



Utilizing Genomic Data For The Molecular Characterization Of Safflower

Steve Zaplachinski

PAG 2005

SemBioSys GENETICS INC.

Overview:

- Introduction to safflower
- Recent interest by biotechnology sector
- Introduction to SemBioSys Genetics Inc.
- Future safflower genomics plans

SemBioSys
GENETICS INC.

Safflower: *Carthamus tinctorius L.*

- **Traditionally grown for dyes and medicinal properties**

- **Currently grown mainly for seed**

- **Birdseed**
- **Animal feed**
- **Industrial oil**
- **Edible oil**

5. Saffire seed - 'bold' white

SemBioSys GENETICS INC.

Safflower: *Carthamus tinctorius L.*

- **High oil content seeds**
- **High oleic and linoleic acid varieties (mono/polyunsaturates)**
- **Very low sat. fatty acid levels**
- **High vitaminE content (400ug/mL)**

1. Cross-section of safflower head, showing seeds

3. Saffire in bloom

25. Combining safflower

SemBioSys GENETICS INC.

Safflower: Renewed interest for molecular farming in N.A.

- **Low risk production platform for recombinant proteins:**

Technology:

- **Easily transformable using Agro**
- **Recombinant protein levels in seeds are high**
- **Very amenable to large scale production and purification**

Containment (regulatory):

- **Low tendency to weediness**
- **High degree of self pollination (>90%)**
- **Low acreages grown in N. America**
- **No weedy relatives**
- **GRAS status**

SemBioSys GENETICS INC.

SemBioSys Genetics Inc.

State-of-the art lab facilities for molecular biology, biochemistry, and plant genetic transformation

Approx 26 R&D staff including 12 Ph.D level scientists

Integrated capacity from gene constructs to field level production

Symbol SBS on TSX

www.sembiosys.com

SemBioSys GENETICS INC.

