Lakehead
UNIVERSITY

A Proposal for the Development of the Lakehead University

Biorefining Research Institute

November 15, 2011

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Lakehead University Biorefining Research Institute

As per the Lakehead University Policies and Procedures for the Establishment of Centres and Research Institutes, approved by Senate February 27, 2004, the following proposal outlines the creation and operation of the new Lakehead University Biorefining Research Institute.

1.0 *Preamble: History and Achievements*

The Biorefining Research Initiative (BRI) commenced with the appointment of the Director, Dr. Robert Dekker, in September 2008. Laboratories located at 1294 Balmoral were refurbished and equipped with instrumentation to conduct world-class research, and were officially opened for research on December 4, 2009. Funds ($1.5 million) were provided by FedNor and NOHFC for this purpose. The BRI presently consists of the Director, Dr. Robert Dekker, who also holds a Senior Ontario Research Chair in Biorefining, one Ontario Research Chair in Biorefining, Dr. Wensheng Qin, and a SHARCNET/MMRC Research Chair, Dr. Wely Floriano. A Canada Research Chair Tier 1 position has been appointed to the BRI and will commence in 2012. Nineteen Associate Members were appointed to the BRI from Lakehead University faculty in 2010, and a further two in 2011. A Research Scientist was appointed in 2011 at no salary cost to the BRI.

Presently some 15 students (6 PhD, 5 MSc, 4 undergraduate) as well as 3 Post-Doctoral Research Fellows are conducting research at the BRI. Visiting Scholars from Brazil (3), China (1), India (1), Italy (1) and Turkey (1) have worked/are presently working at the BRI on research projects, and have brought with them scholarships from research councils in their countries ranging in duration from 3 to 18 months and valued at more than $200,000. Interdisciplinary research collaborations were formed with the Northern Ontario School of Medicine (NOSM), and internationally with Brazil, Chile, Turkey and China under scientific binational agreements with Canada. Under Institute status, the number of Research Scientists, Visiting Scholars, Research Students and research collaborations, nationally and internationally, are expected to grow as BRI gains standing as a Biorefining Institute of research excellence.

Grants totalling $1.55 million were awarded to the BRI during 2009-2011. They included: NSERC-CRD with *FPInnovations* (Montreal, QC) as partner ($620,200 over 4 years; Dekker as PI); NSERC-Engage (5 months) with *Northland Biodiesel Inc*. as partner ($24,680; Dekker, PI); NSERC-Interaction ($8,649; W Qin); and CRIBE with *GreenField Ethanol Inc*. as industrial partner ($894,850 over 2 years; Dekker, PI; Dr A. Chen [*Chemistry Dept*], Co-PI). A specialist workshop on High Performance Liquid Chromatography was sponsored by *Varian Inc*. (Canada) with a grant of $2,500. Ten post-graduate students attending the workshop were trained on aspects of Chromatography.

The BRI has been invited to join a Canadian-wide NSERC Research Network on Lignin (*LignoWorks*), a technology platform for creating novel materials and chemicals based on lignin to replace fossil-fuel based chemicals and products. The *BRI SEMINAR SERIES* commenced in 2010 with four prominent Canadian speakers delivering talks on biorefining

topics. The BRI will host a national conference: "*BioFor – Biorefining, Bioenergy and Bioeconomy in the Forest Sector*" in Thunder Bay, May 14-15, 2012. The first book from the BRI was published in July 2010.

2.0 *Purpose of the Institute*:

The purpose of the Biorefining Research Institute (herein after referred to as the BRI) is to create a world-class centre of excellence dedicated to developing transformative technologies and products based upon biomass from the Boreal Forest. The vision of the Biorefining Research Institute is not limited to fuels and forest biomass for energy, but also considers the economic benefits derived from the forest ecosystem. By creating valuable products from renewable biomass, we can reduce our dependence upon fossil-based fuels and chemicals, while at the same time creating new business ventures and jobs.

> **Mandate**: "*To conduct research on the biorefining process development (biological and chemical) that transforms forest-derived (agricultural and algal) biomass into value-added bio-products and bio-fuels leading to new opportunities for the bioeconomy*".
>
> **Mission**: "*To serve the forest products sector and regional community in north-western Ontario to develop new bio/transformative technologies through scientific and engineering processes that will lead to new bio-based products from plant biomass in a sustainable, environmentally-friendly and economically-feasible manner.*"

To achieve this mission, the BRI will seek to:

- Foster interdisciplinary collaboration towards biorefining and bioprocess technologies
- Provide a nurturing environment for students to support the development of junior faculty, graduate and undergraduate students.
- Conduct workshops in bioprocesses that encourage and promote biorefining research in order to facilitate research and train researchers
- Obtain funding for projects that advance the aims of the Institute
- Support the translation of basic research into tangible products and services
- Provide extension services to the public and industry in the form of lab testing, analysis and consultation.



3.0 *Relevance*

The BRI is in line with *Lakehead University's Strategic Research Plan* wherein Biotechnology and Material Science and Environmental and Resource-based Development, Education and Policy have been identified as strategic areas of research.

The Institute also aims to contribute to the mission of Lakehead University as an accessible and accountable comprehensive university committed to excellence in faculty, graduate and undergraduate research regionally, nationally and internationally.

4.0 *Life Expectancy*:

It is envisioned that the BRI would be set up for an indefinite period, undergoing a performance review every five years as per the '*Policies and Procedures for the Establishment of Centres and Research Institutes*' to verify that the Institute is true to its mandate and operating within its budget.

5.0 *Proposed Budget*:

BRI Operating Costs

Income		
Operating Grant		20,000
	TOTAL	**20,000**
Expenses		
Print Shop		200
Telephone		150
Supplies		
Consumable		8,800
Travel		2,800
Repairs & Renewals		8,000
Postage		50
	TOTAL	**20,000**

Salaries: The salaries of the BRI Director and the Ontario Research Chair are provided through an endowment fund that was granted to Lakehead University by the Ministry of Research and Innovation in 2008. The salary of the BRI/SHARCNET/TBRRI Research Chair is provided through a joint salary agreement of all contributing partners. The MRI endowment also covers the salaries of the BRI's part-time Technician and Administrative Assistant.

6.0 *Research Plan*:

The global energy demand is increasing annually with China, the USA and the European Community as the major users. Petroleum is still the major source of energy fuelling all modes of motor transportation, and the precursor to the synthesis of the majority of industrial chemicals. However, fossil oils are finite and as the consumption continues to increase at levels greater than present output, petroleum prices will tend to increase (presently between $80-100/barrel), and fossil oil is estimated to become limiting within the next 40 years. The search for alternative renewable resources of fuels/chemicals has been an on-going process that predates the 20th century in Europe, and was active during both World Wars. It was in 1973, catalysed by the Middle East oil crisis, that serious efforts were made to consider the feasibility of cellulosic residues as feedstocks for the production of biofuels (and industrial chemicals) through fermentation processes. Since the 1970's, billions of dollars have been invested globally in process technology development (biorefining) to convert cellulose into bioethanol. Yet today, no bioethanol is produced commercially from cellulosic feedstocks, as the biorefining process is still considered uneconomic. Lowering of operational costs through value-adding of by-products can make bioethanol production from cellulosic feedstocks an economic reality.

There is a concerted effort in North America including Canada by academia and industry to develop biorefining process technology with objectives to use renewable cellulosic materials (plant biomass) to replace chemicals that traditionally were derived from crude petroleum. The BRI can play a leading role to foster technology development in *Bioenergy* and *Biorefining* that is linked to adding value to plant biomass resources, preferably forestry. This is a role within the Mandate and Mission of the BRI. To sustain the BRI as an institution, the BRI, through its Chairs and Associate Members, will seek research grant funding that form collaborative efforts with Lakehead faculty and Canadian industry on projects that add value to forest biomass. BRI being located in the heart of the Boreal Forest, and through connection with local industry in Thunder Bay is well-positioned to develop processes in collaboration with local industry to add value to forest biomass.

Canada is the world's largest producer of forestry products. Addressing value-adding of wood and bark through biorefining processes is therefore an important economic consideration in the forest products industry. In making cellulose for paper manufacture, the other components constituting wood, viz., hemicellulose and lignin, are lost during pulping and appear in black liquors to be incinerated to generate power (bioenergy) at the pulp mill. Recovering hemicellulose and lignin by biorefining processes will allow their conversion into novel products that add higher value and a better economic return. Enormous quantities of wood bark are generated in the processing of forests products throughout Canada. The precedent to establish a biorefining industry based upon forest biomass; cellulosic bioethanol, conversion of hemicellulose and lignin into value-added bioproducts, and phytochemicals including biopharmaceuticals from extraction of wood bark/tree foliage could expand business enterprises (including pulp mills) and create new jobs in northwestern Ontario. These process developments will lead to employment within the region and benefit Canada as a whole. It will also enrich our

understanding and knowledge of a forest biorefining process and the nature of chemicals present in tree bark.

The BRI has identified three *strategic* areas of biorefining research that are relevant with the Mandate of the BRI and have potential of being developed to create new business ventures within northwestern Ontario. They include: (i) bark/tree foliage biorefining; (ii) algal biodiesel technology; and (iii) value-adding of hemicelluloses. These programs of research will form the basis of project proposals to obtain grants to conduct research within the BRI, and also in collaborations with other institutions throughout Canada including Canadian industry, and internationally. The research would attract personnel from various places in Canada and abroad. The research would be driven by post-doctoral fellows, research associates, graduate (Masters, PhD) and undergraduate students. Emphasis will be on the training of high quality personnel (HQP). Personnel involved in the development of new biorefining processes and bio-based products would thus be well-trained to fill positions in biorefining industries in Canada.

6.1 Project I: Bark Biorefinery - Phytochemicals and Extractives from Tree Foliage and Wood Bark. A bark biorefinery is an area that can lead to new business ventures. Presently, much of the tree foliage is left in the field, and serves a role as a soil nutrient, and stabilizer of forest soils. Wood bark, by contrast, is collected by debarking tree trunks, and is trucked to the pulp mills, where it serves as a source of bioenergy (*hogfuel*) to produce process steam and electricity. Instead of burning this valuable chemical resource, bark could first be extracted to remove the various phytochemicals and essential oils present, and this could be achieved on site at the pulp mill. The extracted residues could then be pelletized (bonded using lignin extracted from bark) and incinerated for bioenergy. A bark biorefinery could ideally be established on the pulp mill site using mill infrastructure, and would set up a new business practice to create revenue and employment. Likewise, tree foliage could be extracted for similar chemicals, but instead of hauling the low-bulk density leaves and branches at great expense to the pulp mill for extraction, a mobile extractor in the field would be more suitable. The extractor could be taken into the field where the chemicals are extracted from tree foliage, and the residues can then be distributed in the field where they will contribute to the soil's nutrient system. This type of extraction unit would be ideal as a business practice for isolated and remote communities as exist in northern Ontario. An efficient extraction procedure would be supercritical fluid extraction (ScFE) employing carbon dioxide and/or water. The latter has the ability to extract lignins from bark, where, depending upon the botanical species, bark can contain up to 50 % of its mass as lignin. Chemical extractions of lignin can cause damage to the lignin structure thereby limiting its functionality and applications. Lignins can be extracted from bark by SCFE using water under near- and sub- critical extraction (method of C. Xu) and produces a better quality lignin than Kraft, acid- or alkali- extracted lignins, and this adds value to the product. Such extraction systems would be environmentally green and non-polluting. The product streams arising from a bark biorefinery are: essential oils (applications in perfumery, food flavours and stabilizers), phytochemicals (high-valued pharmaceutically-active chemical compounds, and bulk commodity chemicals for industrial applications), and lignin (applications as phenol substitutes for formaldehyde polymers, as carbon fibres, lignin-based adhesives and resins).

6.2 Project II: Biodiesel from Algal Oils. The BRI recognizes that chemicals from algae are an important chemical feedstock resource in the future and this includes biodiesel fuels from algal oils in view of the enormous efforts (billions of dollars) that the USA has invested in developing algal technology. The attractive feature of algal cultivation for oils is that this feedstock will not displace a food product (soybean, maize, canola) for biofuels and chemicals. As supplies of fossil oils (petroleum) become limiting as will occur within the next 30-40 years, the world will need to find alternative resources for replacement of non-fossil fuels and chemicals, and algal produced biofuels and chemicals are considered an ideal renewable feedstock alternative. There are still limitations in using algae, but with the invested interests, appropriate technologies will be developed over the following decades to allow chemicals and fuels production from algae. The BRI recognises the potential of algal chemicals, and is planning to work in this area in the future. The BRI's role would be to develop *clean technology processes* to extract algal oils and their transformation into biodiesel and commodity chemicals. The intention is to explore the potential of using enzymes to (i) lyze algal cells to facilitate the extraction of the oils, and (ii) to catalyse transesterification-alcoholysis reactions of oils into fatty acyl esters that constitute biodiesel. As the biodiesel industry generates enormous quantities of glycerol (1 mole per 3 moles of fatty acyl esters produced from plant seed oil), new uses and applications for this by-product are another avenue of research that can be explored.

6.3 Project III: Studies on Hemicellulose Extraction from Wood & its Conversion into Xylitol. Presently, the BRI is partnering with CRIBE (www.cribe.ca) and GreenField Ethanol Inc. (www.greenfieldethanol.com/) in a pilot-plant facility at Chatham (Ontario) to extract and convert wood hemicellulose (25 % of mass of wood constitutes hemicellulose) into value-added products. This project will present opportunities to expand further upon the products that can be produced from hemicelluloses to add value. The industrial project addresses the production of oligosaccharides from poplar hemicelluloses, and these find niche markets as prebiotics for inclusion into foods and beverages. An alternative value-added product that can be produced from hemicellulose and warranting investigation is xylitol (an alternative sweetener) because the demand for commercial production of xylitol is greater than what can be supplied under present day conditions. Hemicelluloses are a natural source from which to produce xylitol. Hemicelluloses are complex heteropolysaccharides composed of a mixture of sugars, but predominantly of the pentoses xylose and arabinose, and minor amounts of hexoses (galactose, glucose and mannose) and uronic acids. Its composition and structure is dependent upon the type of tree species (softwoods or hardwoods) used as the source of hemicellulose. It is from xylose (and arabinose), hydrolysis products from hemicelluloses, that xylitol is produced through fermentation processes by specific yeasts. Hemicellulose *per se* cannot be fermented directly to xylitol by yeasts, and requires a process step that involves hydrolysis of hemicellulose into its constituent sugars (monosaccharides). This can be achieved either through dilute acids, or specific enzymes (xylanases). An attractive method for pretreating and fractionating the constituent components of lignocellulosic residues (plant biomass) is steam-explosion, and produces an autohydrolysis liquor that contains the hemicelluloses, albeit in a partially-

hydrolysed form requiring further hydrolysis (dilute acid/enzymes) to form the monosaccharides. Hemicellulose hydrolysates consist of a mixture of monosaccharides including both pentose (xylose and arabinose) and hexose (glucose, galactose and mannose) sugars and their conversion to xylitol by fermentation will be studied using different yeast species that can ferment both sugar-types into xylitol. Arabinose can be converted to xylitol metabolically by certain yeast strains, and also through enzymatic transformative processes. This aspect will also be studied. Scale up from lab to pilot-plant levels will allow the BRI to develop a process technology that could lead to commercialisation. Spin-offs from this technology could see the creation of new business ventures from conversion of forest biomass into chemical products, and this will lead to more employment. This will benefit the local and regional economies in Ontario, and Canada as a whole.

6.4 Project IV: Biomolecular Engineering of Microorganisms for Bioconversion of Forest Biomass and Pulp/Paper Mill Sludge into Value-added Bioproducts and Biofuels. Research in biofuels is becoming increasingly important in biorefining, and especially, second generation biofuels (cellulose to bioethanol), where enzymes (esp., cellulases and xylanases) play an important role in plant biomass conversion processes. The commercial production of bioethanol from lignocellulosic materials is impeded by 2 bottleneck technological problems associated with (i) biomass quality (mainly enzyme accessibility to cellulose through some form of pretreatment), and (ii) the potency of the "*enzyme cocktail*" to hydrolyse cellulosic residues and its cost of production by fermentation (mainly cellulases and cellobiases). The research is targeting the second problem by focussing on bioengineering certain bacterial and fungal strains (*Clostridium thermocellum*, *Trichoderma reesei*, *Phanerochaete chrysosporium*) for the large-scale production of "*super enzymes*", and their use in high-efficient conversion of biomass to value-added bioproducts and biofuels. The research focuses on introducing exotic cellulase genes into *Trichoderma reesei* and *Clostridium thermocellum*, hopefully to produce high-enzyme yielding stable strains that will be tested under optimal fermentation conditions. The developed technology will be applied in industrial cellulase production, and the enzymes will be used to convert forest biomass and pulp/paper mill sludge to bioproducts and biofuels such as methane and bioethanol.

7.0 *Commitments by Lakehead University*

The BRI will become a member of the Lakehead University Centre for Analytical Services (LUCAS). Becoming a member will provide the BRI with invoicing and accounting services along with financial reporting and account collections for a fee of 10 % of the invoice total. Lakehead University Finance Department will provide Datatel ordering capabilities and My Budget services for the BRI. LUCAS provides the finance department with a percentage of the 10 % collected from the BRI as payment for these services. All proceeds from LUCAS testing laboratories are used for the non-profit activities of research and teaching at Lakehead University which includes the maintenance and upgrading of laboratory equipment and spaces. BRI presently has part-time administrative support (2.5 days/week).

8.0 *University Facilities*:

The Biorefining Research Institute will be located at 1294 Balmoral utilizing the BRI laboratories and office spaces on the 3rd floor (NO3001) and basement (NO0009). These areas have office space for the Director, the two Research Chairs, an administrative assistant, and several research students. Laboratory space is located on 2 floors (third floor and basement). All required instrumentation (including all laboratory and office equipment and some supplies) are present within the confinement of this space. While the laboratory space at 1294 Balmoral is currently being used to its full potential, there exists a need for supplementary space to house additional laboratory equipment along with areas for graduate and undergraduate students to conduct lab and computer work, research, etc. If pilot-plant studies are to be engaged in for process development, then space for this will need to be leased out of campus, as space for this purpose does not exist at the BRI or Lakehead. Leasing costs will come from research grant(s) or industry contract(s) funding the BRI Institute projects in question. These costs will be embedded into the research proposals on submission for funding of the research work. In partnering with Canadian industry, overhead costs to the extent of 40 % will be embedded into the contract funding the work. Equipment use at BRI and LUCAS for Institute research purposes will be charged against the funding grant/industrial contract on a sample analysis basis. If special equipment needs to be used to develop the research project, then this will be leased over the lifetime of the project where possible and costs for this will be embedded in the grant funding/industry contract. Lab and office consumables will likewise be charged against the research fund.

9.0 *Membership*:

Types of Memberships:

There will be two types of members in a BRI Institute: *Working* and *Associate Members*

9.1 Working Members are those appointed to the BRI, and include the Director, the two Research Chairs in Biorefining, Research Scientists (CV's are included in Appendix A), Administrative staff, Technicians, Research Associates, and Post-Doctoral Research Fellows. Working Members will provide the leadership, day-to-day administration of the institute, and the research conducted at the BRI, either independently, or in collaboration with the Chairs, and Associate Members (see below) at Lakehead or external to the university. Appointments will be

based on professional qualifications and expertise sought to fill appropriate BRI positions. A Committee comprising the Director and Administrative Assistant of the BRI, and any other Member of the BRI as required (depends upon the nature of the position in research), who will evaluate applications. Vacant positions will be advertised, a short-list of candidates selected for interviewing, and appointments made on a term-basis for non-tenured posts.

