Canadian Grain Commission | Commission canadienne des grains

Bulk Commodity Sampling: Consistency and Risk

Blaine Timlick

Program Manager

Infestation Control and Sanitation

Industry Services

Canada

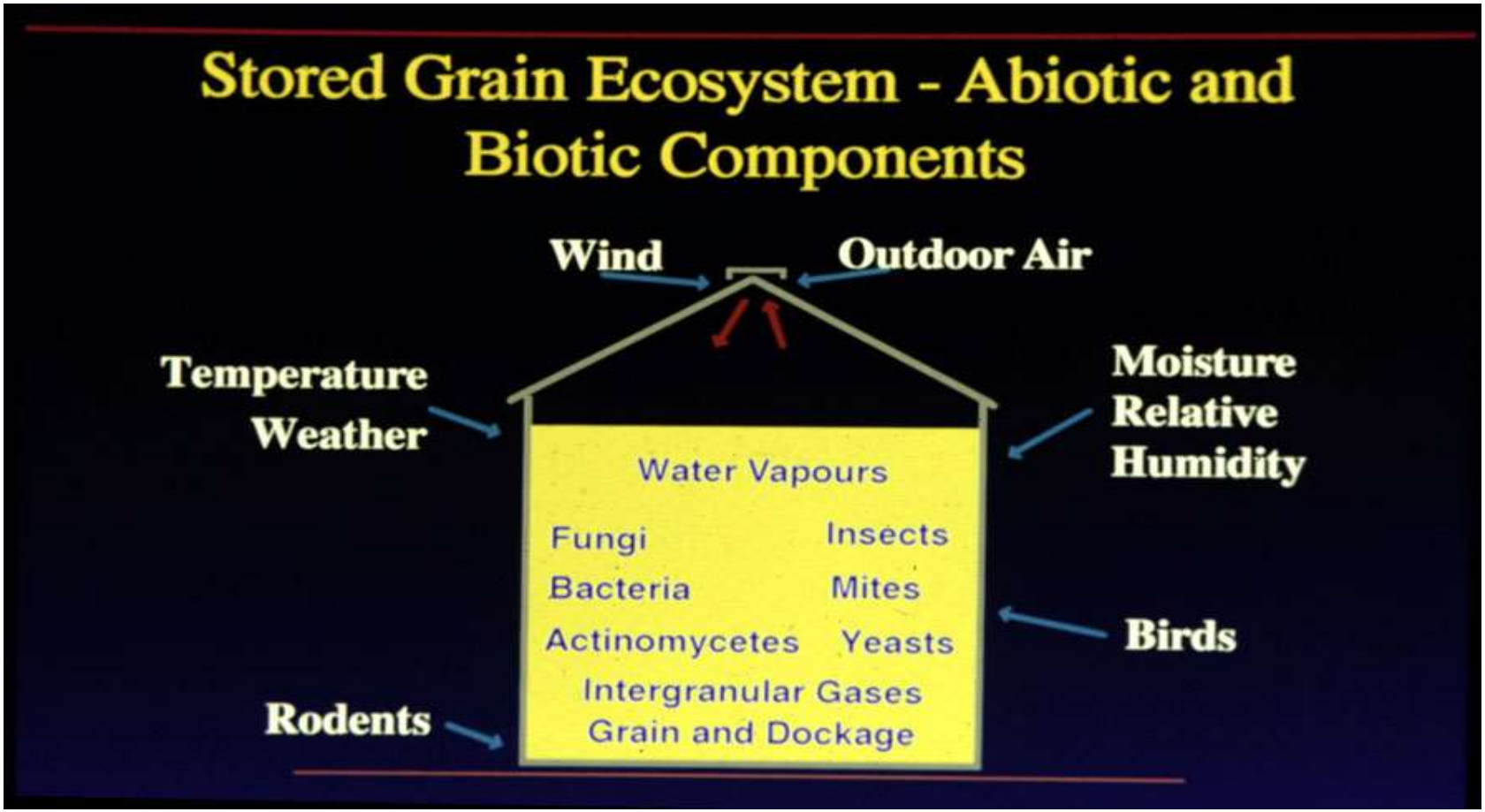
Bulk Grain Commodities

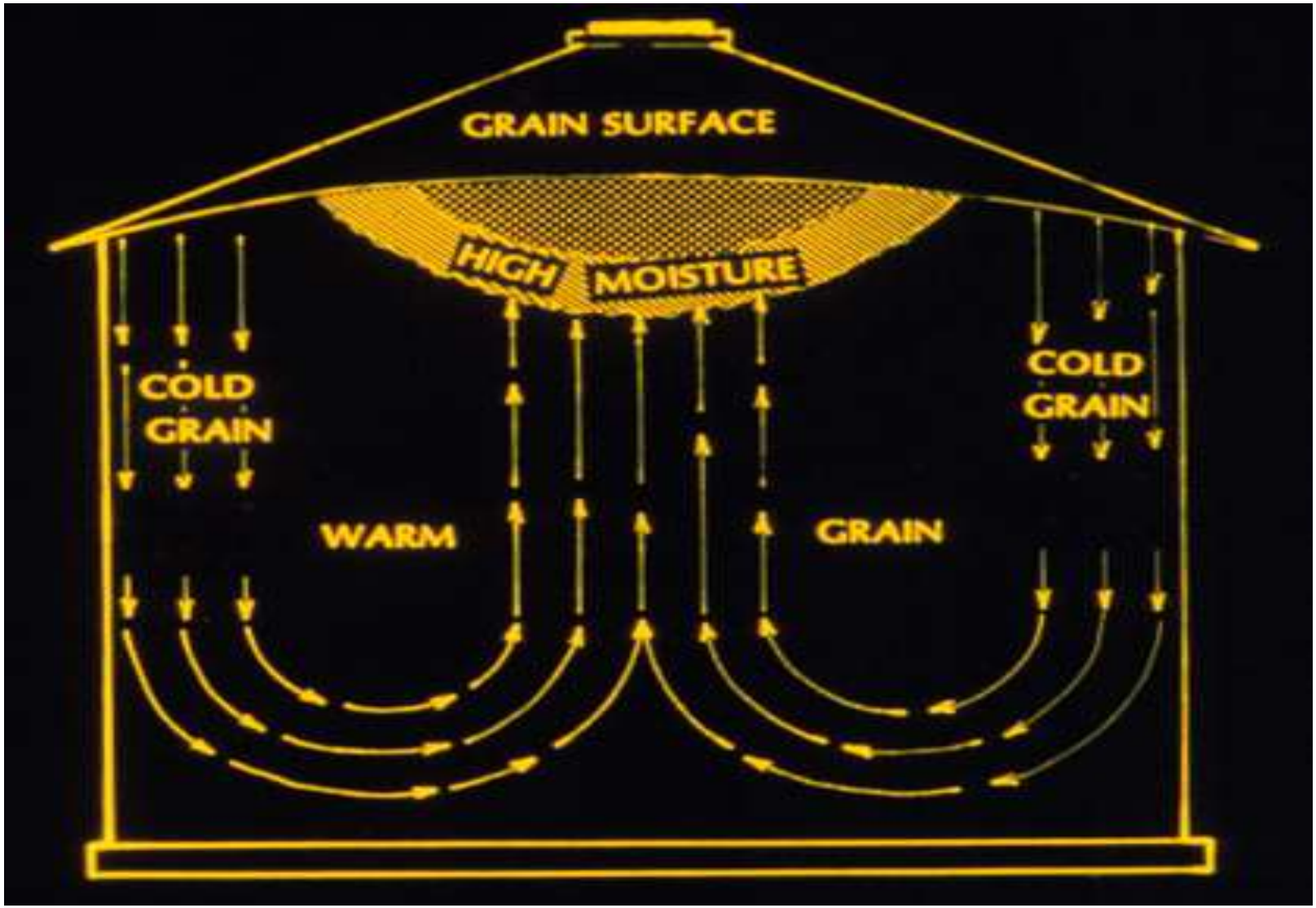





Grain flow pattern in Canada

Why Sample


Stored Grain Ecosystem - Abiotic and Biotic Components
Wind
Outdoor Air
Temperature
Weather
Moisture
Relative
Humidity
Water Vapours
Fungi
Insects
Bacteria
Mites
Actinomycetes
Yeasts
Intergranular Gases
Grain and Dockage
Birds
Rodents

