Goldsmith Apprentice ©

About the Author

Anatoli Graour, a qualified professional goldsmith with 25 years experience in hand made jewellery.
I started my career as a Goldsmith Apprentice in Russia when I was already a grown up man and I took my future job seriously. At the company that I start work for I was given an old, broken bench and one month to fix the bench and get all the tools that I needed for my work. The bench tools was not provided by the company.

I didn't know anything about Goldsmith Suppliers and started my search for tools in hardware stores, which wasn't really successful. After talking to friends and relatives I got some help as some of them worked in factories. They made me triblets, a ingot, a hand vice and some other tools as well. My best investments were secondhand tools that I had purchased from a dental technician. They were a few pliers, tweezers, shears, a motor with a flexible shaft and a set of burs. I still use some of these tools today.

Besides the tools, I purchased a number of books that related to the jewellery industry, including books about different stones and minerals which helped me understand how the stones were created by nature and their characteristics.

As I mentioned earlier, I was already a grown up man at that stage and when it comes to a jewellery I pictured the legendary Carl Fabergé in my mind with his unique jewellery pieces which are treasured in museums and private collections around the world.

I started working in a workshop with about 70 goldsmiths and I learned from the best masters in this trade. After a few days of practicing how to melt, roll and solder metal, I was given my first job to repair costume jewellery. It was proper jewellery, only made from cheap metals, some of them with gems in classical style and looked antique. At my previous work, I had gained experience working with different types of tools and machinery, therefore only the melting and soldering of metals was something new to me.

The quality of my work on costume jewellery proved to be acceptable and after one month, I was given my first order to make jewellery for customers.

It was something plain and easy to make as the company was using pressing dices with different patterns and all I had to do was, cut patterns out, shape and solder them together. Pressing jewelery using dices wasn't very exiting and definitely not what I was expecting. After several months, I attempted to make my own designs, but had many disappointments. It took me a couple of years to master my skills, develop techniques and perfect the quality of my work.

The time did come that I built my reputation and I had many customers who were placing orders several months in advance. But I did not get a chance to enjoy being famous as a few years later, big political changes took place in Russia that nobody thought would happen. The communist system fell and the economy of the country went into a long recession.

I did not think that my countries situation will change during my life time, so I emigrated to South Africa for the sake of my daughter who is now studying at the University of Cape Town as a Screen Writer. She chose a career in the film industry.

After working for a boss for four years, I was offered to buy a small jewelery shop which grew over the years into a big reputable business.

I have trained many students who have either started their own businesses or are working for large jewellery companies and earning excellent salaries thus having spread my reputation throughout the country and many of my customers are from all over the world. The local jewellery school also asked me if I could give lectures to their students.

P.S. Some time back, I explored Interned Marketing and while building my website, was disappointed to find that there were not a single downloadable book available on how to make jewellery. That is when I decided to share my knowledge and many years of experience with those who are passionate about jewellery and seeking help, as they don't have a good teacher. This book will help you.

P.P.S. Goldsmith Apprentice: A jewellery making course for beginners and tips (techniques) for qualified goldsmiths.
This book was written with utmost care and detailed explanations are given on how to work with metals and jewellery, how to avoid mistakes that can cost money and help you master your skills.

I wish you great success in your career and may beautiful pieces, made by you, make your name famous around the world.

Anatoli Graour

http://www.jewellerpro.com/

Metals

I assume you have all the tools and your bench is set up.
It all begins with metals. So what is so special about metal you might ask?
Metal is very sensitive to temperature and chemicals. The quality of the jewellery may vary, depending on these two things.
You have to learn to feel the right temperature. The flame on your torch must be on medium setting and not red in colour. Take a small piece of metal with a thickness of not more then 0.5mm and lets practice.
Point the flame towards the metal and wait until you burn the metal. At first, it will start to bubble and only then will it begin to melt. That way you will learn when the temperature is too high.
This is very important and you must try it. Do not ignore this step.

Melting Points Of Metals

Platinum	**1769°C**
24ct – Pure gold	**1063°C**
18ct gold – 750	**900°C**
14ct gold – 585	**880°C**
9ct gold – 375	**880°C**
Pure silver	**961°C**
Sterling silver – 925	**893°C**
Ruthenium	**2500°C**
Rhodium	**1966°C**
Palladium	**1555°C**
Nickel	**1455°C**
Copper	**1083°C**
Zinc	**419°C**
Lead	**327°C**
Tin	**232°C**

This temperatures are estimated and depends on the alloy in the gold you are working with.

Abbreviations for metals

Au – Gold
Ag – Silver
Cu – Coper
Cd – Cadmium
Ni – Nickel
Pd – Palladium
Pt – Platinum
Rd – Rhodium
Ru – Ruthenium
Zn – Zinc
Pb – Lead

Gold and Alloy

In different countries, different types of gold is used. The carat and colour of the gold depends on other metals (alloy) that has been added to the fine gold – 24ct.

