

TD173.5

QUEEN

TDE

173.5

.R4 1 A2

1990

IC



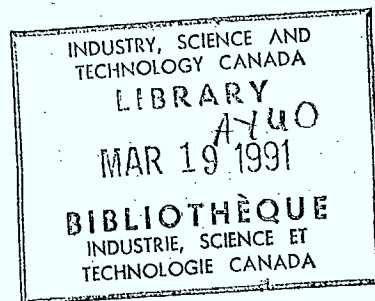
Industry, Science and
Technology Canada

Industrie, Sciences et
Technologie Canada



DIRECTORY OF EXPERTISE
IN
POLLUTION CONTROL TECHNOLOGIES

Canada



**DIRECTORY OF EXPERTISE
IN
POLLUTION CONTROL TECHNOLOGIES**

March 1990

**Prepared by
Jean Reavley**

**Stargate Consultants Limited
Box 995, Station B
Ottawa, Ontario
K1P 5R1**

(613) 224-2940

CONTENTS

Federal and Provincial Governments -----	1
University-based Expertise -----	27
Provincial Research Organization-based Expertise -----	59
Foreign-based Expertise -----	75

**FEDERAL AND PROVINCIAL
GOVERNMENTS**

Lee A. Beaudette

Biohydrometallurgist
CANMET
Energy, Mines and Resources
555 Booth Street
Ottawa, Ontario K1A 0G1

Tel: (613) 992-1416

Fax: (613) 996-9673

Area of Expertise:

- Biodegradation of oxalate ions using a rotating biological contactor (RBC)
- Biological removal of cyanide wastes

Recent Titles:

Beaudette, L. Development of an oxalate biodegradation process using a rotating biological contactor", M.Sc. Thesis, Carleton University, Ottawa, Ontario, 1989

Gould, W.D., Beaudette, L. and McCready, R.G.L. Destruction of cyanide from gold mill effluents using enzymes", in Proceedings of the Third Annual General Meeting of BIOMINET, August 20-21, 1986, Publication SP 86-9E, 1986

Genevieve Béchar

Biohydrometallurgist
CANMET

Energy, Mines and Resources Canada
555 Booth Street
Ottawa, Ontario K1A 0G1

Tel: (613) 992-2489

Fax: (613) 996-9673

Area of Expertise:

- Biological treatment of acid mine drainage
- Biodegradation of organic compounds

Catherine Chalykoff

Biohydrometallurgical Research Technician Tel: (613) 992-1244
CANMET
Energy Mines and Resources Fax: (613) 996-9673
555 Booth Street, Room 304
Ottawa, Ontario, K1A 0G1

Area of Expertise

- Biodegradation of waste organics
- Biological mitigation of acid mine drainage
- Cyanide degradation

Recent Titles

Gould, W.D., McCready, R.G.L., Salley, J., Rajan, S., Chalykoff, C. and Beaudette, L. Microbial treatment of industrial effluents. BIOMINET Proceedings. 1988. pp. 39-56. CANMET SP88-23

Chalykoff, C., Gould, W.D., McCready, R.G.L., and Yamazaki, H. Degradation of aliphatic glycols by a Pseudomonas putida isolate. (in preparation)

C. Edward Capes

Section Head, Chemical Engineering
Chemistry Division
National Research Council
Bldg M-12, Room 140
Montreal Road
Ottawa, Ontario K1A 0R6

Tel: (613) 993-2455

Fax: (613) 952-1275

Area of Expertise

The following information relates to the Chemical Engineering Section (approx. 19 staff) and the Colloids group (5 staff) of the Chemistry Division of NRC. Both groups can be contacted through C.E. Capes.

- Oily waste water treatment by adsorption on secondary waste, and by membranes
- Contaminated soil treatment
- Membrane separation (RO/UF) for various water pollution problems
- Development of membrane materials and systems for various abatement strategies
- Process engineering to prevent pollution

Selection of Recent Titles

Hazlett, J.D., Coleman, R.D., Toll, F. and Capes, C.E. Treatment of oily sludges using coal/oil agglomeration. Special NRCC Report C-1175-89S

Tremblay, A.Y., Matsuura, T., Guiver, M.D., Tam, C.M., Kutowy, O. and Hazlett, J., Biotechnology aspects of the membrane materials and technology program at the NRC. Special NRCC Report No. C-1183-89S

Hazlett, J.D., Kutowy, O. and Tweddle, T.A. Commercial ultra-filtration membrane performance evaluation. Proceedings of the 2nd ICSST Conference, M.H.I. Baird and S. Vijayan, eds., CSChE, Ottawa, 1989, pp. 65-70

Guiver, M.D., Tremblay, A.Y. and Tam, C.M. Reverse osmosis membranes from novel hydrophilic polysulfones. In Advances in Reverse Osmosis and Ultrafiltration, T. Matsuura and S. Sourirajan, eds., NRC, Ottawa, 1989, pp. 53-70

Claudio A. Chuaqui

Head, Biomass Section
Atomic Energy of Canada Limited
Research Company
Pinawa, Manitoba
R0E 1L0

Tel: (204) 753-2311
Fax: (204) 753-8802

Areas of Expertise

- Chemical transformations of biomass and separation and identification of components. Work involved wood and wood products, wood processing, chemistry of cellulose and derivatives, chemistry of lignin, identification and separation of lignin derivatives
- Radiation processing of biomass materials such as wood and derivatives, sludges
- Production of chemicals from biomass materials

M.P. Fillion

Coordinator, Environmental Technology
CANMET
Energy, Mines and Resources Canada
555 Booth Street
Ottawa, Ontario K1A 0G1

Tel: (613) 992-8736

Fax: (613) 996-9673

Area of Expertise:

- Coordinator of the Mine Environment Neutral Drainage Program
- Assessment of waste management practices and impacts resulting from the mining industry and in particular base metals and uranium.
- Coordinating research into waste reduction by recycling, stabilization of sludge, demonstration of technologies to decommission mine sites, particularly sites producing acid mine drainage.

Recent Titles:

Fillion, M.P. and Ferguson, K. Acid mine drainage research in Canada. In Proceedings of the 28th Annual Conference of Metallurgists, Canadian Institute of Mining and Metallurgy, Halifax, N.S., August, 1989

Fillion, M.P. The Mine Environment Neutral Drainage (MEND) program and progress to date. Mineral Sciences Laboratories Division Report MSL 88-115, September, 1988

Fillion, M.P. Dynamic behaviour of rotating biological contactors. Thesis, McMaster University, Hamilton, Ontario, 1979

W.D. Gould

Microbiologist
CANMET
Energy Mines and Resources
555 Booth Street
Ottawa, Ontario, K1A 0G1

Tel: (613) 992-1885

Fax: (613) 996-9673

Area of Expertise

Treatment of effluents produced by the mineral industry using rotating biological contactors, in particular, the treatment of waters containing selenium, cyanide, and ethylene glycol.

Recent Titles

Gould, W.D., Krouse, H.R., McCready, R.G.L., and Rajan, S. Stable isotope composition of sulphate produced during bacterial oxidation of various metal sulphides. Canadian Society of Microbiologists, 38th Annual Conference, 1988. p. 54.

Sanmugasunderam, V., Gould, W.D., McCready, R.G.L., Rajan, S., Beaulne, M. and Mainwaring, P. Bacterial and chemical leaching of complex sulphide ores. Proceedings of the Fourth Annual General Meeting of BIOMINET. Nov. 5, 1987. Sudbury. R.G.L. McCready, Editor. pp. 103-116. CANMET Special Publication, SP87-10

McCready, R.G.L., Sanmugasunderam, V. and Gould, W.D. Workshop on basic microbiology for the mineral industry. 1986.

Gould, W.D., McCready, R.G.L., Salley, J., Rajan, S., Chalykoff, C. and Beaudette, L. Microbial treatment of industrial effluents. BIOMINET Proceedings. 1988. pp. 39-56. CANMET SP88-23

Dr. S.R. Guiot

Research Officer
Biotechnology Research Institute
National Research Council of Canada
6100 Avenue Royalmount
Montreal, Quebec, H4P 2R2

Tel: (514) 496-6181

Fax: (514) 496-6232

Area of Expertise

- Anaerobic biotechnology of industrial wastewaters
- Reductive detoxification - anaerobic toxicity tests
- Bioreactor design - H₂ control
- Self-immobilized biomass systems (environmental, nutritional, metabolic, hydrodynamic factors)
- Interspecies and interphase transfer of metabolites
- Pulp and paper and food processing wastewaters
- H₂S reduction

Recent Papers

Pauss, A., Samson, R., Guiot, S.R. and Beauchemin, C. Continuous measurement of dissolved H₂ in anaerobic digestion using a new hydrogen/air fuel cell probe. Biotechnology Bioengineering, 1990, Vol. 35, pp. 492-501

Pauss, A. and Guiot, S.R. Thermodynamic evidence of trophic microniches in methanogenic granular sludge-bed reactors. Applied Microbiology and Biotechnology, 1990, Vol. 33, pp. 88-92

Pauss, A., Andre, G., Perrier, M. and Guiot, S.R. Liquid-to-gas mass transfer in anaerobic processes: inevitable transfer limitations of methane and hydrogen in the biomethanation process. Appl. Environ. Microbiology, 1990, Vol. 56, pp. 1336-1344

MacLeod, F.A., Guiot, S.R. and Costerton, J.W. Layered structure of bacterial aggregates produced in an upflow anaerobic sludge bed and filter reactor. Appl. Environ. Microbiology. 1990, Vol. 56, pp. 1298-1307

Mr. P. Isles

Manager
MISA Office - Industrial Section
5th Floor, 1 St Clair Avenue West
Toronto, Ontario, M4V 1P5

Tel: (416) 323-4842

Areas of Expertise

The Ontario Government's Municipal-Industrial Strategy for Abatement (MISA) is a program to reduce the flow of toxic chemicals into the environment. The outcome of the program will be to establish regulations for each industrial sector and the municipal sector. A pollution monitoring program for each industrial sector has been established. Regulations for pollution abatement based on best available technology standards will be established for each sector and polluters in that sector will be required to meet the sector's BAT standards. The process is being developed in consultation with industry.