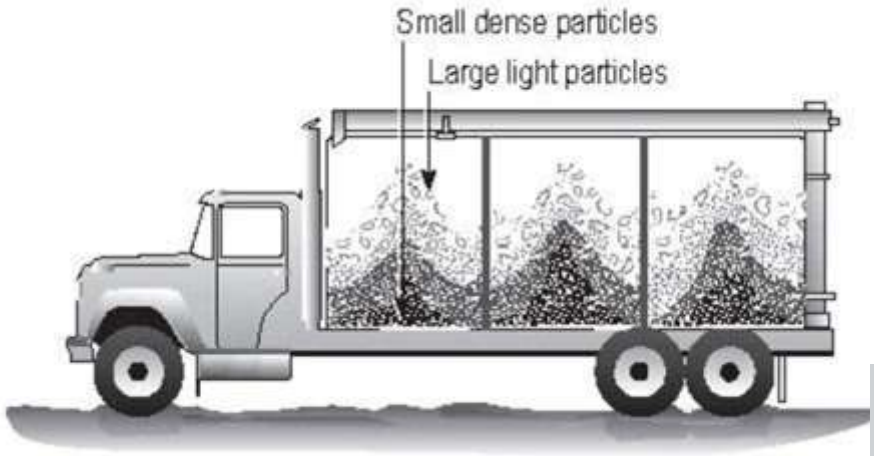

GRAIN SURFACE
HIGH MOISTURE
COLD GRAIN
COLD GRAIN
WARM GRAIN

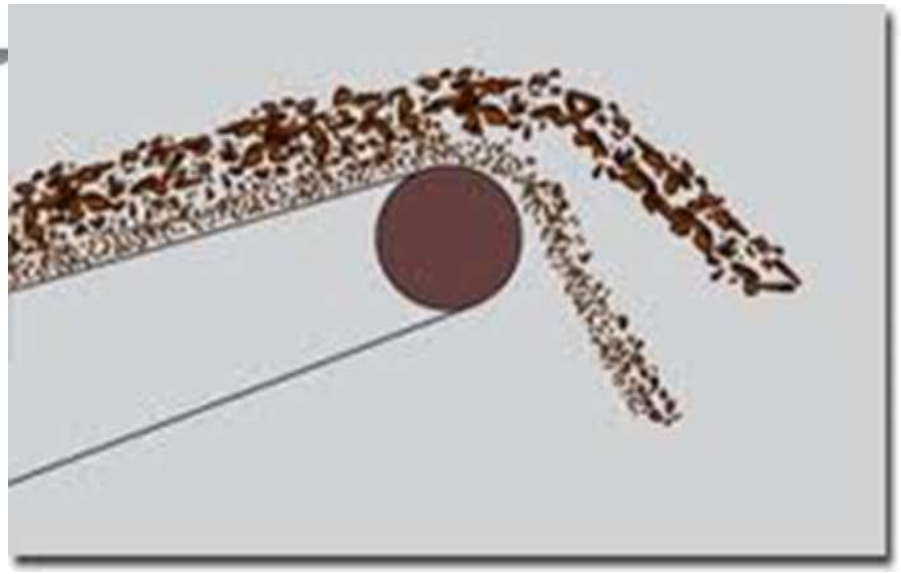
Insect Contamination

Weed Seed Contamination

Storage mould development on non aerated grain

Segregation / Heterogeneity