SemBioSys Oil Seed Systems

Proof-of-Concept

Arabidopsis thaliana

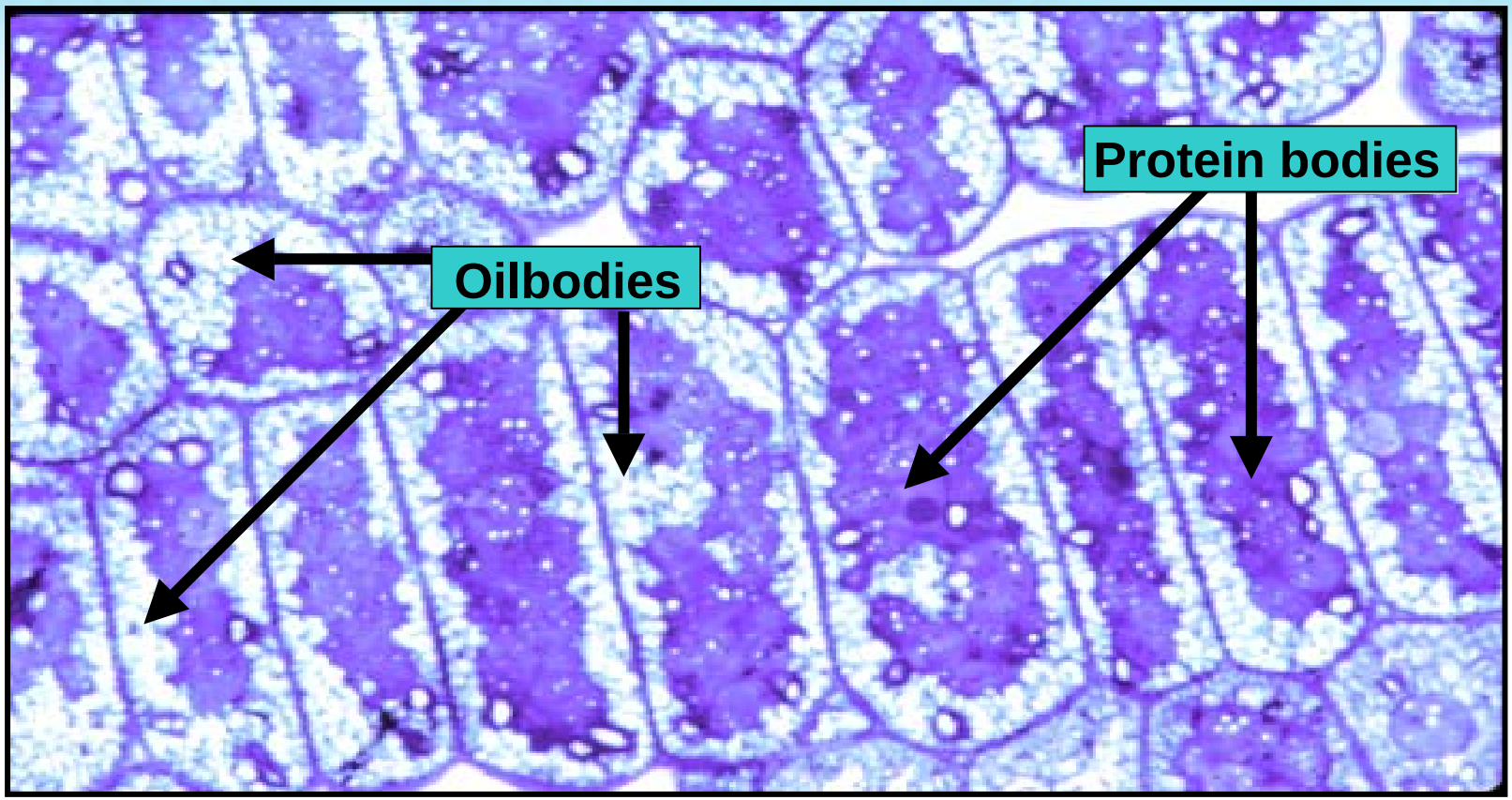
Commercial Production Species

Safflower (*Carthamus tinctorius*)

SemBioSys GENETICS INC.

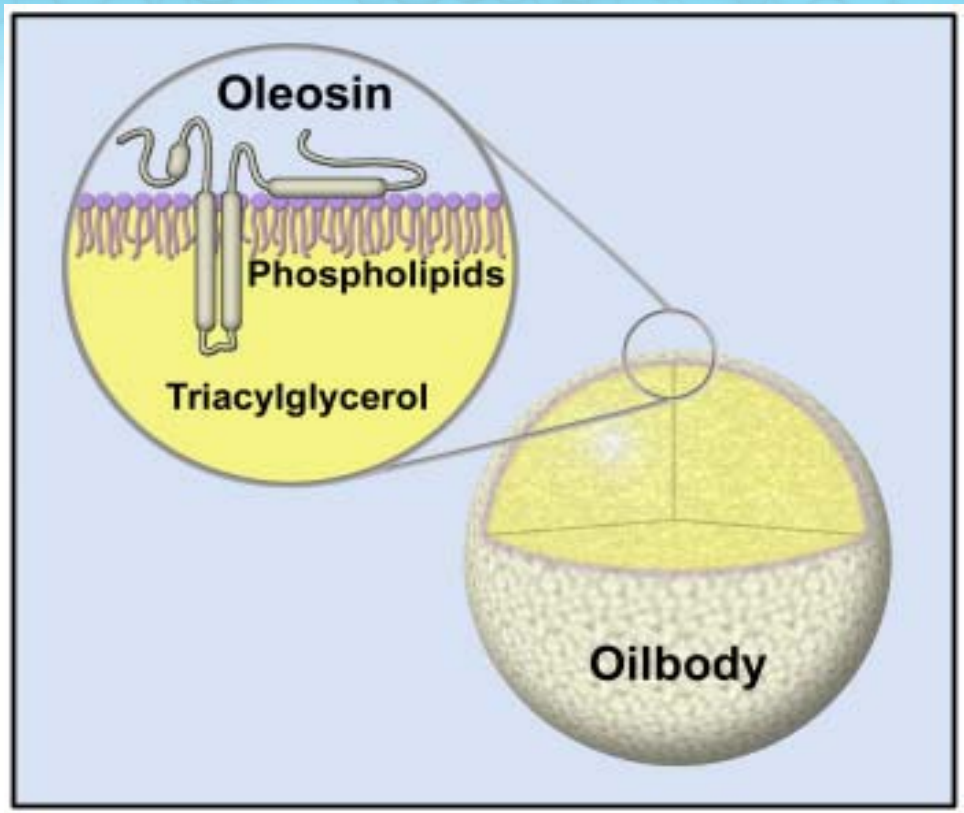
Stratosome™ Biologics System
Seed Oilbodies

