

Dr. P Babu Dayal^{1,2}

Fascinating Thin Film Phenomena: from research to technology entrepreneurship & innovation...

*1*Photonic Components (DFM) Ltd., 1F, 88 San Tong, Lam Tsuen, Tai Po, NT, Hong Kong
*2*AIS Laser Technology Co. Ltd., HKSTP Corporation, Shatin, NT, Hong Kong



Abstract

In this talk, the author begins with his first encounter with thin films in 1997 and briefly introduces the classic phenomenon of thin films in few electronic or photonic devices. Then he will highlight the concepts of semiconductor lasers, especially a *vertical-cavity surface-emitting laser* (VCSEL, pronounced as *vikcell*) invented in 1977 in Japan. 1D or 2D arrays of VCSEL emitters find commercial applications in photonics from high-speed Datacom, high power Consumer electronics & Automotive transport (proximity sensing, illumination, 3D face recognition in mobile/smart phones, LiDAR, computer vision such as AR/VR), Industrial heating (material processing), Surveillance and Security (night vision), Robotics, Drones to Home appliances, Medical (blood oxygen monitoring), OCT (Ophthalmology) and so on. Currently, VCSEL devices are becoming essential commodities for public use in society and its industry is transitioning from a rapid growth to full digital maturity, attracting over US\$ 10 B markets by 2030 even proliferating to the frontiers of neurophotonics/neuromorphic or quantum communication applications.

The author will present some experiences that prompted him to take careers in industry from pure and applied research background. Some bold choices have resulted in networking and engaging with tier-1 companies in the industry with dozens of first rank scientists and researchers around the globe. This further inspired the author to work in technology innovation and entrepreneurship areas to found startups, promoting VCSEL products for high-volume applications, and facing VCs for fundraising. Author would like to explain some of the

entrepreneurship ingredients on technology, startups, business models, hiring the new brains etc to explore challenging and meaningful careers to benefit the society at large. Finally, the author ends the talk with a gratitude to many inspiring individuals for his lifetime opportunity to work in thin-films & lasers that are serving as *life-rays* to humans!

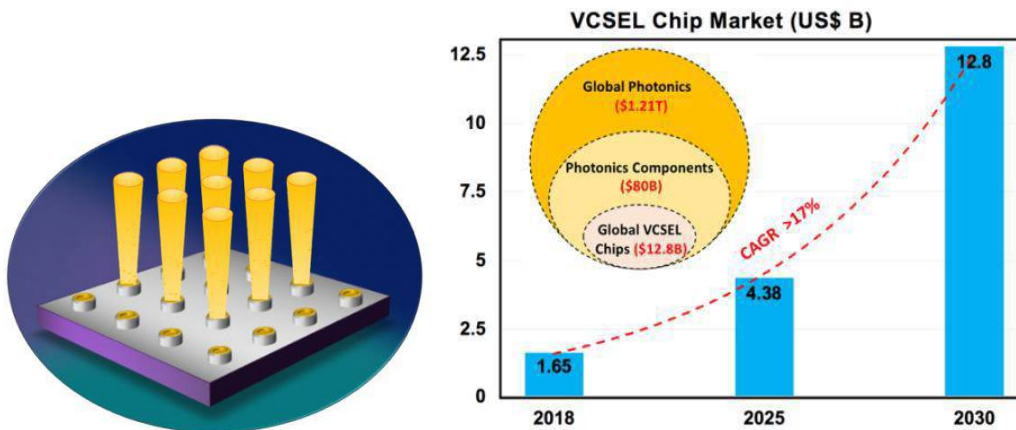


Figure (a) A 2D array of VCSEL emitters [Curtesy of Tokyo Institute of Technology], and (b) estimated future VCSEL Chip market [authors©VCSEL Industry: Communication & Sensing]

Bio

Dr. Babu D Padullaparthi received Ph. D. from IIT Delhi in Nanostructured Materials (1999-2004) and worked on VCSELs in Tokyo Institute of Technology, Japan (2005-09). After a short spell at RRCAT (EELs) and University faculty (teaching), he moved to industry to develop VCSEL products for business. He was instrumental in the development and commercialization of high-speed datacom and high-power sensing NIR VCSELs with his corporate & listed employers in Hong Kong between 2012-19. Based on his 22+ years of experience in III-V compound semiconductors including 16+ years in Optoelectronics/Photonic devices both academia & industry, he successfully executed multiple R&D and VCSEL manufacturing projects worth US\$ 20M. His technological entrepreneurship and product innovation skills have benefited his employers to realize JVs with technology giants, secured funds for fabless chip manufacturing, and pooling further resources from VCs for in-house chip manufacturing (worth US\$ ~100M). He co-founded two startups in HK, co-authored 50+ peer reviewed technical papers, 1 book (in press), over a dozen invited talks and co-inventor of 24 international patents. He can be reached to <https://www.linkedin.com/in/padullaparthi-babu-dayal-1ba8b912/>.