The industrial sectors under the MISA program are:

- electric power generation
- industrial minerals
- inorganic chemicals
- iron and steel
- metal mining and refining
- organic chemicals
- petroleum refining
- pulp and paper

Kevin J. Kennedy

Project Leader
Anaerobic Bioprocessing Group
Division of Biological Sciences
National Research Council of Canada
100 Sussex Drive
Ottawa, Ontario, K1A 0R6

Tel: (613) 998-7891

Fax: (613) 952-9092

Area of Expertise

Biological wastewater treatment of industrial, agricultural and domestic waste. Specific expertise in anaerobic treatment systems, process development design and optimization. Present wastes of interest include pulp and paper wastes, chemical industry wastes, industrial and municipal landfill leachates, and chlorinated aromatics.

Major project of the Anaerobic Bioprocessing Group are:

- Study and application of methanogenic bacteria. This comprises activities in determining the structures and metabolic pathways of the various methanogenic archeobacteria.
- Development of anaerobic treatments of difficult and toxic effluents and substances. Much of this work has been in collaboration with industry, e.g., with Paques Lavalin on processing of chemithermomechanical pulp (CTMP) and thermomechanical pulp (TMP) wastes; with Diversified Research laboratories on kraft mill wastes. The research focus on the recalcitrant compounds is primarily on chlorinated small aromatic molecules. A major project is on the design of reactor systems and their control in order to develop complete systems for the anaerobic destruction of recalcitrant compounds.

Recent Titles

Kudo, A., Kennedy, K., and Andras, E. Anaerobic (USAB) treatment of pulp (CTMP) wastewater and the toxicity on granules. Journal of Water Science and Technology (in press).

Kennedy, K.J., Gorus, S.S., Elliott, C.A., Andras, E., and Guiot, S.R. Media effects on performance of anaerobic hybrid reactors. Water Research, 1989, Vol. 23, No. 1, pp. 1397-1405

McCarthy, P.J., Kennedy, K. and Droste, R.L. Role of resin acids in the anaerobic toxicity of chemithermomechanical pulp waste. Water Research (accepted).

Sanchez, W.A., Kennedy, K., Hamoda, M.F. and Droste, R.L. A study of anaerobic sequencing batch reactors for the treatment of soluble wastes. 44th Annual Purdue Industrial Waste Conference, 1989, Chapter 25. NRCC 30381

Lyne Lortie

Biohydrometallurgist
CANMET

Energy, Mines and Resources Canada
555 Booth Street
Ottawa, Ontario K1A 0G1

Tel: (613) 992-7286

Fax: (613) 996-9673

Area of Expertise:

- Treatment of mill wastes to remove selenium
- Use of rotating biological contactor for the treatment of mineral industry effluent

Alex MacLeod

Petroleum Microbiologist
CANMET
Energy, Mines and Resources Canada
555 Booth Street
Ottawa, Ontario K1A 0G1

Tel: (613) 992-2489

Fax: (613) 996-9673

Area of Expertise:

- Ultrastructure and biochemistry of microbial consortia present in the granular sludge of anaerobic digesters
- Growth of methanogens
- Immobilization of microorganisms by self aggregation (applicable to the optimization of upflow anaerobic sludge blanket reactors)
- Biofilm development and nutrient removal in filter beds (applicable to operation of trickling filter wastewater treatment)

Recent Titles:

MacLeod, F.A., Lappin-Scott, H.M. and Costerton, J.W. Plugging of a model rock system using starved bacteria. Applied and Environmental Microbiology, Vol. 54, pp. 1365-1372

MacLeod, F.A., Swit, S.R. and Costerton, J.W. The layered structure of bacterial aggregates produced in an upflow anaerobic sludge blanket reactor. Submitted to Applied and Environmental Microbiology

Dr. R.G.L. McCready

Head, Biotechnology Section
CANMET
Energy, Mines and Resources Canada
555 Booth Street
Ottawa, Ontario K1A 0G1

Tel: (613) 992-1596

Fax: (613) 996-9673

Area of Expertise:

- Biodegradation of organics in industrial effluents
- Bioadsorption of metal ions
- Bioreduction of metal oxyanions
- Biological mitigation of acid mine drainage
- Biodegradation of hydrocarbon wastes

Recent Titles:

Gould, W.D., Chalykoff, C., McCready, R.G.L., Salley, J. and Worgan, J. Microbial degradation of ethylene glycol using a rotating biological contactor. In BIOMINET Proceedings, 1989

Bechard, G., Rajan, S., Salley, J. and McCready, R.G.L. Neutralization of acid mine drainage using microbial processes. In BIOMINET Proceeding, 1989

Tsezos, M., McCready, R.G.L. and Bell, J.P. The continuous recovery of uranium from biologically leached solutions using immobilized biomass. Biotechnology and Bioengineering, Vol. 34, 1989, pp. 10-17

Clemens Moche

Environmental Engineer
Manitoba Department of Environment
Building 2, 139 Tuxedo Avenue
Winnipeg, Manitoba
R3N 0H6

Tel: (204) 945-7013
Fax (204) 945-5229

Area of Expertise

Industrial liquid wastes in the following industrial sectors:

- Metal mining
- Pulp and paper mills
- Chemical fertilizer production

Reviews environmental impact assessment proposals, develops legal control licences, and enforces industrial effluent qualities.

Dr. R.P. Overend

Project Leader
Anaerobic Bioprocessing Group
Division of Biological Sciences
National Research Council of Canada
100 Sussex Drive
Ottawa, Ontario, K1A 0R6

Tel: (613) 998-7891

Fax: (613) 952-9092

Area of Expertise

Major project of the Anaerobic Bioprocessing Group are:

- Study and application of methanogenic bacteria. This comprises activities in determining the structures and metabolic pathways of the various methanogenic archeabacteria.
- Development of anaerobic treatments of difficult and toxic effluents and substances. Much of this work has been in collaboration with industry, e.g., with Paques Lavalin on processing of chemithermomechanical pulp (CTMP) and thermomechanical pulp (TMP) wastes; with Diversified Research laboratories on kraft mill wastes. The research focus on the recalcitrant compounds is primarily on chlorinated small aromatic molecules. A major project is on the design of reactor systems and their control in order to develop complete systems for the anaerobic destruction of recalcitrant compounds.

Dr. Girish B. Patel

Senior Research Officer
Division of Biological Sciences
National Research Council of Canada
100 Sussex Drive
Ottawa, Ontario, K1A 0R6

Tel: (613) 990-0831

Fax: (613) 952-9092

Area of Expertise

For the past 16 years, has worked on the microbiology of anaerobic digestion processes used in sewage and industrial waste treatment. Has expertise in the isolation, characterisation, nutritional requirements, biochemical pathways, and ultrastructure of cellulolytic and methanogenic bacteria.

In the last five years has been involved in the successful transfer of technology for the treatment of kraft pulp mill wastes.

Involved in studying the toxicity of haloaromatic and benzene ring compounds such as those in pulp mill wastes, petrochemicals, etc., to pure cultures of methanogenic bacteria. This is applied work that has potential application in the anaerobic treatment of recalcitrant industrial wastes, i.e., how to reduce the toxic effect on bacteria and increase the efficiency of the treatment process.

Recent Titles

Patel, G.B. and Sprott, G.D. Methanosaeta concilii gen. nov., sp. nov., ("Methanothrix concilii") and Methanosaeta thermoacetophila nom rev., comb nov. International Journal of Systematic Bacteriology, 1990, Vol. 40, No. 1, pp. 79-82

Kahn, A.W. and Patel, G.B. Cellulose degradation by mesophilic anaerobic microorganisms. In Biosynthesis and Biodegradation of Cellulose and Cellulose Materials, Volume 2, P.J. Weimer and C.A. Haigler, eds. New York: Marcel Dekker Inc. (in press)

Patel, G.B., Sprott, G.D. and Fein, F.J. Isolation and characterization of Methanobacterium espanolae sp. nov., a mesophilic, moderately acidophilic methanogen. International Journal of Systematic Bacteriology, 1990, Vol. 40, No. 1, pp. 12-18

Ferrante, G., Brisson, J.-R., Patel, G.B., Ekiel, I. and Sprott, G.D. Structures of minor ether lipids isolated from the acetoclastic methanogen, Methanothrix concilii GP6. Journal of Lipid Research, 1989, Vol. 30, pp. 1601-1610

Bernard J. Ryma

Manager
Waste Management Section
Saskatchewan Environment and Public Safety
3085 Albert Street
Regina, Saskatchewan
S4S 0B1

Tel: (306) 787-6191
Fax: (306) 787-0197

Areas of Expertise

- Industrial wastewater
- Hazardous waste treatment and disposal

Joseph Salley

Biohydrometallurgical Engineer
Biotechnology Section
CANMET
Energy Mines and Resources
555 Booth Street
Ottawa, Ontario, K1A 0G1

Tel: (613) 992-1416

Fax: (613) 996-9673

Area of Expertise

- Treatment of mill effluents and tailings for the biorecovery of metals such as selenium using a rotating biological contactor
- The bioadsorption of uranium
- Acid mine drainage
- The biodegradation of organics

Recent Titles

McCready, R.G.L., Salley, J., and Gould, W.D. Biorecovery of selenium from smelter effluents. Proceedings of the Pacific Rim Congress, 1990.