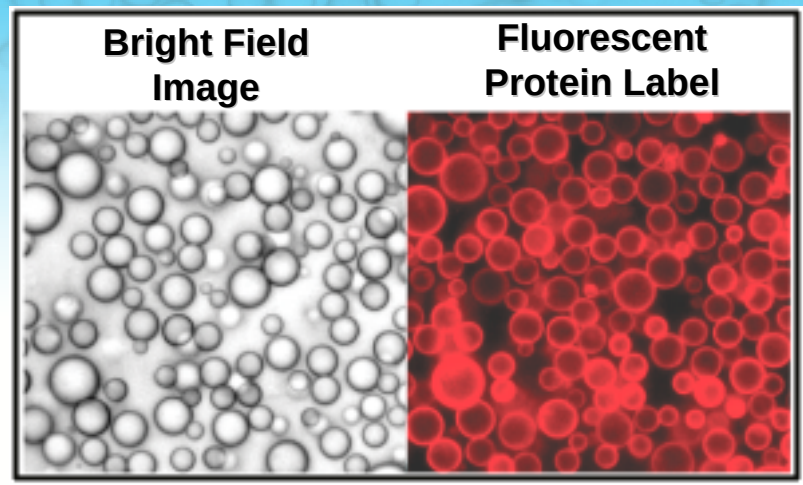
Cross-section of Oil Seed

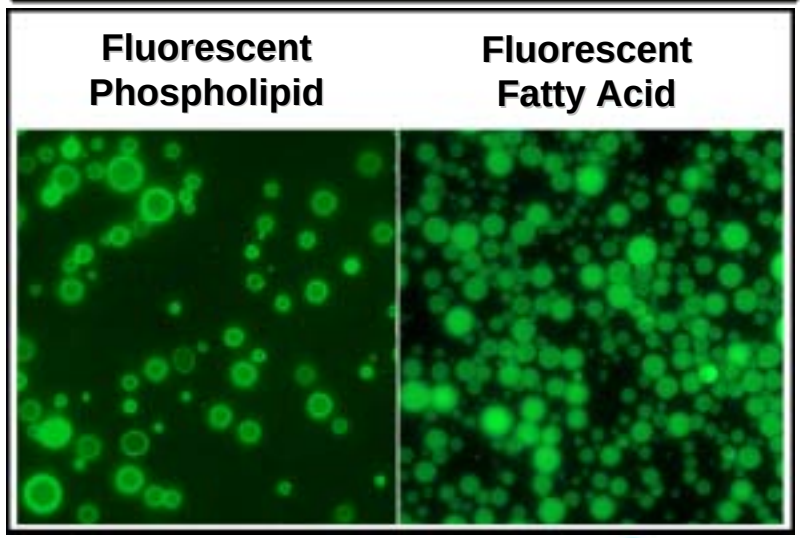


SemBioSys GENETICS INC.

