

Hilbert problems and challenges

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California Institute of Technology

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Cambridge - 21-23 Aug. 2011

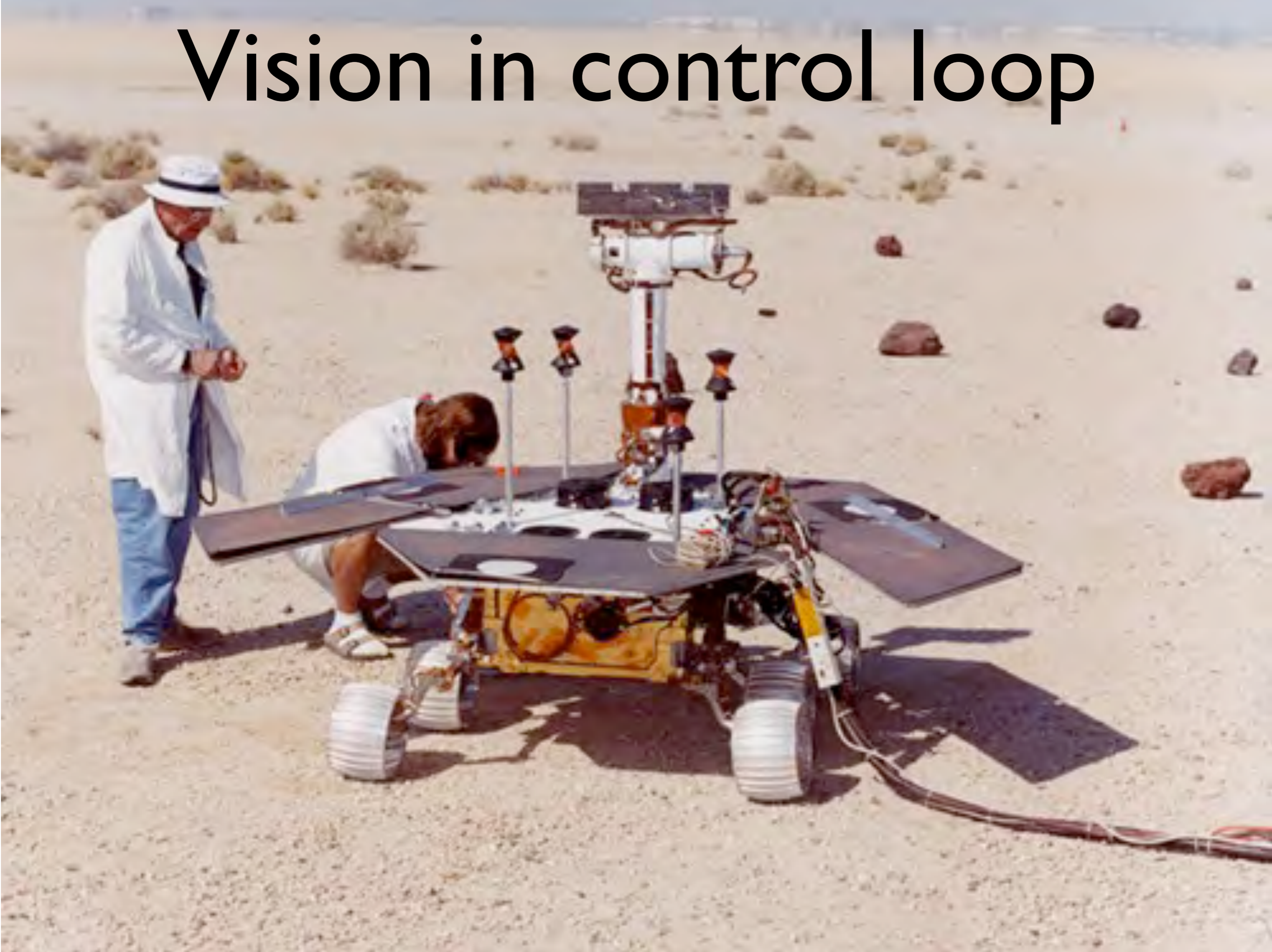
Scene understanding



Scene understanding

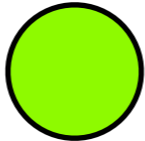
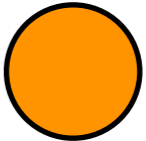
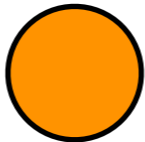
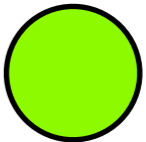
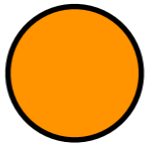
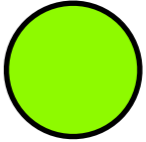