9.2 Associate Members are restricted to Lakehead University faculty and any stakeholder (industry, government, other) with a vested interest in the *mission* and *mandate* of the BRI. *Associate* Members are welcome to participate in research collaborations with Working or other Associate Members of the BRI, as well as attend special BRI events and the BRI Annual General Meeting. Associate Members are invited to the BRI on the basis of their research expertise and profile. Current Associate Members of the BRI are listed in Appendix B.

All Members of the BRI will receive updates by email about events, including public lectures, seminars, conferences, specialist courses and workshops offered, and will be invited to participate in the life of the Institute including the Outreach Programs to disseminate biorefining and bioenergy technologies to the general public.

A BRI "*Professional Club*" will include professional members of the public (industry sector and government organizations), academics from Lakehead faculty, research associates and post-doctoral fellows, and Visiting Scholars ("guests") from other universities in Canada and abroad. Students at the undergraduate and post-graduate levels are included as student members.

Privileges of Club Membership: Members will receive newsletters, updates on BRI Institute activities, concessions to BRI events such as Speaker series, and Members can use this membership as a professional activity in their CV's.

Membership Responsibilities: Attendance and participation at Annual BRI Meetings, participation in Lakehead University Research Week events, and BRI Seminar and Outreach Programs.

10.0 *Governance*:

The BRI will operate with an internally appointment Management Committee and an externally appointed Advisory Committee. The Management Committee will meet on a quarterly basis and the Advisory Committee will meet at least once a year.

The BRI Advisory Committee and the BRI Managment Committee are made up of the following individuals:

BRI Advisory Committee:

Rui Wang (chair)
Umed Panu (vice chair)
Robert Dekker (ex-officio)
Bruce Holm (industry liaison)
Reino Pulkki
Andrew Dean
Heidi Schraft
David Frood,
Martin Kaiser
Alan Gilbert

BRI Management Committee:

Robert Dekker (Director)
Wensheng Qin (Research Chair)
Wely Floriano (Research Chair)
Rui Wang (VP REDI)
other relevant Faculty members

11.0 *Employment Opportunities:*

All research proposals submitted for funding through the BRI will include the provision, where applicable, for the hiring of post-doctoral fellows, graduate and undergraduate students for the positions of research associates, research assistants and laboratory technicians. The BRI will strive to provide these students with research and laboratory training in an effort to produce Highly Qualified Personnel.

The BRI will also take advantage of the Ontario Work Study Program and the Lakehead University Summer Work Program. Both programs provide a wage supplement and/or reimbursement on wages paid to undergraduate students hired during the year.

12.0 *Personnel*:

The Director, Robert Dekker and BRI Chair, Wensheng Qin are paid through the Ontario Research Chairs program. The Molecular Medicine/Biorefining Research Chair, Wely Floriano, has salary funding through the Shared Hierarchical Academic Research Computing Network (SHARCNET) and the Thunder Bay Regional Research Institute (TBRRI, formerly known as Molecular Medicine Research Centre (MMRC). The BRI currently has one part-time Administrative Assistant and one Technician (shared with LUCAS) on staff paid through the BRI operating grant. Post-Doctoral Fellows, Research Assistants and other additional personnel will be hired only if research budgets and grants permit.

13.0 *Legal Implications:*

The Institute and associated researchers/members will only undertake those research projects that have been endorsed by the University through those policies currently in place for travel,

research contracts, ethics coverage, Intellectual Property, etc. In which case, the legal liability and insurance concerns are covered by Lakehead University. For a proposal that includes a contract with an outside body (granting agency, other university or other body) a draft copy of this will accompany the proposal. No contracts or grants will be accepted on behalf of the University without vetting through the usual University approval process for academic research and activities.

Appendix A

Curricula Vitæ of the BRI Chairs and Research Scientists

Curriculum Vitae

NAME: **Robert F.H. DEKKER, PhD**

Position: **Director, and Senior Ontario Research Chair in Biorefining**

Address: Lakehead University, *Biorefining Research Institute*,
955 Oliver Road, Thunder Bay, Ontario, P7B 5E1

***E*-mail address:** rdekker@lakeheadu.ca

Tel: (work) 1+ (807) 343-8844

FAX: 1+ (807) 343-8240

Education

University:

1964-1968: **Bachelor of Science Degree (Honours** in Biochemistry**)**
University of Western Australia, Perth, Western Australia.

1969-1971: **Master of Science** (MSc) **Degree** (Biochemistry: *animal nutrition*)
James Cook University, Townsville, Queensland, Australia.

1972-1974: **Doctor of Philosophy** (PhD) **Degree** (Biochemistry: *enzymology*)
James Cook University, Townsville, Queensland, Australia.

Research Theses:

B.Sc. Hons. (**1968**): "*Aspects of some pigmented metabolites produced by Aspergillus niger*".

M.Sc. (Apr. **1972**): "*The digestion of the polysaccharide constituents of the tropical pasture legume Stylosanthes humilis* (Townsville lucerne) *in the bovine rumen*".

Ph.D. (May **1974**): "*Studies on Fungal Hemicellulases: purification, properties and mode of action of two endo-1,4-ß-D-xylanases produced by the sugarcane phytopathogen, Ceratocystis paradoxa*".

Personal Awards

1964 Commonwealth of Australia Undergraduate Scholarship (WA)
1969 Recipient of a Rural Credits Development Fund (Australia) award
1972 Commonwealth of Australia Postgraduate Research Scholarship
1975 Deutsche Forschungsgemeinschaft (DFG) Research Fellowship (post-doc), Germany
1976 Post-doctoral Research Fellowship at Johns Hopkins University School of Medicine, Baltimore, USA (*offer not taken up*)
1989 Fellowship: Senior Visiting Professor (National Research Council of Brazil, *CNPq*)
1999 Fellowship: Senior Visiting Research Professor (*CNPq*) Brazil
2004 Fellowship: Senior Visiting Research Professor (*CNPq*) Brazil
2006 The *Don Quijote* 400th Anniversary Visiting Professorship, UCLM, Spain
2008 Senior Ontario Research Chair, Lakehead University, Canada

Employment History

1969-1971 **Research Officer** and **Senior Research Officer**; *James Cook University*, Townsville, Queensland, Australia.
1975-1976: **DFG-Research Fellow** (post-doc); *Biologisches Institüt II, Lehrstuhl für Biochemie der Pflanzen, Freiburg Universität*, Freiburg, (*West*) Germany.
1976-1977: **Lecturer**; *University of Natal (Department of Biochemistry),* Pietermaritzburg, South Africa.
1977-1979: **Associate Professor**; *University of Natal*, Pietermaritzburg, South Africa.
1980-1981: **Research Scientist** and **Project Leader**; *CSR Research Ltd., Sugar Division (Biotechnology Group),* Sydney, NSW, Australia.
1982-1985: **Senior Research Scientist**; *CSIRO, Division of Chemical (and Wood) Technology*, South Melbourne/Clayton, Victoria, Australia.
1986-1990: **Principal Research Scientist**; *CSIRO, Divisions of Chemical and Wood Technology, and Biotechnology* (1988-1990) Victoria, Australia.
1989: **CNPq-Visiting Professor**; *Universidade Federal do Rio de Janeiro, COPPE/Dept. of Chemical Engineering,* and *Dept. of Biochemistry,* Rio de Janeiro, Brazil.
1993-1996: **Professor of Industrial Enzymology**; *Murdoch University, Biotechnology Program, School of Biological & Environmental Sciences,* Perth, Western Australia.
1993 (10 mths): **Specialist Consultant**; *Biotech International Ltd*., Perth, W.A.
1997 (6 mths): **Specialist Consultant**; *Biotech International Ltd*., Perth, W.A.
1999-2002: **CNPq- Senior Visiting Professor**; *Universidade Estadual de Londrina, Dept. of Food Science,* and *Dept. of Biochemistry,* Londrina.
2004-06: **CNPq- Senior Visiting Professor**; *Universidade Estadual de Londrina, Dept. of Biochemistry & Biotechnology,* Londrina.
2006-08: **Visiting Professor (full)**; *Universidad de Castilla - La Mancha*, Cuidad Real, Spain.
2008- : **Director**; Lakehead University, *Biorefining Research Initiative*, Thunder Bay, Canada.
Director; *PAPIER* – Canada
Adjunct Professor; Lakehead University (Faculty of Science – Dept. of Biology; Dept. of Chemistry; Faculty of Natural Resources Management)

Industrial Consultancies

- **BIOCONVERSION AND BIODEGRADATION OF LIGNOCELLULOSIC MATERIALS**
  1980 (Apr-Aug): *CSR Ltd., Sugar Division*, Sydney, NSW, AUSTRALIA.
  1989 (Aug): *United Nations Development Program (UNDP/UNIDO),* CHILE.
  1993 (Mar-Dec): *Biotech International Ltd*., Technology Park, Bentley, W.A.
  2006 - **2008**: *Projeto Bioetanol*: Bagasse cellulose-to-ethanol, BRAZIL.

- **ENZYME TECHNOLOGY & BIOTECHNOLOGY**
  1994 (Jan-Mar): *EcoCare Investments P/L.,* Osborne Park, W.A.
  1997 (Jun-Oct): *Biotech International Ltd.,* Technology Park, Bentley, W.A.

Specialist Advisor/Review Panel Member

1979 Specialist Advisor on "*The bioconversion of lignocellulosic materials*" to the **C**ouncil of **S**cientific and **I**ndustrial **R**esearch (*CSIR*, South Africa), Co-operative Scientific Program: National Materials Project:- *Sugarcane bagasse-to-ethanol*; *alternative liquid motor fuels*.

2009 Participated on a peer-review panel for the *Ontario Research Fund-Research Excellence Round 4*: Bio-Economy and Alternative Energy (*Ontario Ministry of Research and Innovation*) to review research proposals from Canada (Ontario universities and research institutions) requesting funding.

2011 Participated on a NSERC Site Visit Committee to review an application submitted under the *College and Community Innovation Program* for an Atlantic Canada Technology Access Center in Biorefining.

Professional Societies

2009- PAPIER (Canada): as a *Director*
2009- PAPTEC (Canada)
2000-2010 American Association for the Advancement of Science (*AAAS*)
1987-1991 Australian Biotechnology Association
1985-1990 International Energy Agency, Bioenergy Branch, Bioconversion of Lignocellulose Section.
1977-1979 South African Biochemical Society
1975-1976 Federation of the European Biochemical Society (FEBS), and the German Biological Chemistry Society
1970-1974 Royal Australian Chemical Institute, and Australian Biochemical Society

Editorial Board

1989-1991 **Member**: Editorial Board - *Applied Biochemistry and Biotechnology*.
2011- **Member**: Editorial Board - *Fermentation Technology*

Skills

Expertise and **research skills** have focused on:

Biochemistry: enzymology, enzyme technology, protein chemistry
carbohydrate & polysaccharide chemistry
Food Science: food enzymology, food polysaccharides
Microbiology: fermentation technology, microbial biochemistry & physiology
Biotechnology: biorefining, bioconversion & biotransformation (enzymatic & microbial)
bioremediation (environmental), industrial enzymology

Research Expertise

Specific skills and **expertise** acquired through research in the following areas:

- **Biodegradation Of Plant Materials**
  - *enzymatic and microbial degradation*
  - *bovine rumen digestion (in-vivo and in-vitro methods)*
- **Bioconversion Of Lignocellulosic Materials**
  - *methods of analysis of plant materials*
  - *enzymatic & microbial degradation*
  - *pulping methods (biological & chemical); biobleaching [enzymatic]*
  - *pretreatment methods (physical & chemical)*
  - *steam explosion pretreatment*
  - *plant polysaccharides (isolation and characterisation)*
- **Biosynthesis Of Microbial Polysaccharides**
  - *ß-1,2-glucan, cellulose, xanthan, lipopolysaccharides*
  - *bacterial membrane enzyme preparations*
- **Carbohydrate & Polysaccharide Bio/Chemistry**
  - *plant and microbial*
- **Enzymology**
  - *induction, synthesis & production of enzymes by bacteria, fungi and yeasts*
  - *methods of enzyme assay*
  - *isolation, purification; characterisation; inhibition; kinetics*
  - *mechanisms of action*
- **Enzymes Studied**:
  - hydrolases *(polysaccharidases and glycosidases*)
  - oxidases (*glucose oxidase, laccase*)
  - isomerases (*glucose isomerase*)
  - dehydrogenases (*cellobiose dehydrogenase*)
  - proteases (*acid, neutral & alkaline*)
  - microbial lipases
  - polyphenol oxidases *(laccases, peroxidases)*
- **Fermentation**
  - *Fermenters (lab-scale (**10-20 L**) and pilot-plant scale up to **100 L** capacity)*
  - *Shake flasks*
  - *Microbial physiology (response-surface statistical methodology)*
  - *Free and Immobilised cells using bacteria, fungi and yeasts*
  - *Ethanol production*
- **Cell And Enzyme Immobilisation**
  - *development of methods for: bacteria, yeasts & fungi, and enzymes*
  - *applications*
- **Reverse Synthesis Of Carbohydrates Using Enzymes**
  - β-*glucosides (cellobiose, laminaribiose, sophorose, gentiobiose)*
  - *trehalose*
- **Bioremediation**
  - *use of wood-decay fungi to detoxify xenobiotic compounds such as polyaromatic hydrocarbons, and aromatic and phenolic compounds*

- *enzymatic mechanisms involved in remediation via oxidation processes*

- **Lignin**
  - use of wood-decay fungal enzymes to change the functionality of lignins for polymer applications
- **Biodiesel**
  - use of fungal lipases in transesterification reactions for the production of biodiesel from plant seed oils

Career Milestones

- **100** research and review papers in peer-reviewed **international** scientific journals
  Published work **cited** >**1500 times** in the literature
  2 textbooks on *Industrial Enzymology*, **1** major industry Consultancy Report
  1 book on "Oligosaccharides"
  13 Conference Proceedings (*full refereed papers*)
  16 technical *Research & Development* Reports (industry & government)
  200+ papers presented at scientific meetings (international & national)
  3 patents (Brasil, 2007; World, 2008)
- **International recognition**: Acknowledged authority in 2 areas of *past* research specialisation on: *The Biodegradation of Lignocellulosic Materials*:
  - xylanases and the hemicellulases (>*750 citations*)
  - steam-explosion as pretreatment for enzymatic hydrolysis of lignocellulose
- **Competitive Research Grant Funding**: (totalling **$2,405,730**)
- **Inter-disciplinary** collaborative research projects with universities and research institutions in Australia, and internationally with Brazil, Chile, Germany, New Zealand, Spain, South Africa
- **Credited** with **first** describing:
  - new *oligosaccharide*: *O-ß-L-arabinofuranosyl-(1,3)-O-ß-D-xylopyranosyl-(1,4)-O-ß-D-xylopyranosyl-(1,4)-D-xylose* (1975)
  - new *enzymes*: *cellobiose dehydrogenase (EC 1.1.99.18)*; and *α-glucuronidase* (1980)
  - new *physiological roles* of the secondary metabolite veratryl alcohol (2001):
    - fruiting body formation promoting earlier fruiting times in the oyster mushroom, *Pleurotus ostreatus*
    - modulating genes regulating the synthesis of plant cell wall-degrading enzymes
  - new *exopolysaccharide* named botryosphaeran (2003)
- **Developed a demonstrable technology** with *industrial potential* for the quantitative conversion of lignocellulosic *waste* residues into fermentable sugars in high yields for *biofuel* production, using steam explosion pretreatment, enzymatic saccharification, and magnetically immobilised enzymes.
- **Specialist Advisor:** *Bioconversion of Lignocellulosic Materials* to the Council of Scientific & Industrial Research (CSIR), South Africa (1978-1979)
- **Principal Research Scientist:** CSIRO (Australia) 1986-1990
- Several **Visiting Professorships** (France, Brazil, Chile, Australia, Spain, Turkey)
- Several **Consultancies** to Australian industry, and the **United Nations** (**UNDP**, 1989)
- **Directorship**: Lakehead University, Biorefining Research Initiative
- **Director**: PAPIER (Canada)

Competitive Research Grant Funding

TOTAL GRANTS FUNDING: **$2,405,730**

1977-1979: Research Grants totalling $200,000 from: *University of Natal*, South Africa; and *Council of Scientific & Industrial Research* (CSIR), South Africa

1981: *National Energy Research and Development Demonstration Council of Australia* grant ($150,000) for a "*Fuels from Biomass*" project; *CSR Ltd., Corporate*, Sydney, matching funds of $200,000

1982-1990: All research conducted at CSIRO was funded by the Australian Government

1984: Joint *CSIRO-James Cook University* grant of $5,000

1993-1996: Murdoch University start-up research fund of $20,000

1995: Small *Australian Research Council* grant of $22,000 (*Trehalose* project)

2001, **05**, **06**: *Araucaria Foundation* grant (Paraná) (jointly with Dr. AM Barbosa, UEL, Brazil) of $35,000 (*Microbial physiology of Botryosphaeria sp.* project); *CNPq* (Brazil), jointly with Dr. AM Barbosa, $35,000 (Studies on botryosphaeran: production, biological properties)

2007-08 Consejería de Agricultura del proyeto de la Universidad de Castillia-La Mancha, Ciudad Real, España, grant of €49,000 (*Busqueda de microorganismos con interesantes actividades enzimaticas para su aplicaron en la alimentación animal*)

2008 NSERC- RCD Grant ($50,000) as Senior Research Chair in Biorefining

2008 Start-up funds ($100,000) – BRI/Lakehead University

2009-2013 NSERC-CRD Grant of $620,200 for "Enzymatic modification of lignin"

2010 NSERC-Engage Grant of $24,680 for "Biodiesel from hempseed oil"

2011-2013 CRIBE Grant of $894,850; value adding of biomass components: hemicellulose, lignin

Teaching Record

1968: **Demonstrator** (*tutor*): *Dept. of Biochemistry, University of W.A*.

1969 - 1973: **Demonstrator** (*casual*): *Dept. of Chemistry & Biochemistry, James Cook University*.

1976 - 1977: **Lecturer** in Biochemistry: *University of Natal*, Pietermaritzburg, South Africa.

1977 - 1979: **Associate Professor** in Biochemistry: *University of Natal*.

1989: **Visiting Professor**: *Dept. of Biochemistry, & COPPE, Dept. of Chemical Engineering, Federal University of Rio de Janeiro*, Brazil.

1991: **Visiting Professor**: *Dept. of Microbiology, Monash University*.

