

Human-Computer Interaction

User

Modeling

Professor Bilge Mutlu

Today's Agenda

- >> Topic overview: *User Modeling*
- >> Discussion
- >> Project Q&A, partner-matching, individual feedback

Topic overview: *User Modeling*

What are models?

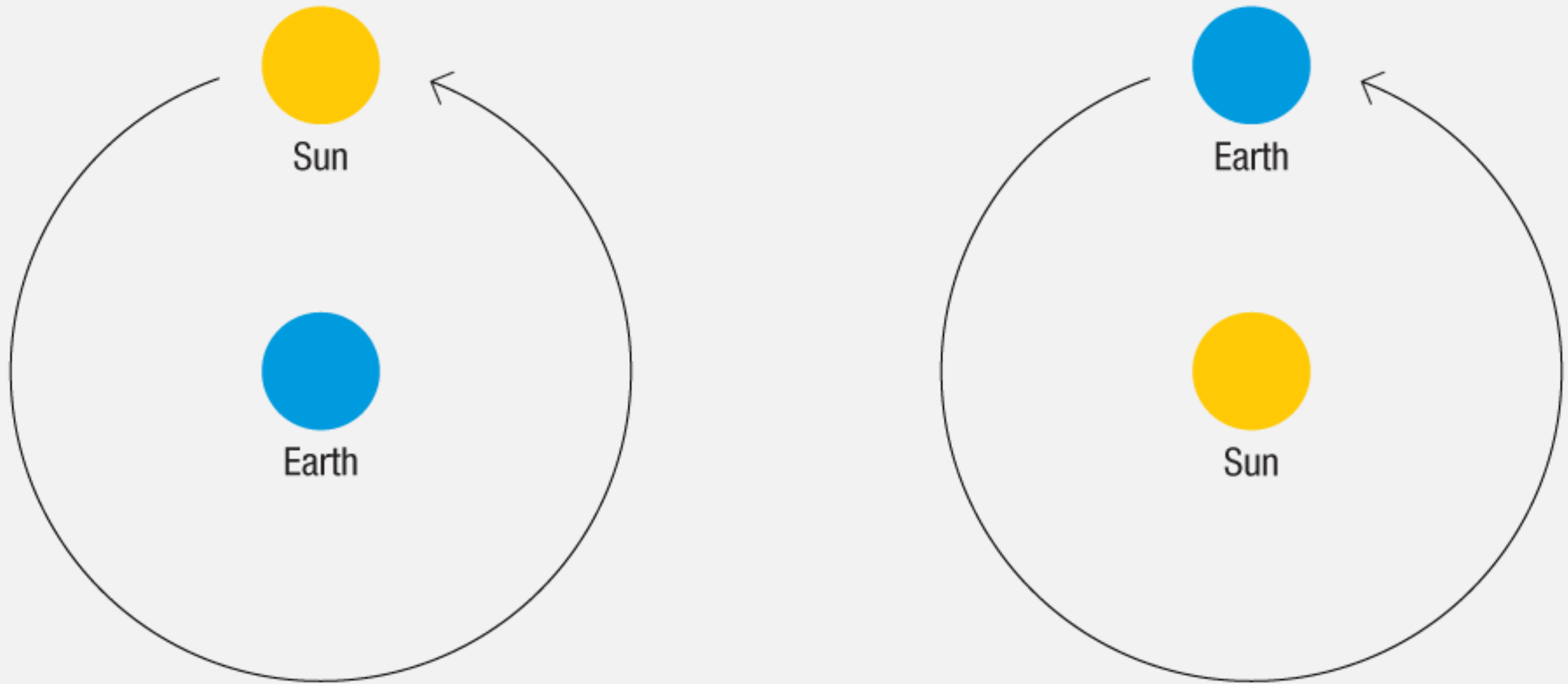
Models are ideas about the world—how it might be organized and how it might work. Models describe relationships: parts that make up wholes; structures that bind them; and how parts behave in relation to one another.

