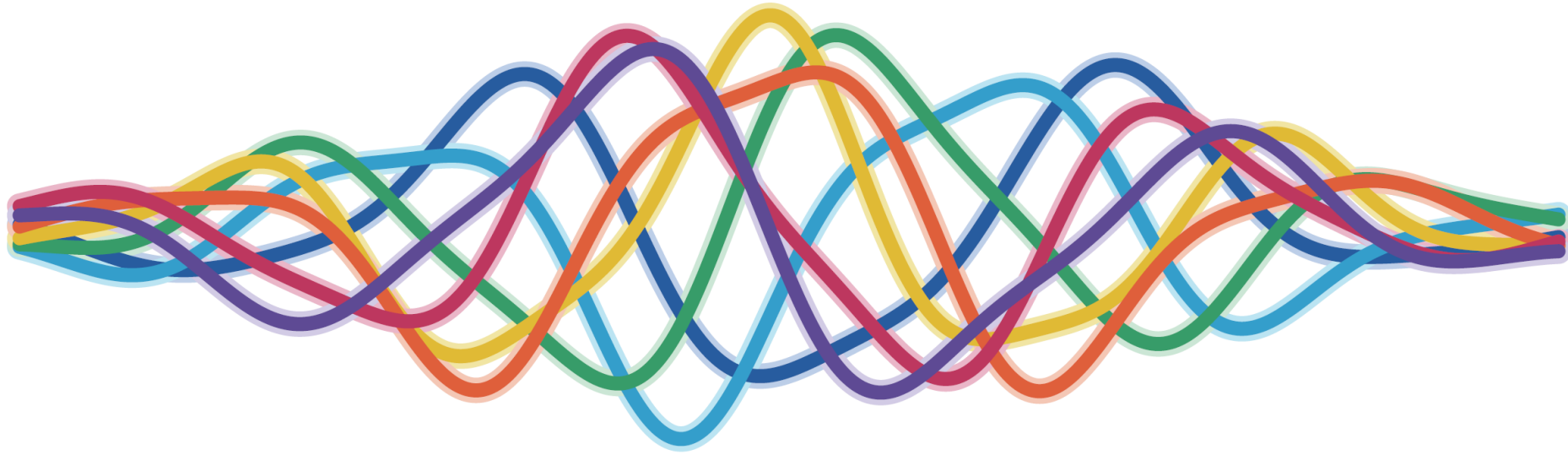




New Directions in Law-Based Explanations in the Sciences

LBEs in the Sciences: *why now?*

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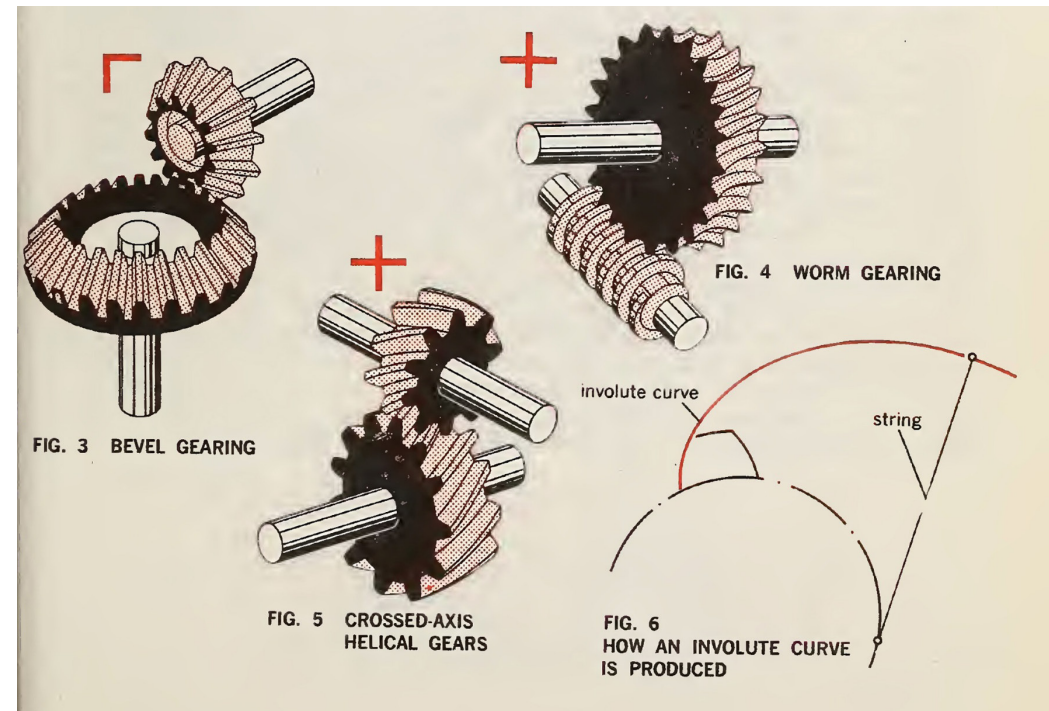
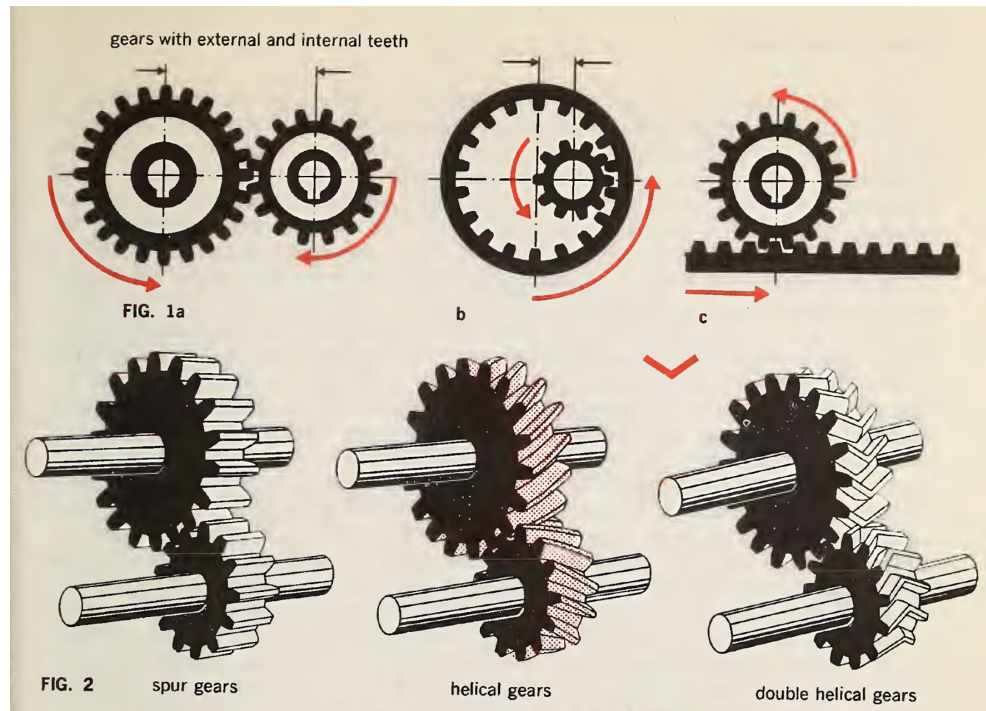
From an intelligible world to intelligible *theories* of the world

- Newton undermined the simple story of rational enquiry expelling ‘ghosts’ from an intelligible machine.
- Rational enquiry moved from demanding an intuitively intelligible world to constructing intelligible *theories* of the world.
- Theories may have a lot to do with how we linguistically enquire of the world. This might be ‘intrusive’ (like *how-* or *why-*questions), or perhaps ‘non-intrusive’:

In Romanian, “by marking an interrogative with *oare*, the speaker signals that she does not assume that the issue she raises will be resolved in a future state of the conversation.” (Farkas, *J Semant* 2022, p. 295)

