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Genetics and Feeding Systems to Improve Competitiveness

John Basarab and Graham Plastow

AFBI Beef Conference
November 13 2014

Who Are We?

Livestock Gentec is a not-for-profit centre developing genomic technologies for the Livestock Industry.

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Genetics and Feeding Strategies

- Measuring feed efficiency
- Predicting feed efficiency through genomics
- Feeding vs Grazing
- The rumen microbiome
- Feed additives
- Feed efficiency and GHGs

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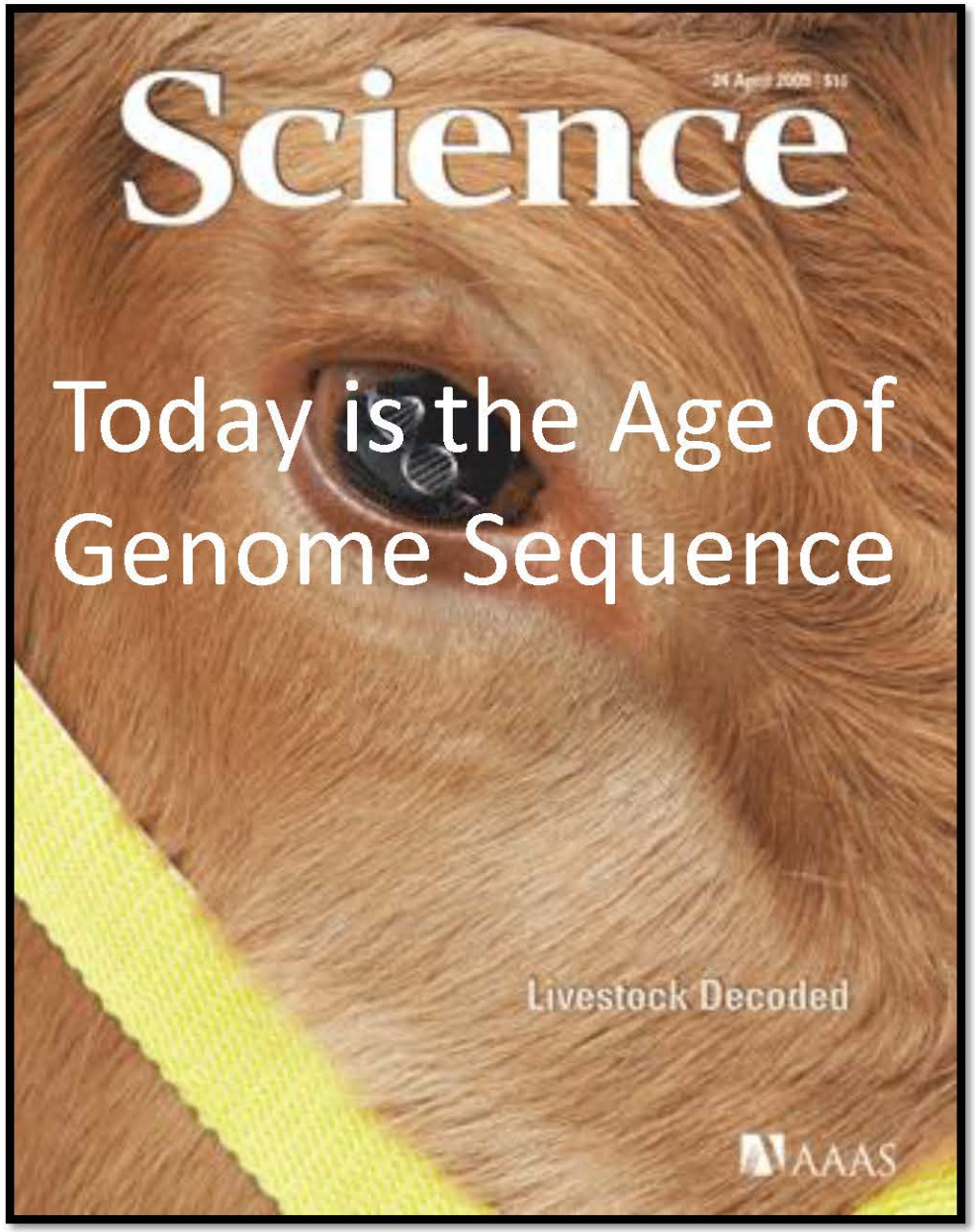
Science
Today is the Age of Genome Sequence
Livestock Decoded
AAAS

Other Genome Projects: cont'd

- The Bovine Genome
  - Completed: **2009**
  - Cost: **$50 million**
  - Time: **4 years**

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NGS – The Past

2010

✖ 100

= 6 Months

2011

✖ 20

= 6 Months

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NGS – The Present (2013/14)

Genome Canada funding provided Next Generation Sequencing for **300** bulls as part of the **1000** bull project.

