

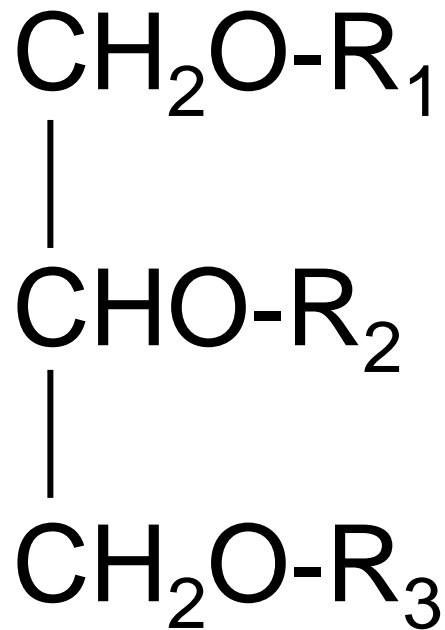
# Fatty Acid Metabolism and Prospects for Genetic Improvement/Alteration in OSR

Matthew Hills  
John Innes Centre

# Overview

- Oil synthesis pathway
- Arabidopsis as a model
- Potential targets for modification in oilseed rape (not GM)

# Rapeseed Oil Structure



R = acyl chain

Edible rapeseed oil:

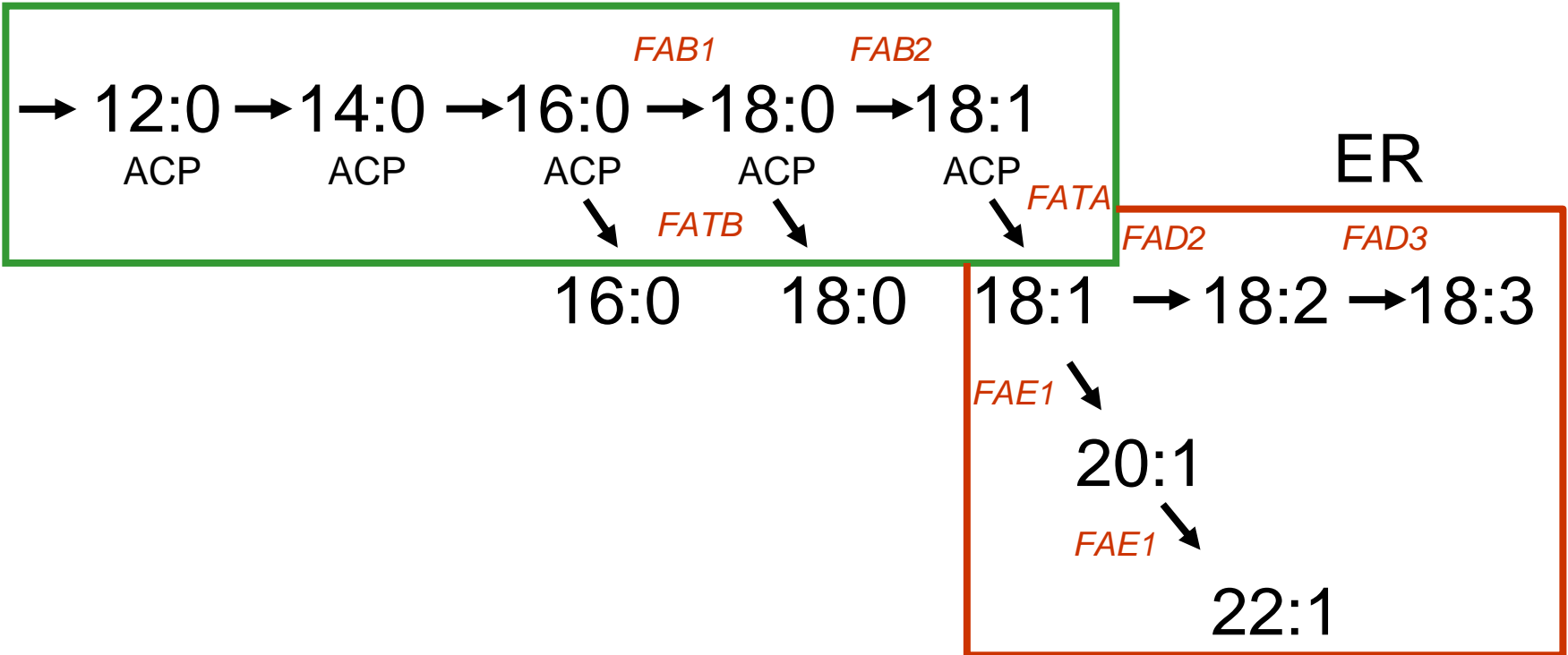
Oleic	18:1 (60-65%)
Linoleic	18:2 (20-25%)
Linolenic	18:3 (5-10%)
Palmitic	16:0 ( 5%)
Stearic	18:0 ( 2%)