Fineness of gold (percentage of gold in alloy)

8ct	9ct	10ct	14ct	18ct	20ct	22ct	24ct
33.33%	37.50%	41.66%	58.33%	75.00%	83.33%	91.66%	100%

Percentage of alloy in 9ct, 14ct and 18ct yellow gold and their melting temperatures:

18ct – 750

Au	Ag	Cu	temperature
75 %	15.0 %	10.0 %	892-900

14ct – 585

Au	Ag	Cu	temperature
58.5 %	21.5 %	20.0 %	829-880

9ct – 375

Au	Ag	Cu	temperature
37.5 %	16.0%	46.5%	880

Sterling Silver - 925

Ag	Cu	temperature
92.5 %	7.5 %	893

Here are some tips of how to make 9ct yellow gold from 18ct yellow gold.
10 gm 18ct yellow gold
0.5 gm fine silver
3.76 gm copper
5.74 gm brass (not the bronze) don't mistaken this two metals, bronze is brittle.

To make 14ct gold from 18ct, minus 22% from silver, copper and brass.

To make 9ct white gold from 18ct white gold with Palladium.
10gm 18ct white gold
10gm fine silver
and, of course to make 14ct white gold, add 7.8gm silver to 10gm 18ct white gold.
Remember this is only for white gold with Palladium and not with Nickel.

Remember you can not mix Palladium and Nickel white gold together.

Work with Metals

Before we even start melting the metal, there is one preparation we have to do.
The crucible, made from raw material will absorb the flux and gold during the melting process. I strongly advise you to prepare the crucible for work first.

Dissolve 50gm of Borax and 25gm Boric Acid (powder) in one litre boiled water.
Soak the crucible in it for at least 5 hours, then take it out. Place it in a crucible holder and start heating the crucible from the bottom with a melting torch. The water (flux) in the crucible will start evaporating. Do not pour it out. Time after time, take the flame away and let the crucible absorb the flux.

When the crucible is dry, pour Borax powder into it and melt it. Make sure the melted flux covers the whole surface inside the crucible. It will look like china. Pour out the excess flux, if any and your crucible is ready for work.

Every time before melting the metal, heat up the crucible inside until it's red and then place the metal inside to melt. If the crucible is cold, the metal sticks to the cold wall of the crucible and it takes longer to melt.

Remember, do not use a flame that is too strong. It burns the alloy out and in some cases, the metal becomes harder and even changes colour, depending on what metal you are working with.

Once in a while, after the melting of metal, melt a little borax in the crucible and pour it out to keep the crucible clean.

Melting of Filings

Melting of metal filings could create trouble and loss in precious metals.
To avoid this, follow these steps:
Clean filings from dirt, like sand paper, wood, etc. It is very important to remove any tiny parts of steel that comes from files, blades, burs and drills by using a magnet. Don't be insulted, I have seen some people don't do this.

Do not melt more then 50gm of filings at a time. It will take too long to melt and causes loss of metal and the burning out of alloy.

When you melt the filings, make a very small flame with very little oxygen to prevent blowing filings out of the crucible, all over the place.

Pour filings on one side of the crucible and hold it at an angle while melting so that the melted gold beads could roll into one place. This way you will melt filings much faster and have less loss. When the filings are melted, add a little borax which will take out any dirt.

Every time after you melt the filings melt more borax to clean it up the crucible.

The metal will still lose some alloy during this process. This depends on what carat and colour of gold you are melting. I advise you not to use melted filings for your work, but melt it one more time by adding pieces of gold (same carat) to it, not less
than the amount of filings you've melted. This way you will improve the quality of your gold in melted filings.
Do not quench the metal immediately. After the melting process, wait for the metal to cool down.

Rolling of Metal

It is a simple step and I can give you only a few suggestions:
Make sure the metal is clean from flux. The flux gets as hard as stone and damages the surface of the rollers. It also gets pressed into the metal you are working with.
If you are rolling a thick metal, 5 – 7 mm, you have to anneal the metal at least two times during this process. When you are rolling a thick square bar to use later for the rolling of a flat strip from it, anneal the square bar and straighten it with a hammer on a steel block and anneal it again before rolling it flat. This is to prevent the metal from rolling skew.

Solder

Solder as well as gold are made from different metals. It depends on the carat and colour of the gold you are working with. This is the solder for yellow gold:

18ct – 750	Au	Ag	Cu	Cd	Zn	Pd	temp-re
Easy	75.0	8.7	8.8	6.0	1.5		740-760
Medium	75.0	9.5	9.5		4.0	2.0	760-780
Hard	75.0	9.7	11.7		3.6		850-890

14ct – 585	Au	Ag	Cu	Zn	temperature
Easy	58.5	16.3	20.7	3.6	770-800
Medium	58.5	12.3	20.7	8.5	800-820
Hard	58.5	12.3	26.2	3.0	82-850

9ct – 375	Au	Ag	Cu	Zn	temperature
Easy	37.5	28.5	30.0	4.0	800-820
Medium	37.5	11.0	43.0	8.5	820-840
Hard	37.5	37.5	25.0		840-860

Here are some tips of how to make solder the easy way:

18ct yellow solder	**9ct yellow solder**
Easy	**Easy**
1 part 18ct yellow gold	1 part 18ct yellow gold
1 part Silver solder	3 parts silver solder
Medium	**Medium**
1 part 18ct yellow gold	1 part 18ct yellow gold
0.70 parts silver solder	1.5 parts silver solder
Hard	**Hard**
1 part 18ct yellow gold	1 part 18ct yellow gold
0.5 parts silver solder	1 part silver solder

Silver solder: Sterling silver 925 – 10gm Brass – 5gm

Chemicals and Jewellery

Chemicals play a crucial role in metals.

