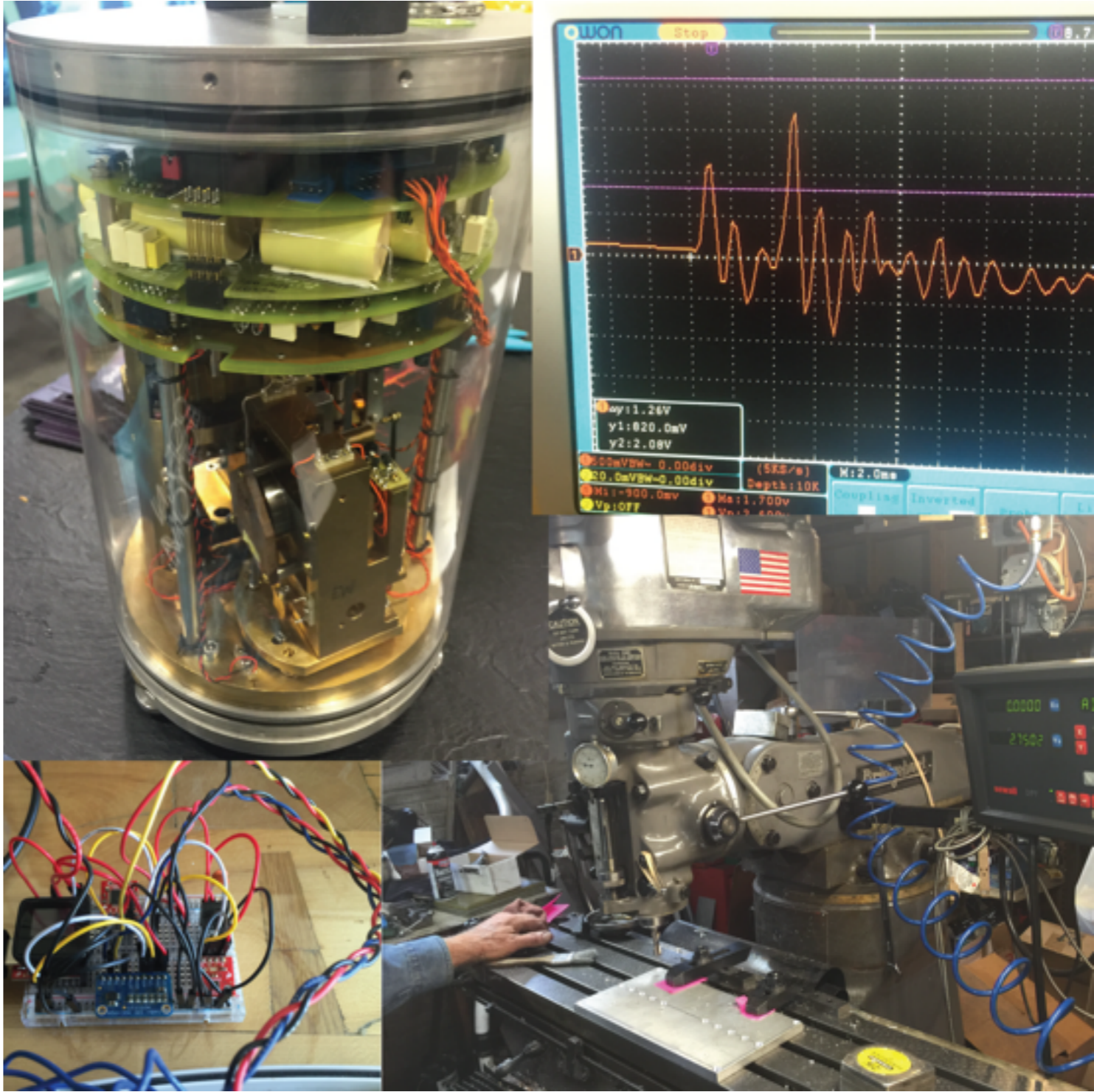


# Tools and Shop Processes

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Techniques of Geoscientific  
Experimentation

September 1, 2016



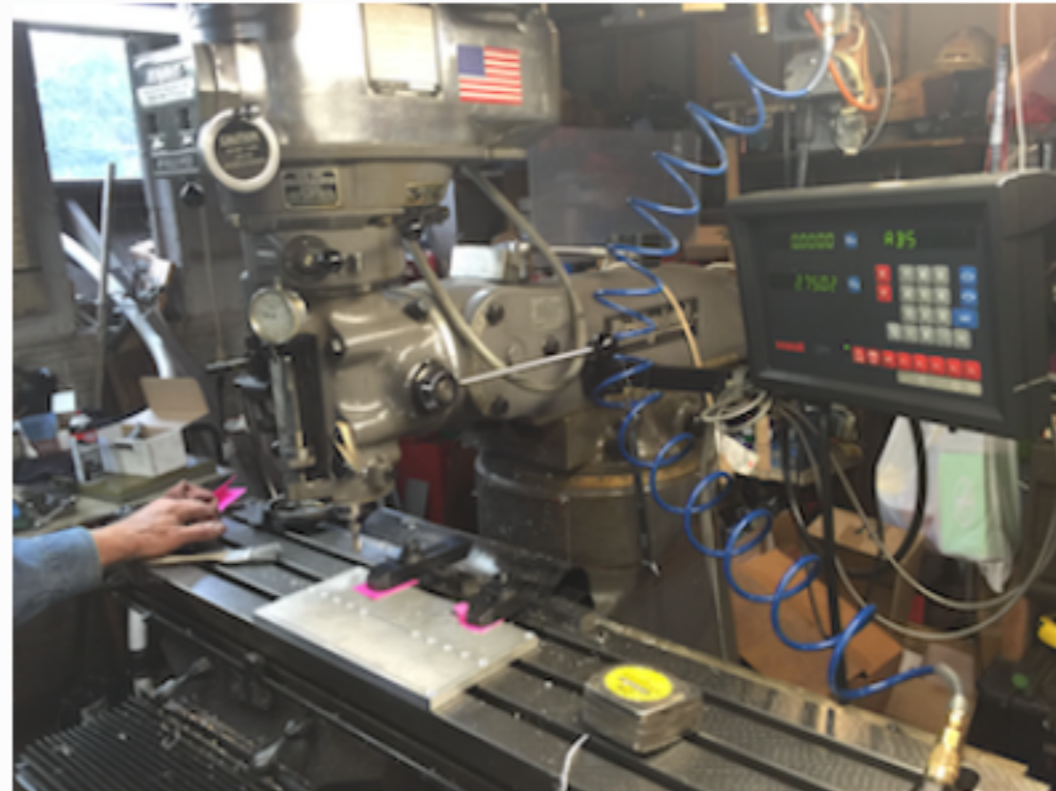
# Checkout this section of the course website

Docs » Shop Tools and Practices

[Edit on GitHub](#)

## Shop Tools and Practices

This course involves making things to accomplish scientific tasks. Making things necessitates the use of tools and mechanical/electrical workspaces. Learning which tools are used for certain tasks, how to use them safely, and how to care for the equipment are essential for success in the shop. In this section we introduce you to the basic tools that you will encounter and how to go home with all of the fingers and eyes you came to work with.



Contents:

- [Hand Tools](#)
- [Machine Tools](#)

<http://tge.geoscience.tech/en/latest/content/shop/index.html>



**Safety is the most important thing when working in the lab or shop**



**Always wear appropriate clothing in the lab or shop**





# Never work alone



**Will anyone  
know  
if you get  
hurt?**

When working alone, identify hazards before starting work and have a backup plan in case of an emergency.

Get real-time tracking and safety news!  
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**SafetyDriven**  
Tracking Safety Council of BC  
[www.safetydriven.ca](http://www.safetydriven.ca)

# Protective eyewear should be worn at all times





# Wear hearing protection when necessary



**Gloves are valuable or harmful depending on the process**





**Never touch a rotating part or blade, even if it is moving slowly**



Image: [4x4earth.com](http://4x4earth.com)

# Never stand in front of a grinder

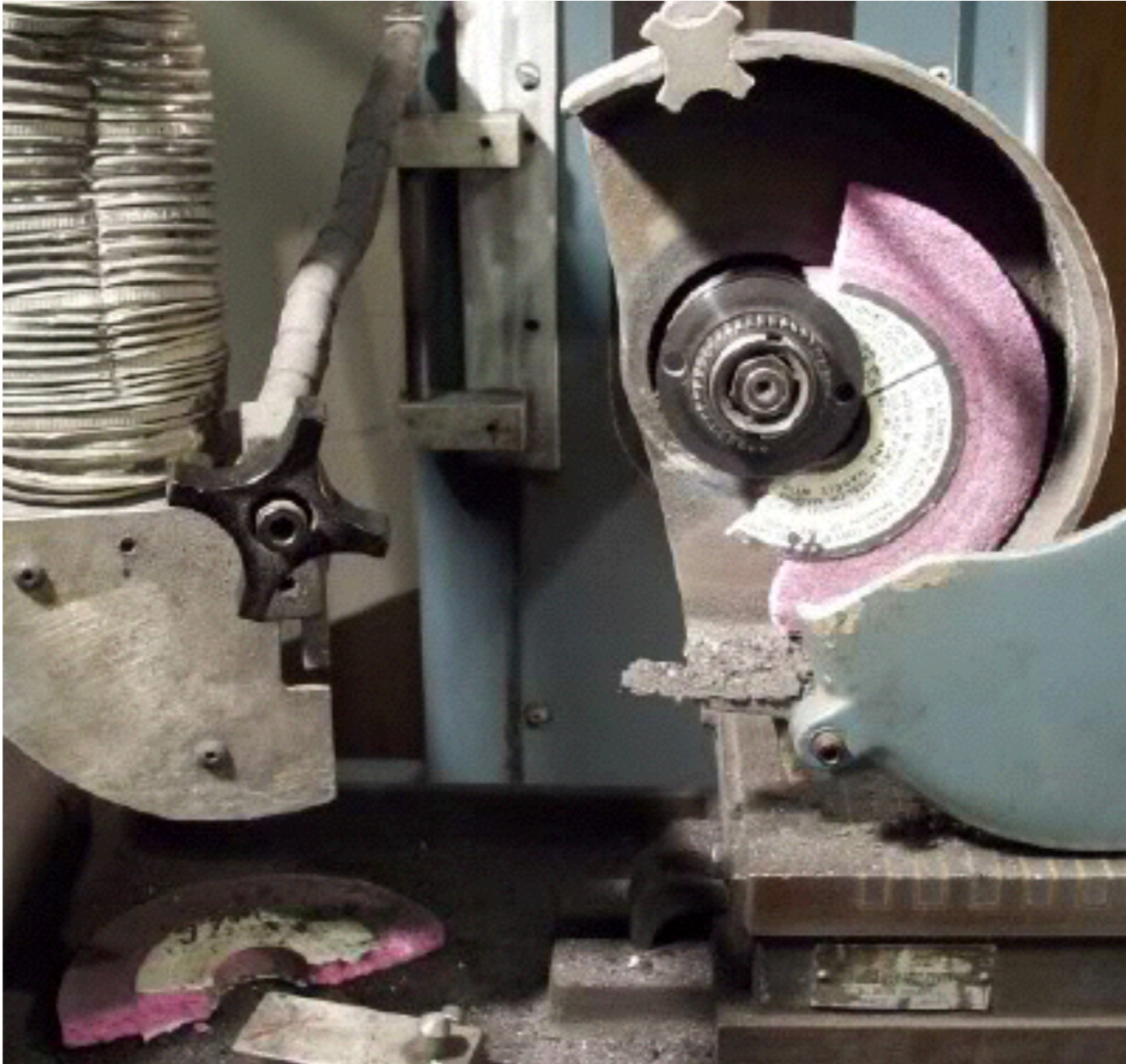


Image: [homeshopmachinist.net](http://homeshopmachinist.net)