Gears: mechanisms and lawlike generalisations

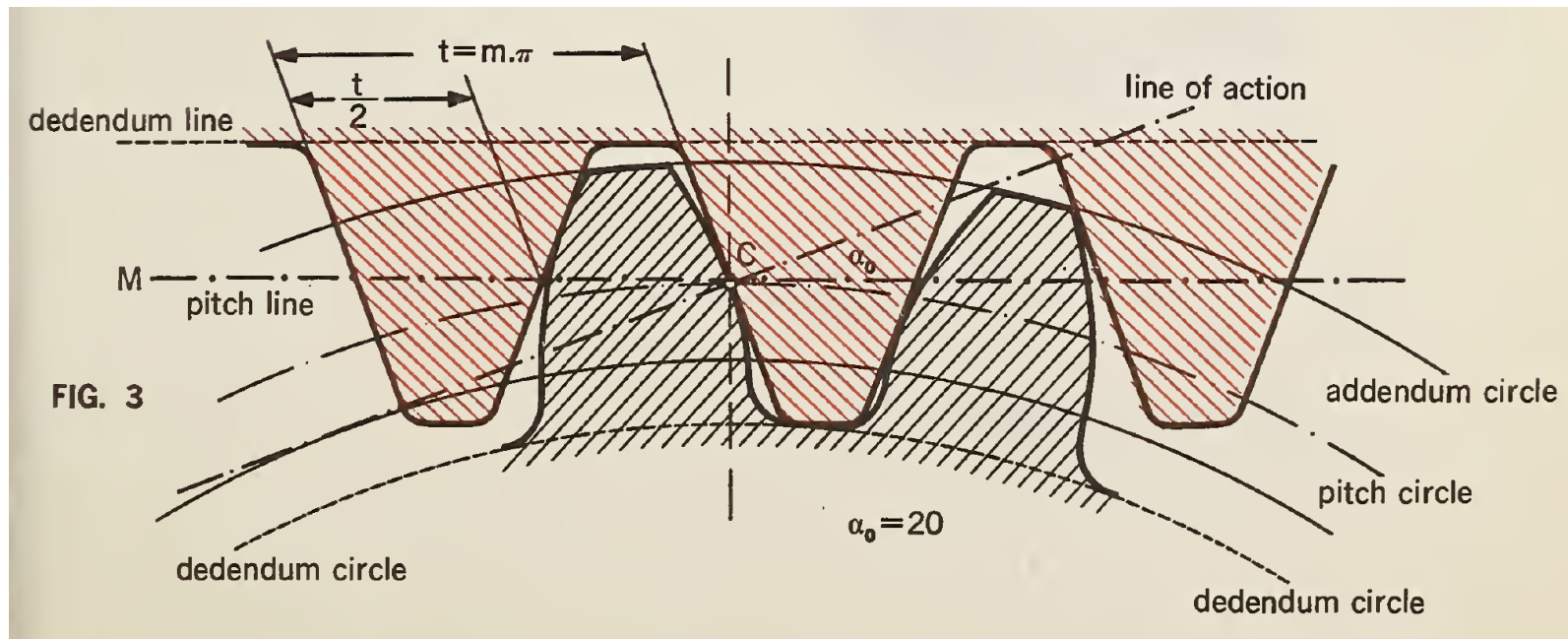
“Toothed wheels whose teeth mesh with one another and which serve to transmit rotary motion or power from one shaft to another are called ‘gears’.” (p. 162)



How Things Work: The Universal Encyclopedia of Machines (Vol 2, 1979), p. 163

Gears: mechanisms and lawlike generalisations

“The rotation speeds of the shafts are inversely proportional to the numbers of teeth on their respective gears” (p. 162)



