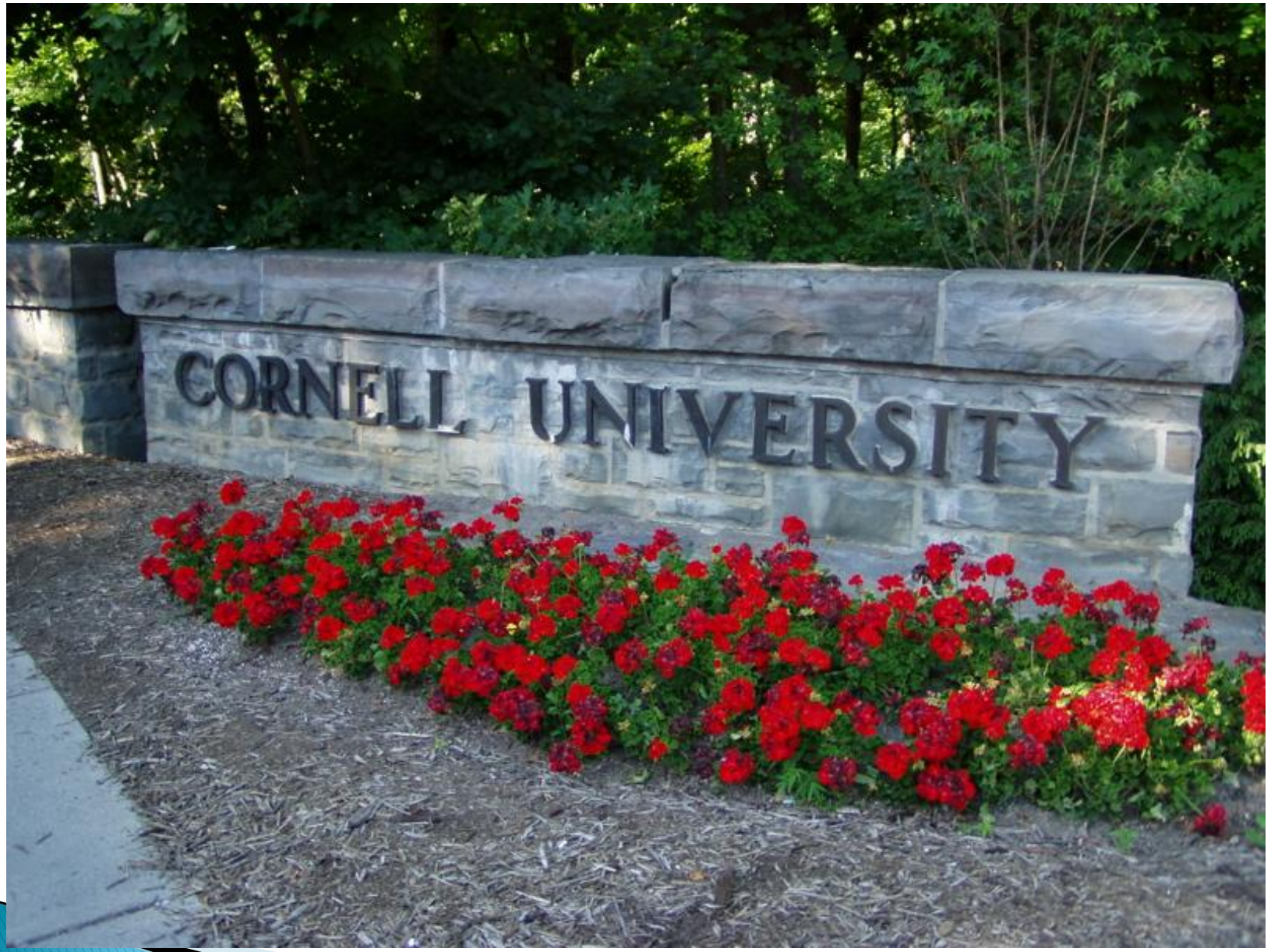
จากเมืองไทยไปทำอะไร?
ที่
Cornell

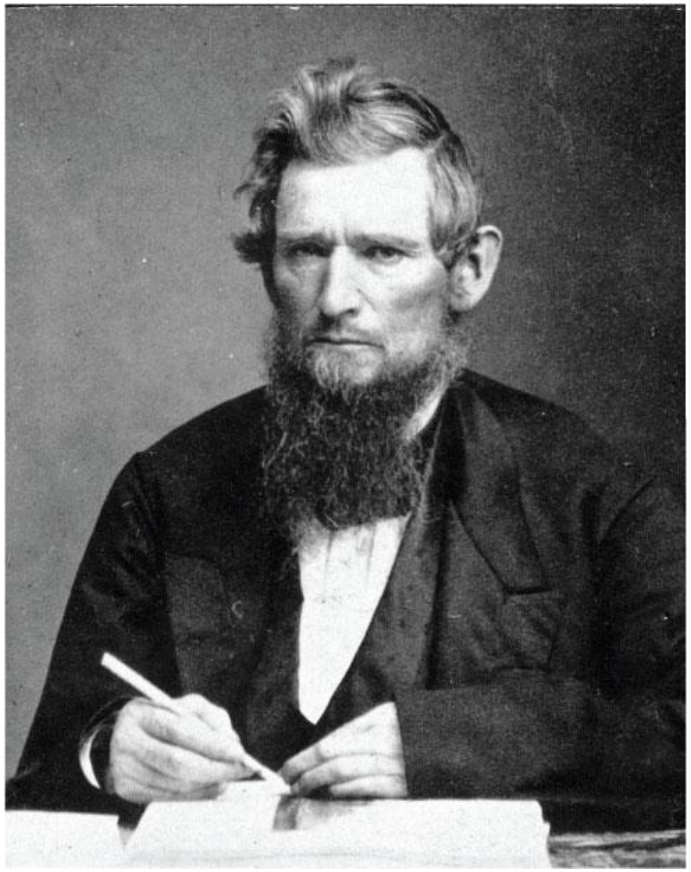

CORNELL UNIVERSITY

Facts about Cornell

- ก่อตั้ง
  - April 27, 1865
  - โดย Ezra Cornell และ Andrew D. White
- ที่ตั้ง Ithaca, New York, USA
  - 745 acres (1900 ไร่)
- Public and Private
  - Federal land-grant institution of New York State
- Ivy League

Facts about Cornell

- 11 Colleges/School
  - College of Agriculture and Life Science
    - Department of Horticulture
- Student (2008)
  - Undergraduate 13846
  - Graduate 6427
- Semester:
  - Fall (Mid Aug. – Mid Dec.)
  - Spring (Late Jan. – Mid May)



Ezra Cornell

Andrew D. White

USA


WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINA
PENNSYLVANIA
NEW YORK
VT
NH
MAINE
MASS
CONN
RI
NEW JERSEY
DELAWARE
DC
MARYLAND
ALASKA
HAWAII
CONN: CONNECTICUT
MASS: MASSACHUSETTS
NH: NEW HAMPSHIRE
RI: RHODE ISLAND
VT: VERMONT


การจราจร
เพิ่มเติม
แผนที่
Ithaca
New York City
Rochester
Fulton
Syracuse
Oneida
Utica
Ilion
Newark
Batavia
Buffalo
Hamburg
Eden
Springville
Auburn
Geneva
Seneca Falls
Penn Yan
Cortland
New York
Amsterdam
Schenectady
Albany
Bennington
Cohoes
North Adams
Pittsfield
Springs
Norwich
Oneonta
Horseheads
Corning
Elmira
Endicott
Binghamton
Olean
Bradford
Kane
St Marys
Ridgway
DuBois
Clearfield
Springfield
Hartford
Connecticut
Danbury
Bridgeport
Stamford
White Plains
Mt Vernon
Clifton
Newark
Edison
East Brunswick
Trenton
Toms River
Scranton
Wilkes-Barre
Nanticoke
Hazleton
Williamsport
Lock Haven
Bloomsburg
Pennsylvania
Sunbury
Mt Carmel
Shamokin
Pottsville
Allentown
Tyrone
Altoona
Lebanon
Reading
Harrisburg
York
Lancaster
Philadelphia
Wilmington
Newark
New Jersey
Millville
Linwood
Atlantic City
Ocean City
Dover
Cumberland
Keyser
Maryland
Frederick
Baltimore
Silver Spring
Columbia
Winchester
Leesburg
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476
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99
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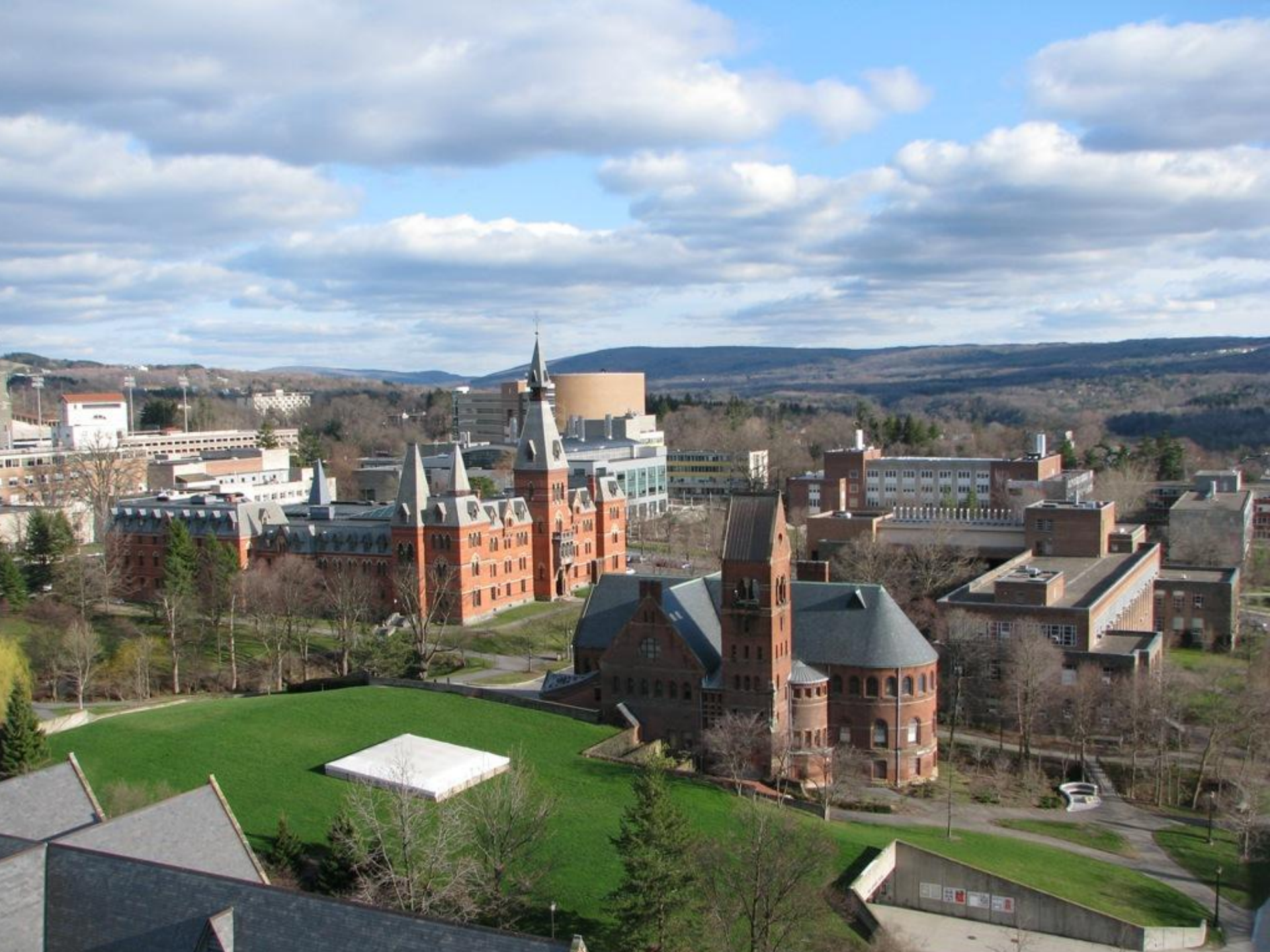
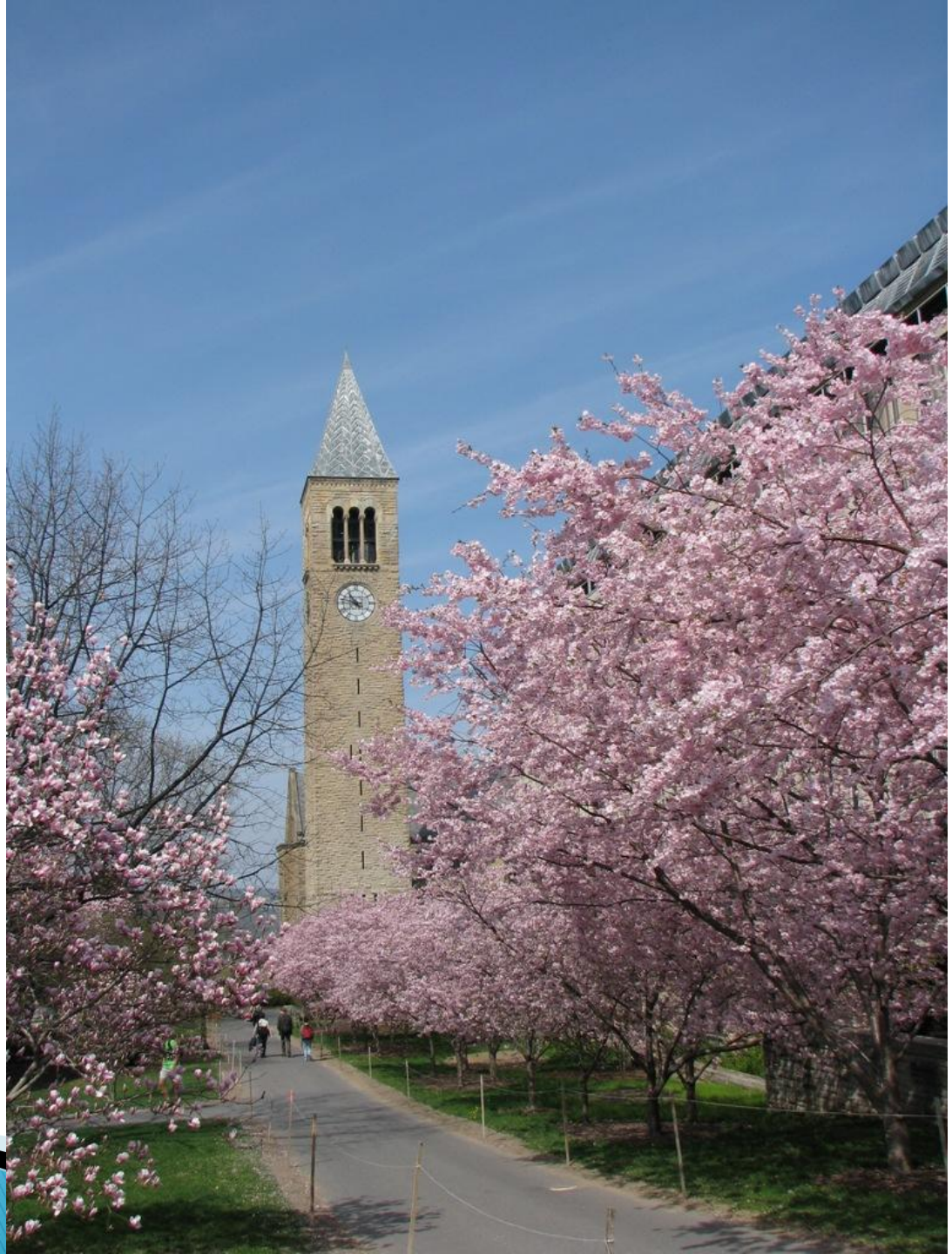
68
83