**Always think ahead**



**There are many ways to fabricate parts**

- Machining**
- Casting**
- Sheet Metal**
- Welding**
- Printing**



# Machining removes material from a stock metal





**Casting and molding create a part from a pattern out of plastic, metal or other materials**



Images: [wikipedia.org](http://wikipedia.org)

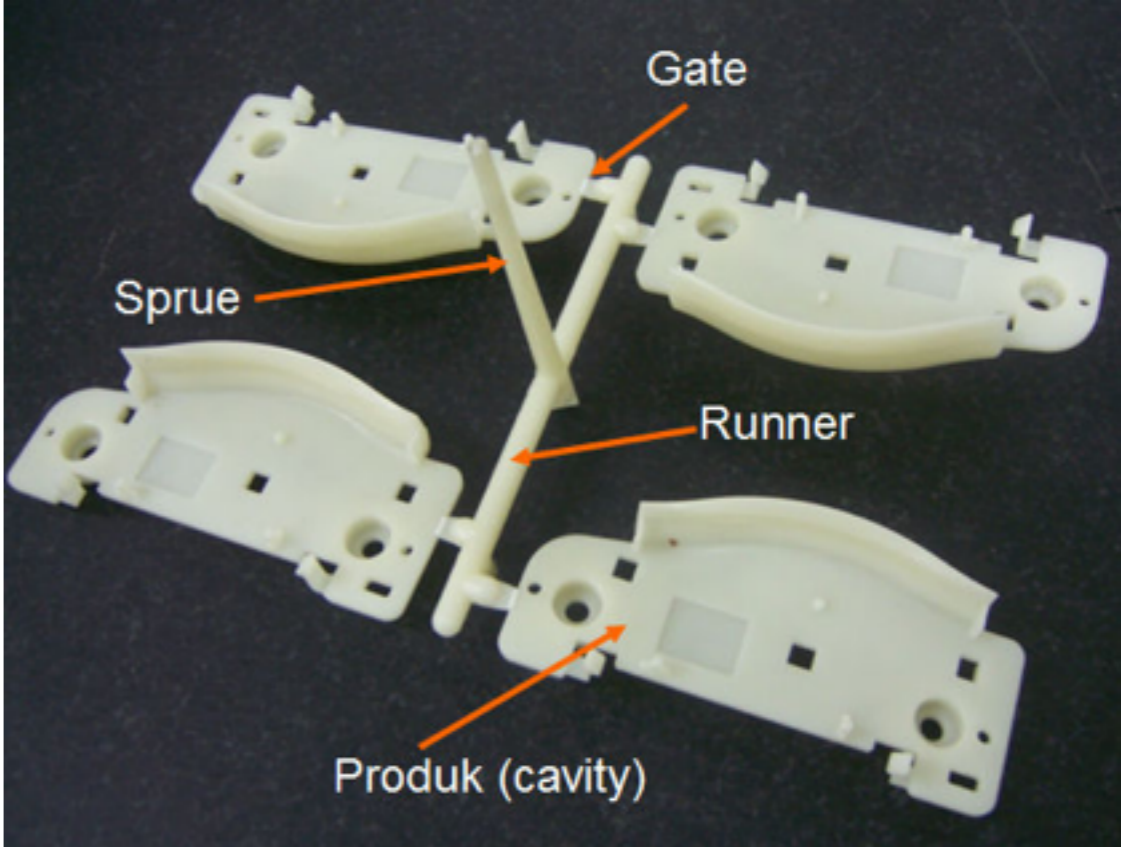




<https://youtu.be/M95bhPrDwA0>



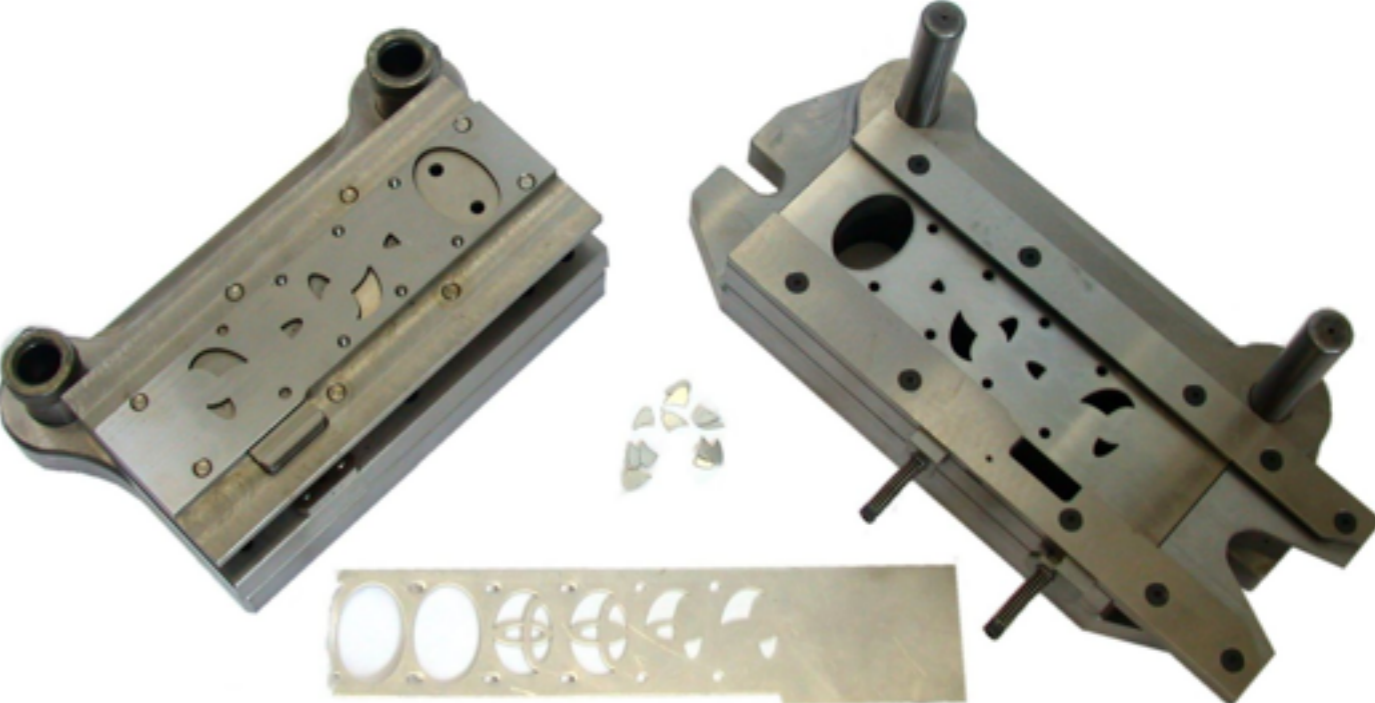
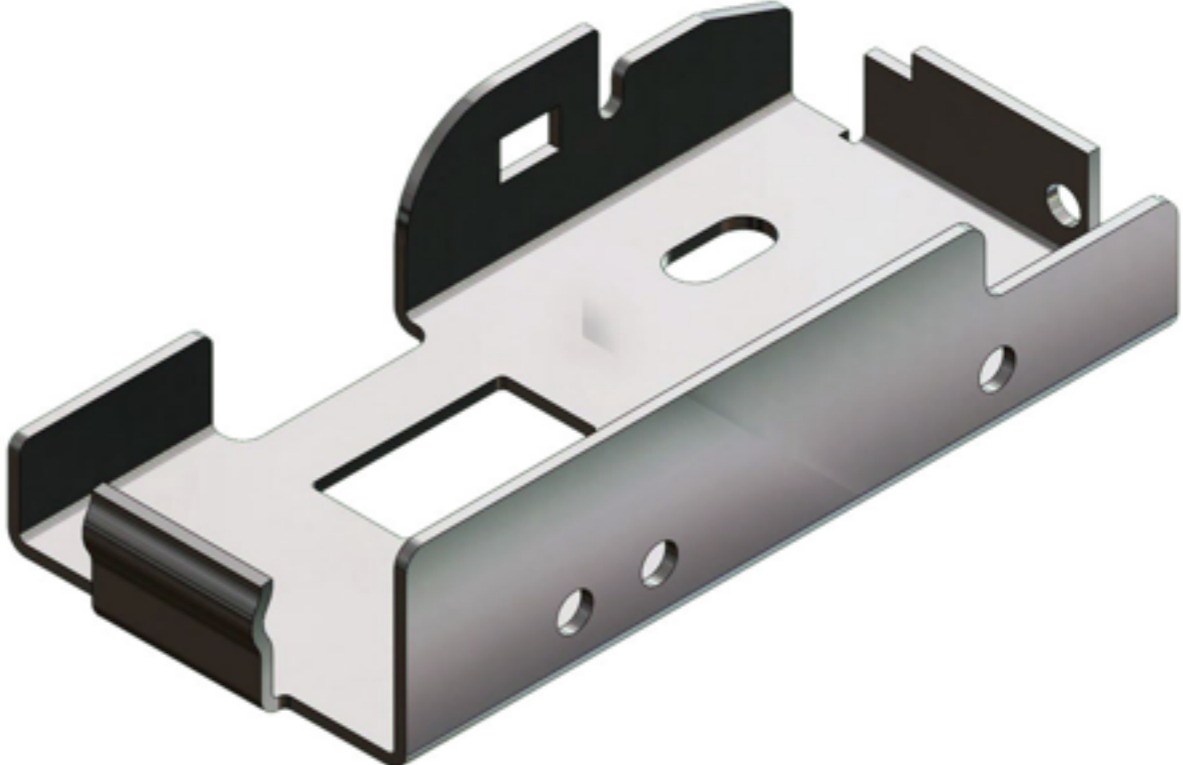
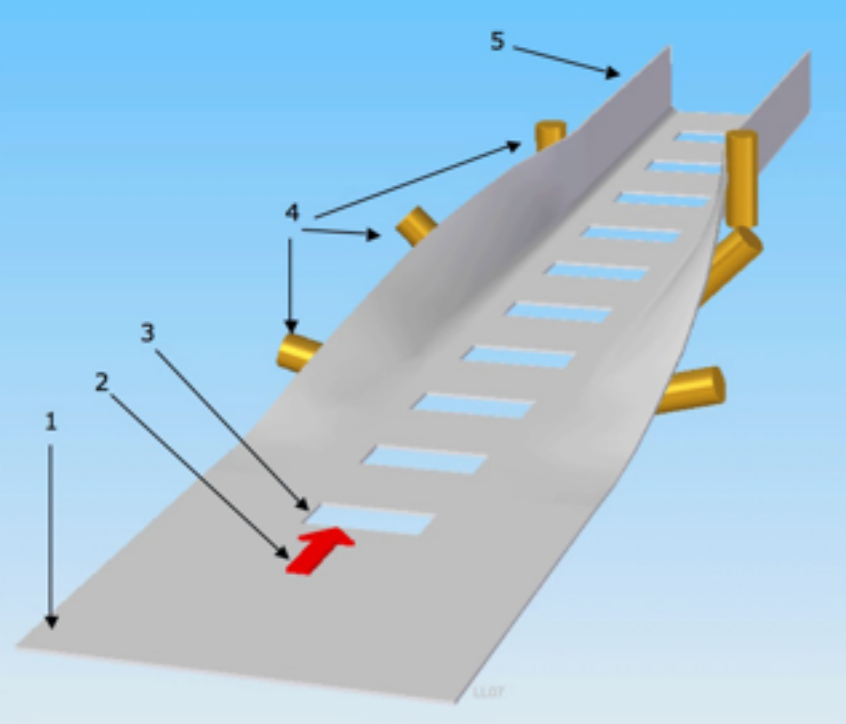
# Casting and molding create a part from a pattern out of plastic, metal or other materials







