

Changing Your Life for the better
2013-2014 Annual Report



UNIVERSITY OF ALBERTA
DEPARTMENT OF AGRICULTURAL,
FOOD & NUTRITIONAL SCIENCE

Leader's Foreword

It is with tremendous pride that I give my final report as the Chair of the Department of Agricultural, Food and Nutritional Science (AFNS).

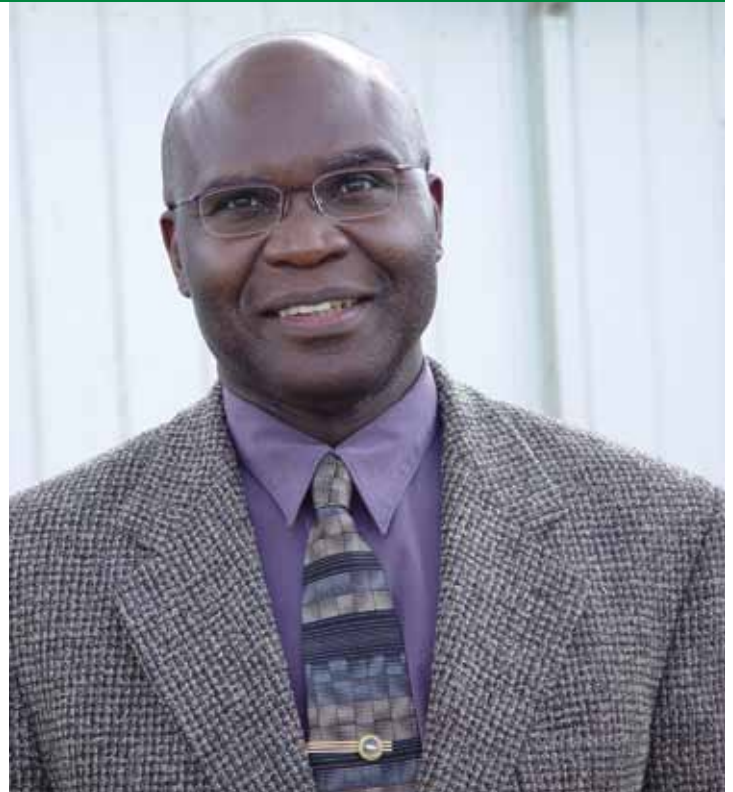
AFNS has been relentless in fulfilling our mission and we have continued to experience remarkable success in all areas of Plant Biosystems, Animal Science, Food Science and Bioresource Technology and Human Nutrition. Our success is built on our excellent faculty staff and the rejuvenation of our department with 41 new faculty staff hired, or seconded in the last nine years.

In 2013-14, AFNS' faculty members attracted more than \$29 M in external research funding, an average of more than \$500,000 per faculty member, an outstanding achievement. The impact of our research on Alberta and the world includes discovering more about the links between food and health, developing value-added products from agricultural residues, enhancing the health and quality of livestock and developing new disease-resistant and higher yielding cultivars better suited to our climate.

AFNS can now count 105 members from industry, NGOs, government agencies and other universities among its many partners. These strong government and industry partnerships including Alberta Livestock and Meat Agency, Alberta Crop Industry Development Fund, Alberta Innovates Bio Solutions, have funded initiatives such as Livestock Gentec, the Poultry Research Centre, Value Added Meats, Phytola, the Biorefining Conversions Network and the CLA network, among others.

AFNS's commitment to teaching and learning is seen in the strengths of our programs, partnerships and connections with our community, and in the impact and amazing accomplishments of our students. The foundation for the future is bright with our undergraduate student numbers increasing by 16 per cent for the BSc Agriculture/BSc Animal Health programs and 28 per cent for the Nutrition and Food Science programs. In addition, our partnership with Alberta Health Services has enabled the Integrated Dietetic Internship Program to double to 50 dietetic internships, becoming the largest program in Canada. The new BSc in Animal Health introduced in January, 2010 has grown to about 200 students in three years. It is no surprise, that in the latest global university rankings, conducted by National Taiwan University, our programs ranked among the best in the world (see page 22).

It has been a great honor for me to have had the opportunity to lead this strong and robust department, one of, if not the, most influential and unique departments of its kind in Canada and the world.



Erasmus Okine CHAIR

Department of Agricultural, Food & Nutritional Science (AFNS)
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Mission Statement

To serve the community through excellence in teaching and research in:

- **efficient and sustainable agricultural production**
- **value added processing**
- **food safety**
- **human health**

to improve the health and quality of life.

Changing Your Life for the better
Through World-class Research

Plant Biosystems

Animal Science

*Food Science and
Bioresource Technology*

Human Nutrition



Plant Biosystems Team

Edward Bork MATTHEIS CHAIR, RANGELAND ECOLOGY & MANAGEMENT

Cameron Carlyle RANGE SCIENCE

Lloyd Dosdall AGRICULTURAL ENTOMOLOGY

Linda Hall ENVIRONMENTAL BIOSAFETY & INTEGRATED WEED MANAGEMENT

Barry Irving MANAGER, RESEARCH STATIONS

Nat Kav BIOCHEMISTRY & BIOTECHNOLOGY

Jocelyn Ozga PLANT PHYSIOLOGY AND HORTICULTURE SCIENCE

Habibur Rahman CANOLA BREEDING & RESEARCH

Dean Spaner PLANT BREEDING AND ORGANIC AGRICULTURE

Stephen Strelkov PLANT PATHOLOGY

Randall Weselake AGRICULTURAL BIOTECHNOLOGY

Rong-Cai Yang STATISTICAL GENOMICS & QUANTITATIVE GENETICS (ARD¹ WORK AFFILIATE)

¹ Agriculture and Rural Development

Changing Your Life for the better

*Through World-class Research
Plant Biosystems*



Researchers develop three wheat varieties

Prairie farmers will have new wheat options in the coming years as three new varieties, successfully developed by the department's wheat breeding program, were approved by the federally regulated Prairie Grain Development Committee in 2013 and 2014.

Wheat breeder Dean Spaner and his research group developed BW947, Coleman and PT769, three high yielding Canada Western Red Spring (CWRS) wheat lines with good resistance to stripe rust, a serious, new disease affecting wheat crops in western Canada, especially Alberta. Coleman also has improved resistance to Fusarium Head Blight,

“ We only have 99 days (in our growing season in Alberta). Early maturity means you can harvest faster, you have less downgrading of the crop, less frost damage and less pre-harvest sprouting.”

a disease of consequence for animal and human health in the harvested grain. All lines mature early, a significant characteristic for wheat growing in Alberta, especially north of Red Deer where the growing season is shorter. PT769 is one of the very earliest lines in western Canada.

