No.3

Seminar I on Agricultural Process Engineering
農産加工学演習　I

Naoshi Kondo, Hiroshi Shimizu

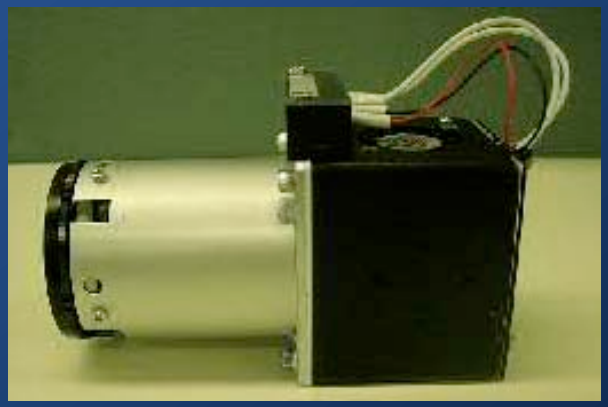
Division of Environmental Science & Technology,
Graduate School of Agriculture, Kyoto University

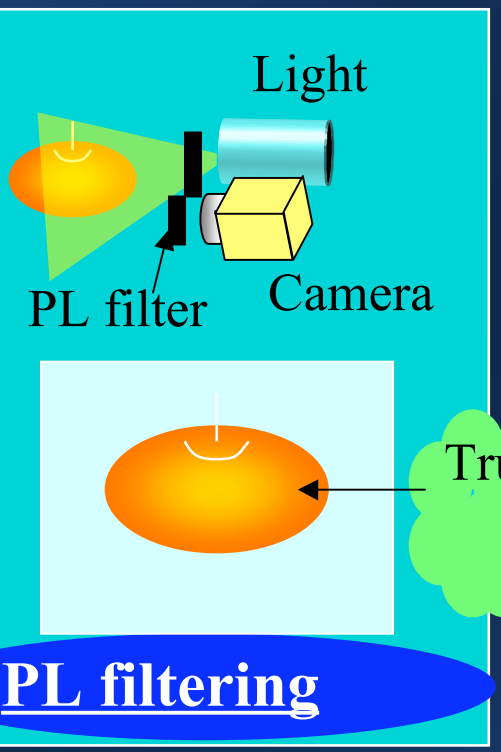
農学研究科　地域環境科学専攻

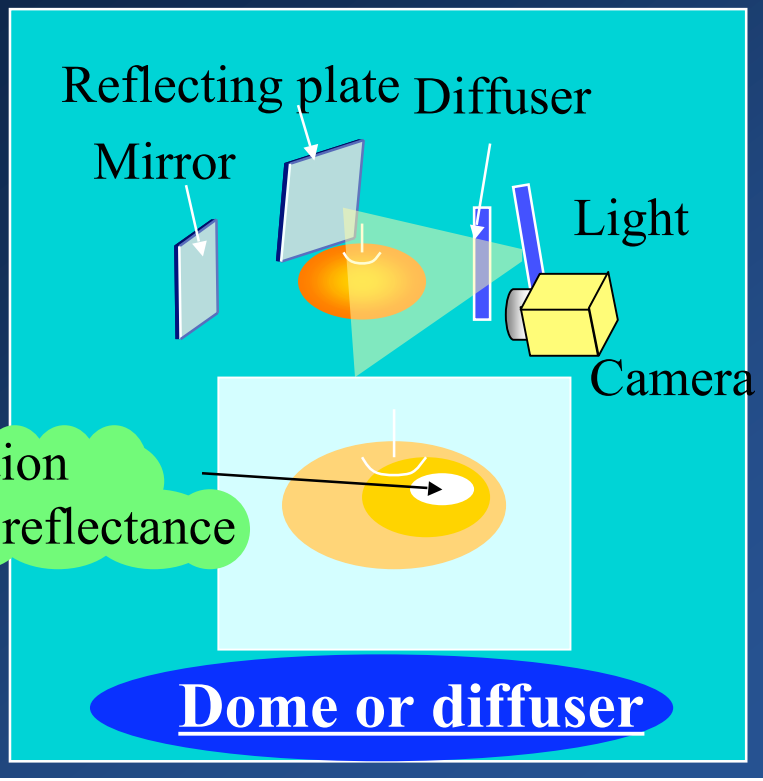
近藤　直・清水　浩

Lighting method

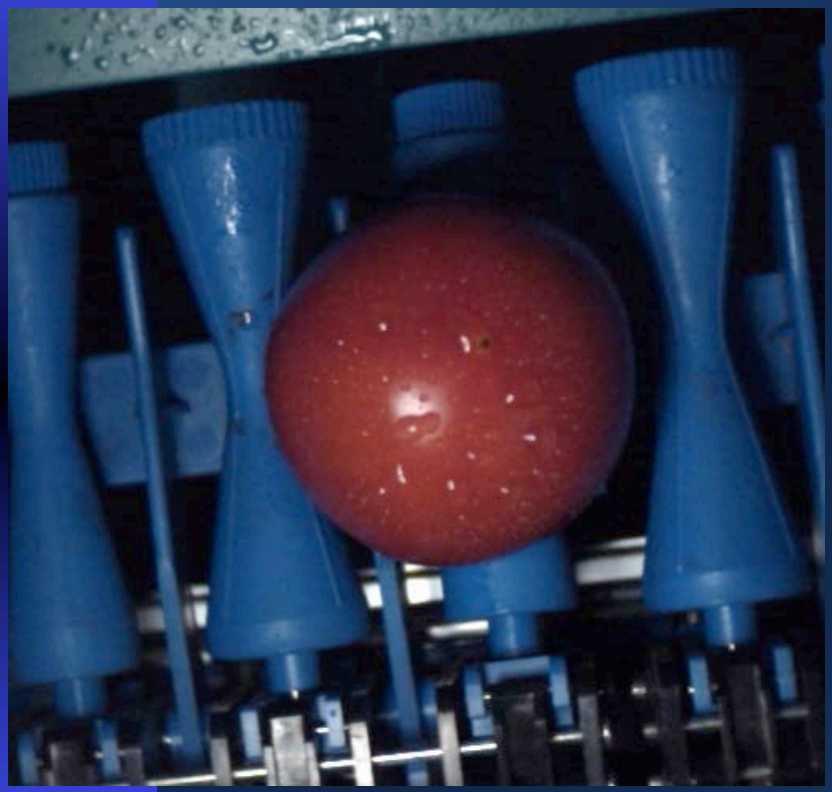
PL filtering Light and Dome



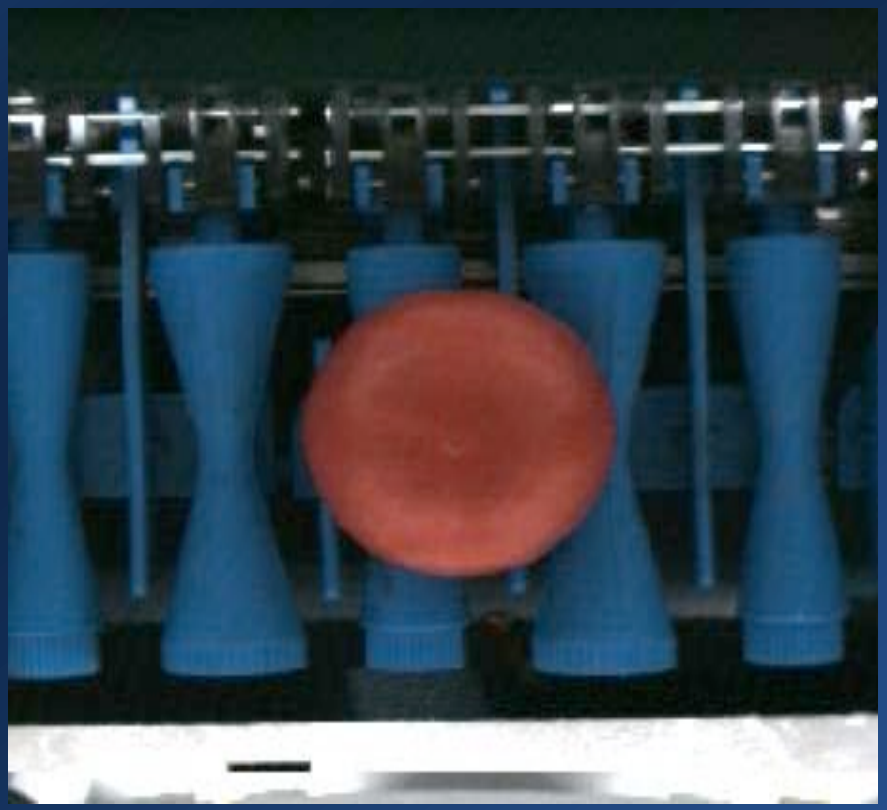




Problems on image acquisition (Dome and diffuser)