2.5

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NGS – The Future

The cost of NGS is steadily declining. What will it cost in the future and what opportunities will this provide?

✖ ?

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Sample & Data Collection

Drives:

- Traceability
- Calibration
  Validation
  Demonstration
- R&D

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Marker Assisted Management

Is this the **best** use of our beef?

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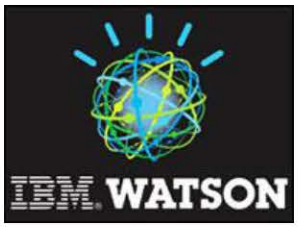
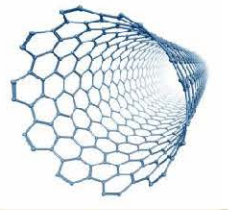
12 Disruptive Technologies

McKinsey&Company





1. Mobile Internet
2. Automation of Knowledge Work
3. Internet of Things
4. Cloud Technology
5. Advanced Robotics
6. Autonomous Vehicles
7. **Next Generation Genomics**
8. Energy Storage
9. 3D Printing
10. Advanced Materials
11. Advanced Oil and Gas Exploration
12. Renewable Energy

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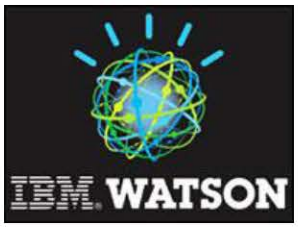

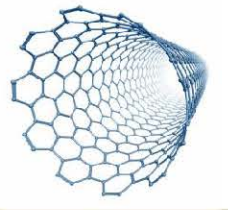

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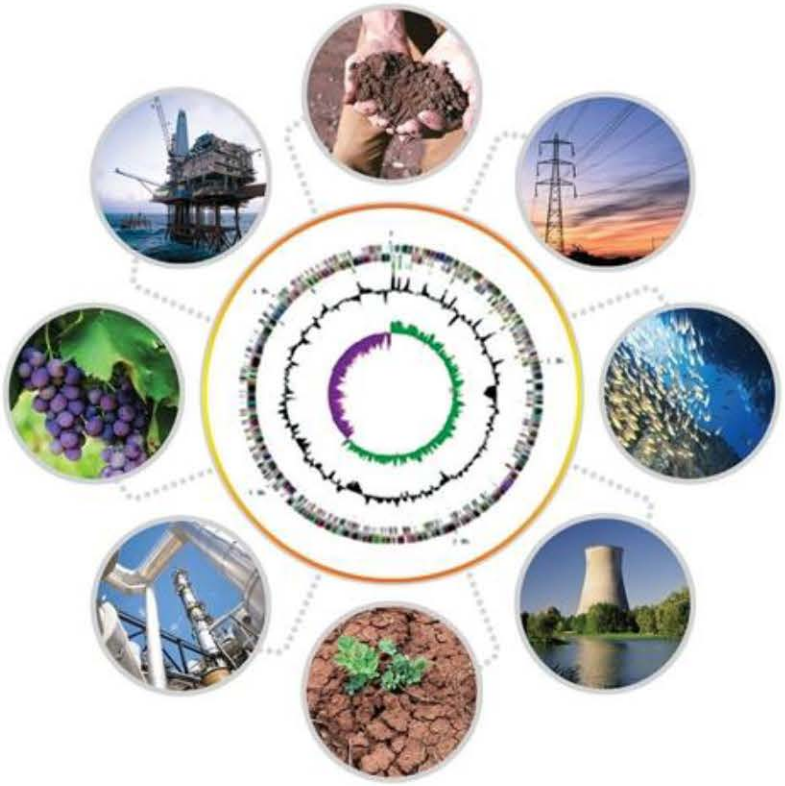
Next Generation Genomics



- Next generation genomics will impact nearly every major industry
  - Especially **agriculture**
- Cost to complete Human Genome Project
  - **$2.7 billion** and **13 years**
- Cost to sequence genome in next 10 years
  - **$100** in **1 hour**

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Making beef cows more efficient

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and

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Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Feed Efficiency-Why?