Besides the chemicals we are working with, there are other ways that chemicals get into contact with jewellery, when people are wearing jewellery, they apply cream on their hands with the jewellery on, use perfume, wash dishes, work in the garden or possibly even work with other chemicals. Swimming, sweat and even dust from the air gets collected inside the jewellery.
Now imagine how much dirt gets collected over the years inside those beautiful pieces. That's all due to chemicals and you have to get rid of them before you start working with jewellery.

Here are two reasons for that;
First - you will struggle to solder dirty pieces.
Second – when dirt burns, it will be very difficult to clean the jewellery afterwards, especially inside small holes under the stones. As a result, stones will look black from the burnt dirt.
The easiest way to clean jewellery is to use Ultrasonic Cleaner or Steam Cleaner.
If not, then place the jewellery in hot water with dish washing soap in it. Wait until the dirt softens and then clean it with an old toothbrush.

I advise my customers to clean their jewellery at least once a month by making a paste from dish washing soap and bicarbonate of soda and once again, using a toothbrush to clean the jewellery with this paste.
The jewellery will stay clean and the stones will sparkle. That way, I don't have any problems cleaning the jewellery when customers come to me for repairs or alterations.

On a few occasions, my customers have complained that their yellow gold rings have turned white. I asked them if they work with chemicals or mercury. Some did reply that they had broken a thermometer. Lets stop here for a moment.

Mercury is a poisonous metal, not only for humans, but deadly for gold as well.
When mercury gets into contact with gold, it starts to slowly destroy the alloy in it and the gold becomes brittle. Eventually the gold will start breaking into pieces and it will not be possible to restore the jewellery. Mercury has to be removed from gold as soon as possible.

Using sandpaper, remove mercury from jewellery where possible. Avoid damaging the pattern on the jewellery, if any, and then anneal jewellery with flux.

There are many chemicals that you will have to work with and I will talk about them during the course.

Soldering Flux

Most of the jewellers use Auflux, a yellow liquid that is ready to use for soldering work. Another jeweller called me the other day and asked if I could lend him some Auflux. Oh boy, was he surprised when I told him that I don't use Auflux.

Here is an easy method to make soldering flux:
Mix 50gm Borax and 25gm Boric Acid (Boracic powder) together.
Boil one litre of water and dissolve the mixture in a glass bottle.
You can buy Borax and Boric Acid at the pharmacy.

Soldering

This is the most difficult process for all beginners.
For soldering work, use an asbestos-free soldering pad. The best is to buy a honeycomb soldering block which is made from special ceramic material that has holes and is ideal for fixing work in place, either directly or by the use of pins.

Always make sure the metal is clean before soldering and that the flame is right for the thickness of the metal and that the metal is fluxed properly. Practice by soldering different thickness of metal and on wire to master your skills.

Before applying solder, warm up the metal by moving the flame along the soldering pieces and never point the flame in one place. When metal is hot and ready for soldering, apply solder, using soldering pick. Remember solder gets flowing where the temperature is higher.

Let me repeat this again, never stop moving the torch. Move the torch in circular motions or horizontally along the working piece. Do not point the flame on the solder itself. The temperature will burn the alloy out of the solder and the solder will make bubbles and cause porosity on soldering place. The solder has to get melted by the high temperature of the metal and not by pointing the flame in to it. Solder has a lower melting point from metal, that's why metal has to be hot enough before applying solder. Lets practice, take two small strips, about 0.5 mm thick, flax them and place on the soldering block, heat them up, but one piece more than the other on purpose. Apply solder on the join and you'll see the solder will jump on the one piece only where the temperature is higher.

Learn to use just enough solder to join the metal and not fill it up with solder. The colour of the gold and solder slightly differ and it will look ugly (untidy) when the solder is too much. It will spread all around the joint and will be very difficult to remove afterwards. Although, sometimes you have to remove any excess solder to make the working piece look neat.
After soldering, wait until the piece cools down. It still has to be warm though and place it into acid (bleach) used for cleaning metal and dissolve the flux.

It will be very good if you can find heat resistant quartz glass that is used in laboratories. Dilute 5% hydrochloric acid to total amount of water in a glass (e.g. 100ml water to 5ml hydrochloric acid). Place the jewellery piece in it and warm it up to 60 – 80°C, using the torch.

It is also good to clean jewellery that way before the repair work.
Don't forget to rinse the jewellery afterwards in clean water. I add a teaspoon of soda into the water to neutralise the acid. You must change water regularly.

Stones

Now we've come to a very difficult part of our work, please pay attention.
Many goldsmiths learn the hard way of how to work with stones by braking and burning them during repairs and alterations which sometimes costs a lot of money.

Take note, be warned that many of the stones don't take high temperatures.
Some of the stones are made from organic minerals and don't take any heat or treatment in acid at all. You have to remove them before the work.
The most common is Pearl, Mabe, Coral, Turquoise, Amber, Tiger's eye, Opal, etc.

CZ – Cubic Zirconia

Nowadays, many countries manufacture synthetic stones and their quality may vary.
CZ can take high temperature, but you must avoid direct flame.

Sometimes when you size a ring, high tension in a tube setting causes the stone to crack. Loosen tension by annealing (heating up) the ring first. When you do alterations, apply flux only on the soldering place and avoid the flux getting onto the stones.

Lets make an experiment. Take an old white CZ and heat it up until it's red in colour. Leave it to cool down and you'll see nothing will happen to it. Now heat it up again and throw it in water. The CZ will become milky white and crack..