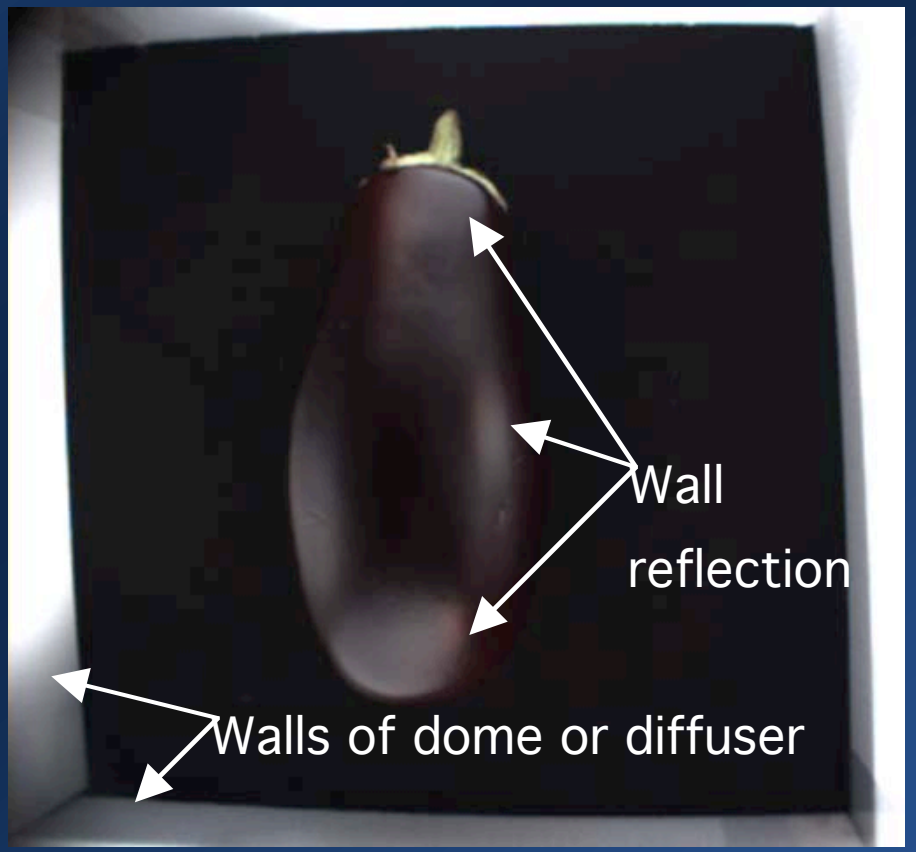
Halation



Surrounding walls reflection

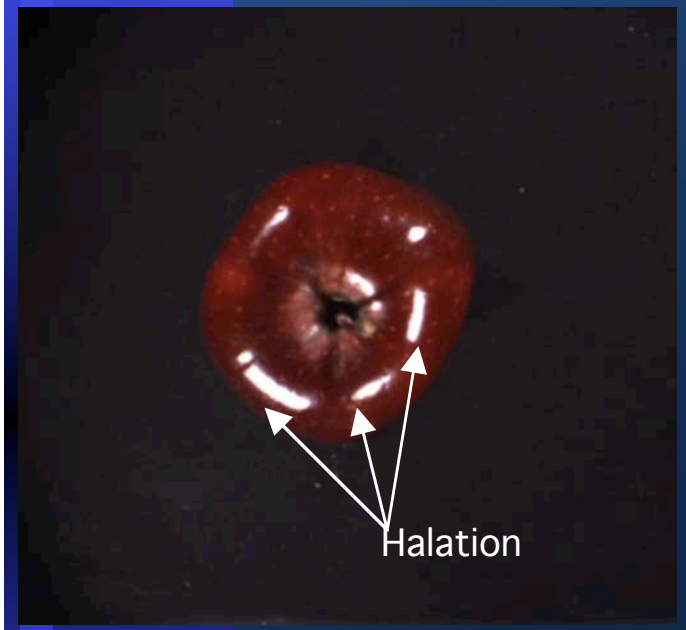
Effect of PL filtering

PL filtering image
(Two PL filters are used in front of camera and light)



