What is the bottom end?

- Part of the engine
- Consists of:
  - Crankcase
  - Crankshaft
    - Flywheel (2 parts)
    - Connecting Rod
  - Camshaft
How does the flywheel work?

- Converts vertical motion of the piston into rotary motion - transmission transfers that to the back wheel

- Piston pushes down connecting rod which rotates flywheel

- 4 stroke engine = 2 full flywheel rotations
  - Intake (vacuum - pulls up connecting rod)
  - Compression (bottom to top)
  - Power *(only stroke that adds energy to flywheel)*
  - Exhaust
Why the connecting rod must be set at an angle (PHYSICS!)

VECTORS

\[
\begin{align*}
\cos \theta & \quad \text{is what moves the flywheel-rotary motion} \\
\sin \theta & \\
\end{align*}
\]

90 degree angle

Non-90 degree angle
Camshaft

- Cam helps to open the valves which make the strokes possible
  - Cam → tappets → push rods (top end) → rocker arms → OPEN VALVES
  - Everything is connected!
Aligning the flywheel
Oil system

- Dry sump Vs. Wet sump
  - Oil pump
- What oils what and where gets oil?
DRY SUMP

WET SUMP

Lubrication System – Wet Sump
<table>
<thead>
<tr>
<th>DRY SUMP</th>
<th>WET SUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADVANTAGES</strong></td>
<td><strong>ADVANTAGES</strong></td>
</tr>
<tr>
<td>➢ Increased oil capacity</td>
<td>➢ Simple design</td>
</tr>
<tr>
<td>➢ Helps lower the center of gravity</td>
<td></td>
</tr>
<tr>
<td>➢ Better weight distribution</td>
<td></td>
</tr>
<tr>
<td>➢ Better cooling</td>
<td></td>
</tr>
<tr>
<td>➢ Better oil pressure maintained</td>
<td></td>
</tr>
<tr>
<td>➢ Easier to maintain and replace</td>
<td></td>
</tr>
<tr>
<td><strong>DISADVANTAGES</strong></td>
<td><strong>DISADVANTAGES</strong></td>
</tr>
<tr>
<td>➢ Cost</td>
<td>➢ Starves racing cars of oil (Not a problem in motorcycles)</td>
</tr>
<tr>
<td>➢ Complexity</td>
<td></td>
</tr>
<tr>
<td>➢ Weight</td>
<td></td>
</tr>
<tr>
<td>➢ Can negatively affect day to day drivability (System is too efficient)</td>
<td></td>
</tr>
</tbody>
</table>
Components to the Dry Sump
OIL FAQ’s

● Where does the oil go in?
  ○ Oil tank, Chaincase oil (Filler plug), Gearbox oil (Gearbox plug)

● What type of oil should I use?
  ○ Chaincase - 20 SAE Gearbox - 30

● How often should I change my oil?
  ○ Every 1000 miles with intermediate 250 and 500 oil changes also.
Getting to the Bottom end / oil system
Taking it apart

Collaboration with Clutch / Top End

Splitting the case
Challenges!
Understanding what we took apart:
Cleaning

“This is the best-cleaned crankcase I have ever seen!”

- John Prevost
A brief break

“This is so useful!”

- Professor Littman
Putting it back together
Finished!

Thanks for such a fantastic semester - we learned so much!

What we learnt

- Technical knowledge of the bottom end / oil system
- Understand what you are working with before you begin to work with it. This helps to get things done faster. Prevents things getting lost.
- Label everything!
- If one strategy doesn’t work, try something else. You’ll figure it out!