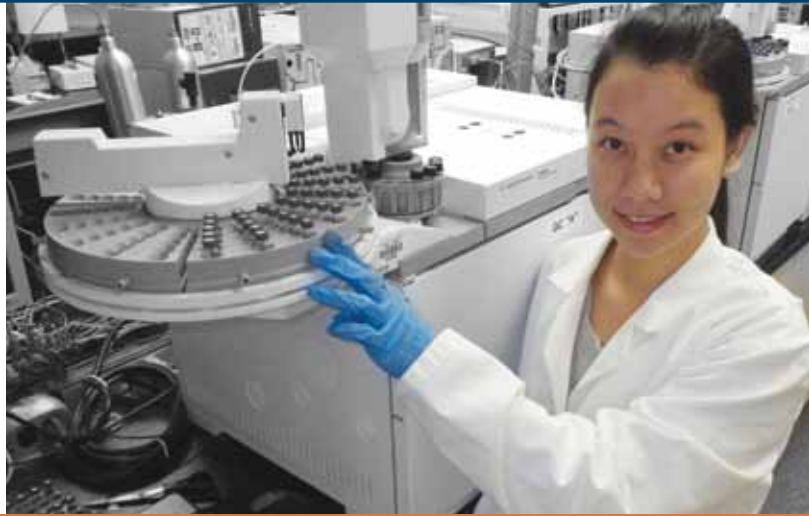
“We only have 99 days (in our growing season in Alberta). Early maturity means you can harvest faster, you have less downgrading of the crop, less frost damage and less pre-harvest sprouting,” explained Spaner.

CWRS wheat is one of, if not the highest quality wheat in the world because of its high protein content, the size of its kernel and the ability of its dough to rise. It is often used to supplement lower quality grains of wheat in industrial purposes. To be approved for registration, CWRS wheat must pass extremely stringent bread-making quality tests over a number of years.

The lines are in the process of being commercialized and will likely be made available to prairie farmers in two to three years.

An AFNS graduate student has discovered a new molecular tool for boosting the level of a valuable essential fatty acid in flax seed oil, creating possibilities for better nutritional and industrial uses.

PhD student Xue Pan wondered why flax seed oil could accumulate so much of its main fatty acid, alpha-linolenic acid (ALA), in comparison with other oilseed crops. To find out, she and her collaborators



Getting more of the good stuff in flax

identified the genes responsible for various enzymes driving the final step in the production of seed oil in flax. They discovered that flax contains phospholipid: diacylglycerol acyltransferase enzymes, which can incorporate ALA more efficiently than the other fatty acids in the oil.

The discovery increases our understanding of the biochemistry of flax oil formation and provides a new tool for further elevating ALA levels in flax oil.

ALA reacts quickly with oxygen to form a soft and durable film, which makes flax oil ideal for industrial uses like manufacturing linoleum, varnishes, paints and drying agents.



Grad investigates Lyme disease-carrying ticks with AARD



Pursuing his MSc in AFNS gave Daniel Fitzgerald an opportunity to do something that hadn't been done in Alberta in 40 years: complete a survey of ticks in the province.

Today, Fitzgerald works as a Laboratory Technologist in Parasitology for Alberta Agriculture and Rural Development where he has expanded on his knowledge of the province's pests.

During his MSc, Fitzgerald found that two species of ticks that hadn't ever been recorded

in the province and alarmingly, one of them one of them – *Ixodes scapularis* – is known to carry Lyme disease.

“The number of *Ixodes scapularis* identified was very surprising. This is strong circumstantial evidence that something is going on with this tick in Alberta. This suggests we have to get out in the field and try to capture more life-cycle stages of this tick for more information,” he said.

His survey covered three years' worth of ticks removed from 800 different hosts.

It means Albertan doctors must consider Lyme disease in diagnoses even if their patients haven't left the province.

“People may think they have to go somewhere to get a tick, but they don't. Ticks can be found nearly everywhere people live in Alberta,” Fitzgerald said. “You can get one in tall grass, any park, even in backyards. They are a part of everyday life here.”

Canola breeder Habibur Rahman's breeding program is focusing on developing stronger, better canola by broadening its genetic diversity in order to create canola hybrids that have better yield, improved agronomic traits such as early flowering, and better resistance to diseases like clubroot and blackleg.

"If you are working with germplasm possessing wider diversity, then there is a greater chance of creating something better than the existing one," he said. "So I'm introducing genes from cabbage, cauliflower, turnip, and these kinds of plant species to canola."

Rahman predicts that yield increases from this broadening of the genetic diversity in what is Canada's top revenue crop could be up to 10 to 20 per cent over five to 10 years,



Creating better canola

based on his experiences with other cases.

He and his team have also achieved flowering about a week earlier than the typical 45-50 days in experimentation.

"It's important in the Canadian condition to improve the earliness," Rahman explained. "If (canola) is late flowering, it's late maturing, and then if frost comes, the crop is damaged."

His research program will also continue to focus on the development of clubroot-resistant improved germplasm and breeding tools even though he has already successfully introduced clubroot-resistance genes into canola and supplied them to private companies that are working on producing clubroot-resistant cultivars.

"It's vital to keep developing and improving clubroot-resistant germplasm to create better and more durable resistance," he said.



Animal Science Team

Judd Aiken PRION DISEASE

Burim Ametaj RUMINANT NUTRITIONAL IMMUNOLOGY

Divakar Ambrose DAIRY REPRODUCTION & MANAGEMENT (ARD¹ WORK AFFILIATE)

Lorne Babiuk IMMUNOLOGY, PATHOGENESIS, VIROLOGY, MOLECULAR VIROLOGY & VACCINOLOGY

Daniel Barreda IMMUNOLOGY (JOINT APPOINTMENT WITH BIOLOGICAL SCIENCES)

Urmila Basu MANAGER, GENOMICS & PROTEOMICS UNIT

Clover Bench APPLIED ETHOLOGY / ANIMAL BEHAVIOR

Heather Bruce CARCASS & MEAT SCIENCE

John Kennelly DAIRY CATTLE NUTRITION & METABOLISM

Walter Dixon MOLECULAR BIOLOGY

Michael Dyck REPRODUCTIVE PHYSIOLOGY / BIOTECHNOLOGY

Carolyn Fitzsimmons BEEF GENOMICS (AAFC² WORK AFFILIATE)

Laki Goonewardene BEEF SCIENCE (ARD¹ WORK AFFILIATE)

Leluo Guan FUNCTIONAL GENOMICS & MICROBIOLOGY

Douglas Korver POULTRY NUTRITION

Changxi Li BOVINE GENOMICS (AAFC² WORK AFFILIATE)

Masahito Oba DAIRY NUTRITION & PHYSIOLOGY

Erasmus Okine RUMINANT NUTRITION & METABOLISM

Graham Plastow LIVESTOCK GENOMICS

Frank Robinson POULTRY MANAGEMENT & PHYSIOLOGY

Paul Stothard BIOINFORMATICS

Richard Uwiera VETERINARY PATHOLOGY (JOINT APPOINTMENT WITH MEDICINE)

Zhiquan Wang BEEF QUANTITATIVE & STATISTICAL GENETICS

Craig Wilkinson DIRECTOR OF ANIMAL CARE

Ben Willing CRC CHAIR, MICROBIOLOGY OF NUTRIGENOMICS

Ruurd Zijlstra INGREDIENT EVALUATION & CARBOHYDRATE NUTRITION

Martin Zuidhof POULTRY SCIENCE & BIO-ECONOMIC MODELING

¹ Agriculture and Rural Development

² Agriculture and Agri-Food Canada



A new feeding system for chickens may hold the key to increasing the reproductive capacity of hens.

Martin Zuidhof developed a prototype precision feeding system that could increase broiler breeder chick production by up to 10 per cent.

“Every year, the broiler grows faster and heavier, but for breeders, the competition for feed increases,” said Zuidhof. “What we’re seeing in the industry now is a huge challenge to distribute feed equally to the birds within a flock.”

Zuidhof’s precision feeding system, which he developed with a team of engineers, is designed to give each bird the right amount of food at the right time.

However, flock uniformity is not his main goal.

