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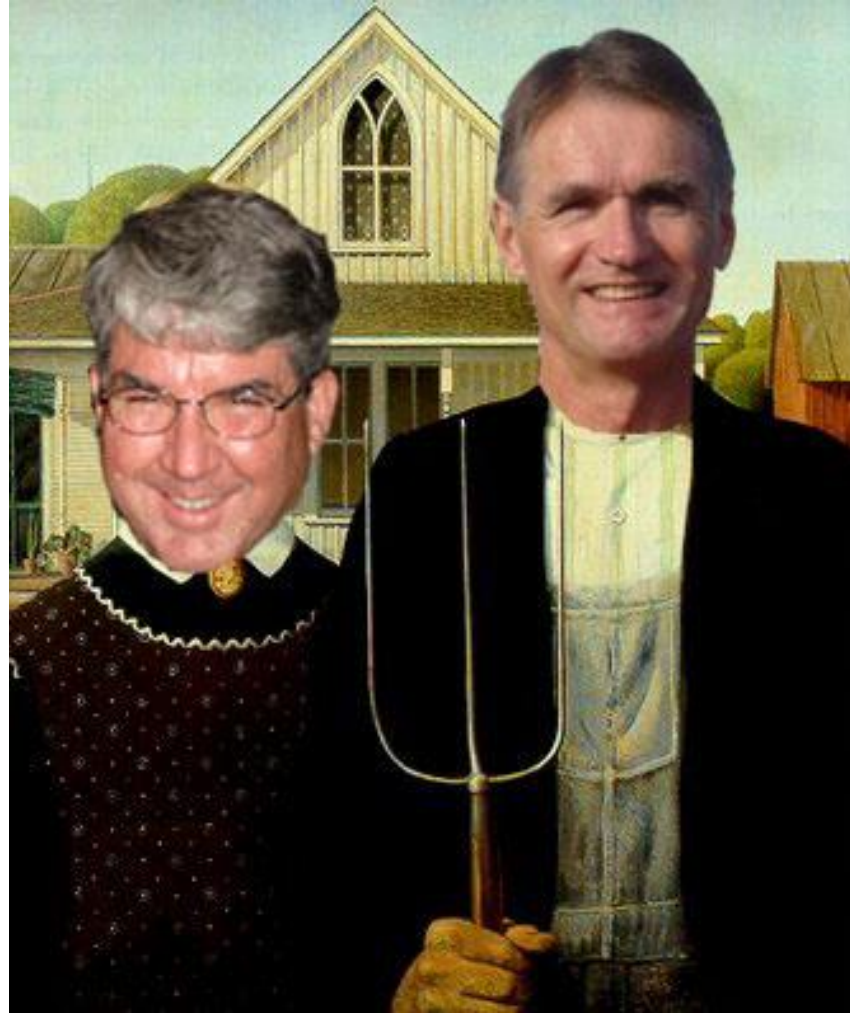
THE ART AND SCIENCE OF ROSE BREEDING



Agenda

- Introductions
- Six-Step Rose Breeding Overview
- The Perfect Example
- Tom's Favorites
- The Not-So-Perfect Example
- Keith's Favorites
- Biotechnology & the Blue Rose
- The Future of Rose Breeding

Introducing: The Godfathers of Rose Breeding



Tom Carruth and Keith Zary



Six-Step Rose Breeding Overview

- Step 1: Set breeding objectives
- Step 2: Parental selection
- Step 3: Hybridizing process (April-June, December)
- Step 4: Progeny selection (4-6 years)
- Step 5: Global trialing (2 years)
- Step 6: Build-up and commercial introduction

Step 1: Set Breeding Objectives

Shared Breeding Objectives

- Disease resistance
- Overall garden performance
- Attractive growth habit
- New colors
- New fragrances



Tom's 'Fourth of July'



Keith's 'Diana, Princess of Wales'

Tom gives special focus to garden beauty, attractive aging color, and rapid repeat-blooming climbers.

Keith concentrates heavily on own-root vigor, powerful fragrances, and strong hybrid teas with high-centered bloom form.