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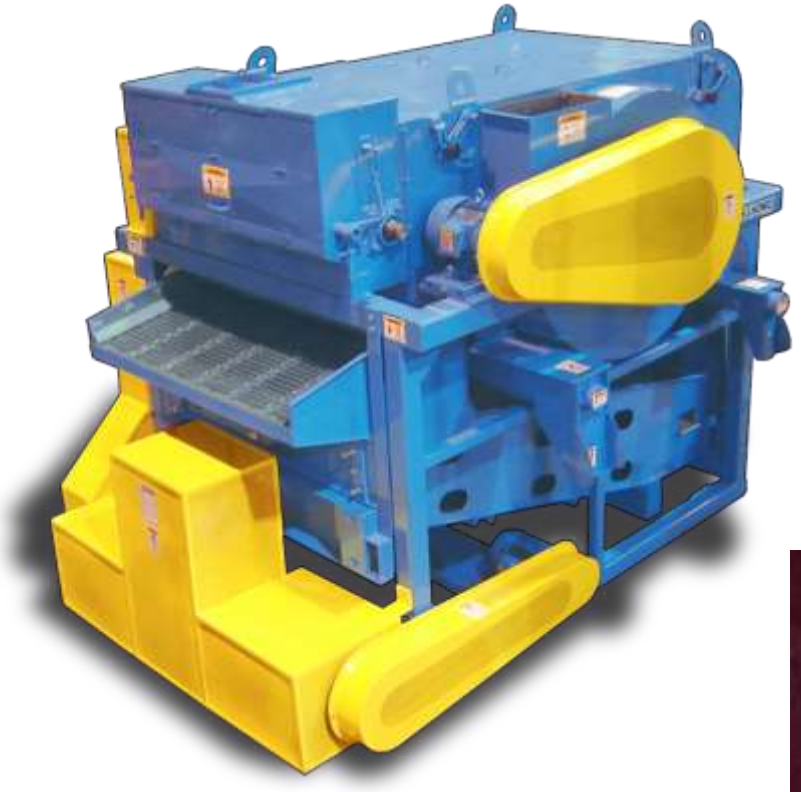

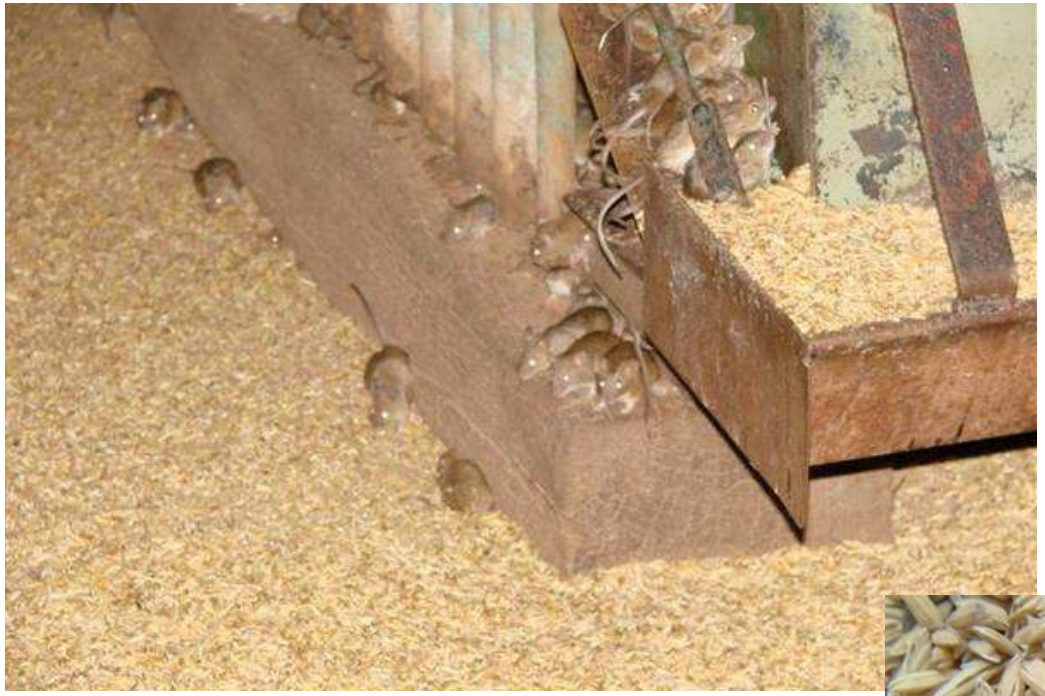

Required Information for Grain Trade

- **Quality attributes**
  - Color
  - Protein
  - Moisture
  - Foreign material
  - Analytical tests
    - Oil, Diseases / metabolites, Ash, Enzyme activity etc.