1993 - 1996: **Professor** in Industrial Enzymology: *Biotechnology Program, Murdoch University.*

1999 - 2002: CNPq **Visiting Professor**: *Dept's. of Biochemistry & Food Science, State University of Londrina, Brazil*

2005 - 2006: CNPq **Visiting Professor**: *Dept. of Biochemistry*, UEL. Londrina, Brazil

2006 - 2008: **Profesor Catedrático de Biotecnología**: Universidad de Castilla-La Mancha, Ciudad Real, Spain

International Courses Presented

1. *Developments on the Enzymatic Hydrolysis of Cellulosic Materials, and Aspects of the Fermentation of the Sugars Produced* (10 lectures), 2-day **Workshop Meeting** of Second National (Brazilian) Seminar on "*Enzymatic Hydrolysis of Biomass*" - *Universidade Estadual de Maringá*, **Brazil**, 9-13 December 1985.
2. *Biodegradation of the Heteroxylans* (6 lectures) - *Universidade Federal do* Paraná (Dept. of Biochemistry), Curitiba, **Brazil**, 18-19 July 1989.
3. *The Enzymatic Hydrolysis of Lignocellulosic Materials* (20 lectures) - Ninth International Course of Biochemical Engineering, *Universidad Católica de Valparaíso*, **Chile**, 8-11 August 1989.
4. *How to Write a Scientific Paper* (6 lectures)
   - *Universidade Estadual de Londrina* (Dept. of Biochemistry; and Dept. of Food Science), Londrina, **Brazil** (**1999, 2005**)
   - *Universidad de Castilla - La Mancha* (Faculty of Chemistry), Ciudad Real (**2006**), **Spain**
   - *Marmara University* (Dept. of Bioengineering), Istanbul, **Turkey** (2008)

Advanced Courses Presented

1. *Enzyme Immobilisation* (6 lectures) - *Universidade Federal do Rio de Janeiro* (Dept. of Chemical Engineering/COPPE), **Brazil** (**1989**)
2. *Industrial Applications of Enzymes* (8 lectures) - *Monash University* (Master of Biotechnology; Dept. of Microbiology), **Australia** (**1991**)
3. *Immobilization of Biocatalysts: Enzymes and Microbial Cells* (24 lectures) - *Universidade Estadual de Londrina* (Dept. of Biochemistry), **Brazil** (**2000/05**)
4. *Food Enzymology: Fundamental Principles and Industrial Applications* (40 lectures)
   - *Universidade Estadual de Londrina* (Dept. of Food Science), Londrina, **Brazil** (**2000**)
   - *Universidad de Castilla - La Mancha* (Dept. of Food Technology), Ciudad Real (**2007/08**), **Spain**

Undergraduate Teaching Courses

- **Biochemistry (1977-1979; University of Natal)**
  2nd year (*Biochemistry II*) carbohydrate chemistry, practical class supervision - 12 lectures
  3rd year (*Biochemistry III*) plant biochemistry - 24 lectures, biochemical methods - 10 lectures, practical classes supervision
  Honours (*Biochemistry IV*) biomembranes - 36 lectures, biochemical perspectives - 10 lectures, supervision of Honour's degree projects

- **Bioprocessing & Industrial Enzymology (1993-1996; Murdoch University)**
  A year-3 level one Semester course (40 lectures):
  fundamental concepts of enzymology, history of enzyme technology, kinetics, enzyme production, immobilisation of enzymes and microbial cells, biosensors, recent advances in enzyme technology, industrial applications of enzyme technology with emphasis on enzymes used in food & beverage processing

Laboratory component of 5 experiments (each of 2-week duration):
Enzyme kinetics, enzyme production by free and immobilised microbial cells, immobilisation of enzymes, construction of enzyme electrode biosensors, and some applications of enzyme technology

- **Cell Biology & Biochemistry I (1993-1996; Murdoch University)**
  Laboratory supervision and marking of practical reports and exam papers

- **Course Co-ordinator (1993-1996; Murdoch University)**
  Bioprocessing and Industrial Enzymology (3rd year)
  Advanced Biotechnology (4th year, 6-12 months research project)
  Cell Culture (2nd year)

- **Food Enzymology (2007; Universidad de Castilla-La Mancha, Spain)**
  20-Lecture course (4th year) on applications of enzyme technology to processing agricultural materials for foods and beverages

Visiting Professorships (*by invitation*)

1979 **France: (June; 4 weeks)**
- *Centre National de la Recherche Scientifique* (**CNRS**), Centre de Recherches sur les Macromolecules Vegetales (**CERMAV**); and University of **Grenoble**.
- *Institute National de la Recherche Agronomique* (**INRA**), Centre de Recherches des **Nantes**.
- *Universite de Paris VI*, Faculte de Pharmacie, Lab. de Chimie Biologique, **Paris**.

1989 **Brazil: (full year)**
Universidade Federal do Rio de Janeiro (COPPE-Dept. of Chemical Engineering, and Dept. of Biochemistry)

1989 **Chile: (August)**
Universidad Católica de Valparaíso (Dept of Biochemical Engineering), Valparaíso

1987-90 **Australia:** (***Honorary***)
Swinburne University of Technology (Dept. of Applied Chemistry), Hawthorn, Victoria

1991 **Australia: (full year)**
Monash University (Dept. of Microbiology), Clayton, Victoria

1999, 2006 **Brazil: (5 years)**
Universidade Estadual de Londrina (Dept's. of Biochemistry, and Food Science), Londrina

2006-08 **Spain**
Universidad de Castilla-La Mancha (Facultad de Ciencias de Químicas), Cuidad Real

2008 **Turkey (April)**
Marmara University (Dept of Bioengineering), Istanbul

Lecture Tour of Europe (*1 month, 1979*)

In **1979**, as *invited Visiting Professor to France*, I was also *invited* (sponsor funded) to present Seminars on aspects of my research work, which, at the time, was of much interest to researchers in the field following the publication of my research on enzymes degrading hemicelluloses. The topics covered (*xylanases, hemicellulases, and bioconversion of lignocellulose*) and were presented at the following *institutions* within Europe:

- *University of Grenoble & the CERMAV*; Grenoble, France; *University of Paris VI*, Paris, France; and *INRA*, Nantes, France
- *University of Fribourg*, Fribourg, Switzerland
- *Gulbenkian Institute of Science*, Oerias, Lisbon, Portugal
- *Freiburg University*, Freiburg, West Germany; *Institute für Holzchemie*, Hamburg, West Germany
- *Swedish Pulp and Paper Research Institute*, Stockholm, Sweden

Chairperson at International Congresses (*invited*)

1982 **Colloquium** on: *Production of Biological Fuels*: *12th International Union of Biochemistry Congress, Perth, Western Australia, 15-21 August 1982.*

1988 **Session** on: *Biotechnical Applications*: *VTT Symposium - "Non-waste Technology", Espoo, Finland, 20-23 June 1988.*

Invited Conference Speaker (mostly *sponsor funded*)

1978 **Plenary Lecturer:** 27th Easter School Symposium on "*Polysaccharides in Foods*", School of Agriculture, University of Nottingham, **England**, 4-6 April.

1979 **Plenary Lecturer:** Symposium of the Portuguese Society of Biochemistry on "*Bioconversion of Cellulose and Hemicellulose*", Gulbenkian Institute of Science, Oerias, **Portugal**, 29 June.

1982 **Chairman:** Specialist Colloquium of the 12th International Union of Biochemistry Congress on "*Biological production of liquid and gaseous fuels*", Perth, **Australia**, 15-21 August.

1985 **Plenary Lecturer:** 1st International Energy Agency/Bioenergy Branch Symposium on "*Pretreatment of Lignocellulosic Materials*", Rotorua, **New Zealand**, 25-29 March.

Opening Address: 2nd Seminário de Hidrólise Enzimática de Biomassa Brasileiro (SHEB) on the "*Enzymatic Hydrolysis of Biomass*", Maringá, **Brazil**, 11-13 December.

1986 **Invited External Examiner (Jury):** Doctor of Science thesis (J.M. Brillouet), C.N.R.S./CERMAV, Grenoble, **France**, 20 June.

Keynote Speaker: 2nd IEA/Bioenergy Branch Symposium on "*Pretreatment of Lignocellulosic Materials*", Graz, **Austria**, 23-27 June.

Invited Speaker: Workshop Meeting, 7th Australian Biotechnology Conference on "*Fermentative Ethanol Production*", Melbourne, **Australia**, 24-28 August.

1987 **Invited Panellist:** International Working Group, Biochemical Methods, IEA, Bioenergy Agreement [Biomass Conversion Annex IV], Voluntary Standards Activity, on "*Methods of Biochemical Analysis of Biomass for Fuels and Chemicals*", Solar Energy Research Institute, Denver, Colorado, **USA**, 18-20 November.

1988 **Invited Keynote Speaker:** 195th American Chemical Society National Meeting and 3rd Chemical Congress of North America Symposium on "*Biogenesis and Biodegradation of Plant Cell Wall Polymers*", Toronto, **Canada**, 5-11 June.

1988 **Keynote Speaker:** 3rd IEA/Bioenergy Branch Symposium on "*Bioconversion of Lignocellulosics*", Ottawa, **Canada**, 12-16 June.

Invited Keynote Speaker and Chairman: VTT Symposium on "*Non-Waste Technology*", Espoo, **Finland**, 20-23 June.

Plenary Lecturer: International Symposium on "*Steam-Explosion Techniques; Fundamental Principles and Industrial Applications*", Milan, **Italy**, 20-21 October.

1989 **Specialist Consultant:** United Nations Development Program, "*Bioconversion of Lignocellulose*", Santiago, Concepcion and Valparaiso, **Chile**, 1-11 August.

Invited Speaker: Aracruz Celulosa S.A., Aracruz-ES, **Brazil**, 28 April.

Invited Speaker: State of Paraná Association of Biotechnology Industries, Curitiba-PR, **Brazil**, 20 July.

2001 **Plenary lecturer:** 4th Latin American Symposium on Food Science – "*Foods for the 21st Century: Challenges and Trends for Latin America*", Campinas-SP, **Brazil**, 12-15 November.

2002 **Invited Speaker:** 5th Seminário Brasileiro de Tecnologia Enzimática (EnziTec 2002), Brasilia-DF, **Brazil**, 7-10 April.

2006 **Invited Seminar**: *Biodegradation and Bioconversion of Lignocellulosic Materials: An overview of the technology developed*. Universidad de Castilla - La Mancha, Ciudad Real, **Spain**, 11 July.

Plenary Lecturer: 1st Reunião do Projeto de Bioetanol Brasileiro, Campinas-SP, **Brazil**, 27-28 July.

2007 **Invited Seminar:** *Studies on Botryosphaeran: the exopolysaccharide produced by Botryosphaeria rhodina*", University of Tuscia, Dept. of Agrobiology & Agrochemistry, Viterbo, **Italy**, 12 June.

2008 **Invited Seminars:** (i) "*Botryosphaeria rhodina: A nasty fungus with exploitable goodness".* (ii) "*Bioconversion of Lignocellulose: Pretreatment and Enzymatic Saccharification of Cellulose: Steps in the Pathway to Bioethanol - An overview of the technology developed in Australia"*. Marmara University (Dept of Bioengineering), Istanbul, **Turkey**, 1-9 April.

"Bioconversion of lignocellulosic materials: Concept for a biorefinery", Lakehead University, Thunder Bay, **Canada**, 21 May.

Biorefining: The Science behind the Forest Bioeconomy, "Mind to Market", Thunder Bay, 7 November.

Biorefining Technologies: Chemicals and industries for the 21st Century. St Ignatius High School, Thunder Bay, **Canada**, 12 December.

2009 **Invited Seminars:** (i) "*Studies on Botryosphaeran: A new exopolysaccharide produced by the fungus Botryosphaeria rhodina"*. Lakehead University (Dept of Biology), **Canada**, 29 January.

(ii) "*Bioconversion of Lignocellulose: Pretreatment and Enzymatic Saccharification of Cellulose - Steps in the Pathway to a Biorefinery. An overview of the technology developed in Australia (1980-1988)"*, Lakehead University (Faculty of Forestry), **Canada**, 19 March.

2010 **Invited Speaker**: (i) "*The Biorefining Research Initiative at Lakehead University: Evolution, Mandate and Developments"*; (ii) "*Second Generation Biofuels: Pathways leading to the production of fermentable sugars from lignocellulosic residues: Steam explosion pretreatment and enzymatic saccharification"*. Agriculture Canada/Saskatoon Research Council, Saskatoon, **Canada**. 25-26 March.

Invitations to Contribute Book Chapters and Reviews

1974 **Review article** in: *Advances in Carbohydrate Chemistry and Biochemistry* Academic Press (published 1976). (article cited **>360 times**)
1975 **Book chapter** in: "*Carbohydrate Research in Plants and Animals*" Landbouwhogeschool, University of Wageningen, The Netherlands (1976).
1977 **Book chapter** in: "*Polysaccharides in Foods*", Butterworths (1979).
1983 **Book chapter** in "*Biosynthesis and Biodegradation of Wood Components*" Academic Press (1985). (article cited >**100** times)
1986 **Book chapter** in: "*Methods in Enzymology; Volume 160, Biomass*", Academic Press (1988).
1987 **Book chapter** in: "*Biogenesis and Biodegradation of Plant Cell Wall Polymers*" American Chemical Society Symposium Series **No. 399**, (1989).
1988 **Book chapter** in: "*Steam Explosion Techniques; Fundamental Principles and Industrial Applications*", Gordon and Breach Scientific Publishers (1991)
2009 **Book chapter** for "*Handbook on Carbohydrate Polymers: Development, Properties and Applications"*, Nova Science Publishers Inc. NY (USA) (2010)
2009 **Author Book** on "*Bioactive Oligosaccharides: Production, Biological Functions and Potential Commercial Applications*" for Nova Science Publishers Inc. NY (USA) (2010)

Thesis Examination & Journal/Grant Refereeing

On a *regular basis* over the past 35 years I have:

- *examined* **Masters** and **Doctoral Theses** from various universities around the world including those from:

  Australia, Brazil, Canada, France, Germany, India, Indonesia, Malaysia, South Africa and Thailand

- *refereed* various **Research** & **Review papers** for several international *peer-review* science journals:

Applied Biochemistry & Biotechnology, Applied Microbiology and Biotechnology, American Journal of Enology and Viticulture; Australian Journal of Biotechnology; Biocatalysis & Biotransformation; *Biotechnology & Bioengineering; Biotechnology Letters; Bioresources; Bioresource Technology; Biotechnology Progress; Brasilian Journal of Microbiology; Carbohydrate Research; Carbohydrate Polymers; Enzyme & Microbial Technology; Environmental Technology; European Journal of Biochemistry; FEMS Microbiology Letters; Food Science and Technology International*; *International Journal of Biological Macromolecules; International Microbiology; Journal of Agricultural and Food Chemistry; Journal of Applied Microbiology; Journal of the Science of Food & Agriculture; Journal of Wood and Chemical Technology; Letters in Applied Microbiology; Oxidative Medicine and Cellular Longevity; Process Biochemistry; Biochimica et Biophysica Acta – Proteins and Proteomics; Biotechnology for Biofuels;*

Scientific Publications

Laccase enhancement by *Botryosphaeria rhodina* MAMB-05 grown on soybean oil as sole carbon source.
World Journal of Microbiology and Biotechnology: submitted **2011**
J.P. Sacchetto, M.I. Rezende, **R.F.H. Dekker**, I.S. Scarminio, M.A.Z. Zyub, A.F. da Silva Filho, A. M. Barbosa

Hypoglycemic and hypocholesterolemic effects of botryosphaeran from *Botryosphaeria rhodina* MAMB-05 in diabetes-induced and hyperlipidemia conditions in rats.
*Mycobiology 39 (**2011**) 187-193.*
C.C.B.O. Miranda-Nantes, E.A.I. Fonseca, C.T.B.V. Zaia, **R.F.H. Dekker**, N. Khaper, I.A. Castro, A.M. Barbosa

Diversity of plant oil seed-associated fungi isolated from seven oil-bearing seeds and their potential for the production of lipolytic enzymes.
World Journal of Microbiology and Biotechnology: *on-line 26 May **2011***.
B. Venkatesagowda, E. Ponugupaty, A.M. Barbosa, **R.F.H. Dekker**

Thermal and rheological properties of a family of botryosphaerans produced by *Botryosphaeria rhodina* MAMB-05.
*Molecules 16 (**2011**) 7488-7501.*
P.R.M.S. Fonseca; **R.F.H. Dekker**; A.M. Barbosa; J.L.M. Silveira; A.F.D. Vasconcelos; N.K. Monteiro; G. Aranda-Selverio; M.L. Corradi da Silva

Chemical modification of botryosphaeran: Structural characterization and anticoagulant activity of a water-soluble sulfonated (1→3)(1→6)-β-D-glucan.
*Journal of Microbiology and Biotechnology 21 (**2011**) 1036–1042*
J. Brandi, E.C. Oliveira; N.K. Monteiro; A.F.D. Vasconcelos; **R.F.H. Dekker**; A.M Barbosa; J.L.M. Silveira; P.A.S. Mourão; M.L. Corradi da Silva

Soybean oil and meal as substrates for lipase production by *Botryosphaeria ribis*, and soybean oil to enhance the production of botryosphaeran by *Botryosphaeria rhodina*.
In: Soybean - Biochemistry, Chemistry and Physiology, Tzi-Bun Ng (Ed.), **2011**, Chapter 7, pp 101-118. ISBN: 978-953-307-219-7, InTech Publishers
A.M. Barbosa, J.M. Messias, M.M. Andrade, **R.F.H. Dekker**, B. Venkatesagowda

Comparison of β-1,3-glucanase production by *Botryosphaeria rhodina* MAMB-5 and *Trichoderma harzianum* Rifai and its optimization using a statistical mixture-design.
*Biochemical Engineering Journal 53 (**2010**) 239-243.*
E.C. Giese, **R.F.H. Dekker**, I.S. Scarminio, R. da Silva, A.M. Barbosa

Extracellular β-glucosidase production by the yeast *Debaryomyces pseudopolymorphus* UCLM-NS7A: optimization using response surface methodology.
*New Biotechnology 27 (**2010**) 374-381.*
A.M. Barbosa, E.C. Giese, **R.F.H. Dekker**, D. Borsato, A.I. Briones Pérez, J.F. Úbeda Iranzo

Bioactive Oligosaccharides: Production, Biological Functions and Potential Commercial Applications. Nova Science Publishers, Inc. NY (USA), (**2010**) 60 pp. [ISBN: 978-1-61668-149-4]
A.M. Barbosa, **R.F.H. Dekker** and E. C. Giese

Extremophiles as Sources of Exopolysaccharides. In: *Handbook on Carbohydrate Polymers: Development, Properties and Applications*, (Editor: Ryouichi Ito and Youta Matsuo). Chapter 19. Nova Science Publishers, Inc. NY (USA), (**2010**) *pp. 605-619.* [ISBN: 978-1-60876-367-2]
H. Kazak, E. Toksoy Öner and **R.F.H. Dekker**

Pathways to Bioactive Oligosaccharides: Biological Functions and Potential Applications.
In: *Handbook on Carbohydrate Polymers: Development, Properties and Applications*, (Editor: Ryouichi Ito and Youta Matsuo). Chapter 8. Nova Science Publishers, Inc. NY (USA), (**2010**) *pp. 279-309.*
EC Giese, AM Barbosa and **R.F.H. Dekker**

Screening *Botryosphaeria* species for lipases: Production of lipase by *Botryosphaeria ribis* EC-01 grown on soybean oil and other carbon sources
*Enzyme and Microbial Technology 45 (**2009**) 426-431.*
J.M. Messias, B.Z. da Costa, V.M.G. de Lima, **R.F.H. Dekker**, M.I. Rezende, N. Krieger, A.M. Barbosa

Sulfonation and anticoagulant activity of the β-(1,3; 1,6)-D-glucan produced by the fungus *Botryosphaeria rhodina* MAMB-05 grown on fructose as a carbon source.
International Journal of Biological Macro-molecules: *45 (**2009**) 305–309*
S. Ferreira Mendes., O. dos Santos Junior, A.M. Barbosa, A.F.D. Vasconcelos, G. Aranda Selverio, **R.F.H. Dekker**, M. Sá Pereira, A.M.F. Tovar, P.A. de Souza Mourão, and M.L. Corradi da Silva

Caracterização reológica dos botriosferanas produzidos pelo *Botryosphaeria rhodina* MAMB-05 em glucose, sacarose e frutose como fontes de carbon (*Rheological characterization of botryosphaerans produced by Botryosphaeria rhodina MAMB-05 in glucose, sucrose and fructose as carbon source*)
*Brazilian Journal of Food Technology: 12 (**2009**) 53-59.*
R.A. Macedo Bongiovani, J.L. Meira Silveira, AL. Barretto Penna, **R.F.H. Dekker**, A.M. Barbosa, M.L. Corradi da Silva

Evaluation of the β-glucanolytic enzyme complex of *Trichoderma harzianum* Rifai for the production of gluco-oligosaccharide fragments by enzymatic hydrolysis of 1,3;1,6-β-D-glucans. In: "*Current Research Topics in Applied Microbiology and Microbial Biotechnology*" (A. Mendez-Vilas Ed.), World Scientific Publishing Co. Pte. Ltd., January **2009**, pp. 438-441. [ISBN-13: 978-981-283-754-7]
EC Giese, AC Monteiro, **R.F.H. Dekker**, AM Barbosa, ML Corradi Da Silva, E Gomes, R Silva.