ทำอย่างไร? ถึงได้ไป Cornell

ความสามารถ
หรือ
โชคช่วย?

การเรียนปริญญาเอก

Department of Horticulture

- Floriculture & Ornamental Horticulture
- Pomology
- Vegetable Crops

- Postharvest Physiology
- Graduate Research Assistantship

Plant Science Building

PhD Degree Requirements

- Special committee
  - อย่างน้อย 3 คน
- Coursework
  - แล้วแต่ Special committee
  - สัมมนา 4 หน่วย
- ผ่าน “Q-Conference”
- ผ่าน “A” exam
- ผ่าน “B” exam

PhD Degree Requirements

- TA (Teaching assistant)
- ส่งเล่มวิทยานิพนธ์

Grad Field Review Day

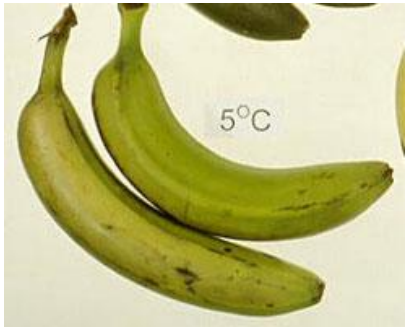
การทำวิทยานิพนธ์

Prof. Dr. Christopher B. Watkins

Effects of Chilling on Tomato Fruit Ripening

Chilling = an exposure to low, but non-freezing, temperatures

Chilling injury = a physiological disorder that occurs when plant or plant parts exposed to low, but non-freezing, temperatures.



Part 1. Cell Wall Metabolism

alteration of cell wall metabolism by chilling → mealiness or woolliness in peaches and nectarines

lack of juiciness, dry and mealy texture

major commercial problem

Objective:

To evaluate the hypothesis that tomato could be a model system to investigate cell wall alteration induced by chilling injury in fruit

Breaker stage

cv. Trust

3 °C

1, 2, 3 weeks

Cold storage

20 °C

0, 1, 3, 5, 7, 9, 12 d

Ripening

20 °C

0, 1, 3, 5, 7, 9, 12 d

Ripening

Fruit assesments:
- Ethylene production
- Color
- Firmness (Deformation)
- Extractable juice

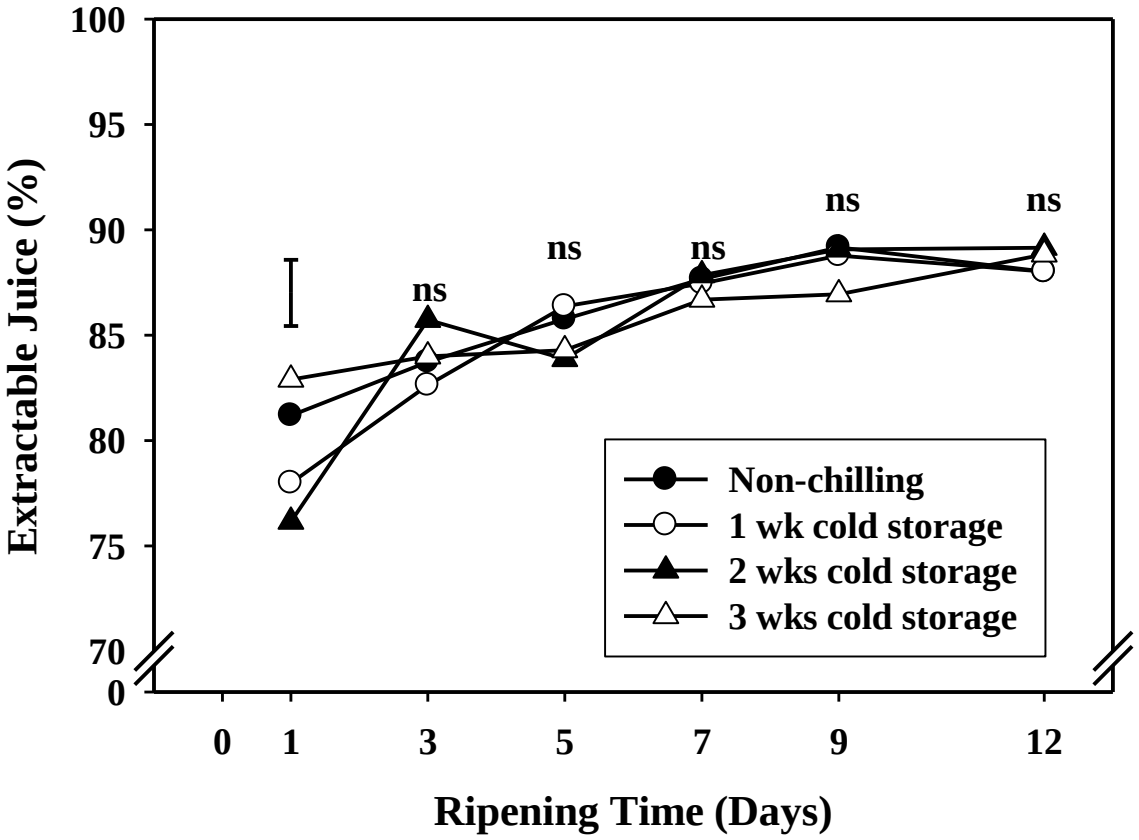
Cell wall analyses:
- Pectin solubilization
- Pectin depolymerization

Enzyme activity:
- Polygalacturonase (PG)
- Pectin methylesterase (PME)
- β-galactosidase (β-gal)
- Endo-β-1,4-glucanase (EGase)

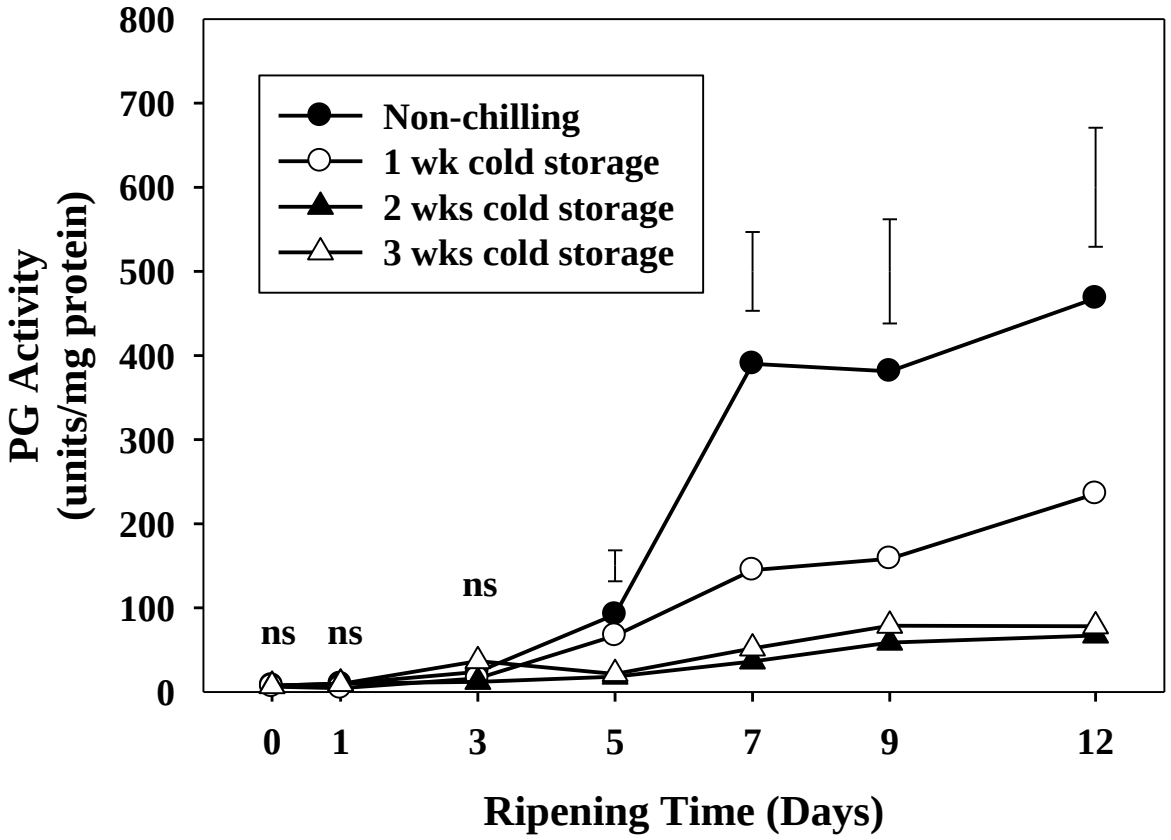
Gene expression (northern blot analysis):
- *PG* → PG
  PME1.9 → PME
  LeExp1 → Expansin
  TBG4 → β-galactosidase
  Cel1,Cel5,Cel8 → EGase