— Dubberly, 2009¹

¹Dubberly, 2009, Models of models

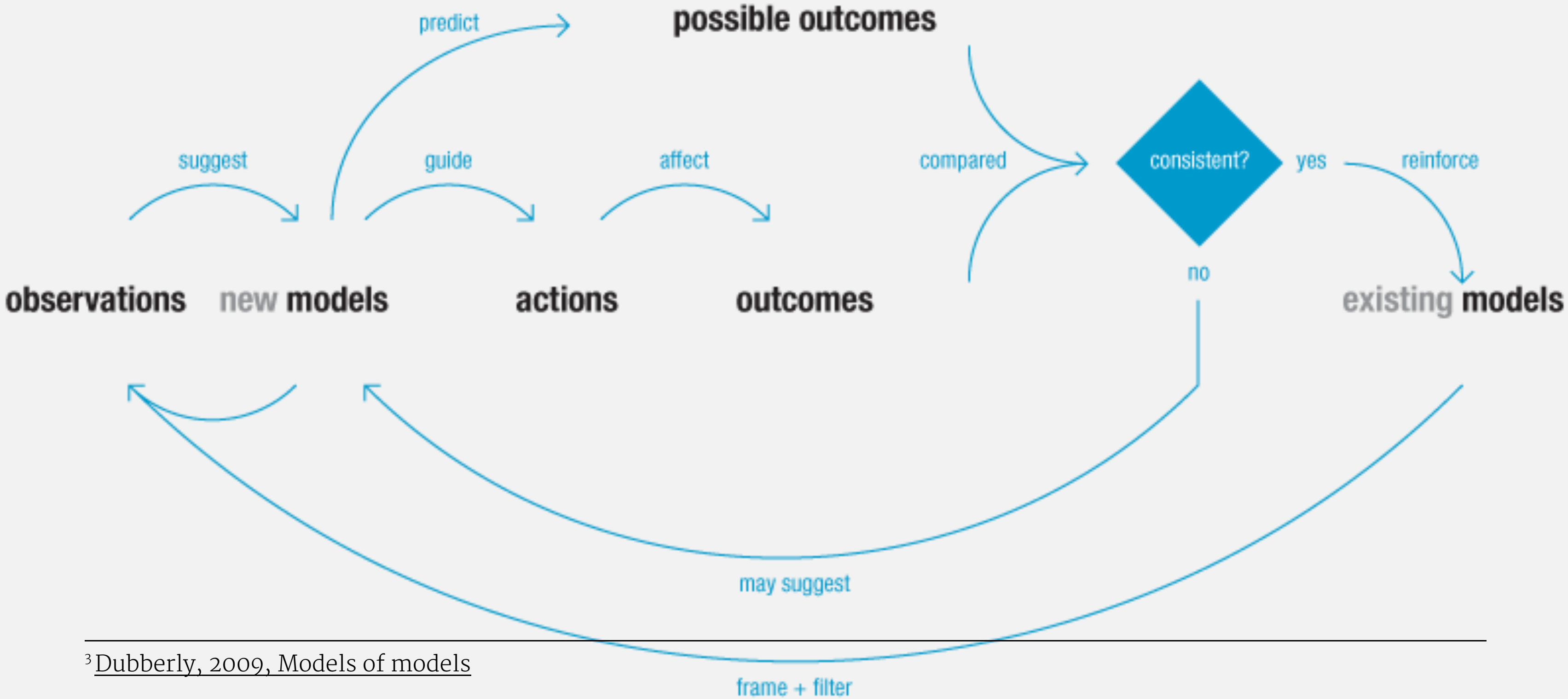


¹Dubberly, 2009, Models of models



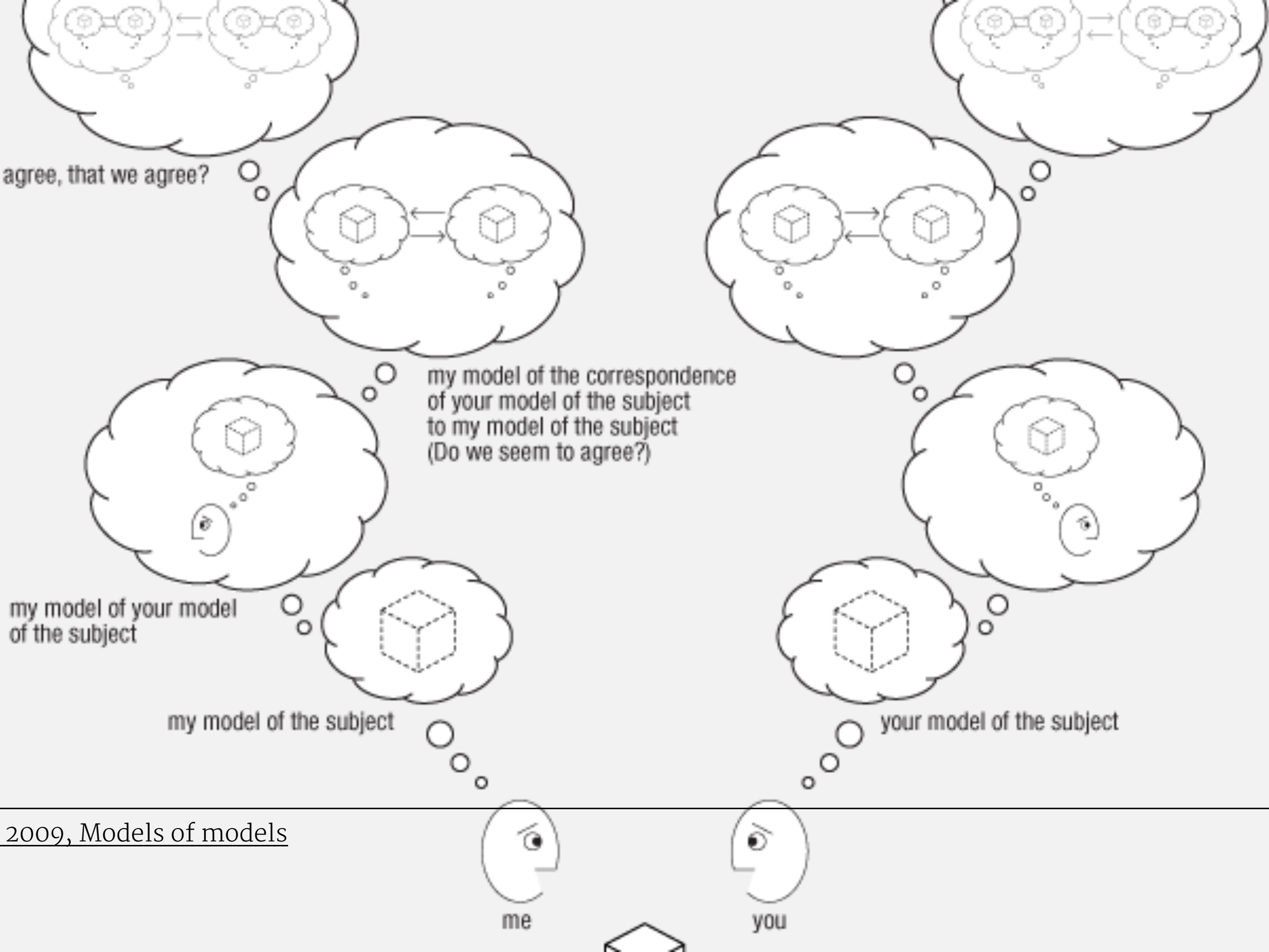
²Dubberly, 2009: **Left**: Ptolemaic, geo-centric model; **Right**: Copernican, helio-centric model

How do we build models? What for?



³Dubberly, 2009, Models of models

Do we seem to agree, that we agree?