Oilbody Structure & Components



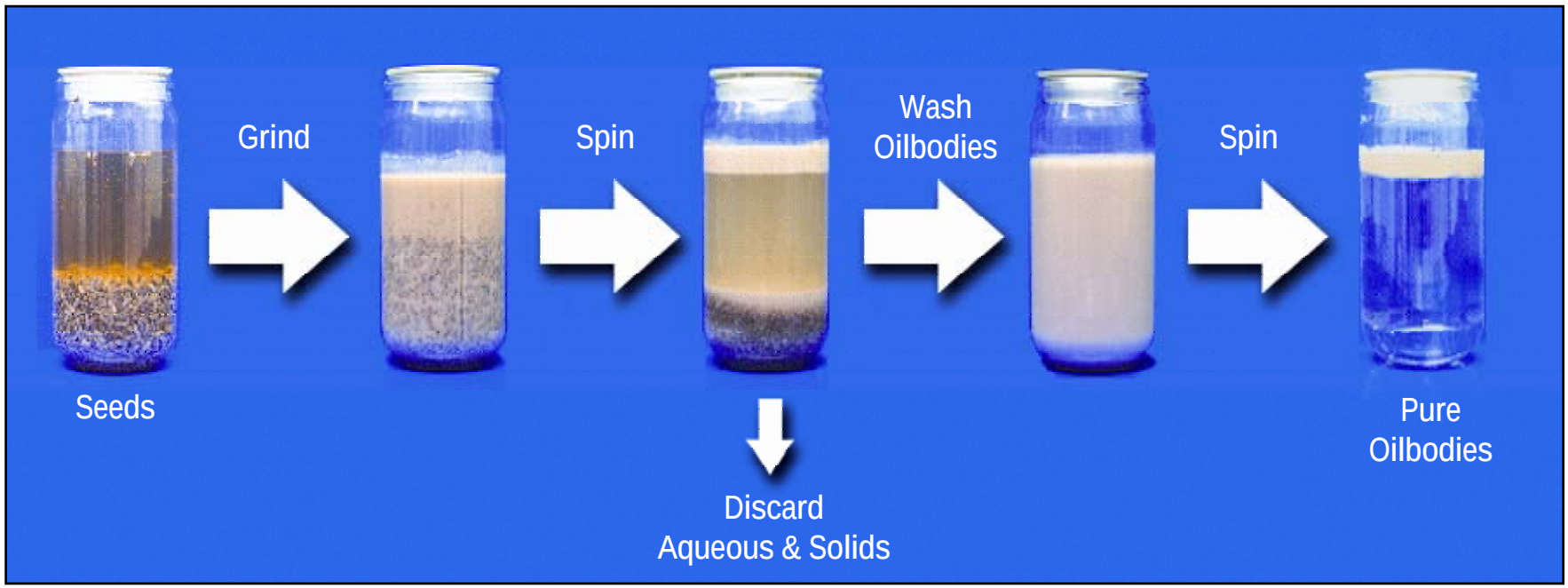




SemBioSys GENETICS INC.

