



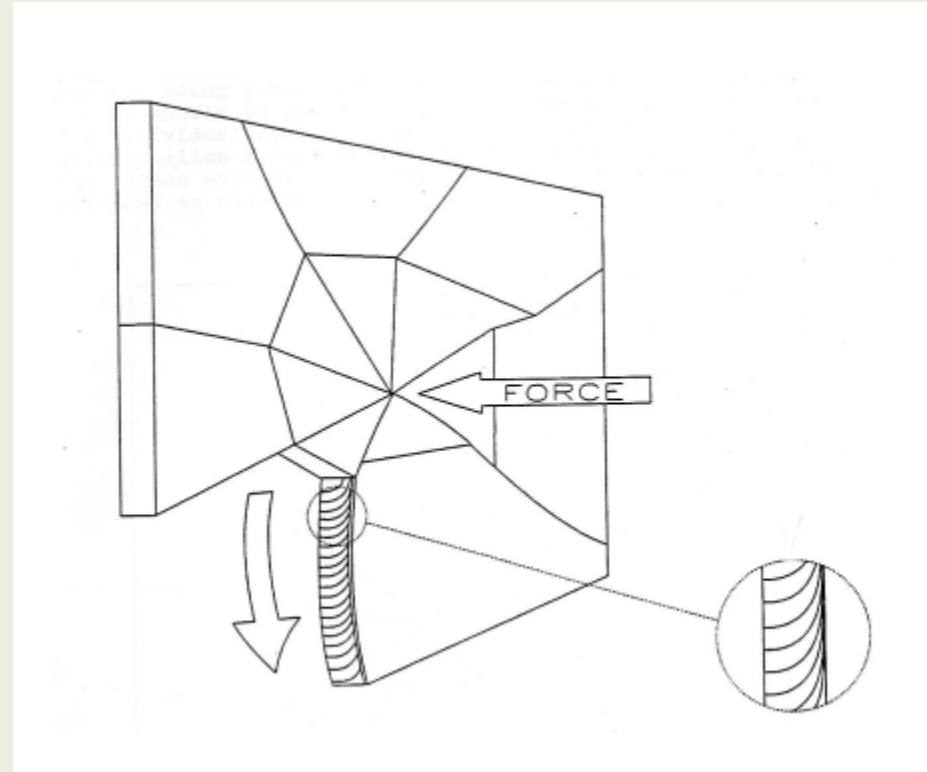
TRACE EVIDENCE:  
GLASS



# Fracture Patterns

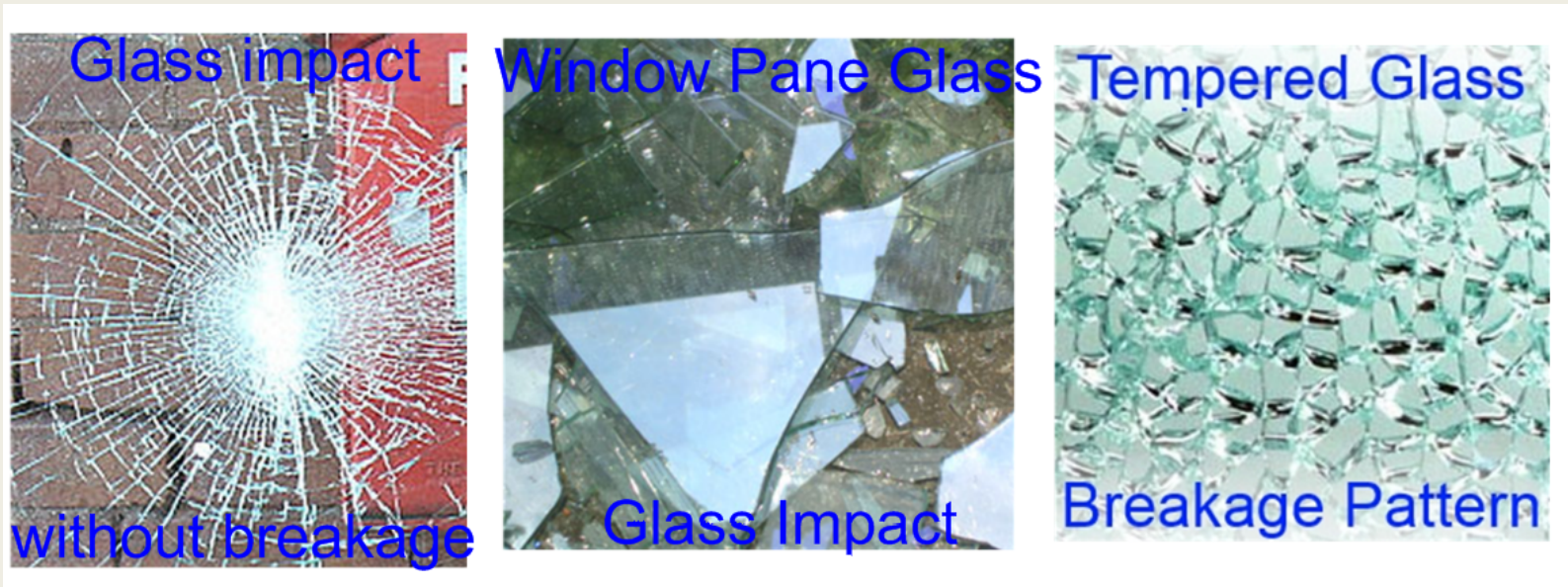
Glass is flexible up to a point. When glass is hit, it can stretch slightly.