# Sheet metal work can make strong and thin parts



Images: [wikipedia.org](http://wikipedia.org), [vibadirect.com](http://vibadirect.com)



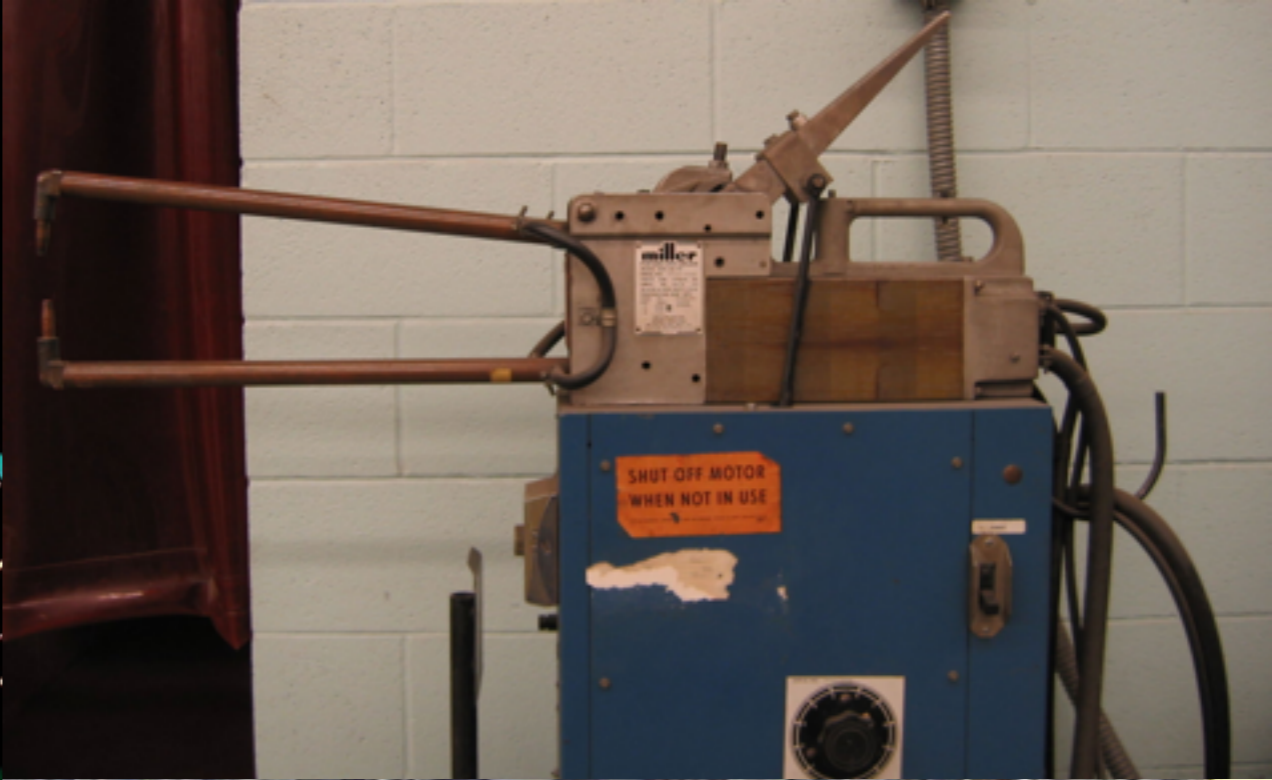




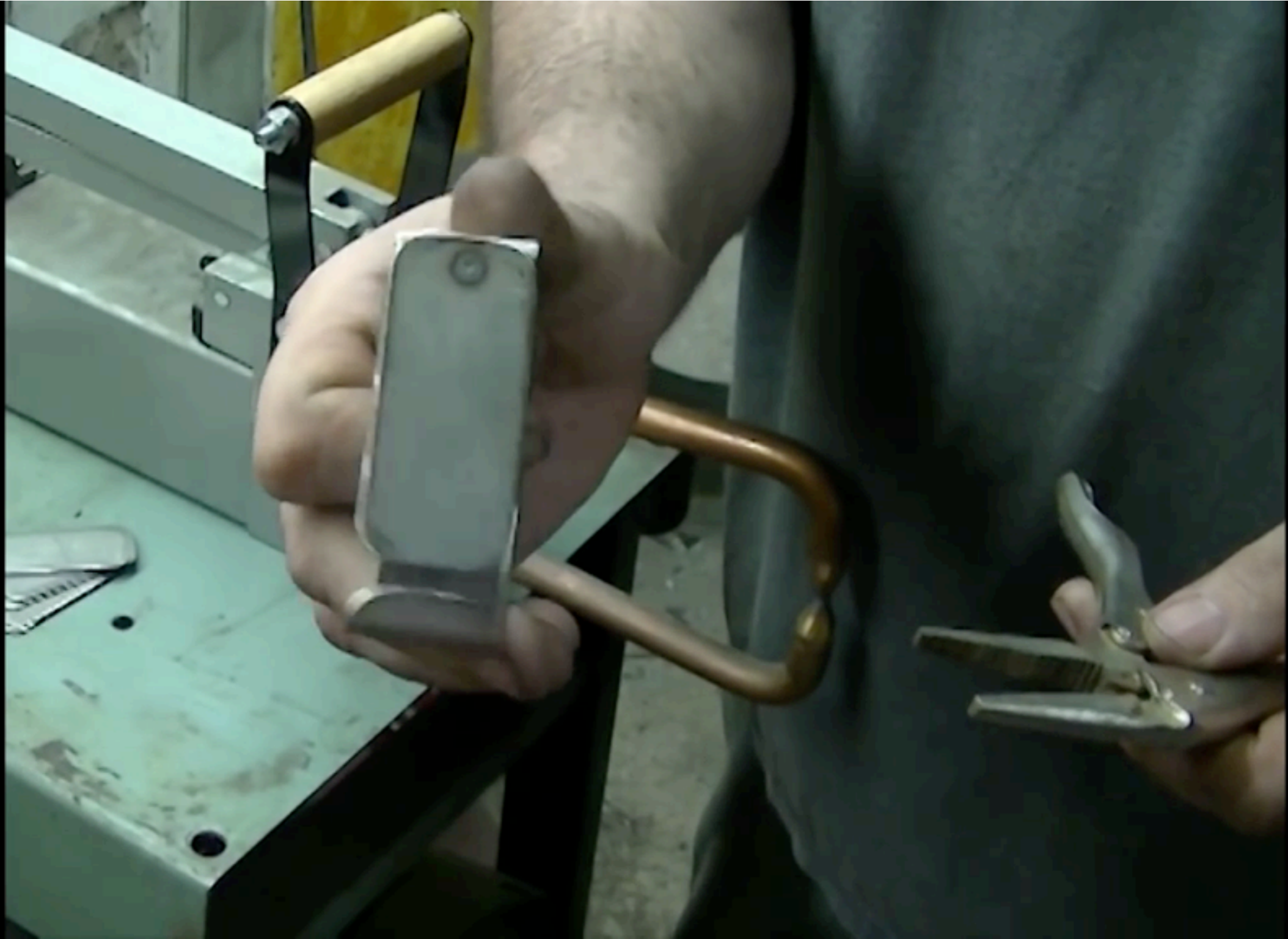




# Welding joins most metals together with a very strong bond

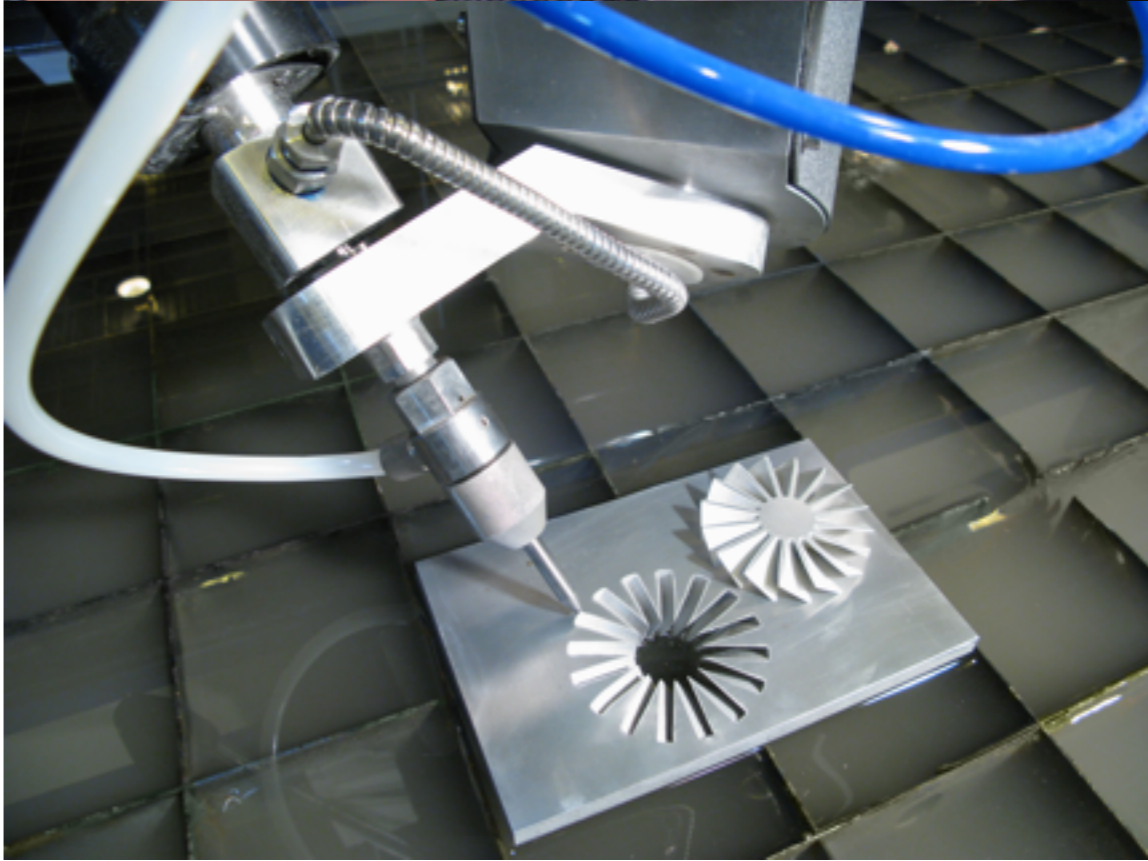
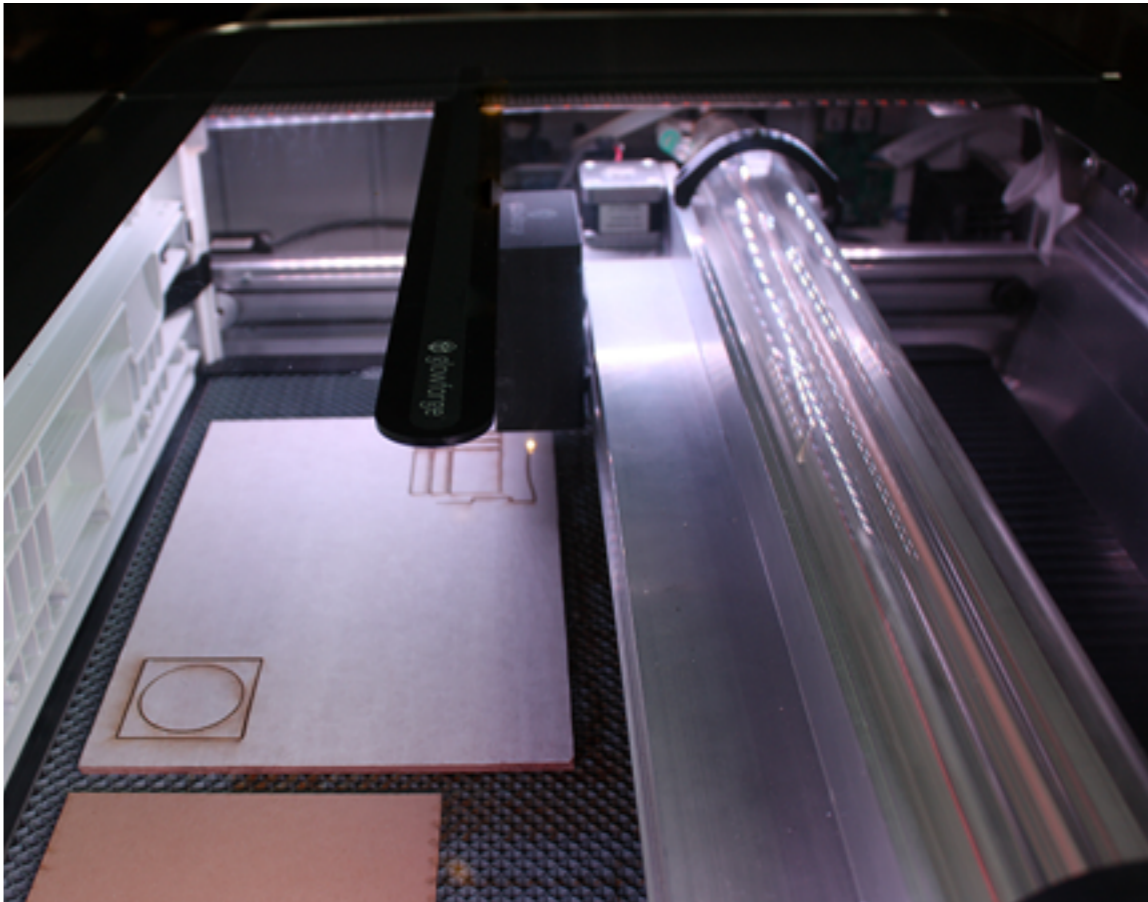