You can protect the stones with Heat Paste that is especially made for this purpose and can be bought from Goldsmith Suppliers.

There is another way to protect stones.
Take 10gm Boric Acid and add Methylated Spirits until it becomes a thick paste, apply on stones and light the paste. Wait until the spirits burns and then you can do the soldering.

There are three types of stones that can take high temperatures and don't need protection. They are Diamonds, Rubies and Sapphires. Rubies and Sapphires become very dark in colour during work. After you finish soldering, leave the jewellery to cool down and the colour of the stones will get back to normal. You can then bleach the jewellery in acid or pickling solution (the bleach).

Moh's Table Hardness

Hardness refers to scratch resistance.

10	**9**	**9**	**8**	**8**	**7.5 – 8**	**7.5 – 8**	**7 – 7.5**
Diamond	Ruby	Sapphire	Spinel	Topaz	Emerald	Aquamarine	Garnet

7 – 7.5	**7 – 7.5**	**7**	**7**	**6.5 – 7.5**	**6.5 - 7**	**6.6 – 7**	**6.5 – 7**
Iolite	Tourmaline	Amethyst	Citrine	Zircon	Agate	Peridot	Tanzanite

6 - 6.5	**5.5 – 6.5**	**5 – 6**	**5 – 6**	**5**	**2.5**
Moonstone	Opal	Lapis Lazuli	Turquoise	Glass	Amber

Here is the common stones that used in the jewelery industry and if you like to know about other stones characteristics, please send me e-mail and I will answer your questions.

Identifying the stones

Sometimes it can be very frustrating, even for experienced goldsmiths and it takes a little work to recognize the real thing from imitation stones. There are three basic methods of copying gemstones: Genuine gemstone set on a base of, for instance glass. Coloured Cubic Zirconia, and synthetic gems grown in laboratories and sometimes it takes an expert to identify them from real thing.

It can be very confusing to identify stones only by colour because different stones can have identical colours and one stone can have a big variety of colours such as Tourmaline, from black to brown, green, red, pink, peach, blue, white, colourless and multiple colour variations, such as Watermelon Tourmaline.

Gemstone Colour Varieties

Blue - violet	Green	Red - pink	Yellow - orange
Tanzanite	Emerald	Ruby	Citrine
Blue Sapphire	Green Sapphire	Pink Sapphire	Yellow Sapphire
Iolite	Tzavorite	Spinel	Yellow Topaz
Blue Topaz	Peridot	Rhodolite	Beryl
Tourmaline	Tourmaline	Tourmaline	Tourmaline
Aquamarine	Dioptase	Pink Topaz	Amber
Amethyst	Malachite	Rose Quartz	Spessartine
Blue Zircon	Jade	Kunzite	Fire Opal
Blue Spinel	Chrysoprase	Morganite	Carnelian
Lapis Lazuli	Beryl	Rhodochrosite	Tiger eye
Turquoise	Green Agate	Diamond	Diamond

Birth Stones

January	February	March	April	May	June
Garnet	Amethyst	Aquamarine	Diamond	Emerald	Pearl

July	August	September	October	November	December
Ruby	Peridot	Sapphire	Opal	Topaz	Turquoise

Carat - Weight of a stone.

A carat is subdivided into 100 points. 1 point = 0.01carat, 50 points = half a carat.

Diamonds average weight by size - Round.

0.01ct	0.02ct	0.03ct	0.05ct	0.10ct	0.15ct	0.20ct	0.25ct
1.35mm	1.70mm	2.00mm	2.40mm	3.00mm	3.40mm	3.80mm	4.10mm

0.30ct	0.40ct	0.50ct	0.75ct	1.00ct	2.00ct	3.00ct	4.00ct
4.40mm	4.70mm	5.00mm	5.80mm	6.50mm	8.20mm	9.50mm	10.50mm

Conversion table

1carat = 0.20grams	1gram = 5 carat	1 carat = 4 grainer's	1 inch = 2.54 cm
1oz = 31.1035 grams	1 kg = 32.1507 ounces	1 cm = 0.394 inches	

Wedding anniversary gifts - Traditional

1st	Paper	**13**th	Lace
2nd	Cotton	**14**th	Ivory
3rd	Leather	**15**th	Crystal
4th	Fruit, flowers, silk	**20**th	China
5th	Wood	**25**th	Silver
6th	Iron, sugar, sweets	**30**th	Pearl
7th	Wood, copper	**35**th	Coral, platinum
8th	Bronze, pottery	**40**th	Ruby
9th	Willow, pottery	**45**th	Sapphire
10th	Tin, aluminium	**50**th	Gold
11th	Steel	**55**th	Emerald
12th	Silk, linen	**60**th	Diamond

Gemstones average weight by size

Round

Size in mm	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0
Sapphire, Ruby, Garnet								
Weight in ct	0.04	0.08	0.15	0.25	0.35	0.65	1.00	1.60
Topaz								
Weight in ct	0.035	0.07	0.15	0.20	0.30	0.60	1.0	1.60
Tanzanite, Peridot, Tourmaline								
Weight in ct	0.035	0.07	0.13	0.20	0.25	050	0.90	1.25
Emerald, Aquamarine, Amethyst, Citrine, Iolite								
Weight in ct	0.028	0.055	0.10	0.15	0.23	0.45	0.80	1.20

