

Curriculum vitae

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Founded July 29, 1999

Independent Consulting since October 1995

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TECHNICAL ACCOMPLISHMENTS & EXPERIENCE

Expert Consulting

EXECUTIVE SUMMARY

Senior consultant, domestic and international, in the following major areas:

1. Classical chemistry and biochemistry, especially the separation, purification, characterization and analysis of small molecules, enzymes and proteins and related processes. Adept at assessing and evaluating current processes and procedures!
2. Chemical and biochemical processes, their development, evaluation, optimization, including biocatalysis (enzymatic and microbial) and applied biotechnology
3. Environmental science, especially bioremediation
4. Microbiology & fermentation science
5. Regulatory compliance (OSHA, EPA, Groundwater, USDA, Homeland Security, etc.)
6. Expert witness & consultant; patent infringement, claim construction, trade secrets,

LABORATORY AND APPLIED BIOCHEMISTRY & CHEMISTRY: PROCESSES, ANALYSIS AND SEPARATIONS SCIENCE:

Broad experience and understanding of physical, chemical and biochemical processes and related analytical methods (assay development) and: spectroscopy, electrophoretic and chromatographic separations, protein modification, ligand binding, enzyme assay and kinetics, thermodynamic calculations etc.

- Analytical chemistry, bioassays and separations science (especially chromatography, liquid-liquid extractions, countercurrent separations; electrophoresis)
- Biochemistry and biophysics combined with physical chemistry, especially through the use of UV/Vis (Ultraviolet / Visible) Spectrophotometry
- Separations technology for purification and analysis of numerous small molecules, proteins, peptides, carbohydrates, and natural products used in commercial applications

- Small molecule binding studies, ligands, inhibitors especially involving enzymes
- Adsorbents, ion exchange and activated carbon
- Separations science experience includes extensive application of:
 - ❖ Chromatographic separations
 - DEAE cellulose
 - CM cellulose
 - DEAE Sephadex
 - CM Sephadex
 - Hydrophobic interaction chromatography (HIC)
 - Sepharose
 - Size exclusion
 - ❖ Electrophoresis
 - PAGE
 - SDS
 - Cellulose acetate
 - ❖ Membrane separations
 - Reverse Osmosis
 - Ultrafiltration
 - Microfiltration
 - ❖ Liquid/liquid, Liquid/solid separations
 - ❖ Precipitation using...
 - Chaotropic agents (altering solubility, salting out, precipitations)
 - Salts
 - Organic solvents

PROCESS EVALUATION

- Adept at evaluating current processes at customer facilities in the Chemical, Biochemical, Microbiological and Food industries and suggested improvements to increase efficiency and reduce costs.

CHEMISTRY and BIOTECHNOLOGY

Expert in applied industrial chemistry, enzymology, biocatalysis, biotransformations & bioprocessing, especially low-waste “green” systems and thermostable enzymes; emphasis on practical aspects of research, development, scale-up, pilot plant and commercialization. Adept at working with both laboratory personnel & development engineers; hands on when needed.

- Applied enzymology: Marriage of organic chemistry and enzymology... use of enzymes to make products in high yield with little waste (see examples below).
- Industrial enzyme projects include mostly “green” and thermostable industrial processes; Expert in continuous, heterogeneous biologically catalyzed processes (immobilized enzymes and immobilized whole cells).
 - Preparation and application of immobilized whole cell hydantoinase suite of enzymes for industrial biotransformation process for production of enantiomerically-pure amino acids
 - Pilot-scale immobilization of pig liver esterase for production of anti-AIDS drug and subsequent project management for scale-up
 - Employing a statistical DOE approach for optimizing coupling of a peptide with a microbial polysaccharide for commercial vaccine production (Tetanus Toxoid); optimization of conditions for efficient coupling of enzyme to chemically-modified polymer surface

- Optimization of ethanol precipitation of plasma proteins for industrial plasma fractionation
- Acetone precipitation and purification of proteins
- Use of salts for commercial enzyme/protein purification
- Development and testing of novel hydrophobic enzyme support for industrial lipase, esterase application in production of pharmaceuticals
- Fermentation, E. coli producer strain, optimization of cell yield
- Immobilization and application of genetically modified Pseudomonas sp lipase for enantioselective hydrolysis of pharmaceutical intermediates
- Research and commercial development of novel, incompressible, high-throughput immobilized enzymes (food industry).
- Invention, application, and development of new method for enzyme stabilization
- Invention of novel magnetic support for enzyme immobilization
- Commercial application of thermodynamics of activation vs. deactivation (Arrhenius plot) to increase industrial enzyme process efficiency by 20-30%
- Other industrial bioprocessing, enzyme transformation and biochemical projects include:
 - Purification, characterization and application of numerous enzymes, especially with metal or metalloids cofactors, including:
 - Carbonic anhydrase (zinc; for CO₂ sequestration)
 - Superoxide dismutase (copper / zinc; superoxide destruction)
 - Horseradish peroxidase (iron heme; enzyme stabilization; generation of oxidants)
 - Catalase (iron heme; peroxide catalysis)
 - Hemoglobin (iron heme; oxygen transfer)
 - Glutathione peroxidase (selenium)
 - Carbohydrate conversions (see food section)
 - Chemical modification of hydrocolloids for metal binding application (food and environmental applications)
 - Hydrocolloids for enzyme immobilization (food application)
 - Lipases for making synthetic cocoa butter
 - Lipases (esp. Cal B, thermostable) for mono- di- and triglyceride production and transesterification; value added products (especially involving ferulic acid, soy/soya lipids/oil, fish oil)
 - Lactase /protease combination employed for whey treatment
 - Yeast alcohol oxidase for methanol oxidation
 - Glucose oxidase for production of D-glucono- δ -lactone
 - Glutaraldehyde as sterilant for food applications
 - Biochemical fuel cell
 - Microbiology, especially fermentative production of enzymes
- Medical and Pharmaceutical:
 - Use of applied enzymology for the production of pharmaceutical intermediates;
 - Patent holder, peptide-based anti-microbial pharmaceuticals employed in wound dressing applications.
 - Small molecule protection against reperfusion injury (ischemic stroke and heart attack) and anti-inflammatory effects of riboflavin (vitamin b2)
 - Small molecules and metals to enhance wound healing rates

