

process foundational to how your brain works." No, you need the "serendipitous kind of rediscovery" Goldstein mentions to find such connections yourself. That continual process of renewal is what keeps us going when we hit those inevitable dead ends. And the combination of reading widely and making broad connections is a fruitful form of renewal. (See, for example, Douglas Hofstadter's 1979 classic *Gödel, Escher, Bach: An Eternal Golden Braid*.)

References

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4. See A. L. Hodgkin, A. F. Huxley, *J. Physiol.* **117**, 500 (1952) and references therein.

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One of the papers chosen by Ray Goldstein in his survey of gems in the old literature (*PHYSICS TODAY*, September 2018, page 32) is by Theodor Engelmann, who used oxygen-sensitive putrefying bacteria to determine the wavelength dependence of photosynthesis. Engelmann (1843–1909) made important contributions to physiology, botany, and photosynthesis; less well known is that he was an excellent cellist and a close friend of Johannes Brahms, who dedicated his String Quartet no. 3 to him. Engelmann, in turn, sent Brahms his scientific papers. When in Utrecht, the Netherlands,

Brahms often stayed with Engelmann and his wife Emma, herself an eminent pianist, and played chamber music with them.

Known for the brevity and haste of his correspondence, Brahms wrote an unusually long, light-hearted, rambling letter to Emma after he received her husband's papers. In his letter, Brahms whimsically links the dissolved O (oxygen) that attracts the bacteria (aerotaxis) to the ohs and ahs that art evokes in sensitive persons and he wonders what music would be without these. Styra Avins included and discussed the letter in *Johannes Brahms: Life and Letters* (1997; letter number 403).

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Bhabha's legacy: Atoms for peace and war

The article by Stuart Leslie and Indira Chowdhury on Homi Bhabha's many accomplishments to advance science and technology in India (*PHYSICS TODAY*, September 2018, page 48) made only a few oblique references to that country's nuclear weapons program. India's speed in achieving the successful detonation of a 12-kiloton device in 1974 was clearly due to the infrastructure that Bhabha initiated and guided.

Although the explosion, carried out

by the Indian Army, was termed "Smiling Buddha," then prime minister Indira Gandhi called it a "peaceful test." Nonetheless, it initiated a nuclear arms race with Pakistan (see Stuart Leslie's article "Pakistan's nuclear Taj Mahal," *PHYSICS TODAY*, February 2015, page 40). Thus Bhabha could be called the father of Indian nuclear weaponry. One wonders whether nuclear weapons development was his main justification for establishing the Trombay complex.

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► **Leslie and Chowdhury reply:** Homi Bhabha clearly designed Trombay with nuclear weapons as more than an afterthought, though Bhabha himself remained ambivalent about a nuclear-armed India. The CIRUS heavy-water reactor and its successors produced weapons-grade plutonium that supplied the material for India's first atomic bomb, and the plutonium itself was extracted in the facility designed by Edward Durell Stone for the Trombay campus. In India—as in France, Israel, and every other member of the nuclear fraternity—atoms for peace could never be entirely separated from atoms for war.

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