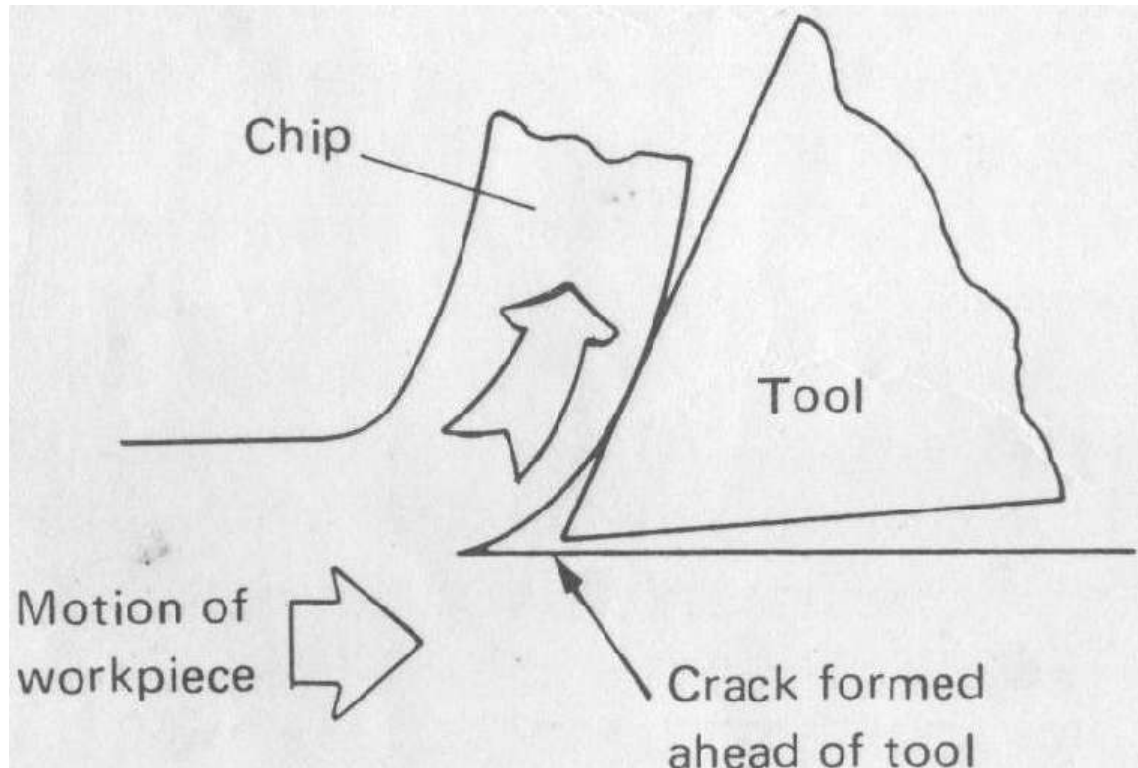


Theories of Chip Formation

- ✚ Chip formation studies helps in understanding mechanics of metal cutting or physics of machining
- ✚ They lead to equations that describe the interdependence of the process parameters such as ***depth of cut, relative velocity, tool geometry*** etc. These relations help us in selecting optimal process parameters.

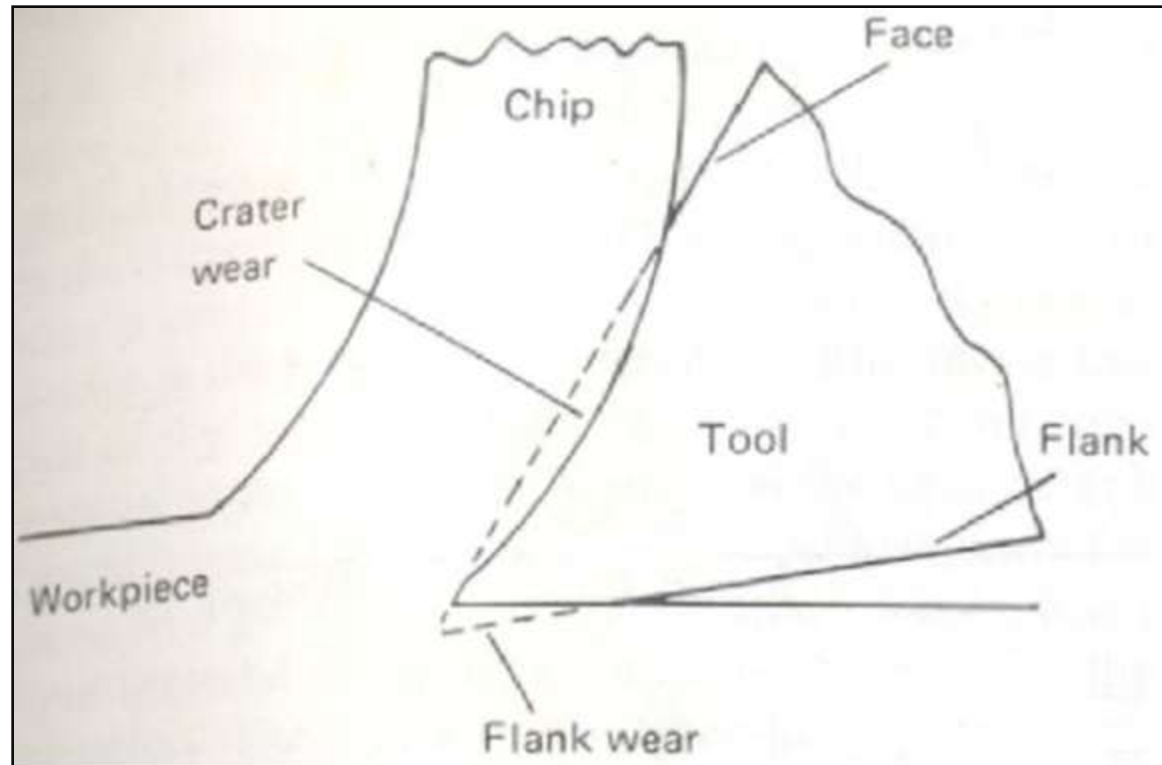
Theories of Chip Formation – Theory of Tear