Vision in control loop



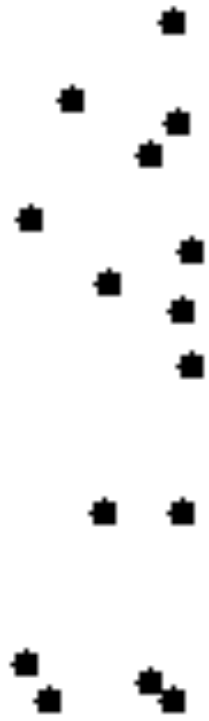
Other sensors...



	scene understanding	vision in the loop
<i>ease of experimentation</i>		
<i>goal</i>	representation	decision/action
<i>active perception</i>		
<i>other sensors</i>		

Visual recognition

Recognizing..



Materials



Objects



Actions



Scenes

Recognizing..



Materials



Objects

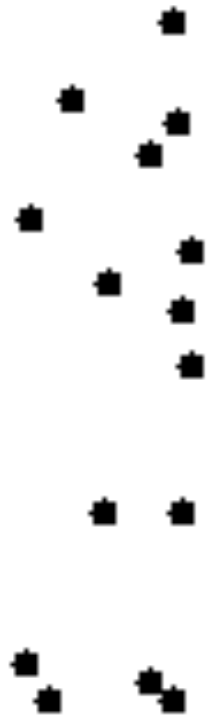


Actions



Scenes

Recognizing..



Materials



Objects

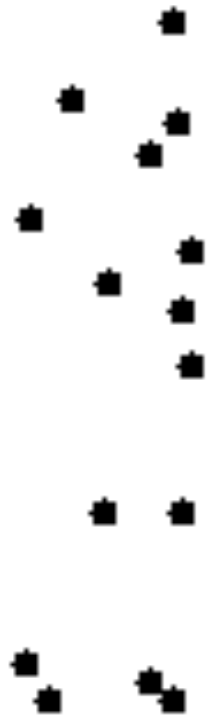


Scenes



Actions

Recognizing..



Materials



Objects

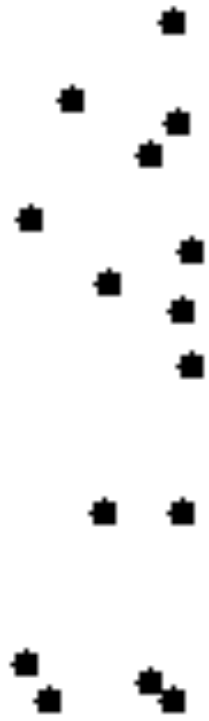


Scenes



Actions

Recognizing..



Materials



Objects

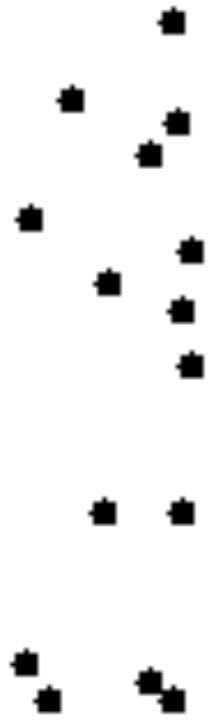


Actions



Scenes

Recognizing..



Materials



Objects

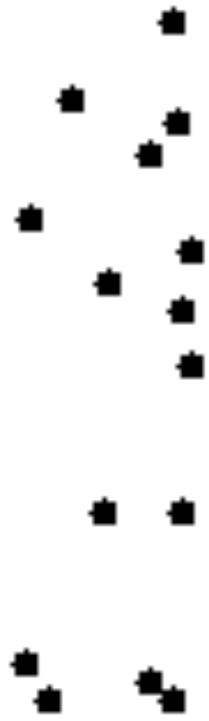


Actions



Scenes

Recognizing..