How Things Work: The Universal Encyclopedia of Machines (Vol 2, 1979), p. 165

Nobel Prizes in Physiology or Medicine

- 2017** “for their discoveries of *molecular mechanisms* controlling the circadian rhythm”
- 2016** “for his discoveries of *mechanisms* for autophagy”
- 1992** “for their discoveries concerning reversible protein phosphorylation as a biological *regulatory mechanism*”
- 1976** “for their discoveries concerning new *mechanisms* for the origin and dissemination of infectious diseases”
- 1971** “for his discoveries concerning the *mechanisms* of the action of hormones”
- 1970** “for their discoveries concerning the humoral transmitters in the nerve terminals and the *mechanism* for their storage, release and inactivation”
- 1969** “for their discoveries concerning the *replication mechanism* and the genetic structure of viruses”
- 1964** “for their discoveries concerning the *mechanism and regulation* of the cholesterol and fatty acid metabolism”
- 1963** “for their discoveries concerning the *ionic mechanisms* involved in excitation and inhibition in the peripheral and central portions of the nerve cell membrane”
- 1961** “for his discoveries of the *physical mechanism* of stimulation within the cochlea”
- 1959** “for their discovery of the *mechanisms* in the biological synthesis of ribonucleic acid and deoxyribonucleic acid”
- 1938** “for the discovery of the role played by the sinus and aortic *mechanisms* in the regulation of respiration”
- 1920** “for his discovery of the capillary motor *regulating mechanism*”

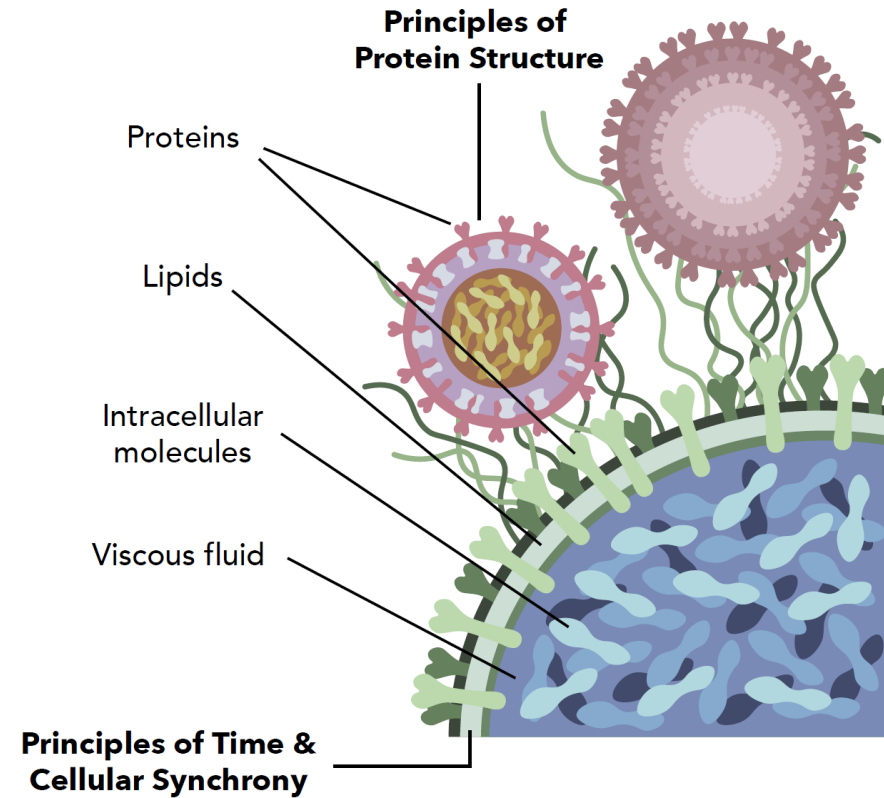
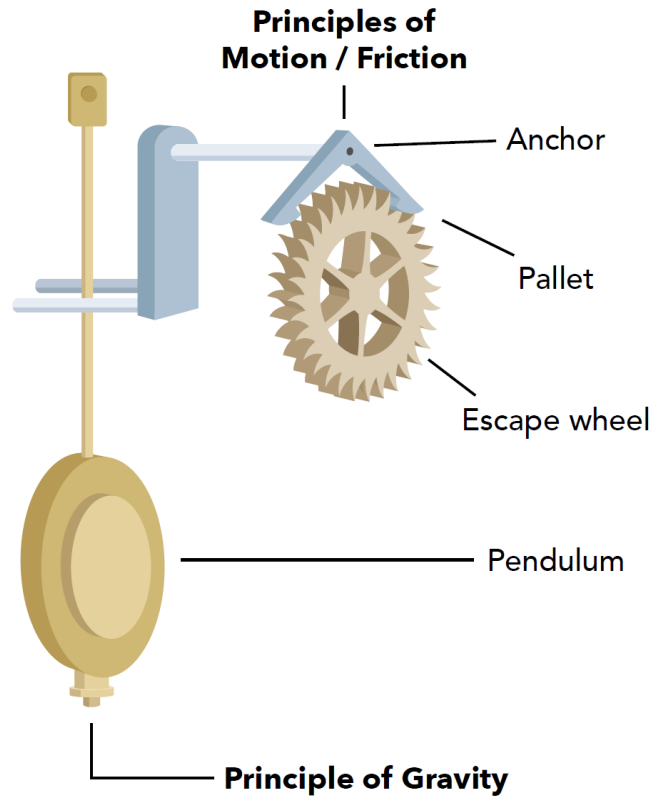
Imre Lakatos (1978)



