

Zeroth Law of Thermodynamics

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What did Galileo think about Heat?!

- *Is there is an “observation” when there is no observer?*
- Galileo (1564-1642) imagined heat to be a response of the senses
- Effectively, there is no such thing as “heat” if there is no one to experience it!
- Rene Descartes (1596-1650) of “Cartesian coordinates” & “I think, therefore I am” fame followed up with similar “ideas”
- Importance of instrumentation science and engineering: Meaning & measurements

Zeroth Law of Thermodynamics

- If two bodies are in thermal equilibrium with a third body, they are also in thermal equilibrium with each other
- Implication: Third body=Thermometer
- T is intensive & independent of mutual contact of bodies via “*diathermal*” interfaces (Note: “*dia*” in Greek means “through”)
- Law...?

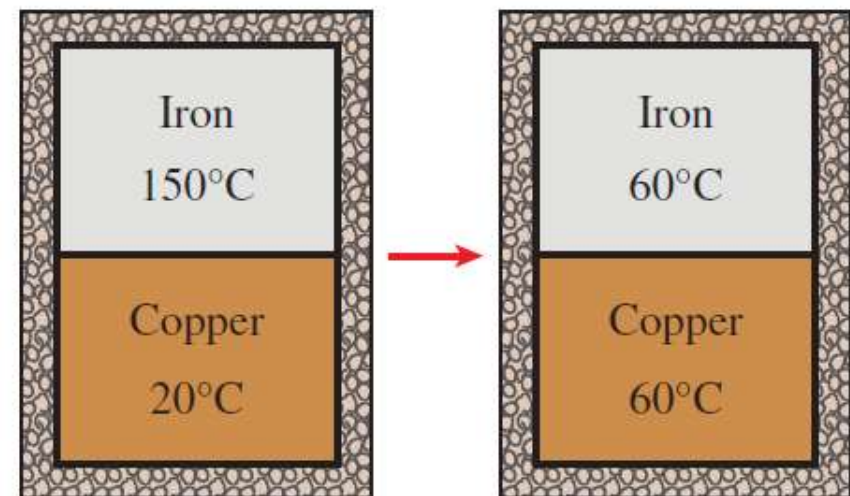


FIGURE 1–34

Two bodies reaching thermal equilibrium after being brought into contact in an isolated enclosure.

Contribution of Indian Scientists to 0th Law?

- A Text Book of Heat by **Saha & Srivastava** (1st Ed-1931); 2nd edition-1935 was reviewed by the originator of 0th Law **R. H. Fowler**
- “THE authors of this book have written a most stimulating version of the old song “Heat a Mode of Motion”, and written it, too, rather in the grand manner...

“A text book of heat” by Saha & Srivastava...

... Their arrangement of matter follows classical lines. Formal thermodynamics is not introduced until more than half-way through the book. Before that point is reached, there are **excellent descriptive chapters on thermometry, calorimetry, production of low temperature, heat engines, gases, changes of state, elementary kinetic theory and other topics**. These are all treated in a most pleasing broadly descriptive manner, with a temperature based on the perfect gas scale and an occasional forward reference to the second law where unavoidable. The ideas of hot and cold and heat are here quite properly treated as familiar primary concepts which need not be further analysed—quantities which we must set to work to measure precisely—and the **kinetic interpretation of heat** is brought in naturally in its right place. The chapter on **heat engines** seems to me to be exceptionally satisfactory for the elementary treatment that is intended, being practically **without reference to entropy**, and using merely a perfect **gas Carnot cycle** as standard. An exceedingly pleasing feature is the section on the **Otto cycle gas or oil engine, the Diesel engine and steam turbines**. The latter, however, are not given credit for the full overall efficiency that has recently been attained.

Correlations & speculations...

- R. H. Fowler was the Ph.D advisor of Paul Dirac, a pioneer of quantum mechanics (Central drama: Solvay conference-1927)
- In quantum mechanics the measurement “collapses the wave function”- Indeed there is no “observation” without the observer!
- Wonder if importance of measurements in QM had something to do with Fowler’s preoccupation about meaning of measurements in TD