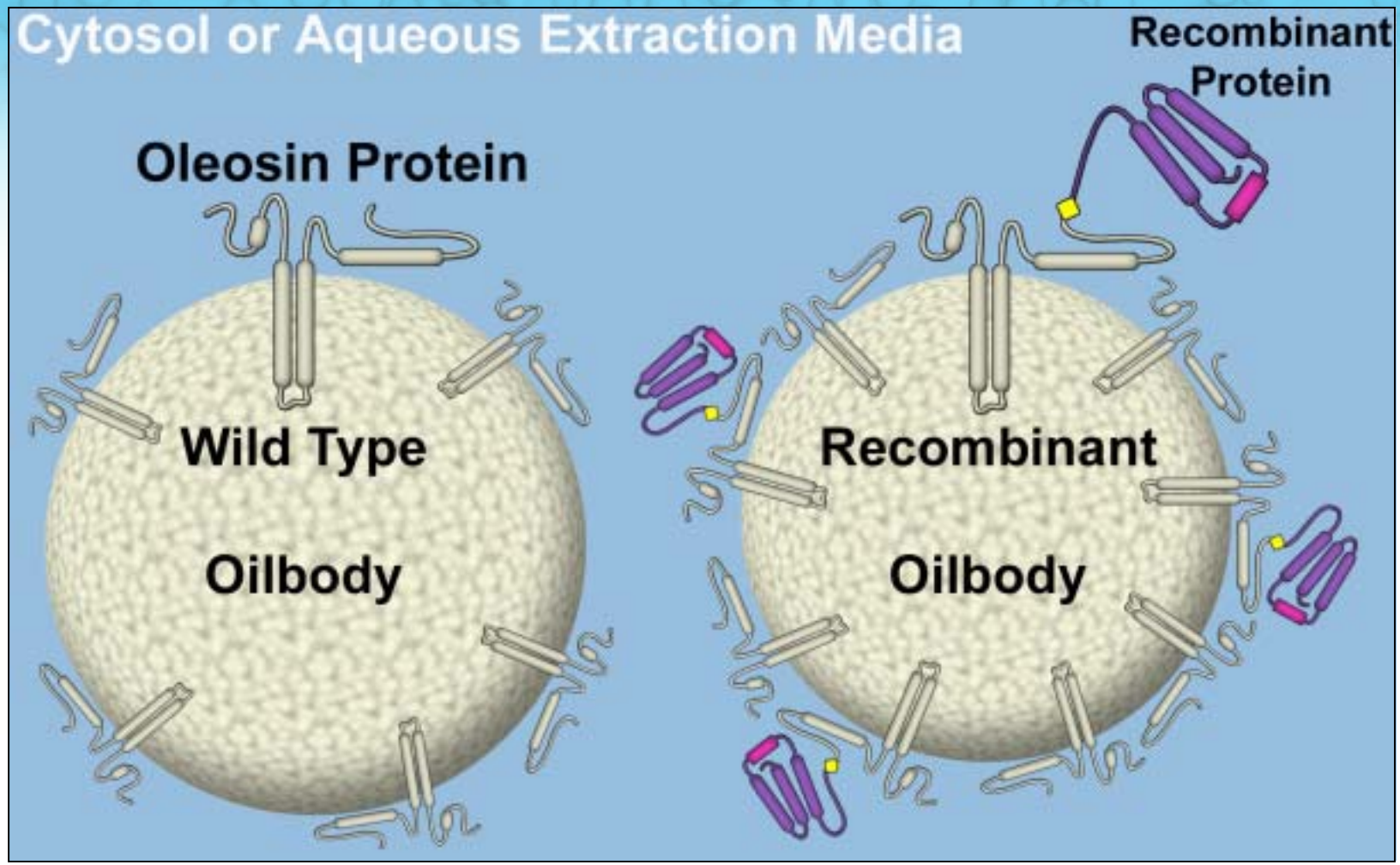
Purification of Oilbodies

The process of flotation-centrifugation results in substantial purification of the oil body fraction.



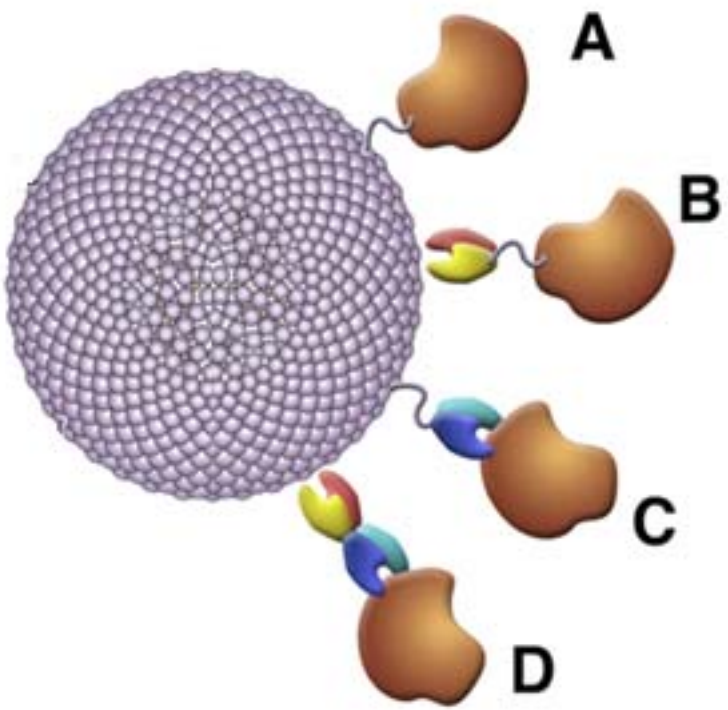
SemBioSys GENETICS INC.