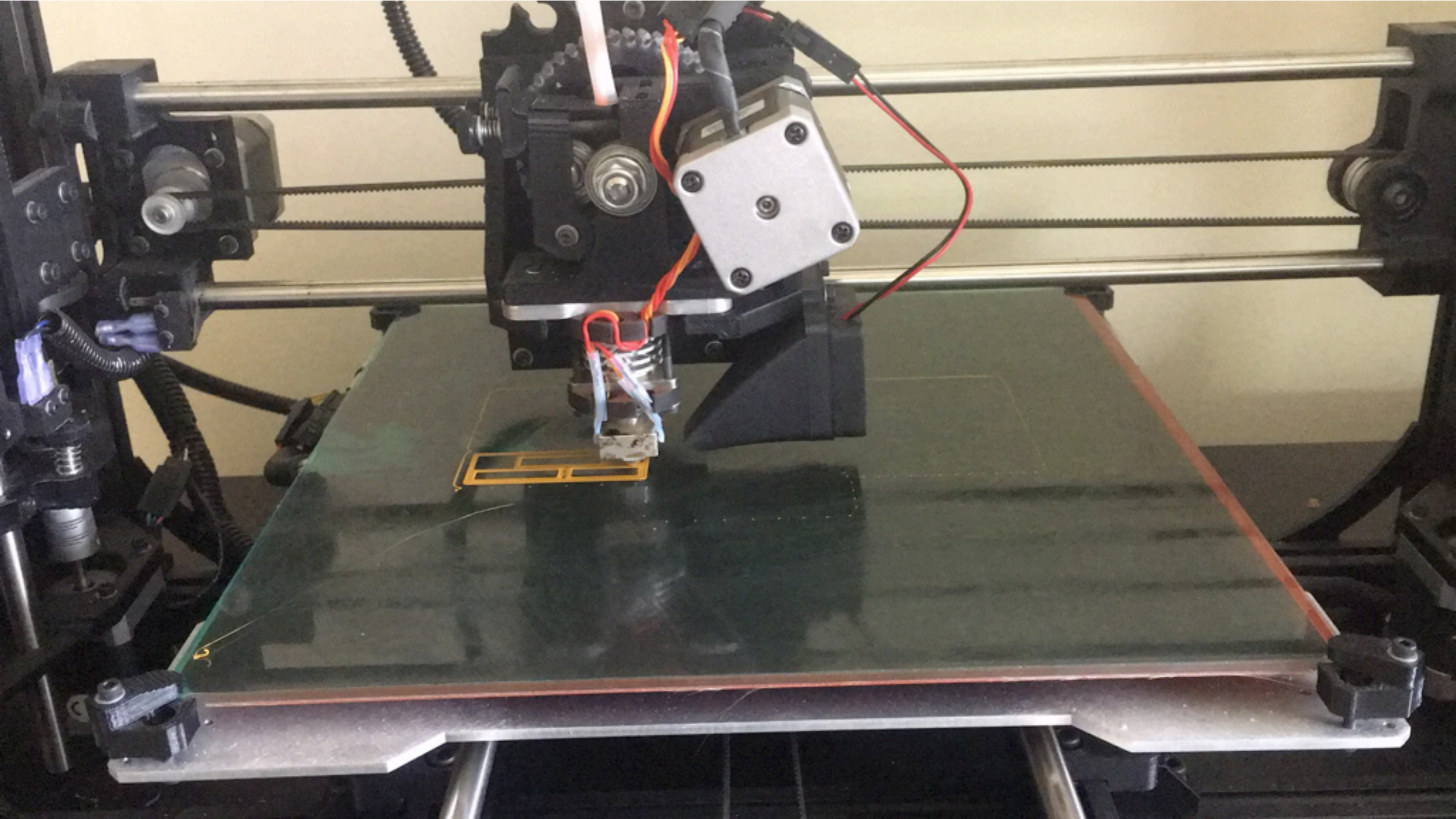


# “Printing” is a NOT new way of creating quick prototypes



Images: [wikipedia.org](http://wikipedia.org), glowforge, SparkFun







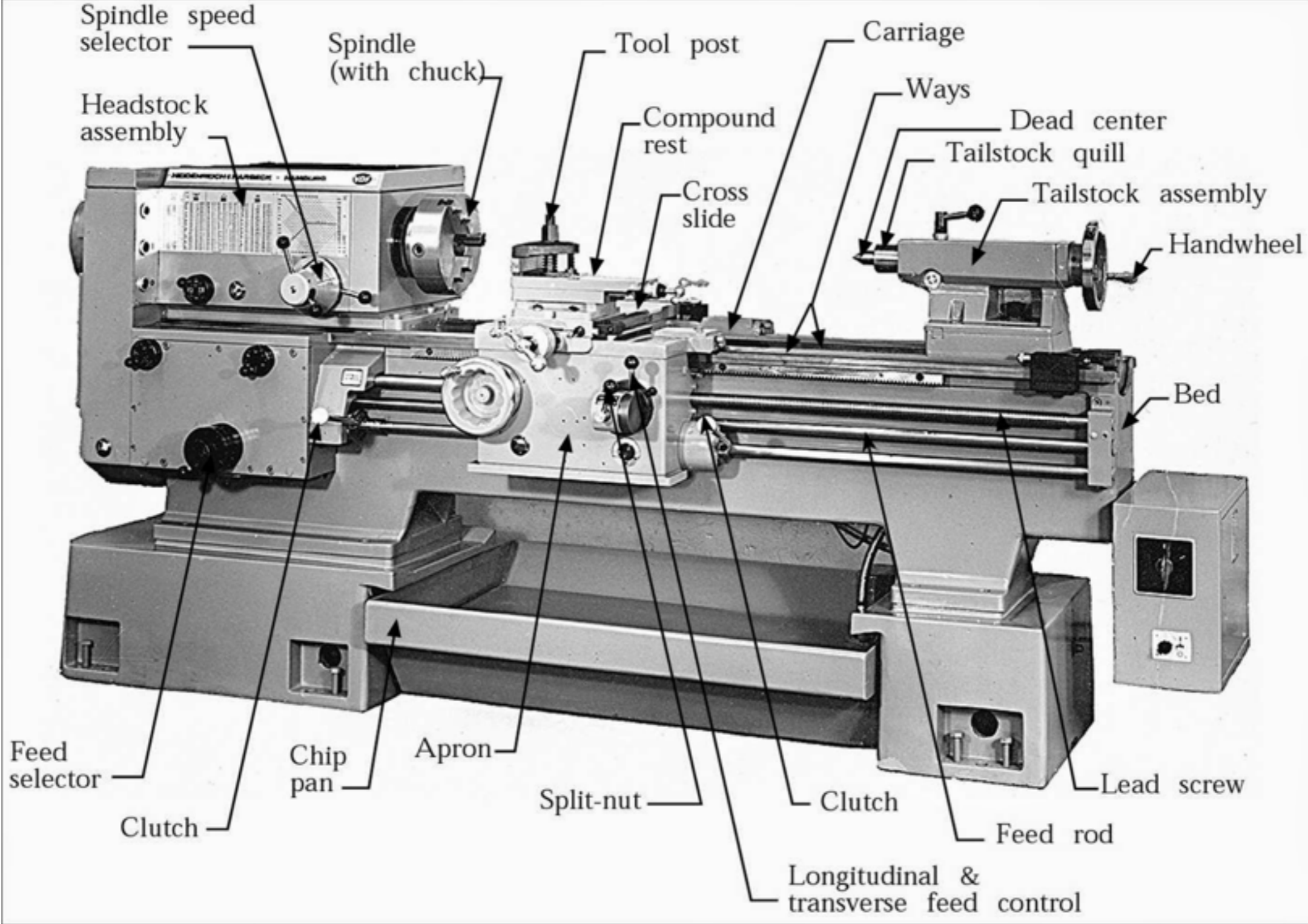


