

[original insight]

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The insight behind the discovery of quanta by Max Planck

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Abstract

We explore the origin of Planck's insight, $E = h\nu$.

keywords: quantum, Planck, energy, frequency

From the equipartition theorem to $E = h\nu$

1. "In classical statistical mechanics, the equipartition theorem relates the temperature of a system to its average energies" [1, 2].
2. k_B is the Boltzmann constant, and T is the temperature of a physical system.
3. The quantity $E = k_B T$ is a measure of energy.
4. Temperature is related to oscillation, so $T \propto \nu$, where ν is the frequency of oscillation.
5. From (3) and (4), one can relate energy and frequency by writing $E = h\nu$.
6. h is the Planck's constant.

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Final Remarks

7. We did not explain the discretization of energy exchanges that happen within the quantum realm.
8. Instead, we gave the physical interpretation on the origin of the energy-frequency proportionality in the formula $E = h\nu$.

Open Invitation

Review, add content, and co-author this paper [3, 4]. *Join* the **Open Physics Collaboration**. Send your contribution to mplobo@uft.edu.br.

Ethical conduct of research

This original work was pre-registered under the OSF Preprints [5], please cite it accordingly [6]. This will ensure that researches are conducted with integrity and intellectual honesty at all times and by all means.

References

- [1] Wikipedia contributors. *Equipartition theorem*.
https://en.wikipedia.org/wiki/Equipartition_theorem (accessed May 19, 2019)
- [2] Reif, Frederick. *Fundamentals of statistical and thermal physics*. Waveland Press, 2009.
- [3] Lobo, Matheus P. “Microarticles.” *OSF Preprints*, 28 Oct. 2019.
<https://doi.org/10.31219/osf.io/ejrct>
- [4] Lobo, Matheus P. “Simple Guidelines for Authors: Open Journal of Mathematics and Physics.” *OSF Preprints*, 15 Nov. 2019.
<https://doi.org/10.31219/osf.io/fk836>

- [5] OSF. *Open Science Framework*. <https://osf.io>
- [6] Lobo, Matheus P. “The Insight Behind the Discovery of Quanta by Max Planck.” *OSF Preprints*, 19 May 2019. <https://doi.org/10.31219/osf.io/a9xmt>

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