Step 2: Parental Selection

Weeks/J&P Breeding Programs

- Each program has about 2-300 parents
- About half are proprietary
- Both programs located in So Cal
- Important to select parents that will help reach breeding objectives



'Baby Love'



'Beloved'

Tom's Top Parents

- Voodoo
- City of San Francisco
- Baby Love
- Santa Claus
- Unnamed yellow R. soulieana derivative from Herb Swim's work

Keith's Top Parents

- Beloved
- Gemini
- Snowcone
- Unnamed red arching SH seedling from Footloose
- Unnamed fragrant yellow orange blend floribunda seedling from Mirabella

Step 3: Hybridizing Process



Conducting pollinations

- Conduct pollinations (April to June)
- Harvest and clean seed (August to September)
- Stratify seed (70 to 90 days at 2°C)
- Plant seed (December)



Harvesting seed – by hand and by blender



Planting seed

Step 4: Progeny Selection

- First year selection in seedling greenhouse
- All subsequent selections conducted in Wasco fields
- Trialed for at least 6 years
- Selection criteria
 - Disease resistance
 - Vigor and plant habit
 - Beauty of flower
 - Floriferousness
 - Fragrance
 - Cold hardiness



Step 5: International Trialing

All-America Rose Selections (AARS)

- Established in 1938 in response to Plant Patent Act
- 20-25 test gardens across the country
- Rigorous two-year, unbiased trial
- AARS winners considered the best roses in the country