“We’re after chick production,” he explained. “Our hypothesis is that a very stable metabolism

New poultry feed system will lead to more chicks



“ We’re talking at least a 10 per cent increase in chick production, which is huge. This is a game-changing technology, if we can get it to work commercially.”

will yield great dividends in terms of egg production and chick production from breeders.”

Evidence of this can already be seen in other countries. Zuidhof saw it when he visited Colombia, where producers were averaging 145 chicks per hen, 30 chicks more than in Alberta.

“Conservatively, we should easily see a 10 per cent increase in chick production, which is huge. This is a game-changing technology, if we can get it to work commercially.”

Commercialization is at least a couple of years away. Zuidhof will be starting a 60-week trial this summer comparing his system to conventionally fed birds at the Poultry Research Centre on South Campus. Once he gets results of the trial, he’ll begin on-farm research trials and commercial trials.

It's safe, inexpensive, easy to do and will help dairy cows digest their dinner better.

Burim Ametaj and his research group found that soaking barley grain in lactic acid and then heating the mixture at low temperature before it's fed to dairy cows will help prevent a common digestive disorder.

Subacute rumen acidosis, or SARA, is caused when the rumen (one of four compartments in a cow's stomach) has an



New technology helps prevent common digestive disorder

acid imbalance because of the fermentation of the starch in cows' stomach. SARA can result in severe digestion problems and even metabolic disorders.

Ametaj says barley grain is an important source of energy which dairy cows need to produce milk. It's also relatively cheap and plentiful, particularly in western Canada. However, barley's starch content can also cause SARA.

"An important benefit of this new processing technology is that part of the barley's starch bypasses the rumen and its digestion occurs in the intestines. We found a 24 per cent increase in the amount of resistant starch that bypasses the rumen," explained Ametaj.

He added that other benefits include that the feed increases the cows' milk fat content and lowers their somatic cell count.

He said the former result is particularly important because milk fat produced by grain-fed dairy cows decreases. It's known as milk fat depression syndrome and causes losses to dairy producers.



From Ghana to AFNS to the Bill and Melinda Gates Foundation



At first, Donald Nkrumah wasn't sure he could get past the weather in Edmonton. But somehow he did and it was here, in our cold climate, that the native of Ghana

found a place to build a future and launch himself into the world.

Nkrumah grew up in a small and poor farming community in the African country and came to AFNS to do a PhD under the supervision of Erasmus Okine, Mick Price, John Basarab and Steve Moore.

"These people guided me to learn about cattle genetics, the Alberta way. You have to

stay with the animals and you need to do it through the crazy winter weather and the dangerous roads."

Nkrumah's training at the Alberta Bovine Genomics Program (now Livestock Gentec) prepared him first for positions at Merial and then Pfizer Animal Health, developing genomics technology and improving animal genetics.

Then the Bill and Melinda Gates Foundation called with an offer to join their Global Agricultural Development Team as a Senior Program Officer in Livestock Genetics. The team's research is aimed at reducing poverty for smallholder farmers in Sub-Saharan Africa and South Asia. It also gives Nkrumah the chance to use his professional expertise to help families like his own.

"For me, AFNS and Alberta represented an opportunity to transform. I was lucky because I met people who were willing to give you a chance and shape you into something better than what you think you could be."



A new piece of equipment, the only one of its kind in Canada, will help place the Canadian pet food industry at the forefront of product innovation.

The Wenger X-115, a single-screw pilot extruder, will be making its home at Agri-Food Discovery Place on South Campus later this year. It will enable animal scientist Ruurd Zijlstra and his food science colleagues, working closely with pet food companies, to test and develop new and innovative products.

“It’s a very nice piece of equipment to have because pet food producers can directly develop new products on a small-scale but relevant production system that is scalable to a commercial level. We can also use it as a research tool,” said Zijlstra.

An added benefit to having the extruder at

*At the forefront of innovation in the
pet food industry*

“It’s a very nice piece of equipment to have because pet food producers can directly develop new products on a small-scale but relevant production system that is scalable to a commercial level. We can also use it as a research tool.”

Agri-Food Discovery Place is that food science researchers can create functional ingredients in the same facility that can be tested in extruded pet food.

“We only need to go one or two doors down and then we can incorporate these into new pet foods,” explained Zijlstra.

He said that because the facility can operate at food-grade quality, the extruder can produce food products. It can produce novel animal feed, such as for piglets or other animals with high nutritional demands. Such feed can be tested in a ring of animal facilities that surround Agri-Food Discovery Place.

The extruder is scheduled to be delivered this fall and be operational by the end of the year.



Food Science and Bioresource Technology Team

Marleny Aranda-Saldana FOOD/BIO
ENGINEERING PROCESSING

Mirko Betti MUSCLE FOOD CHEMISTRY &
PROCESSING

David Bressler FERMENTATION & BIO/FOOD
ENGINEERING

Heather Bruce CARCASS & MEAT SCIENCE

Lingyun Chen PLANT PROTEIN CHEMISTRY &
TECHNOLOGY

Jonathan Curtis LIPIDS / ANALYTICAL
CHEMISTRY

Michael Gänzle CRC CHAIR, MICROBIOLOGY
AND PROBIOTICS

Lynn McMullen FOOD MICROBIOLOGY

Lech Ozimek DAIRY PROCESSING
TECHNOLOGY & FOOD PRODUCT DEVELOPMENT

Feral Temelli FOOD PROCESS ENGINEERING

Aman Ullah UTILIZATION OF LIPIDS

Thava Vasanthan GRAIN SCIENCE &
TECHNOLOGY

Wendy Wismer SENSORY & CONSUMER
SCIENCE

Jianping Wu FOOD PROTEIN CHEMISTRY

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Food Science and Bioresource Technology



Agricultural, medical and computer science researchers

from the University of Alberta have teamed up to develop a test that will make Canadians feel safer about the meat they put on their tables.

The testing device, which is the size of a large shoebox, can detect pathogenic *E. coli* while meat is still at food processing facilities. The test is more sensitive at picking up *E. coli* strains, faster at pinpointing results and less expensive than other tests that are currently used.

AFNS' Lynn McMullen, along with Linda Pilarski, co-led the U of A team that fine-tuned the *E. coli* test,

New, simple E coli test developed for food processing facilities



which allows users to simply place a sample of meat in a machine and push a button. Results are available in less than an hour. The device makes millions of copies of the genes in the meat sample to determine whether *E. coli* is present.

“It’s like a molecular Xerox machine,” explained Pilarski.

McMullen is excited that industry will have a tool to make rapid decisions on the safety of their products with a quick test that can be done in the processing facility without highly trained microbiology technical expertise.

She’s equally eager to see what the U of A team can do in the future with the technology.

“The application of the technology to *E. coli* is only a starting point. There is potential to expand the technology to other food-borne pathogens,” she said.

An adhesive created by using the protein

of spent hens or canola could be the glue of the future.

With a patent pending, Jianping Wu is in the process of commercializing an adhesive he created using the protein of canola meal leftover after oil extraction, usually used as a feed additive or fertilizer, and spent hens that would otherwise be disposed of in landfills.

Most adhesives currently being used on products



Glue of the future?

are petroleum based, but the adhesive industry has been moving away from using the oil over the last 10-20 years due to the fluctuating cost and potential health concerns.

“Petroleum-based adhesives emit carcinogenic components, which are harmful to our health,” Wu explained. “They’re not sustainable or environmentally friendly.”