Dome image

Cuticular layer of apple fruit

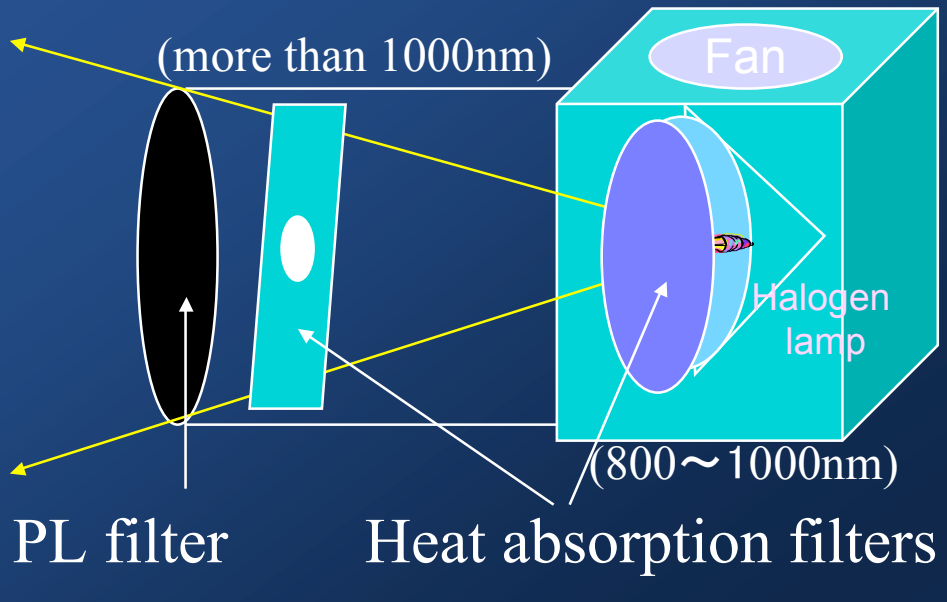


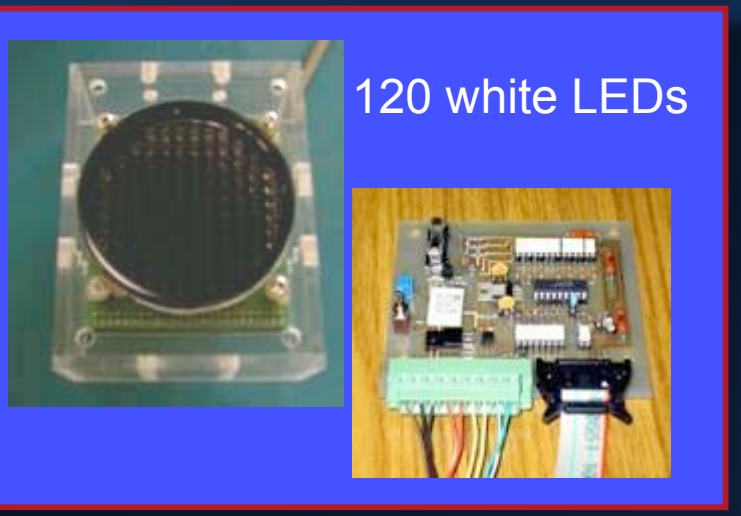
Cuticular layer

Epidermis

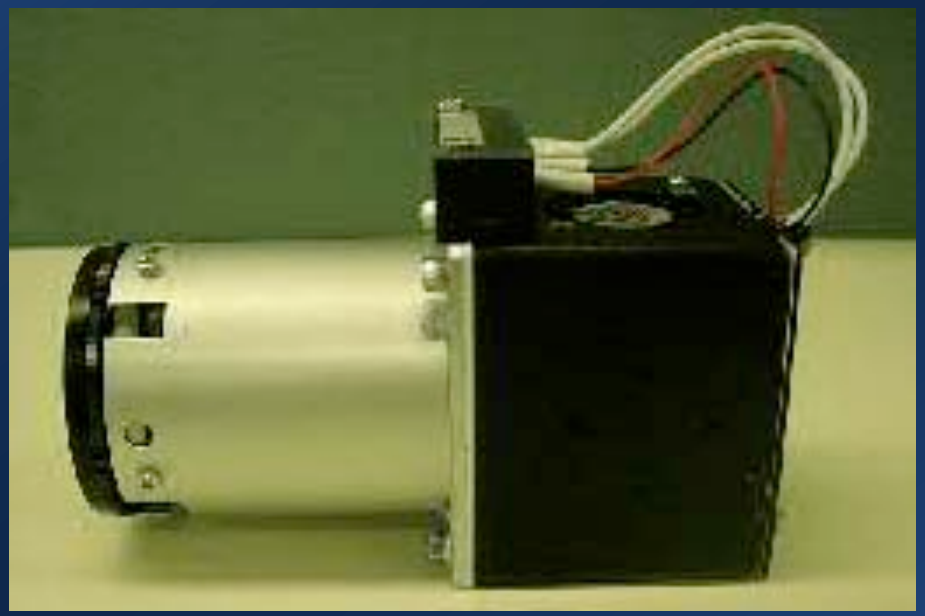
Parenchyma