- **Increasing global population (FAO)**
  - ***8 billion by 2030; 9 billion by 2050***
  - ***Global demand for meat is expected to increase by 55%***

    (3 billion people trying to move into the middle class in emerging economies will increase demand for meat)
- **Safe, affordable, nutritious and environmentally sustainable beef products**
- **5% improvement means $100 M annually at a 30% adoption rate**

% Change in greenhouse gas emissions and global warning potential achieved through genetic improvement (1988-2007)

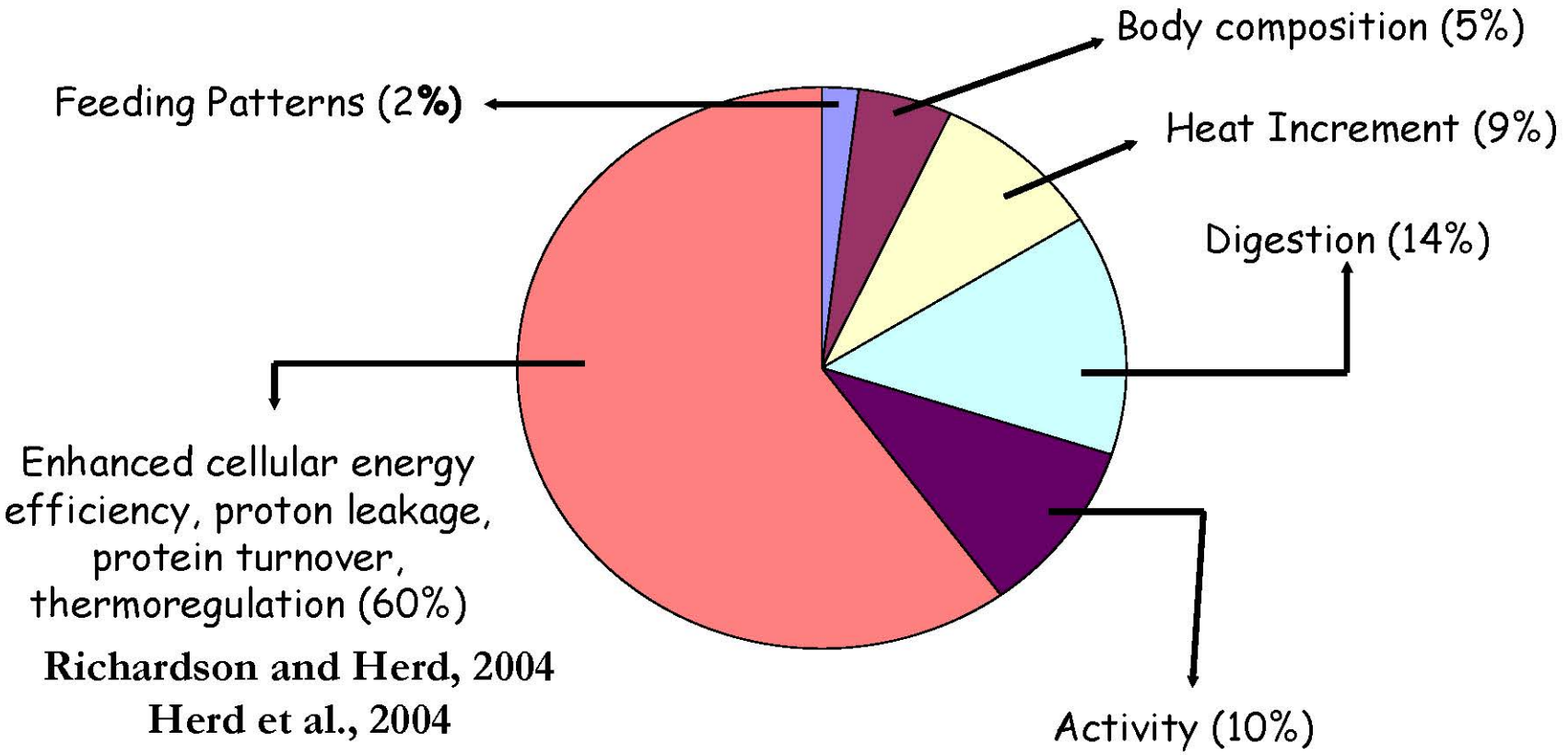
Species	CH_4	NH_3	N_2O	GWP_{100}
Chickens – layers	-30	-36	-29	-25
Chickens – broilers	-20	10	-23	-23
Pigs	-17	-18	-14	-15
Cattle – dairy	-25	-17	-30	-16
Cattle – beef	0	0	0	0
Sheep	-1	0	0	-1