Protein accumulation (western blot analysis):
- PG and Expansin 1

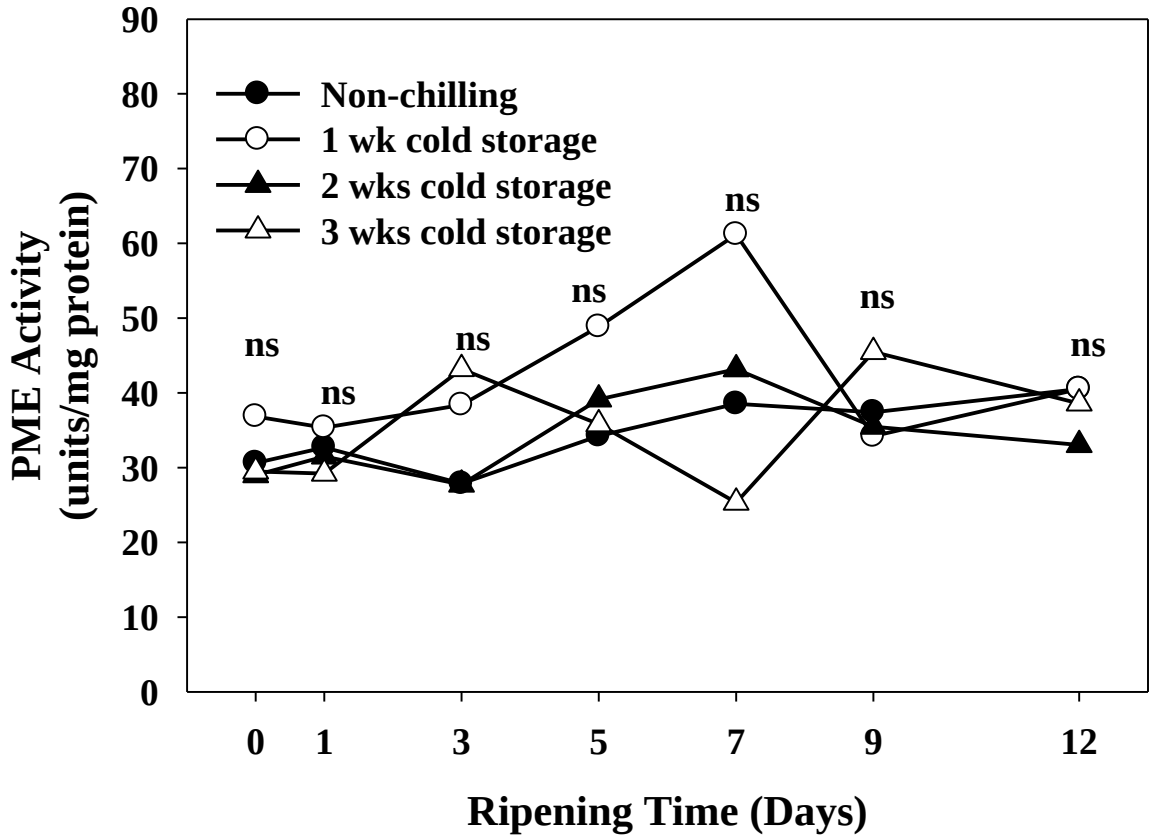
Extractable juice



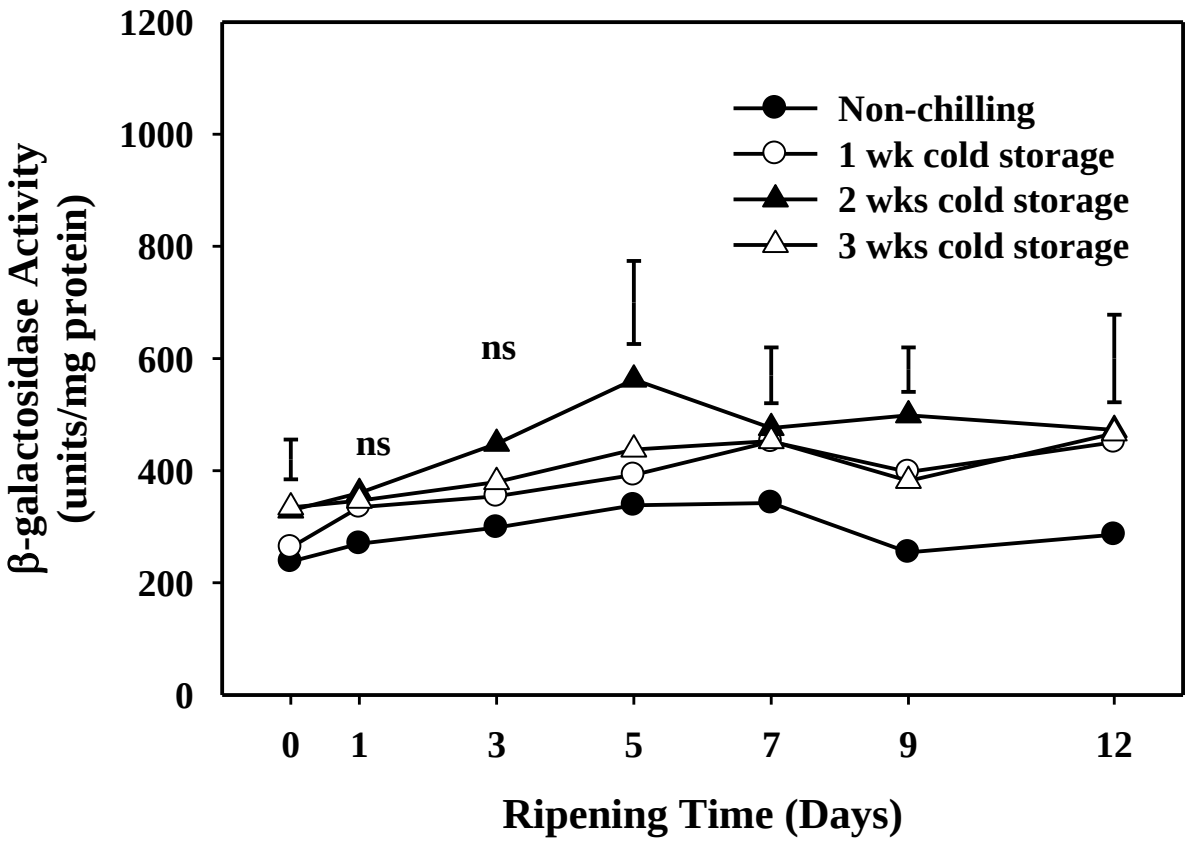
PG activity


800
700
600
500
400
300
200
100
0
PG Activity
(units/mg protein)
Non-chilling
1 wk cold storage
2 wks cold storage
3 wks cold storage
ns
ns
ns
0
1
3
5
7
9
12
Ripening Time (Days)

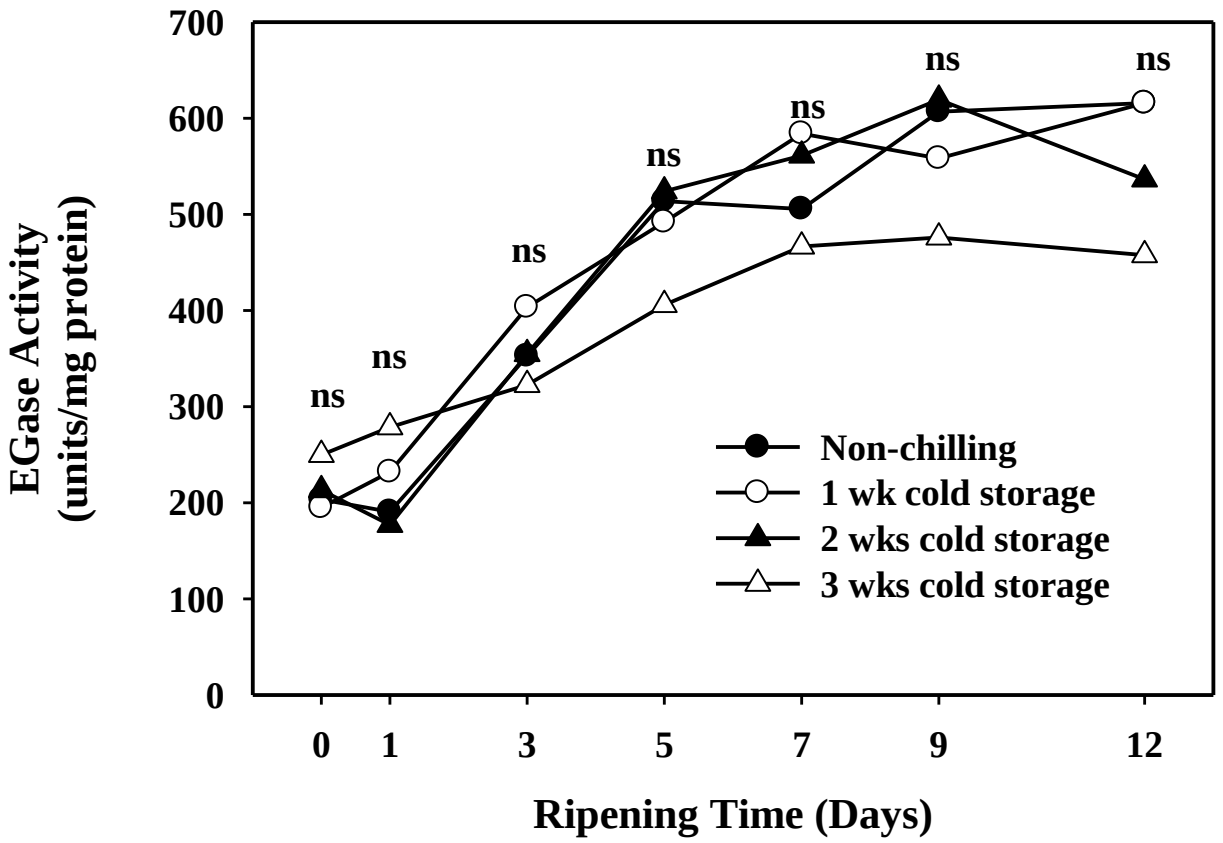
PME activity



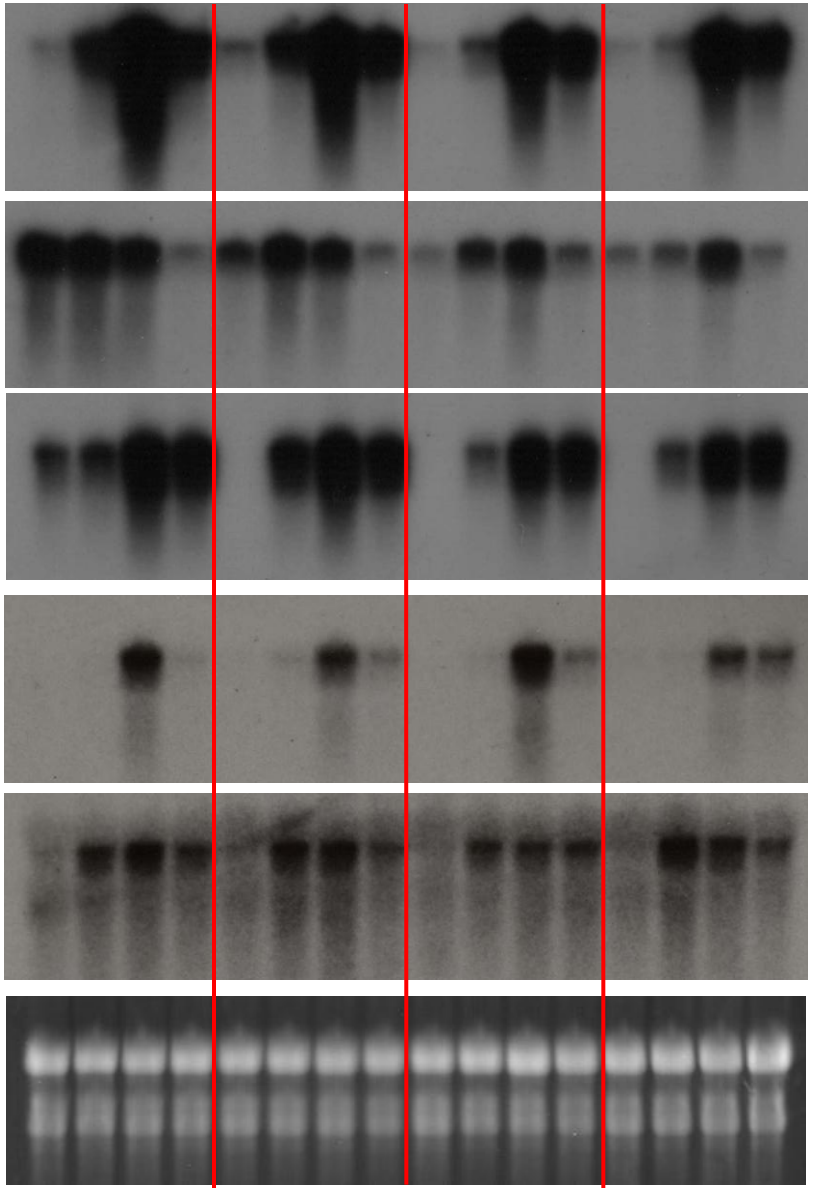
β-gal activity



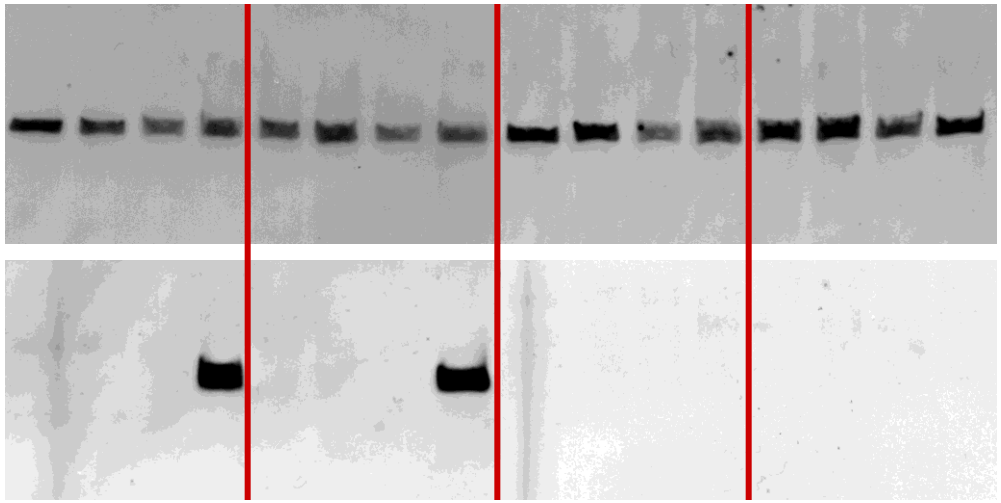
EGase activity



Northern blot analysis



Western blot analysis



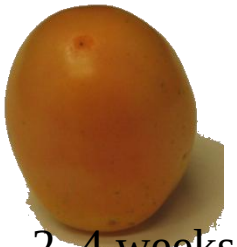
Part 2. The expression of ripening-related genes affected by chilling in tomato fruit