Oval

Size in mm	5x3	6x4	7x5	8x6	9x7	10x8	12x10	14x10

Sapphire, Ruby, Garnet

Weight in ct	0.35	0.60	1.0	1.50	2.20	3.10	6.00	7.25

Topaz

Weight in ct	0.35	0.55	0.95	1.45	2.10	3.00	5.80	7.00

Tanzanite, Peridot, Tourmaline

Weight in ct	0.25	0.50	0.90	1.35	1.80	2.50	4.00	6.00

Emerald, Aquamarine, Amethyst, Citrine, Iolite

Weight in ct	0.22	0.45	0.75	1.20	1.70	2.40	4.10	5.10

Square

Size in mm	2 x 2	3 x 3	4 x 4

Sapphire, Ruby, Garnet

Weight in ct	0.06	0.25	0.45

Topaz

Weight in ct	0.055	0.25	0.45

Tanzanite, Peridot, Tourmaline

Weight in ct	0.05	0.20	0.40

Emerald Aquamarine Amethyst Citrine Iolite

Weight in ct	0.04	0.15	0.35

Work with Stones

Many goldsmiths hate this part of their work and some of them are even afraid to touch the stones. Diamond Setter - is a profession on its own and it takes years to master this skill. Besides the setting techniques, you must learn about the physical characteristics of the stones, like hardness, resistance to chemicals and temperature.

Many of the semi-precious stones belong to one group of minerals – Quartz, which includes Amethyst, Aventurine, Agate, Citrine, Carnelian, Tigers eye, and others. They are fairly hard and easy to work with. But irrespective of hardness, it is possible to brake any stone, even diamonds, the hardest material there is. This depends on the shape and quality of the stone.
Obviously shapes like marques and square are easy to brake at the corners of the stones while setting them. When you setting this shape of stones in tube, take 0.8mm round bur or drill and deepened corners of the tube to avoid tension on stone.
Poor quality of the stones can cause damage as well.
If your customer supplies you with stones, you have to examen them for possible defects like cracks, flaws and chips. If you find any, tell your customer about possible damage while working so that they can not hold you responsible for any damages.

It is possible to damage the stones even while you polish jewelery. Hard buffing and paste can damage the surface of the stones and they will loose their brilliance (glance). When you make jewelry, pre-polish it before the setting of the stones.

Tips - For General Work

Why Tips? In order to teach you how to make jewelery, you have to sit next to me and watch me working. That is why, in this book, I can only give you tips on specific parts of the work.
OK, lets start from the very beginning again, the melting of the gold. When you melt filings, do not mix with borax before the melting process. It brakes the gold into many beads and afterwards it's difficult to get it into one piece.

If you use one crucible for different types of metals, make sure that your crucible is clean to avoid mixing white and yellow gold. White gold require a higher temperature and small beads that stay behind after the melting can get in to the yellow gold when you melting one and show up later in your jewelery in least expected places. It did happened to too many people.

Some metals require high temperature and in order to reach this temperature you have to use Acetylene instead of Oxygen. But there is a trick to reach high temperature.
Instead of Borax use Boric Acid (Boracic powder) when you melt the metal.

In some cases it helps to get rid of alien metals in gold (Lead, Tin, Pewter etc.) which you could have melted by accident with old jewelery, but it helps only if these metals are in very small quantities. Boric Acid will help increase the temperature and burn out alien metals because their melting point is very low.

Annealing of metals
Heat the entire surface with a large flame to dull red colour.
Let air cool to a grey colour.
Immediately quench in water or bleach.

Metal	**Heat -Colour**	**Cooling**
Silver 925	Light red	Quench in water
Coloured gold	Dull red	Quench in alcohol
White gold	Cherry red	Cool slightly, quench in water
Platinum	White heat	Water quench
Copper	Red heat	Water quench
Brass	Light red	Water quench when red is gone

OK, now you on a bench and please tell me, what is the first most important tools**???**
Whatever your answer is, it is wrong. The first most important tools are**.....**
First: The brush, yes the brush that you use to sweep the bench.
During my first working months in South Africa, one goldsmith was watching me brushing my hands and tools all the time while working, but because of my poor English, he didn't attempt to ask me what the hell I was doing. Later on, he admitted that the second month he did the same and saved on losses, 5gm of gold.

The second tool is a Gauge (Gage, Calliper, Vernier), whatever you call it.
You have to constantly measure your working piece to avoid filing too much, cutting too short or drilling too big hole and then you may have to start your piece all over again. You have to train your eyes until you see a difference in 0.1 of a millimetre without measuring.

I would like to give you advice on how to modify your Gage for better use.
Two working points of the Gage is rounded up on the outside. If you grind them sharp, it will make more comfortable to mark metal during work.
Grind it very slowly to avoid overheating the points, cool it often in water.

Making a Ring

After you solder a ring, file off excess solder inside of the ring before re-round on the triblet to avoid hammering solder in to the metal.
When you re-round a thick ring start hammering on the solder mark first to avoid solder mark getting open. It happens in 9ct and coloured gold.
Reminder: If you quench coloured gold in alcohol (methylated spirits), it makes metal softer.
You might have to anneal the ring once or two more times if the metal is very thick. If the ring is broad, you will have to make the ring a half or one size bigger because a broad ring fits tighter on the finger.

