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## Career Summary

A technology-focussed 16-year academic career followed by a move into entrepreneurship with a pattern of leading high-performance technical teams in aggressive developments of disruptive technologies, largely derived from the academic research.

## Technologies Developed

bandpass  $\Delta\Sigma$

The first rigorous work on bandpass  $\Delta\Sigma$  converters and on continuous-time  $\Delta\Sigma$  loops (originally bandpass, but later generalized) led to prototype converters clocking at GHz rates. Commercial versions are now in radars, digital receivers and RF power amplifiers.

switching RF power amplifiers

An asynchronous type of bandpass  $\Delta\Sigma$  converter allowed switched feedback techniques to operate at RF, giving high efficiency and small form-factor power amplifiers at 2GHz and 200W.

complex analog filters

Developing a rigorous theory for I/Q filtering allowed generalization of older Hilbert-filter circuits to provide circuit structures well suited to integration; commercial embodiments are in receiver IF strips and RF power amplifiers.

adaptive analog filters

A range of techniques, specifically adapted to integration, for controlling analog filters; resulted in high-volume commercial products in wireline data and storage read channels.

A/D diagnosis and trim

Early contributions to diagnosis and test of pipeline A/D converters led to new "on-line" automatic trimming techniques now being commercialized for commodity data communications products.

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Parallel Processing

Early work on "smart memory" SIMD computing, and particularly for video signal processing, led to a family of five US patents sold to MO-SAID and licensed on from there. The machine vision for the latest Lexus, for example, is based on this technique.

## Chronology

2008 - .	Founder & CEO, Kapik Integration, a design services firm specializing in "smart analog"
2004 - 2008	Founder & CTO, Dissonance Inc., which has done consulting for PulseWave RF (linearizing switching RF PAs), Isco Int'l. (new DSP-based interference management system for basestations), Snowbush Inc. (various, but principally disk-drive read channels), et al.; concurrently Chief Technologist at PulseWave RF
1998/07 - 2003/12	Cofounder & CTO, Soma Networks, Inc.; took the company to first product shipment of a full wireless local loop system
1998/07-1999/07	Chief Scientist, Philsar Electronics, Ottawa; spin-out of Carleton lab, patents and chips based on lab technologies of bandpass delta-sigma and adaptive correction of I/Q circuits; company sold to Conexant
1992/07 - 1999/06	Professor and holder of the OCRI/NSERC Industrial Research Chair in High-Speed Integrated Circuits, Dept. of Electronics, Carleton University, Ottawa; collaborations with Nortel & Mitel; theory and GHz realizations for continuous-time $\Delta\Sigma$ and for self-trim in multistep A/D
1987/07 - 1992/07	Associate Professor, Dept. of Electrical Engineering, University of Toronto; invention of complex $\Delta\Sigma$
1991/03 & 04	Visiting Professor, Oulu University, Finland
1989/01-07 & 1990/01-07	Resident Visitor, AT&T Bell Labs, Reading, PA; first work on bandpass $\Delta\Sigma$
1982/07-1987/06	Assistant Professor, Dept. of Electrical Engineering, University of Toronto; developed technologies in SIMD and MIMD signal processing
1982/01-07	Visiting Investigator, Instituto Nacional de Astrofisica, Optica y Electronica, Tonantzintla, Pue., Mexico
1982	Ph.D. thesis: initial theory for state-space filter synthesis and self-trim and for complex analog filtering

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## Patents

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