Phytosanitary Requirements

- **Freedom from:**
  - Regulated organisms
    - Insects
    - Weed seeds
    - Plant Diseases

How to make determinations on Quality and Phtosanitary Obligations

- **Sampling Design**
  - Biased sampling to reduce risk / probability
    - Location
    - Units
    - Statistical Relevance / Biological Understanding
  - Uniform Sequential Sampling
    - Target Population
    - Representativeness

On farm sampling

Sampling – Primary Elevator

Sampling – Primary Elevator

- **Information required**
  - Integrity – color uniformity, broken, diseases, moisture, foreign material
  - Representativeness – need for overall info of lot, blending for larger shipments


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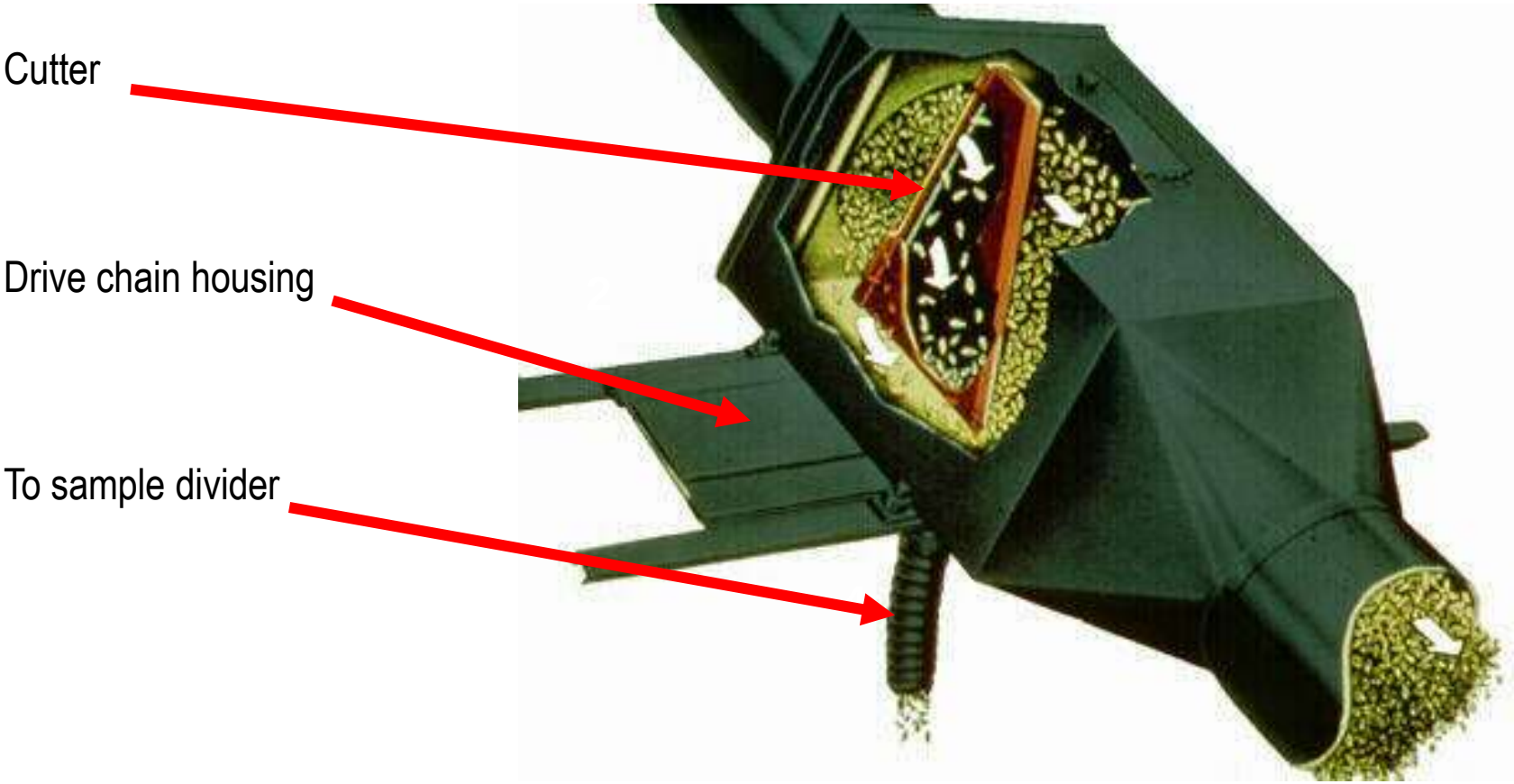
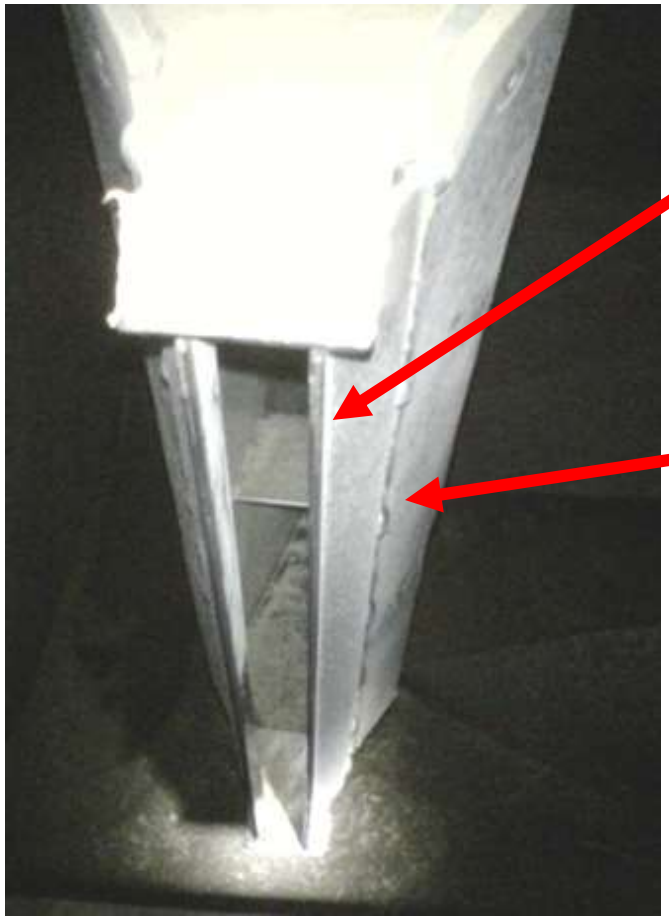
Sampling – Terminal Elevators