Production of Oleosin Fusions



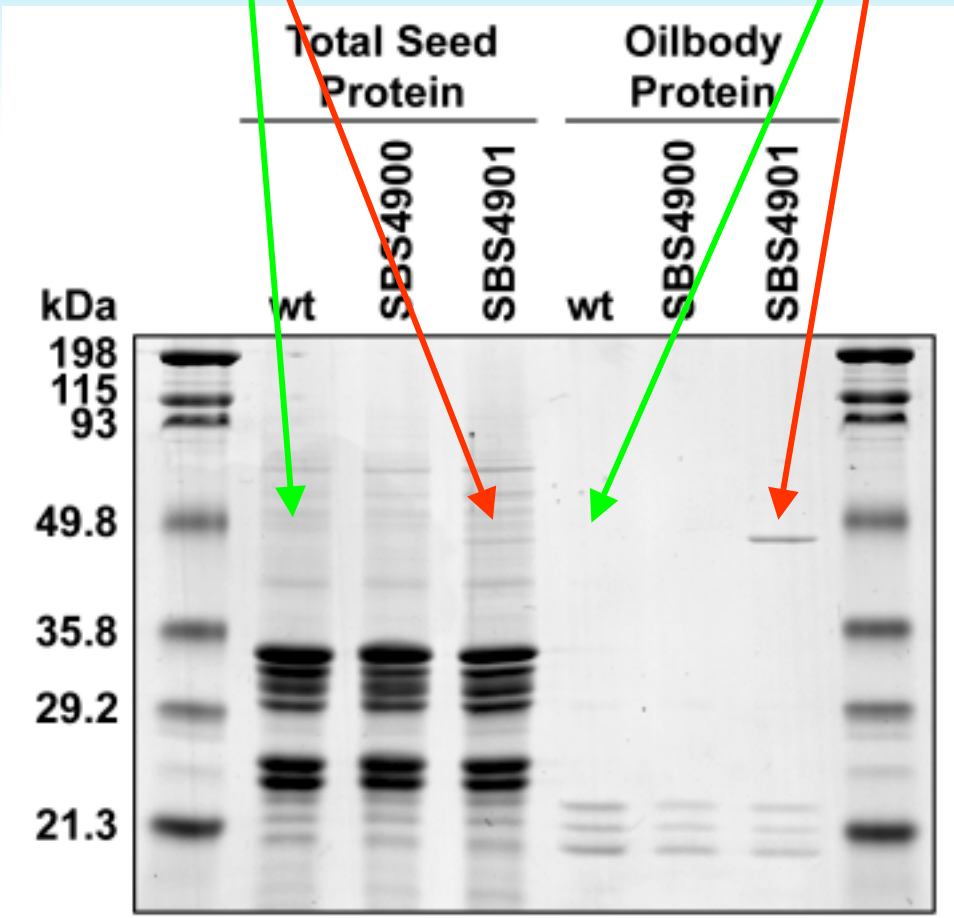
SemBioSys GENETICS INC.

Attachment to Oilbodies



SemBioSys GENETICS INC.

