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Synchrotron Light: A Physics Journey from Laboratory to Cosmos

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Why have we chosen to write yet another book on synchrotron light? After all, the classical physics of synchrotron-light emission is an established field, and many excellent books on the topic have already been published. In this talk we will present our recently published book and the educational approach we took. Most existing textbooks on the subject either cover a wide range of applications of synchrotron light, or are pitched at an advanced (i.e. graduate) level. The inspiring motivation for us was to find a middle ground and write an upper-undergraduate-level book, but with a wider perspective encompassing the broader conceptual fabric of physics research.

Our book provides a broad introduction to the topic in an easy-to-read format, describing the fundamental underpinning physics, and combining rigorous treatment of the main concepts with a fresh outlook. The presentation is rich in images and graphics, that is typical of basic physics textbooks. All topics are described in a way that requires only undergraduate knowledge in physics and mathematics, and, with only a few exceptions, all results are derived from first principles.

In this spirit, this talk will highlight a few of the connecting threads which the synchrotron-emission concept weaves through the fabric of physics, including quantum-mechanical aspects of synchrotron light, astrophysical sources of synchrotron light, and generalisations of the concept of synchrotron light to fundamental interactions beyond the electromagnetic force.

Reference: D. Pelliccia and D. M. Paganin, *Synchrotron Light: A Physics Journey from Laboratory to Cosmos*, Oxford University Press, 2025 (see <https://global.oup.com/academic/product/synchrotron-light-9780192846280>).

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