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Objective

Use my technical strength, leadership experience, and communication skill to help define and achieve corporate goals.

Summary

I see my strength as a combination of experience in modeling and simulation as well as experiments and processing. I have led efforts, and have been part of larger efforts, to identify opportunities, secure funding, assemble teams, define targets, establish facilities, and monitor R&D accomplishments. In academia I established and ran materials processing and testing laboratories, as well as process and materials simulation efforts. My microelectronics research groups worked with IC companies and equipment suppliers to improve process models. In industry I worked in both process development and process modeling and simulation.

Being a successful corporate leader is much the same as being a successful academic researcher. A key role for either is to help define exciting goals, then explain the purpose, progress, and potential of R&D projects to investors, collaborators, and customers. Developing people is central to good leadership in either position.

For an academic CV visit https://www.process-evolution.com/cale/CV/academic_cv.pdf which lists hundreds of relevant publications and presentations. For a longer version of this resume visit https://www.process-evolution.com/cale/CV/bio_5pages.pdf which expands on relevant leadership and technical contributions. Please let me know of any access issues. References are available on request.

Education

Ph.D. Chemical Engineering, University of Houston, 1980 (Dissertation in supported heterogeneous catalysis)

B.S. Chemical Engineering, Arizona State University, 1976 (summa cum laude)

Experience

Industrial (post-BS):

1997 -	Principal, Process Evolution, Ltd., a software and consulting company focused on material evolution; particularly in “3d printing” and IC fabrication
2011 - 2015	Advisor, CTO (2013-15), reNature, Inc., a startup focused on bio-processing food waste to soil additives
2008 – 2011	CTO, Ambature, LLC, a startup focused on superconducting materials and devices
1991 – 1997	Process Simulation Engineer, Motorola - summers, a sabbatical year, and a year on assignment by ASU
1986	Process Engineer, Intel, summer - an intro to IC fabrication
1976	Process Engineer, Monsanto, before grad school - an intro to petrochemical processing

Academic:

1998 - 2007	Professor of Chemical Engineering, Rensselaer Polytechnic Institute
1998 - 2004	Director, Focus Center - New York, RPI: Interconnections for Hyperintegration
1993 - 1995	Director, Center for Solid State Electronics Research, ASU
1981 - 1997	Professor of Engineering, ASU (Asst., Assoc., Full)

Selected Leadership Contributions

Industrial:

CTO of Ambature, LLC: We established a laboratory to fabricate and test superconducting materials and devices. The value of Ambature soared based on developments made by my technology team. I

developed a crucial collaboration with ASU for specialized fabrication and testing, in addition to accessing relevant expertise. The company is now producing devices for customer testing.

CTO of reNature, Inc.: We established a pilot scale bioreactor system to convert food waste into soil additives. In parallel with demonstrating process viability, we worked with farmers to test our additives. Though the process is viable, and field tests showed promise, the economics were not right. The effort ended in 2017.

Academic:

I developed successful academic research programs by proposing exciting projects, and working with funding agencies to ensure impact, satisfaction, and continuation. It was exciting to help define new areas of research and establish my R&D and business development leadership credentials. These led to my directing two microelectronics-focused academic research centers:

1. Focus Center – New York, Rensselaer: Interconnections for Hyperintegration: At RPI I managed a multi-million dollar per year portfolio of projects to develop materials and processes, as well as materials, process, and device simulations. I developed external and corporate collaborations to make the center a success. We made a major impact in “3D ICs”, a crucial area of IC R&D today.
2. Center for Solid State Electronics Research at ASU: The goal of “CSSER” was to broadly facilitate solid state electronics research. The facilities included a clean room, and multi-project processing, testing, and simulation tools. My most impactful contribution at CSSER was driving leadership exchanges between Motorola and ASU.

Professional:

I served on program committees of many conferences and symposia, presented keynote and invited talks at many conferences and symposia, and am co-author of hundreds of papers and hundreds of presentations. I offered short courses to improve process understanding. I was the major adviser for more than 50 graduate students who now contribute via careers in industry, academia, and government.

Selected Technical Contributions

I have established several materials processing and characterization laboratories. The materials processed and tested in these laboratories ranged in scale from milliliters of catalysts and specialized centimeter scale equipment to silicon wafers processed in industrial scale equipment. I also set up computational facilities and directed modeling and simulation efforts. I am probably best known for IC process and materials modeling and simulation.

My first major research area, pursued at ASU, was heterogeneous catalysis. More on this phase of my research activities can be found via the links in “Summary”.

Microelectronics was my second focus of research and teaching. At both ASU and RPI, I worked with IC companies and equipment suppliers to improve our understanding of key aspects of IC fabrication processes. These processes include PVD, CVD, PECVD, ALD, ECD, and CMP. We also demonstrated multiscale modeling, from submicron film conformality in features, to pattern scale loading, to wafer scale uniformity. For more detailed information on the modeling and simulation efforts related to such processes, see my academic CV (see first link in “Summary”). Or ask me for pointers.

The FC-NY, RPI participated on an academic, industrial, and government team that helped restart worldwide R&D in “3D-ICs”. Our 3D-IC process team at RPI worked with Albany Nanotech process researchers to demonstrate stacked wafer interconnections. Our 3D-IC simulation team at RPI used process, thermomechanical, and materials modeling in a start towards establishing design windows to guide the development of stable, reliable 3D-IC interconnects. More details can be found in the links in "Summary”.