE ALWAYS WELCOME

## SHOW AND TELL

November birthstones are topaz and citrine. Also, consider bringing an ore for one of the Metals of Antiquity.

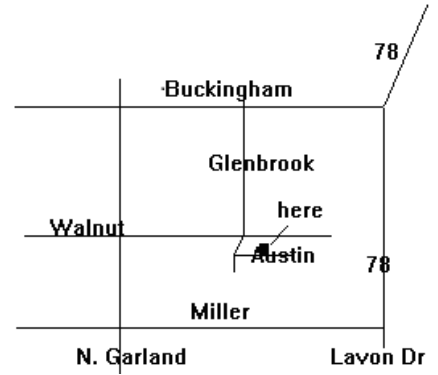
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**PLEASANT OAKS GEM and MINERAL CLUB of Dallas**



**Meetings**  
 First Thursday of each month, 7:30 PM  
 Garland Women’s Activities Building  
 713 Austin St., Garland, TX  
 (Northeast corner of Austin & Glenbrook)

**Membership**  
 Single Adult: \$16.50,  
 Junior: \$5.00, Family: \$27.50  
 (Plus badge fee for new members)



**PURPOSE**

The Pleasant Oaks Gem and Mineral Club of Dallas is organized for charitable and educational purposes to promote interest in the various earth sciences, particularly those hobbies dealing with the art of cutting and polishing gemstones, the science of gems, minerals and metal crafts, as well as their related fields. Pleasant Oaks Gem and Mineral Club of Dallas is a Section 501(c)(3) not-for-profit organization

**CHIPS AND CHATTER**

Pleasant Oaks Gem & Mineral Club  
 PO Box 831934  
 Richardson, TX 75083-1934

To:

**VISITORS ARE ALWAYS WELCOME**

**Meetings: First Thursday of each month at 7:30 PM, Garland Activities Building, Garland TX**  
**Next Meeting: November 7, 2019 - Presentation will be a DVD about Metal Smithing**

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