# Uses of Rapeseed Oil

- Human consumption
  - food and preparation
- Industry
  - Plastics (also high erucic rape)
  - Biofuel
  - Lubricants
  - Coatings

# Fatty acid synthesis

Plastid

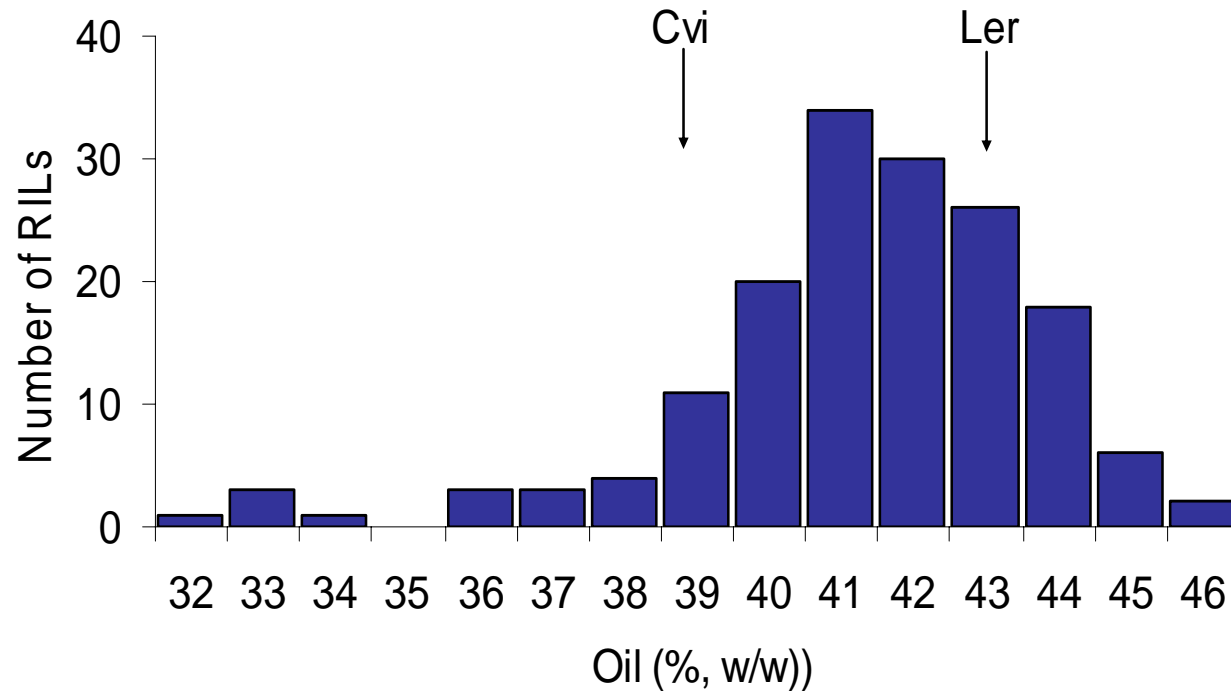