However, when the glass is forced to stretch too far, **FRACTURE LINES** appear and the glass may break.

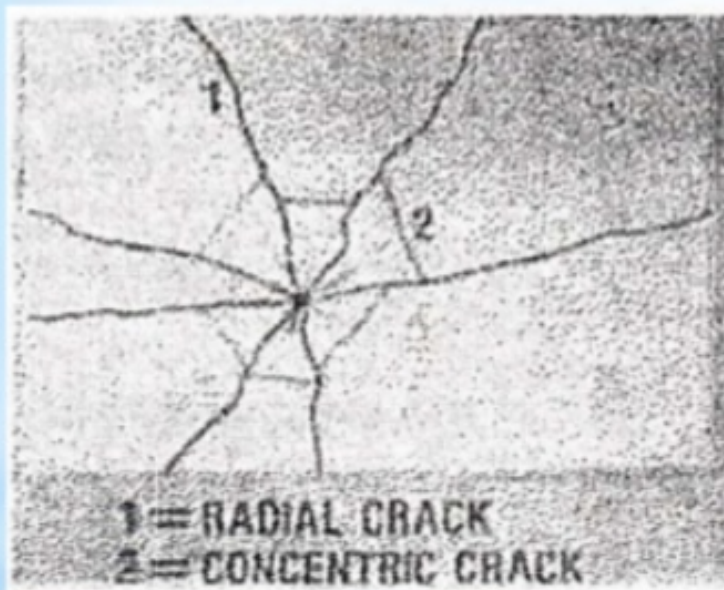


# Glass is an amorphous solid

- Therefore glass will break into **irregular shaped fragments**, and not into regular pieces



# BROKEN WINDOW CAUSED BY FIST OR STONE



low-speed impact



high-speed projectile



The fracture patterns formed on broken glass can provide clues about the direction and rate of impact.



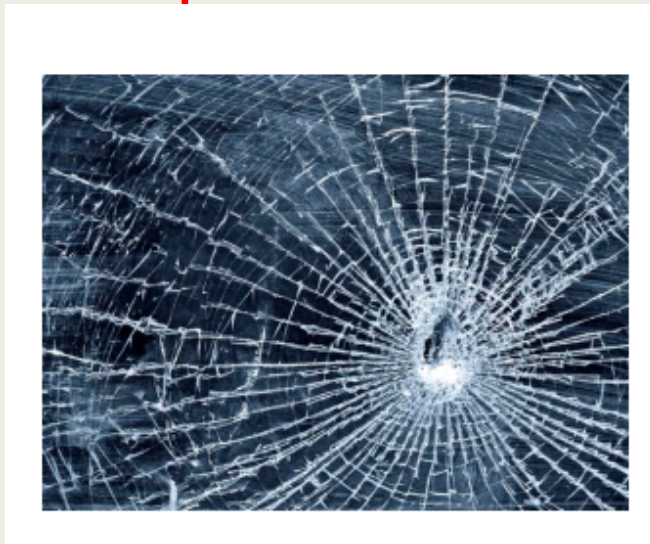
When glass breaks fracture patterns form on the surface. **These first breaks are called RADIAL FRACTURES**

- start at the point of impact and **radiate outward from there** (look like spider webs)
  - form on the side **opposite** the point of impact.