Hot Cocoa

2003 AARS winner

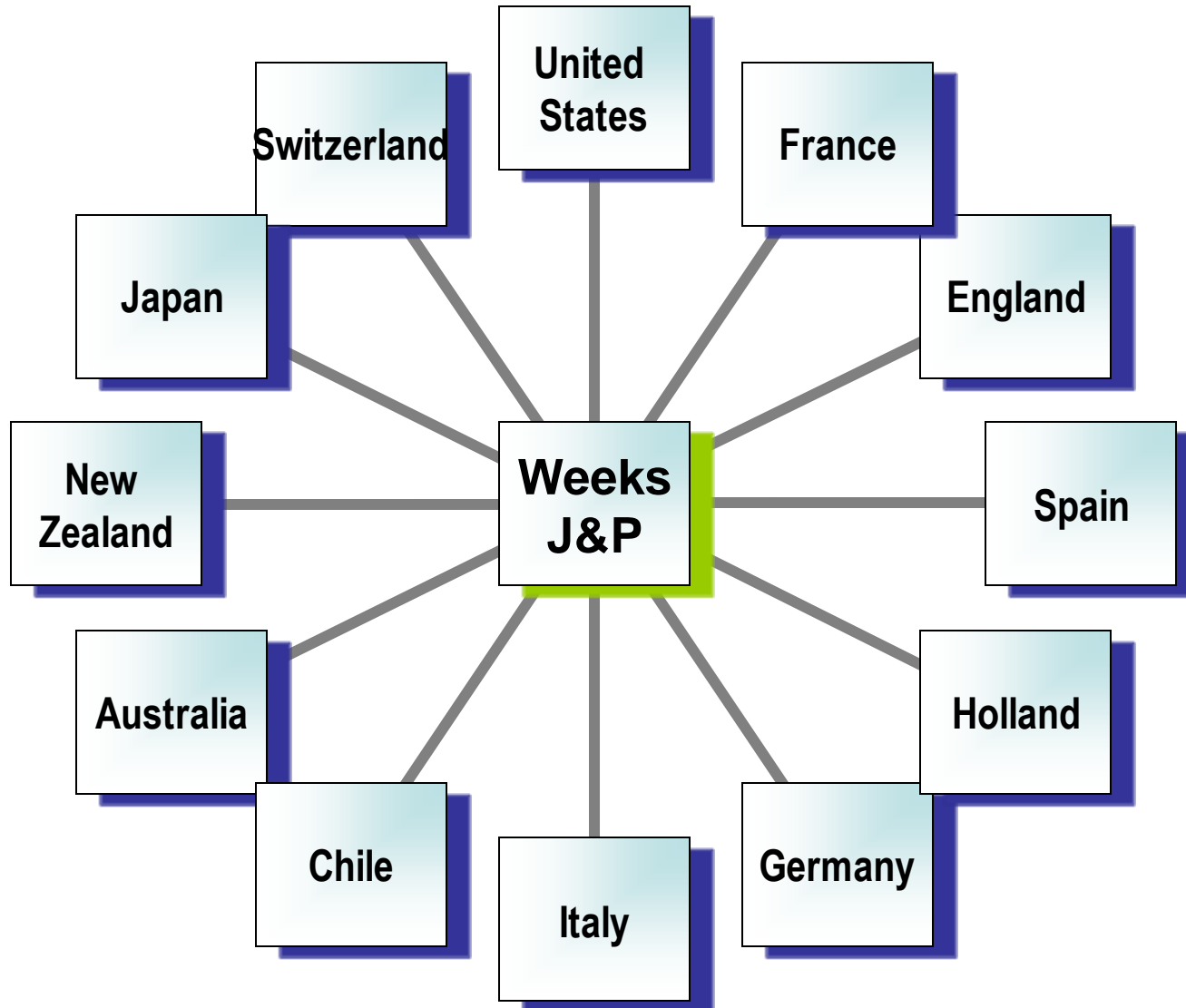


Gemini

2000 AARS winner



Step 5: International Trialing



The Perfect Example

Breeding Objectives

Vigorous climber

Fast repeat bloom

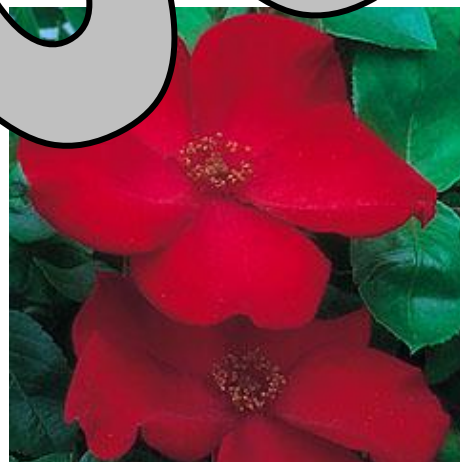
Novel colorations

Disease resistance

Large sprays of flowers

Nationwide performance

Parental Selection



Altissimo



Fourth of July
1999 AARS winner

SUCCESS



Tom's Favorite Rose Creations



Fourth of July



Ebb Tide



Home Run



Julia Child



Moonstone

The Not-So-Perfect Example

Breeding Objectives

Soft pink hybrid tea

Color blend

Powerful fragrance

Super clean foliage

Own-root vigor

High center blooms

Parental Selection



Fragrant Lace



Pope John Paul II

FAILURE



Keith's Favorite Rose Creations



Gemini



Beloved



Snowcone



Tahitian Sunset



Tuscan Sun

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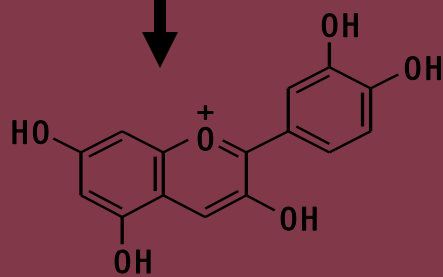
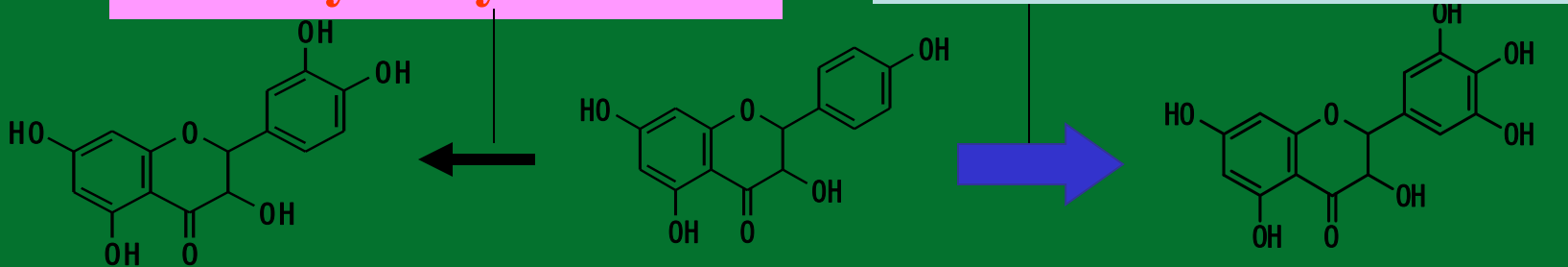
The Mysterious Blue Rose