On the diversity of the laccase gene: A phylogenomic perspective from *Botryosphaeria rhodina* (Ascomycota: Fungi) and other related taxa
Biochemical Genetics: 47 (**2009**) 80-91.
F.J.D. Castilho, R.A. Torres, A.M. Barbosa, **R.F.H. Dekker** and J.E. Garcia

Three exopolysaccharides of the β-(1→6)-D-glucan type and a β-(1→3; 1→6)-D-glucan produced by strains of *Botryosphaeria rhodina* isolated from rotting tropical fruits.
Carbohydrate Research: *343 (**2008**) 2481–2485*
A.F.D. Vasconcelos, N.K. Monteiro, **R.F.H. Dekker**, A.M. Barbosa, E.R. Carbonero, J.L.M. Silveira, G.L. Sassaki, R. da Silva and M.L. Corradi da Silva.

Triple helix conformation of botryosphaeran, a (1→3;1→6)-β-D-glucan *p*roduced by *Botryosphaeria rhodina* MAMB-05.
*Carbohydrate Polymers: 74 (**2008**) 953–956*
E.C. Giese, **R.F.H. Dekker**, A.M. Barbosa and R. da Silva

Purificação e caracterização de uma gentiohexaose obtida de botriosferana por hidrólise ácida parcial (Purification and characterisation of a hexasaccharide (gentiohexaose) obtained by partial acid hydrolysis of botryosphaeran).
*Química Nova: 31 (**2008**) 1015-1019.* [ISSN 0100-4042 I.R]
Silva, N.K. Monteiro, P.F. Martinez, N.L. Izeli, A.F.D. Vasconcelos, M.S. Cardoso, M.L. Corradi da Silva, A.M. Barbosa, **R.F.H. Dekker**, G.V.J. da Silva, L.A.B. de Moraes

Anticlastogenic activity exhibited by botryosphaeran, a new exopolysaccharide produced by *Botryosphaeria rhodina* MAMB-05
*International Journal of Biological Macromolecules 42 (**2008**) 172-177*
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Patents

1. "Processo de produção de β-glucana (botriosferna), por via fermentativa e suas propriedades antimutagenicas e hipoglicemiantes"
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Education

Postdoctoral Fellow, Sept., 2005 to May, 2008: Departments of Biological Sciences and Plant Biology, Stanford University, USA. [Partial research in University of California at Berkeley, USA].

Ph. D, Sept., 2000 to Aug, 2005: Department of Biology, Queen's University, Canada.

M. S., Sept., 1986 to July, 1989: Faculty of Agriculture and Biotechnology, Zhejiang (Agricultural) University, China.[Partial research in Zhejiang Academy of Medical Sciences, China].

B. S., Sept., 1982 to July, 1986, Faculty of Agriculture and Biotechnology, Zhejiang (Agricultural) University, China.

Professional Activities

[A]. Editorial Activities

8). 2010-2013, Associate Editor, Journal of Applied Microbiology, UK
7). 2010-2013, Associate Editor, Letter in Applied Microbiology, UK
6). 2010-Senior Editorial Board Member, International Journal of Biochemistry and Molecular Biology (IJBMB), USA
5). 2009-, Editorial Board Member, Journal of Molecular Microbiology and Biotechnology, Switzerland and USA
4). 2009-, Editorial Board Member, Biomass Science, Czech Republic
3). 2009-, Reviewer, Biotechnology and Molecular Biology Reviews, Malaysia
2). 2008-, Editorial Board Member, International Journal of Biological Sciences (IJBS), USA
1). July 1, 2008-, Editorial Advisor of Biochemical Journal, UK

[B]. Reviewer of the journals

African Journal of Biotechnology, Nigeria
Biochemical Journal, UK
Biofuels, UK
Bioscience Reports, UK
Biomass Science, Czech
Bioresource Technology, USA
Bioenergy Research, USA
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Environmental Technology, UK

International Journal of Biological Sciences (IJBS), USA
International Journal of Chemical Reactor Engineering, USA
Journal of Environmental Management, USA
Microbial Ecology, USA
Process Biochemistry, France

[C]. Reviewer of Research Grant Proposals

6). International Foundation for Science (IFS) Research Grant (September 23, 2011).
5). NSERC-Strategic Project Proposal, Canada (August 15, 2011).
4). ERA-Industrial Biotechnology (IB), the Netherlands (August 2010).
3). Netherlands Organisation for Scientific Research (NWO), the Netherlands (June 2010).
2). National Fund for Scientific & Technological Development (FONDECYT), Chile (November 2009).
1). United States-Israel Binational Science Foundation, USA and Israel (March 2010).

[D] Recent Seminar Presentations

27. May 20, 2011: Hubei University of Technology, China.
26. May 19, 2011: Zhejiang Academy of Agricultural Scienes, China.
25. April 28, 2011: Yangtze Delta Institute of Tsinghua University, China.
24. March 14, 2011: University of Waterloo, Ontario, Canada
23. July 21, 2010: Institute of Process Engineering, Chinese Academy of Sciences, China
22. July 17, 2010: Zhejiang Yangtze Delta Institute of Tsinghua University, China
21. July 16, 2010: Zhejiang Agriculture and Forestry University Seminar II, China
20. July 15, 2010: Zhejiang Agriculture and Forestry University Seminar I, China
19. May 27, 2010: Algoma University, Canada
18. February 2, 2010: FPInnovations, Canada
17. November 19, 2009: Western Kentucky University, USA
16. May 5, 2009: East China University of Science and Technology, China
15. April 30, 2009: Zhejiang Academy of Agricultural Sciences, China
14. April 29, 2009: Zhejiang University, China
13. April 27, 2009: Southwest Jiaotong University, China
12. April 21, 2009: China Agricultural University, China
11. March 26, 2009: Lakehead University, Ontario Canada.
10. Sept. 25, 2007: Thompson Rivers University, British Columbia, Canada
9. Sept. 21, 2007: Lakehead University, Ontario, Canada
8. June 8, 2007: Queen's University, Ontario, Canada
7. June 6, 2007: Agriculture and Agri-Food Canada, Ontario, Canada.
6. March 2, 2007: Brock University, Ontario, Canada.
5. June 26, 2006: Cornell University, Ithaca, New York, USA.
4. Aug. 2, 2005: The Salk Institute for Biological Studies, San Diego, California, USA.
3. July 18, 2005: Stanford University, Stanford, California, USA.
2. July 11, 2005: Cornell University, Ithaca, New York, USA.
1. May 13, 2005: Duke University, Durham, North Carolina, USA.

[E]. Other Professional Activities

(5) October 20, 2011-: Scientific Adviser of International Foundation for Science, Sweden.
(4) July 2010-: Adjunct Professor, Faculty of Natural Resources Management, Lakehead University, Canada.
(3) May 2010 –: Representative of Canadian Society for Molecular BioSciences (CSMB), Canada.

(2). Co-chair of Robust Enzymes Development: From Mild to Extremophilic Enzymes section. The 3rd World Congress of Industrial Biotechnology, July 25-27, 2010, Dalian, China.
(1). Member of Canadian Society of Microbiologists, Canada.

Teaching at Lakehead University
Biotechnology 6230: Topics in Environmental Biotechnology
Biology 3610: Environmental Biology

Research Experience

Sept.1999-Aug.2000: Researcher, Department of Medicine and Biochemistry
Queen's University, Canada.
Apr.1999-Aug.1999: Researcher, Oncology Research Department, Toronto General Hospital, University of Toronto, Canada (Moved to Queen's University with the professor and laboratory).
Nov.1997-Mar.1999: Researcher, Department of Biology, University of Waterloo, Ontario, Canada.
Jan. 1996-Nov.1997: Researcher, Department of Biochemistry
Kansas State University, USA.
Apr.1995--Dec.1995: Research scientist, Genetic Engineering Department
Mexican National Polytechnic Institute, Mexico.
July.1991-Apr.1995: Assistant Professor, Key Laboratory of Virology & Biotechnology
Zhejiang Academy of Agricultural Sciences, China.
July 1989-June 1991: Research Associate, Key Laboratory of Virology & Biotechnology
Zhejiang Academy of Agricultural Sciences, China.
(In the period of July, 1989-April, 1995, conducted several short-term visiting researches in Chinese Academy of Sciences, Beijing, China).

Publications

50. Mehdi Dashtban, Robert Buchkowski, Wensheng Qin **[Corresponding Author]**. (2011). Effect of different carbon sources on cellulase production by *Hypocrea jecorina* (*Trichoderma reesei*) strains. International Journal of Biochemistry and Molecular Biology 2: 274-286.

49. W. J. Gao, K.T. Leung, **W. S. Qin**, and B. Q. Liao (2011). Effects of temperature and temperature shock on the performance and microbial community structure of a submerged anaerobic membrane bioreactor. Bioresource Technology 102: 8733–8740.

48. Miranda Maki, Michael Broere, Kam Tin Leung, and **Wensheng Qin. [Corresponding Author]** (2011). Characterization of some efficient cellulase producing bacteria isolated from paper mill sludges and organic fertilizers. International Journal of Biochemistry and Molecular Biology 2: 146-154.

47. Xi Chen, Zi-Hua Jiang, Sanfeng Chen, **Wensheng Qin**. **[Corresponding Author]** (2011). Microbial and Bioconversion Production of D-xylitol and Its Detection and Application. International Journal of Biological Sciences 6: 833-834.

46. Xu, F., Chen, S., **Qin, W**., Yu, Z., Zhao, H., Xing, X., Li, H (2011). Strain Improvement for Enhanced Production of Cellulase in *Trichoderma viride.* Applied Biochemistry and Microbiology, 47: 53–58.

45. B. Rosa, S. Oh, B. L. Montgomery, J. Chen*,W. Qin*. **[*Corresponding Authors]** (2010). Computing Gene Expression Data with a Knowledge-Based Gene Clustering Approach. International Journal of Biochemistry and Molecular Biology 1: 51-68.

44. *Dashtban, M., *Maki, M., (* Authors with equal contributions) Leung, K. T., Mao, C., and **Qin, W. [Corresponding Author]**. (2010). Cellulase activities in biomass conversion: Measurement methods and comparison. Critical Reviews in Biotechnology 30: 302-309.

43. Mehdi Dashtban, Heidi Schraft, Tarannum Ahsan Syed and Wensheng Qin **[Corresponding Author].** (2010). Fungal Biodegradation and Enzymatic Modification of Lignin. International Journal of Biochemistry and Molecular Biology 1: 36-50.

42. Chen, X., Liang, Y., Hua, J., Tao, L., **Qin, W.,** Chen, S. (2010). Overexpression of bacterial ethylene-forming enzyme gene in *Trichoderma reesei* enhanced the production of ethylene in biomass media. International Journal of Biological Sciences in USA 6: 96-106.

41. Rosa, B., Malek, L., and **Qin, W. [Corresponding Author]** (2009). The development of the pitcher plant *Sarracenia purpurea* into a potentially valuable recombinant protein production system. Biotechnology and Molecular Biology Reviews 3: 105-110.

40. M. Dashtban, H. Schraft, **W. Qin [Corresponding Author]** (2009). Fungal Bioconversion of lignocellulosic residues; Opportunities & Perspectives. International Journal of Biological 5: 578-595.

39. M. Maki, K. Leung, W. Qin **[Corresponding Author]** (2009). The prospects of novel cellulase-producing bacteria for the bioconversion of lignocellulosic biomass。 International Journal of Biological Sciences 5：500-516.

38. Doucet, D., Walker, V. K., and **Qin, W. [Corresponding Author]** (2009). The bugs that came in from the cold: molecular adaptations to low temperatures in insects. Cellular and Molecular Life Science 66: 1404-1418.

37. **Qin, W**., Doucet, D., Tyshenko, M.G., and Walker, V.K. (2007). Antifreeze protein gene regulation in *Choristoneura fumiferana.* Insect Molecular Biology, 16: 423-434.

36. Graham, L. A., **Qin, W**., Lougheed, S. C., Davies, P. L., and Walker, V.K. (2007). Evolution of Hyperactive, Repetitive Antifreeze Proteins in Beetles. Journal of Molecular Evolution, 64: 387-398.

35. Qin, C., Li, M., **Qin, W.**, Bahn, S., Wang, C., and Wang, X. (2006). Expression and Characterization of Arabidopsis Phospholipase Dγ2. BBA - Molecular and Cell Biology of Lipids, 1761: 1450-1458.

34. **Qin, W.,** Tyshenko, M.G., Doucet. D., Walker, V. K. (2006). Characterization of antifreeze protein gene expression in summer spruce budworm larvae. Insect Biochemistry and Molecular Biology, 36: 210-218.

33. **Qin, W**., and Walker V.K. (2006). Analysis of antifreeze protein genes from *Tenebrio molitor*. Gene. 367: 142-149.

32. **Qin, W.**, Neal, S., Robertson, R. M., Westwood, T., and Walker, V. K. (2005). Cold hardening and transcriptional change in *Drosophila melanogaster*. Insect Molecular Biology, 14: 607-613.

31. **Qin, W**., Tyshenko, M. G., Wu, B. S., Walker, V. K., Robertson, R. M. (2003). Cloning and characterization of hsp70 from *Locusta migratoria*, a highly thermotolerant insect. Cell Stress & Chaperones 8, 144-152.

30. Yang, X., **Qin, W**., Lehotay, M., Toki, D., Dennis, P., Schutzbach, J., and Brockhausen, I. (2003). Soluble human core 2 b6-GlcNAc-transferase requires its conserved Cys residues for full activity. Biochimica et Biophysica Acta (Elsevier, BBA). 1648:62-74.

29. Allen, M., **Qin, W**., Moreau, F., and Moffatt, B. (2002). Adenine phosphoribosyltransferase isoforms of Arabidopsis and their potential contributions to adenine and cytokinin metabolism. Physiologia Plantarum. 115: 56-68.

28. Brockhausen, I., Lehotay, M., Yang, J., **Qin, W**., Young, D., Lucien, J., Coles, J., and Paulsen, J. (2002). Glycoprotein biosynthesis in porcine aortic endothelial cells and changes in the apoptotic cell population. Glycobiology, 12: 33-45.

27. Moffatt, B. A.,Wang, L.,Allen, M., Stevens, Y., **Qin W ,** Schwartzenberg,K.(2000). Adenosine kinase of *Arabidopsis thaliana*: kinetic properties and gene expression. Plant Physiology 124: 1775-1785.

26. **Qin, W.**, Dayer., J, Zheng, L., ,and Wang, X.(1999). Isolation and nucleotide sequence of fourth phospholipase D, PLDdelta, from *Arabidopsis*. Plant Physiology 120, 2:635.

25. Wang, X, Pappan, K., Fan, L., and **Qin, W.** (1998). Multiple forms of phospholipase D and their roles in hormonal and stress signaling. In: J. Sanchez *et al*., eds: Plant Lipids. Servicio de publicationes, Spain, PP398-401.

24. **Qin, W**., Pappan, K., Wang, X. (1997). Molecular heterogeneity of phospholipase D (PLD): cloning of PLD gamma and regulation of plant PLDs gamma, beta, and alpha by and calcium. J. Biol. Chem.272, 28267-28273.

23. Pappan, K., **Qin, W., (*co-first author*)**, Dayer, J. H., Zheng, L., Wang, X (1997). Molecular cloning and functional analysis of a novel plant phospholipase D that requires polyphosphoinositides and submicromolar calcium for activity in *Arabidopsis*. J. Biol. Chem. 272, 7055-7062.

22. Fang, R., Zhu, H., Wang, Q., Mang, K., Gao, D., **Qin, W.**, Zhang,L., Cao, S. Tian,W., Li, L. (1996). Construction of transgenic rice plants resistant to rice yellow stunt virus, a

plant rhabdovirus. In Rice Genetics III: Proceedings of the 3rd International Rice Genetics Symposium. GS Khush. page 201-205, 1996. IRRI. (1011 pages).

21. Gao, D., and **Qin, W**. (1995). The forecast of rice stripe disease with varietal susceptibility. Chinese Journal of Rice Science. 9, 235-238.

20. Gao, D., and **Qin, W**. (1995). Establishment and application of rice virus disease forecasting formula with varietal resistance. Zhejiang Agricultural Sciences, 12, 124-126.

19. Fang, R., Wang, Q., Xu, B., Pang, Z., Zhu, H., Mang, K., Gao, D., **Qin, W**., and Chua, N. (1994). Structure of the nucleocapsid protein gene of rice yellow stunt rhabdovirus. Virology 204, 367-375.

18. Gao, D., **Qin, W**. (1994). Three kinds of symptoms rice yellow stunt disease. Jiangxi Plant Protection. 17(3), 13.

17. **Qin, W**.,Gao, D., Chen, S. (1994). Studies on techniques of rapid detecting rice stripe virus in *Laodelphax striatellus*. Zhejiang Journal of Agriculture Sciences. 6(4): 226～229.

16. Gao, D., **Qin, W.** (1994). Effects of varietal resistance in preventing the occurrence and epidemic of rice stripe virus. Acta Agricultural Zhejiangensis 6 (3), 146-149.

15. Gao, D., **Qin, W**. (1994).The different oversumering effects of *Laodelphax striatellus* in resistant and susceptible varieties to rice stripe virus. Plant Protection 3, 21.

14. Ye, Q., **Qin, W.,** Wang, G., Chi, X., and Mao, J.(1994). Polyacrymide electrophoresis of protein patterns from *Fusarium moniliforme* var.hangzhouense. Acta Agricultural Zhejiangensis 6 (1), 32-36.

13. **Qin, W**., Gao, D. (1994). The solution of problems in RYSV purification. Journal of Hebei Agricultural University. Supplement-March 1994, 858-860.

12. **Qin, W**., Gao, D., Chen, S. Fang, R., Pang, Z. (1993). Studies on separation of tructural proteins and production of ascite antibodies to the proteins of rice yellow stunt virus. Journal of Zhejiang Agricultural University 19 (4), 410-412.

11. Chen, S., Yu, J., **Qin, W**., Liu, L., Gao, D. (1993). Studies on stunt disease of hybrid rice in Wenzhou of China-Vector, host, symptom and morphology of virus. Virological Sinica 8 (4), 373-378.

10. Gao, D., **Qin, W**., Li, A. (1993). Studies on the technology of resistance test of rice variety to stripe disease of rice plant. Zhejiang Agricultural Sciences 5, 215-216.