Gould, W.D., Chalykoff, C., McCready, R.G.L., Salley, J. and Worgan, J. Microbial degradation of ethylene glycol using a rotating biological contactor. BIOMINET Proceedings. 1989

Bechard, G., Rajan, S., Salley, J. and McCready, R.G.L. 1989. Neutralization of acid mine drainage using microbial processes. BIOMINET Proceedings. 1989

Gould, W.D., McCready, R.G.L., Salley, J., Rajan, S., Chalykoff, C. and Beaudette, L. Microbial treatment of industrial effluents. BIOMINET Proceedings. 1988. pp. 39-56. CANMET SP88-23

McCready, R.G.L., Salley, J., Hoppe, D.G. and Bartlett, D.R. Progress on emulsification and flotation as means of upgrading a Cu/Mo concentrate. BIOMINET Proceedings, 1987, pp. 147-155. CANMET SP 87-10

Ljuba Simovic

Metal Casting Sector Specialist
Ontario Ministry of the Environment
MISA Industrial
One St. Clair Avenue West
Toronto, Ontario
M4V 1K6

Tel: (416) 323-4833
Fax: (416) 323-2785

Areas of Expertise

- Air stripping of volatile organics - applicable whenever volatiles are present, e.g., in groundwater, industrial effluent, wastewater
- Vapour-phase adsorption - applicable for the treatment of off-gases coming from the air stripper
- Natural degradation of cyanide from gold mining wastewaters

Recent Publications

Simovic, L. and Snodgrass, W.J. Tailings pond design for cyanide control at gold mills using natural degradation. Proceedings of the Seminar - Gold Mining Effluent Treatment, Vancouver, B.C., Feb. 15-16, 1989

Simovic, L., Lishman, L.A. and Zaidi, S.A. The use of air stripping and vapour-phase adsorption processes for the removal of volatile organics from contaminated groundwater. Proceedings of the Second International Conference on New Frontiers for Hazardous Waste Management, Pittsburgh, PA, September 27-30, 197

Simovic, L. and Jones, J.P. Removal of organic micropollutants from contaminated groundwater by oxidation and stripping. Water Pollution Research Journal of Canada, 1987, Vol. 22, No. 1

Ranjit Singh

Chemical Engineer
Biomass Section
Atomic Energy of Canada Limited
Research Company
Pinawa, Manitoba
R0E 1L0

Tel: (204) 753-2311
Fax: (204) 753-8802

Areas of Expertise

- Separation technology
- Supercritical fluid extraction

G. Dennis Sprott

Project Leader
Anaerobic Bioprocessing Group
National Research Council of Canada
100 Sussex Drive
Ottawa, Ontario
K1A 0R6

Tel: (613) 998-7891

Fax: (613) 952-9092

Area of Expertise

Research concerns microbiology of anaerobic waste disposal, specifically concentrating on the methanogens. Works predominantly with pure cultures, from their isolation to studies of metabolic pathways and structural features.

Major project of the Anaerobic Bioprocessing Group are:

- Study and application of methanogenic bacteria. This comprises activities in determining the structures and metabolic pathways of the various methanogenic archeobacteria.
- Development of anaerobic treatments of difficult and toxic effluents and substances. Much of this work has been in collaboration with industry, e.g., with Paques Lavalin on processing of chemithermomechanical pulp (CTMP) and thermomechanical pulp (TMP) wastes; with Diversified Research laboratories on kraft mill wastes. The research focus on the recalcitrant compounds is primarily on chlorinated small aromatic molecules. A major project is on the design of reactor systems and their control in order to develop complete systems for the anaerobic destruction of recalcitrant compounds.

Recent Papers

Sprott, G.D. The F₄₂₀ reducing hydrogenase of Methanospirillum hungatei strain GPI. FEMS 1990 (in press)

Ferrante, G., Richards, J. and Sprott, G.D. Structures of membrane ether lipids from the deep sea archaeobacterium Methanococcus jannaschii. Biochem. Cell Biology. January 1990. (in press)

Ferrante, G., Brisson, J.-R., Patel, G.B., Ekiel, I. and Sprott, G.D. Structures of minor ether lipids isolated from the aceticlastic methanogen Methanotrix concilii GP6. Journal of Lipid Research, 1989, Vol. 30, pp. 1601-1610

Sprott, G.D. Inorganic ion gradients in methanogenic archaeobacteria: a comparative analysis to other prokaryotes. In Metal Ions and Bacteria, T.J. Beveridge and R.J. Doyle, eds. New York, John Wiley and Sons, Inc. 1989

WASTEWATER TECHNOLOGY CENTRE

867 Lakeshore Road
P.O. Box 5050
Burlington, Ontario
L7R 4A6

Bruce E. Jank
Director

Tel: (416) 336-4599/4740

Areas of Responsibility

Responsible for development, demonstration, and marketing of control technology for municipal and industrial liquid effluents, sludges, and hazardous residues.

John H. Neate
Associate Director

Areas of Responsibility

Managing the multidisciplinary research, technology development and technology transfer programs of the Centre.

BIOLOGICAL PROCESSES DIVISION

Henryk Melcer,
Chief

Tel: (416) 336-4546

Areas of Responsibility

Directs research programs focused on the management of toxic contaminants in biological treatment facilities. The division provides improved process design criteria for pulp and paper wastewater treatment plants and the control of activated sludge systems using sensor based computer control, and develops new and improved biological treatment processes.

Computer Control of Biological Treatment Processes

Contact: Gordon Speirs

- Development and demonstration of computer-based process audit techniques for assessing the true capacity of an existing wastewater treatment plant and for determining the energy savings achievable with automated process control
- Development of knowledge-based expert systems for biological treatment processes

Trace Contaminant Control

Contact: H. Melcer or D. Chapman

- Development of a computer-based modelling system which simulates the behaviour of toxic contaminants in order to predict the emission rates of toxic contaminants that occur in treated effluents, waste sludges and process off-gases at municipal wastewater treatment plants
- Development of sampling and analytical protocols for measuring volatile organic chemical emission rates from treatment plants

Pulp and Paper Wastewater Treatment

Contact: Eric Hall

- Re-assessing the performance capabilities of conventional biological treatment processes such as aerated lagoons and activated sludge systems
- Development and demonstration of advanced anaerobic and aerobic biotechnologies for removing toxic compounds such as chlorinated organic chemicals from bleached pulp mill effluents, or the highly concentrated wood extractives in chemi-thermomechanical pulping (CTMP) wastewaters
- Incorporation of advanced physical/chemical techniques, such as membrane separation, into biological treatment systems

Compliance Monitoring Methodology

Contact: David Chapman or H. Melcer

- Development of statistical techniques that would enable regulators and plant operators to interpret treatment plant data more effectively
- Improvement of secondary clarifier design and monitoring methods

Development of Advanced Biotreatment Technologies

Contact: H. Melcer or R. Jones

- Use of autothermal thermophilic aerobic digestion systems
- Techniques for accelerating biofilm attachment and development in high rate anaerobic reactors

PHYSICAL/CHEMICAL PROCESSES DIVISION

J.W. Schmidt
Chief

Tel: (416) 336-4541

Areas of Responsibility

Development and evaluation of new technologies for the physical and chemical treatment of wastewater and contaminated groundwater.

Contaminated Groundwater Treatment Technology

Contact: Robert Booth

- Development and demonstration of cost-efficient technologies for the treatment of contaminated groundwater

Mining

Contact: Abbas Zaida or J.W. Schmidt

- Development of improved and more cost-effective methods of removing cyanide, heavy metals and other contaminants from gold and base metal mining industries' effluents

Oil and Gas

Contact: Abbas Zaida or J.W. Schmidt

- Development and demonstration of cost-efficient treatment technologies, such as vapour compression evaporation or silica removal by activated alumina, for recycling wastewater from heavy oil processing
- Development of reliable on-line oil-in-water monitors for wastewater from offshore oil production

Metal Fabrication and Finishing

Contact: Derek Vachon

- Automated process control for the alkaline chlorination process in metal finishing
- Evaluation and testing of commercial chlorine analyzers

Industrial Pretreatment and Recycling Technologies

Contact: A. Zaida or Sandra Kok

- Evaluation and development of membrane technologies such as electrodialysis, ultra-filtration, micro-filtration, pervaporation, new polymer membranes and supported liquid membranes, for specific industrial wastewaters

- Processes to recover and recycle chlorinated organics from industrial waste streams

Development of Advanced Physical/Chemical Treatment Technologies

Contact: David Averill

- Characterization of suspended particles
- Improved precipitation of soluble pollutants such as phosphorus and aggregation of precipitate particles and other suspended material by coagulation and flocculation
- Improved design of and operating procedures for wastewater treatment employing granular media filtration

RESIDUE MANAGEMENT DIVISION

Herbert W. Campbell
Chief

Tel: (416) 336-4717

Areas of Responsibility

Research activities related to sludge conditioning, sludge dewatering, incineration, cost analysis and evaluation of integrated sludge management systems.

Sludge Treatment

Contact: H. Campbell

- The use of a sludge conditioning controller to measure and adjust the amount of polymer added to a wastewater stream to enhance the dewatering of sludge
- Low temperature conversion of sludge to fuel oil

Land Application of Sludge

Contact: Mel Webber

- Methodology to measure volatile organic contaminants in sludge/soil/water matrices
- Determination of the fate of toxic chemicals in heavy oil wastes and industrial sludges when applied to soil
- A microcosm technique for studying plant uptake of organic contaminants from sludge-amended soils

Waste Characterization

Contact: Tom Constable

- Identification of toxic constituents of various waste residues, and determination of their leachability
- Assessment of methods for conducting leaching tests

Waste Solidification and Stabilization

Contact: Tom Constable

- Development, validation and standardization of test methods for characterizing the effectiveness of solidification techniques

Site Remediation

Contact: Tom Constable

- Evaluation of bioremediation techniques for in situ treatment of PCB contaminated soils
- Development of an expert system entitled, "Aid for Evaluating the Redevelopment of Industrial Sites" (AERIS) which calculates the concentrations of a pollutant in soil, water, air and plants, and predicts the potential human exposure to the pollutant in anticipated land use scenarios.