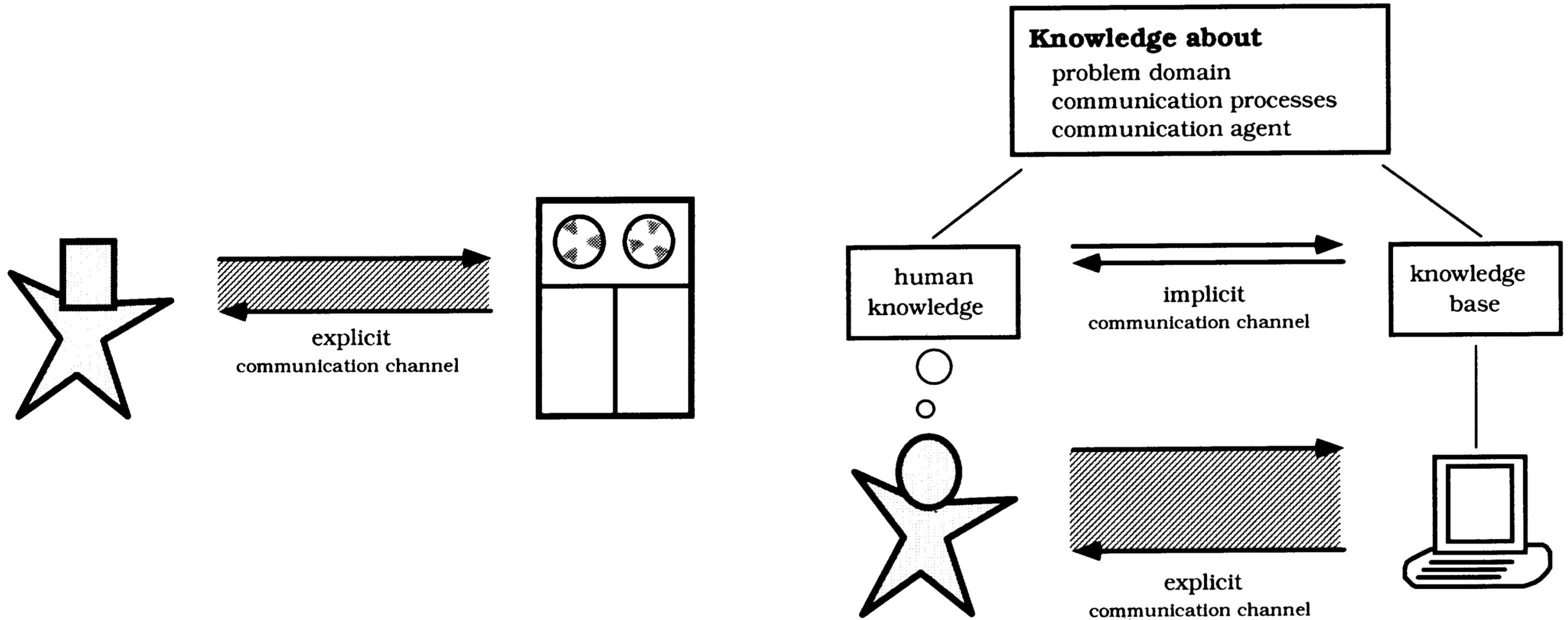
⁴Dubberly, 2009, Models of models

Good models involve...

1. **Fit**: How does the model fit the observation?
2. **Least means**: Is a simpler model conceivable? (Law of parsimony; Novacula Occami)
3. **Consistency**: Is the model internally consistent?
4. **Predictive value**: How well does the model predict?⁵

⁵Dubberly, 2009, Models of models

Why do we need models in HCI?



⁶Fischer, 2001, User modeling in human-computer interaction: **Left**: human-computer dyad; **Right**: knowledge-based HCI