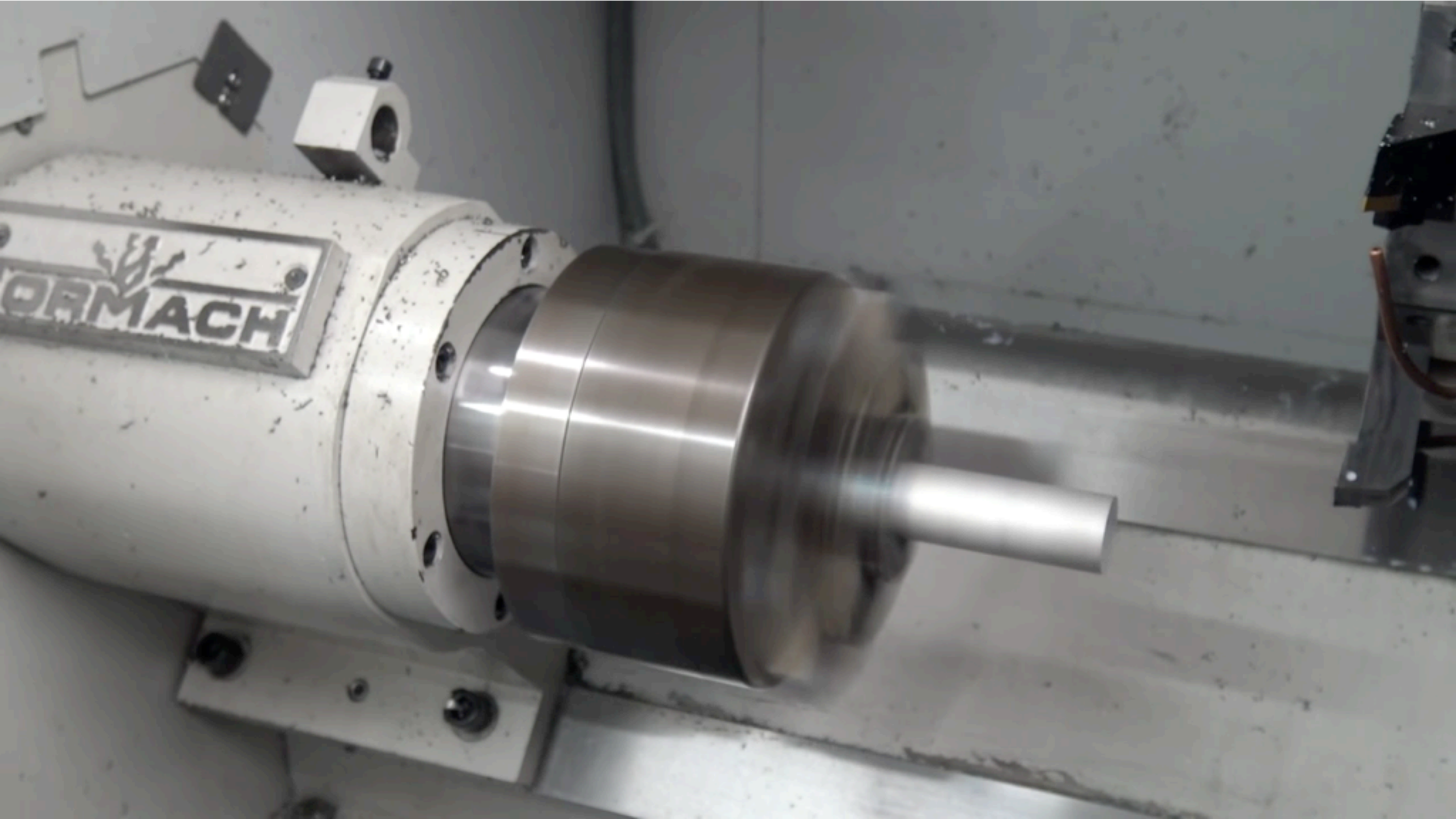
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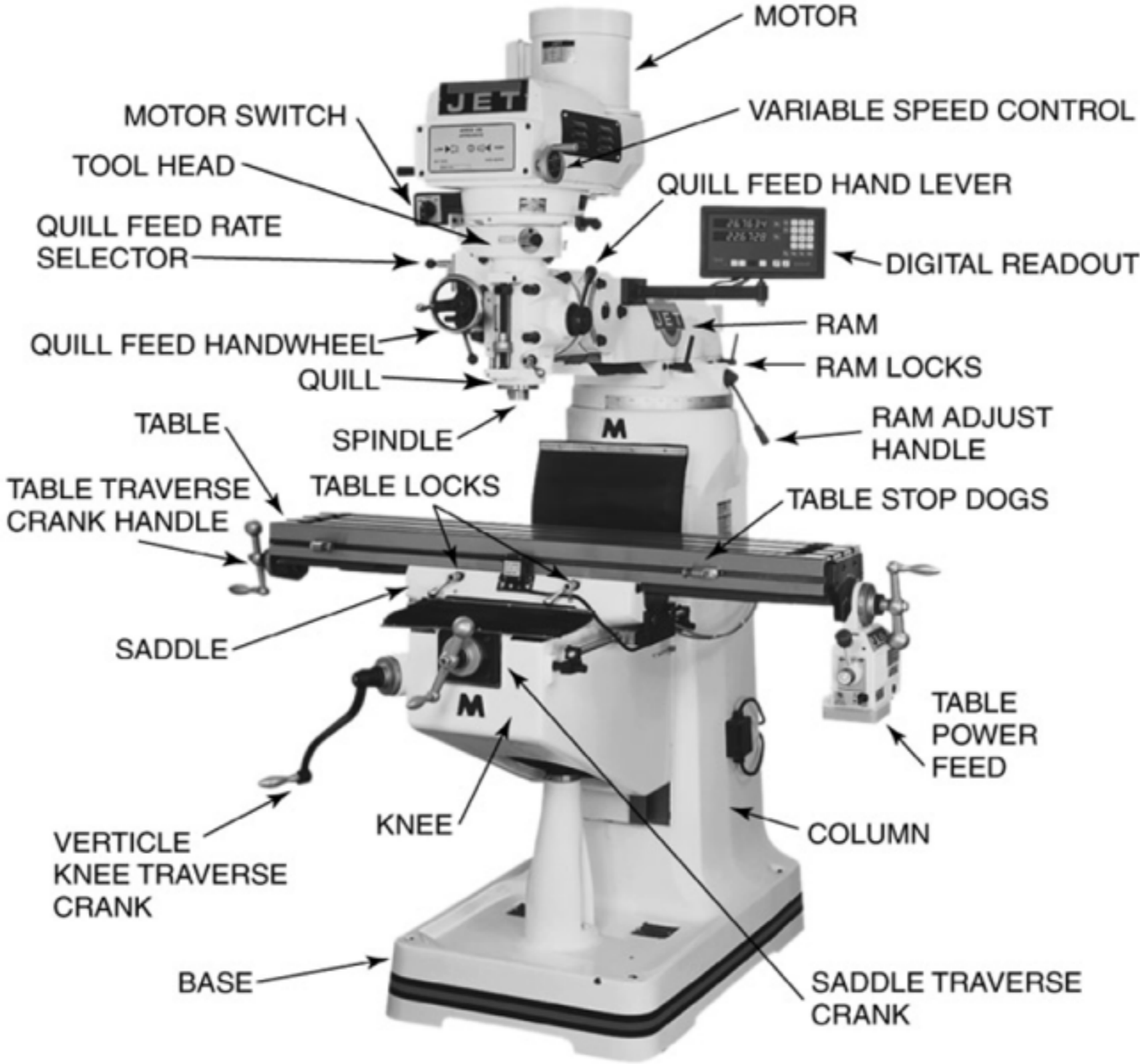
# The lathe is a widely used and fascinating machine tool