Objective:

To examine the effects of chilling on a wider range of metabolic processes than those involved in cell wall disassembly

Breaker stage

IL 11-2



3 °C

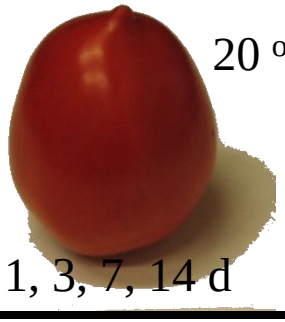
1, 2, 4 weeks

Cold storage

20 °C

0, 1, 3, 7, 14 d

Ripening



20 °C

0, 1, 3, 7, 14 d

Ripening

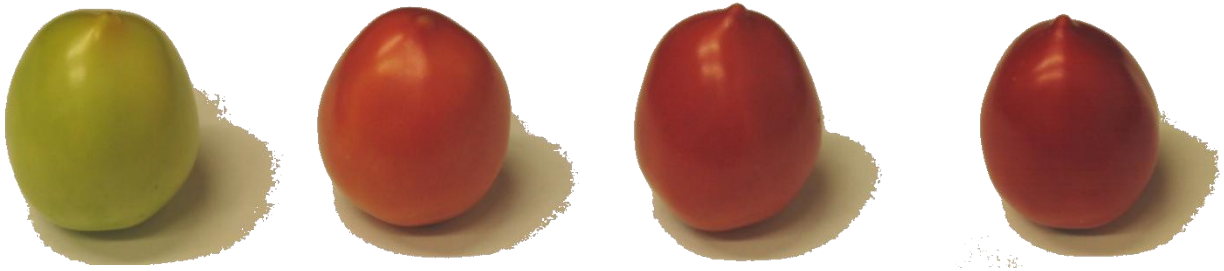
Fruit assessments:
- Ethylene production
- Color
- Firmness

Gene expression:
- Reverse transcription polymerase chain reaction (RT-PCR) analysis
- Candidate genes
    (1) previous published work
    (2) microarray analysis

nonchilled vs. fruit stored for 4 weeks

5 groups of genes investigated:
1. color, 2. softening, 3. volatiles, 4. ethylene biosynthesis and perception, 5. LeMADS-RIN

Nonchilling

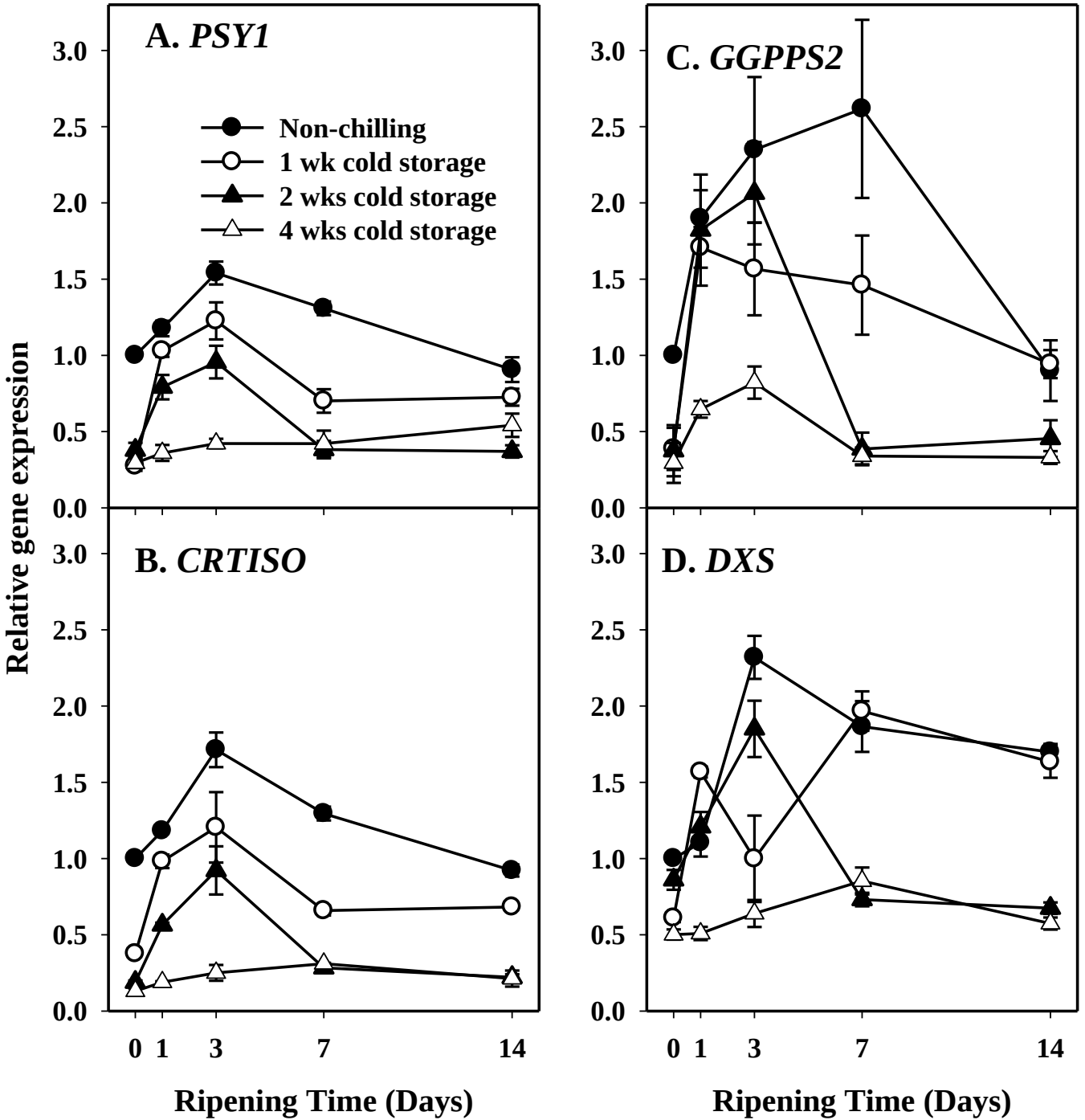


Day(s) at 20 °C	0 d	3 d	7 d	14 d	21 d

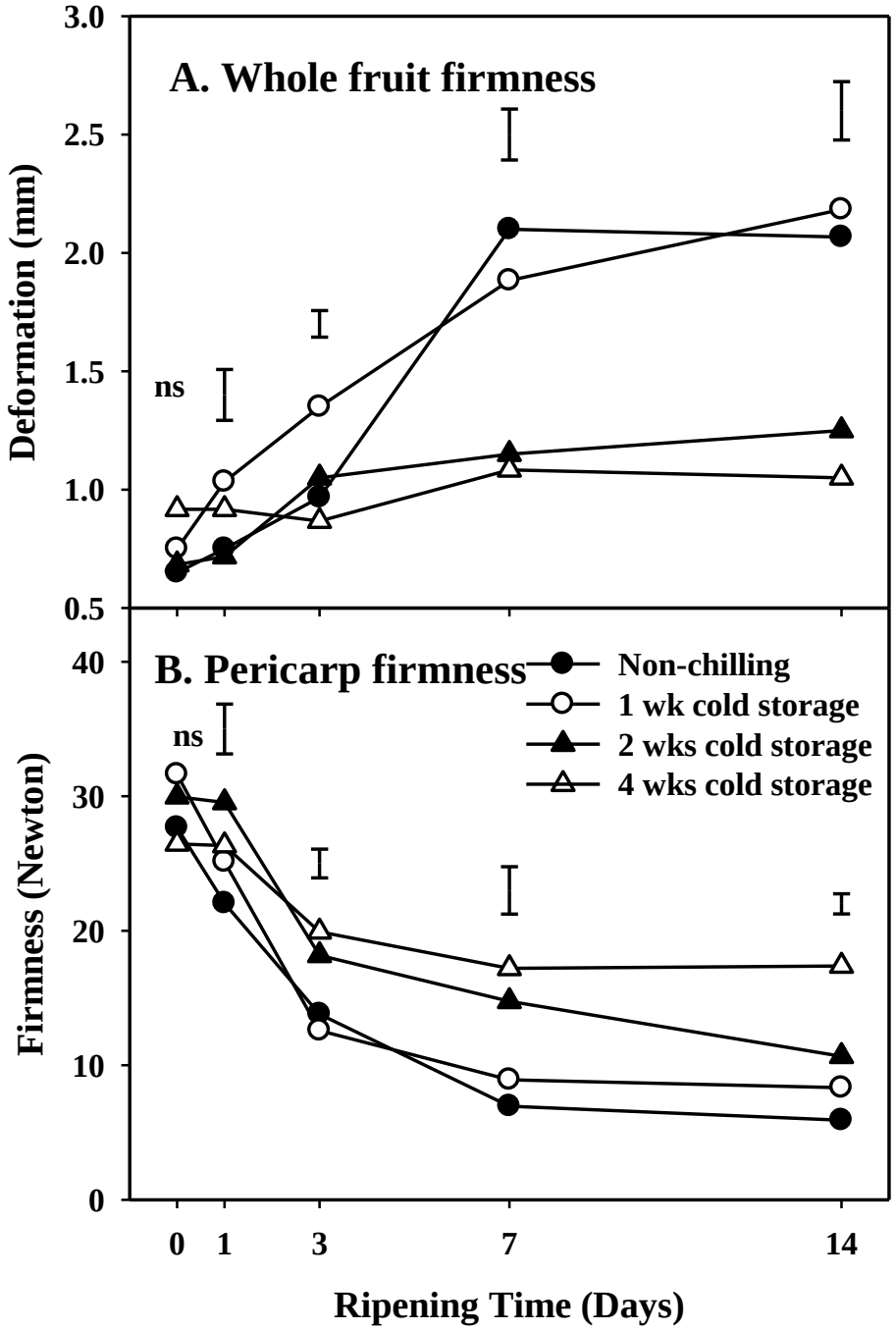
4 wks cold storage

1. *PSY1* = phytoene synthase 1
2. *CRTISO* = carotenoid isomerase
3. *GGPPS2* = geranylgeranyl diphosphate synthase 2
4. *DXS* = 1-deoxy-D-xylulose-5-phosphate synthase