Recovery of proteinX on Oilbodies



ProteinX – Oleosin

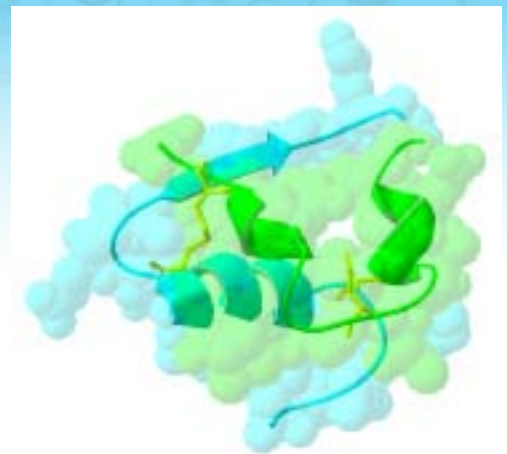
Oleosins

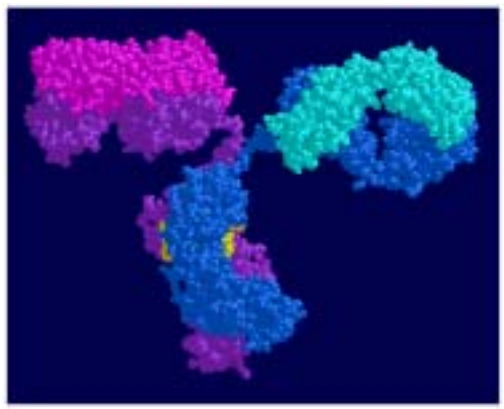
Protein Gel

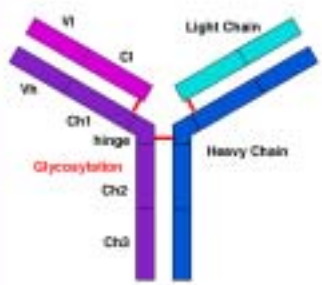
SemBioSys GENETICS INC.

Products of interest

- Insulin
- Apolipoprotein A1
- Growth hormones
- Healthy fatty acids
- Antibody production and capture







- Safflower oilbodies for use in cosmetic ingredients

SemBioSys GENETICS INC.

Safflower Genomics platform

- **NSERC CRD Grant submitted**

Modest budget

Short term goals:

- **Generate safflower BAC genomic library and seed EST library**
- **Use MAGPIE (www.visualgenomics.ca/) to annotate genes expressed in lettuce and sunflower**
- **Isolate and characterize oleosin genes (RNAi), other seed storage protein genes**
- **Identify high expressing seed specific promoters**
- **Isolate genes involved in lipid metabolism (nutraceutical fatty acids)**

SemBioSys GENETICS INC.

Safflower Genomics platform

Long term goals:

- Expand EST library to include other tissues
  -microarrays

- mapping effort and BAC fingerprinting effort

- Larger scale genomic sequencing effort (i.e. Orion Genomics™)
  -using reduced representation techniques

SemBioSys GENETICS INC.