9. Gao, D., **Qin, W**., Li, A., Chen, S. (1993). The identification of continental rice yellow stunt disease and Taiwan rice transitory yellowing disease by immunological techniques. Chinese Virology 8 (2), 177-180.

8. Gao,D., Li, A., **Qin, W**. (1993). Resistance identification of rice varieties to stripe blight. Acta Phytophylocica Sinica 20 (11), 76-82.

7. Gao, D., **Qin, W**., Li, A., Chen, S. (1993). Relationship between rice varietal resistance and rice stripe disease. Chinese Journal of Rice Science 7 (1), 58-60.

6. Gao, D., **Qin, W**., Li, A., Chen, S. (1992). Identification of yellow stunt disease of Continental rice and transitory yellowing disease of Taiwan rice by ELISA. Acta Agricultural Universities Zhejiangensis 4 (4), 186-188.

5. Fang R., Pang Z, Xu B., Mang K., Gao, D., Li, A., **Qin, W**., Chen, S.(1992). Partial purification of rice yellow stunt virus and characterization of virus structural proteins and RNA genome. Chinese Journal of Virology 1 (8)1, 62-68.

4. **Qin, W**., Gao, D., Chen, S., Mao, J. (1992). DIBA detection of rice stripe viruses in planthoppers. Research and Application of Microbiology (4), 10-12.

3.**Qin, W**., Gao, D., Li, A., Chen, S. (1992). The study history and recent advances of rice yellow stunt disease. Plant Protection (4), 33-34.

2. **Qin, W**., Gao, D., Li, A. (1991). The recent advances in purification techniques for plant rhabdoviruses. Biotechnology (1) 4, 8-10.

1. **Qin, W**., Zhang, Y., Li, D., Li, G. (1990). Study on monoclonal antibodies to *Xanthomonas campestris* pv. oryzicola. Acta Agricultural Universities Zhejiangensis 16(4), 357-362.

Recent Conference Presentations

34. Miranda Maki, Amna Idrees, Kam Tin Leung and Wensheng Qin. (2011). Lignocellulase-producing Bacteria Isolated from Peat and Municipal Landfill: Characterization and Application. 61st Annual Conference of the Canadian Society of Microbiology, Memorial University, June 20-23, 2011, Canada.

33. Mehdi Dashtban, Robert Buchkowski and Wensheng Qin (2011). Carbon Source Regulation of Total Cellulase Activity in *Hypocrea jecorina* (*Trichoderma reesei*) Strains. 61st Annual Conference of the Canadian Society of Microbiology, Memorial University, June 20-23, 2011, Canada.

32. Yuanyuan Hong, Mehdi Dashtban, Sanfeng Chen, Ruiqing Song and Wensheng Qin. (2011). Fungal degradation of lignin in peat and paper mill sludge during submerged fermentation. 61st Annual Conference of the Canadian Society of Microbiology, Memorial University, June 20-23, 2011, Canada.

31. Miranda Maki, Amna Idrees, Kam Tin Leung and **Wensheng Qin**. (2011). Cellulase-producing Bacteria Isolated from Landfill and Peat: Characterization and Application. Research and Innovation Week, Lakehead University, February 12-18, 2011, Canada [Received Poster Award].

30. Mehdi Dashtban, Robert Buchkowski and **Wensheng Qin** (2011). Optimization of cellulase production by *Hypocrea jecorina* (*Trichoderma reesei*) Strains. Research and Innovation Week, Lakehead University, February 12-18, 2011, Canada.

29. Yuanyuan Hong, Mehdi Dashtban, Sanfeng Chen, Ruiqing Song, **Wensheng Qin**. (2011). Degradation of Peat and Paper Mill Sludge by Basidiomycetous Fungi. Research and Innovation Week, Lakehead University, February 12-18, 2011, Canada.

28. K. C. Das, and **W. Qin** (2011). Isolation and characterization of rumen bacteria of cattle (*Bos taurus*) as microbial feed additive or for biofuel production. Research and Innovation Week, Lakehead University, February 12-18, 2011, Canada.

27. Bruce Rosa, Robert Jackson, Jin Chen, **Wensheng Qin** (2010). The identification of novel lignin biosynthesis genes using a knowledge-based gene clustering approach. International Symposium on Plant Productivity, October 24-26, 2010, Peterborough, Canada.

26. **Qin, Q**., Somerville, C. (2010). Functional analysis of a gene involved in xylem development in *Arabidopsis thaliana.* International Symposium on Plant Productivity. October 24-26, 2010, Peterborough, Canada.

25. Dashtban, M., Esau, C., Jackson, R., **Qin W**. Carbon Source Regulation of Transcriptional Factors and Cellulases Production in the Fungi *Hypocrea jecorina* (*Trichoderma reesei*). The 3rd World Congress of Industrial Biotechnology, July 25-27, 2010, Dalian, China. Co-chair of Robust Enzymes Development Section: From Mild to Extremophilic Enzymes section.

24. Maki, M., Broere, M., Leung, K., **Qin W**. Characterization of Some Efficient Cellulase Producing Bacteria Isolated from Paper Mill Sludges and Organic Fertilizers. The 3rd World Congress of Industrial Biotechnology, July 25-27, 2010, Dalian, China. Co-chair of Robust Enzymes Development Section: From Mild to Extremophilic Enzymes section.

23. B. Rosa, J. Chen, **W. Qin**. (2010). Improving *Arabidospsis* gene coexpression networks by circadian synchronization. February 25, 2010, Lakehead University Graduate Student Poster Competition, Canada.

22. Y. Hong, Y. Ma, J. Sun, **W. Qin**, S. Chen. (2010). Characterization and promoter analysis of *nifH* genes from *Paenibacillus sabinae* $T27^T$. February 24, 2010, Lakehead University, Canada.

21. B. Rosa, **W. Qin** (2010). The Development of Gene Coexpression Networks. February 20, 2010, Thunder Bay, Canada.

20. M. Maki, K. T. Leung, **W. Qin** (2010). Bacterial Conversion of Plant Biomass into Bioethanol using Molecular Biology Techniques. February 20, 2010, Thunder Bay, Canada.

19. B. Rosa, J. Chen, **W. Qin** (2009). The Discovery of Potential Novel Lignin Biosynthesis Genes Using Bioinformatics. Biorefining Research Initiative Grand Opening, December 4, 2009, Lakehead University, Canada.

18. M. Maki, K.T. Leung, **W. Qin** (2009). Cellulase-producing bacteria for the

bioconversion of lignocellulosic biomass. Biorefining Research Initiative Grand Opening, December 4, 2009, Lakehead University, Canada.

17. M. Dashtban, H. Schraft, **W. Qin** (2009). Bioethanol Production Using Fungal Systems. Biorefining Research Initiative Grand Opening, December 4, 2009, Lakehead University, Canada.

16. **W. Qin**, V. K. Walker (2009). Antifreeze Protein Genes and Their Applications in Agriculture and Forestry for Biomass Production. Biorefining Research Initiative Grand Opening, December 4, 2009, Lakehead University, Canada.

15. X Chen, Y Liang, J Hua, L Tao, **W Qin**, S Chen (2009). Overexpression of bacterial ethylene-forming enzyme gene in *Trichoderma reesei*. Biorefining Research Initiative Grand Opening, December 4, 2009, Lakehead University, Canada.

14. **Qin, W**., Vorwerk, S., Hou, B. H., Somerville, S., and Somerville, C. (2008). Functional Analysis of a pectate lyase-like gene (PMR6) in *Arabidopsis thaliana.* The 19th International Conference on *Arabidopsis* Research, Montreal, Canada, July 23-28, 2008.

13. **Qin, W**., and Somerville, C. (2008). IRX9, a gene involved in xylem development in *Arabidopsis thaliana. The 50th* Annual Meeting of the Canadian Society of Plant Physiologists, Ottawa, Canada, June 14-17, 2008.

12. **Qin, W.,** Walbot, V. (2006). Functional characterization of MURB protein in maize. The 48th Annual genetics conference, Asilomar Conference Grounds, Pacific Grove, California, U. S. A. March 9-12, 2006.

11. **Qin,** W., Neal, S. J., Robertson, R. M., Westwood J. T., Walker, V. K. (2005). Cold hardening and transcriptional change in *Drosophila melanogaster.* "The 44th annual meeting of the Canadian Society of Zoologists", p 38. Queen's University, Kingston, Ontario, Canada, May 10-14, 2005.

10. **Qin, W**., Graham, L. A., Davies P. L., and Walker, V.K. (2004) Insect antifreeze protein genes and their regulation. 10th SCBA International Symposium, July 18-23, 2004, Beijing, China.

9. Graham, L. A., **Qin, W**., Davies, P. L., and Walker,V. K. (2004) Molecular evolution of repetitive insect antifreeze protein genes: rearrangements, codon bias, convergent and divergent evolution. 47th Annual Conference of The Genetics Society of Canada (GSC), Toronto, Canada, June 17-20, 2004.

8. **Qin, W**., Lupinsky, D.A., Walker, V.K. and Robertson, R.M. Photoperiod-induced variation of the heat shock response in *Locust migratoria*. Bull. Can. Soc. Zool. 34:85 (2003).

7. **Qin, W.,** Tyshenko, M.G., Wu, B., Walker, V.K. and Robertson, R.M. The expression of hsp70 in voltage-sensitive tissue of *Locusta migratoria* adults. Bull. Can. Soc. Zool. 32:97 (2001).

6. Wang, X., Pappan, K., **Qin, W**. Role of phospholipase D in vesicular trafficking. (1998).13th International Symposium on Plant Lipids, Seville, Spain. July 7, 1998.

5. Wang X, Pappan K, Fan L, **Qin W** (1998) Multiple forms of phospholipase D and their roles in hormonal and developmental signaling. Plant Biology, American Society of Plant Physiologists, Madison, Wisconsin. June 27-July 1, 1998.

4. **Qin, W**., Lu, F., Zheng, S., Pappan, K., Wang, X. (1997) Molecular cloning and expression of four isoforms of phospholipases D in Arabidopsis thaliana. 1997 Plant Biology Meeting ,August 2-6, 1997 Vancouver, BC, Canada.

3. Pappan, K., **Qin,W.,** Zheng, Li, Wang, X. (1997) Biochemical properties of multiple plant phospholipase D isoforms. 1997 Plant Biology Meeting, August 2-6, 1997 Vancouver, BC, Canada.

2. **Qin,W**., Lu.,F.,Zheng,S., Pappan, K., and Wang, X. (1997). Molecular cloning and analysis of multiple phospolipase D genes in *Arabidopsis.* 1997 Biochemistry and Molecular Biology of Plant Fatty Acids and Glycerolipids Symposium, June 4-8,1997, South Lake Tahoe, California, USA.

1. Pappan, K., **Qin, W**., Zheng, L., and Wang, X. (1997). Biochemical characterization of multiple isoforms of plant phospholipase D. 1997 Biochemistry and Molecular Biology of Plant Fatty Acids and Glycerolipids Symposium, June 4-8, 1997, South Lake Tahoe, California, U. S. A.

Services

[A] Services to Lakehead University

15). November 18, 2011, the Annual Ethics Workshop, St. Joseph's Heritage, Thunder Bay, Canada
14). May 28, 2011, Lakehead University Convocation Ceremonies.
13). Biosafety Committee Representative for the Department of Biology since 2010-
12). Senate Research Ethics Board as NSERC Representative 2010-2013.
11).Member of Lakehead Biology Department Seminar Committee 2010-
10). Member of Lakehead Biology Department Student Recruiting Committee 2010-
9). November, 2010: Review for Biology Department OGS Applications
8). Coordinator of Biorefining Seminar Program 2010-
7). Since 2009, with the help of my graduate students, we have been running Medicorp Products Biobar Services (Free shipping and discounted prices of research supplies for all Lakehead researchers). October 2009-
6). Since 2009, with the help of my graduate students, we have been running Operon DNA Sequencing/Oligo Synthesis services to all Lakehead University Researchers for discounted prices and free shipping. October 2009-
5). February 26, 2009: Judging posters for Biology 5010 course.
4). January 23-28, 2009: Review undergraduate summer NSERC Award applications for Biology Department.
3). Since 2008, with the help of my graduate students, we have been running Fermentas Life Sciences Company Biobar Freezer services to all Lakehead University Researchers for discounted prices and free shipping.

2). November 2008: Represent Biology Department to attend Due Diligence Training for Safety Issues, Lakehead University.
1). October 2008: Review OGS and NSERC scholarship applications for Biology Department, Lakehead University.

[B]. Services to the Community

13). 2011-2012: BIOFOR 2012 Symposium Scientific Committee.
12). July 26, 2011: Thunder Bay Agricultural Research Station Open House.
11). June 13-14, 2011: Ontario Government "Think North II" meeting, Canada.
10). Judge of Ontario Biology Day Symposium, March 12-13, 2011, Waterloo, Ontario, Canada.
9). February 17, 2011, Judge of Postdoctoral Fellow Poster Competition at Lakehead University's Research and Innovation Week, February 12-18, 2011.
8). January 20, 2011: Northwestern Ontario Emerald Ash Broer Planning Meeting, Thunder Bay, Canada
7). November 19, 2010: "the 8th Ethics of Human Research Workshop" in Thunder Bay and received a certificate.
6). November 18, 2010: "Planning for Emerald Ash Borer in Northwestern Ontario" meeting in Thunder Bay.
5). September 30, 2010: Forest Products Sector Council Study: Key HR Issues and Trends meeting.
4). Outreach: Presentation in St. Ignatius High School, Canada on December 18, 2009.
3). June 17, 2009: Northeast Superior Forest Community Directors of Board meeting.
2). February 2-3, 2009: Ontario Government's "Think North Summit" meeting.
1). January 8, 2009: Ontario Government's "Places to Grow" meeting.

High Quality Personnel Training (HQP)

[A] Current Laboratory Personnel

15. Malaya Nanda, Ph. D student (Supervisors: Dr. C. Xu, Dr. H. Ghaziaskar, Dr. W. Qin).
14. Amber Jarvinen, Graduate Scholarship (OGS) supported Ph. D student.
13. Miranda Maki, NSERC Scholarship supported Ph. D student.
12. Bruce Rosa, NSERC Scholarship supported Ph. D student.
11. Mehdi Dashtban, Ontario Graduate Scholarship (OGS) supported Ph. D student.
10. Yuanyuan Hong, visiting Ph. D student with Government Scholarship.
9. Alaa Alhazmi, M. Sc student with Government Scholarship.
8. Jeremy Yang, M. Sc. Student (Supervisors: Dr. Kam Leung, Dr. B. Liao, Dr. W. Qin)
7. Haider Hassan, M. Sc student
6. Phil Vanheuangdy, M. Sc student
5. Amna Syedah Idrees, Undergraduate Research Student
4. Christina Asmussen, Undergraduate Research Student
3. Lachlan Armstrong, Undergraduate Research Student
2. Tyler Drawson, Undergraduate Research Student
1. Daniel Dalcin, Undergraduate Research Student

[B] Member of Ph. D Study Supervisory Committees

(9). Ali Azizishirazi (Supervisor: Dr. Greg Pyle)

(8). YoungJun Ju (Supervisor: Dr. Rui Wang, Dr. Guangdong Yang)
(7). Zaid Altaany (Supervisor: Dr. Rui Wang, Dr. Guangdong Yang)
(6). Ling Zhang (Supervisor: Dr. Rui Wang, Dr. Guangdong Yang)
(5). Christopher Edmunds (Supervisor: Dr. David Law)
(4). Asieh Ahmadalinezhad (Supervisor: Dr. Aicheng Chen)
(3). Miranda Maki (Supervisor: Wensheng Qin, Dr. Kam Leung)
(2). Mehdi Dashtban (Supervisor: Wensheng Qin)
(1). Bruce Rosa (Supervisor: Wensheng Qin)

[C] Member of Ph. D Comprehensive Examination Committees
(2). April 13, 2011. Chair for Brenda Magajna's comprehensive examination (Supervisor: Heidi Schraft).
(1). July 8, 2009. Shannon Costigan (Supervisor: Dr. David Law, Dr. Peter Lee).

[D] Member of Master's Study Supervisory Committees
(9) September 2011-: John Wigg (Supervisor: Dr. W. Floriano)
(8) May 2011-: Haider Hassan (Supervisors: Dr. W. Qin, Dr. Justin Jiang
(7) May 2011-: Phil Vanheuangdy (Supervisor: Dr. Qin)
(6) September 2010-: Alaa Alhazmi (Supervisor: Dr. W. Qin)
(5) September 2010-: Robert Jackson (Supervisor: Dr. Ingeborg Zehbe)
(4) September 2010-: Michael Broere (Supervisor: Dr. David Law)
(3) September 2010-: Jeremy Yang (Supervisors: Dr. Kam Leung, Dr. W. Qin)
(2) September 2009-: Maryjane Moses (Supervisor: Dr. Douglas Morris)
(1) September 2008-: Mary Chang (Supervisor: Dr. Lada Malek)

[E] Member of Ph. D Thesis Examination Committee
(1) September 16, 2011, Chair of Ph. D thesis defence committee of Weijue Gao (Supervisor: Dr. Baoqiang Liao).

[F] Member of Master's Thesis Examination Committees

(4). Mary Chang, Defended on July 14, 2011 (Supervisor: Dr. Lada Malek).
(3). Wei Shi, Defended on May 25, 2010 (Supervisors: Dr. Baoqiang Liao, Dr. Charles Chunbao Xu).
(2). Shawn Langevin, Defended on August 5, 2009 (Supervisor: Dr. Baoqiang Liao).
(1). Lee Burdenuk, Defended on September 14, 2009 (Supervisors: Dr. Bruce H. Kjartanson, Dr. Kam Leung).

[G] Finished Student Supervision

[A] Ph. D students supervised
(1) Xi Chen, September 2006-June 2011, Defended on June 10, 2011 (Supervisors: Dr. S. Chen, Dr. W. Qin).

[B] Master's students supervised

[C] Visiting Scientists Supervised
(2). Dr. Wenju Wan, Postdoctoral Visiting Scholar with Chinese Government Fellowship. August 2010-January 2011.
(1). Dr. K. Chandra Das, Postdoctoral Visiting Scholar with Indian Government Fellowship. August 2010 – October 2010.

[D] Honors Thesis Students Supervised

(4). Robert Jackson (September 2009- April 2010)
(3). Crystal Esau (September 2009- April 2010)
(2). Michael Broere (September 2009- April 2010)
(1). Ryan Jackson (September 2009- April 2010)

[E] Tutorial course students supervised

(2) Biology 4630-WG: Cellulase enzymology (January-April, 2011, Amna Syedah Idrees).
(1) Biology 4630-WF: Practical biorefining technology (January-April, 2011, Robert Buchkowski).

[F] Research Intern Students Supervised (3990/3991)

(6) Lachlan Armstrong (January-April 2011)
(5). Robert Buchkowski (September-December, 2010)
(4). Amna Syedah Idrees (September-December, 2010)
(3). Robert Jackson (September-December 2008)
(2). Mohammad Noroozi (January-April 2009)
(1). Nicholas Tkaczyk (January-April 2009)

Student Awards

8). 2005-2007, Natural Sciences and Engineering Research Council of Canada (NSERC), NSERC Postdoctoral Fellowship, Canada
7). 2004-2005, Ontario Graduate Scholarship, Canada.
6). 2003-2004, Ontario Graduate Scholarship, Canada.
5). 2002-2003, Ontario Graduate Scholarship, Canada.
4). 2001-2002, Ontario Graduate Scholarship, Canada.
3). 2000-2001, Queen's Graduate Award, Canada.
2). 1984-1985, Outstanding Student Award, Zhejiang (Agricultural) University, China.
1). 1983-1984, Outstanding Student Award, Zhejiang (Agricultural) University, China.