Carotenoid biosynthesis

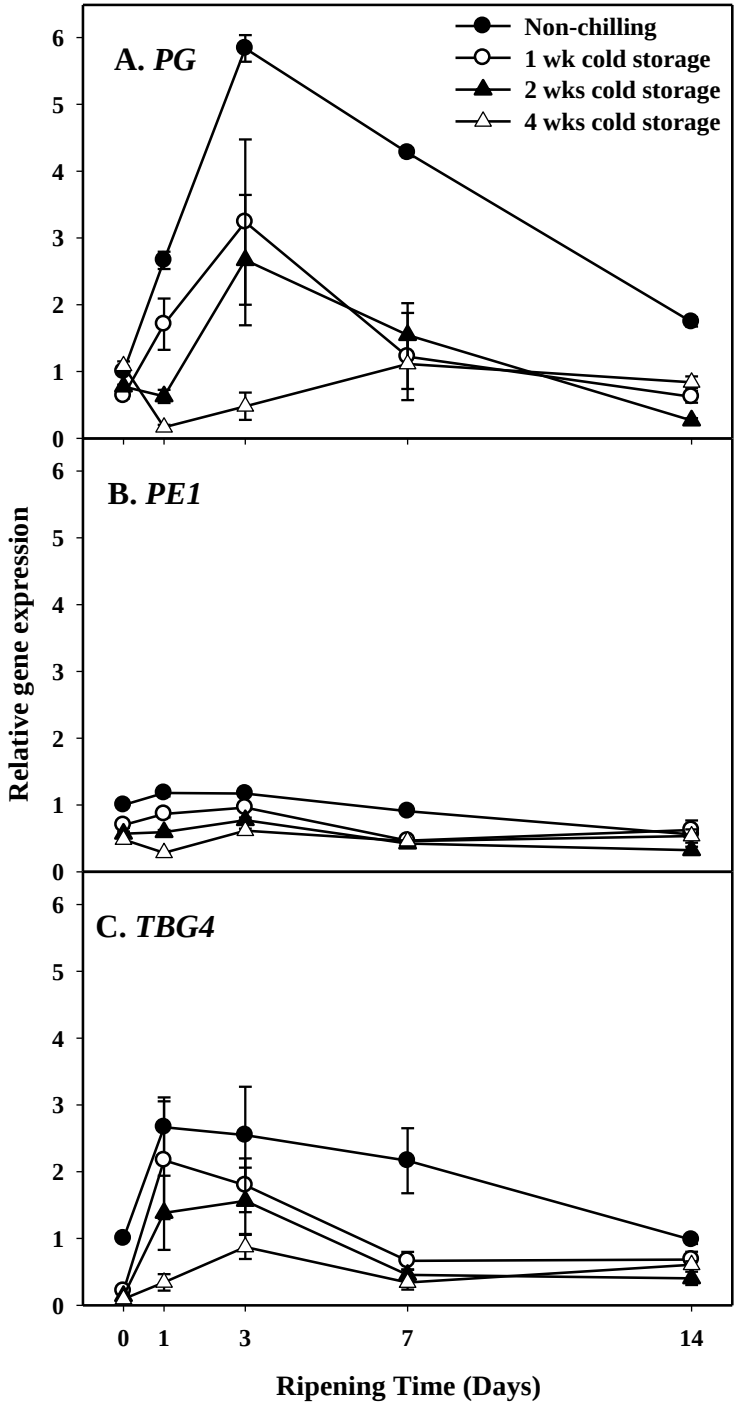


2. Softening

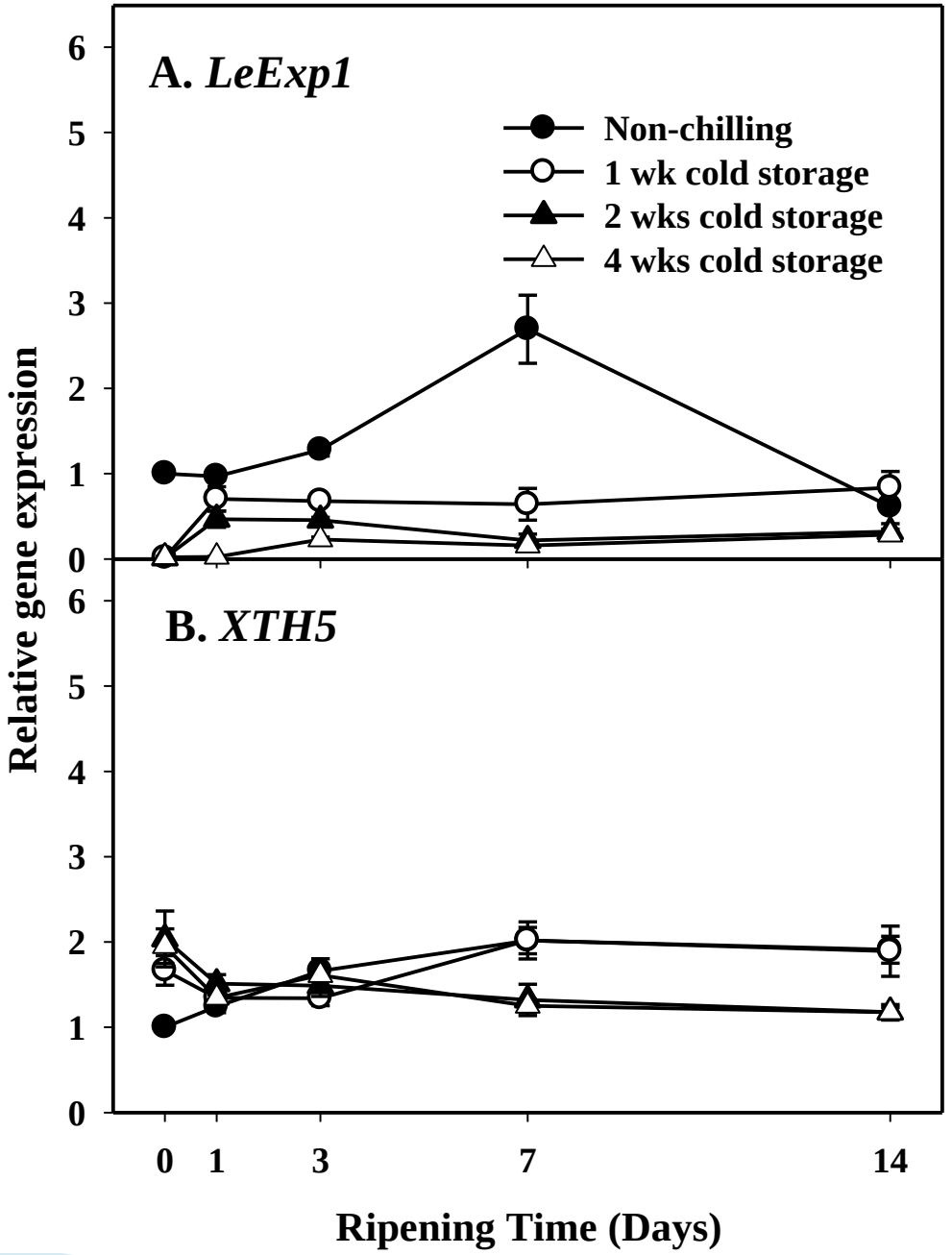

A. Whole fruit firmness
Deformation (mm)
3.0
2.5
2.0
1.5
1.0
0.5
ns
B. Pericarp firmness
Firmness (Newton)
40
30
20
10
0
ns
Non-chilling
1 wk cold storage
2 wks cold storage
4 wks cold storage
0
1
3
7
14
Ripening Time (Days)

1. *PG* = polygalacturonase
2. *PE* = pectin esterase 1
3. *TBG4* = b-galactosidase TBG4
4. *LeExp1* = tomato expansin 1
5. *XTH5* = xyloglucan endotransglucosylase/ hydrolase 5

Cell wall disassembly (1)

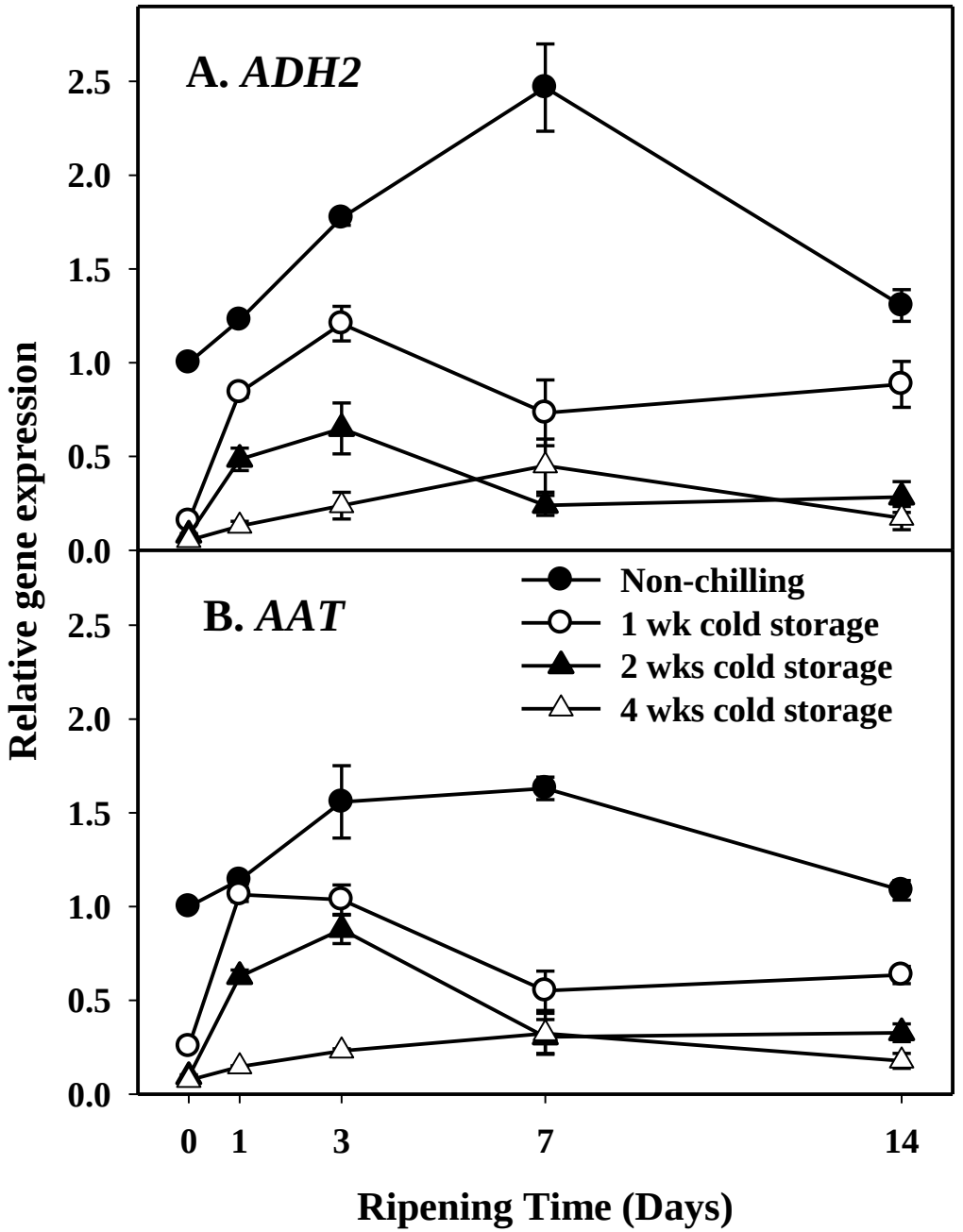


Cell wall disassembly (2)