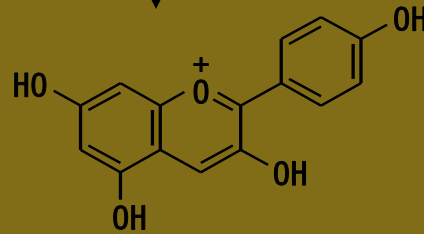
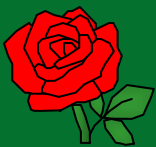
Biosynthetic Pathway of Pigments

Flavonoid 3'-hydroxylase

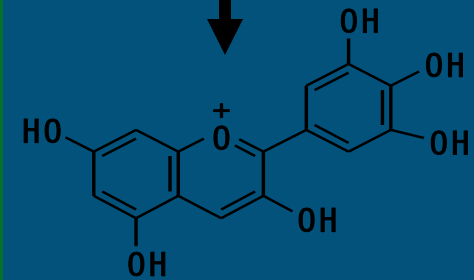
Flavonoid 3', 5'-hydroxylase



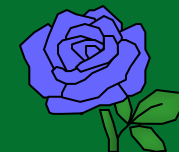
cyanidin



Pelargonidin



**delphinidin
blue pigment**



The pathway of roses

Roses are Red, Violets are Blue



Lavande



Madam Violet



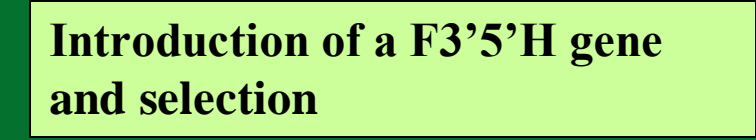
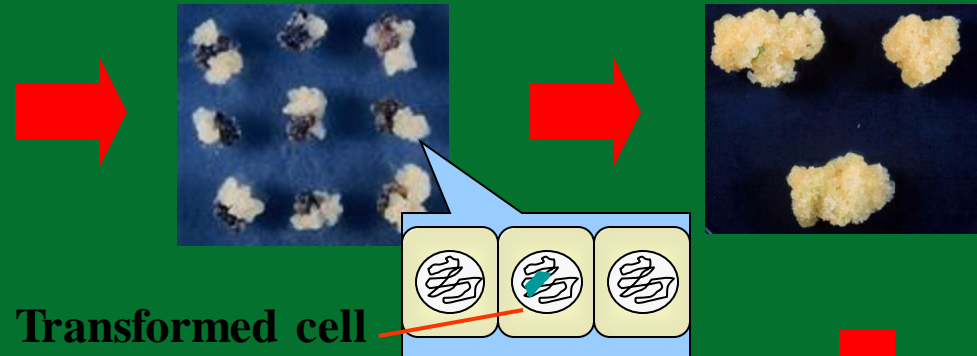
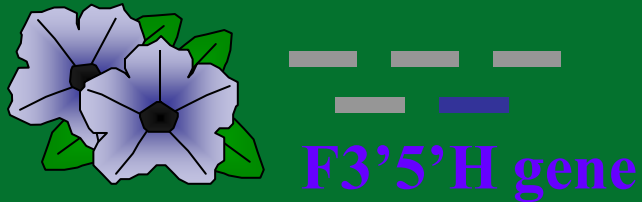
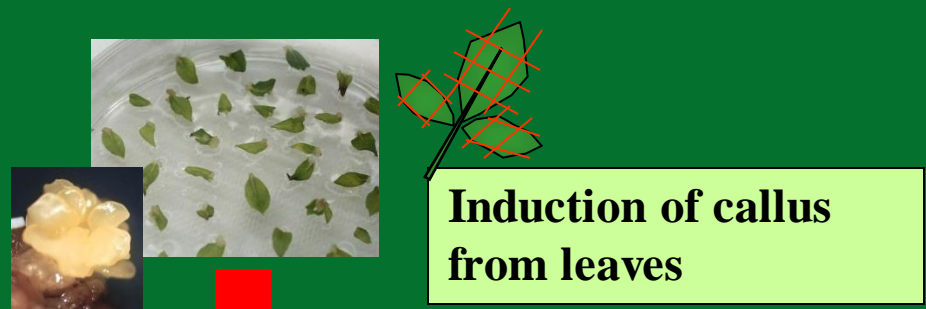
AOZORA (Blue sky)



Seiryu (Blue Dragon)



