Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **359** Type: **Plenary Speaker / Conférencier(ère) plénier(ère)**

Computational electronics: from classical to quantum devices

Monday 9 June 2025 16:15 (30 minutes)

Technology Computer-Aided Design (TCAD) refers to software tools used for modeling semiconductor devices and fabrication processes. As we approach fundamental scaling limits, TCAD must evolve to address new critical frontiers of hardware design: nanoelectronic devices requiring atomic-scale precision and quantum technologies demanding fundamentally new simulation approaches. Over three decades, with our collaborators we worked to develop theoretical formalisms and reduce them to practically useful software of atomistic-TCAD and QTCAD to meet the new challenges of modern computational electronics. I will discuss the present status of this research domain. As examples, predictions of atomistic-TCAD of a novel FET design to achieve low power transistor operation, and predictions of QTCAD on donor spin qubits, will be presented and compared to experimental measurements. The atomistic-TCAD and QTCAD frameworks provide powerful new tools for physics research and technology innovation.

Acknowledgements. I am profoundly grateful to CAP for this honor. This honor represents the collective achievement of an extraordinary team of students, postdocs, and collaborators whose creativity and dedication made these advances possible. Financial support from the federal and Quebec granting agencies, McGill University, and industrial partners are greatly appreciated. I thank the Digital Research Alliance of Canada for substantial computational support.

Keyword-1

Lifetime Achievement

Keyword-2

Medalist

Keyword-3

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Session Classification: M-PLEN3 Achievement Medal Plenary Session | Session plénière - Hong Guo, McGill U.

Track Classification: Herzberg Public and Plenary Talks / Conférenciers des sessions Herzberg et plénières