Cross Cut Automatic Samplers



Cutter Lips and Pelican



Cutter

- Cutter lips are installed at the front of the pelican, and determine the width of the opening.

Pelican

- Purpose is to hold the grain as it is being selected by the cutter from the grain flow
- Designed to allow the sampled grain to be either pneumatically drawn from the pelican or via gravity into delivery system to the 1st divider (also called secondary sampler)

Traverse Speed

- The traverse speed of the sample cutter across the grain stream must be set at 0.47 – 0.51 meter per second (18 – 20 inches per second) and at an even rate of acceleration.
- The drive mechanism to the sampling system must ensure a smooth and unaffected operation of all components (being either: pneumatic, hydraulic or electric powered sources).

Traverse Interval

- When loading or unloading railcars or trucks, the timer of a cross-stream sampler **must be set to an interval not greater than 20 seconds**. The divider reduction rate and the sampler timer interval must be set to collect a sample quantity representing between 0.0025 percent and 0.0075 percent of the lot being sampled. For example; on a 90 tonne railcar, between 2.25-6.75 kg of sample must be collected.

- When loading or unloading vessels or barges, the timer of a cross-stream sampler **must be set to an interval not greater than 45 seconds**. The divider reduction rate and the sampler timer interval must be set to collect a sample quantity representing between 0.0005 percent and 0.001 percent of the lot being sampled. For example; on a 2000 tonne increment, between 10 to 20 kg of sample must be collected.

Statistical Relevance

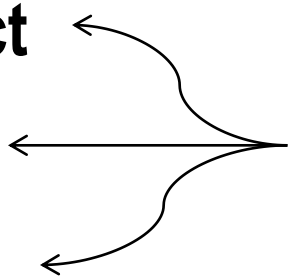
- Variance in heterogeneity – Is the bulk being sampled homogeneous in its heterogeneity?
- Sampling Process Error – Sample Type (composite, incremental (eg. ISTA methods) etc., Sample Size (typically 1 kg), Sampling Mode (typically systematic)
- Distribution and Concentration (Insects aggregate and segregate, seeds of different size/shape segregate)

Assumptions

- Continuous Sampling – of the product to determine consistency / representativeness and of the handling locations that may be refugia for pests
- Consistent Detection Methodology – Visual Inspection, Berlese Funnel, Floatation etc – Using inspection staff and the best available techniques