DL with PL filter





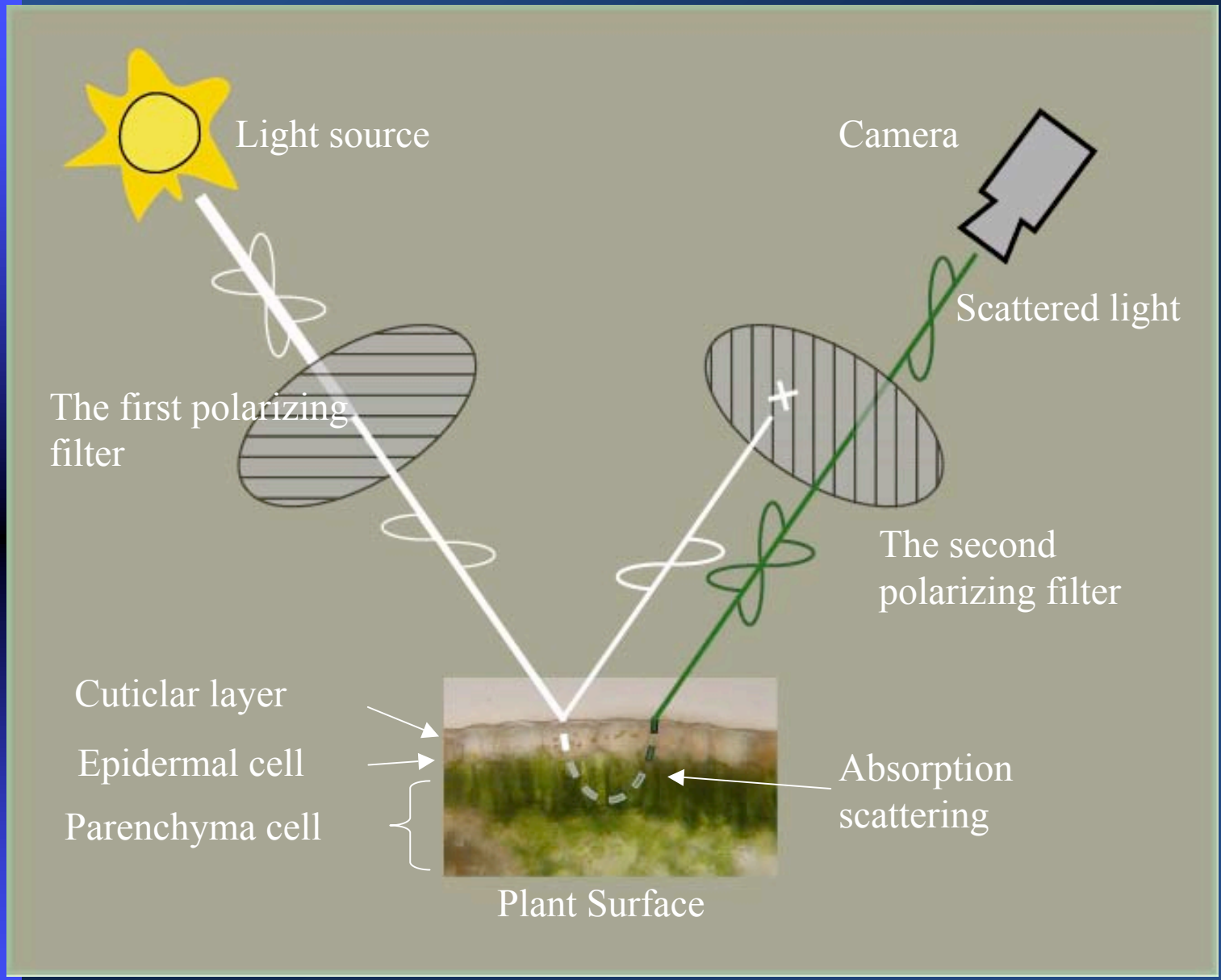
Ready to sell! 10 year warranty



"DL" is an SI Seiko-original illumination equipment for image acquisition to make direct lighting possible.