Wu’s adhesive is designed for interior application on items like doors and furniture, and he and his team have been working to make it more water resistant so it can stand up to exterior conditions. He added that while the spent hen and canola adhesive isn’t on the same level as synthetic adhesives yet, it is more robust than a soy bean adhesive that is available in the United States.

While processing of spent hens into food uses is no longer economically viable and canola protein is not a traditional food protein source, their usage for non-food applications like adhesives could provide an economic benefit for their respective industries. This potential windfall could be especially important for the canola industry, the major oilseed crop in Canada.



Converting algal biomass into fuels at U.S. Renewable Energy Lab



AFNS’ variety of research areas and interests proved to be a perfect fit for Brenna Black.

Black worked on research ranging from edible oils and linoleic acids in yogurt to fermentation in sourdough bread. After earning her PhD, she got a job developing technologies to convert algal biomass into fuels at the U.S. National Renewable Energy Laboratory in Golden, Colorado. Her work is an important part of making renewable fuels and chemicals.

“I wanted to use my skills to do what was important to me - something that benefits society and the environment. NREL was exactly

what I was looking for,” said Black.

She said it was a combination of a fourth-year AFNS capstone course and an internship in Prague that showed her the possibilities of a career in research.

“There is definitely something special about making a discovery; when you have that moment where you get to say: ‘wow, we are the first people who know this’, which can be incredibly satisfying, especially since you have likely discovered every other way that your experiment will not work.”

Black said being an AFNS graduate not only gave her the work-related skills she needs but also lifelong personal connections. “The multi-cultural aspect was also something I highly valued; I have a best friend from Brazil, another from China and I met my American husband in AFNS. After travelling to other institutions, I do believe that’s something unique to Canada and the U of A for graduate programs. The support was amazing, the opportunities were plentiful and the group of people are really some of the most wonderful I have ever worked or studied with.”

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Food Science and Bioresource Technology



Developing the next generation of renewable fuels

The next-generation of renewable fuels is here.

Almost 10 years in the making, Forge Hydrocarbons is commercializing a patented conversion process developed by David Bressler that takes agricultural feed stocks like animal fat, such as beef tallow, crop seed oil and even restaurant grease, and converts them into ‘drop in’ fuels.

Unlike traditional renewable fuels like bio-diesel, ethanol and bio-jet fuel, drop in fuels are chemically similar to and interchangeable with petroleum-based fuels, which means they can be used in their pure form as, for example, gasoline or natural gas or jet fuel. The patented process also converts the same agricultural feed stocks into solvents and diluents.

“This is the first technology that creates drop-in fuels from agricultural and forestry feed stocks and I know it will dominate the renewable fuel industry,” said Tim Haig, president and CEO of Forge Hydrocarbons, an experienced entrepreneur who founded and ran BIOX, Canada’s biggest and most successful renewable fuel plant, for 12 years before this opportunity presented itself.

Bressler said an added benefit of the production of these drop-in fuels is that it emits 90 per cent less greenhouse gas emissions than the production of traditional petroleum-based hydrocarbons.

A pre-commercial plant, funded by Forge, Western Economic Development and ALMA, that has a capacity of producing 200,000 litres a year using the company’s patented conversion process was recently completed. Located in Edmonton’s Advanced Energy Research Facility, the plant is operational. Bressler and his team are currently optimizing its processes. The following phase of the company’s evolution will be a full-scale commercial plant.



Human Nutrition Team

Heidi Bates DIRECTOR, INTEGRATED DIETETIC INTERNSHIP

Rhonda Bell HUMAN NUTRITION

Jean Buteau HUMAN NUTRITION

Cathy Chan HUMAN NUTRITION (JOINT APPOINTMENT WITH PHYSIOLOGY)

Anna Farmer COMMUNITY NUTRITION (JOINT APPOINTMENT WITH SCHOOL OF PUBLIC HEALTH)

Catherine Field NUTRITION & METABOLISM

Rene Jacobs HUMAN NUTRITION

Diana Mager CLINICAL NUTRITION (CROSS APPOINTMENT WITH PEDIATRICS)

Vera Mazurak NUTRITION & METABOLISM

Linda McCargar CLINICAL NUTRITION

Spencer Proctor METABOLIC & CARDIOVASCULAR DISEASES

Donna Vine HUMAN NUTRITION

Noreen Willows COMMUNITY NUTRITION

Jens Walter CAIP CHAIR, NUTRITION, MICROBES & GASTROINTESTINAL HEALTH



Nutrition researchers publish comprehensive eating plan for the prairies

Nutrition researchers Rhonda Bell and Cathy Chan are making it easy for people living on the Prairies to eat a healthy diet using easily available foods that are affordable.

They've published *Pure Prairie Eating Plan: Fresh food, practical menus and a healthy lifestyle*, a book that contains a detailed 28-day menu, complete with numerous recipes for three meals and three snacks every day.

"It promotes a pattern of healthy eating above all else, and emphasizes fruits, vegetables, whole grains and other foods," said Chan.

The book also includes weekly ingredient lists for easier shopping along with tips for healthy eating, adjusting calories, carbohydrate counting and other useful information about the foods in the plan.

"We wrote this book for people who want to eat

healthy foods but don't necessarily know how to go about it. Everything we need to eat healthier is available at our local grocery stores," said Bell.

Chan noted that the *Pure Prairie Eating Plan* follows the *Eating Well with Canada's Food Guide* and uses local ingredients and culturally appropriate food choices.

"For example, the Mediterranean Diet uses olive oil extensively. Olive oil is quite expensive on the prairies but it turns out we have canola oil. It's plentiful, fairly inexpensive and just as healthy," explained Chan.

The plan was first developed by Bell and Chan as a tool to help people living with type 2 diabetes follow dietary recommendations. Research results indicated that type 2 diabetics who followed the plan improved their blood sugar levels but it quickly became clear that the healthy eating plan could benefit everyone.

Some pregnant woman may be consuming too many calories during their pregnancy, making it difficult to shed unwanted pounds after childbirth and increasing their risk of chronic disease later in life.

Nutrition researchers Rhonda Bell, Linda McCargar and Paula Robson are leading a set of studies to promote appropriate maternal and postpartum weight through healthy dietary intake, thanks to \$2.5 million in funding for the next five years from Alberta Innovates - Health Solutions (AIHS).



Achieving healthy weights during and after pregnancy

Fifty six percent of women gain more weight than is good for them during their pregnancies. Eighty percent of those who are already overweight going into their pregnancy will exceed the healthy weight gain recommendations outlined by Health Canada.

“Up until 2009, there was a general message that pregnant women should make sure that they gained enough weight. However, now it looks as though women gain too much weight - for their health during pregnancy, their long term health, and even for the health of their infant,” says Bell.

There is also a misconception that excess weight gained during the pregnancy period will come off once the mother commences breast feeding. However, many women find the weight doesn't disappear as they had expected.

Bell, McCargar, Robson and their collaborators will be working with pregnant and postpartum women as well as their care providers, to determine strategies that will help women achieve healthy weights during and after pregnancy. Their hope is that women will understand what healthy weight is during and after pregnancy and how to choose a healthy diet to support this.



Impacting public health nutrition through research



Dana Olstad wondered why recreation centres have everything for people to lead a healthy life – except its food.

Her curiosity led her to examine the food sold in recreation centres around Alberta. She found only a dismal six per cent of them offered healthy food options that followed the voluntary Alberta Nutrition Guidelines for Children and Youth.