Materials



Objects



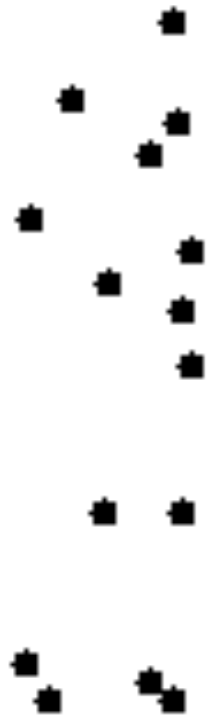
Actions



Scenes



Recognizing..



Materials



Objects



Scenes



Actions

Recognizing..



Materials



Objects



Actions



Scenes

Geometry and materials



How many?



Weakly
supervised
learning

Transfer
learning



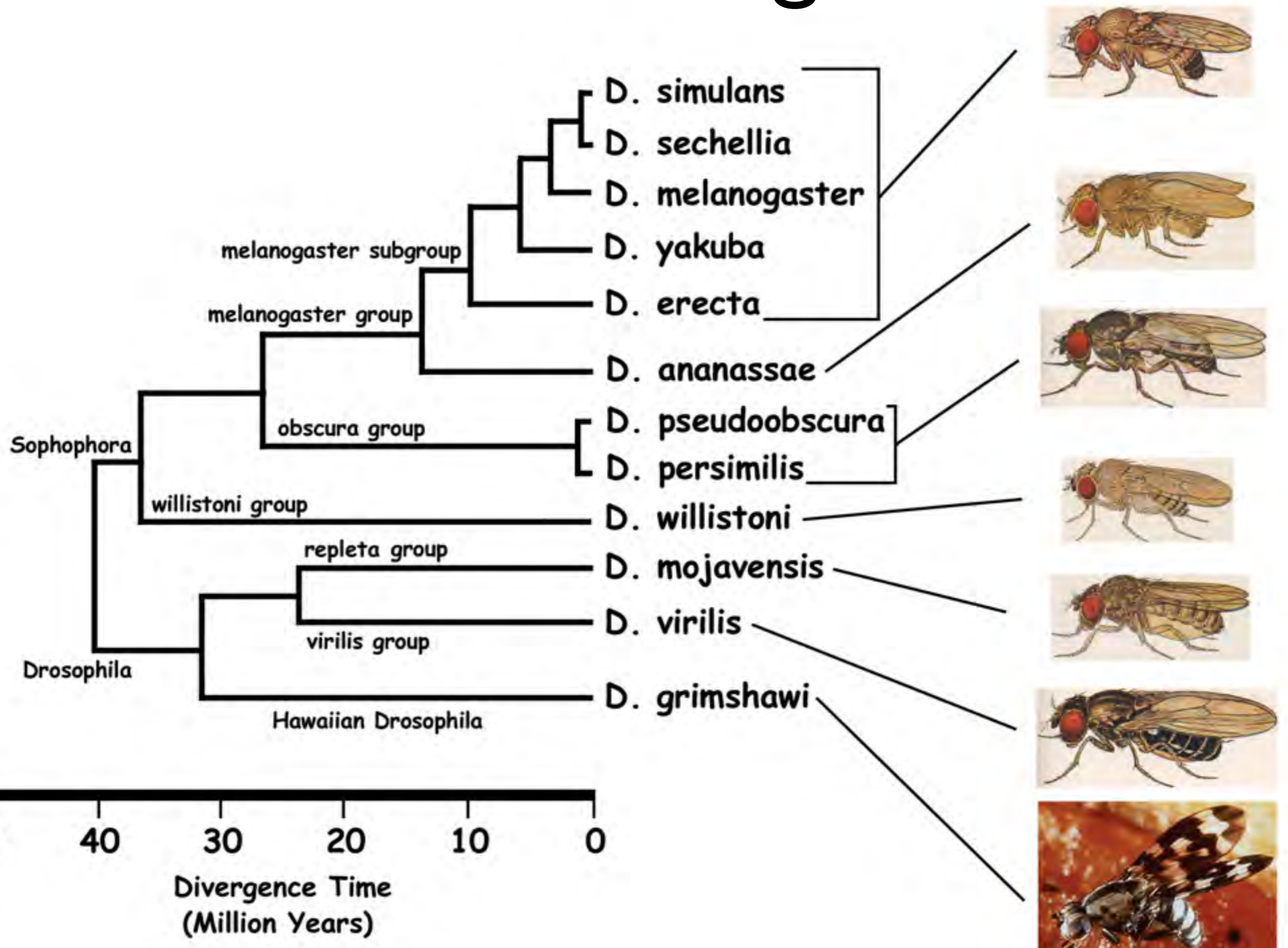
Incremental learning



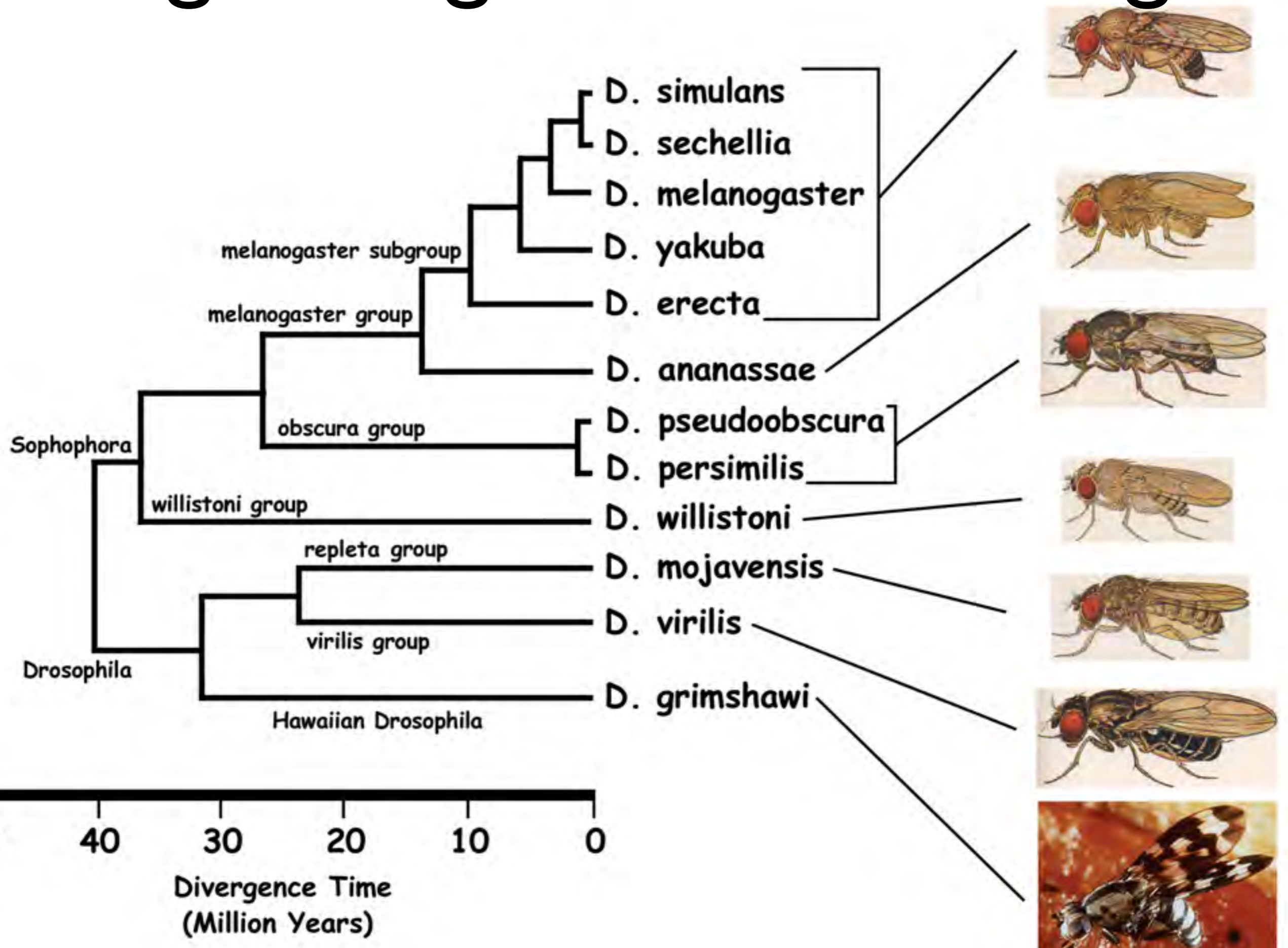
...