# QTL for oil in Arabidopsis

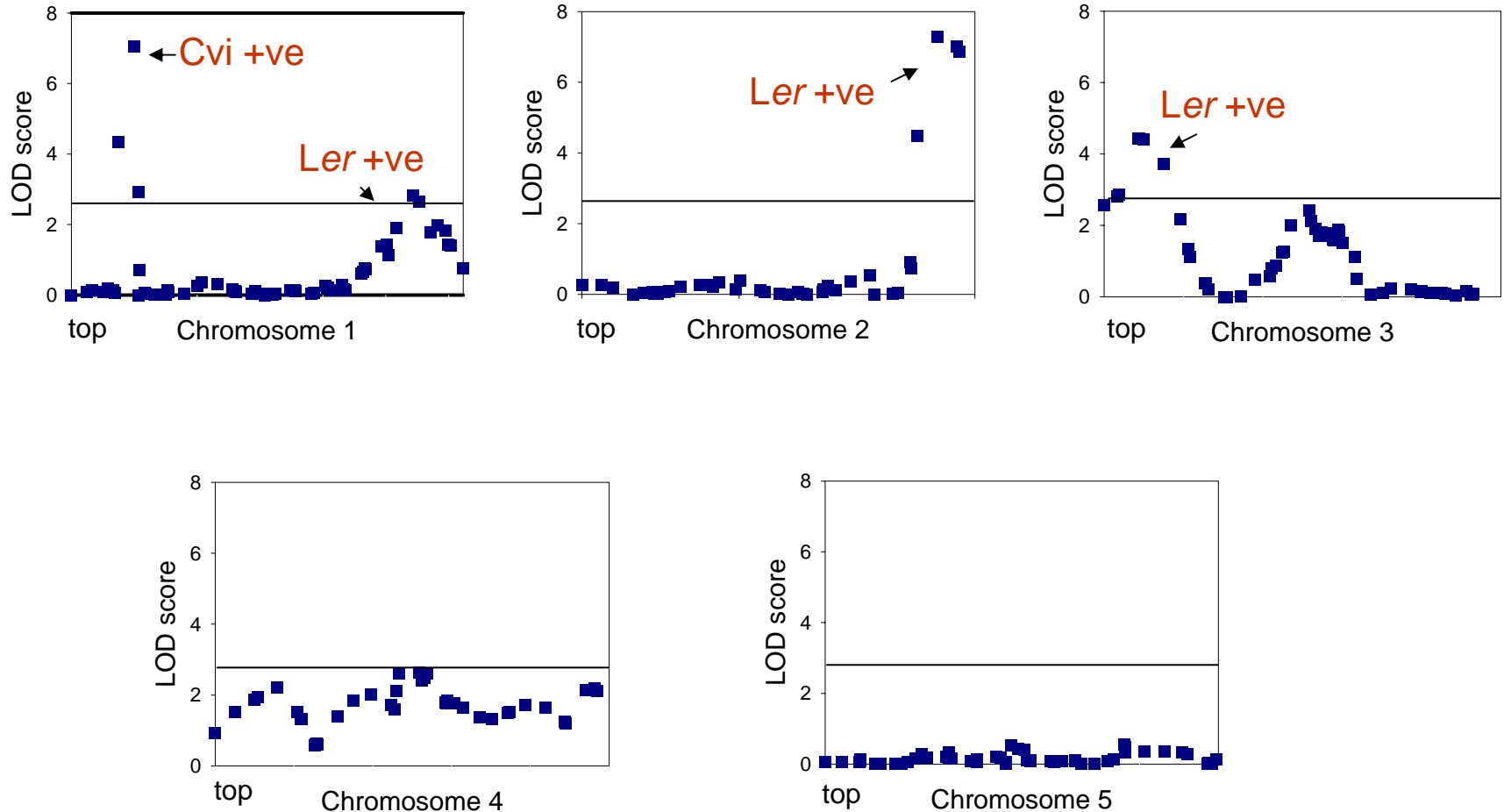
- Ler x Cvi population (Koornneef)
- 162 lines 5 reps – randomised
- Oil content and fatty acid composition

(Hobbs et al (2004) Plant Physiol. 136, 3341-3349)