Those findings inspired her to come up with a way to take that research and develop

it into effective policies. She's currently developing a Children's Food Environment and Policies Report Card. It will use data – such as hers on food in recreation centres – to grade provinces and territories on their progress in providing children access to healthy food choices.

Olstad has been with AFNS for 18 years, starting out as an undergrad and then a Master's student in clinical nutrition. She worked for AFNS' Human Nutrition Research Unit before pursuing a PhD. She's currently a research associate in the U of A's School of Public Health.

She says it was her time with the Human Nutrition Research Unit that sparked her interest in public health nutrition and changed her career trajectory.

“During my seven years in that position, Drs (Linda) McCargar and (Tom) Clandinin mentored me closely and encouraged me to pursue a PhD,” said Olstad.

“Without their mentorship and encouragement, I would not be where I am today. The strength of AFNS is its people.”



Children living with celiac disease in Alberta

may be at a higher risk for low bone-mineral density because of a lack of sun exposure and essential vitamins.

Diana Mager found that 30 to 35 per cent of children diagnosed with celiac disease had poor bone health due to a lack of vitamin D, vitamin K and calcium in their diets.

The shortage of vitamin D in particular comes from a lack of UV exposure from the sun – a lack worsened by the fact Canadians typically don't get enough vitamin D in their diets through fortified dairy products like margarine, milk and some fatty fishes.

Celiac disease linked to low bone density in kids

“The UV rays from the sun stimulate specific cells on our skin that synthesize the vitamin D in our body,” said Mager. “However, it's very difficult to get enough vitamin from the sun in Alberta due to the long winter.”

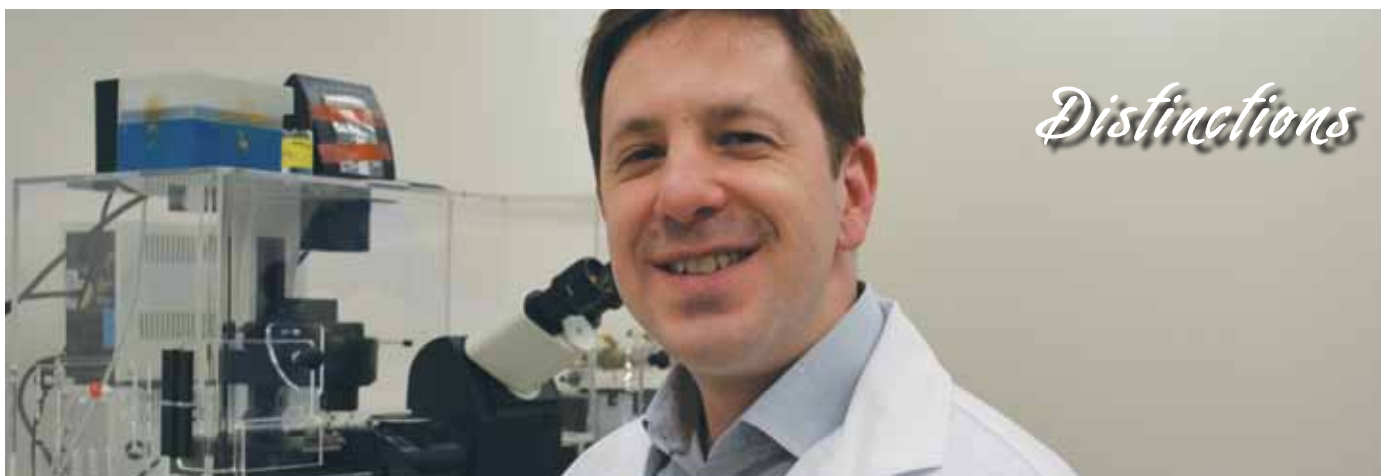
Mager added that children with celiac disease may appear to be growing well but they can still have very bad bone health.

“Understanding about bone health if you're at risk or have this disease is particularly important in childhood, because about 50 per cent of our skeleton and bones are formed during this critical period of time,” she said.

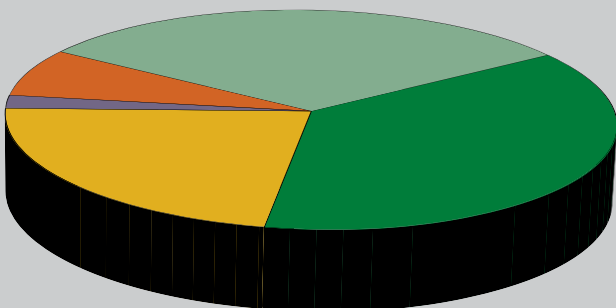
The treatment for celiac disease is to eat a gluten-free diet. It allows sufferers to absorb nutrients in the same way as children who don't have the disease. By sticking to the lifelong gluten-free diet and making sure a sufficient amount of foods higher in vitamin D are consumed, individuals with celiac disease can improve their bone mineral density.

“ Understanding about bone health if you're at risk or have this disease is particularly important in childhood, because about 50 per cent of our skeleton and bones are formed during this critical period of time.”

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Research Funding: \$29,216,112



Graduate Student Enrollment

128 Doctoral
106 Masters
4 Visiting
238 Total



Facts

41 New graduate students started in 2013/2014
50 Graduate Students convocated in 2013/2014

Over the past two years, researchers from the University of Alberta and beyond have transformed the Mattheis Ranch into a working rangeland for industry-scalable research.

U of A alumni Ruth and Edwin Mattheis donated their 12,300-acre Southern Alberta ranch to the university in 2010. The University of Alberta's Rangeland Research Institute (RRI) was formed in 2011 and research began on the property in 2012. The land operates as a working ranch, with large portions of it being grazed by herds of cattle for more than six months each year.



Rangelands Research Institute gains momentum

The institute connects research on the ranch with practical rangeland ecology and management applications, from working to enhance cow-calf producers' economic viability to improving land reclamation. The institute's program coordinator, Adrienne Tastad, said that since the area is treated as an operating ranch, research performed there is scalable to real-life agricultural practice. This kind of research, in turn, can help producers create better outcomes for their land, for themselves and for consumers, she said.

"One of the main thrusts that we're now exploring with research is examining how these working ranch landscapes provide a rich variety of ecological goods and services that benefit all of society," she said.

The institute directly supports University of Alberta research projects through its competitive grants program, and funded five unique studies in 2012 based out of two different faculties. In 2013, the RRI funded seven more projects, five of which were led by ALES researchers. These projects are assessing the effects of land management practices on the ecology of rangelands, such as greenhouse gas production and carbon storage, plant community dynamics, regulation of water quality and quantity, and support for plant and songbird diversity.

In the coming year, research at the Mattheis Ranch will expand to explore topics such as nutrient cycling under different grazing practices and the role of rangelands in providing habitats for pollinators and supporting pollinator diversity. Another project is going to examine whether cattle that are efficient in feedlots, meaning they don't eat more than they require to gain a certain amount



of weight, are also efficient on the open range.

Several other non-RRI-funded projects have been conducted on the ranch since 2012, and were carried out by Denmark's Aarhus University, University of Lethbridge, University of Waterloo, Agriculture and Agri-Food Canada, Agricultural Financial Services Corporation and Ducks Unlimited.

Tastad said bringing in researchers from different organizations allows more data sets to be collected across the ranch, which can be used in future projects to address even more novel questions. She noted that collecting a rich set of data from across the ranch will help investigators better identify beneficial management practices to ensure the economic and environmental sustainability of rangelands over the long term.