Subordinate categorization



Organizing visual knowledge



Intentions, causes, consequences, ...



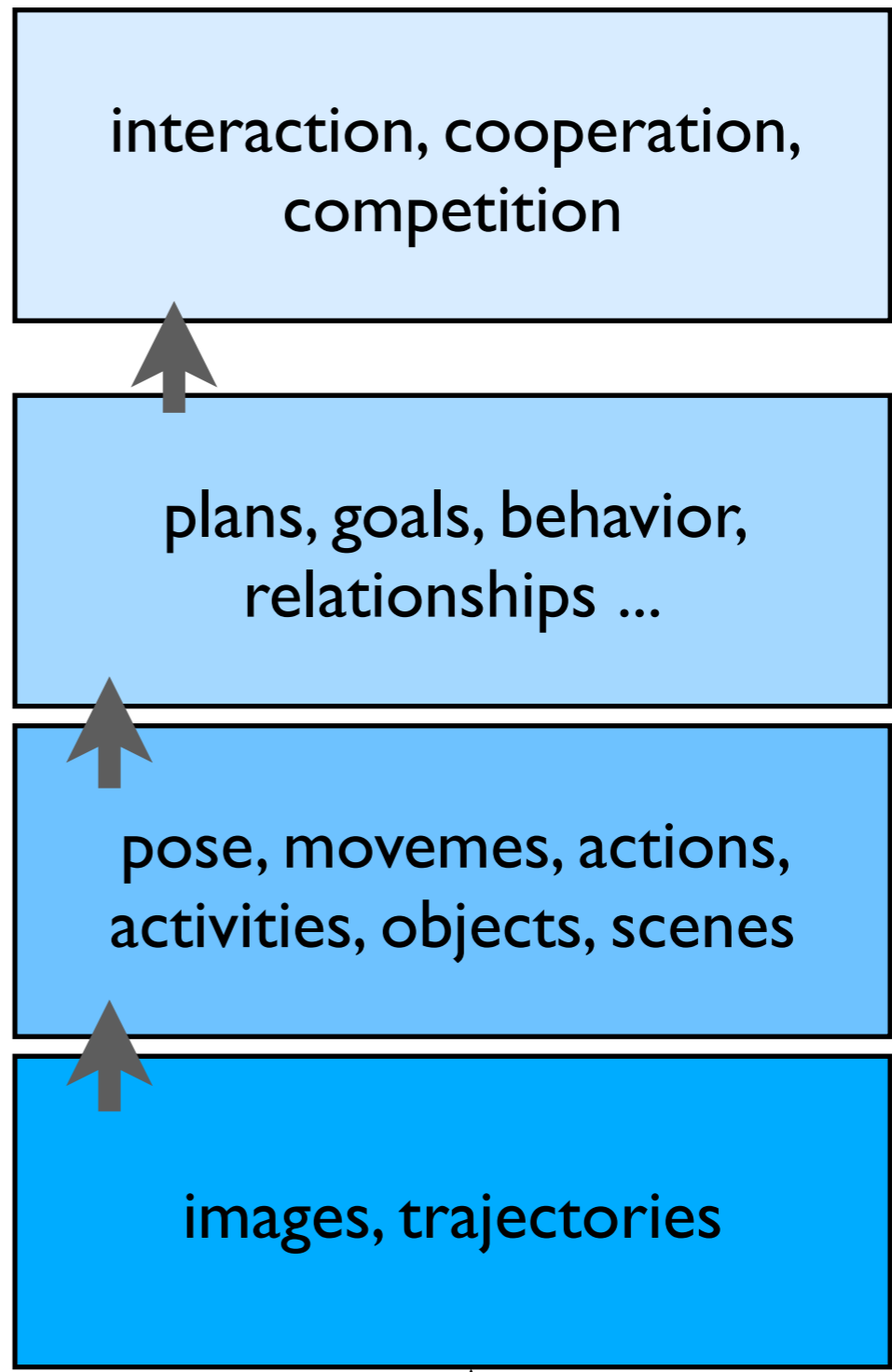
Behavior, events





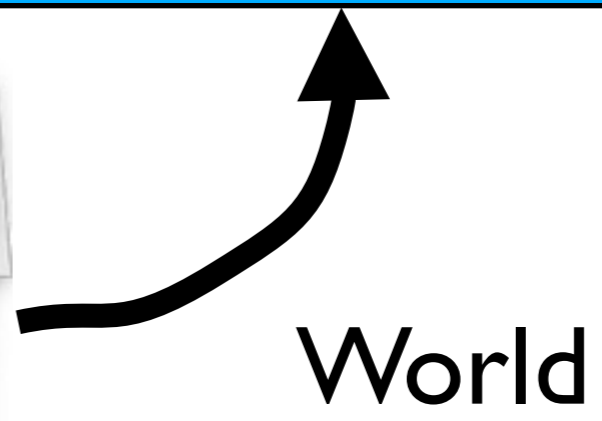
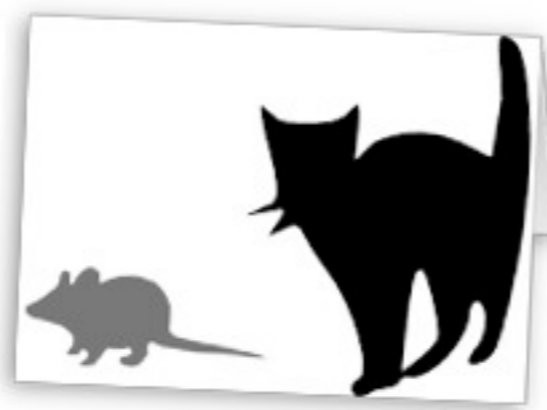
Friday, August 26, 2011