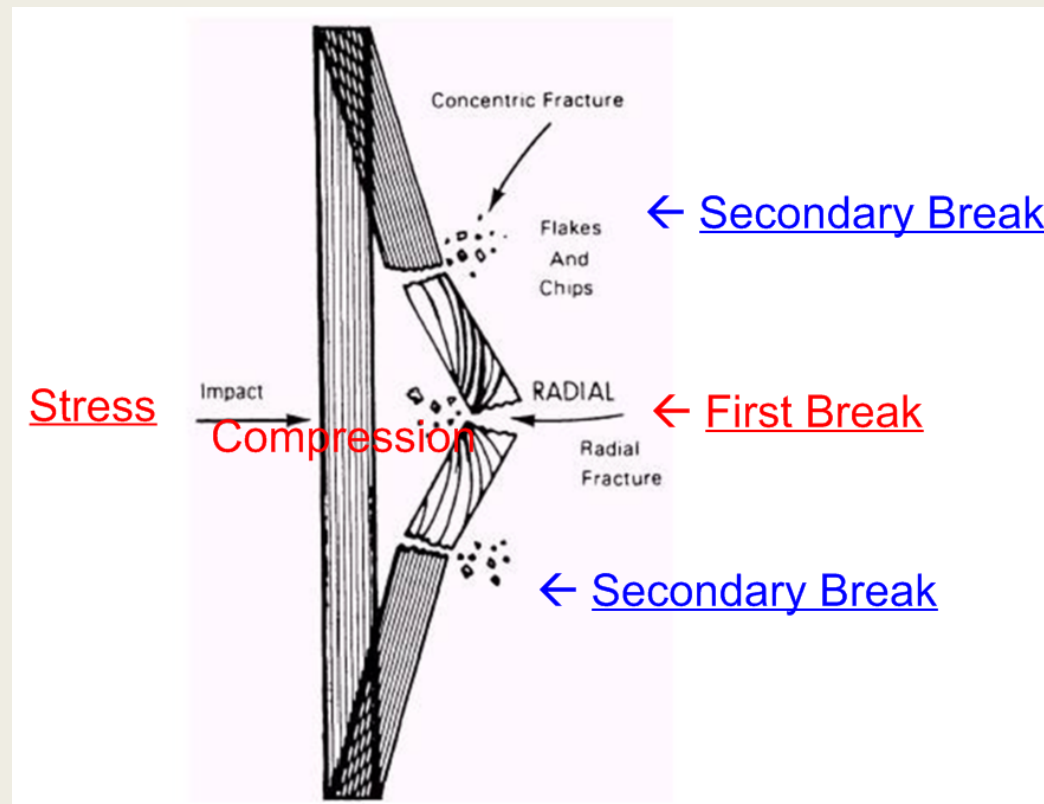
Secondary fractures called **CONCENTRIC circle fractures** may form around the point of impact.

- **form on the same side as the point of impact.**



- Depending on the size of the object and the force of the object that strikes glass, concentric circles may or may not form

By examining these glass fracture patterns, it is possible to determine which side of the glass was hit





# Order of Impact

If there are several strikes to the glass, the ORDER in which the strikes occurred can be determined

- The first impact produces the first set of radial fracture lines. These lines set the boundaries for further fracturing by following shots.
- Radiating fracture lines from a second impact stop at the edge of fracture lines already present in the glass.

THIS PHOTO DEPICTS TWO BULLET HOLES IN SAFETY GLASS.

WHICH HOLE WAS CREATED FIRST?





Each time glass is struck, it gets weaker and weaker

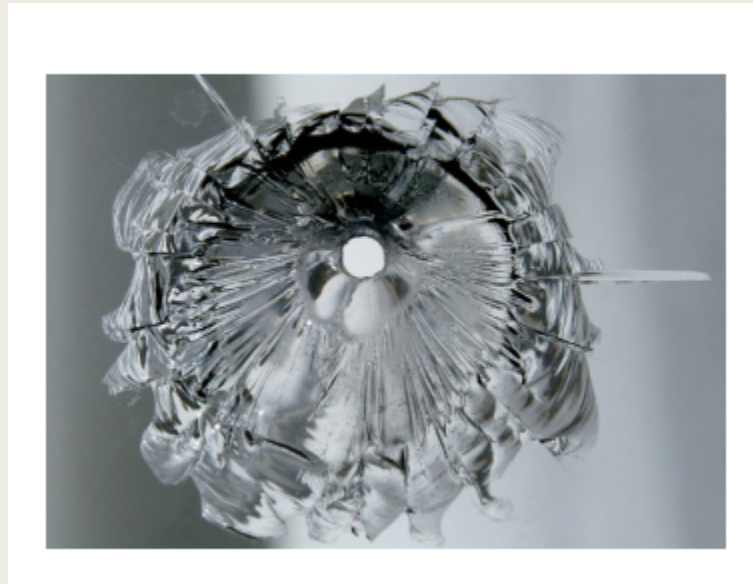
- The **number of radial and/or concentric fractures typically will INCREASE** with each strike/impact on the same piece of glass





# Bullet Fractures

- As the bullet passes through the glass, it pushes some glass ahead of it, causing a **CONE shaped piece of glass** to exit along with the bullet.