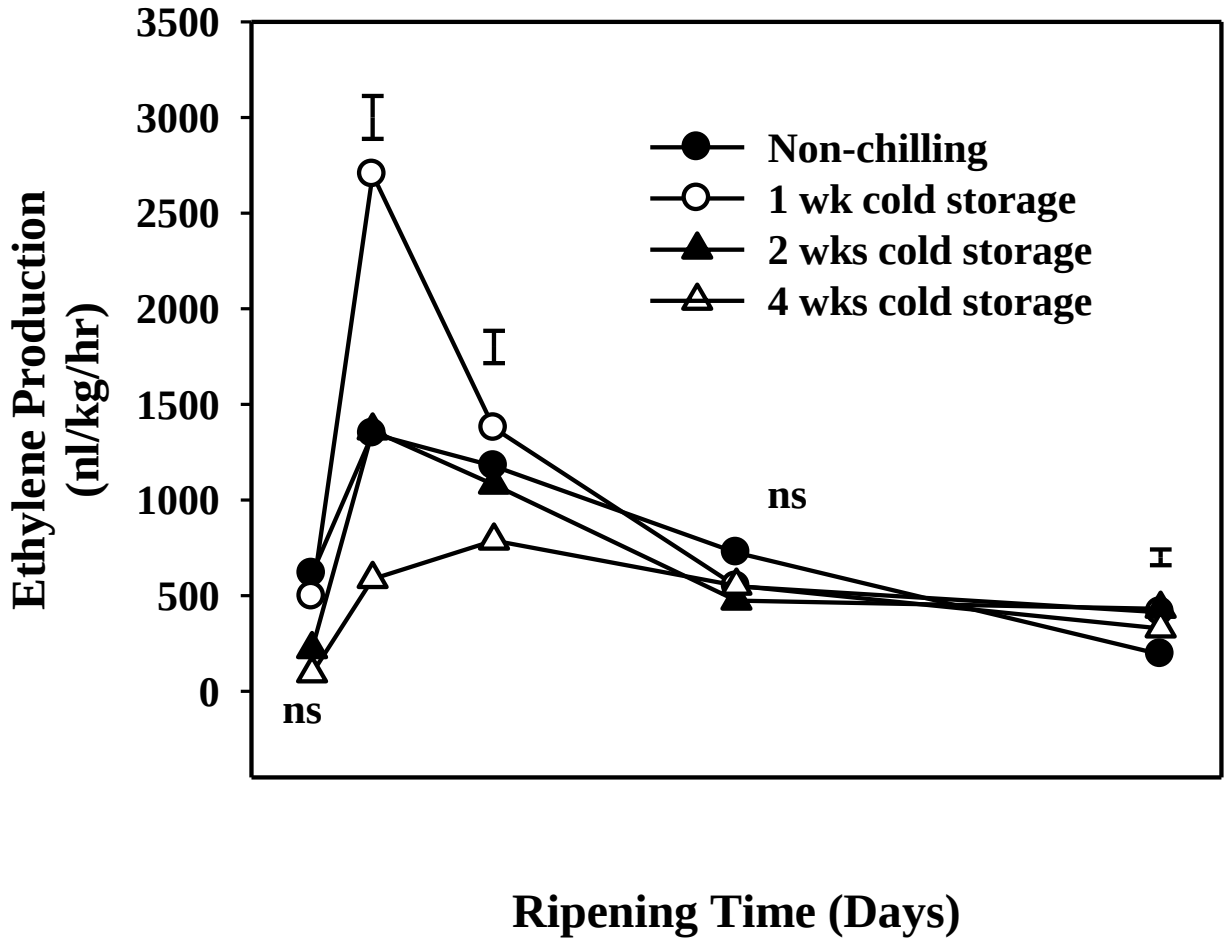


1. *ADH2* = alcohol dehydrogenase 2
2. *AAT* = alcohol acyltransferase

3. Volatile Biosynthesis

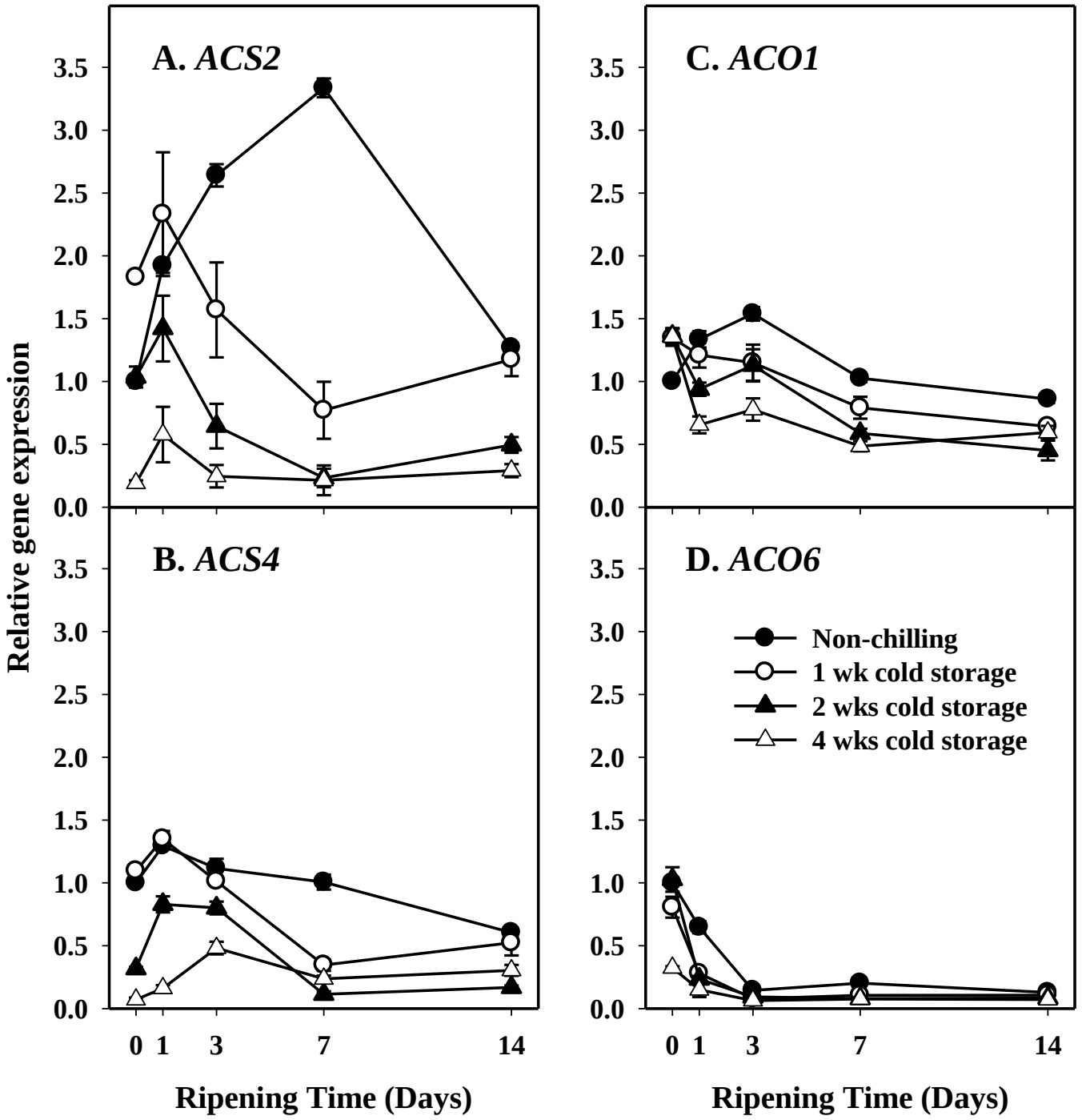


4. Ethylene Biosynthesis and Perception

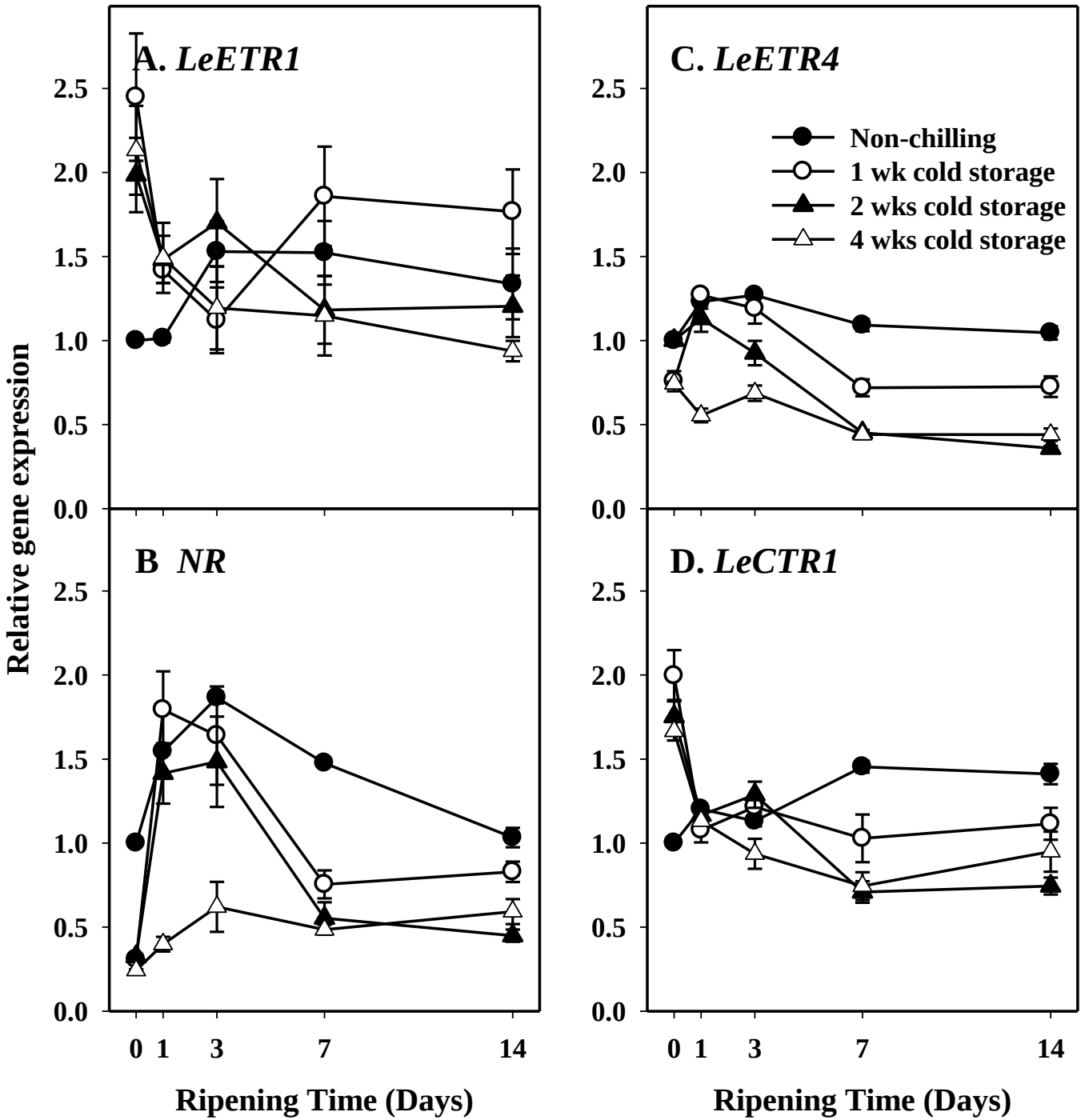


1. *ACS2* = 1- amino cyclopropane-1-carboxylic (ACC) synthase 2
2. *ACS4* = ACC synthase 4
3. *ACO1* = ACC oxidase 1
4. *ACO6* = ACC oxidase 6