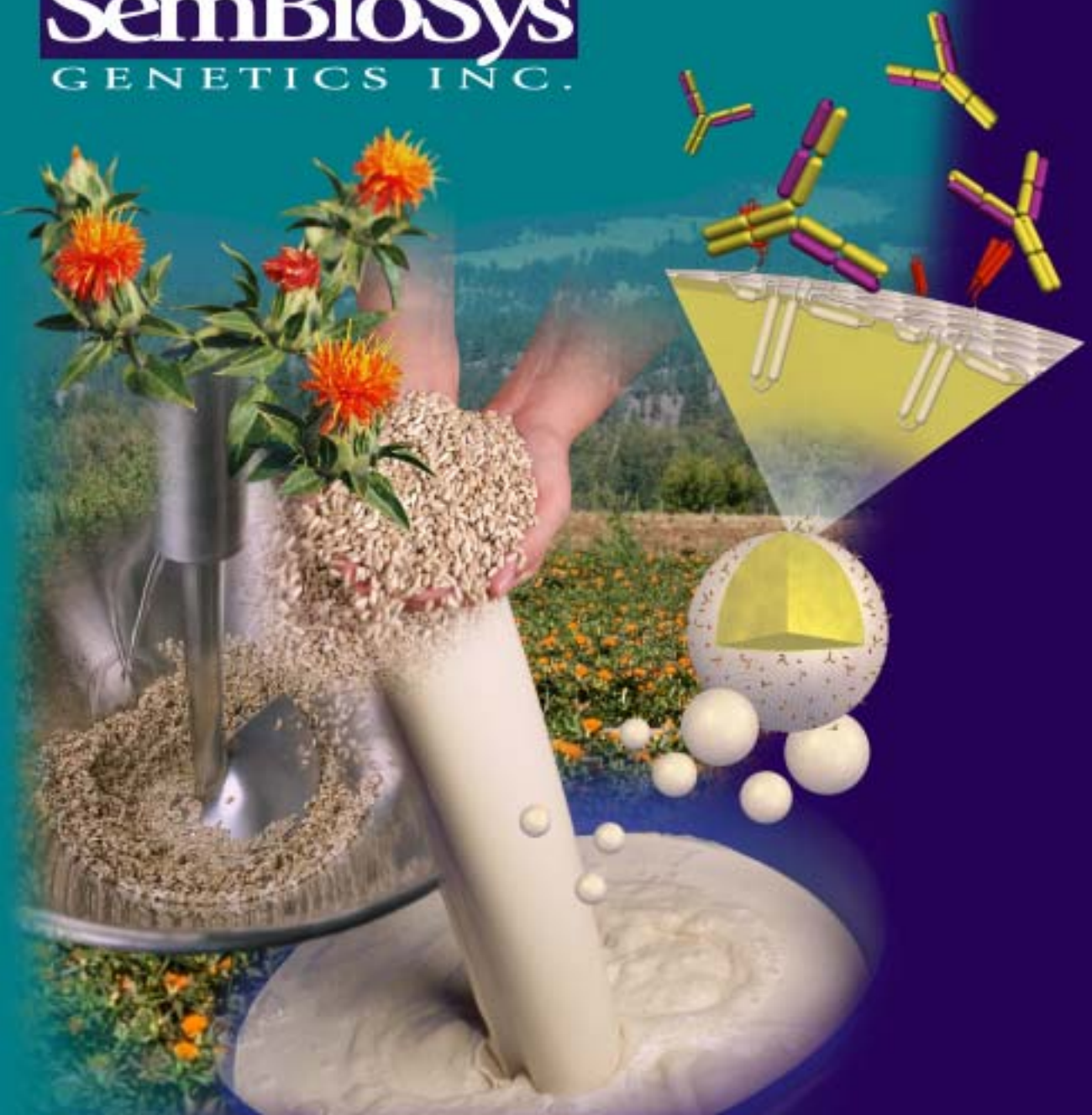
Collaborations

- **SemBioSys Genetics Inc.**
- **Randy Weselake (Univ. of Alberta)**
- **Christoph Sensen (Sun Center of Excellence for Visual Genomics)**
- **Allen Good (Univ. of Alberta)**

- **Steven Knapp (Univ. of Georgia)**
- **Richard Michelmore (UofC Davis)**

SemBioSys
GENETICS INC.

SemBioSys
GENETICS INC.



TRANSFORMING LARGE SCALE PROTEIN PRODUCTION

Stratosome™ Biologics System

Parenteral Biologics & Peptides
Topical Therapeutics
Oral Delivery
Nutraceuticals

Compelling Upstream Economics
Downstream Processing Breakthroughs
Enabling Technology
Additional Intellectual Property Protection

- Cost Effective
- Scalable Capacity
- Competitive Time Lines
- Capital Avoidance
- Safe

DermaSphere™ Ingredient System

Designable Carrier/Delivery System
Small Molecules & Proteins/Peptides
Cosmeceuticals
Enabling Platform
Additional Intellectual Property Protection

- Cost Effective
- Ease of Loading & Formulation
- Safe & Non-Allergenic
- Cosmetically Elegant
- Scalable Capacity

Contact Information

- **CEO – Andrew Baum**

  bauma@sembiosys.com

- **CSO – Maurice Moloney**

  moloneym@sembiosys.com

www.sembiosys.com

Symbol SBS on TSX