Recent Titles:

1989 Program Overview, Wastewater Technology Centre, Technology Development Branch, Environment Canada, 1990

UNIVERSITY-BASED EXPERTISE



D. Grant Allen

Professor
Department of Chemical Engineering
and Applied Chemistry
University of Toronto
200 College Street
Toronto, Ontario
M5S 1A4

Tel: (416) 978-8517

Fax: (416) 978-8605

Area of Expertise

- Biochemical engineering
- Biological wastewater treatment

Research has focused on:

- Biological treatment of chlorinated organics from kraft pulp mill effluent
- Biological treatment of pentachlorophenol
- Aerated lagoons

Potential applications:

- Pulp and paper effluent treatment
- Effluent treatment from wood preserving facilities
- Biological remediation of soils

Recent Publications

Allen, D.G. and Robinson, C.W. Measurement of rheological properties of filamentous fermentation broths. Chem. Eng. Sci., 1990, Vol. 45, pp. 37-48

Allen, D.G. and Robinson, C.W. Hydrodynamics and mass transfer in Aspergillus niger fermentations in bubble column and loop bioreactors. Biotechnol. Bioeng., 1989, Vol. 34, pp. 731-740

Allen, D.G., Tomar, P., Hossain, A. and Collins, T. Removal of organochlorine from kraft mill effluent by an aerated lagoon. 25th Canadian Symposium on Water Pollution Research, Burlington, Ontario, Feb. 15, 1990

Allen, D.G. Biochemical engineering approaches to the removal of chlorinated organic compounds. Canadian Pulp and Paper Association, Research Committee Meeting, April 27, 1989.

Laxman (Lucky) M. Amaratunga

Associate Professor
School of Engineering
Laurentian University
Ramsey Lake Road
Sudbury, Ontario
P3E 2C6

Tel: (705) 675-1151 X2251

Fax: (705) 673-6532

Areas of Expertise:

- Mill tailings disposal
- Reduction in tailings pond accumulation
- Prevention of mine acid drainage (MAD) from mill tailings

Recent Titles:

Concept of agglomeration of mill tailings for backfill. Paper presented in Halifax at the CIM Metallurgist Conference entitled, International Symposium on Tailings and Effluent Management, August, 1989

David G.B. Boocock

Professor
Dept. of Chemical Engineering
University of Toronto
200 College Street
Toronto, Ontario
M5S 1A4

Tel: (416) 978-4906

Fax: (416) 978-8605

Areas of Expertise:

- Sewage sludge liquefaction process
- Identification of sewage sludge liquefaction mechanism
- Sewage sludge solvent extraction (potential of reducing amounts of sludge incinerated or dumped)

Selected Recent Titles:

Boocock, D.G.B. and Agblevor, F.A. The origins of phenol produced in the rapid hydrothermolysis and alkaline hydrolysis of hybrid poplar lignins. Journal of Wood Chemistry and Technology, (in Press)

Boocock, D.G.B., Agblevor, F.A., Chirigoni, F. Crimi, T., Khelawan, A. and Campbell, H. The mechanisms of sewage sludge liquefaction during thermolysis. In Thermochemical Biomass Conversions, T. Bridgewater and J. Kuester, eds., Elsevier Applied Science Publishers, in press.

Boocock, D.G.B. Denitrogenation of sewage sludge oils. Final Report for Waste Water Technology Centre, Environment Canada, May, 1988

K.T. Chuang

Professor
Department of Chemical Engineering
University of Alberta
Edmonton, Alberta
T6G 2G6

Tel: (403) 492-4767

Fax: (403) 492-7219

Areas of Expertise

- Separation technology: development of distillation/absorption equipment used in purification of gas and liquid wastes
- NO_x removal process applied to nitration, nitric acid and metal processing plants
- Removal and destruction of organic compounds in waste waters: application areas include chemical, petroleum, petrochemical and pulp and paper plants

J. William Costerton

NSERC Professor of
Biofilm Microbiology
Biological Sciences
University of Calgary
2500 University Drive N.W.
Calgary, Alberta
T2N 1N4

Tel: (403) 220-7301

Fax: (403) 282-4839

Areas of Expertise

- Bacterial remediation of underground spills using ultramicrobacteria (umb) to penetrate low permeability zones
- Accelerated start-up of wastewater reactors by promotion of specific bacterial consortia
- Role of bacterial communities within reactor particles in waste remediation
- Microbial detoxification of oilsands and mining wastes

Recent Publications

Cusack, F., Lappin-Scott, H.M. and Costerton, J.W. Effects of biocide treatment and backflow pressure on the permeability of microbially fouled model cores. *Journal of Industrial Microbiology*, 1988, Vol. 2, pp. 329-335

Lappin-Scott, H.M., Cusack, F. and Costerton, J.W. Nutrient resuscitation and growth of starved cells in sandstone cores: a novel approach to enhanced oil recovery. *Applied and Environmental Microbiology*, 1988, Vol. 54, No. 6, pp. 1373-1382

Lappin-Scott, H.M., Cusack, F., MacLeod, A., and Costerton, J.W. Starvation and nutrient resuscitation of Klebsiella pneumoniae isolated from oil well waters. *Journal of Applied Bacteriology*, 1988, Vol. 64, pp. 541-549

Ronald L. Droste

Associate Professor
Department of Civil Engineering
University of Ottawa
Ottawa, Ontario
K1N 6N5

Tel: (613) 564-3348

Fax: (613) 564-9860

Areas of Expertise:

- Water treatment
- Wastewater treatment (anaerobic biological treatment)
- stormwater management

Selected Recent Titles:

Sanchez, W.A., Kennedy, K., Hamoda, M.F. and Droste, R.L. A study of anaerobic sequencing batch reactors for the treatment of soluble wastes. 44th Purdue Industrial Waste Conference, Purdue University (accepted February, 1989)

Boileau & Associes and Droste, R.L. Etude des couts d'immobilisation et d'exploitation concernant les techniques de traitement des boues et des modes d'elimination finale, Vols. 1-3, Societe Quebecoise D'Assainissement des Eaux, Québec, 1989

Droste, R.L. and Kennedy, K.J. Dynamic model of downflow fixed film reactor. Journal of Environmental Engineering Division, ASCE, 114, 3, 1988, pp. 606-620

Droste, R.L., Guiot, R.L., Gorur, S. and Kennedy, K.J. Anaerobic treatment of dilute wastewaters with an USB reactor. Water Pollution Research Journal of Canada, 22, 3, 1988, pp. 474-490

Droste, R.L. and Kuczynski, L.W. Flocculation in granular media. Proceedings of the 1986 CSCE Annual Conference, Vol. 3, CSCE, Toronto, May, 1986

Leta Fernandes

Assistant Professor
Dept. of Civil Engineering
University of Ottawa
161 Louis Pasteur
Ottawa, Ontario

Tel: (613) 564-7022

Fax: (613) 564-9860

Areas of Expertise

Research, teaching and consulting in the areas of:

- Wastewater treatment (physical, chemical and biological)
- Agricultural waste management
- Water treatment
- Solid waste management
- Water supply and sanitation in developing countries

Recent Titles:

Fernandes, L. An integrated treatment system for liquid swine manure. Ph.D. Thesis, McGill University, 1989

Fernandes, L., McKyes, E. and Obiniak, L. Performance of a continuous belt microfiltration unit for solid/liquid separation of swine waste. Canadian Society of Agricultural Engineering, Vol. 30, No. 2, 1988

Gordon R. Finch

Department of Civil Engineering
University of Alberta
Edmonton, Alberta
T6G 2G7

Tel: (403) 492-5124
Fax: (403) 492-0249

Areas of Expertise:

- Ozone application to wastewater
- Leachate treatment with immobilized cell processes

Recent Titles:

Finch, G.R. and Smith, D.W. Ozone dose-response of Escherichia coli in activated sludge effluent. Water Research (submitted)

Smith, D.W. and Finch, G.R. Editors. Proceedings, Second International Conference on the Role of Ozone in Water and Wastewater Treatment, April 27-29, 1987, Edmonton, Alberta

Heinke, G.W., Smith, D.W. and Finch, G.R. Guidelines for cold climate lagoon design. International Symposium for Cold Regions development, Harbin, Peoples Republic of China, August 9-13, 1988

J.J. Ganczarczyk

Professor
Dept. of Civil Engineering
University of Toronto
Toronto, Ontario
M5S 1A4

Tel: (416) 978-5399

Fax: (416) 978-6813

Areas of Expertise:

- Biological treatment of industrial effluents including pulp mill wastewater
- Detoxification of concentrated cyanide liquors
- Pozzolanic solidification of industrial sludges
- Landfill leachate treatment

Selected Recent Titles:

Zahid, W.M. and Ganczarczyk, J.J. Suspended solids in effluents from biological filters. Water Research, Vol. 24, 1990, pp. 215-220

Li, D-H. and Ganczarczyk, J.J. Structure of activated sludge flocs. Biotechnology and Bioengineering, Vol. 35, 1990, pp. 57-65

Ganczarczyk, J.J. and Guichun, Tang. Simultaneous removal of cyanide and heavy metals from cyanide-containing liquor with polysulfide. (in Chinese), Acta Scientiae Circumstantiae, Vol. 7, No. 2, 1987, pp. 257-262

Suthersan, S. and Ganczarczyk, J.J. Inhibition of nitrate oxidation during nitrification: some observations. Water Pollution Research Journal of Canada, Vol. 21, 1986, pp. 257-266

Dr. Ronald Gehr

Associate Professor
Dept. of Civil Engineering
McGill University
817 Sherbrooke Street West
Montréal, Québec H3A 2K6

Tel: (514) 398-6861

Fax: (514) 398-7361

Areas of Expertise:

- Process design for water and wastewater treatment
- Specialized research interests:
 - dissolved air flotation
 - polyelectrolytes
 - respirometry
 - trihalomethanes
 - fixed-film processes

Recent Titles:

Gehr, R, Bayat-Mokhtari, F., Rao, S.R., Finch, J.A. and Leduc, R. Water treatment and flotation studies on recycle water from a pyrochlore processing plant. in Proceedings of the International Symposium on Processing of Complex Ores, G.S. Dobby and S.R. Rao, eds., Halifax, N.S., August 20-24, 1989, Pergamon Press

Warren, C.F. and Gehr, R. Desorption of cationic polyacrylamide from bleached kraft pulp fibres. Water Science and Technology, Vol. 19, (Rio), 1987, pp. 939-951

Cailas, M.D., Cavadias, G. and Gehr, R. Application of a nonparametric approach for monitoring and detecting trends in water quality data for the St. Lawrence River. Water Pollution Research Journal of Canada, Vol. 21, No. 2, 1986, pp. 153-167

Steve E. Hrudey

Professor
Department of Civil Engineering
University of Alberta
Edmonton, Alberta
T6G 2G7

Tel: (403) 492-4138

Fax: (403) 492-0249

Areas of Expertise

- Hazardous waste management
- Taste and odor problems in water and fish
- Trace organic byproducts of drinking water disinfection
- Risk assessment in water treatment
- Oil sands, heavy oil and coal conversion waste management
- Treatment of phenolic wastewaters
- Anaerobic biological treatment of industrial wastes

Recent Publications

Vandermeulen, J.H. and Hrudey, S.E. Editors. Oil and freshwater: chemistry, biology and countermeasure technology. Pergamon Press, 1987.

Fedorak, P.M. and Hrudey, S.E. Anaerobic degradation of phenolic compounds with applications to treatment of industrial wastewaters. In Biotechnology applied to environmental problems: a. Bioenvironmental Systems. D.L. Wise, editor. CRC Press. (in press)

Fedorak, P.M. and Hrudey, S.E. Cyanide transformation in anaerobic phenol-degrading methanogenic cultures. Water Science and Technology, 1988, Vol. 21, pp. 67-76

Barnes, D., Forster, C.F. and Hrudey, S.E. Editors. Surveys in industrial wastewater treatment: manufacturing and chemical industries. Vol. 3. London, Longmans Ltd., 1987

Peter M. Huck

Professor
Department of Civil Engineering
University of Alberta
Edmonton, Alberta
T6G 2G7

Tel: (403) 492-4138

Fax: (403) 492-0249

Areas of Expertise

- Use of biological processes in drinking water treatment
- Computer modelling of adsorption on activated carbon
- Development of a new process for removal of radium-226 from uranium mining effluents

Recent Publications

Huck, P.M., Anderson, W. and Andrews, R. Removal of radium from aqueous liquids. U.S. Patent issued June 24, 1986. S.A. Patent, 1986. Patents pending in Canada, France and Australia

Huck, P.M. , Anderson, W.B. and Andrews, R.C. Development of a new process for treating uranium mining effluents. Water Science and Technology, 1985, Vol. 17, No. 2/3, pp. 337-350

Huck, P.M., Anderson, W.B., Savage, E., von Borstel, R.C., Daig-nault, S.A., Noot, D/.K. and Williams, D.T. Comparison of ozone to other drinking water oxidants using chemical and biological testing. Proceedings, Second International Conference on the Role of Ozone in Water and Wastewater Treatment, Edmonton, April 27-28, 1987.

P.H. Jones

Professor
Faculty of Civil Engineering
Institute of Environmental Studies
University of Toronto
Toronto, Ontario
M5S 1A4

Tel: (416) 978-7078

Fax: (416) 978-3884

Areas of Expertise:

- Chemical, biological and physical wastewater treatment
- Industrial waste treatment and disposal
- Hazardous waste treatment and disposal
- Biological nutrient removal from wastewaters
- Municipal solid waste management
- General pollution abatement technology

Selected Recent Titles:

Jones, P.H. and Howard, K. Studies of groundwater transport of complex chemicals. Presented at the Pacific Basin Conference on Hazardous Waste, Honolulu, Hawaii, February 1-5, 1988

Jones, P.H. and Tasfi, L. Profile of hazardous waste management and research in Canada; New Zealand; Australia. (3 separate papers), presented at the Pacific Basin Conference on Hazardous Waste, Honolulu, Hawaii, February 1-5, 1988

Jones, P.H. and Tasfi, L. The effect of applied direct current on biological phosphorus uptake. Water Research, 21, 1987, pp. 723-729

Jones, P.H. and Brown, G. Anaerobic digestion study to investigate the biodegradability of a C¹⁴ labelled polymer. Presented at the Centennial Conference of C.S.C.E., Montreal, 1987

Eva Knettig

Associate Professor
Department of Civil Engineering
University of Alberta
Edmonton, Alberta
T6G 2G7

Tel: (403) 492-4138

Fax: (403) 492-0249

Areas of Expertise

- Anaerobic biodegradation of chlorophenols
- Removal of toxic chemicals from wastewaters by activated carbon adsorption
- Operation and evaluation of different biochemical oxidation processes for industrial wastewater treatment (biox, aerated lagoon, trickling filter, biodisc, sludge digestion)
- Operation and evaluation of different physical - chemical treatment processes for industrial wastewater treatment (dual media filtration, induced and dissolved air flotation, activated carbon adsorption, chemical oxidation)
- Oily sludge decomposition by land farming
- Biocides treatment for cooling water
- Flow measurements in sewer systems using tracer techniques
- Analytical procedures for evaluation of activated carbon quality

Recent Publications

Hrudey, S.E., Knettig, E., Fedorak, P.M. and Daignault, S.A. Anaerobic, semicontinuous culture biodegradation of dichlorophenols containing an orthochlorine. Water Pollution Research Journal of Canada, 1988, Vol. 22, pp. 427-436

Hrudey, S.E., Knettig, E., Daignault, S.A. and Fedorak, P.M. Anaerobic biodegradation of monochlorophenols. Environmental Technology Letters, 1987, Vol. 8, pp. 65-76

Knettig, E., Thomson, B.M. and Hrudey, S.E. Competitive activated carbon adsorption of phenolic compounds. Environmental Pollution, Series B., 1986, Vol. 12, No. 4, pp. 281-300

Dr. Roland Leduc

Assistant Professor
Dept. of Civil Engineering
and Applied Mechanics
McGill University
Macdonald Engineering Building
817 Sherbrooke Street West
Montréal, Québec H3A 2K6

Tel: (514) 398-6675

Fax: (514) 398-7361

Areas of Expertise:

- Uncertainty modeling of environmental engineering system
- Computerized design of activated sludge systems and of rotating biological contactors (RBCs)
- Biodegradation of selected polyaromatic hydrocarbons (PAHs) in soils

Paul Lessard

Departement Genie Civil
University Laval
Quebec
G1K 7P4

Tel: (418) 656 -7293
Fax: (418) 656-2928

Areas of Expertise

- Wastewater treatment
- Modelling treatment procedures
- Process control

Recent Publications

Lessard, P. and Beck, M.B. Dynamic modelling of wastewater treatment processes: where does it stand. Environmental Science and Technology. (in preparation)

Lessard, P. and Beck, M.B. Impacts et controle des debits en temps de pluie a une usine d'epuration par boues activees. Sciences Techniques Eau, 1989, Vol. 22, No. 2, pp. 131-140

Lessard, P. and Beck, M.B. Modelling of the activated sludge process: a case of Norwich plant. Biotechnology Bioengineering. (in preparation)

Lessard, P. and Beck, M.B. Dynamic simulation of a primary clarifier. J. Environmental Engineering, American Society of Civil Engineers, 1988, Vol. 114, No. 4, pp. 753-769

Kwan-Chow Lin

Professor
Dept. of Civil Engineering
University of New Brunswick
Fredericton, N.B.
E3B 5A3

Tel: (506) 453-4521

Fax: (506) 453-3568

Areas of Expertise:

- Aerobic and anaerobic biological treatment of wastewaters from municipal and industrial sources such as pulp and paper

Dr. A. Margaritis

Professor and Chairman
Dept. of Chemical and Biochemical
Engineering
University of Western Ontario
London, Ontario, N6A 5B9

Tel: (519) 661-2146

Fax: (519) 661-3808

Areas of Expertise

- Biodegradation of pulp and paper solid wastes and wastewater treatment by the activated sludge process
- Removal of heavy toxic metals from wastewaters originating from metals and minerals processing, surface mining and various chemical industries
- Removal of hazardous compounds from wastewaters by biodegradation techniques
- Processing of mineral ores tailings by bioleaching methods
- Development of extremely sensitive biosensors to measure the concentration (in parts per billion) of toxic pollutants present in wastewaters and "clean" water supplies. This represents a new generation of advanced sensor technology to measure pollutant compounds at extremely low concentrations

R.J. Mitchell

Professor
Dept. of Civil Engineering
Queen's University
Kingston, Ontario
K7M 4N8

Tel: (613) 545-2133

Fax: (613) 545-2128

Areas of Expertise:

- Geo-environmental pollution abatement technology and remedial measures
- Contaminant transport in partly saturated and saturated soils
- Clay liner leakage, control testing

Jan Oleszkiewicz

Professor
Department of Civil Engineering
University of Manitoba
Winnipeg, Manitoba
R3T 2N2

Tel: (204) 474-9220 X8722

Fax: (204) 261-9534

Areas of Expertise

- Biological treatment of industrial wastes such as pulp and paper industry, petrochemical industry and food processing using anaerobic and aerobic processes
- Management of industrial and municipal solid wastes using digestion and composting
- Fate of industrial pollutants in municipal treatment plants
- Toxicity of inorganics: sulfide, ammonia, cyanide, heavy metals

Lambert Otten

Professor
School of Engineering
University of Guelph
Guelph, Ontario
N1G 2W1

Tel: (519) 824-4120 X3070

Fax: (519) 836-0227

Areas of Expertise

- Sludge and municipal solid waste composting

K.L. Pinder

Professor and Head
Dept. of Chemical Engineering
University of British Columbia
2216 Main Mall
Vancouver, B.C.
V6T 1W5