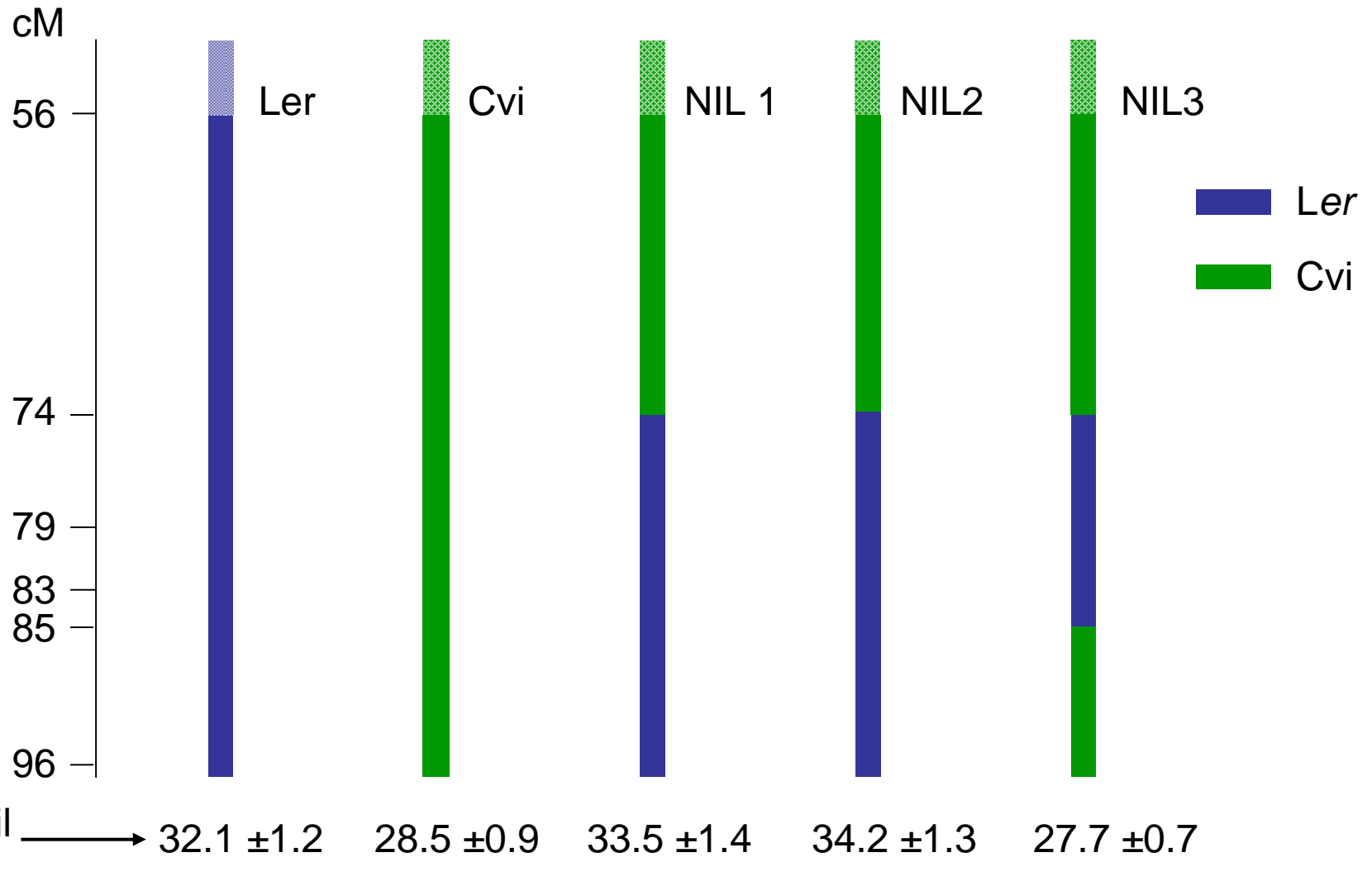
# Frequency distribution of seed oil content in *Ler/Cvi* RILs



# QTL map for seed oil content in *Arabidopsis thaliana*



# Oil content of near isogenic lines for QTL2



# Oil Targets

- High oleic (>75% 18:1)
- High oleic/low linolenic (>70% 18:1, <5% 18:3)  
(health and n-6:n-3 ratio)
- Stabilise 18:3 with respect to GxE
- Low saturates (<7% 16:0 +18:0 + 20:0 +22:0)
- High erucic/low polyunsats (60% 22:1, 40% 18:1)

# Approaches

- Rule out GM for purposes of this discussion
- Mutation – selection on fatty acid composition
- Introgress from germplasm with useful alleles
- TILLING of oil gene paralogs
- Manipulate regulatory genes (need to understand regulation first!)