Sampling Requirements

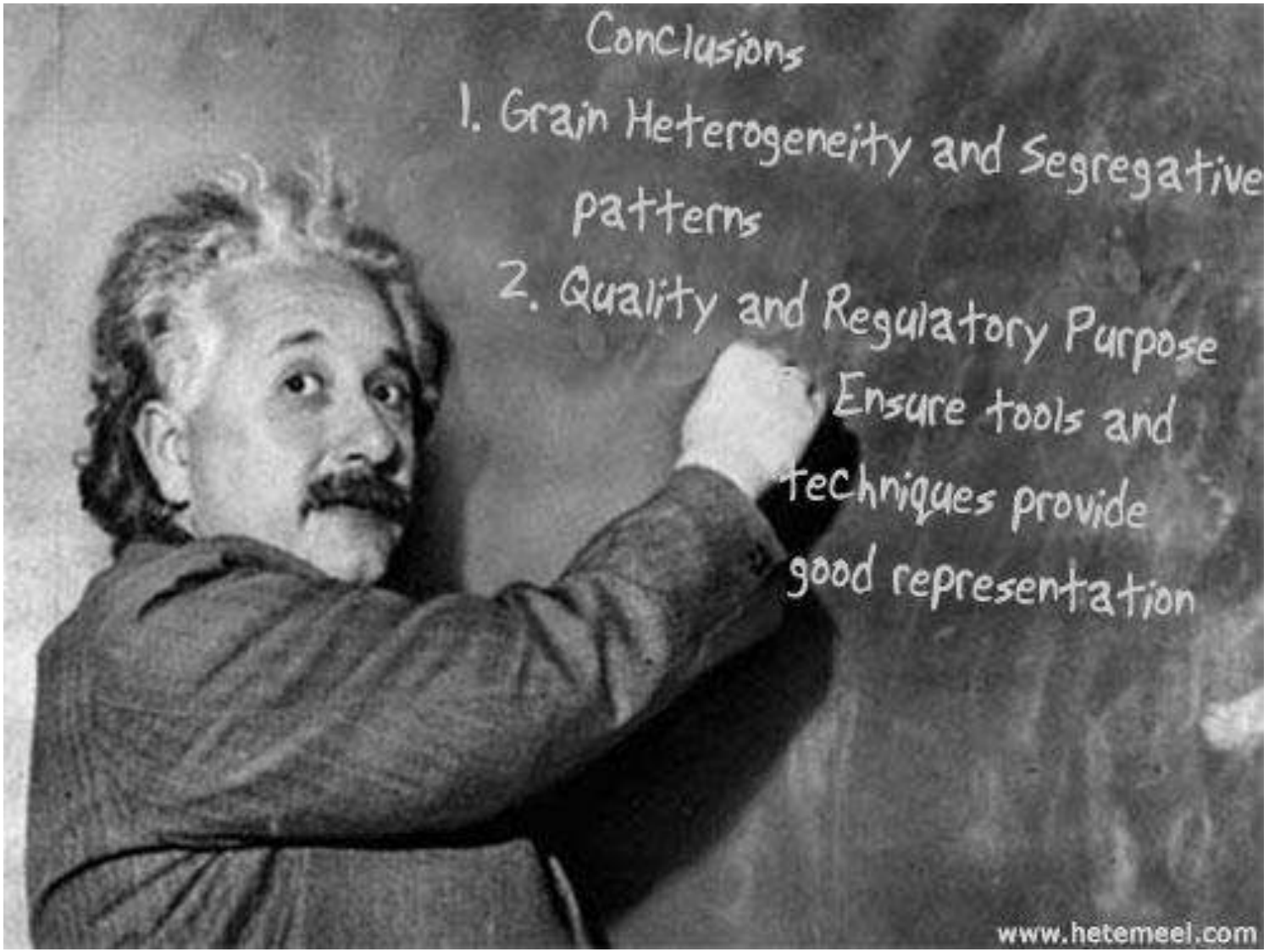
- **Trade / Contract**
- **Phytosanitary**
- **Cargo**



All of these must be achieved from a single sample set

Conclusion

- **Awareness of Phytosanitary Requirements**
  - Shippers / exporters need to make informed decisions based upon proper understanding
  - Awareness of the risk associated with regulated organisms
  - Coordination of Efforts – ensuring sampling, detection, identification are acceptable for regulatory certification


Conclusions
1. Grain Heterogeneity and Segregative patterns
2. Quality and Regulatory Purpose
Ensure tools and techniques provide good representation
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