Length of metal for the rings sizes from 15.5 to 24 mm inside diameter.

Ring sizes from 15.5 – 19.5 mm

Thickness	**15.5**	**16.0**	**16.5**	**17.0**	**17.5**	**18.0**	**18.5**	**19.0**	**19.5**
0.8mm	51.18	52.75	54.35	55.89	56.46	59.03	60.60	62.17	63.74
0.9	51.49	53.06	54.63	56.20	57.77	59.34	60.91	62.48	64.05
1.0	51.81	53.38	54.95	56.62	58.09	59.66	61.23	62.80	64.37
1.1	52.12	53.69	55.26	56.83	56.40	59.96	64.54	63.11	64.68
1.2	52.43	54.00	55.57	57.14	58.71	60.28	61.85	63.42	64.99
1.3	52.75	54.35	55.89	57.46	59.03	60.60	62.17	63.74	65.31
1.4	53.06	54.63	56.20	57.77	59.34	60.91	62.48	64.05	65.62
1.5	53.38	54.95	56.52	58.09	59.66	61.23	62.80	64.37	65.94
1.6	53.69	55.26	56.83	58.40	59.96	61.54	63.11	64.68	66.25
1.7	54.00	55.57	57.14	58.71	60.28	61.85	63.42	64.99	66.56
1.8	54.35	55.89	57.46	59.03	60.60	62.17	63.74	65.31	66.88
1.9	54.63	56.20	57.77	59.34	60.91	62.48	64.05	65.62	67.19
2.0	54.95	56.52	58.09	59.65	61.23	62.80	64.37	65.94	67.51
2.1	55.26	56.83	58.40	59.96	61.54	63.11	64.68	66.25	67.82
2.2	55.57	57.14	58.71	60.28	61.85	63.42	64.99	66.56	68.13
2.3	55.89	57.46	59.03	60.60	62.17	63.74	65.31	66.88	68.45
2.4	56.20	57.77	59.34	60.91	64.48	64.05	65.62	67.19	68.76
2.5	56.52	58.09	59.65	61.23	62.80	64.37	65.94	67.51	69.08
2.6	56.83	58.40	59.96	61.54	63.11	64.68	66.25	67.82	69.39
2.7	57.14	58.71	60.28	61.85	63.42	64.99	66.56	68.13	69.70
2.8	57.46	59.03	60.60	62.17	63.74	65.31	66.88	68.45	70.02
2.9	57.77	59.34	60.91	62.48	64.05	65.62	67.19	68.76	70.33
3.0	58.09	59.65	61.23	62.80	64.37	65.94	67.51	69.08	70.65

Sometimes to bend a thick metal to make a ring can be a mission if you don't have the right tools, but it can be accomplished very easily on the block of lead. Just use the handle of a dapping punch and a big hammer.

Buy a few kg's of lead at the scrap yard or hardware store and melt it in a big sized tin. You can use a cake mold which woman used for baking a cake.
You can use the lead block for shaping (Forging) of metal for different designs.
It is better if you use thin leather to prevent the lead from sticking to the gold. Either way make sure there is no lead on your working piece before you start soldering.
Even a small piece of lead can destroy your work by melting into the gold or silver.

Ring sizes from 20.0 – 24.0 mm

Thickness	**20.0**	**20.5**	**21.0**	**21.5**	**22.0**	**22.5**	**23.0**	**23.5**	**24.0**
0.8mm	65.24	66.88	68.45	70.02	71.59	73.16	74.73	76.30	77.87
0.9	65.62	67.19	68.76	70.33	71.90	73.47	75.04	76.61	78.19
1.0	65.94	67.51	69.08	70.65	72.22	73.79	75.36	76.93	78.50
1.1	66.25	67.82	69.39	70.96	72.53	74.10	75.67	77.24	78.81
1.2	66.56	68.13	69.70	71.27	72.84	74.41	75.98	77.55	79.12
1.3	66.88	68.45	70.02	71.59	73.16	74.78	76.30	77.87	79.44
1.4	67.19	68.76	70.38	71.90	73.47	75.04	76.61	78.18	79.93
1.5	67.51	69.08	70.65	72.22	73.79	75.36	76.93	78.50	80.07
1.6	67.82	69.39	70.96	72.58	74.10	75.67	77.24	78.81	80.38
1.7	68.13	69.70	71.27	72.84	74.41	75.98	77.55	79.12	80.69
1.8	68.45	70.02	71.59	73.16	74.73	76.30	77.87	79.44	81.01
1.9	68.76	70.33	71.90	73.47	75.04	76.61	78.18	79.75	81.32
2.0	69.08	70.65	72.22	73.79	75.36	76.93	78.50	80.07	81.64
2.1	69.39	70.96	72.53	74.10	75.67	77.24	78.81	80.38	81.95
2.2	69.70	71.27	72.84	74.41	75.98	77.55	79.12	80.69	82.26
2.3	70.02	71.59	73.16	74.73	76.30	77.87	79.44	81.01	82.58
2.4	70.33	71.90	73.47	75.04	76.61	78.18	79.75	81.32	82.89
2.5	70.65	72.22	73.79	75.36	76.93	78.50	80.07	81.64	83.21
2.6	70.96	72.53	74.10	75.67	77.24	78.81	80.38	81.95	83.52
2.7	71.27	72.84	74.41	75.98	77.55	79.12	80.69	82.26	83.83
2.8	71.59	73.16	74.73	76.30	77.87	79.44	81.01	82.58	84.15
2.9	70.90	73.47	75.04	76.61	78.18	79.75	81.32	82.89	84.46
3.0	70.22	73.79	75.36	76.93	78.50	80.07	81.64	83.21	84.78

Fire Stain on silver. To avoid fire stain, warm up your working piece and dip it into the flux before annealing or soldering. Flux will protect silver from overheating and prevent copper in silver from oxidizing and leaving black marks.
Do not quench very hot silver in acid. It will become dirty black in colour.