"The most exciting thing is that by bringing together all these researchers, we're creating an opportunity for researchers to build on each other's work to answer new and increasingly complex questions about ranching systems."



Department programs among world's elite

The Department of AFNS' agricultural programs rank among the world's best, according to the latest rankings from National Taiwan University.

Overall, the University of Alberta was ranked 40th in the world in agriculture, one of six fields in which the world's top 500 universities were evaluated and ranked.

The field of agriculture was sub-divided into three subjects, environment/ecology, agricultural sciences, and plant and animal science. The U of A placed 35th overall in environment/ecology, 39th in agricultural sciences and 65th in plant and animal sciences.

"Our department conducts research that provides solutions to some of the major challenges our world is facing today, including food and nutritional security and environmental sustainability," said Erasmus Okine, chair of the Department of Agricultural, Food and Nutritional Science. "We have outstanding faculty members. I'm convinced the standard of excellence they consistently demonstrate will carry on for a long time as we have had the good fortune

to be in a position to attract excellent young professors across many disciplines over the last 10 years."

Eight subject-categories comprised the agricultural sciences category, namely agricultural economics and policy, agricultural engineering, dairy and animal science, multidisciplinary (agriculture), agronomy, food science and technology, nutrition and dietetics, and horticulture.

Entomology, fisheries, forestry, marine & freshwater biology, mycology, ornithology, plant sciences, veterinary sciences and zoology were considered to get an overall plant and animal sciences score.

Overall, the University of Alberta ranked 77th in the world.

The National Taiwan University Ranking is a performance ranking of scientific papers for the world's top 500 universities. According to its website, the ranking is entirely based on statistics of scientific papers which reflect three major performance criteria, research productivity, research impact, and research excellence.



Three AFNS researchers honoured for patents

Better canola, better flax and better cattle could be the end result of discoveries made by AFNS researchers.

Nat Kav, Randall Weselake and Stephen Moore were each awarded a patent in 2012 and were honoured for their accomplishment at a TEC Edmonton event.

Nat Kav's patent is for a novel approach to fighting sclerotinia stem rot, a common fungal pathogen that attacks the stem, eventually breaking it and causing the plant to die. He found that introducing an anti-bogy gene in to a plant, a technique typically used to combat viral diseases, dramatically increased its tolerance to the disease. TEC Edmonton is currently exploring licensing opportunities for this patent.

Increasing the oil content in various crop seeds is Randall Weselake's mission as a scientist. He and his team were granted a patent for a process to clone a gene responsible for influencing seed oil content in flax and using it to boost seed oil content in camelina, which is an oil seed crop that grows well on marginal land but could benefit from increased oil content.

Camelina is commonly known as false flax. "Essentially, we cloned a gene in flax to put it in false flax," said Weselake, with a laugh. He said increased seed oil content in camelina will mean more available feedstock for the production of biofuels.

Steve Moore, the former CEO and scientific director of Livestock Gentec who has since left the Department of AFNS, was granted a patent for a genetic test that predicts the efficiency of nutrient utilization in cattle.

Feed is the major cost of beef cattle production. Surprisingly, the amount of feed consumed by cattle of the same weight and age can vary considerably. Up until now, the only way to measure feed intake is expensive, technically challenging and time-consuming. Moore's test can be applied at a very early age and be used to select efficient cows and bulls for breeding programs.

These three patents add to the nine U.S. patents granted to AFNS researchers between 2007 and 2011. During that time, 64 reports of inventions were filed and 10 license agreements were negotiated, which generated \$1.47 million in royalties and revenues.



In the wake of budget cuts, the department's Poultry Research Centre had to find a way to generate some of the \$75,000 it takes to support their 1,500 free-run heritage chickens.

The centre initiated the adopt-a-chicken pilot program in March 2013. For \$75, donors got to name a chicken and receive a dozen fresh eggs every two weeks from the university's Poultry Research Centre. The program was so successful, a second, larger one was initiated last November, doubling the number of adopters to 400.

Agnes Kulinski, Business Director at the Poultry Research Centre, said the program owes its success to its ability to educate donors about the behaviour and environment of the heritage chickens through events and correspondence.

"We had this opportunity to showcase heritage

Poultry Research Centre hatches plan to preserve heritage chickens

“We had this opportunity to showcase heritage chickens,” she said. “What we realized is that the program is a good way to educate people and I think that’s what makes the program sustainable ... [the donor] really feels like it’s their chicken.”

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The five heritage chicken breeds at the Poultry Research Centre – New Hampshire Light Sussex, Barred Plymouth Rock, White Leghorn, and Dark Brown Leghorn – were introduced to North America as long as 150 years ago, and contain more genetic material and a higher immune system than commercial birds. The collection of chickens at the centre acts as a genetic bank; in case of disease in commercial breeds, the conserved genes at the centre could be bred to regenerate the commercial populations.

Recently, the centre began distributing its products, like supplying local businesses with eggs and giving program participants chicken pot pies made from the

heritage chickens. They are currently partnering with retailers to start selling chicks from the Poultry Research Centre in their stores.

To learn more about the program, visit www.heritagechickens.ca



ALES Range Team rides home with best showing ever

The Faculty of ALES Range Team, composed of students from AFNS and the Department of Renewable Resources, walked away from the student competition of the annual meetings of the Society for Range Management with an unprecedented 10 awards. It was the team's best showing ever.

The team took the top prize for the Undergraduate Range Management Exam (URME) and placed third in both the plant identification exam and the Rangeland Cup poster session in this year's competition held in Orlando, Florida.

The URME is a two-hour multiple-choice exam that covers material common in an undergraduate degree in resource management. The plant

ID exam consists of 100 stations set up in a large circle, with a student at each one. The students have one minute to identify the plant at each station before moving on to the next. The plants were drawn from a list of the 200 most common rangeland plants in North America.

ALES students also won seven individual awards.

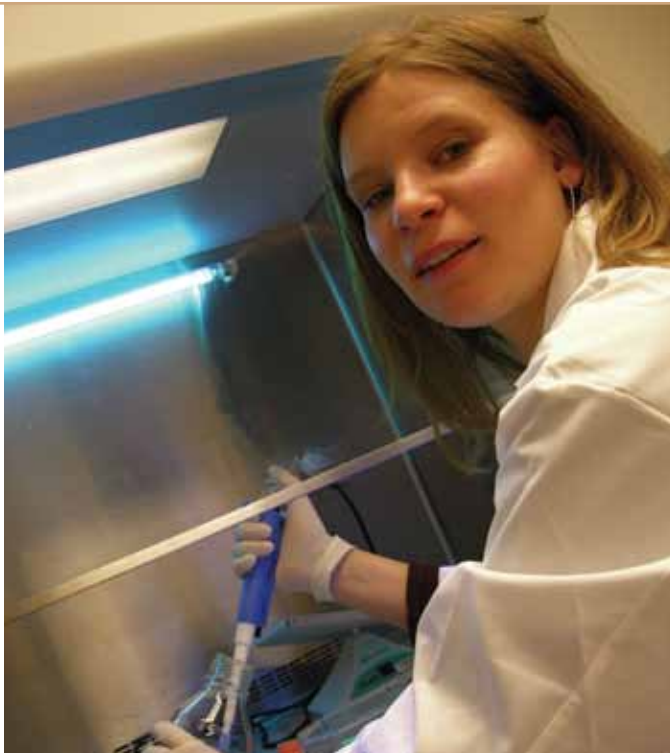
Jeff Hogberg scored the second-highest marks in the URME, while Leah Rodvang placed fourth out of the 150 students taking the exam. Fellow team member Leah Predy earned fourth place in the plant ID exam. ALES students swept the spots from second to fifth in the overall combined marks for the two exams. Hogberg placed second, followed by

Predy in third, Rodvang in fourth, and Megan Rennie in fifth. Other team members were Ian Brusselers, Zoey Zapisocki, Christine Lien, Felicitas Sander and Kassia James.