Small power（50W） and high conversion efficiency from electricity into light.

SIseiko



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How to eliminate halation

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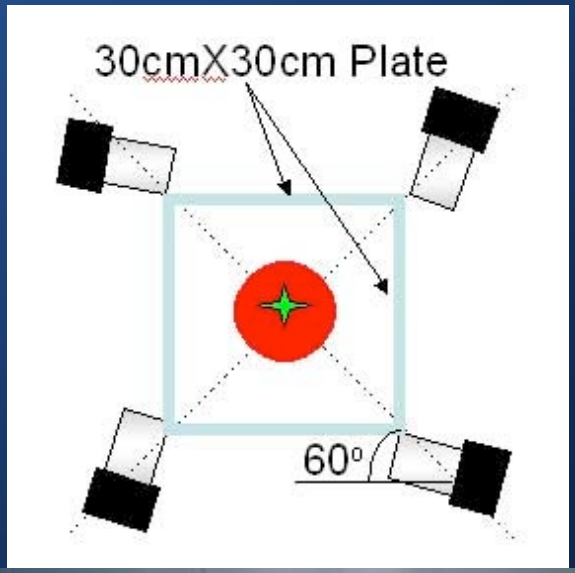
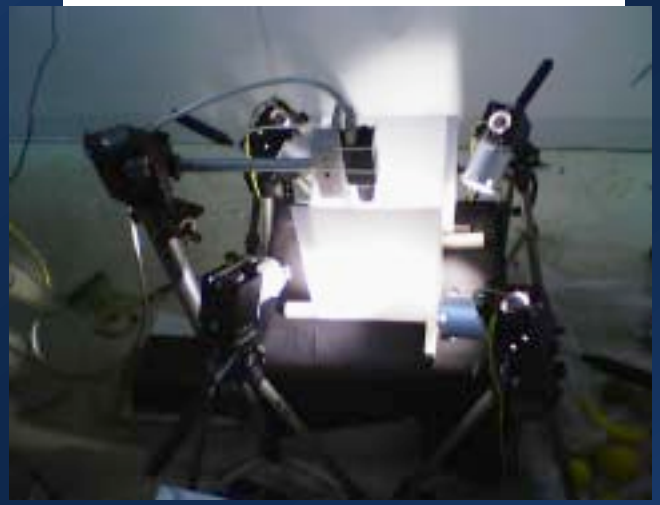
Biological materials

- **category 1** (glossy surface fruits:
  apples, tomato, eggplant, pepper, lemon)
- **category 2** (short hair fruits or powdery fruits:
  kiwi, peach, pear, banana)
- **category 3** (root vegetables:
  potato, Daikon radish)

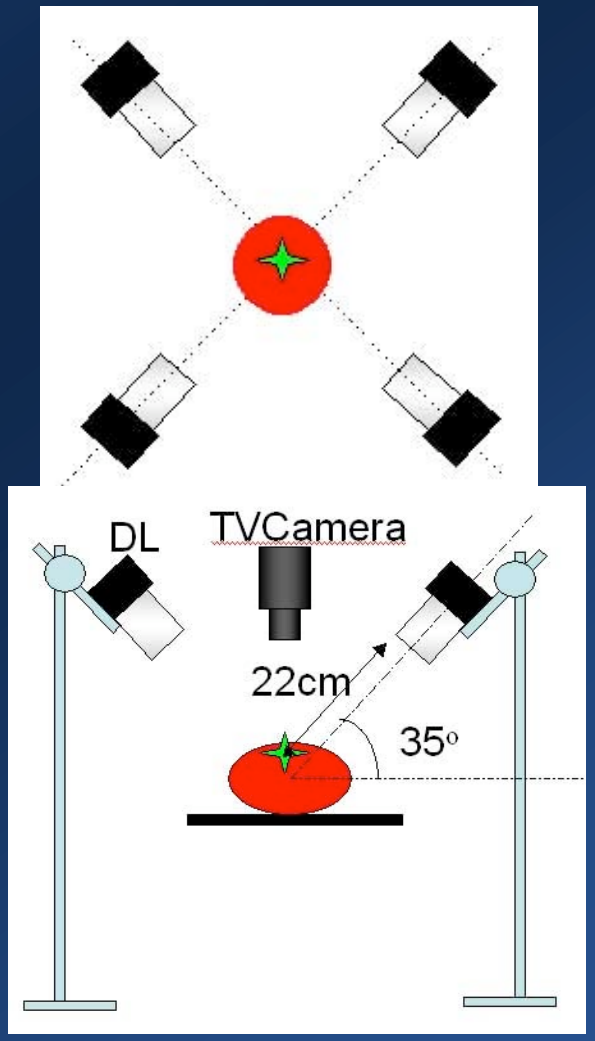
Lighting Device Arrangement

Arrangement 1
(Dome walls and 4 lamps)