Soldering small piece to a large. Always heat up the large piece first. Remember solder flows to the higher temperature. If you heat up both pieces at the same time, the small piece will get hot faster and solder will flow onto that piece.

If possible, apply solder on small piece first. Attach to a large piece using binding wire (thin steel wire-0.5mm, to hold parts together). Heat up the large piece until the solder runs. Remove the wire before quenching in acid.

Make sure that parts get soldered properly before quenching in acid. If there is small holes on the joint, sometimes it won't be possible to fix it afterwards.

You can use the acid to stop solder from running into places you don't want too.
Take a broken saw blade and dip in acid, apply on the parts where you don't want solder to run to and dry it up with a torch.
This technique can be used on joints like, bracelets, hinge bangles, earrings or any flexible parts.

Soldering two pieces with one side split apart Lets say you are soldering two rings with a gap on top. File the bottom parts of the rings which you are going to join at a slight angle, Place the right size of steel wire between the two rings and tie up with binding wire. Adjust gap between the two rings on top and solder the shank.
Find a few different diameters of steel wire (1mm, 1.5mm, 2mm) and keep in a safe place. You will need it for your future work. You will be surprised how useful it is by joining different parts of the jewellery.

Making templates

During your career, you will be dealing with thousands of different designs which require a number of patterns. Every time you design a piece and if you think that you might use this pattern again (e.g. leaves, flowers, etc.), make yourself a template. Take a piece of copper or brass and roll it to 0.5 mm thick. Cut out the pattern and keep in a box for future work.
It will save you lots of time when you design another piece of jewellery.

Back to the ring
It is very important that your jewellery is very neat and looks professionally made.
Reduce the weight of the heavy ring (inside of the band) by using round burs.
After that, use 1mm round bur to finish off the surface with small dots. Your piece will look like it is factory made.

When you drill holes for the setting of stones, always finish them off on the inside with a bigger size round bur. Sharp edges collect dirt (polishing paste) and makes it difficult to clean afterwards.

Thick and broad bands is very uncomfortable for people to wear (e.g. bend finger), round up edges on inside of the ring for – (comfy fit).
You will receive many compliments from your costumers.
Use half round file or flat bur to round up edges, then cut two round pieces of sandpaper medium grit - 360, about 3mm bigger then inside diameter of the ring. Screw on mandrel (used for holding miniature disks) and finish off round edges.

Choosing the right saw blade

I have seen it many times when some of my students take a saw frame and without thinking start sawing the metal. A few seconds later, the blade is broken.
The right size of a saw blade is when two teeth of a blade is equal thickness of the metal.
If for some reason the metal is not evenly thick, hold the blade at a 45° angle towards the metal which is thinner in places. It will prevent the metal getting stuck between the teeth of the blade which causes the blade to brake.

Where are the rules, there is a always exceptions. When you are cutting small elements on the inside of thick metal, use a thin size of blade (No-4/0) and cut very slowly to avoid braking the blade and achieve accurate cutting of a pattern and neat edging of the metal. Applies to thickness of metal of 1.5mm and up.

Thread sandpaper through the eye of a large sewing needle. Put the needle in the flex shaft and you have miniature sanding mandrel to finish off metal in places where you can not use a needle file.

Cut a strip of sandpaper, the length of saw blade. Fold it lengthways so that the grit is on the outside. String it in a saw frame and you have a sander to reach tight places.

There is a number of tools that you can make yourself by using old jewellery burs.
Take a big sized bur, about 6mm that is used for the setting of stones. Grind off the sharp point. It must look like a (T) from the side. Shape top into a triangle Δ. The corners of the triangle must not be very sharp though, Finish with sandpaper and rubber wheel. It would be the best burnisher you can wish for.

Again take an old bur, any shape or size because you have to brake the point off.
Sharpen it like a pencil, only in triangle shape at about 60° and polish the point.
The point must not be too sharp though. Hammering metal with this tool will give a texture that looks like tiny crystals. This effect has a name - Diamontin.
It is look very good on silver and white gold.

With different shapes of burs, you can make a big variety of textures on the wedding band. For example, use a 1mm round bur to make dots around the band. Matt the dots after you polish the ring. Use a knife edged bur to cut lines in different directions on the band. Use your imagination and you will discover new techniques that you never thought about before.

Here is one more for you. Sharpen a bur like a pencil and you have a perfect scriber for marking patterns on the metal. If you sharpen the same bur off centre and put in a flexible shaft, then you have a tool to make a matt finish surface on metals very quickly.

Have you tried to make a perfect ball from metal?
OK, you need to take a calculator and.....
I will make it easy for you.

Diameter of ball	Diameter of disk
4mm	5.2mm
5mm	6.5mm
6mm	8.2mm
7mm	9.6mm
8mm	11.2mm
9mm	12.5mm
10mm	13.5mm
11mm	15.0mm
12mm	16.5mm

Thickness of metal, 0.4mm.