It was Hogberg's second year on the team. He was so focused on preparing for the competition this year that it started to carry over into his leisure time.

"You catch yourself – like you're walking somewhere and you see something growing and you think, 'That looks like a...' and you walk over to investigate and then you think, 'No, stop that, not in public,'" said Hogberg, chuckling.

Twenty-two different schools took part in this year's competition from Canada, the U.S. and Mexico.



VERA MAZURAK



FERAL TEMELLI

Vera Mazurak was awarded the CIHR Knowledge Translation and Training Award, which honours and supports the exemplary knowledge translation efforts and activities of an exceptional individual, team or organization that has made an outstanding contribution to increasing the application of research findings, improving the health of Canadians, health services and products, or strengthening the health care system

Feral Temelli was awarded a Killam Annual Professorship in recognition of her distinguished scholarship.

Temelli specializes in separation and conversion technologies, specifi-

cally taking a grain and splitting it into its components to be used in different forms. Working mostly with oats and barley, together with a colleague, Temelli developed the technology to better process these grains to concentrate beta-glucan, which lowers cholesterol and reduces the risk of heart disease.

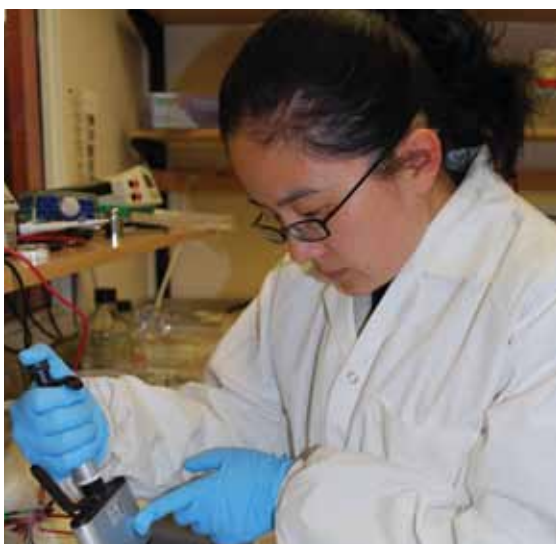
“We’ve been basically selling our crops without adding further value onto them,” said Temelli. “If we do some processing and sell some of the ingredients and final products, we can generate a much higher value for what we grow.”

Stephen Strelkov was honoured with

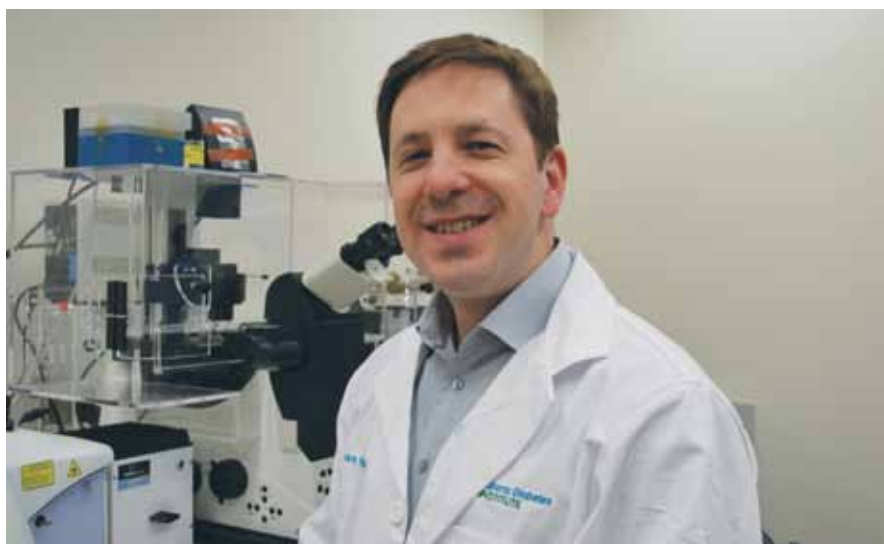
the Outstanding Young Scientist Award from the Canadian Phytopathological Society at their annual meeting in Niagara Falls this year for his work in combatting clubroot disease in canola plants.

The award recognizes superior research accomplishment in plant pathology, meritorious contribution to plant pathology scholarship or literature, unusually valuable practical application of scientific expertise and significant leadership in plant pathology.

Lorne Babiuk was named a recipient of one of the world’s most prestigious international awards for research in



LELUO GUAN



JEAN BUTEAU

Changing Your Life for the better Distinctions



STEPHEN STRELKOV



LORNE BABIUK

medical science – the Canada Gairdner Wightman Award – for his work in vaccine development. Babiuk is a leading researcher in infectious diseases, particularly zoonotic diseases – those that pass from animals to humans – and is acclaimed for his work in vaccine development.

He received the award for his extraordinary national and international leadership in vaccine development and research in human and veterinary infectious disease control.

Leluo Guan won the Canadian Society of Animal Science’s award for

Technical Innovation in Enhancing Production of Safe Affordable Food.

The award recognizes excellence in technical innovation and teaching with particular emphasis in the fields of biotechnology, genetics, physiology and animal behavior. Her research will contribute significantly to the future applications to improve animal production and health for more sustainable livestock production in a manner that ensures that Canadian agriculture continues to produce safe and affordable food.

Jean Buteau was awarded a CIHR New Investigator Award, designed

to provide outstanding New Investigators the opportunity to develop and demonstrate their independence in initiating and conducting health research through provision of a contribution to their salary.

Habibur Rahman was given an Honorary Life membership of the Alberta Seed Growers Association.

Martin Zuidhof won the University of Alberta’s Provost’s Award for Early Achievement in Excellence in Undergraduate Teaching, in recognition of his excellence in teaching.



HABIBUR RAHMAN



MARTIN ZUIDHOF



TOP: Craig Wilkinson, the Faculty of ALES' director of animal care, and Divakar Ambrose, who specializes in reproductive physiology and management of dairy cattle, discuss a procedure in the new Westgen Surgical Suite.

A new cattle surgical unit was built thanks, in large part, to a \$150,000 donation from Westgen, a western Canadian company focussed on artificial insemination for cattle.

The new facility is located in the **Dairy Research and Technology Centre**, which houses 140 dairy cattle. It's the latest addition to the impressive research infrastructure available to researchers in the Department of Agricultural, Food and Nutritional Science. Other infrastructure includes:



Agri-Food Discovery Place, a world class innovative research, training and technology transfer facility specializing in food safety, value-added processing and value-added bio-refining of food and industrial products.

The **Poultry Research Centre**, which supports research in reproductive efficiency, controlled environment, nutrition, production efficiency and economics, value-added product development, packaging and food safety. It houses a technology centre, a hatchery, environmental chambers and more.

The **Swine Research and Technology Centre** supports research in swine production efficiency and sustainability, feeds and feedstuff utilization, as well as reproduction and breeding herd management. It houses swine facilities, laboratories, and a surgery and interpretive unit.

The **Crops and Land Resource Unit** supports research in agronomy and breeding to improve the sustainable production and quality of forage, cereal, oilseed and horticulture crops.