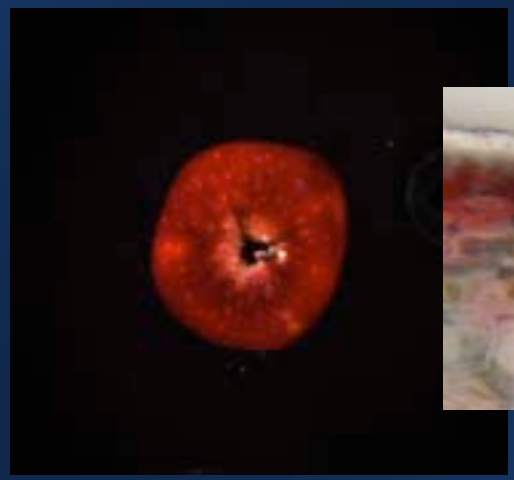




Arrangement 2 and 3
(Diffusers or PL filters and 4 lamps)



Category 1 (Smooth and thick cuticle)



Apple

Eggplant

Dome

Diffuser

PL filter

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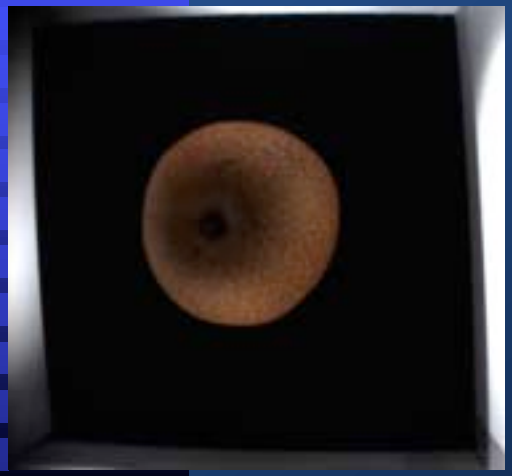
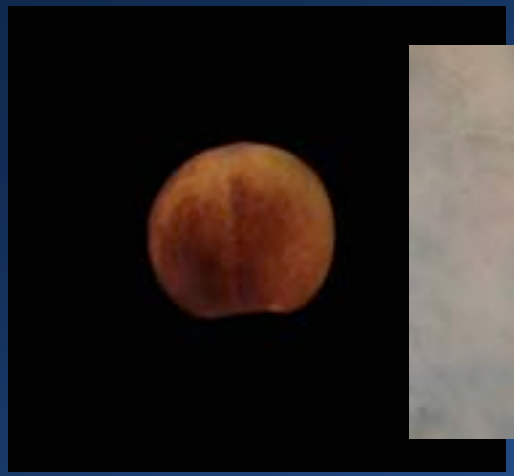
Category 2 (Rough cuticle)




Pear






Peach

Dome

Diffuser

PL filter

Category 3 (No cuticle)





Daikon radish





Potato

Dome

Diffuser

PL filter

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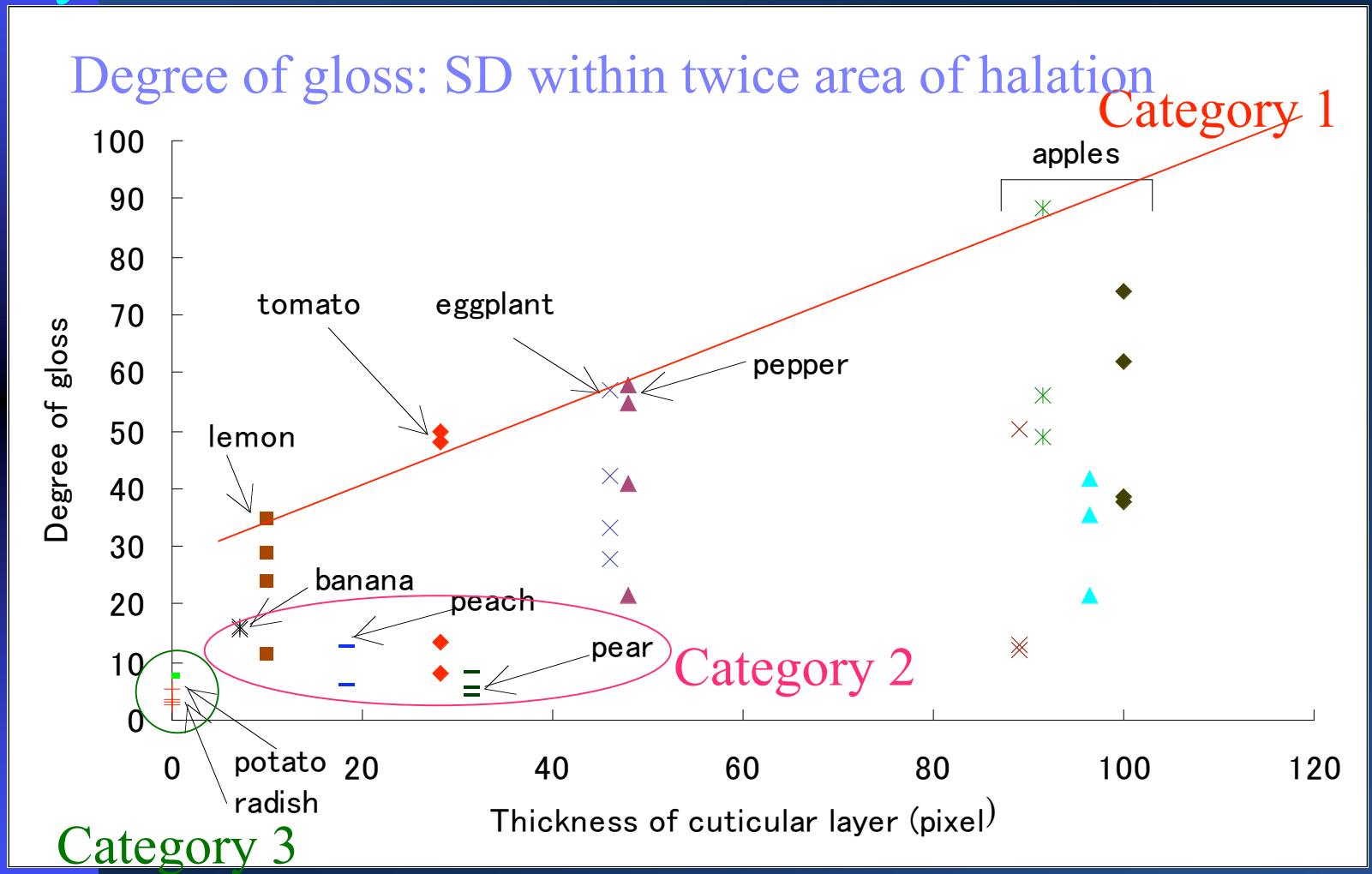
Relation between degree of gloss and cuticular layer thickness