Tel: (604) 228-2583

Fax: (604) 228-6003

Areas of Expertise:

- Chlorine dioxide generator waste recovery (H_2SO_4 for recycle, Na_2SO_4 for sale)
- Anaerobic fermentation of high BOD wastes such as cheese whey, fruit packing wastes etc. to produce burner gas
- De-inking of paper

Selected Recent Titles:

Lobley, D.C. and Pinder, K.L. Elemental sulfur - an alternative reducing agent for the generation of chlorine dioxide. Journal of Pulp Paper Science, 15:J142-5, 1989

Kisaalita, W.S., Lo, K.V. and Pinder, K.L. Influence of dilution rate on the acidogenic phase products distribution during two-phase lactose anaerobiosis. Biotechnology and Bioengineering, 34:1235-50, 1989

Kisaalita, W.S., Lo, K.V. and Pinder, K.L. Kinetics of whey/lactose acidogenesis. Biotechnology and Bioengineering, 33: 623-30, 1989

Douglas Reeve

Associate Professor
Dept. of Chemical Engineering
University of Toronto
200 College Street
Toronto, Ontario
M5S 1A4

Tel: (416) 978-3062

Fax: (416) 978-8605

Area of Expertise:

- Effluents from bleached kraft pulp mills (organochlorine)

A.P.S. Selvadurai

Professor
Department of Civil Engineering
Carleton University
Ottawa, Ontario
K1S 5B6

Tel: (613) 788-5785

Fax: (613) 788-3951

Areas of Expertise:

- Groundwater pollution modelling
- Computer modelling in environmental engineering
- Engineered barriers for containment structures
- Flow of immiscible fluids in porous media
- High level nuclear fuels waste management

Dr. J.M. Shaw

Associate Professor
University of Toronto
200 College Street
Toronto, Ontario, M5S 1A4

Tel: (416) 978-3059

Fax (416) 978-8605

Area of Expertise

- Automotive paint sludge (industrial solid waste reduction). A process is currently under development where automotive paint sludge is recycled to the paint industry. A patent is in preparation.
- Chloride removal from kraft pulping processes (liquid effluent reduction). A process to reduce water consumption and chlorinated organic liquid effluent from kraft pulping processes has been developed. This process is the subject of current research.

Recent Publications

Shaw, J.M. and Oloman, C.W. Removal of chloride from process solutions. U.S. Patent 4,717,450, January 1988

Shaw, J.M. A process for automotive paint sludge recycling. Patent in preparation.

Daniel W. Smith

Professor
Department of Civil Engineering
University of Alberta
Edmonton, Alberta
T6G 2G7

Tel: (403) 492-4138

Fax: (403) 492-0249

Areas of Expertise

- Ozone water and wastewater treatment
- Advanced wastewater treatment studies
- Land application of wastewater
- Solid waste management
- Low temperature, dilute wastewater treatment
- Water treatment and water quality studies
- River water quality and indicator organism modelling
- Pulp mill wastewater treatment

Recent Publications

Smith, D.W. and Finch, G.R. The role of ozone in water and wastewater treatment. Proceedings of the Second International Conference. TekTran International, Kitchener, Ontario. 1987

Smith, D.W. and Tilsworth, T. Cold regions environmental engineering. Proceedings of the Second International Conference. TekTran International, Kitchener, Ontario. 1987

Finch, G.R., Stiles, M.E. and Smith, D.W. Recovery of a marker strain of Escherichia coli from ozonated water by membrane filtration. Applied and Environmental Microbiology, 1987, Vol. 53, No. 12, pp. 2894-2896

James W. Smith

Professor & Chairman
Dept. of Chemical Engineering
and Applied Chemistry
University of Toronto
Toronto, Ontario
M5S 1A4

Tel: (416) 978-4020

Fax: (416) 978-8605

Areas of Expertise:

- Elimination of hydrogen sulphide emissions in industrial and environmental process gas streams. Technology developed can be applied to the treatment of waste waters containing trace amounts up to equilibrium levels of hydrogen sulphide.

Recent Titles:

Lee, N. Characteristics of a modified flotation cell in the removal of hydrogen sulfide. M.A.Sc. Thesis, Department of Engineering and Applied Chemistry, University of Toronto, 1990

Giles, T.W.R. Hydrodynamic and kinetic studies of modified flotation cell hydrogen sulphide scrubbing technology. M.A.Sc. Thesis, Department of Chemical Engineering and Applied Chemistry, University of Toronto

Dr. S. Sourirajan

Director,
Industrial Membrane Research Institute
Department of Chemical Engineering
University of Ottawa
Ottawa, Ontario K1N 6N5

Tel: (613) 564-3479

Fax: (613) 564-9856

Area of Expertise:

- Application of membrane separation technology for the treatment of industrial wastewaters for pollution control, water reuse, and waste recovery

Carl St. Pierre

Professor
Department of Environmental Engineering
University of Windsor
Windsor, Ontario
N9B 3P4

Tel: (519) 253-4232

Fax: (519) 973-7062

Area of Expertise

- Stabilization, drying and processing municipal wastewater sludge into soil conditioners or fertilizers

Dr. Marios Tsezos

Associate Professor
Chemical Engineering
McMaster University
Hamilton, Ontario
L8S 4L7

Tel: (416) 525-9140 X4292

Fax: (416) 521-1350

Areas of Expertise:

- Selective sequestering of metals from waste water and water.
- The ultimate fate and treatment of priority organic pollutants in biological treatment plants.
- Radionuclide biosorption. Treatment of radioactive waste waters.

Recent Titles:

Tsezos, M. Engineering aspects of metal binding by biomass. in Microbial Mineral Recovery, C. and J. Brierley, eds., New York: McMillan Publishing, in print, 1990

Tsezos, M. and McCready, R.G.L. Recovery of uranium from biologically leached solutions using immobilized biomass. Biotechnology and Bioengineering, Vol. 34, pp. 10-17, 1989

Tsezos, M. et al. Detailed computer assisted plant designs for the following processes: uranium production with ferric chloride leach; biological waste water treatment; pure oxygen production by pressure swing adsorption; integrated incineration of biological sludges; pure oxygen production by fractional distillation; and high rate aerobic and anaerobic biochemical reactors. Department of Chemical Engineering, McMaster University, Hamilton, Ontario, 1988/89

Tsezos, M. and Bell, J.P. Comparison of the biosorption of hazardous organic pollutants by live and dead biomass. Water Research, Vol. 23, No. 5, pp. 561-568, 1989

Tsezos, M., "A New Immobilized Biomass Technical Adsorbent for Metal Recovery", British Society of Chemical Industry, in "IEX-88. Ion Exchange for Industry", M. Streat, ed., Chichester, England: Ellis Horwood Publishers, 1988

PROVINCIAL RESEARCH ORGANIZATION-BASED EXPERTISE

Alex E. Birbeck

Senior Research Consultant
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Fax: (604) 224-0540

Areas of Expertise

- Landfill leachate containment and treatment
- Pulp and paper, petrochemical, and small industry wastewater treatment and wastewater minimization
- Use of anaerobic and aerobic biological treatment for effluent from pulp and paper, petrochemical, food industries, and miscellaneous small industries
- Use of ozone and hydrogen peroxide as oxidants polishing effluents by filtration, screening, and land (marsh) application. Potential application for small and large industries.

Gordon Esplin

Manager, Air Program
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Tel: (604) 224-0540

Areas of Expertise

- Measuring toxic or odorous atmospheric emissions from waste handling facilities, effluent treatment lagoons, etc.
- Evaluation of toxic waste incineration facilities (destruction removal efficiency, emissions, mass-balances, etc.)

Rhona Hunter

Research Engineer
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Tel: (604) 224-0540

Areas of Expertise

- Wastewater remediation using various macrophytes. Present research and development work is in treatment of landfill leachate, sewage, pulp and paper effluent and hog fuel is being undertaken.
- Resin acid removal from pulp and paper effluent. A novel concept that destroys the resin acids in solution is in the research phase. Potential applications in the forest industry, mining industry, food industry and small industries, tanneries, etc.

V.I. Lakshmanan

Manager
Environmental Technologies
ORTECH International
2395 Speakman Drive
Mississauga, Ontario
L5K 1B3

Tel: (416) 822-4111 X216

Fax: (416) 823-1446

Areas of Expertise

- Process development for recovery of values (rare earths, PPGs, etc) from mineral processing waste streams.

Resources include metallurgists, chemical engineers, environmental scientists, plus extensive pilot plant facilities and analytical laboratories

R.G.W. Laughlin

Manager
Environmental Technologies
ORTECH International
2395 Speakman Drive
Mississauga, Ontario
L5K 1B3

Tel: (416) 822-4111 X265

Fax: (416) 823-1446

Areas of Expertise

- Waste reduction surveys for chemical and metal finishing sectors
- Operation of Ontario Waste Exchange and Canadian Waste Materials Exchange
- Application development using rotating biological contactors and wet air oxidation systems
- Leachate treatment using aerobic and anaerobic treatment systems
- Treatability studies using in-house and third party bench/pilot equipment
- Trace chemical analysis, both organic and inorganic

Donald Livingstone

Research Engineer
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Tel: (604) 224-0540

Areas of Expertise

Consulting engineering expertise in:

- Industrial site environmental assessment and remediation
- Soil remediation
- Pulp mill environmental aspects
- Gold/silver mining environmental aspects

G. Matolcsy

Manager
Pulp and Paper
ORTECH International
2395 Speakman Drive
Mississauga, Ontario
L5K 1B3

Tel: (416) 822-4111 X309

Fax: (416) 823-1446

Areas of Expertise

- Waste reduction in pulp and paper sector

Derick Monteith

Manager, Bioassays
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Tel: (604) 224-0540

Area of Expertise

Aquatic bioassays relating to industrial effluents with particular reference to the pulp and paper and mining industry

Barry Nicolle

Head, Industry Services
New Brunswick Research and
Productivity Council
P.O. Box 20000, 921 College Hill Road
Fredericton, N.B.
E3B 6C6

Tel: (506) 452-8994

Fax: (506) 452-1395

Areas of Expertise

- Mining and mineral processing
- Environmental engineering

J.W. Thorpe

Director

Laboratory Services

Nova Scotia Research Foundation Corp.