The **Human Nutrition Research Unit** is a state-of-the-art research and training facility that supports nutrition research in, but not limited to, adult and child-related health concerns including diabetes, cancer, cardiovascular disease and obesity.

The 12,000-acre **Rangelands Research Institute – Mattheis Ranch** supports research in grazing system produc-

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Infrastructure



tion, reclamation, drought management and water conservation, and business diversification, all with a goal of enhancing the long-term economic and environmental sustainability of rangeland.

The 12,000-acre **Kinsella Research Station** is a beef cattle breeding facility that supports research in animal breeding and genetics.

The 800-acre **St. Albert Research Station**, located just north of St. Albert, supports agronomic and environmental research.

Other research infrastructure includes the plant growth facilities, the plant pathology lab and the many laboratories in the Agriculture/Forestry Centre and other university buildings that support research in food microbiology, product development, consumer and sensory evaluations, and genomics and proteomics.

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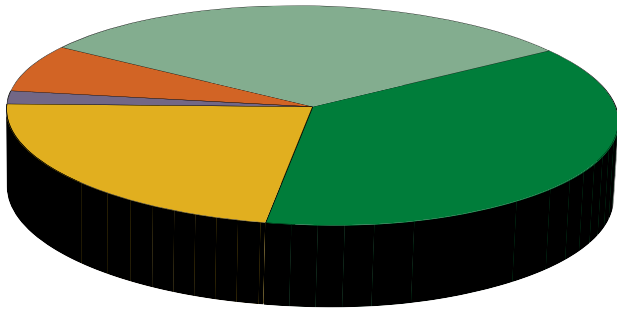
An aerial view of South Campus, which includes from bottom left, Agri-Food Discovery Place and the dairy, swine and crops research units. Inside the dairy unit. Entrance to the Mattheis Ranch.



AFNS Partners/Granting Agencies 2013/14

Agriculture and Agri-Food Canada
Agriculture Funding Consortium includes:
 Alberta Barley Commission
 Alberta Canola Producers Commission
 Alberta Chicken Producers
 Alberta Crop Industry Development Fund
 Alberta Innovates-Bio Solutions
 Alberta Livestock Meat Agency Ltd
 Alberta Milk
 Alberta Pork
 Alberta Pulse Growers Commission
 Alberta Wheat Commission
 Egg Farmers of Alberta
 Western Grains Research Foundation
Alberta Agriculture and Rural Development
Alberta Centre for Child, Family and
 Community Research
Alberta Hatching Egg Producers
Alberta Innovates-Health Solutions
Alberta Innovates-Technology Futures
Alberta Innovation and Advanced Education
Alberta Pacific Forest Industry Inc.
Alberta Turkey Producers
Alberta Vista – A division of AB Agri. Ltd.
Alltech Inc.
AVAC Ltd
Aviagen Inc.
BASF Canada Inc.
Bayer Crop Science Inc.
Beef Cattle Research Council
BioNeutra Inc.
Burnbrae Farms Ltd.
Canada Foundation for Innovation
Canada Research Chairs
Canadian Cattlemen's Association
Canadian Diabetes Association
Canadian Food Inspection Agency
Canadian Foundation for Dietetic Research
Canadian Institute of Health Research
Canadian Liver Foundation
Canadian Poultry Research Council
Canadian Swine Research and Development Cluster
Canola Council Canada
Cargill Limited
Centre for International Forestry Research
Chemtura Canada Co.
Dairy Farmers Canada
Danone Institute
Diabetes Quebec
Dow AgroSciences Inc.
DSM Nutritional Products
Dupont Pioneer
Egg Farmers of Canada
Fazer Bakeries
Forge Hydrocarbons Corporation
Genesis Inc.
Genome Alberta
Genome Canada
Genome Prairie
Heart and Stroke Foundation of Alberta, NWT
 and Nunavut
Heart and Stroke Foundation of Canada
Hieco Ltd – A subsidiary of May-Ruben
 Technologies
Hypor LP
International Development Research Centre
International Life Sciences Institute
Kellogg Company
Kidney Foundation of Canada
Lilydale Inc. – A Sofina Foods Company
Linnaeus Plant Sciences Inc.
Manitoba Canola Growers Association
Maple Leaf Foods Inc.
McGill University
Merck Frosst Canada Ltd
Monsanto Canada Inc.
National Centre of Excellence BioFuelNet Canada
National Institute of Health
Novozymes A/S
Natural Sciences and Engineering Research Council
 of Canada
Olds College
Ontario Pork
P2 Science Inc.
PIC USA Inc.
PigGen Canada
Poultry Industry Council
Royal Embassy of Saudi Arabia
Saskatchewan Canola Development Commission
Society to Prevent Dutch Elm Disease
Soy 20/20
Syngenta Crop Protection Inc.
Teagasc – Agriculture and Food Development
 Authority
Three Feathers Farm
TransCanada Pipelines Ltd.
University of Calgary
University of Laval
University of Manitoba
University of Saskatchewan
University of Toronto
Viterra Inc.
Western Economic Diversification

Research Funding: \$29,216,112



- AB Provincial Government: **\$10,886,457** (37%)
- Federal Government: **\$6,405,208** (22%)
- Other Government*: **\$692,279** (2%)
- Industry: **\$2,128,866** (7%)
- Other**: **\$9,103,301** (31%)

*Municipal, Provincial, Foreign

**Not-for-profit and Individuals, Endowment Spending Allocation, Sales and Investment Income

Operating Budget: \$13,294,262



Distribution of Operating Budget:

- Academic & Teaching Support: **65%**
- Administrative & Computing Support: **8%**
- Central Laboratories: **10%**
- Research Stations: **17%**

Academic Staff

- 64** Professors (including AAFC and ARD academic work affiliates/cross and joint appointments)
- 38** Adjunct Professors
- 34** Professor Emeritus
- 56** Post-doctoral fellows
- 26** Research Associates
- 42** Visiting Scientists



- 331** Refereed Publications
- 679** Oral/Poster presentations + abstracts

Undergraduates enrolled in degree programs

- 542** BSc in Nutrition and Food Science
- 186** BSc in Animal Health
- 169** BSc in Agriculture
- 53** BSc in Agricultural/Food Business Management
- 950** Total



Graduate Student Enrollment

- 128** Doctoral
- 106** Masters
- 4** Visiting
- 238** Total



- 41** New graduate students started in 2013/2014
- 50** Graduate Students convocated in 2013/2014

Technology Transfer

- 2** Exclusive licenses
- 1** Exclusive option to license
- 9** Technologies with patent protection initiated
- 50** Investments by TEC Edmonton, inventors, and/or industry in patent applications or breeder's rights.
- 24** Material Transfer Agreements



Central Laboratories

- Agri-Food Materials Science Unit
- Agricultural Genomics and Proteomics Unit
- Food Science facilities
- Nutrition & Metabolism facilities
- Human Nutrition Research Unit
- Plant Growth facilities



Off-campus Research Facilities

- Agri-Food Discovery Place
- Alberta Poultry Research Centre
- Crops&Land Resources Unit
- Dairy Research & Technology Centre
- Land W McElroy Metabolism & Environment Research Unit
- Swine Research & Technology Centre
- Enclosed Composting Facility
- Feedmill
- Ministik Field Station
- University of Alberta Kinsella Research Ranch
- St. Albert Research Station
- Mattheis Research Station



Changing Your Life for the better
2013-2014 Annual Report

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