CARBON FOOTPRINT (CO_2e/kg product); Pork 2.8-4.5 kg; Chicken 1.9-2.9; Dairy1.3 kg; **Beef 18-36 kg**

Sources: Project for DEFRA by Genesis Faraday Partnership and Cranfield University (AC0204) from Hume et al. (2011), J. Ag. Sci., doi:10.1017/S0021859610001188 .

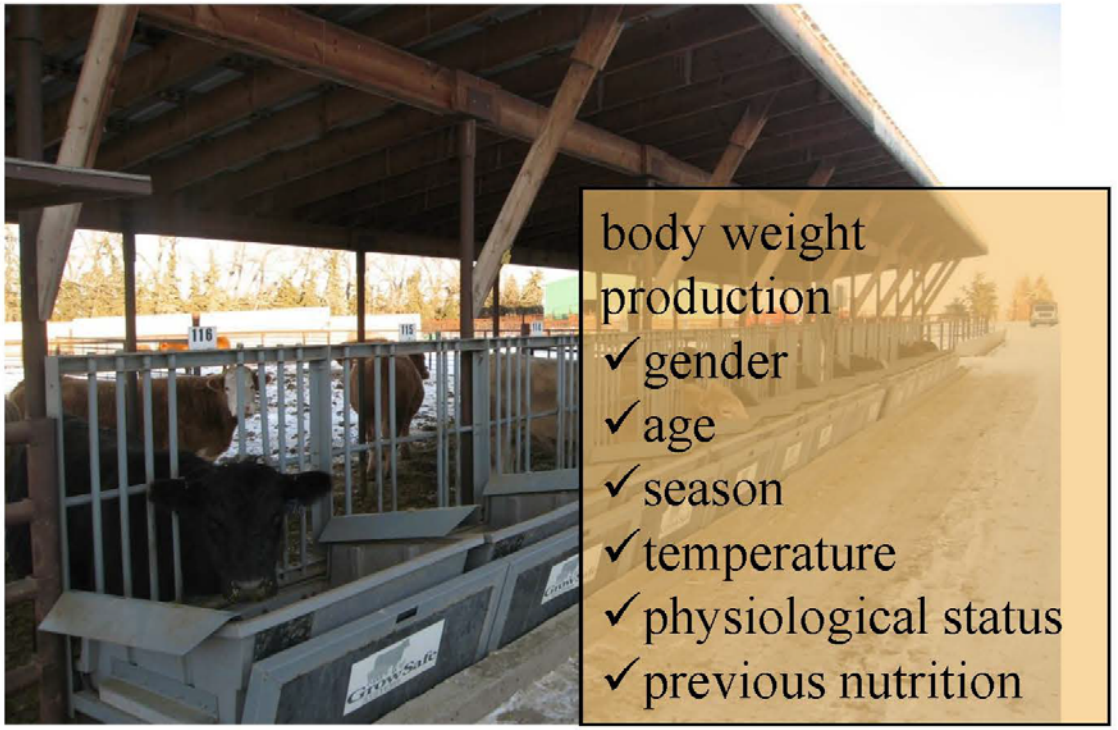
Slide courtesy of Chris Warkup Biosciences KTN