P.O. Box 790

101 Research Drive

Dartmouth, Nova Scotia

B2Y 3Z7

Tel: (902) 424-8670

Fax: (902) 424-4679

Areas of Expertise:

- Analysis of trace heavy metals and organics in the pulp and paper, refinery, and pressure-treated wood industries

Hubert Timmenga

Research Scientist
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4431

Tel: (604) 224-0540

Areas of Expertise

- Research and development in compost technologies including process evaluation and standards development and vermiculture
- Conducting community-wide waste audits
- Research and program development for treatment technologies of farm wastes, including separation, treatment of liquid phase, treatment of solid phase using anaerobic digestion and composting. Potential applications for forest industry, agricultural wastes and food industries.

R.J.Vos

Technical Officer
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Tel: (604) 224-0540

Areas of Expertise

- Acid mine drainage test work
- Solid waste leaching control
- Industrial metal waste
- Use of ozone for waste treatment and settlement with flocculating chemicals
- Metal finishing industries, mining.

J. Blair Wallace

Research Engineer
British Columbia Research Corporation
3650 Wesbrook Mall
Vancouver, B.C. V6S 2L2

Tel: (604) 224-4331

Tel: (604) 224-0540

Areas of Expertise

Responsible for conception, promotion, direction and development of timely research studies into waste utilization and treatment schemes and processes. Provides engineering consultation in project and contract development on behalf of industrial clients, government agencies or individuals.

- In-plant reuse, reduction and reclamation techniques
- Provincial and federal waste management regulations
- Potable water purification, disinfection systems
- Chemical/biochemical methods of waste conversion
- Anaerobic waste utilization processes and process schemes
- Novel waste recovery/concentration operations especially related to metal and metal finishing industries
- Control, optimization and modelling of chemical and biochemical processes

FOREIGN-BASED EXPERTISE

Edward Barth

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7669

Areas of Expertise

- Stabilization technologies for solid, liquid or sludge wastes, either in situ or in containers. Stabilization technologies can be applied to organic or inorganic waste streams as well as contaminated soils containing nonvolatile organics and ash containing heavy metals

Edward Bates

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7774

Areas of Expertise

- Chemical extraction processes for separating contaminated sludges and soils into organics, water and particulate solids phase fractions

Paul dePercin

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7797

Areas of Expertise

- In situ chemical treatment for contaminated soils and wastes, including petroleum hydrocarbons, chlorinated hydrocarbons, metals, PCBs, and radionuclides
- low temperature thermal stripping systems for removal of volatile organic compounds from soils or sludges
- In situ vacuum and steam extraction technologies for removal of volatile organic compounds from soils

W.W. Eckenfelder

Professor
Department of Civil Engineering
Vanderbilt University
Nashville, TN

Tel: (615) 322-2720

Areas of Expertise

- Industrial effluent treatment
- Treatability testing

Harry M. Freeman

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7529

Area of Expertise

- Wet air oxidation for treatment of liquid and sludge waste streams containing organic and oxidizable inorganic wastes, including halogenated organics, inorganic/organic cyanide and phenols in inorganic/organic sludges

Frank Freestone

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
Edison
NJ 08837

Tel: (201) 321-6632

Areas of Expertise

- Rotary kiln incineration for treatment of organic waste containing solids and sludges, and liquid and gaseous organic wastes

Henning Friege

Chemical and Physical Investigations Division

State Agency for Water and Waste

Tel: (0211) 15 90-0

North Rhine-Westphalia

Fax: (0211) 15 90 176

Auf dem Draap 25

P.O.B. 5227

4000 Dusseldorf 1

Federal Republic of Germany

Area of Responsibility

- Chemical and physical analysis of surface water, sediment, groundwater, wastewater, sludge, waste and contaminated sites
- Development of analytical methods
- Monitoring water quality of the river Rhine

Gerhart Friesecke

Wastewater and Waste Division
State Agency for Water and Waste
North Rhine-Westphalia
Auf dem Draap 25
P.O.B. 5227
4000 Dusseldorf 1
Federal Republic of Germany

Tel: (0211) 15 90-0
Fax: (0211) 15 90 176

Area of Responsibility

- Drainage and treatment of public wastewater and treatment and recycling of the sludge. Facilities for handling materials that are hazardous to water and soil
- Wastewater reduction and treatment methods for industrial plants
- Generation, reduction and recycling of commercial/industrial waste
- Treatment of contaminated sites

Eugene Harris

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7862

Areas of Expertise

- Biological treatment technologies for biodegradation of organic contaminants in sludges and soils

Dr. Tom Hauser

Waste Reduction Institute
for Scientists and Engineers
Department of Civil and Environmental Engineering
University of Cincinnati
741 Rhodes Mall, Mail location 71
Cincinnati, OH 45221

Tel: (513) 556-3693

The WRISE is an Institute housed at the University of Cincinnati and jointly sponsored by EPA and the University. The goals of the Institute are:

- To establish and maintain effective liaison between the researchers in waste minimization and potential implementers of new and improved waste minimization techniques across the United States
- To encourage the incorporation of waste minimization concepts within the engineering curricula of universities (especially in plant design and process chemistry courses)
- To enhance the credibility, within industrial circles, of EPA's Waste Minimization Research Program
- To promote the acceptance and early adoption of waste minimization concepts among industrial and other generators of all types of waste

Jonathan Herrmann

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7839

Areas of Expertise

- In situ vitrification for treatment of contaminated soils, waste burial grounds, tanks containing hazardous sludges or salt cakes, and process sludges

Ronald Lewis

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7856

Areas of Expertise

- Biological treatment technologies for biodegradation of organic contaminants in sludges and soils

Ivars J. Licis

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7718

Areas of Expertise

- Pyrolytic incineration technologies for treatment of hazardous wastes
- Vitrification thermal treatment to immobilize hazardous wastes

Dr. Perry L. McCarty

Environmental Engineering and Science
Civil Engineering Department
Stanford University
Stanford, CA, 94305

Area of Expertise

- Anaerobic utilization of halogenated organic compounds

Joseph McSorley

U.S. Environmental Protection Agency Tel: (919) 541-2920
Air and Energy Engineering Research Laboratory
Research Triangle Park
NC 27711

Areas of Expertise

- Fluidized bed incineration for treatment of soils, sludges, slurries and liquids containing hazardous wastes

Network for Environmental Technology Transfer

Square de Meeus 25
B-1040 Bruxelles
Belgium

Tel: (2) 511 24 62

Fax: (2) 511 25 22

NETT is a new European initiative to help exchange know-how between companies and organizations in the fields of clean and low waste technology. Its role is also to supply information on more efficient and cost effective pollution control technologies.

Membership of NETT is open to organizations such as manufacturers of pollution control equipment, university research departments, consultants, government research laboratories, industrial research associations, users of pollution control products and regulatory authorities such as local and central government organizations.

Donald Oberacker

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7341

Areas of Expertise

- Fluidized bed incineration for treatment of soils, sludges
slurries and liquids containing hazardous wastes

Charles J. Rogers

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7757

Areas of Expertise

- Glycolate dechlorination for dehalogenation of some classes of chlorinated organics in contaminated organic liquids, sludges and soils
- Chemical reduction-oxidation processes to destroy hazardous components in waste streams or to convert hazardous components to less hazardous forms. Wastes suitable for redox treatment include benzene, phenols, most organics, cyanide, arsenic, iron, manganese, chromium(VI), mercury, lead, silver, chlorinated organics and unsaturated hydrocarbons

M. Salkinoja-Salonen

Associate Professor
Department of Microbiology
University of Helsinki
Mannerheimintie 172
SF -00282
Helsinki, Finland

Tel: 90-47351

Fax: 358-0-656591

Area of Expertise

- Biological treatment of chlorinated organic compounds
- Bioremediation of wood preserving sites

Mary Stinson

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
Edison
NJ 08837

Tel: (201) 321-6683

Areas of Expertise

- In situ chemical treatment for contaminated soils and wastes, including petroleum hydrocarbons, chlorinated hydrocarbons, metals, PCBs, and radionuclides
- In situ vacuum and steam extraction technologies for removal of volatile organic compounds from soils

Robert Thurnau

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7692

Areas of Expertise

- Low temperature thermal stripping systems for removal of volatile organic compounds from soils or sludges

Richard Traver

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
Edison
NJ 08837

Tel: (201) 321-6677

Areas of Expertise

- Soil washing to extract contaminants from sludge or soil matrices using liquid media such as water, organic solvents, acids, bases, etc, depending of the contaminants to be removed. Excavated soils are fed into washing unit.
- In situ soil flushing for unexcavated soils using injection systems and recovery of contaminants in leachate or ground-water

Eckhart Treunert

Data-Processing, Waste Water Charge
State Agency for Water and Waste
North Rhine-Westphalia
Auf dem Draap 25
P.O.B. 5227
4000 Dusseldorf 1
Federal Republic of Germany

Tel: (0211) 15 90-0
Fax: (0211) 15 90 176

Area of Responsibility

- Planning, organizing and coordination of the use of data-processing in the State Organization of Water Management and Waste Disposal, North Rhine-Westphalia
- Assessment and collection of the Waste Water Charge according to the polluter pays principle
- Determining the noxiousness of polluted water and storm water, evaluation of the results from control including wastewater jurisdictional questions