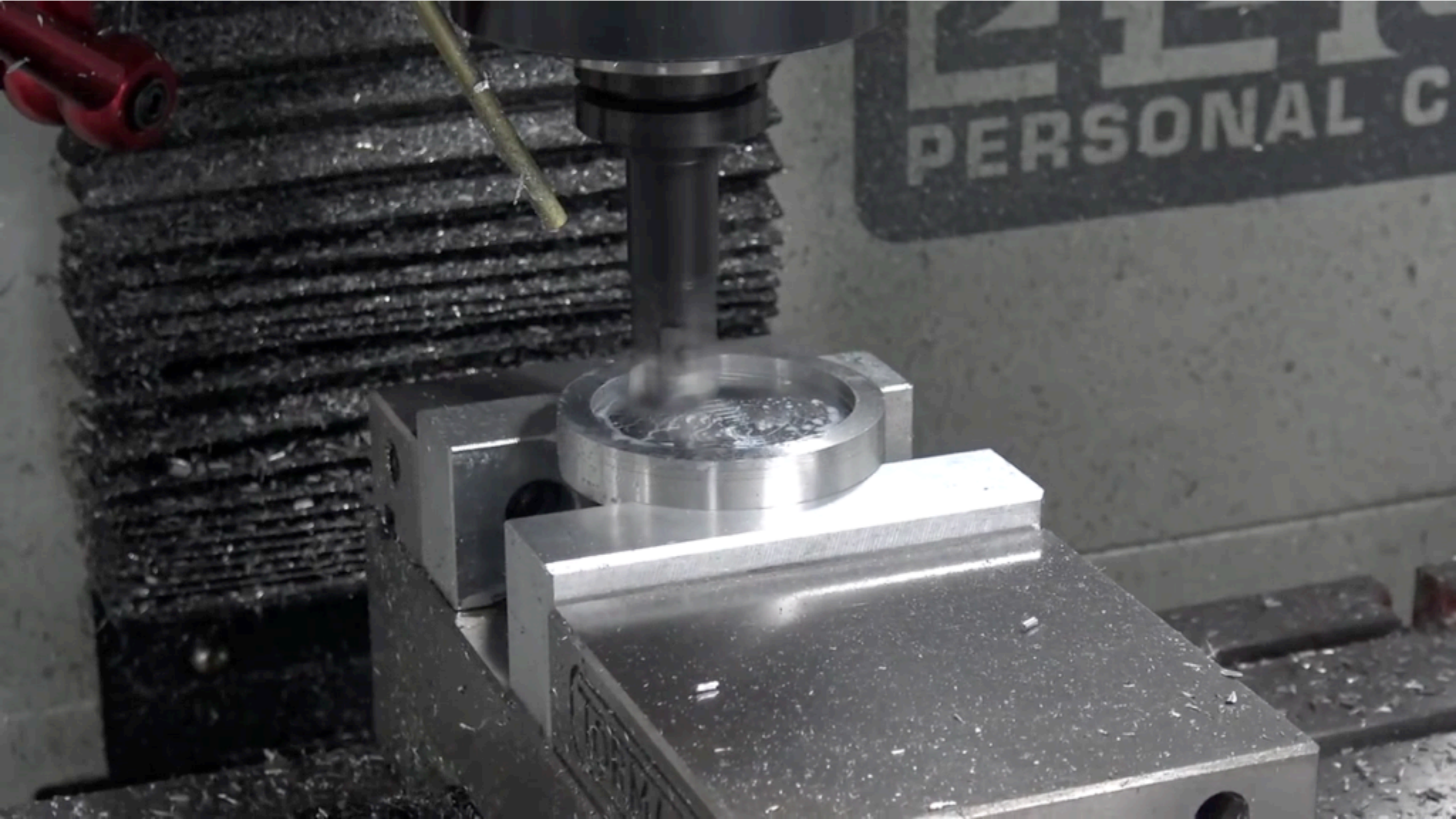






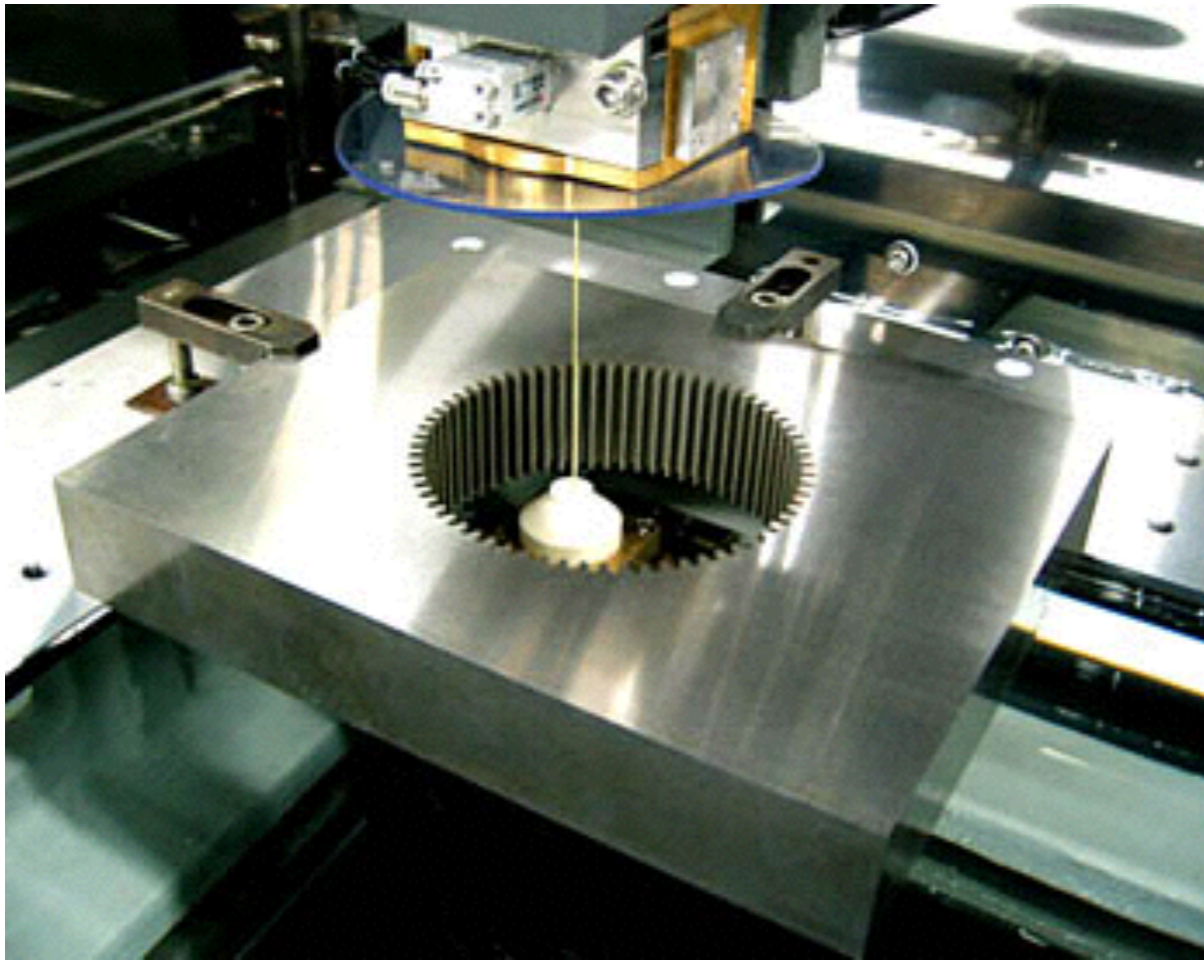
# The milling machine is the second most commonly used tool