Biological Mechanisms Contributing to Variation in RFI



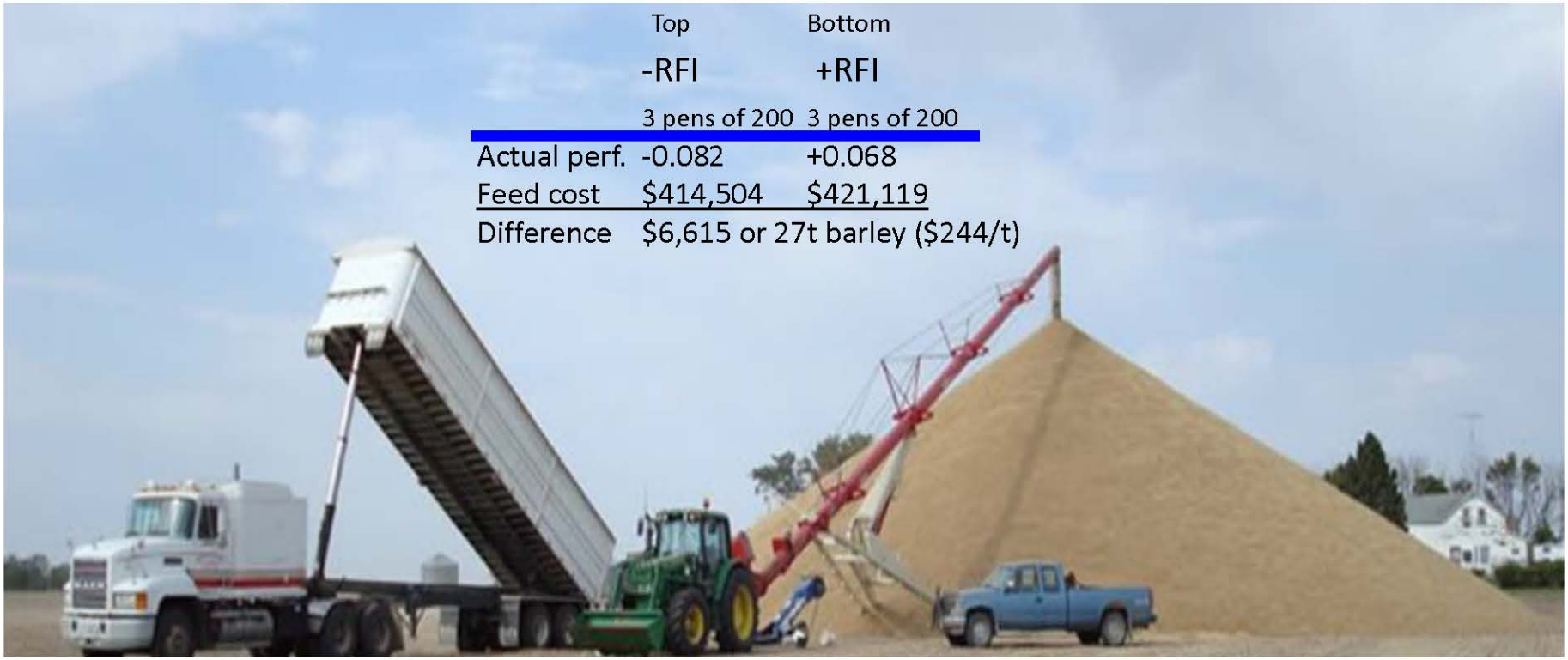
Richardson and Herd, 2004
Herd et al., 2004

Measurable: Individual Animal Feed Intake Facilities



Global GrowSafe capacity: ~68,000 animals; facilities in Canada (8%), US (76%), UK, Brazil, Aus (16%); Sunstrum 2012.

Ranking of sires based on their EBV for RFI



	Top	Bottom
	-RFI	+RFI
	3 pens of 200	3 pens of 200
Actual perf.	-0.082	+0.068
Feed cost	$414,504	$421,119
Difference	$6,615 or 27t barley ($244/t)	

99 lbs feed/feeder x 10,000 market ready feeders =

495 Tons of Barley Saved!!!!!

Slide source, J.A. Basarab and G. Plastow, 2013; grain picture source http://www.newagco.com/images/crop-protection-barley-pile.jpg

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Optimists vs. Pessimists

Which one are **you**?

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