The materials age

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Modern materials: alloys
Jet engine: military jet
Jet engine: turbine discs
Designing a new alloy – what is required?

- Fracture toughness
- Yield strength
- Cost
- Density
- Fatigue life
- Creep
- Oxidation resistance
- Corrosion resistance
- Processibility

Required properties for new alloy
Multidimensional design space

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<th>Cr</th>
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<th>Mo</th>
<th>W</th>
<th>Ta</th>
<th>Nb</th>
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<td>P</td>
<td>V</td>
<td>Hf</td>
<td>Mg</td>
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and 4 different manufacturing processes
Calculating material properties
Testing the yield stress
Testing the yield stress

![Graph showing the relationship between yield stress and temperature. The graph indicates a decrease in yield stress with increasing temperature.](image)
Testing the yield stress
Conclusions: why study condensed matter?

- Union of different sciences that encourages analysis with a variety of techniques – analytical, numerics, and experiments
- Close connection to real-world problems
- Academic funding and well-paid industrial jobs