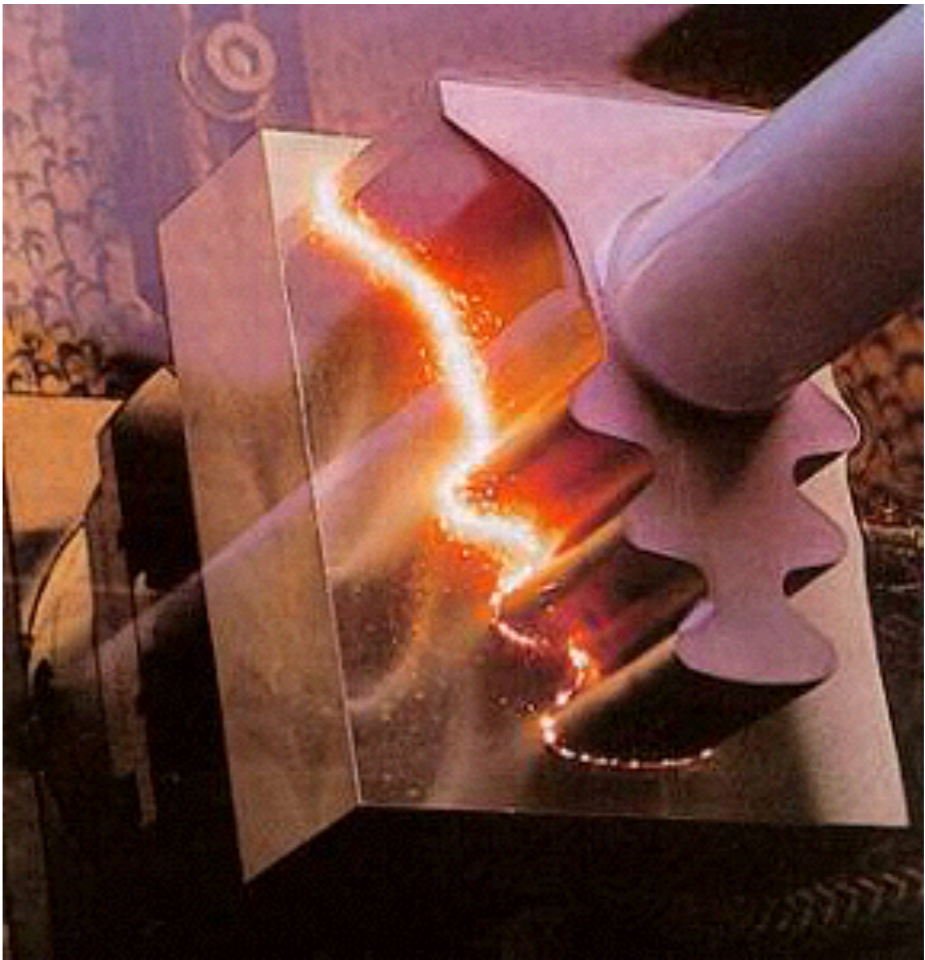




**The EDM is not available in many shops, but is very precise**



**Image: <http://www.fagorautomation.com>**



**Image: <http://www.mercatech.com>**



<https://youtu.be/TM-xTFKuReY>

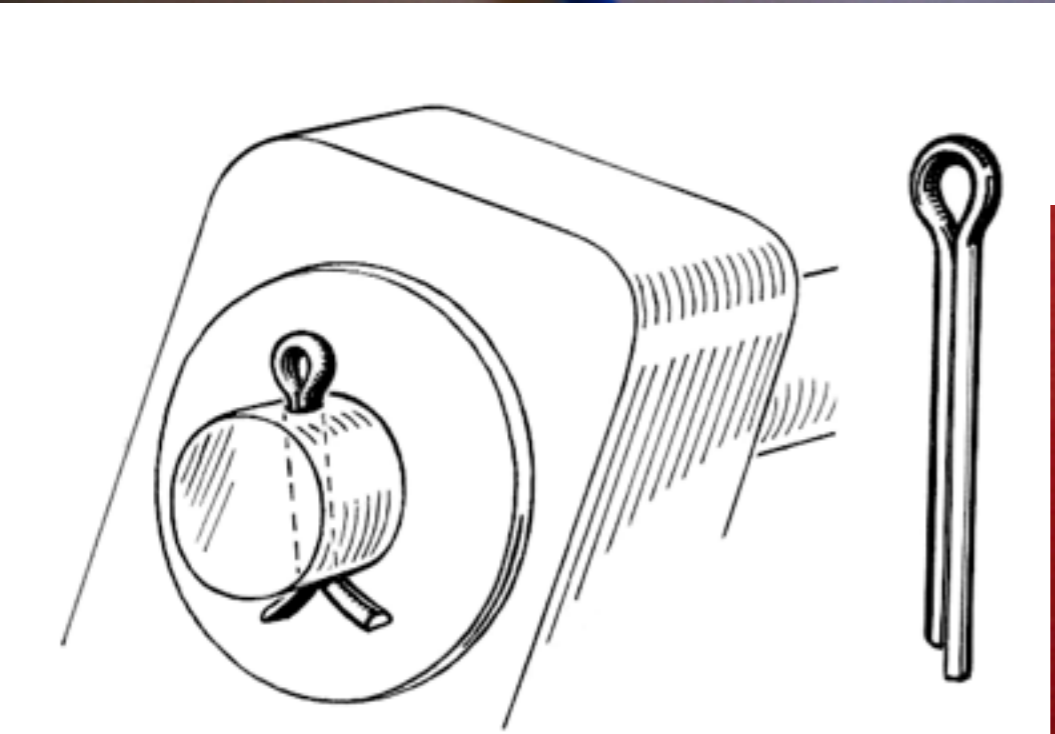
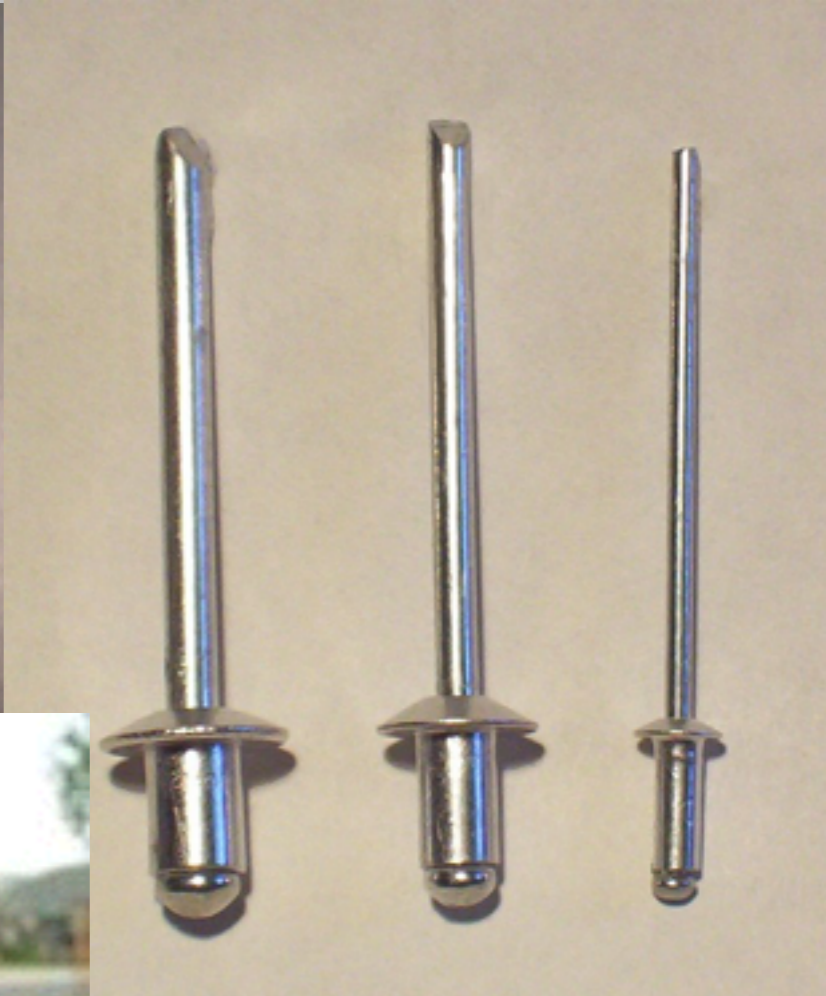
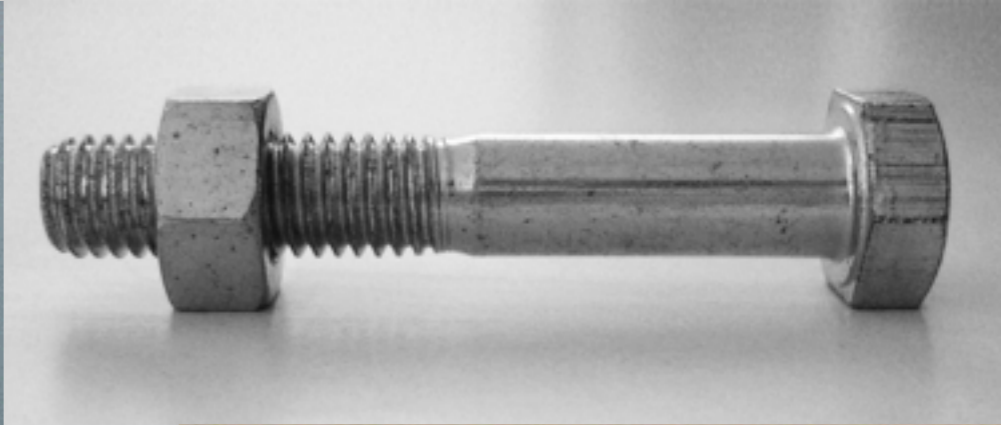
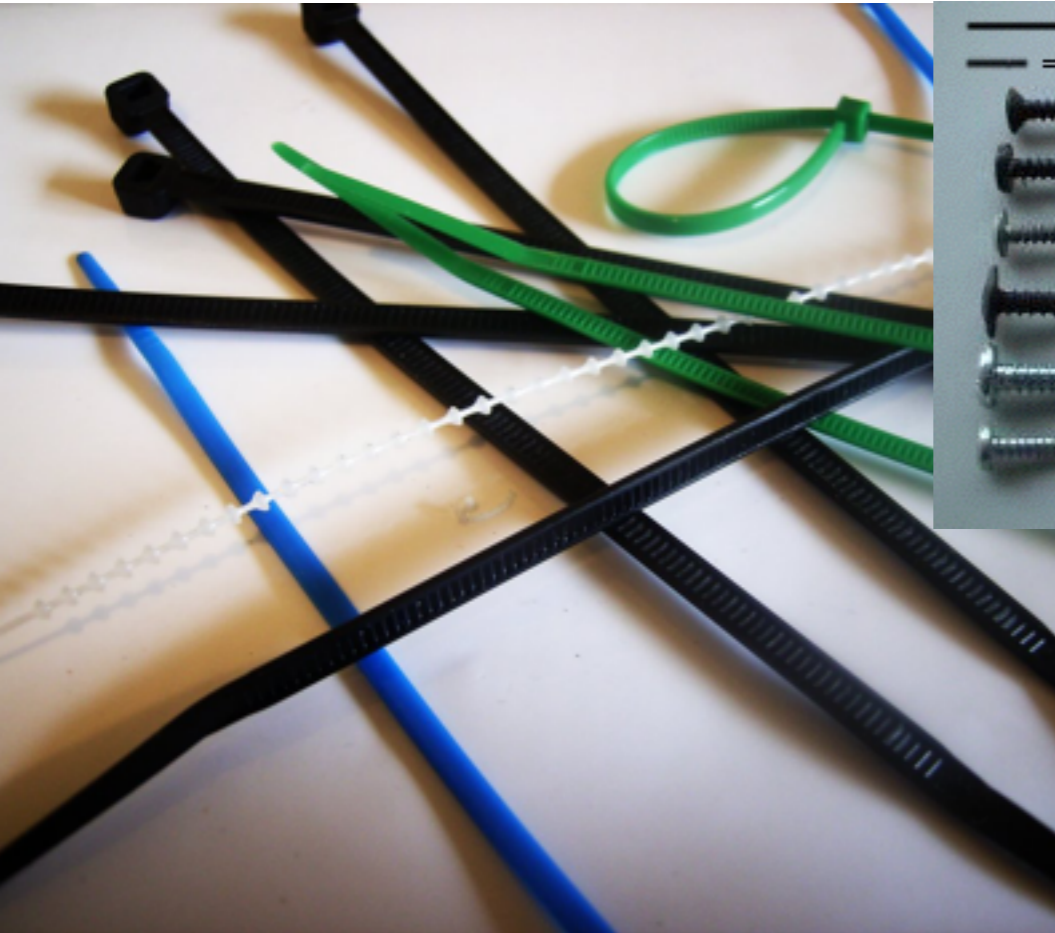