Perception



PSYCHOLOGY

SENSORY

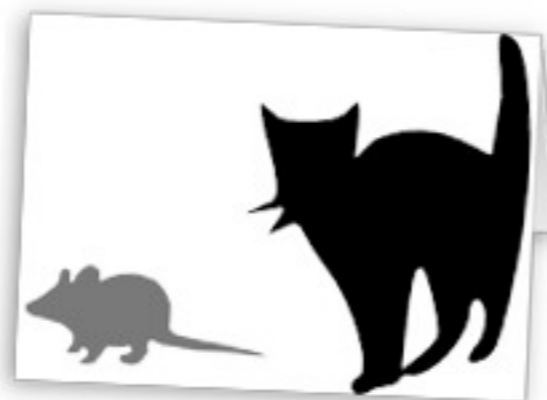
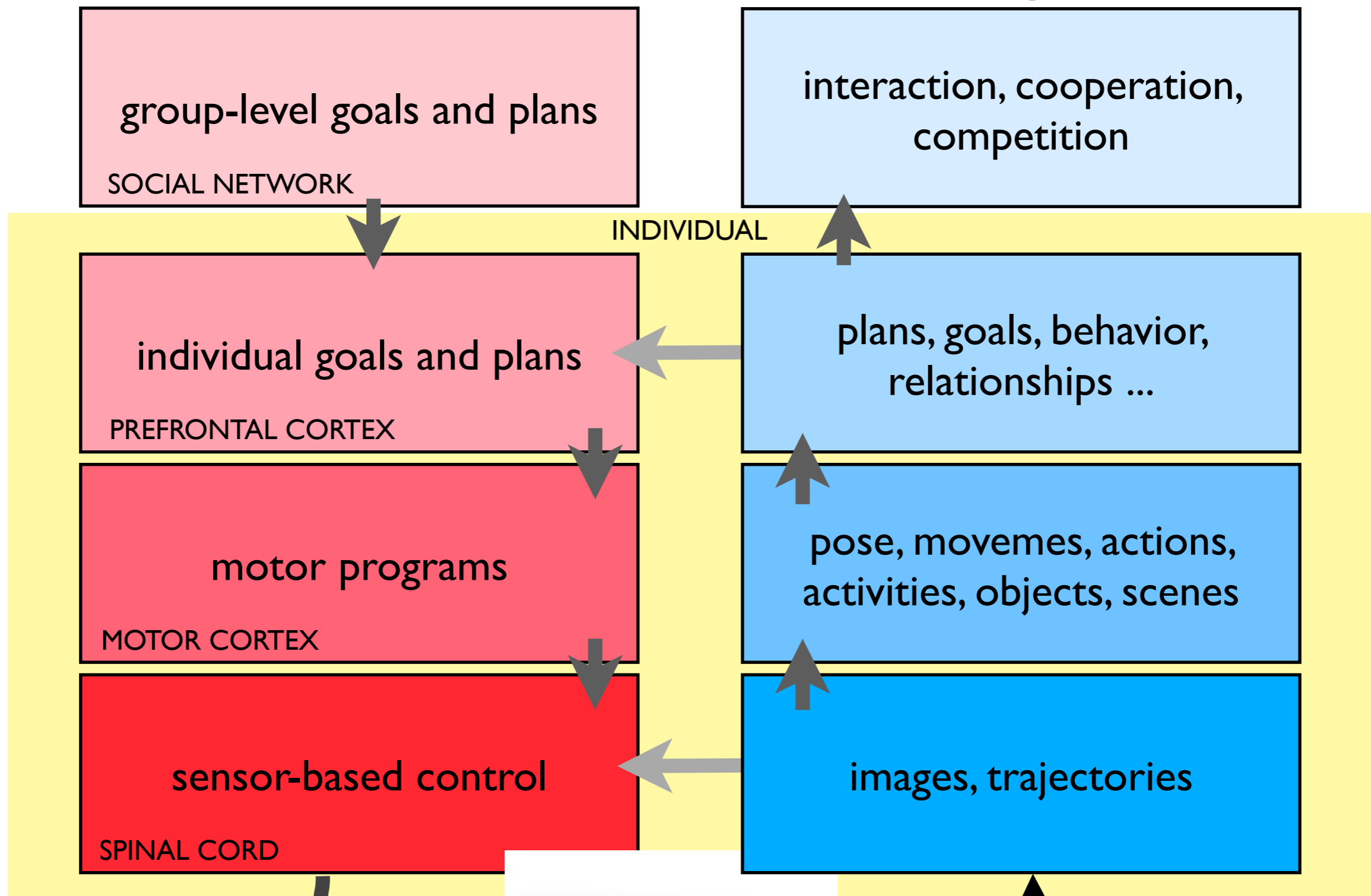


Action

Perception

MOTOR PLANNING

PSYCHOLOGY
SENSORY



World

Behavior

- Hierarchical representation
- Interactions
- Beyond description: intentions, plans, consequences,

Sharing visual representations with humans

JUNTA NACIONAL DE CARNES

LEY 11.747

SECRETARIA DE INDUSTRIA Y COMERCIO

CORTES OFICIALES PARA RESES DE NOVILLOS, VACAS, VAQUILLONAS Y NOVILLITOS



REIMPRESION LAMINA ORIGINAL AÑO 1948 - INSTITUTO DE PROMOCION DE LA CARNE VACUNA ARGENTINA

Grand challenges

Drosophila behavior

[Dankert et al., Nature Methods, April 2009]

Drosophila behavior

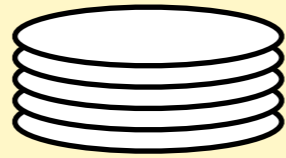


[Dankert et al., Nature Methods, April 2009]