Student Leadership Activities

3). 1988-1989, President, Graduate Student Society of Zhejiang (Agricultural) University, Zhejiang, China
2). 1987-1988, Minister of External Liaison, Graduate Student Society of Zhejiang (Agricultural) University, China.
1). 1986-1987, Deputy Minister of student life, Graduate Student Society of Zhejiang (Agricultural) University, China.

Current Research Collaborations

Dr. Kam Leung, Lakehead University, Canada
Dr. Douglas Morris, Lakehead University, Canada
Dr. Justin Jiang, Lakehead University, Canada
Dr. Virginia Walker, Queen's University, Canada
Dr. Charles Xu, University of Western Ontario, Canada
Dr. Sanfeng Chen, China Agricultural University, China
Dr. Zhiyong Wang, Stanford University, USA
Dr. Jin Chen, Department of Energy (DOE) Research Lab, USA
Dr. Chris Somerville, University of California at Berkeley, USA

Curriculum Vitae

Wely B. Floriano
Associate Professor
Department of Chemistry, Lakehead University
SHARCNET/BRI/TBRRI Molecular Simulation Research Chair
Email: wely.floriano@lakeheadu.ca
Phone: (807) 766-7215 (work); (626) 794-8184 (home)

Educational Background

Ph.D. Phys Chem/Computational Biochemistry Federal University of Rio de Janeiro (UFRJ), Brazil, 1998
M.Sc. Physical Chemistry Federal University of Rio de Janeiro (UFRJ), Brazil, 1992
B.S. Chemistry Federal University of Rio de Janeiro (UFRJ), Brazil, 1988

Professional Experience

July 1, 2009- Associate Professor, Chemistry Department, Lakehead University, Thunder Bay, ON, Canada
July 1, 2009- Scientist, Thunder Bay Regional Research Institute
2005-2009 Assistant Professor of Bioinformatics, Biological Sciences Department, California State Polytechnic University, Pomona CA, USA
2002- 2004 Senior Scientist, California Institute of Technology, CA, USA
1999-2002 Associate Scientist, California Institute of Technology, CA, USA
1993-1998 Assistant Professor of Molecular Physics, Department of Physics, Federal University of Espirito Santo (UFES), Brazil

Publications

Papers in Refereed Journals (last 6 years only):

30. Bachmanov AA, Bosak NP, Floriano WB, Inoue M, Li X, Lin C, Murovets VO, Reed DR, Zolotarev VA, Beauchamp GK (2011). Genetics of sweet taste preferences. Flavour and Fragrance Journal 26, 286–294.
29. X Li, AA Bachmanov, K Maehashi, W Li, R Lim, JG Brand, GK Beauchamp, D R Reed, C Thai and WB Floriano. (2011). Sweet receptor gene variation and aspartame blindness in primates and other species. *Chem Senses* 36(5):453-75.
28. D Balesh and WB Floriano. (2011). Unfolded Annealing Molecular Dynamics Conformers For Wild-Type And Disease-Associated Variants Of Alpha-Synuclein Show No Propensity For Beta-Sheet Formation. *J Biophys Chem* 2(2): 124-134
27. Ramjan ZH, Raheja A, Floriano WB. (2008). A Cluster-Aware Graphical User Interface for a Virtual Ligand Screening Tool. IEEE Eng Med Bio Soc 1(4):102-5 (2008).
26. Floriano WB. (2008). A Portable Bioinformatics Course for Upper-Division Undergraduate Curriculum in Sciences. Biochem and Mol Bio Education 36(5): 325-335.
25. Floriano WB, Domont GB, Nascimento MAC (2007). A Molecular Dynamics Study of the Correlations between Solvent-Accessible Surface, Molecular Volume and Folding State. *J Phys Chem* B 111(7): 1893-9.
24. Vaidehi, N; Schlyer, S; Trabanino, RJ; Floriano, WB; Abrol, R; Sharma, S; Kochanny, M; Koovakat, S; Dunning, L; Liang, M; Fox, JM; de Mendonca, FL; Pease, JE; Goddard, WA; Horuk, R. (2006). Predictions of CCR1 chemokine receptor structure and BX 471 antagonist binding followed by experimental validation. *J. Biol. Chem.* 281:27613-27620 (2006).
23. Floriano WB, Hall SE, Vaidehi N, Kim U, Drayna D, Goddard WA. (2006). Modeling the Human PTC Bitter Taste Receptor Interactions with Bitter Tastants. *J Mol Modeling* 12:931-941 (2006)
22. Vaidehi, N; Kalani, YS; Hall, SE; Freddolino, PL; Trabanino, RJ; Floriano, WB; Spijker, P; Goddard, WA.(2005). First principles structure and function prediction for G-protein coupled receptors. *Biophys. J*. 88: 357A-357A.
21. Hummel P, Vaidehi N, Floriano WB, Hall SE, Goddard WA. (2005). Test of the Binding Threshold Hypothesis for olfactory receptors: Explanation of the differential binding of ketones to the mouse and human orthologs of olfactory receptor 912-93. *Prot Sci*, 14 (3): 703-710.
20. Cho AE, Wendel JA, Vaidehi N, Kekenes-Huskey PM, Floriano WB, Maiti PK, Goddard WA. (2005). The MPSim-Dock hierarchical docking algorithm: Application to the eight trypsin inhibitor cocrystals *J Comp Chem*, 26 (1): 48-71.
19. Hall SE, Floriano WB, Vaidehi N, Goddard III WA. (2004). 3D Structures for mouse I7 and rat I7 olfactory receptors from theory and odor recognition profiles from theory and experiment. *Chem. Senses 29: 595 - 616*.
18. Floriano WB, Vaidehi N and Goddard III WA. (2004). Making sense of olfaction through predictions of the 3D structure and function of olfactory receptors. *Chem. Senses* 29(4): 269-290.
17. Floriano WB, Nagarajan V, Zamanakos G, and Goddard III WA. (2004). The HierVLS Hierarchical Docking Protocol for Virtual Ligand Screening of Large Molecule Databases. *J Med Chem* 47:56-71.
16. Floriano WB, Nascimento MAC. (2004). Dielectric constant and density of water as a function of pressure at constant temperature. *Brazilian Journal of Physics* 34 (1): 38-41.

15. Trabanino RJ, Hall S, Vaidehi N, Floriano WB, Goddard III WA. (2004). First principles Predictions of the Structure and Function of G-Protein Coupled Receptors: Validation for Bovine Rhodopsin. *Biophys J.* 84(4): 1904-1921.
14. Freddolino PL, Kalani MY, Vaidehi N, Floriano WB, Hall SE, Trabanino RJ, Kam VWT and Goddard III WA. (2004). 3D Structure for Human beta2 Adrenergic Receptor and the binding site for Agonists and Antagonists. *Proc. Natl. Acad. Sci.USA* 101:2736-2741.
13. Kalani MYS, Vaidehi N, Hall SE, Floriano WB, Trabanino RJ, Freddolino PL, Kam VWT, and Goddard III WA. (2004). Three-dimensional structure of the D2 human dopamine receptor and the binding site and binding affinities for agonists and antagonists. *Proc. Natl. Acad. Sci.USA* 101:3815-3820.

Manuscripts Submitted and in Preparation

1. Z Ramjan, A Clark, D Daniels, S Dadgar, WB Floriano. Novel Inhibitor and a Fluorescent Recognition Agent for Botulinum Neurotoxin Subtype A Discovered Through Holistic Binding Virtual Screening. (submitted)
2. Floriano, WB. The Holistic Binding Scoring Scheme for Virtual Ligand Screening
3. Avila A, Ramjan Z,Clark A,Daniels D, Floriano WB. The Protein Scanning with Virtual Ligand Screening Approach for Probe Discovery
4. Daniels, D, Thai, C, Floriano, WB. Allosteric regulation of taste chemosensors: insights from molecular modeling and docking.

Patents

Pending U.S. Patent Applications. (1) Methods and apparatus for predicting ligand binding interactions. Wely B. Floriano, Nagarajan Vaidehi and William A. Goddard III. Caltech reference number CIT 3192. U.S. Serial Number 10/10,725 (November 30, 2001). (2) Method and apparatus for predicting structure of transmembrane proteins. Nagarajan Vaidehi, Wely B. Floriano, Michael S. Singer, Gordon M. Shepherd and William A. Goddard III. Caltech reference number CIT 3191. U.S. Serial Number 09/816,755 (March 23, 2001).

Undergraduate and Graduate Instruction

Undergraduate Courses. Bioinformatics (Lectures and 24 computer laboratory activities), Computer Assisted Drug Design (Lectures and 10 computer lab activities), Cell and Molecular biology (lecture), Genomes and Genomics (lectures and hands-on class activities), Physics for Biological Sciences (lecture), Physics III - Electromagnetism (lecture and lab), Physics IV - Waves and Modern Physics (lecture), Physics I – Classical Mechanics (lecture)
Graduate Courses. Advanced Cell Biology - Chemical Senses, Computer Assisted Drug Design
Supervisory Courses. Training in Graduate Research, Directed Study (Undergraduate), Directed Study (Graduate), Present of Research Proposals, Thesis Research.

Committees and Institutional Responsibilities

2010	Chair of Faculty Hiring Committee- Interdisciplinary Studies and Chemistry
2007-2009	Head of the Biological Sciences Department Microarray Facilities, Biological Sciences Department California State Polytechnic University Pomona
2006-2007	Member of: Scheduling and Faculty Workload task forces; Faculty Hiring Committee – Physiologist; Hiring Committee – College of Science IT Consultant; Hiring Committee – College of Science Student Unix, Biological Sciences Department California State Polytechnic University Pomona
2005-2006	Member of the Department Chair Hiring Committee and the Biotechnology Major Committee, Biological Sciences Department California State Polytechnic University Pomona

Graduate Students (completed)

- Avila A. (MSc, 2009). Eshu: A Set Of Analysis Tools For The Orunmila Ligand-Protein Docking And Scoring System. Master Thesis, California State Polytechnic University Pomona, Pomona, CA.
- Ramjan, ZH. (MSc, 2009). Usability, Performance and Data Management Improvements to Cassandra, A Tool for Virtual Ligand Screening. Master Thesis, California State Polytechnic University Pomona, Pomona, CA.
- Chen, D. (MSC, 2009). CAMD Analysis Of Human Bitter Taste Receptors. Master Thesis, California State Polytechnic University Pomona, Pomona, CA.
- Thai, CA. (MSc, 2009). Modeling Of Aspartame Binding To Human and Mouse Sweet Taste Receptors. Master Thesis, California State Polytechnic University Pomona, Pomona, CA.
- Balesh, D. (MSc, 2009). Structural Characterization of Unfolded States of Native and Disease-Associated Human Alpha-Synuclein Obtained by Molecular Dynamics. Master Thesis, California State Polytechnic University Pomona, Pomona, CA.
- Thakkar, H. (MSc, 2011). A Systematic Methodology for Creating Virtual Libraries of Fluorescent Compounds from Biorefining-related Chemicals. Master Thesis, California State Polytechnic University Pomona, Pomona, CA.

Graduate Students (in progress)

- Saedeh Dadgar (Fall 2010 – in progress). Development of a Multi-probe Fluorescence-based Assay for Detection of BoNTA.

Research Support

Current

1. Title: "Development of taste receptor ligands using structure-activity studies".
   Role: Co-PI (PI: Rucker)
   Agency: NIH SBIR (R43/R44) – Integral Molecular Inc. (07/01/09-06/30/11) $193,187

Completed in the last 3 years

1. Title: "Selective ligands for fast identification of *botulinum* neurotoxin types A and B"
   Role: PI
   Agency: NIH S06 GM053933 (09/01/2006-08/30/2009) $404,132

Academic Honors and Awards

- SHARCNET/BRI/TBRRI* Molecular Simulations Research Chair (July 1, 2009-present)
  SHARCNET = Shared Hierarchical Academic Research Computing Network
  BRI = Biorefining Research Initiative
  TBRRI = Thunder Bay Regional Research Institute
- Honored professor by the Mathematics graduate class of 1994 at UFES (1994).
- Fellowships: from Brazilian CAPES (Doctorate, Apr 1992-Aug 1993) and from Brazilian National Research Council

Other Scholarly Activities

Peer reviewer for professional journals. Journal of the American Chemical Society, BMC Bioinformatics, European Journal of Medicinal Chemistry, Chemical Senses, Sensors, Journal of Biological Physics, Drug Development Research, Journal of Computational Science Education.

Reviewer of research proposals. European non-profit organization International Foundation for Science (natural products division); National Sciences Foundation (Advances in Biological Informatics and Cyber-enabled Discovery and Innovation).

Outreach work. Science Fair judge for the Northwestern Ontario Regional Science Fair (April 24, 2010); Demonstration for St Ignatius and Churchill High School visit (Feb 19, 2010). Used portable 3D visualization equipment to promote the Bioinformatics program; Demonstration for Preview Day (Dec 4th, 2009). Used 3D visualization equipment at Lakehead's Virtual Reality facilities to promote the Bioinformatics program and Computer Science.

Professional Affiliations (current)

- American Chemical Society (ACS)
- International Society for Computational Biology (ISCB)
- Association for Chemoreception Sciences (AChemS)

Software Development

- Cassandra - a multi-platform, multi-processor software application for docking, estimating binding energies of protein/small ligand complexes, virtual ligand screening, binding site and protein function prediction.
- Multi-purpose data analysis programs.

CURRICULUM VITAE

SUDIP KUMAR RAKSHIT
Vice President (Research)
&
Professor Food Engineering and Bioprocess Technology Program
Asian Institute of Technology
PO Box 4, Klong Luang,
Pathum Thani 12120
Thailand
Tel : 66-2-524-5089, 524-6306 (Office)
66-2-524-5904 (Residence)
Email : rakshit@ait.ac.th, vpresearch@ait.ac.th

DATE /PLACE OF BIRTH 12th August, 1957
Chennai, India

NATIONALITY: Indian

ACADEMIC QUALIFICATIONS:

Ph.D.	**Biochemical Engineering and Biotechnology,** Indian Institute of Technology (IIT), Delhi, India. **"Modeling and optimization of cellulase enzyme production",** 1987
M.Tech.	Biochemical Engineering and Biotechnology IIT, Delhi, India, 1982 **"Selective adsorption of water for the production of anhydrous ethanol for use as biofuel"**
B.Tech.	Food Technology and Biochemical Engineering, Jadavpur University, Calcutta, India, 1980
B.Sc. (Honors)	Chemistry (Major), Mathematics and Physics (Ancillaries), Loyola College, Madras, India, 1977

EMPLOYMENT RECORD:

September 2005 -	Vice President Research, Asian Institute of Technology, (AIT), Bangkok, Thailand
October 2004 -	Professor, Food Engineering and Bioprocess Technology AIT
Jan 1995 to October 2004:	Associate/Assistant Professor. AIT, Bangkok, Thailand
August 1987 – Dec 1994	Associate Professor / Assistant Professor, Lecturer, Department of Chemical Engineering, Indian Institute of Technology (IIT), Madras, India

ACADEMIC AND RESEARCH EXPERIENCE

I. TEACHING EXPERIENCE:

Simultaneous with research and research administration have twenty two years teaching experience at under graduate and post graduate students in the rapidly advancing area of Food and Bioprocess technology.

Initiated two laboratories in two universities – the biochemical engineering laboratory in the Indian Institute of Technology (IIT), Chennai, India and the Bioprocess Technology laboratory at the Asian Institute of Technology (AIT) in Bangkok, Thailand. This included all aspects of curricula development, infrastructure, choice of research specializations, etc.

II. RESEARCH INTERESTS:

Biofuels : Technical, socio-economic and policy aspects – food-feed-fuel aspects
Food Safety : Rapid detection of food pathogens using new biotechnological methods

During the Masters and Doctoral program at IIT, Delhi, India was part of a large group of researchers in various in the bioconversion of cellulosic residues like rice straw, wheat straw and sugar cane bagasse into ethanol. With experience from over 30 doctoral students working in the areas of delignification, hydrolysis and fermentation to ethanol pilot plant was set up with multiple routes for conversion of these agricultural residues to alcohol. The capacity of the designed plant was production of 100 litres of anhydrous alcohol per day.

III STUDENT RESEARCH PROJECT SUPERVISION:

COMPLETED PROJECTS:

Ph.D.	:	10
Masters	:	68
B.Tech	:	30 (at IIT, Madras, India)

ONGOING PROJECTS:

Ph.D.	:	9
Masters	:	10

III. PUBLICATIONS SUMMARY

<u>(See details in Annex -1)</u>

a) Books and monographs:	**3**
b) Book Chapters:	**10**
c) Patents:	**2**
d) Papers in international journals :	**70**
e) Papers communicated to journals:	**6**
f) Presentations in seminars/conferences:	**105**
g) Other publications:	**3**
h) Papers in preparation:	**8**

V. INVITED SCIENTIST / VISITING FACULTY / COLLABORATIVE VISITS – some examples

Visiting Professor at the Korea Institute of Science and Technology (KIST), Seoul, Korea to teach courses on Advanced methods in Biotechnology to students in their International R & D academy, June 2003 and May/June 2005

External expert for the evaluation of research in the area of food safety and nutrition for the Agricultural Research and Training Project (ARTP), Ethiopian Agricultural Research Organization, Ethiopia, September 2004

Participant in project in Human Resource Development in Food Safety and Quality for Sustainable Development in collaboration with the Van Hall Instituut, The Netherlands, Sheffield Halam University, UK and University of Jember, Indonesia, May/June 2004

Resource person for course in Bioprocess Technology at the University of San Carlos, Cebu, The Philippines, October 20-31, 2003

Invited researcher for collaborative research project "Utilization of genomic information of a thermophile for the production of thermostable enzyme", at the National Institute of Biosciences and Human Technology (NIBH), Agency of Industrial Science and Technology (AIST), Tsukuba, Japan., March, 2001

Invited by the French Ministry for education, research and technology, Republic of France to the Center for International cooperation in Agricultural Research and Development (CIRAD), Montpellier, France, to extend collaboration and develop further activities (spent sabbatical leave) February to May, 2000

Center for International Cooperation in agricultural research and development (CIRAD), Montpellier, France, for collaboration on the, 'Fractionation of fish oils for the production of nutraceutical poly-unsaturated fatty acids'. March 22 to June 25, 1998

Invited researcher Japanese Industrial Technology Association (JITA) for collaborative research project, `Lipase engineering for effective utilization of oil resources', at the National Institute of Biosciences and Human Technology (NIBH), Agency of Industrial Science and Technology (AIST), Tsukuba, Japan. September 3-20, 1997

Invited researcher, JITA, NIBH, Tsukuba, Japan. June 10-25, 1996

Research Administrator by invitation at the National Institute of Biosciences and Human Technology, Agency of Industrial Science and Technology, Tsukuba, Japan. March 12-20, 1994:

Visiting Faculty Agricultural and Food Engineering Program Asian Institute of Technology, Bangkok, Thailand under Government of India Secondment, Sept. 1993 to Dec. 1993:

UNIDO international expert for workshop on: `The use of meat and fish byproducts in Africa', held in December, 1995 at the Central Leather Research Institute (CLRI), Madras, India. Delivered lecture : `Utilization of fish byproducts for non-food purposes.'