(100 pixels is almost 25 mm.)

Images on different exposure conditions

Exp.1 (dark)

Exp.2 (mid)

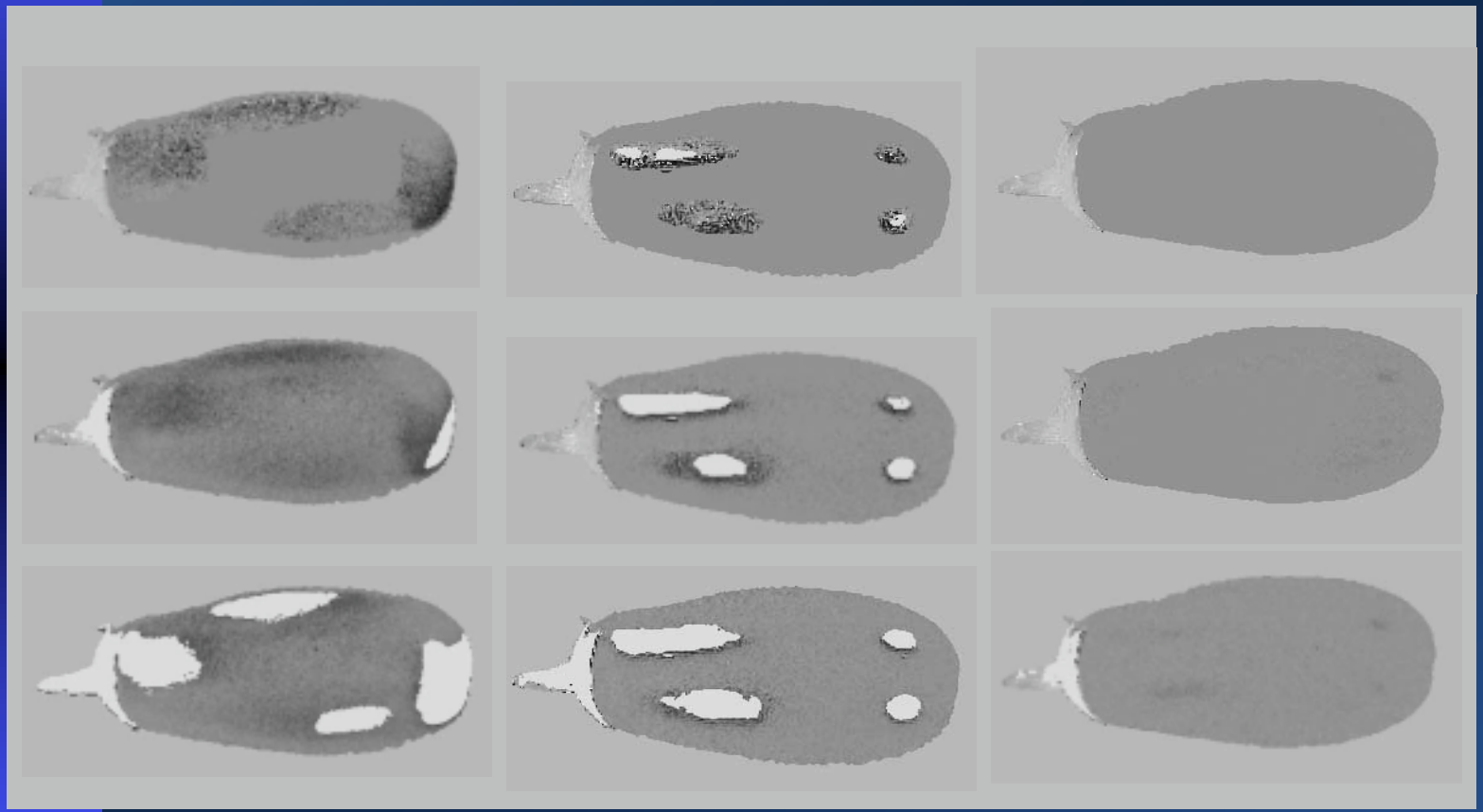
Exp.3 (bright)

Dome

Diffuser

PL filter

Hue



Exp.1 (dark)

Exp.2 (mid)

Exp.3 (bright)