Howard Wall

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7691

Areas of Expertise

- Infrared thermal treatment for organic wastes

Carlton Wiles

U.S. Environmental Protection Agency
Risk Reduction Engineering Laboratory
26 West Martin Luther King Drive
Cincinnati
OH 45268

Tel: (513) 569-7795

Areas of Expertise

- Stabilization technologies for solid, liquid or sludge wastes, either in situ or in containers. Stabilization technologies can be applied to organic or inorganic waste streams as well as contaminated soils containing nonvolatile organics and ash containing heavy metals

John Wilson

U.S. Environmental Protection Agency Tel: (405) 332-8800
Robert S. Kerr Environmental Research Laboratory
Ada
OK 74820

Areas of Expertise

- In situ biodegradation of organic compounds in soils using indigenous or introduced aerobic or anaerobic bacteria

Dr. Lily Young

Department of Microbiology
New York University Medical Center
550 First Avenue
New York, NY, 10016

Area of Expertise

- Microbial degradation of phenolic compounds

SUBJECT INDEX

- Acid mine drainage, 2, 3, 6, 13, 18, 30, 72
- Activated carbon adsorption, 42
- Activated sludge systems, 22, 23, 37, 43
- Aerated lagoons, 23, 29
- Aerobic processes, 23, 45, 48, 61, 65
- Air stripping, 19
- Aliphatic glycols, 3
- Anaerobic biological treatment, 8, 10, 12, 15, 16, 21, 23, 34, 39, 42, 48, 45, 61, 65
- Anaerobic waste utilization processes, 73
- Automated process control, 22
- Bacterial leaching, 7
- Bacterial oxidation, 7
- Base metals, 6, 24
- Bioadsorption, 13
- Biochemical engineering, 29
- Biochemical oxidation processes, 42
- Biodegradation, 13, 46
- Biofilms, 12, 23
- Biological treatment, 10, 22, 23, 85, 88
- Biomethanation process, 8
- Bioreactor design, 8
- Bioreduction, 13
- Biosensors, 46
- Canadian Waste Materials Exchange, 65
- Cellulolytic bacteria, 16
- Cellulose, 5
- Chemical technologies, 5, 24, 32, 65
- Chemical extraction processes, 78
- Chemical fertilizers, 14
- Chemical industries, 10, 46
- Chemical leaching, 7
- Chemical oxidation, 42
- Chemithermomechanical pulp, 10, 15, 21, 23
- Chlorinated organic chemicals, 10, 23, 25, 29, 94, 95
- Chlorine dioxide, 50
- Chlorophenols, 42
- Coagulation, 25
- Cold climate lagoon design, 36
- Compost technologies, 49, 71
- Computer modelling, 23, 40, 43, 44, 52
- Contaminated soil, 4
- Cyanide wastes, 1, 3, 7, 19, 24, 37
- De-inking, 50
- Dissolved air flotation, 38, 42
- Electric power generation, 9
- Electrodialysis, 24
- Ethylene glycol, 7, 13, 18
- Expert systems, 22
- Filtration, 42
- Fixed-film processes, 38
- Flocculation, 25
- Gold mill effluents, 1
- Granular sludge-bed reactors, 8
- Halogenated organic compounds, 90
- Hazardous waste, 17
- Heavy metals, 24, 37, 46, 70
- Heavy oil processing, 24
- Hydrocarbon wastes, 13
- Hydrogen peroxide, 61
- Hydrogen sulphide emissions, 55
- Immobilized cell processes, 36
- In situ biodegradation, 102
- In situ chemical treatment, 79, 96
- In situ vitrification, 87
- Incineration, 25, 62, 82, 89, 91, 93
- Industrial minerals, 9
- Infrared thermal treatment, 100
- Inorganic chemicals, 9
- Iron and steel, 9
- Kraft mill wastes, 10, 15, 16, 29, 51, 53
- Lignin, 5
- Lignin derivatives, 5
- Membrane materials, 4, 24
- Membrane separation, 4, 23, 24, 56
- Metabolites, 8
- Metal finishing, 24, 65, 72
- Metal mining, 9, 14
- Metal processing, 9, 32, 46

Metal sulphides, 7
 Metal waste, 72
 Metals, 58
 Methanogenic bacteria, 10, 12, 15, 16, 21
 Microbial processes, 3, 7, 18
 Microbiology, 7, 16, 21
 Micro-filtration, 24
 Mill tailings, 18, 30
 Mine Environment Neutral Drainage Program, 6
 Mineral processing, 11, 64, 69
 Mining, 6, 46, 63, 68, 69, 72
 Municipal-Industrial Strategy for Abatement, 9

 Network for Environmental Technology
 Transfer, 92

 Oily sludge, 42
 Oily waste water, 4
 Ontario Waste Exchange, 65
 Ores tailings, 46
 Organic compounds, 2, 9, 13, 18, 32, 70
 Organic wastes, 3
 Oxalate biodegradation, 1
 Ozone, 36, 61, 54, 72

 Paint sludge, 53
 PCB contaminated soils, 26
 Pentachlorophenol, 29
 Per-evaporation, 24
 Petrochemicals, 16, 32, 48, 61
 Petroleum refining, 9, 32
 Phenolic wastewaters, 39, 103
 Physical treatment systems, 24
 Polyelectrolytes, 38
 Pozzolan solidification, 37
 Pulp and paper, 8, 9, 10, 14, 16, 22, 23, 29, 32,
 45, 46, 48, 61, 63, 67, 68, 70

 Radiation processing, 5
 Radionuclide biosorption, 58
 Reduction-oxidation processes, 94
 Reductive detoxification, 8
 Respirometry, 38
 Reverse osmosis membranes, 4
 Rotating biological contactors, 1, 6, 7, 11,
 13, 18, 43, 65

 Secondary clarifier design, 23
 Selenium, 7, 11, 18
 Sensors, 22
 Separation technology, 20, 32
 Sludge conditioning, 25
 Sludge dewatering, 25
 Sludge stabilization, 6
 Soil remediation, 29, 66

 Solidification techniques, 26
 Stabilization technologies, 77, 101
 Steam extraction technologies, 79, 96
 Sulphide ores, 7
 Supercritical fluid extraction, 20

 Tailings pond, 30
 Thermomechanical pulp, 10, 15, 21
 Thermal stripping, 79, 97
 Trickling filters, 12
 Trihalomethanes, 38

 Ultrafiltration membranes, 4
 Ultramicrobacteria, 33
 Ultra-filtration, 24
 Upflow anaerobic sludge blanket reactors, 8, 12
 Uranium, 6, 13, 18

 Vapour-phase adsorption, 19
 Vitrification, 89
 Volatile organics, 19, 23, 25, 79

 Waste reduction, 6
 Waste Reduction Institute for Scientists
 and Engineers, 86
 Wet air oxidation, 65, 81
 Wood preserving, 29

NAME INDEX

Allen, G., 29
Amaratunga, L.M., 30
Averill, D., 25

Barth, E., 77
Bates, E., 78
Beaudette, L.A., 1
Bechard, G., 2
Birbeck, A.E., 61
Boocock, D.G.B., 31
Booth, R., 24

Campbell, H.W., 25
Capes, E., 4
Chalykoff, C., 3
Chapman, D., 23
Chuang, K.T., 32
Chuaqui, C.A., 5
Constable, T., 25, 26
Costerton, W., 33

DePercin, P., 79
Droste, R.L., 34

Eckenfelder, W.W., 80
Esplin, G., 62

Fernandes, L., 35
Filion, M.P., 6
Finch, G.R., 36
Freeman, H.M., 81
Freestone, F., 82
Friege, H., 83
Friecke, G., 84

Ganczarczyk, J.J., 37
Gehr, R., 38
Gould, W.D., 7
Guiot, S.R., 8

Hall, E., 23
Harris, E., 85
Hauser, T., 86
Herrmann, J., 87
Hrudey, S.E., 39
Huck, P.M., 40
Hunter, R., 63

Isles, P., 9

Jank, B.
Jones, P.H., 41
Jones, R., 23
Kennedy, K.J., 10
Knetting, E., 42
Kok, S., 24

Lakshmanan, V.I., 64
Laughlin, R.G.W., 65
Leduc, R., 43
Lessard, P., 44
Lewis, R., 88
Licis, I.J., 89
Lin, K.-C., 45
Livingstone, D., 66
Lortie, L., 11

MacLeod, A., 12
Margaritis, A., 46
Matolcsy, G., 67
McCarty, P.L., 90
McCready, R.G.L., 13
McSorley, J., 91
Melcer, H., 22, 23
Mitchell, R.J., 47
Moche, C., 14
Monteith, D., 68

Neate, J.H., 22
Nicolle, B., 69

Oberacker, D., 93
Oleszkiewicz, J., 48
Otten, L., 49
Overend, R.P., 15

Patel, G.B., 16
Pinder, K.L., 50

Reeve, D., 51
Rogers, C.J., 94
Ryma, B.J., 17

Salkinoja-Salonen, M., 95
Salley, J., 18
Schmidt, J.W., 24
Selvadurai, A.P.S., 52
Shaw, J.M., 53
Simovic, L., 19

Singh, R., 20
Smith, D.W., 54
Smith, J.W., 55
Sourirajan, S., 56
Speirs, G., 22
Sprott, D., 21
Stinson, M., 96
St. Pierre, C., 57

Thorpe, J.W., 70
Thurnau, R., 97
Timmenga, H., 71
Traver, R., 98
Treunert, E., 99
Tsezos, M., 58

Vachon, D., 24
Vos, R.J., 72

Wall, H., 100
Wallace, J.B., 73
Webber, M., 25
Wiles, C., 101
Wilson, J., 102

Young, L., 103

Zaida, A., 24

QUEEN TD 173.5 .R4 1990
Reavley, Jean
Directory of expertise in po

DATE DUE
DATE DE RETOUR

[illegible]

CARR MCLEAN

38-296

INDUSTRY CANADA/INDUSTRIE CANADA



118409