WIKIPEDIA

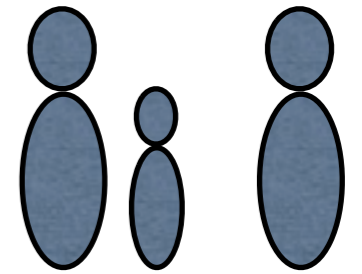


VISIPEDIA



Images, segments
annotations, links,
GUIs, diagnostics

Users



Experts

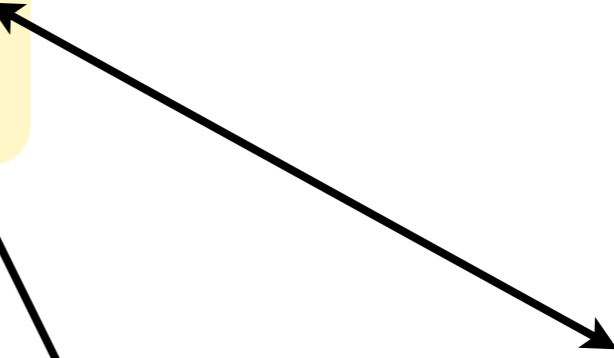
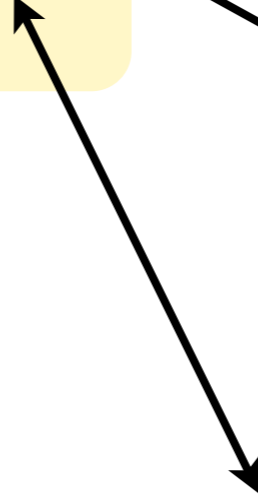
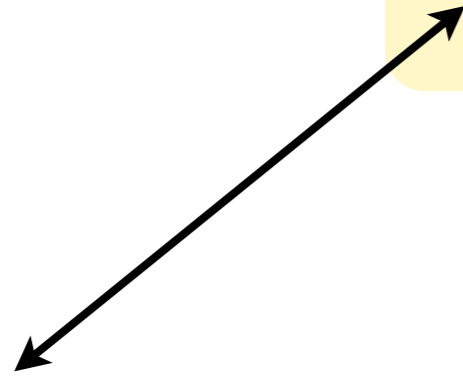
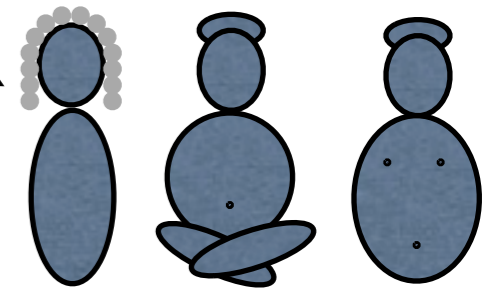
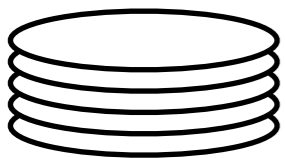
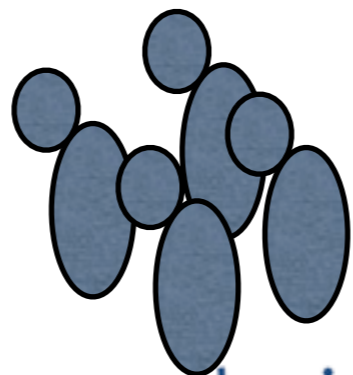


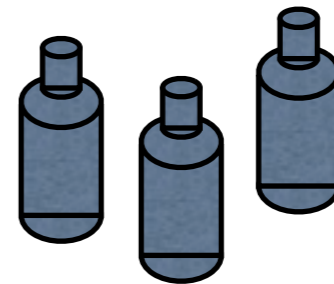
Image databases



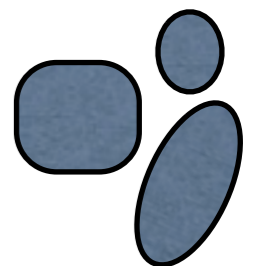
Annotators



Automata



Vision scientists



IMAGENET

Autonomous driving



FUN
Mansion.com

Grand challenges

- Recognition -> Visipedia
- Behavior -> Fly behavior (mouse, ...human)
- Scene understanding -> ???
- Vision for action -> Autonomous driving (how about manipulation?)
- Sustainable economy -> ???

Summary

- Scene understanding vs vision-for-action
- Recognition: just started, much to be done
- Behavior: ditto
- Sharing visual knowledge with humans??
- Grand challenges: many, fun and worthwhile