Invited lecture "Utilization of cassava starch" at the, "Technology of starch Manufacturing", organized by the Department of Agricultural Engineering, University of Illinois at Urbana Champaign, USA, June 7th to 9th, 1998, Holiday Inn Convention Center, Urbana, Illinois, USA.

Invited lecture, "Recent trends in cassava starch production and application". Presented at 51st Starch Convention 2000, Association of Cereal Chemists, Detmold, Germany, 12-14 April, 2000.

International expert in Xuzhou international expert at the International workshop on new technologies for sweet potato improvement, Xuzhou, China 12-14 September, 2002.

Co-chairman of the Keynote address at the International Agricultural Engineering Conference, Wuxi, China, 28-30 November, 2002.

Chairman of Plenary and technical session of the "International Conference on Innovations in Food Technology and Engineering, December 11th to 13th, 2002, Bangkok, Thailand.

Co-chairman of session at the International Conference on Management of research and Development in the New Millennium, (ICMARD 2003), 10th and 11th January, 2003, N. Delhi, India.

Chairman of a plenary lecture session and a technical session at the Third Asian-Pacific Drying Congress (ADC), Asian Institute of Technology, 1st to 3rd September, 2003, Bangkok, Thailand.

SPONSORED RESEARCH:

1. **Bio-ethanol production from residues of Pulp and Paper Industries, Project sponsored by the Royal Thai Government (RTG) to encourage collaboration with industry, Partnership with DA Research Centre Company Ltd. And AIT, Utilization of topping of eucalyptus not used in paper manufacture for bioethanol production. Initiated June, 2010.**

2. SIDA NUOL : Principal investigator for research management project in the National University of Laos. Involves creation of the NUOL research strategy which is line with the national research strategy o Laos PDR. (ongoing)

3. **FAO Food innovation** : Study on the food innovation of traditional snacks in countries like Thailand and the factors that affect their existence in competition with major food outlets. This study involves SME's as well street vendors who have to develop new products and skills to stay in business.

4. **Royal Thai Government (RTG): Two projects working with the support of RTG and with partnership with the BIOTEC labs of the National Science and Technology Agency (NSTDA), Kasetsart University, on new paradigm changes required for first and second generation biofuels production including metagenomic cellulase.**

5. **Two Agency Francophone supported projects on first generation and second generation biofuels and provides networking with the Hanoi University of Technology in Vietnem, ITC in Cambodia, the University of Marsielle and the University of Dijon in France.**

6. **A bio-innovation project supported by IDRC which provides support for projects that utilize Bio-innovation to help in poverty alleviation, better health care and environmental change in some countries in Asia.**

6. Applied Biotechnology for Industrial Products, sponsoring agency, Ministry of Human Resource Development **(MHRD),** Government of India.

7. Development of an high productivity process for the production of lactic acid by membrane technology application, Sponsoring Agency, Department of Biotechnology **(DBT),** Government of India.

8. Development of indigenous technology for Sodium glutamate production by bioroutes, Sponsoring Agency,**IIT Madras**, India

9. Enzymatic lipolysis for effective utilization of tropical oil resources. Sponsoring Agency, National Institute of Human Technology (**NIBH**), Agency of Industrial Science and Technology (AIST), Tsukaba, Japan.

10. Utilization of cassava starch for the enhanced production of lactic acid. Research Initiation Grant, **AIT**.

11. Efficient procedure for the extraction of sweet potato starch, Sponsoring agency, International Potato Research **(CIP), Lima, Peru**

12. Bioconversion of Palm oil to Lubricant oil, Sponsoring agency, **PORIM**, Malaysia

13. Southeast Asia Fish Processing Pollution - EU perspective, Sponsoring agency, **Asia Eco-Best**, Singapore.

14. Extraction of nutraceutical antioxidants from rice bran, Sponsoring agency, Royal Thai Government (**RTG**), Thailand.

15. Characterization of chitosan membranes to be used for membrane treatment. Sponsoring Agency, Southeast Asian Center for Water Environment Technology (**SACWET**), Bangkok, Thailand

16. Development of Integrated Product Recovery Process or Urokinase Production and Purification, Sponsoring Agency, Sida Sweden.

17. Traceability of fish depending on their lipid content, Sponsoring Agency, **CIRAD**, Montpellier, France.

18. Technology for probiotic production and feed formulation containing viable beneficial organisms for enhanced healthy chicken production. Sponsoring Agency, **BIOTEC, NASTDA**, Thailand.

19. Quality and safety of fish aquatic fish processing in Vietnam and Thailand, Sponsoring agency L'orgainization internationale de la Francophone (**AUF**), France.

20. Development of rapid methods for the detection of pathogens in aquatic food. Sponsoring agency, The Royal Thai Government (**RTG**), Thailand.

21. Capacity building of small scale shrimp farmers on adaptation of best management practice to promote Thai shrimp export to the **EU**. Sponsoring agency, EU.

22. Workshop on Integrated Policies for Bio-innovations in Agriculture and Health in Asia Sponsoring Agency, **IDRC and Rockfeller Foundation**

23. **Production of biodiesel from used vegetable oil, Sponsor agency, Part of 3R (reduce, recycle, reuse) Knowledge hub supported by the Asian Development Bank (ADB)**

24. FAO study on Worldwide Food Losses and the potential for investment in food packaging in developing countries, in partnership with MTT Agrifood Research, Finland (under negotiation)

25. Production of bioethanol and biomaterials from palm oil biomass: A study of feedstock sustainability, technological efficiency and social applicability. SDCC / AIT French Network project, Initiated June 2010

PROFESSIONAL MEMBERSHIP:

1) Member of the American Chemical Society (ACS), Washington DC, USA
2) Nominated into Editorial Board of the Asian Agricultural Journal of the Asian Association of Agricultural Engineers, January, 2004
3) Secretary General and Foundation Member, Asian Association for Agricultural Engineering (AAAE), AIT, Bangkok, Thailand.
4) Member of the Indian Biotechnology Society, N.Delhi, India

JOURNAL / NEWS LETTER EDITOR/ REFEREE:

1) Reviewer of journal papers in the following international journals:
   - International Agricultural Engineering Journal', an AAAE journal.
   - Journal of Heat and Mass Transfer', Asia/Pacific Center for Heat and Mass Transfer.
   - Applied Biochemistry and Biotechnology
   - Trends in Biotechnology
   - Developments in Chemical Engineering and Mineral Processing
   - Enzyme and Microbial Technology
   - Food and Science and Technology, LWT
   - Journal of Agriculture and Food Chemistry
   - Bioresources Technology
   - Biotechnology and Bioengineering

2) Co-Editor Proceedings of the international conference on, "Innovations in Food Processing Technology and Engineering", 11-13 December 2002, AIT, Bangkok, Thailand.

3) Editor of the Asian Association of Agricultural Engineering (AAAE) News Letter from September, 2001

4) Editorial Board of the "Asian Biotechnology and Development Review", publication is supported by the UNESCO and the Department of Biotechnology (DBT) of the Government of India, May 2009

4) Editorial Board of the Agricultural Engineering Journal of the Asian Association of Agricultural Engineering, 2004.

EXTERNAL Ph.D. THESIS EXAMINER:
Australia (University of Queensland)
India (IIT's, Indian Institute of Science, Bangalore, BHU, and Madras University, Chennai)
Malaysia (University of Malaya and University of Putra Malaya)
Pakistan (NWFP Agricultural University)

LANGUAGE SKILLS :
English : Language of education and communication throughout
French: Was subject of study for three years – but now limited to reading comprehension
Bengali : Mother tongue – can read, write and speak – spoken in India and Bangladesh
Hindi : Read, write and speak – understood in India, Pakistan and Bangladesh
Tamil : Can speak, spoken in India, S.Lanka, Malaysia and Singapore
Thai : Working knowledge

RESPONSIBILITIES IN PRESENT POSITION AS VICE PRESIDENT RESEARCH AIT:

- Integrate research and academic activities at all levels in the institute and with partner institutions
- Facilitate and advocate the research activities of AIT's thematic research areas a large portion of which is in the area of sustainable development
- Identify research strategy and priorities in line with AIT's research focus areas and strengths.
- Identify and obtain external and internal funding for research.
- Facilitate provision of infrastructure and research facilities.
- Facilitate working relationships among various constituents on campus which promote quality research.
- Ensure compliance with regulations and policies, and ensure ethical standards are met in research conducted.
- In charge with the commercialization, protecting, managing, and transferring the intellectual property generated
- To promote and market the Institute's capabilities in contract research.
- To give guidance on the preparation construction of project proposals.
- To analyze the effectiveness of institutional activities in sponsored research and make appropriate recommendations to the President.
- To ensure timely fulfilment of institutional consultancy obligations.
- Develop structures for communication of research activities and outcomes internally and externally.
- Develop mechanisms to enhance research innovation capacity of the Institute.

INITIATIVES TAKEN INSTITUTE WIDE AS VP RESEARCH:

I. Development of a Thematic Knowledge Area called "Sustainable Development in the context of Climate Change". (See www.sdcc.ait.asia)

Inaugurated by Dr. Noeleen Heyzer, Under-Secretary-General of the United Nations and Executive Secretary of the Economic and Social Commission for Asia and the Pacific (UNESCAP), initial support from SIDA, The French Cooperation and Siam Cement Group (SCG), with special session with 15 funding agencies working in region. Presentations on the research directions to be followed in the near and middle term were in the following sub-themes:

- Vulnerability and Disaster Risk Reduction
- Agriculture, Food security, Forestry and land use
- Urban and Rural Sustainability
- Water resources and coastal adaptation
- Low Carbon Society and renewable energy technology
- Cleaner Production and Waste Refining

II. Pro-active Project Development and support

The office has VPR has started working pro-actively with donors and supporters on the type of projects that needs to be initiated in the region. The candidate thus has considerable knowledge of the needs, demands and future plans of the agencies funding research and development in the region and beyond. These include SIDA, CIDA, IDRC, USAID, ADB, The World Bank, the French Cooperation, Foundations including Rockefeller, MacArthur and Ford, the Royal Thai Government (RTG), Ministries in different countries (eg. MoFA Finland, MONRE, Vietnam, etc), private companies and other agencies.

In order to further to facilitate project bids and submissions, the office of the VPR is created professional proposal writing and budget preparation services for AIT faculty and staff. Multi-disciplinary teams from within the institute and with partners from outside the institute were invited for the preparation of the bids in a professional manner.

Total number of ongoing project: 425
Increase in the number during period of administration of candidate : 40%
Value of project: 2 Billion Thai Baht (62 million US $)

III. Strategy Development

The creation of an "AIT Research Strategy" is being carried in line with the "AIT Strategy 2013". This will indicate the future direction of research in the institute taking into account the experience of working in the region, informed intelligence of the needs and plans of the countries in the region, the required human resources and investment required within institute to achieve the same, etc. In line with the demands of many funding agencies (including CIDA) this is done following a Results Based Management Approach (RBM). The office also established an AIT Outreach Board with eminent practitioners working in the region, who will advise on ways to further strengthen the developmental activities in region,

IV. AIT Consultancy Service

The establishment of a specialized and possibly an autonomous entity for providing professional consulting services to clients interested in capacity building and implementation of projects. This involves strengthening internal mechanisms the possibility of setting up a non-profit but autonomous unit, preparation of internal and external rooster of experts, creation of a cell to for proposal and bid call intelligence, etc.

V. Innovation Initiative

With the need to further develop innovation and entrepreneurship activities in the region a pre-incubator to provide support and advise for business plan preparation and funding has been developed. In order to encourage the development of original innovative ideas within the institute an fund for Innovation Development to Entrepreneurship Actualized (IDEA) has been

created. The needs of the SME sector and the creation of clusters at a sub-sectoral level will be supported. An IP Advisory committee that has been constituted also provides feed back required for patent applications, protection of intellectual property and ways to encourage ways to use best practices developed in the institute.

IV. Distance Education

Looking into the future it is felt that AIT needs to urgently strengthen our online distance and e-learning activities. The office of the VP Research has developed plans to expand and make possible such activities which can be used to work with more clients / stake holders. The needs of provide this support and professional training to local change agents who may not be able to break away for a formal education is considered important

VI. Dissemination and communication activities

In the period of his administration the candidate has developed an "AIT Research Report" in hard, soft and online versions (See www.ait.asia/research) This has helped develop better and increased networking and clients find it easier to find the expertise they are looking for.

The VP Research initiated an AIT Masters Theses Competition from the year he took office. There were seven competition categories, namely: Energy/Environment, Resources, Development, ICT, Information Systems, Civil Engineering and Management. Students with excellent grades in their theses were nominated to represent their respective fields of study. Theses presentations have been judged according to the relevance, originality, scientific/society contribution; general knowledge of the field, future potential for innovation; and presentation skills. A number of spin off activities have resulted from this competition including student placement, new projects, press coverage of the research presented, collaboration with other institutions, etc.

The candidate has also played an important role in highlighting the activities of his organization in public media. These include the following:
Thailand TV show , Channel 7, Morning talk – climate change
www.youtube.com/watch?v=kNsANp7aMK4

Second Generation biofuels – the way forward, Checkbiotec Newsletter.
Link: http://bioenergy.checkbiotech.org/news/bio_fuels_create_green_future_delhi_cm_dtu

"The Nation" newspaper, Opinion coxolumn, " A bio-driven future"
http://nationmultimedia.com/option/print.php?newsid=30040890

Appeared of TV of the Peoples Republic of China - CCTV - on the production and extraction of sweet potato. Invited to attend the Sweet Potato conference in Xuzhou, China, 2002.

Appeared on UBC, Thailand, TV channels for a program, "Technology with AIT".
Topic: Extraction of high value anti-oxidants from rice bran byproducts, 2002.

STEERING COMMITTEES, CONSULTATIONS AND FACT FINDING MISSIONS - some examples

Member of Steering Committee for a number of projects. The terms of reference for these committees is guide and advise the project investigators and the team involved on the direction and activity they should take on, the required change in strategies if any and opinion on the activities already carried out. They also involve the confirmation of selected projects and personal if any. Some examples are given below.

- The Energy and Environment Programme (EEP) supported by the about the Ministry of Foreign Affairs (MoFA),. The committee decides on projects to be funded s proposals from the Greater Mekong Sub-region (GMS)
- The EuroAsia Erasmus Mundus project supported by the European Commission (EC) which involves a consortium of 10 universities and supports the mobility between the institutions for faculty, staff, post doctoral candidates, undergraduate and graduate students to carry out research and development
- The Wetland Alliance Project (WAP) supported by the Swedish Development Agency (Sida) and involves four institutions the World Wildlife Fund (WWF), World Fish, the Coastal Resources Institute and AIT. These agencies provide support in terms of funds and back stopping with expertise required by local agencies to bring about development and change. Support by inter-disciplinary teams including technical, managerial, socio-economical and policy expertise have proven very useful.
- Steering Committee of UNCECAR – University Network for climate and Ecologgical Change Adaptation, hosted by UNU, Tokyo and IR3S

On the Advisory Board of the International Tsunami Training Institute (ITTI), University of Washington, USA.

Steering Committee member of the international consortium for Low Carbon Society with membership of the Stony Brook University, New York, IGES, Tokyo, AIT, etc.

FAO/WHO Regional expert consultation of the Asia Pacific network for food and nutrition on "Nutrition orientation to food production" Bangkok , Thailand , 3 to 5 October 2006 RAP PUBLICATION 2006/21

Quality/ Food Safety Specialist in ADB TA for Strengthening Capacity and Regional Cooperation in Advanced Agricultural Science and Technology, & September 2005 to 12 September 2007

FAO/WHO Regional Expert Consultation of the Asia Pacific network for food and nutrition on " Functional foods and their implications on the daily diet", Bangkok, Thailand, 16-19 November, 2004, RAP PUBLICATION 2004/33

Fact finding mission for food and biosafety "Technical assistance for Capacity Strengthening Co-operation in Advanced Agricultural Science and Technology in the Greater Mekong Region", Octo ber 2004, consultant for the Asian Development Bank (ADB), Manila, The Philippines.

UNIDO international expert for workshop on:`The use of meat and fish byproducts in Africa', held in December, 1995 at the Central Leather Research Institute (CLRI), Madras, India. Delivered lecture : `Utilization of fish byproducts for non-food purposes.'

Resource person for training course: `Quality management in the food industry in Asian and Pacific Less Developed Countries'. Supported by AIT Extension, Delivered lectures: 1) Problems of Food Processing in Developing Countries. 2) Role of Biotechnology in the food quality - Case Study.

Coordinator of a Thailand-Japan Symposium on Enzymatic Reaction Engineering for effective utilization of tropical oil resources sponsored by the Japan External Trade Organization (JETRO) to be held in Bangkok on November 22-23, 1998.

International resource person in a DANIDA sponsored seminar on Cleaner Production technology in the fish processing industry. This involved executives from more than a 100 fish exporting industries in Vietnam. Two seminars were held - 25-26th September in Dan Nang and 28-29th September,2000 in Ho Chi Minh (Saigon), Vietnam.

Resource person in workshop on "Developments in Food Processing Technology", with participation from persons from 15 countries. Presented talks on, "Developments on food Bioprocess Technology" and "Cleaner Production in the Food industry'.

Member of the International Advisory Committee for the "International Conference Management of Research and Development", 10th and 11th January, 2003, New Delhi, India.

Secretary General and Foundation member of the Asian Association of Agricultural Engineers (AAAE), from September 2001.

Nominated member of the steering committee for the South East Asian Center for Biological Resources Management (SACBRM) for a joint center between University of Tokyo (UT) and AIT, July 2005.

Chair Panel discussion on "Biological and thermo-chemical processes in 2nd generation biofuels production, EU – Southeast Asia Expert Meeting on 2nd Generation Biofuels: Identifying Opportunities for collaboration, September 8-9, 2009, Sirindhon Science Home, Thailand Science Park, Pathumthani, Thailand.

SOME RECENT INVITED LECTURES

Food, Fuel and fiber, Competition or synergies?
SE Asia EU Net Climate Change Adaptation and Mitigation Conference
Bogor, Indonesia, November 11-12, 2009

Renewable energy and sustainable development in SE Asia - context of biofuels
European Science Cooperation Conference
Mandalay, Myanmar, 4-5 December, 2009

Regional Research Priorities - Expectations from a Partnership with Europe
International Conference Dialogue between Europe and its Southern partners on Agricultural Research and Climate Change, Brussels, December 16-17, 2009

Food security in SE Asia: Not only about Climate Change
Sida-SENSA partners retreat, Chiang Mai, Thailand, 16 March, 2010

Trans –disciplinary Capacity Building : Education and Training
LCS-Rnet & ICLCS Panel 4, IGES
Tokyo, June 27, 2009

Climate Change – Challenges and Opportunities in Higher Education
EU Asia Higher Education Platform symposium
Bangkok, Thailand ,30th October, 2009

Looking Forward - Charting the Transition to a Low-carbon society
"The Ultimate Policy Challenge : Rising Energy Demands versus Emissions Reduction"
GSI-IPS Convened Asia Pacific Media Forum
Bangkok, 23-24 July, 2009

Challenges and Opportunities in Higher Education
Climate Change Adaptation Conference, UNU Sponsored UN-CECAR
Yojokarta, Indonesia, 10 March, 2010

Climate Change Knowledge Area and Business Opportunities
SIRIM- WAITRO International Conference
Kaula Lumpur, Malaysia, 12-15 August, 2008

Looking Forward : Charting the Transition to a Low-carbon society
"The Ultimate Policy Challenge : Rising Energy Demands versus Emissions Reduction"
Asia Pacific Media Forum convened by the "Global Subsidies Initiative" (GSI and the Inter Press Service, Asia Pacific Bureau, Bangkok, Thailand, 23 -24 July, 2009.