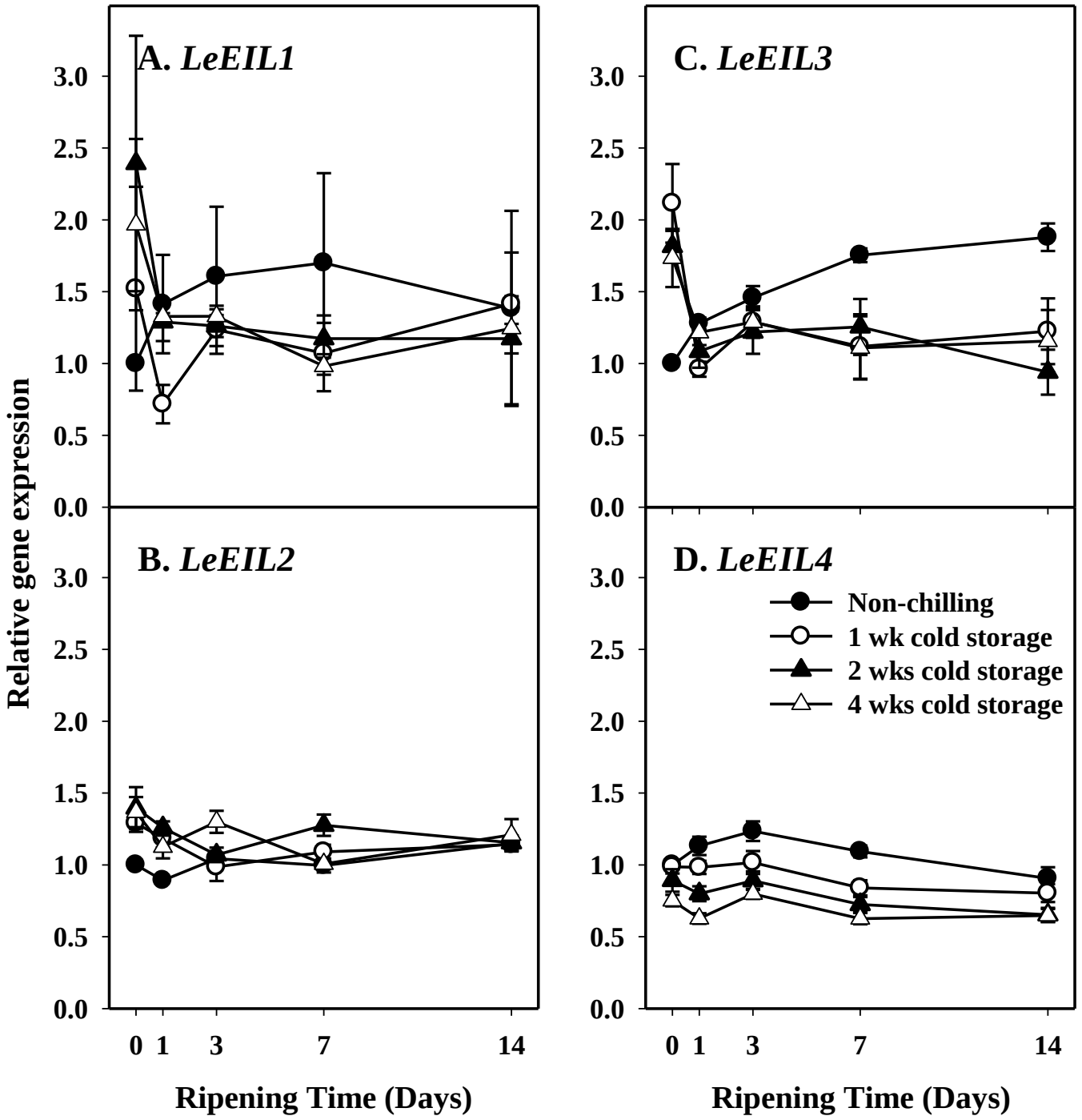
Ethylene biosynthesis



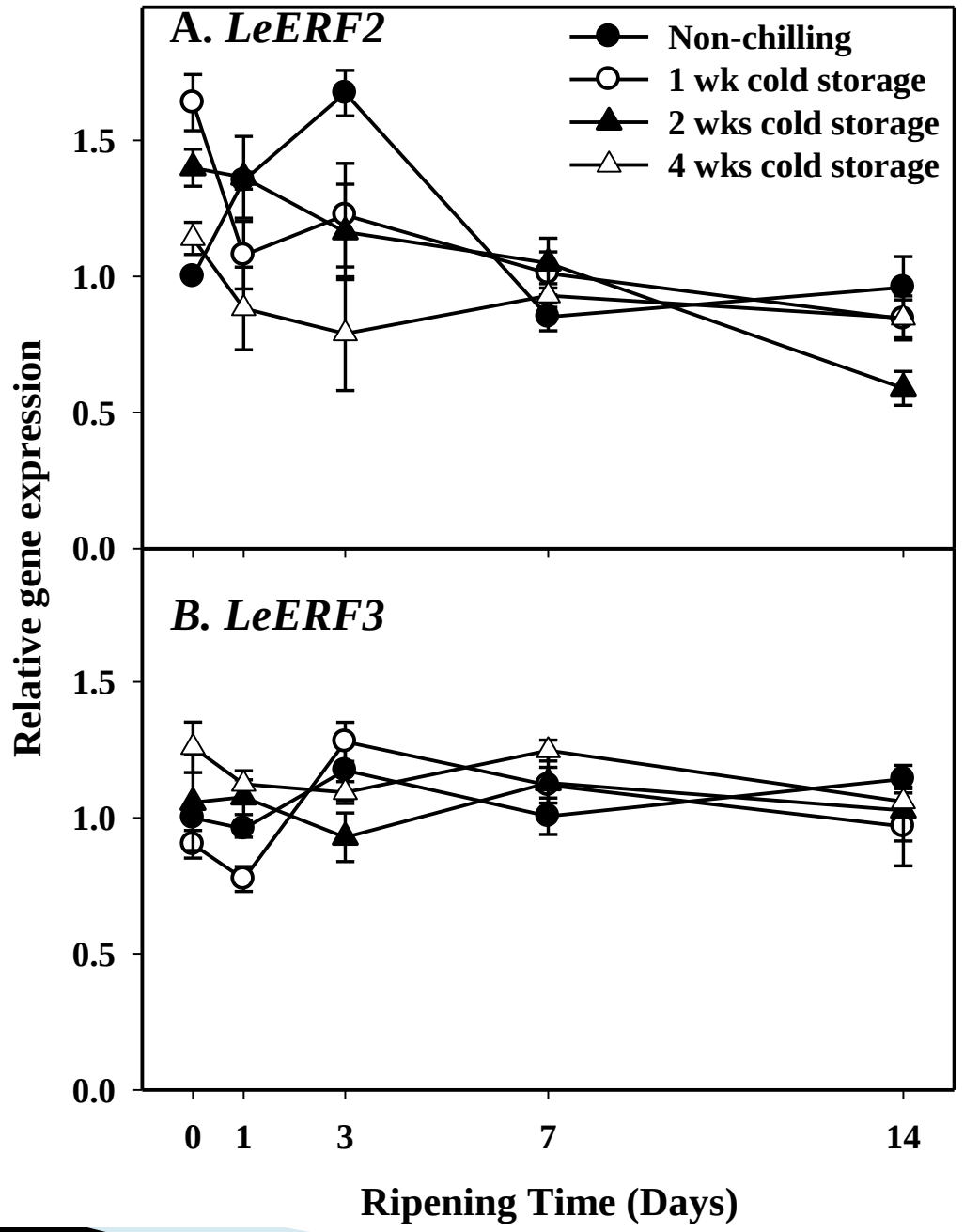
Ethylene perception



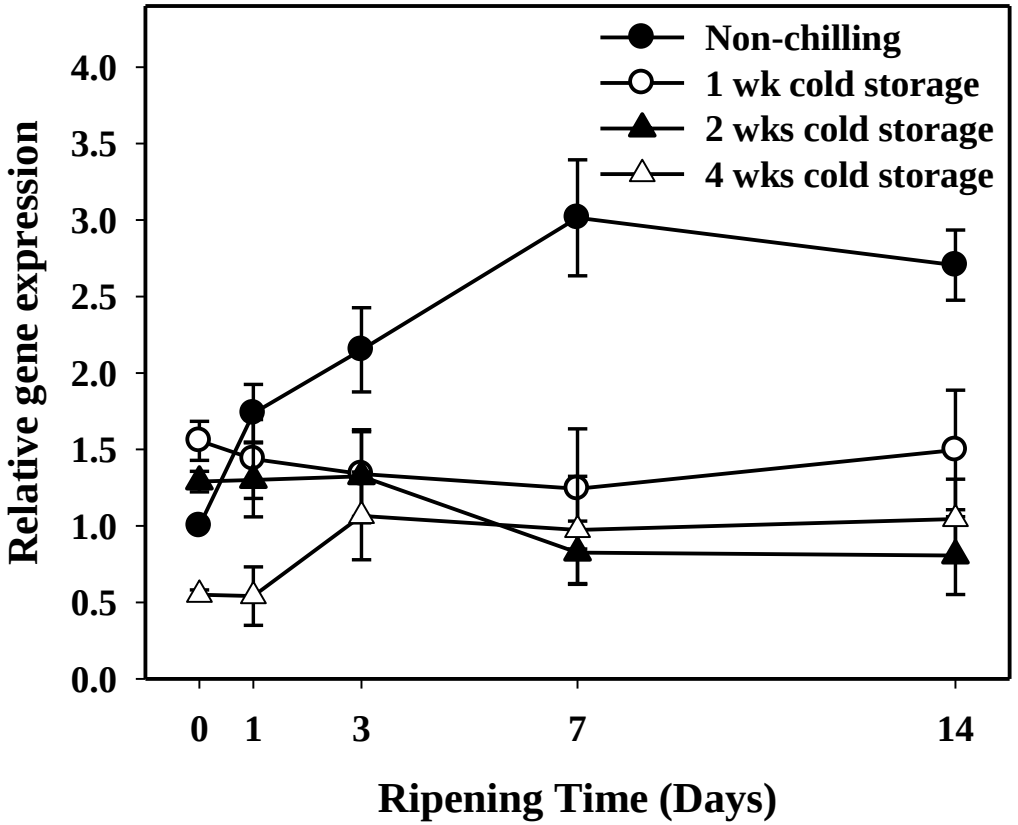
Ethylene transduction signal (1)



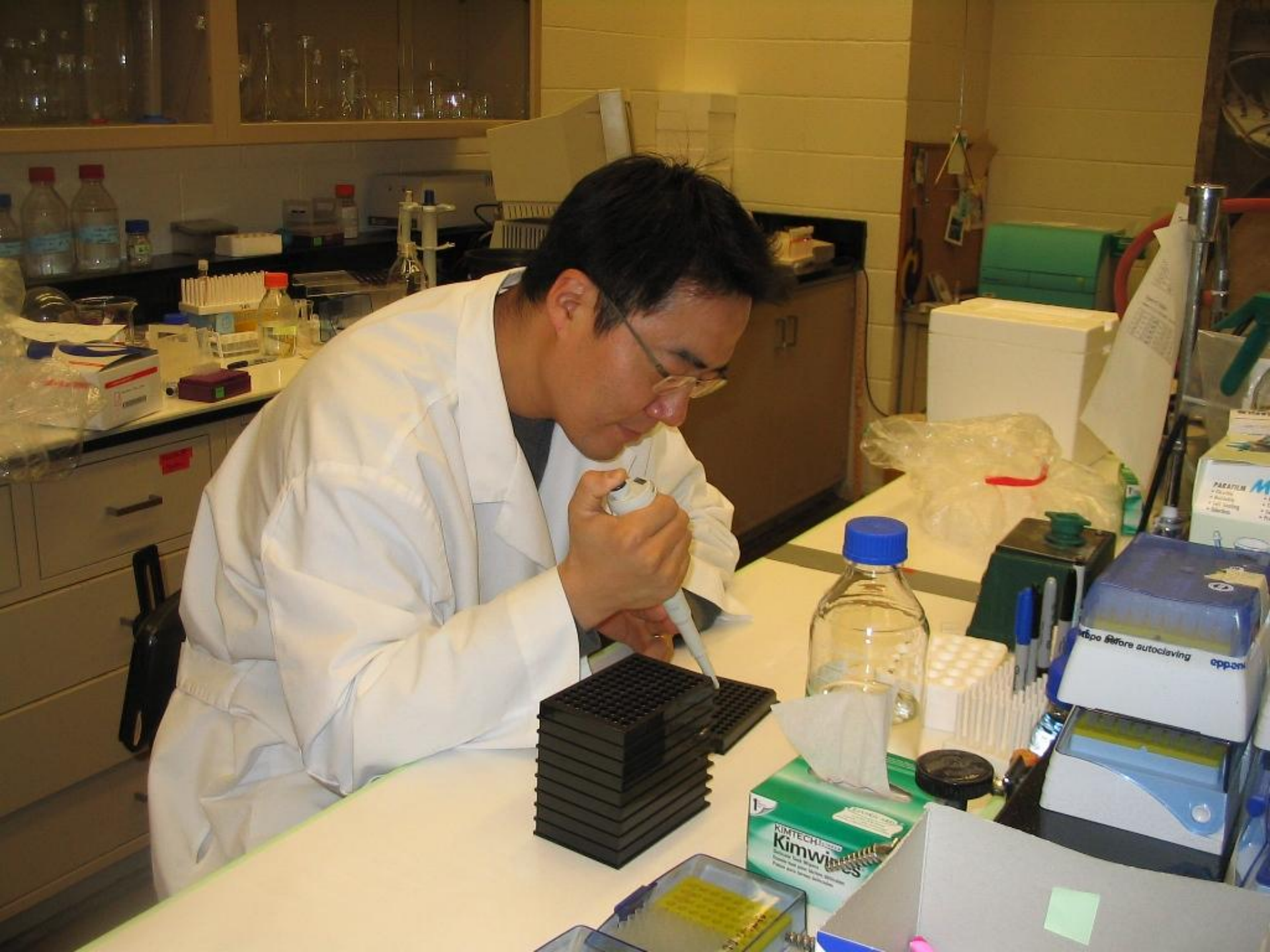
Ethylene transduction signal (2)



5. *LeMADS-RIN*


Non-chilling
1 wk cold storage
2 wks cold storage
4 wks cold storage
Relative gene expression
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
3
7
14
Ripening Time (Days)