Generation of Blue Roses

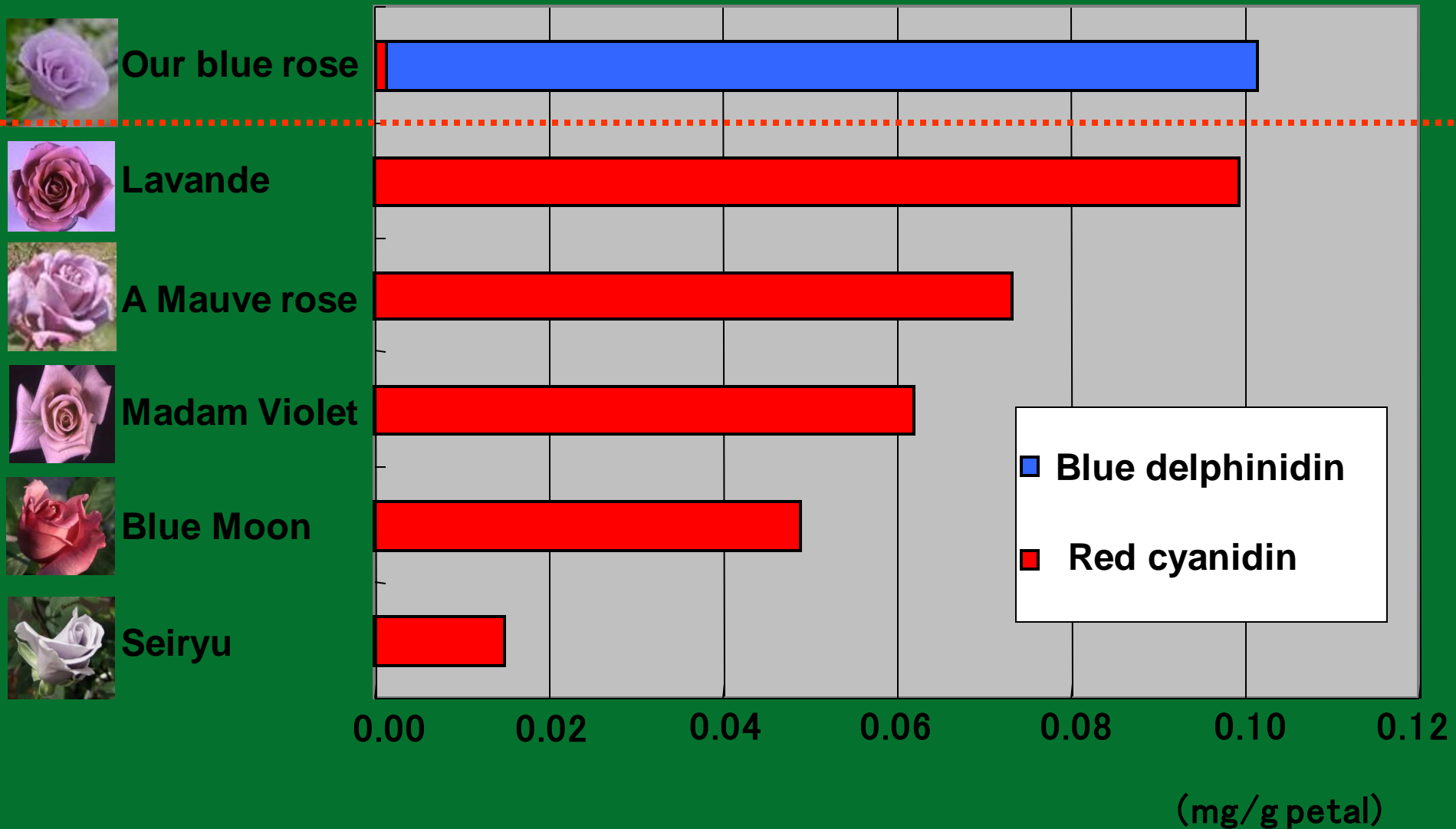


Flowering

Cultivation in glasshouse

Regeneration

Pigment Analysis vs. Mauve Roses



In the End, Roses ARE Blue!

(Well, sort of...)



Host

Transgenic



Jackson & Perkins[®]

TO INFINITY AND BEYOND!
The Future of Rose Breeding



Compact Plant with Big Blooms



New Colors



Really Big Tree Roses



Shade-Loving Roses



Drought Tolerant Roses



Water-Loving Roses



Really Cold Hardy Roses!



New Fragrances



Rainbow Roses?



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ANY QUESTIONS?