# Material makes the difference in the cost and performance of your part

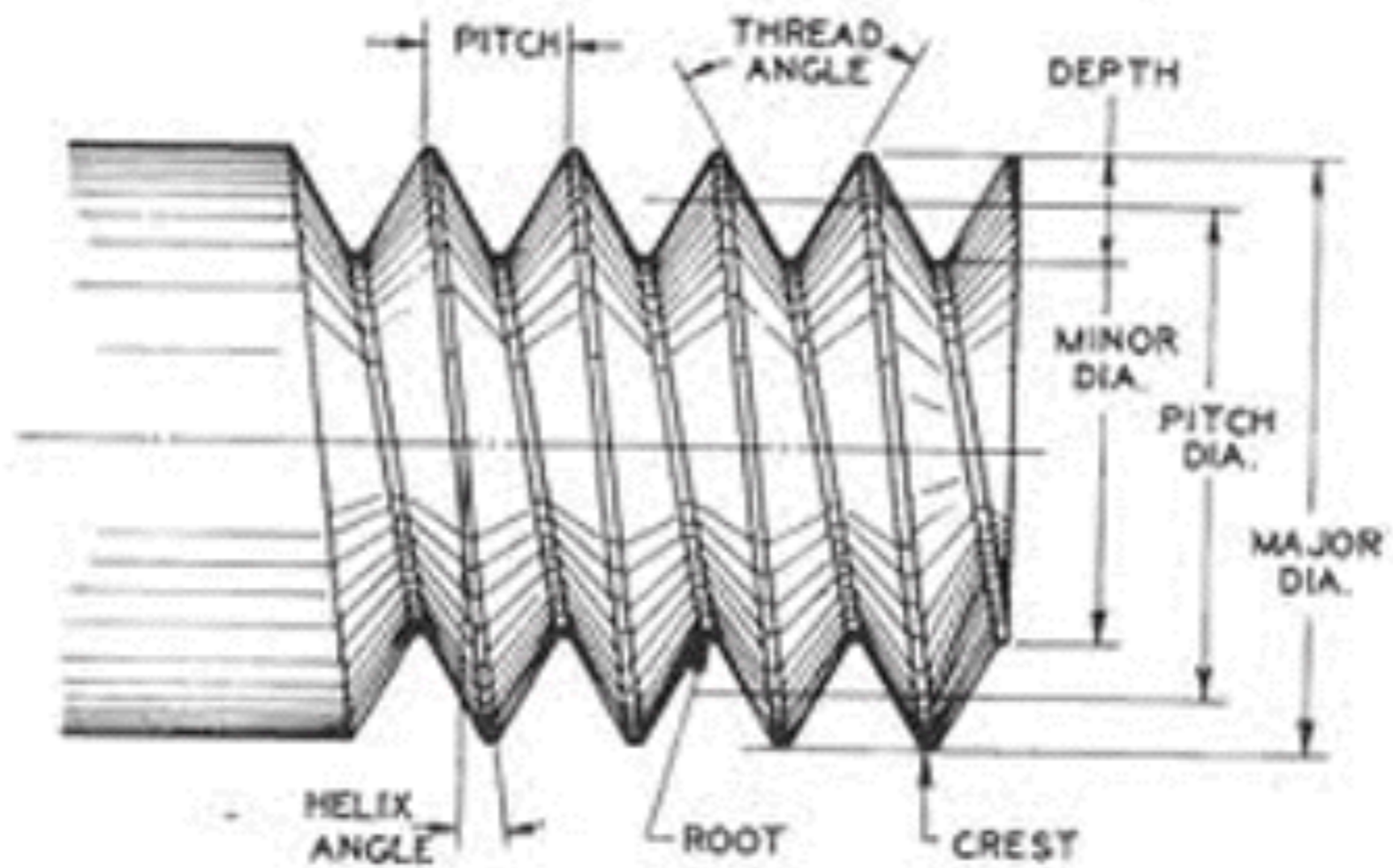


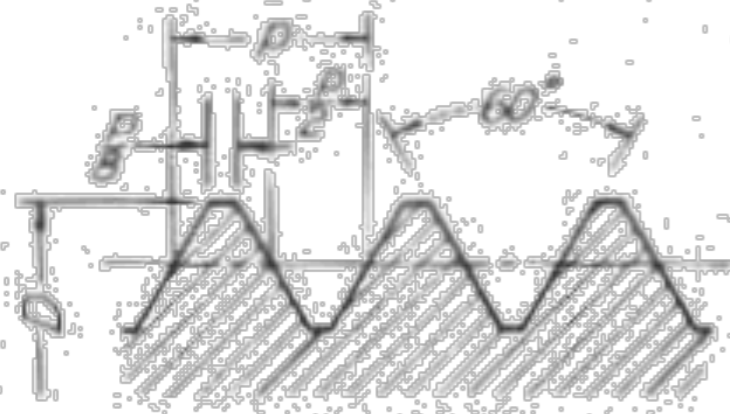


# Fasteners hold our parts together into assemblies

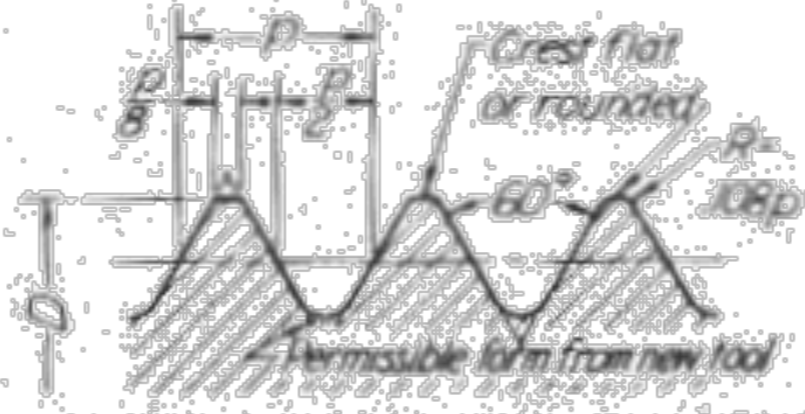




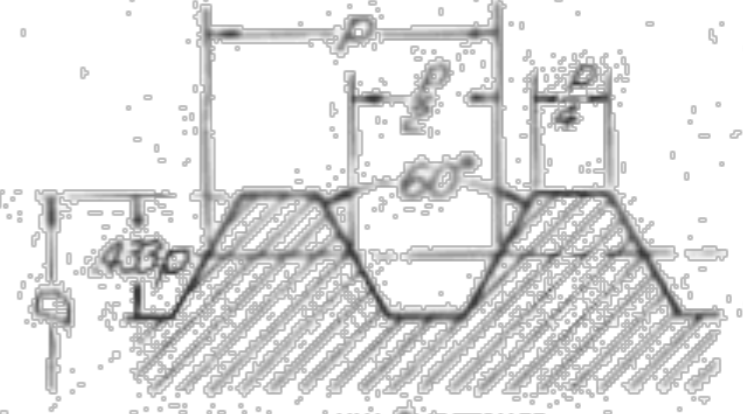




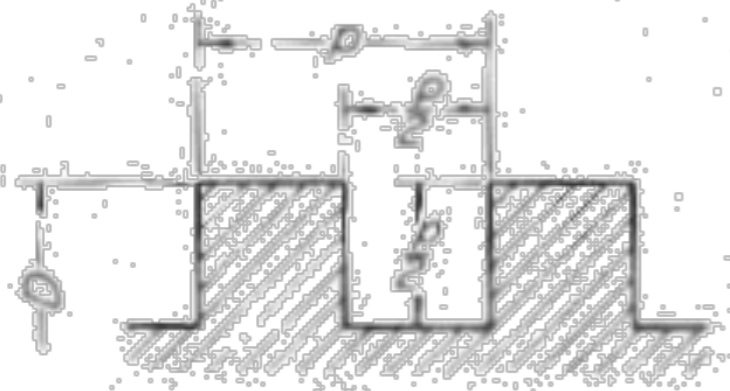
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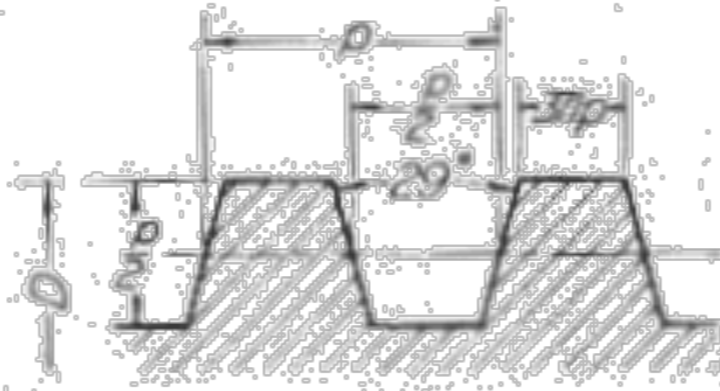
AMERICAN NATIONAL (UNIFIED)



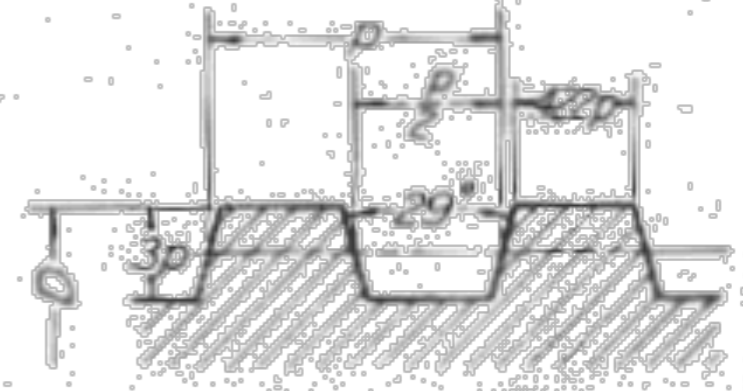
$60^\circ$  STUB



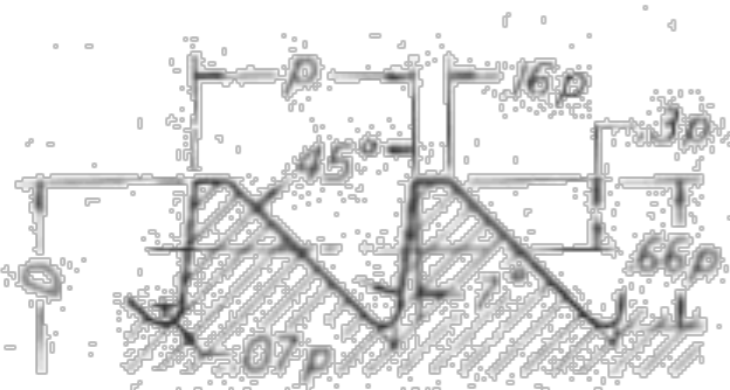
SQUARE



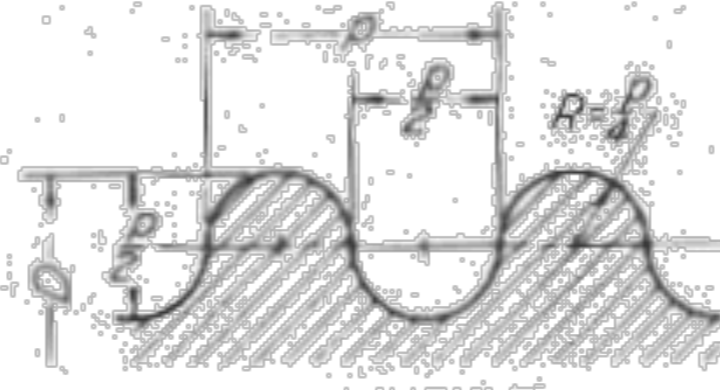
ACME



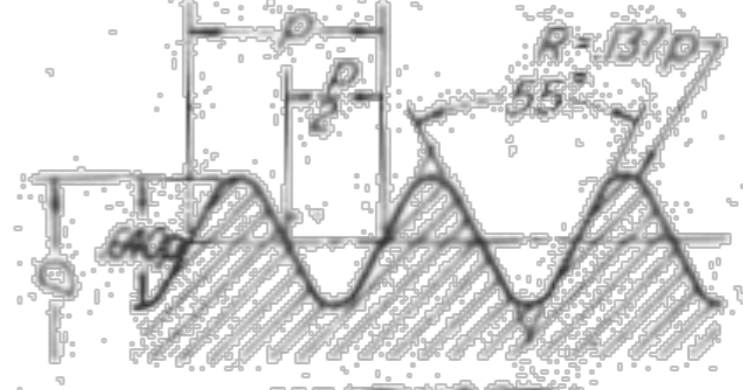
STUB ACME



BUTTRESS



KNUCKLE




WHITWORTH



# US Machine Screw Diameters

Size	Thread Diameter	
	Decimal	Nearest Fractional
#0	0.06"	1/16"
#1	0.07"	5/64"
#2	0.08"	3/32"
#3	0.09"	7/64"
#4	0.11"	7/64"
#5	0.12"	1/8"
#6	0.13"	9/64"
#8	0.16"	5/32"
#10	0.19"	3/16"
#12	0.21"	7/32"
#14	0.24"	1/4"



A diagram of a machine screw with a dimension line across its threaded section. The dimension line is labeled "Diameter" and has arrows pointing to the top and bottom of the thread.

# Activity: Part Manufacturing Techniques

We've discussed the many ways that parts and assemblies are manufactured. Get a few different parts and objects from your everyday environment. Describe and discuss how they are made. Look for clues like the surface finish of the part, what material it is made of, and where mechanical movement and wear happens.

## Questions

- What techniques were used to create the part? Why?
- What fasteners were chosen? Why?
- What is the part made of? Why?



Image: [Wikipedia](#).



## **Assignment: Prepare for next class**

- \* Watch video on the threading activity**
- \* Remember to wear shop appropriate clothing**