GUTERMAN
BIOCLIMATIC
LABORATORIES


KIMTECH
Kimwipes

กิจกรรมนอกเวลาเรียน


30
20
GREEK PEAK
MOUNTAIN RESORT


CORNELL
UNIVERSITY


กระทิงแดง


STATE


LESSONS HERE
BEGINNER LESSONS EVERY 30 MIN.
ADVENTURE LESSONS 10,12,2,7
LESSON MEETING SPOT


RAGE!
RAGE!
RAGE!
RAGE!
RAGE!
RAGE!
RAGE!
61
174

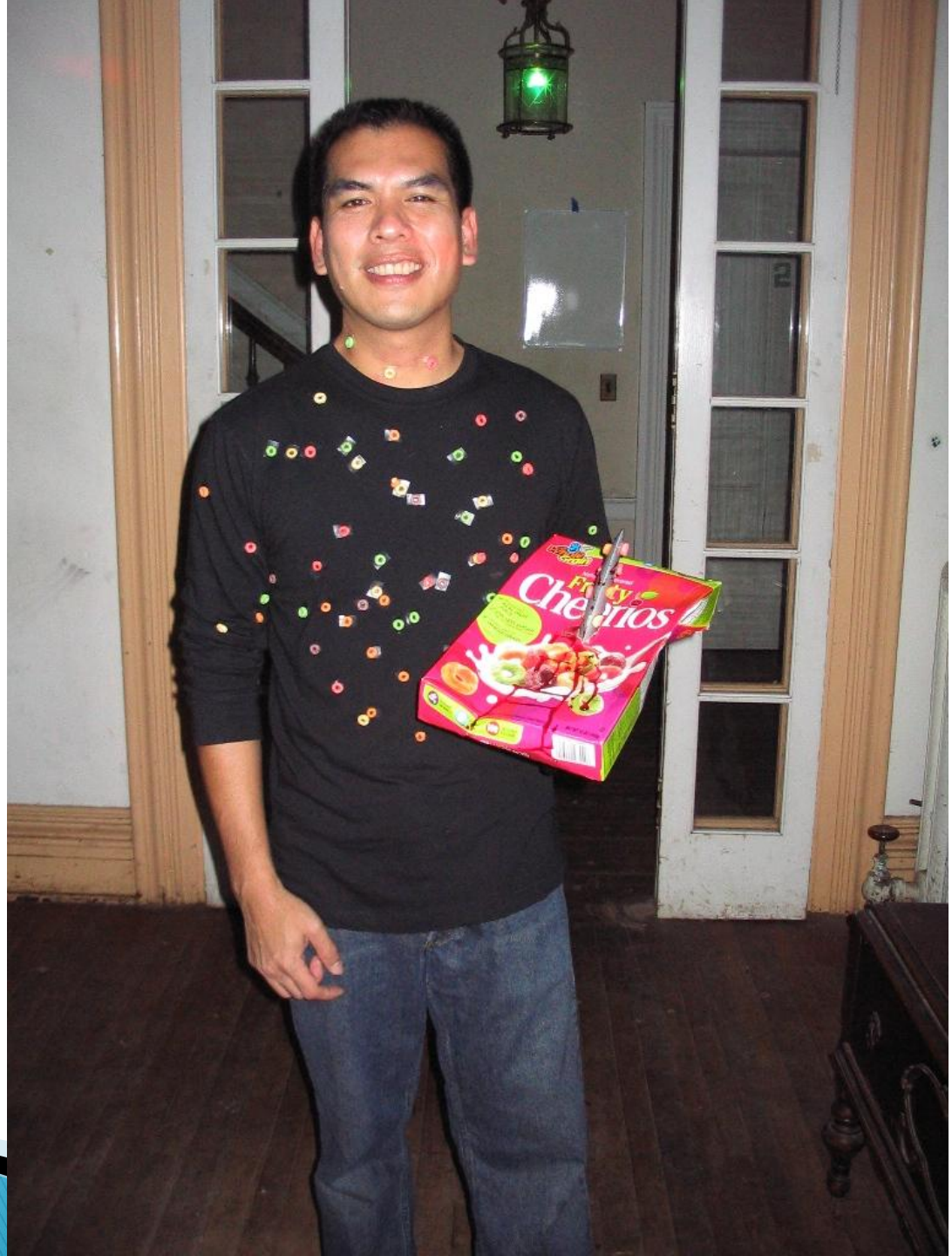

RAGE!
RAGE
RAGE!
RAGE!
RAGE!
Student Massage Clinic

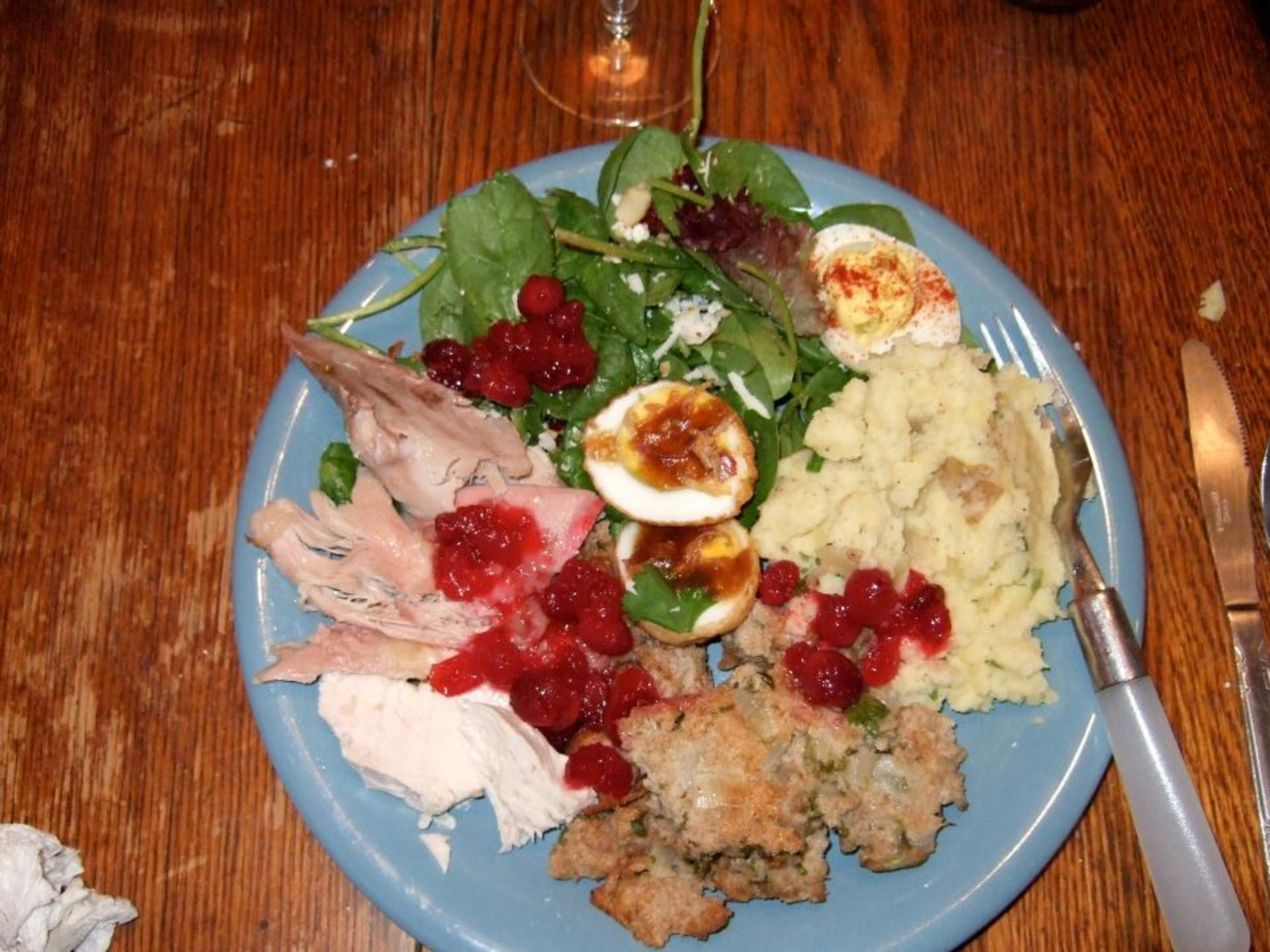

RAGE!
RoadID.com
61
RAGE!

Stewart Little Co-op

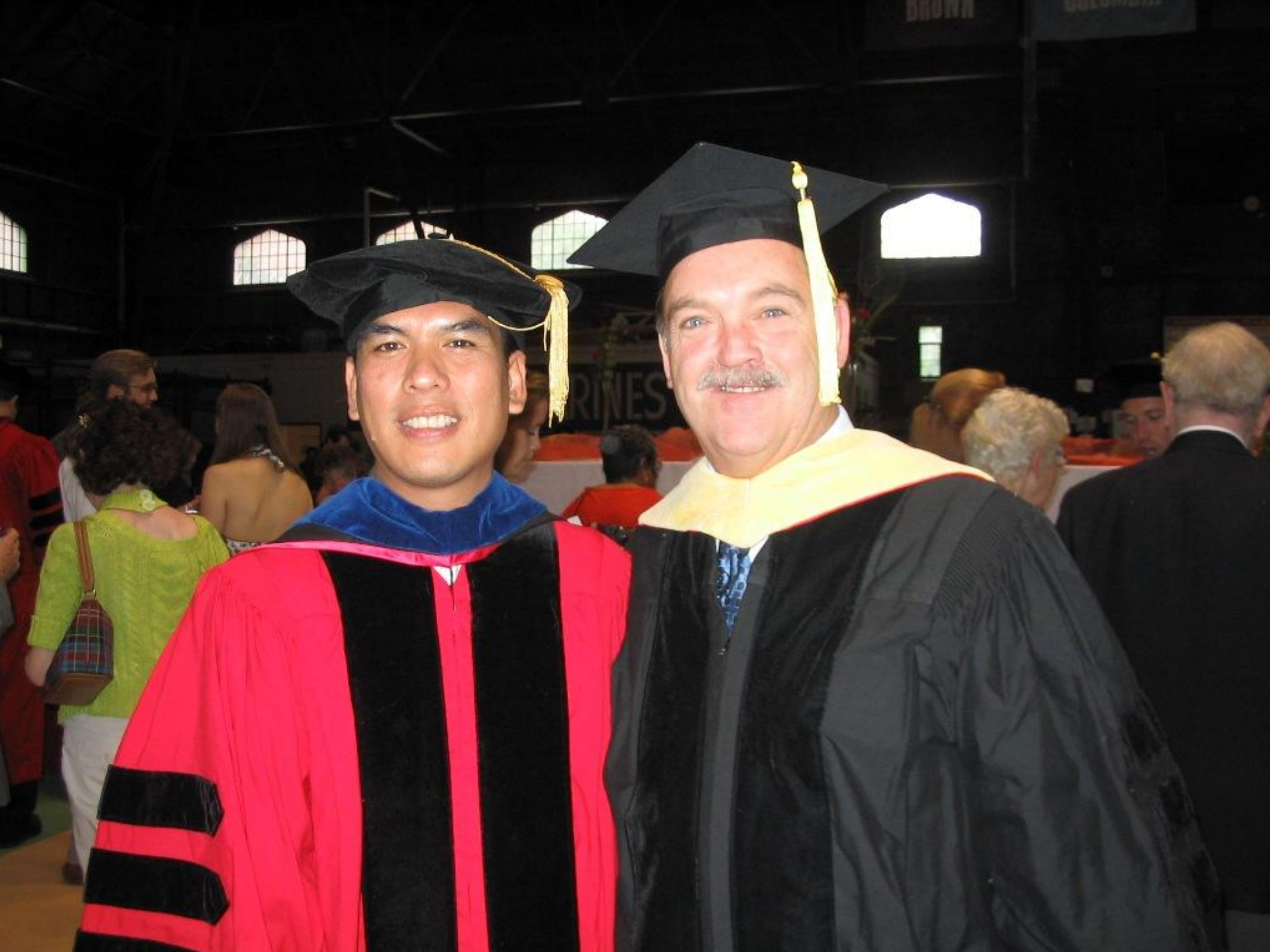

FUCK WITH US
WE KILL YOU


Fruity
Cheerios

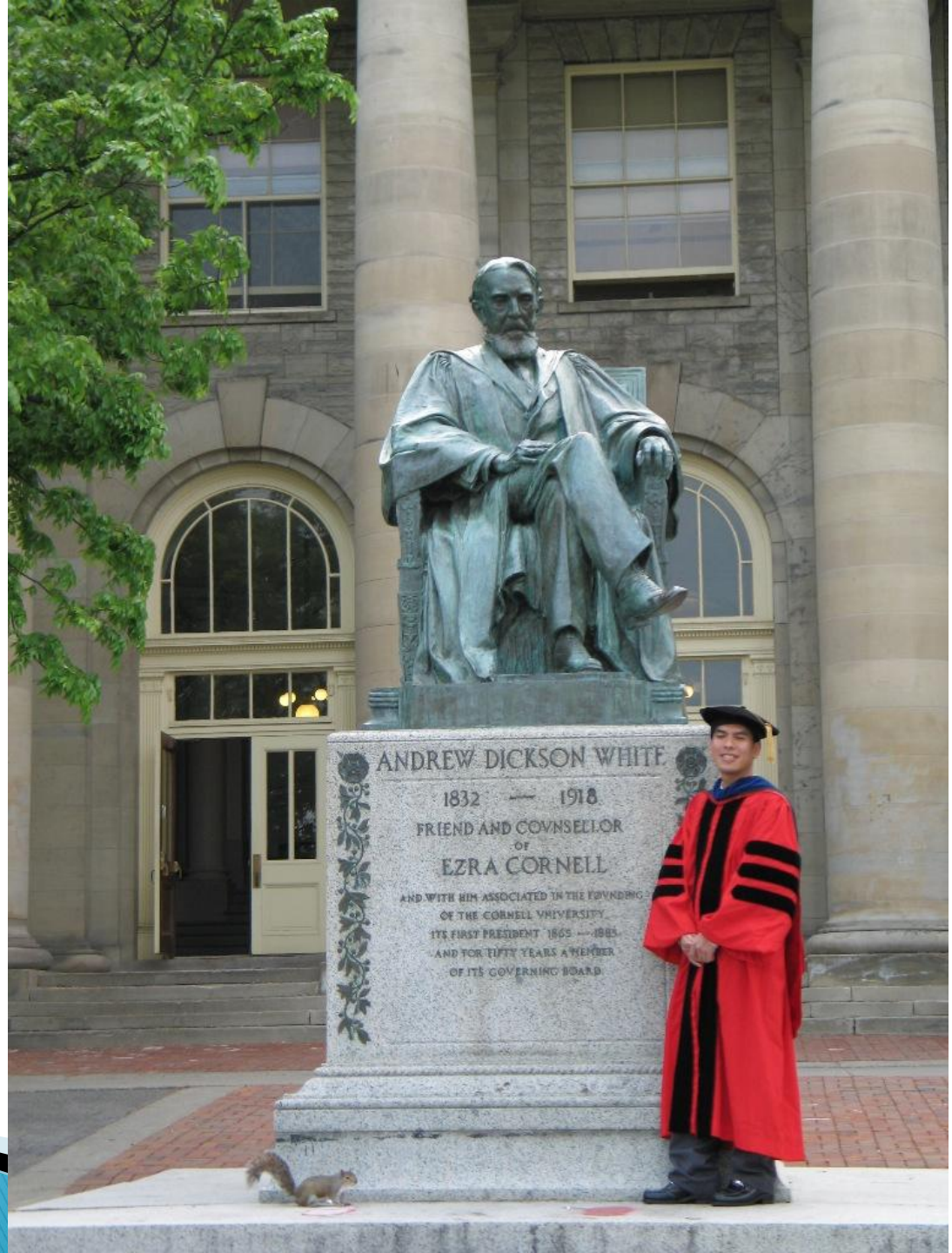

Cheerios



พิธีรับปริญญา




EZRA CORNELL
MDCCCVII - MDCCCLXXIV


ANDREW DICKSON WHITE
1832 — 1918
FRIEND AND COUNSELLOR
OF
EZRA CORNELL
AND WITH HIM ASSOCIATED IN THE FOUNDING
OF THE CORNELL UNIVERSITY
ITS FIRST PRESIDENT 1865 — 1885
AND FOR FIFTY YEARS A MEMBER
OF ITS GOVERNING BOARD


UNIVERSITY

Thank you

ขอบคุณครับ