You can make a big variety of jewellery with the balls, like bracelets, necklaces, earrings and even a ring.
Make two of 4mm or maximum 5mm balls and solder on the points of 1.2mm wire.
Bend wire around the triblet and twist balls on top to make them lock in.
This ring has a name - The Kiss, because it looks like two faces.
Girls love them and you can sell them by the dozens.

There is a trick how to solder two halves of the balls.
After you dome two disks, file them to the exact half size of the ball. Remove harp edges on the inside and flux it. Place on soldering block, better charcoal. Apply solder inside as close to the top as possible. Place second half on top and finish soldering by heating up the top half of a ball. Remember, solder flows to the higher temperature.

Another nice piece to make is a pendant named - Mystic bell.
Melt about 2mm solid bead. Insert into a ball diameter 12mm and solder.
Then make about 25mm size ball (disk-38mm). Cut out filigree pattern on two halves. Place first ball (12mm) inside and solder it. Make a "V" loop and you have a Mystic bell with beautiful sound. Decorate it with elements, like small cups on top and bottom. Solder two different sizes of small beads at the bottom.

Another way to join to halves of the filigree ball: Make about a 1.5mm ring, metal 0.5mm, with inside diameter the size of the ball, Solder one half on the middle of the ring and then insert second half and solder. Melt about 1.0mm beads and solder on the ring, all around. You can decorate many jewellery pieces with beads, it will make them more attractive.

Different sounds are possible to make by changing shapes and metals inserted into a ball. If you make a ball from metal 0.3mm thick, the sound will change too.
The thinner the metal, the better the sound.
Inserting beads from copper or brass or even instead of a bead insert a disk that is slightly dome shaped. This will change the sound . Solder a small jump-ring on bead or disk. Take a short piece of thin wire and make rings on both sides. Make another piece of wire with the ring on one side. Drill a hole on one half of the ball and solder that wire with ring inside. Attach first wire to that ring with bead or disk on the other side, so it will be loose inside of the ball (it work just like a real bell).
You can make an experiment with different metals and shapes until you get the sound that you like most.

Make earrings

Join 3 different sizes of balls with the jump rings and you have drop earrings.
Cutting out patterns on the balls will give you many new ideas of different designs for earrings, bracelets and necklaces.

Make a coin frame

There is always a few different ways to make any type of jewellery.
Before you begin, find two or three different methods and choose one that gives better quality.
The Frame: Lets say the coin is 20mm in diameter. Make a 5mm broad and 2mm thick stripe and make a ring, 21mm in diameter on the outside.

Now you need a flat bur to fraze inside the ring to fit the coin. Leave 0.5mm in front of the frame to support the coin. Finish it off with sandpaper. Mark 4 claws and cut it with saw blade. Make sure that solder mark is between the claws. You will solder jump ring on that place to cover the joint. Fit the right size V-loop and pre-polish frame before setting the coin.
If you don't have a flat bur, you can make one from a stone setting bur, about 5mm , by grinding off the tapered point of the bur.

Second method: Use 0.5mm thick stripe to make ring-frame with inside diameter 20mm. Make a ring 20mm diameter from a 1mm square bar to fit inside the frame and solder it. File the front of the frame flat and again mark and cut 4-claws.

You can solder a V-loop directly onto the frame if you don't want the coin frame to swing. It is more practical for big sized coins. It will have less wear and tear between the jump ring and V-loop. You can use the same method for any type of pendants.

Second method of making a frame have disadvantage. The solder mark between the main frame and inside ring can show up afterwards, but it is possible to cover up by making a pattern over it.

Make jewellery with multiple parts

It is not an easy task to make jewellery by joining too many elements.
You must use 3 types of solder, hard, medium and easy solders.
Start using hard solder first for making a main ring or main frame and then switch to medium solder for smaller parts and easy solder for the smallest parts.

Besides that, always protect the closest parts by clamping soldering tweezers.
The tweezers will take away the temperature from the nearest soldering parts and prevent solder from melting.
Remember, if any piece you are working on has flexible parts, protect them by applying acid and dry off before soldering new parts.

You can also protect stones with tweezers.
Lets say it is a ring with a big sized stone in the centre. Take two tweezers and clamp them on both sides of the stone. For some stones you still have to use a Heat Paste for protection, but not needed for white CZ, only prevent Flux from getting on stones.

It is possible to build up claws on a collet with a CZ in it.
If you have to build up all the whole claws on the collet, then take the stone out. Flux the collet and dry it off with soft flame. Insert stone into collet and build up claws one by one by using a short sharp flame.

Do you have customers who bring their own jewellery to melt down and make new jewellery? Then practice on the jewellery. Make experiments and you will master your skills.
Only by practising, will your skills get better and better.
Make time for that. It is very frustrating when you damage newly made jewellery.

I will end it up on that note and remember, you get more than this book. You have got me as a personal teacher. Send me an e-mail if you have any questions to ask. If I have to put all my knowledge in this book, the book will possibly be too expensive and not affordable for many people. I am currently working on my second edition which includes more advanced techniques and setting of stones.

I don't know your level of knowledge or how many years of experience you have.
Please do ask. There is no such thing as a stupid question. It is the only way to learn, when you ask. **Contact me**

Thank you.
Anatoli Graour

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