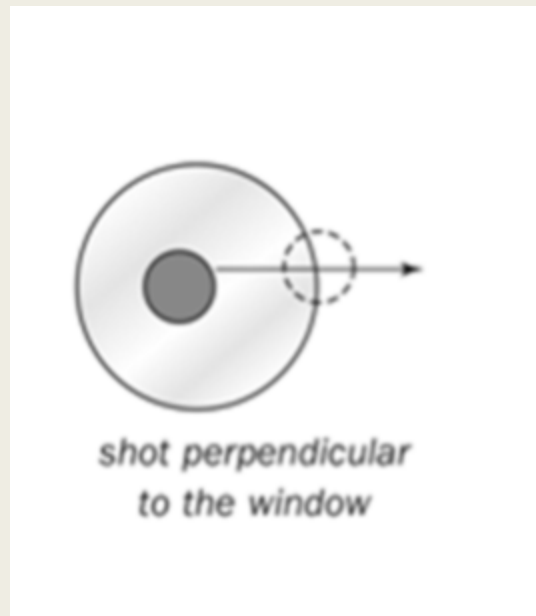


- This cone of glass makes the **exit hole larger than the entrance hole** of the bullet.

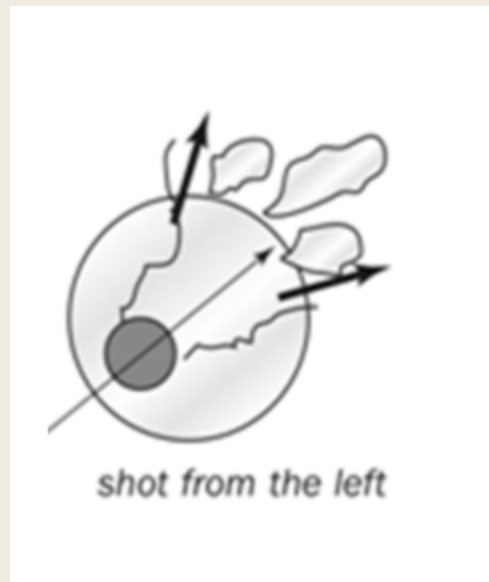


# Path of a Bullet

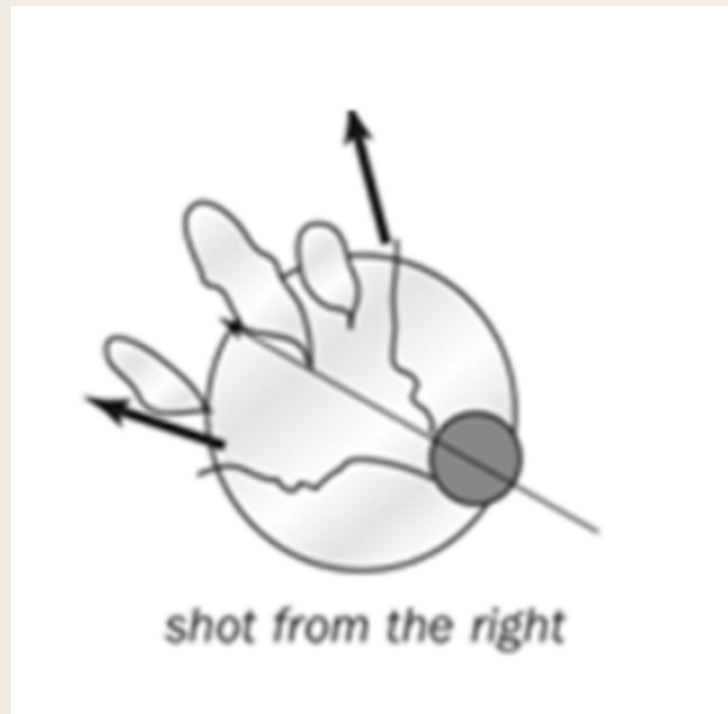
If the bullet was **fired perpendicular** to the windowpane, the **entry hole of the bullet will be ROUND.**



If the shooter was firing at an angle coming from the left, glass pieces will be forced out to the RIGHT. The bullet's exit hole will form an irregular oval as it exits to the right.



If the shot originated at an **angle coming from the right, glass pieces will be forced out to the LEFT**, leaving an irregular oval hole to the left.



# Which side did the impact come from?

- If the glass completely shatters, it is important to be able to tell direction of impact
  - *If an object strikes a piece of glass that is large enough to shatter it, the majority of the glass will be on the **opposite** side of impact*
    - Momentum will carry glass in direction object is moving
  - Only a small amount of glass called “**blowback**” will originate towards the impact