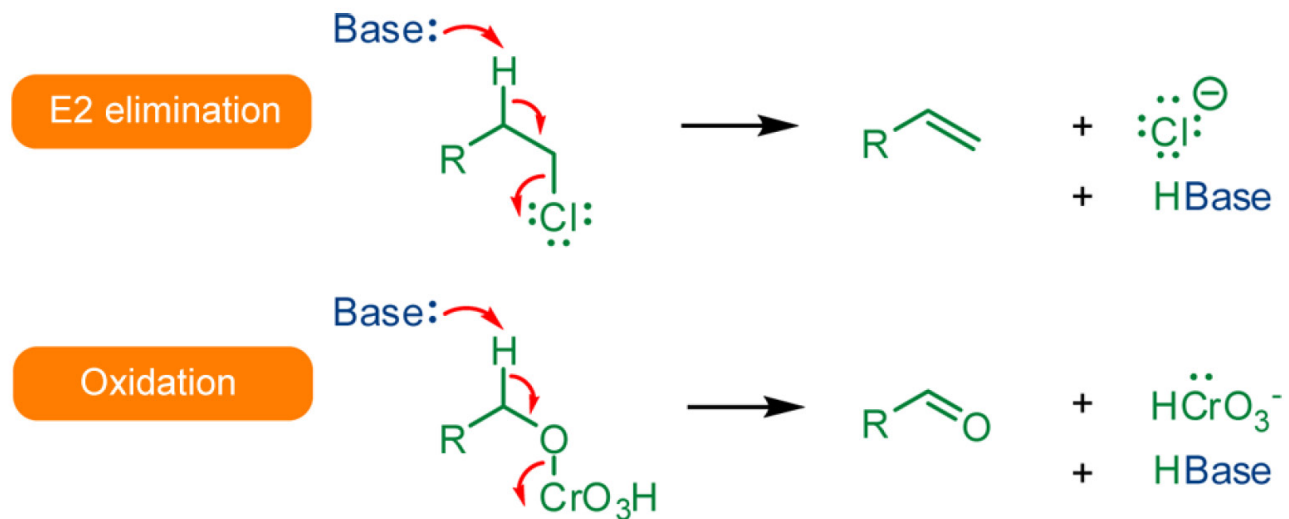
“A given fact is explained scientifically only if a new fact is also explained with it.”

“Falsification and the methodology of scientific research programmes,” reprinted in *The Methodology of Scientific Research Programmes: Philosophical Papers*, Volume 1, edited by John Worrall and Gregory Currie (Cambridge University Press, 1978), p. 34

Mechanisms and cell-biological laws



Organic chemistry: mechanisms and laws



Flynn & Ogilvie
Journal of Chemical Education 2015