ENVIRONMENTAL BIOTECHNOLOGY, INDUSTRIAL EFFLUENT PRETREATMENT, BIOREMEDIATION AND EMISSIONS TREATMENT

- Nationally-recognized consultant in biological and chemical treatment of air pollutants, hazardous waste, hazardous chemicals, water pollution, drinking/potable water

- Inventor of Biological Air Treater (BAT) for low-cost transfer of gases / vaporous organics (air pollutants) from air phase to water phase and subsequent biocatalytic transformations (patented/commercial)
- Microbial ecology approach to waste treatment and bioremediation
- Extensive field experience... pilot plant direction, data analysis, scale-up estimation, commercialization; patent holder, biologically-based reactor development and commercialization (especially fixed-film reactors)
- Developed structured adsorbent used as microbial support in bioremediation of industrial effluent, groundwater and vaporous (air) emissions (patented/commercial)
- Developed mixed media employed as plugging-free microbial support in bioreactor packing (patented/commercial)
- Developed *in situ-ex situ* bioremediation method for detoxification of metals, especially hexavalent chromium, Cr(VI), by combining inorganic chemistry and microbial ecology (sulfate reducing bacterial consortia); patented
- Chemically modified natural polymers for use as heavy metal adsorbers.
- On-Site international experience (China [PRC], Taiwan [ROC], UK)
- Designed and implemented numerous waste treatment and remediation strategies for diverse industrial effluents, impacted groundwaters, drinking water, soils, and air emissions
- Supervised replacement of PCB (polychlorinated Biphenyl) -Transformer and replaced with non-toxic, biodegradable electrolyte-containing transformer

FOOD AND NUTRITIONAL SUPPLEMENTS

- Carbohydrate transforming enzymes, esp. glucoamylase, alpha amylase, glucose isomerase
- Fish oil and Omega-3 fatty acids

FOOD SAFETY AND FDA

- Food storage and handling
- Odor reduction and sanitation using chlorinated chemicals
- HACCP plans (Hazard Analysis and Critical Control Point) and process flow charts, especially for ready to eat foods
- SSOP (Sanitation Standard Operating Procedures); Regulatory requirements under the federal meat inspection act and the poultry products inspection act, especially 9cfr PART 416—SANITATION)

REGULATORY, OSHA & EPA

- Multiple private consulting projects to achieve compliance with Federal & State regulations, including
 - ⇒ OSHA 1910.119, Process Safety Management (PSM)
 - ⇒ EPA 112r, Risk Management Planning (RMP);
 - ⇒ SARA Title III Emergency Planning and Community Right to Know Act (EPCRA);
 - ⇒ Storm Water Pollution Prevention Plans (SWPPP).
- Drinking water standards

TECHNICAL MARKETING, SALES, MANAGERIAL & BUSINESS ACCOMPLISHMENTS & EXPERIENCE

- Experienced in all phases of commercialization business, from research to development to marketing and sales;
- Successfully commercialized laboratory scale reactor (biological waste treatment) through rapid development phase into commercial product; business profitable at 13 months; ten-fold increase in sales.
- Account manager, proposal generation, expert in managing numerous \$100K to \$1000K projects from conception to commercialization.
- Budgetary estimation.
- Technical sales presentations directly to customers; responsible for visiting outside customers to determine their actual needs and then partnering/ bridging with internal experts to achieve technical and commercial goals.
- Technical marketing and sales, environmental area.
- Excellent communication skills.
- Professional recruiting (fourteen years).
- Long-term experience in TQ approach to solving cross-disciplinary problems with teams of 2 to 10 individuals, on and off site.

EXPERT WITNESS and PATENT INFRINGEMENT

- Experienced (defendant and plaintiff)
 - Insurance investigations
 - Expert witness
 - Deposition
 - Evidentiary hearing
 - Preparation for trial
 - Patent infringement, claim construction, trade secrets
 - Litigation-related experience supplied upon request

EDUCATION

- **Postdoctoral Fellow** under Prof. Quentin H. Gibson, Cornell University, 7/76 - 7/78.
- **Postdoctoral Fellow** under Prof. Donald E. Hultquist, The University of Michigan, 1/76 - 6/76.
- **Ph.D.**, Biological Chemistry, The University of Michigan, 9/71 - 1/76.
- **BA**, Chemistry (Honors), Queens College, The City University of New York 5/71.

SELECT TRAINING/DEVELOPMENT/PRESENTATIONS

- HAZWOPPER Emergency response Refresher Training (40 hour initial training, 8 hour Haz. Waste Operations Management continuing yearly), 1991 to Current (1995).
- Emergency Notification Release Reporting Training, EPCRA 304; CERCLA 103 (EPA Region 5), 1999
- Risk Management Program Assistance (IEMA), 1999
- Basic Ammonia Refrigeration, 1998
- Statistical Design of Experiments (DOE), 1996
- Scorecard Training, 1996

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