ANNEXURE -1

PUBLICATIONS (Summary):

a) Books and monographs:	**3**
b) Book Chapters:	**10**
c) Patents:	**2**
d) Papers in international journals :	**50**
e) Papers communicated to journals:	**6**
f) Presentations in seminars/conferences:	**105**
g) Other publications:	**3**
h) Papers in preparation:	**8**

BOOK CHAPTERS :

1. "Utilization of starch industry wastes". In, "Bioconversion of waste materials to industrial products", Book Editor, Dr.A.M. Martin, Blackie Academic and Professional, Second Edition, 1998.

2. Contribution to the encyclopedia, World of Genetics. K. Lee Lerner & Brenda Wilmoth Lerner (eds) (Lerner and Lerner Publications, Alabama, USA)Published by Thomson Publishing's Gale Group. December, 2001. Hardcover, 1st edition 826 pages ISBN: 0787649589. **" DNA probes"**

3. Contribution to the encyclopedia, World of Genetics. K. Lee Lerner & Brenda Wilmoth Lerner (eds) (Lerner and Lerner Publications, Alabama, USA)Published by Thomson Publishing's Gale Group. December, 2001. Hardcover, 1st edition 826 pages ISBN: 0787649589 **"Fungal genetics"**

4. Contribution to the encyclopedia, World of Genetics. K. Lee Lerner & Brenda Wilmoth Lerner (eds) (Lerner and Lerner Publications, Alabama, USA)Published by Thomson Publishing's Gale Group. December, 2001. Hardcover, 1st edition 826 pages ISBN: 0787649589 **"Mutants : enhanced tolerance to pH, temperature and alkalinity"**

5. **S.K.Rakshit, Neutraceutical production and use**, In Concise Encyclopedia of Bioresource Technology", Editor Ashok Pandey, The Haworth Press, Inc. Binghamton, NY 3904-1580 USA, June 2004, pp. 277-284.

6. **S.K.Rakshit, "Pre- and probiotics",** In "Concise Encyclopedia of Bioresource Technology". Editor Ashok Pandey, The Haworth Press, Inc. Binghamton, NY 13904-1580 USA, June 2004, pp. 285-292.

7. **S.K.Rakshit, "Application of biopolymers"**, In "Concise Encyclopedia of Bioresource Technology". Editor Ashok Pandey, The Haworth Press, Inc.

Binghamton, NY 13904-1580 USA, June 2004, pp. 179-187.

8. **S.K.Rakshit**, **"Thermozymes"**, in "Enzyme Technology", Book Editors Dr.Ashok Pandey (India), Prof. Colin Webb (UK), Prof. Carlos Ricardo Soccol (Brazil) and Prof. Christian Larroche (France), Asiatech Publishers, New Delhi, India, Chapter 30, Part IV, pp. 603-614, 2005.

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10. **"Bioinformatics bonanza" and "From genomics to proteomics"**, in "The stuff of life", Celebrating the 50th anniversary of the discovery of the structure of DNA, Published by the Public Understanding of Science, Technology and Innovation Project, NSTDA and The Nation with the support of the National Science and Technology Development Agency, Ministry of Science and Technology, Thailand, 2003.

11. Thermostable enzymes and the PCR, in 'The PCR Revolution – Basic Technologies and Applications", Edited by Stephen A. Bustin, Cambridge Press. 2010.

PATENTS :

1) Yoshitsugu Kosugi, .M.S.R.C. Murthy, K.Murali Manoj, T.Swaminathan and S.K.Rakshit Japanese patent through AIST, Japan : Manufacture of fatty acids from their esters with alcohol resistant lipase immobilized on cation exchangers.
Jpn. Kokai Tokkyo Koho JP 10225298 A2 25 Aug 1998 Heisei, 5pp. (Japanese)
CODEN : JKXXAF CLASS: ICM : C12P007-64. APPLICATION : JP 97-29076 Feb 1997
DOCUMENT TYPE : Section 16 Fermentation and Bioindustrial Chemistry.

2) Y. Kosugi. K.Murali Manoj, T.Swaminathan and S.K.Rakshit. Japanese patent through AIST, Japan for : Manufacture of fatty acids or their alkali metal salts with immobilized alkaline lipase. Jpn. Kokai Tokkyo Koho JP 10215888 A2 18 Aug 1998 Heisei, 4pp. (Japanese)
CODEN : JKXXAF CLASS: ICM : C12P007-40. APPLICATION : JP 97-20358 Feb 1997
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PUBLICATIONS IN INTERNATIONAL JOURNALS AND CONFERENCES :
(* = Referred International Journals)

1983

1. **Ethanol separation by selective of adsorption of water. S.K. Rakshit, P. Ghosh and V.S. Bisaria. Technical Session of India Institute of Chemical Engineers, (I.I.Ch.E.) Annual Meeting January 2-5, 1983, Andhra University, Waltair.**

1987

2. **Selection of a new mutant of *Trichoderma reesei* for the hyperproduction of cellulase enzyme, S.K. Rakshit and V. Sahai. Technical Session of I.I.Ch.E. Annual Meeting December 19-22, 1987, Sindri.**

1988

3. **Modeling of cellulase enzyme production using a mutant of *Trichoderma reesei.* S.K. Rakshit and V. Sahai, Technical Session of I.I.Ch.E. Annual Meeting 18-19 December 1988, Vadodara.**

4. Transient modeling of a biochemical reactor using a cell-enzyme co-immobilized system., N. Chitra, A. Baradarajan and S.K. Rakshit. Technical Session of I.I.Ch.E. Annual Meeting 18-19 December 1988, Vadodara.

5. Optimal pH control for production of cellulase in a batch culture of *Trichoderma reesei E-12.*, S.K. Rakshit and V. Sahai. Symposium on Recent Advances in Bioprocess Engineering, December 20-21, 1988, IIT, Delhi.

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6.* **Cellulase production by a partially catabolic resistant mutant of *Trichoderma reesei.* S.K. Rakshit and V. Sahai, *Journal of General and Applied Microbiology*, 35, 441-450 (1989).**

7. Modelling of cellulase biosynthesis using a mutant of *Trichoderma reesei E-12.* S.K. Rakshit and V. Sahai. Second National Symposium on Modeling and Simulation in Chemical Engineering, July 6-8, 1989, IISc Bangalore.

8. Extractive fermentation of acetone-butanol-ethanol using lignocellulosic hydrolysates. P. Sadasivamurthy and S.K. Rakshit. National Seminar on Bioconversion of Agro/Cellulosic Residues in Energy, Food and Chemicals, 3-4 October 1989, Andhra University, Waltair.

9. **Recent advances in biomethanation - a selective review., H.J. Prabhu, M. Satyanarayana, A. Baradarajan, T. Panda and S.K. Rakshit. National Seminar on**

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14. **Studies of biomass growth in a tapered and non-mechanically agitated bioreactor. M.K. Gowtham, S.K. Rakshit and A. Baradarajan. Proceedings of Asia Pacific Biochemical Engineering Conference. April 22-25, 1990, Kyungju, Korea, p. 49-52.**

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19.* Studies on RTD and continuous culture (SCP) in cylindrical and tapered reactors. M.K. Gowthaman, S.K. Rakshit, K.Krishniah and A. Baradarajan. *Bioprocess Engineering*, 6, 41-46, (1991).

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31.* **Ethanol separation by selective adsorption of water. S.K. Rakshit, P. Ghosh and V.S. Bisaria, *Bioprocess Engineering*, 8, 279-282, (1993).**

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34. Microbial urea reduction in waste water containing urea. Udayakumar, S.K. Rakshit, A. Baradarajan and C.A. Sastry. National Symp. on management of Radioactive and Toxic wastes, Indira Gandhi Centre for Sciences Research, Kalpakkam, March 17-19, 1993.

35. Removal of Cs-137 by precipitation and ultra filtration. C. Ananda Babu, R.V. Amalraj, S.K. Rakshit and M.S. Ananth. 10th National Conf., Bhabha Atomic Research Centre, 1993, Bombay.

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PRESTON McEACHERN

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EDUCATION

Ph.D. Environmental Biology and Ecology - Limnology, University of Alberta, 2003.
M.Sc. School of Natural Resources - Limnology University of Missouri, 1996.
B.Sc. Honors Zoology, University of Toronto, 1990.
Q.E.P. Qualified Environmental Professional – Institute of Professional Environmental Practice, 2007.

PROFESSIONAL EXPERIENCE

2007-Present Section Head, Science, Research and Innovation, Government of Alberta, Alberta Environment.

- Manage top scientific and engineering staff in oil sands.
- Responsible for technical input, strategic analysis, decision support and instrumental in policy development for the Clean Energy Branch.
- Lead technical authority for Alberta Environment developing government policy on oil sands tailings waste management.
- The Oil Sands Research and Information Network (OSRIN): Created the business case and acquired 4.5 million dollars to establish this research unit under the Canadian School of Energy and Environment for reclamation and mine waste management research.
- The Oil Sands Leadership Initiative (OSLI): Primary regulatory driver for establishing a regional water management system including pipelines, water treatment requirements and the possibility for aquifer storage of process water. This is a multi-billion dollar project.
- Canadian Oil Sands Network for Research and Development (CONRAD): Research expert for Alberta Environment in the parent group.
- University of Alberta Civil and Environmental Engineering: NSERC-CRD research grant holder supporting students investigating the impacts of pollutant load on the Athabasca River and modeling of water quality. Spearheading the development of a Contaminant Transport and Fate Center as a focal point for research on analytical techniques, ambient monitoring and modeling.
- Helmholtz Initiative: Driving solute waste management solutions through water quality modeling and optimizing water treatment processes in the oil sands.
- Titanium Corporation: On the research review board for this multi-million dollar project attempting to recover residual hydrocarbons, diluents and heavy metals from tailings waste.
- Energy Innovation Fund and Climate Change Emissions Management Fund: Reviewer for Alberta Environment assessing research applications to these funds.
- National science committees: National Acid Rain Science Network and the National In-stream Flow Needs Science Committee providing guidance on regional issues and input to Federal programs. Work closely with the Director General of Science in Environment Canada on their programs in Alberta.

2001-2007 Senior Limnologist/ Water Quality Specialist, Government of Alberta, Alberta Environment.

Role as Northern Region limnologist:

- Water quality assessments of the Peace and Athabasca Rivers.
- In-stream Flow Needs (IFN) assessment and creation of water management frameworks under the Water Act and the Environmental Protection and Enhancement Act.
- Reviewer and expert witness for environmental impact assessments.
- Develop field programs for Northern Region water quality management.
- Develop long-term management tools for water quality.
- Establish Watershed Planning and Advisory Councils and research to support management issues.
- Research coordinator for CEMA acid deposition effects.

2005 – Present, Adjunct Associate Professor, Universities of Alberta, Victoria and Lakehead University

- Currently hold three faculty appointments, Adjunct Associate Professor in Civil and Environmental Engineering at the University of Alberta and Adjunct Professor in Geography at the University of Victoria and Adjunct Professor in Natural Resources Management at Lakehead University.
- Supervised 10 graduate students, participate in development of research programs at the three universities and their partners and hold an NSERC grant in Environmental Engineering.

1996-2003 Ph.D. Student, University of Alberta. Degree awarded March 2003.

- Created a surface water quality and hydrologic model for predicting maximum allowable timber harvest and optimum location of harvest while minimizing water quality impacts.
- Completed courses in environmental engineering in addition to core biology courses.
- Worked with First Nations to form harvest guidelines that balance timber and economic needs with traditional lifestyles.

1994-96 M.Sc. Student, University of Missouri, Columbia, MO, USA

- Analyzed a large and complex database describing water quality in Nepal.
- Developed curriculum and taught limnology sections in class and field settings.
- Completed several courses in environmental law including pollution and conservation regulations in addition to core courses.
- Obtained funding and initiated joint project with a university in Thailand to investigate impacts of prawn aquaculture on water quality.

1992-94 Wetlands Biologist, The World Conservation Union, Nepal.

- Investigated the status of crocodilians and developed a restoration plan for the marsh mugger (*Crocodylus palustris*). Captured and tagged several hundred crocodiles.
- Collected water quality, biotic and socio-economic data for 150 waterbodies.
- Created a combined geographic and relational database for aquatic data.
- Part of 3 - member team that worked with the government to create wetland conservation guidelines for Nepal.

LEADERSHIP EXPERIENCE

2011 to present. Director, Canadian Land Reclamation Association

Facilitate research and communication on oil sands reclamation in Alberta

1998 to 2003. Lakewatch Director, Alberta Lake Management Society.

Developed a volunteer lake monitoring program with the Alberta Government. The program is highly successful and is a model for other jurisdictions.

1988-90. NCOIC, 365th Evacuation Hospital, Niagara Falls. N.Y.

Non-**C**ommissioned **O**fficer **I**n-**C**harge of field medical and survival training.

1990-91. NCOIC, 365th Forward Surgical Team, Operation Desert Storm, Iraq.

Non-Commissioned officer for a select combat surgical team stationed in Iraq during the 1990-1991 Gulf War (Operations Desert Shield and Desert Storm)

SELECTED AWARDS

Alberta Premiers Award of Excellence (Silver) 2005
Alberta Environment Individual Leadership Award 2005
Alberta Environment Achievement Award 2004

Publications

McEachern, P. 1994. Interim results of the IUCN Nepal Crocodile survey for *Gavialis gangeticus* and *Crocodylus palustris*. Crocodile Specialist Group. 1994. Crocodiles. *Proceedings of the 12th Working Meeting of the Crocodile Specialist Group, IUCN-The World Conservation Union*, Gland, Switzerland. Vol 2. ISBN 2-8317-0239-9. 340 p.

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McEachern, P., E. E. Prepas and D, Chanasyk (2005). Landscape control of catchment hydrology, solute flux and water chemistry for streams in northern boreal Alberta. *J. Hydrol.* **323:** 303-324.

Lima Neto, I.E., D. Zhu, N. Rajaratnam, T. Yu, M. Spafford, P. McEachern (2007). Dissolved oxygen downstream of an effluent outfall in an ice-covered river: natural and artificial aeration. *Journal of Environmental Engineering ASCE* **131:11** 1051- 1060

Bennettt, K. J.J. Gibson, P. McEachern (2008). Water-yield estimates for critical loadings assessment: comparisons of gauging methods versus an isotopic approach. *Can. J. Fish. Aquat. Sci.* **65:** 83-99.

McEachern, P. (2008). Cumulative effects management and the role of predictive models in the new policy for regulating land disturbance in Alberta. *J. Environmental Engineering and Science,* **7(supp. 1):** S13-S21.

Jones, J. R., P. McEachern, and D. Seo, (2009). Empirical evidence of monsoon influences on Asian Lakes*, Aquatic Ecosystem Health & Management*, **12:** 2, 129 -137

Gibson, J.J., S.J. Birks, S. Kumar, P.M. McEachern, R. Hazewinkel (2010). Inter-annual variations in water yield to lakes in northeastern Alberta: Implications for estimating critical loads of acidity. *J. Limnol.* **69 (Supp 1):** 56-66.

Kusumakar S., P. McEachern, M. Spafford, D. Zhu, T. Yu (2009). Spatial Variation of Sediment Oxygen Demand in Athabasca River: Influence of Water Column Pollutants, Proceedings of World Environmental and Water Resources Congress, 2009, organized by ASCE/EWRI at Kansas City Missouri, USA, May 17-21, 2009.

K. Sharma, T. Yu and P. McEachern, (2009). Biofilm activity of ammonium oxidation in cold region river sediment under impulse nitrogen load studied with microsensors, Proceedings of Processes in Biofilms: Fundamentals to Applications, specialized conference of International Water Association (IWA) at Davis, California, USA, September 13-16, 2009.

McEachern, P., E.E. Prepas and D. Chanasyk (In review). Impacts of clear cut forest harvesting on hydrology, element export and stream chemistry in catchments of northern Alberta. *J. Hydrol.*

McEachern, P., P. McCormack and E.E. Prepas (In review). Improving watershed management through indigenous knowledge. *Ecological Applications.*

Kusumakar S., T. Yu, P. McEachern, (2010). Nutrient Fluxes across Sediment Water Interface of a Freshwater System in Psychrophilic Condition. Paper submitted to IWA World Congress, Montreal, Quebec, Canada, September 19-24 , 2010.

Book Chapters

H. V. Andrews & P. McEachern, 1994. Crocodile Conservation in Nepal. IUCN Nepal Doc. W2: 32 pp

McEachern, P. Hydrologic processes, water quality and watershed management in the boreal forest of northern Alberta. In: *Sustainable Forest Management in Alberta.* University of Alberta Press. (Chapter accepted, book in prep.)

APPENDIX B

ASSOCIATE MEMBERS OF THE BRI

1. Dr. Lionel Catalan (Dept of Chemical Engineering); chemical process engineering, remediation

2. Dr. Aicheng Chen (Dept of Chemistry); international authority on nanomaterials and lignin modification through chemical techniques

3. Dr. Bahram Dadgostar (Faculty of Business Studies); expertise on business principles is considered important to future developments at the BRI

4. Dr. Gautam Das (Dept of Physics); fibre optics and photonics applications to on-line monitoring

5. Dr Pedram Fatehi (Dept of Chemical Engineering); expertise on chemical process engineering associated with pulp and paper production, and biorefining

6. Dr. Mathew Leitch (Faculty of Natural Resource Management); expert in wood science and technology, value-adding of wood

7. Dr. Baoqiang Liao (Dept of Biochemical Engineering); fermentation processes and membrane technology

8. Dr. Nancy Luckai (Faculty of Natural Resource Management); expert on Forest Conservation and Ecology, and Forest soils

9. Dr. Lada Malek (Dept of Biology); plant biotechnology. Presently collaborating with the BRI on a NSERC-CRD project involving lignin modification by fungal enzymes

10. Dr. Carney Matheson (Dept of Biology); expert on ancient materials, genomics

11. Dr. Livio Di Matteo (Dept of Economics); expertise valuable to future BRI

12. Dr. Preston McEachern (Government of Alberta, Alberta Environment); technical authority for Alberta Environment developing government policy on oil sands tailings waste management. Has acquired 4.5 million dollars to establish special research unit under the Canadian School of Energy and Environment for reclamation and mine waste management research

13. Dr. Reino Pulkki (Faculty of Natural Resource Management); expert on value-chain management, feedstocks and wood-flow logistics

14. Dr. Sudip Kumar Rakshit (appointed CRC Tier-1); expertise in chemical process engineering, and biorefining (cellulosic biofuels)

15. Dr. Brian Ross (NOSM); expert on plant natural products for pharmaceutical applications, and use of Selective Ion Flow Tube - Mass Spectroscopy for analysis of chemicals

16. Dr. Greg Ross (NOSM); plant natural products

17. Dr. John Ashley Scott (Laurentian University, Sudbury, Dept of Biochemical Engineering); expertise in process development of growing and harvesting microalgae for pharmaceuticals

18. Dr. Chander Shahi (Faculty of Natural Resource Management); Expertise on forest economics, and market sector analysis

19. Dr. Charles Xu (Faculty of Engineering, University of Western Ontario); international authority on pyrolysis, gasification and liquefaction of biomass

Appendix C

Letters of Support for the BRI