A crack propagates ahead of the tool tip causing tearing similar to splitting wood [Reuleaux in 1900]



Theories of Chip Formation – Theory of Tear

Against the traditional wisdom, the tool was observed to wear, not at the tip, but a little distance away from it. Therefore, this theory was subscribed by many researchers for a long time.



Theories of Chip Formation – Theory of Tear

Further studies attributed the wear away from the tip to the following:

- ✚ Chip velocity w.r.t. the tool is zero at the tip.
- ✚ The tip is protected by BUE.
- ✚ Temp is also high a little away from the tip due to the frictional heat.

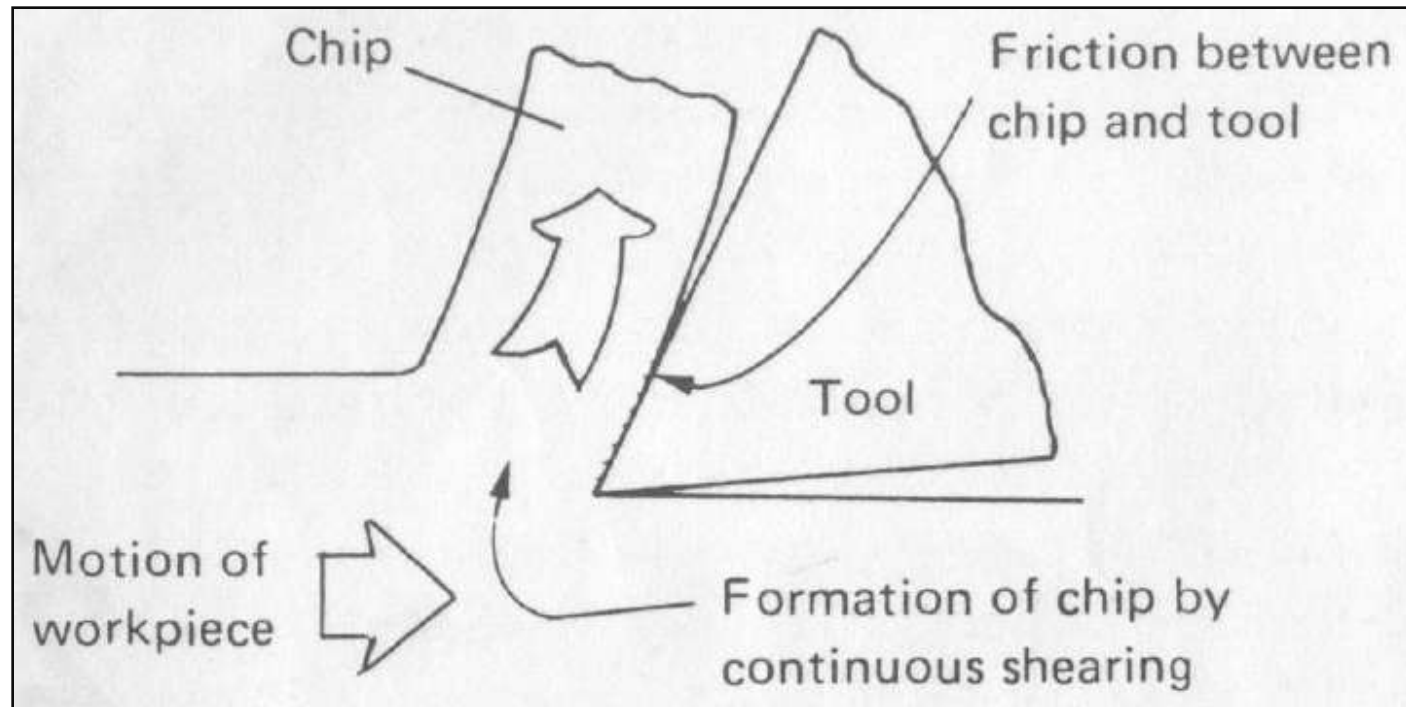
Subsequent studies proved the chip formation as *shear and not tear*. Thus the theory of tear was rejected.

Theories of Chip Formation – Theory of Compression

- ✚ The tool compresses the material during machining.
- ✚ This was based on the observation that the chip length was shorter than the uncut chip length.
- ✚ Later it was established that this shortage in length corresponds to the increase chip thickness.
- ✚ Thus this theory too was wrong

Theories of Chip Formation – Theory of Shear

The excessive compressive stress causes shear of the chip at an angle to the cutting direction [Mallock in 1881].



Theories of Chip Formation – Theory of Shear

Mallock's other contributions

- ✚ Emphasis on the influence of friction at chip-tool interface
- ✚ Studied the effect of cutting fluids
- ✚ Studied the influence of tool sharpness
- ✚ Studied chatter

His observations on the above studies still hold good although he could not explain all of them at that time.