PLANT BIOSYSTEMS

Team Members

EDWARD BORK Mattheis Chair in Rangeland Ecology & Management

CAMERON CARLYLE Rangeland Ecology

LINDA HALL Environmental Biosafety and Integrated Weed Management

BARRY IRVING Manager, Research Stations

NAT KAV Biochemistry & Biotechnology

JOCELYN OZGA Plant Physiology & Horticultural Science

HABIBUR RAHMAN Canola Breeding & Research

DEAN SPANER Plant Breeding & Organic Agriculture

STEPHEN STRELKOV Plant Pathology

RANDALL WESELAKE Canada Research Chair, Agricultural Lipid Biotechnology

RONG-CAI YANG Statistical Genomics & Quantitative Genetics

Grassland researchers help settle global debate on biodiversity

Findings refute a four-year-old paper, which concluded that empirical patterns between biodiversity and productivity are weak and inconsistent.

Working with a large network of scientists worldwide who studied grasslands of every type in all climate zones, rangeland ecology researchers **Edward Bork** and **Cameron Carlyle** helped reaffirm a theory of diversity that had been under attack.

They've confirmed that the humped-back model of diversity, which states that plant diversity peaks in grasslands of intermediate (medium) productivity, while high- and low-productivity grasslands tend to have fewer plant species, is accurate.

"Working with an unusually large network of data we were able to see that pattern," said Carlyle who, along with Bork, took samples at the Department's Mattheis Research Ranch in southern Alberta.

"We were also able to conclude that the pattern held across a wide range of spatial scales within these grasslands."

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The data set also included samples from the Department's Roy Berg Kinsella Research Station in central Alberta (see story on p. 36). All told, the landmark study involved 62 scientists from 19 countries and six continents, who examined 30 sites. The findings refute a four-year-old paper, which concluded that empirical patterns between biodiversity and productivity are weak and inconsistent.

"It's important to come to a consensus on the pattern because it changes how we might look at, interpret and manage, low-, moderate- and high-productivity sites, particularly if the conservation of plant diversity is an important objective," said Bork, who is the Mattheis Chair in Rangeland Ecology and Management.

For instance, under the humped-back model, conservation of overall plant diversity may be more dependent on strategically retaining and enhancing grasslands of intermediate productivity. Meanwhile the conservation of biodiversity in high- and low-productivity sites may focus particular attention on a smaller group of plant species to ensure their functional role in the ecosystem is maintained.

Many other management decisions on grasslands are also dependent on knowing whether there's a vital relationship between biomass and biodiversity, said Bork.

Rangeland ecology students study grasslands as part of a worldwide effort to settle an old debate

Discovery adds health benefits to common Canadian crops

Elzbieta Mietkiewska, a Research Associate with Phytola, isolated three genes from pomegranates and incorporated them into high-value oilseed crops adding punicic acid to its list of nutritional benefits.

Punicic acid is a polyunsaturated fatty acid that has been found to help slow the growth of skin, prostate and breast cancer cells. Until now, it was only found in pomegranates and Chinese cucumber seed oil.

> Elzbieta Mietkiewska isolated three genes containing pucinic acid and incorporated them into high-value oilseed crops.

Mietkiewska's experimental plants, in which she inserted the three genes, accumulated up to 25 per cent punicic acid in the oilseeds that initially contained no punicic acid at all.

Punicic acid also assists with weight loss, has anti-inflammatory characteristics, and can even act as a chemical agent that can help paints dry quicker.

Because of punicic acid's unique benefits and the progress made so far in Canadian oilseed crops, interest in Mietkiewska's research is quickly growing.

Mietkiewska, who has a patent pending on the discovery, is confident that in the coming years, the oilseed crops that Phytola is developing in partnership with Alberta Innovates Technology Futures, will make products containing punicic acid easier to access and help more people capitalize on their benefits.

Research Associate Elzbieta Mietkieska

In addition to the nutritional value they already contain, common Canadian crops like canola and flax may soon have cancer fighting benefits too.

ALUMNI PROFILE

Barbara Ziesman

'11 BSc (Ag)
Crop Science and current PhD student

CURRENT POSITION:

Provincial Specialist, Oilseed Crops for the Government of Saskatchewan

Barb's portfolio covers canola, mustard, flax, sunflower and other oilseed crops as carinata and camelina. Her responsibilities include delivering extension education — presenting to farmers and agronomists and writing fact sheets and other materials on hot issues and best management practices — and keeping the provincial agriculture minister informed on issues concerning oilseed crops.

HER ROUTE THERE:

After completing an undergrad in biology, Barb refined her knowledge at AFNS with a BSc Agriculture, majoring in Crop Science. With two years' preparation for a master's under her belt, she impressed her advisors with her research skills and transferred directly into a PhD. Her thesis, scheduled for completion in early 2016, focuses on her development of a quantitative (q)PCR assay to detect the fungus *Sclerotinia sclerotiorum* on canola petals. The hope is that the (q)PCR assay can be used as a tool to forecast the disease so that fungicide can be applied proactively.