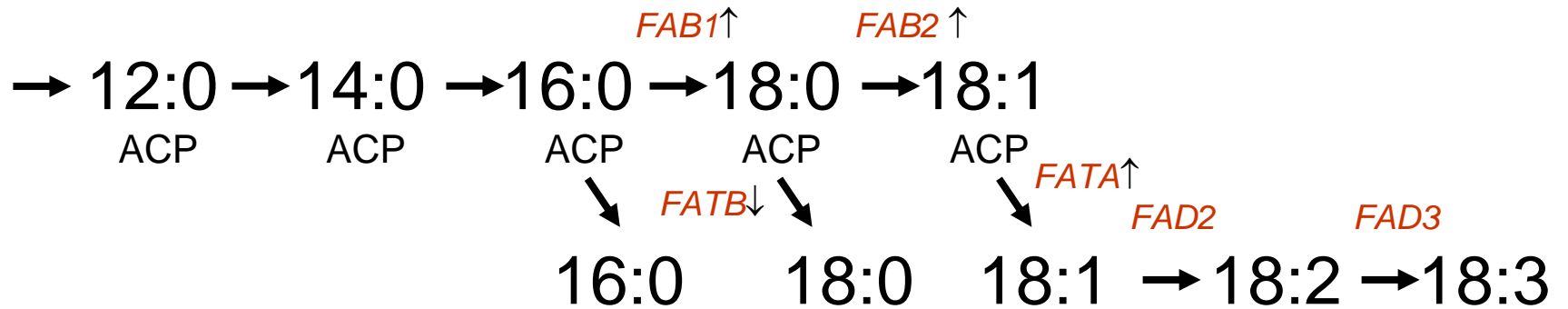


# High Oleic/Low Linolenic

	<b>18:1</b>	<b>18:2</b>	<b>18:3</b>
Canola	63	19-21	10
P6	78	11-13	2-3

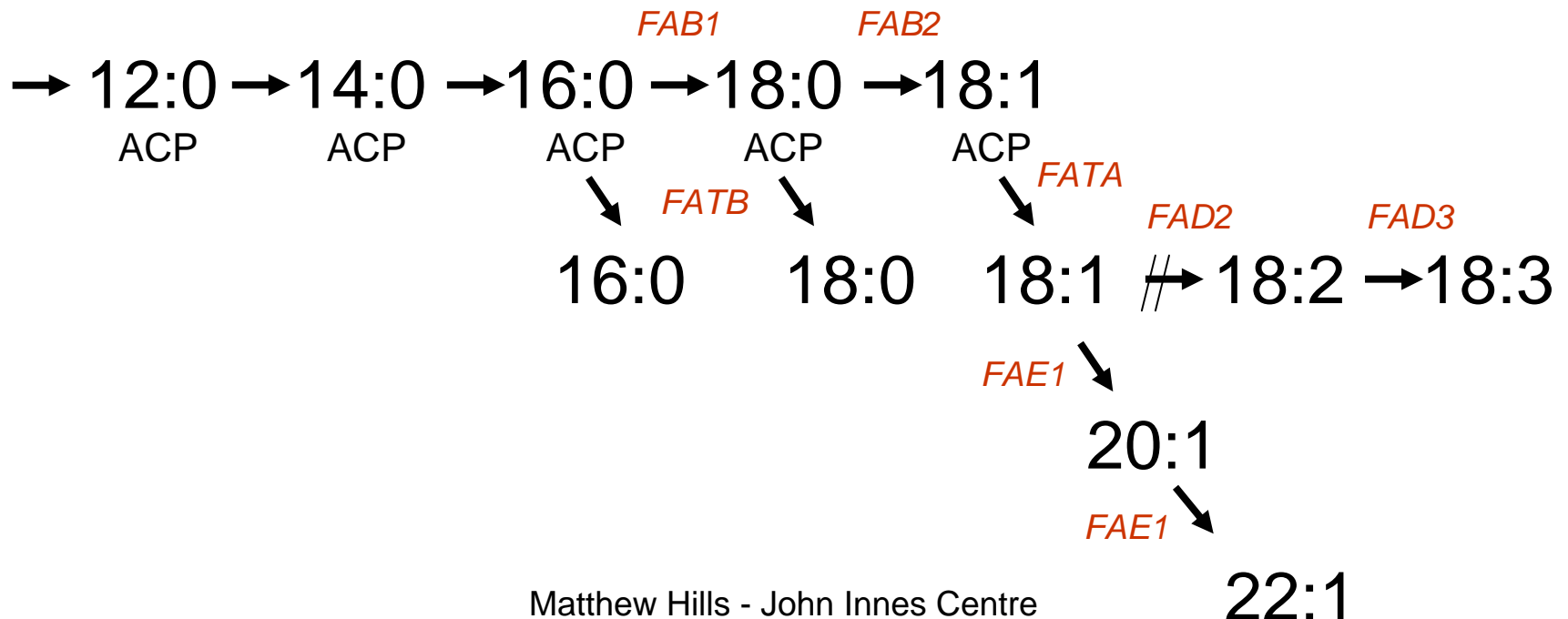
Example from Pioneer Canada 1999

# Low Saturates



# High erucic – low polyunsaturate

- Decrease content of low value co-product
- Optimize recovery of 22:1 in fractionation
- Competition from Crambe? 55% 22:1, 8% 18:2 + 18:3



Thanks to: Doug Hobbs and John Flintham