Dome

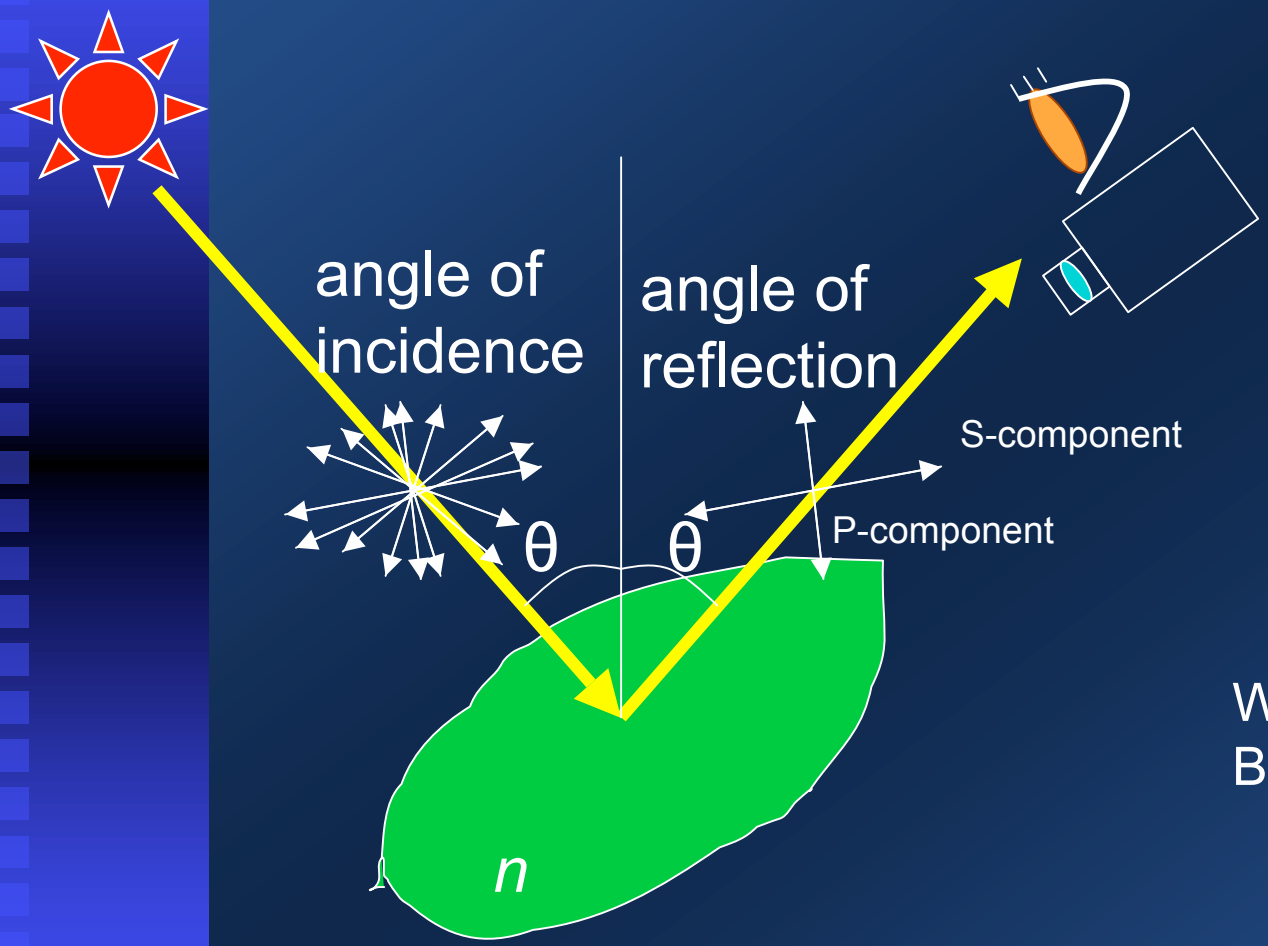
Diffuser

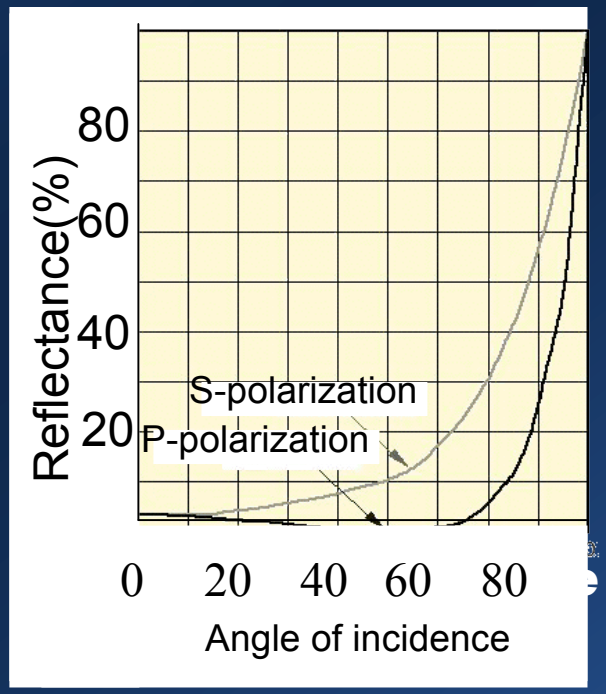
DL with PL filter

Polarization on crops

Cuticular Layer

Polarization





When "*n*" is 1.5,
Brewster angle is 56.3.

Tan θ= *n*

***n* : refractive index**

Assignment

On sunshiny day's evening, you stood in front of a coffee plant field. There were much halation on plant leaves and you felt too bright.

The halation became much weak when you wore sunglasses of PL filter heading (East, West, North, or South).

Explain this phenomenon.