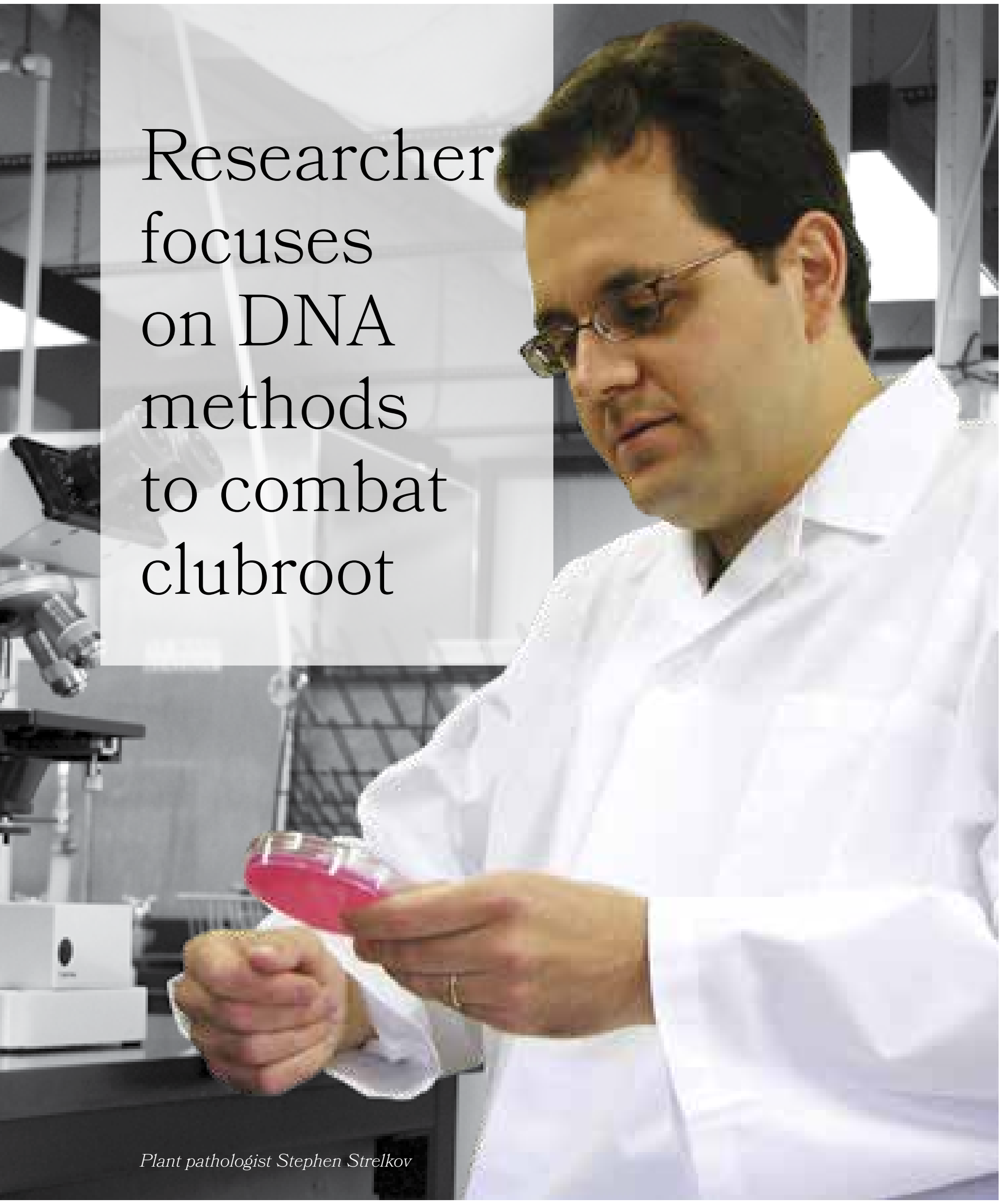
THE ADVANTAGES OF AFNS:

"At the U of A, I developed the skills to think critically and at AFNS I was introduced to many issues facing farmers in Western Canada. My education and the networks made through my PhD research opened many doors and provided me with opportunities which led to my current career."

"My education and the networks made through my PhD research opened many doors and provided me with opportunities which led to my current career."

BARBARA ZIESMAN '11 BSc (Ag) Crop Science and current PhD student commenting in the advantages of AFNS

Researcher focuses on DNA methods to combat clubroot



Plant pathologist Stephen Strelkov

By analyzing DNA extracted from dust soil ... Strelkov and his team showed for the first time that clubroot spores can be quantified and measured in windborne dust.

AFNS plant pathologist **Stephen Strelkov** is working on DNA-based tools to fight clubroot, canola's most significant threat.

By analyzing DNA extracted from dust soil samples in 2011 and 2012, Strelkov and his team showed for the first time that clubroot spores can be quantified and measured in windborne dust.

That's significant because it demonstrated that clubroot spreads mostly through infested soil carried by farm machinery, and that the disease needs a host.

Strelkov monitors about 400 fields every year. He found a new strain of clubroot in a resistant variety of canola in 2013. Nine more strains were found in fields across a 600-kilometre stretch in central Alberta in 2014.

"We would like to develop molecular markers to distinguish the strains. It would make a time-consuming and labour-intensive process much quicker."

Since 2015 was such a dry year, it's possible the clubroot infestation won't be as severe this season, says Strelkov. But the pathogen spores can stay dormant in the soil for up to 20 years, waiting for enough moisture and the presence of host roots to germinate and cause infection.

So a race is on between its spread and that of DNA-based tools to detect it and react.

"We would like to develop molecular markers to distinguish the strains," said Strelkov. "It would make a time-consuming and labor-intensive process much quicker."