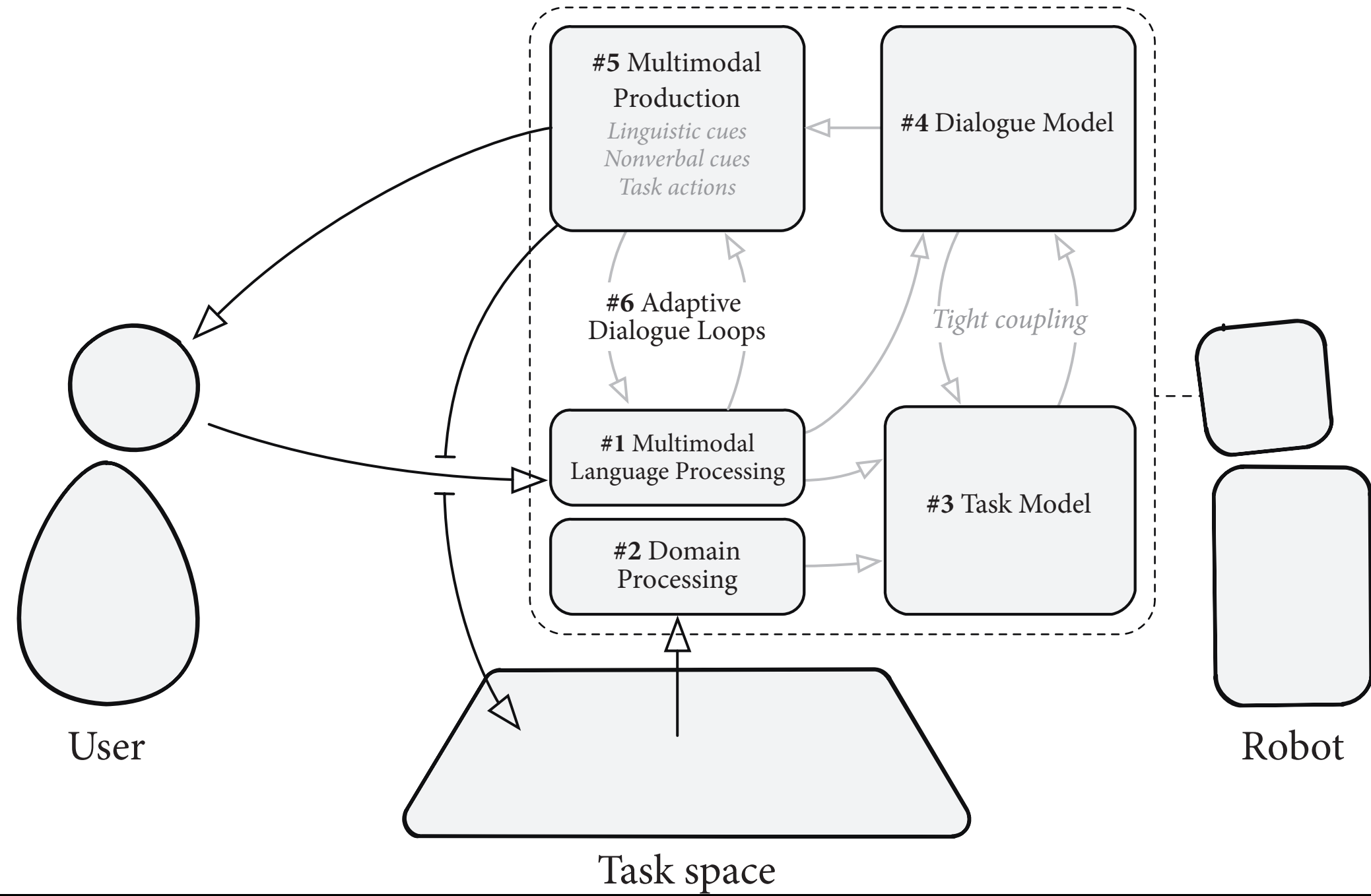
Implicit communication requires computer to have...

1. Knowledge about the problem domain
(E.g., *what is the user doing?*)
2. Knowledge about communication processes
(E.g., *when can I communicate with the user?*)
3. Knowledge about the communication agent⁷
(E.g., *what does the user know?*)

⁷Fischer, 2001, User modeling in human-computer interaction

Common models:

1. Knowledge about the problem domain → **task models**
2. Knowledge about communication processes → **dialogue models**
3. Knowledge about the communication agent → **user models**



⁸ Mutlu et al., 2014, Enabling human-robot dialogue

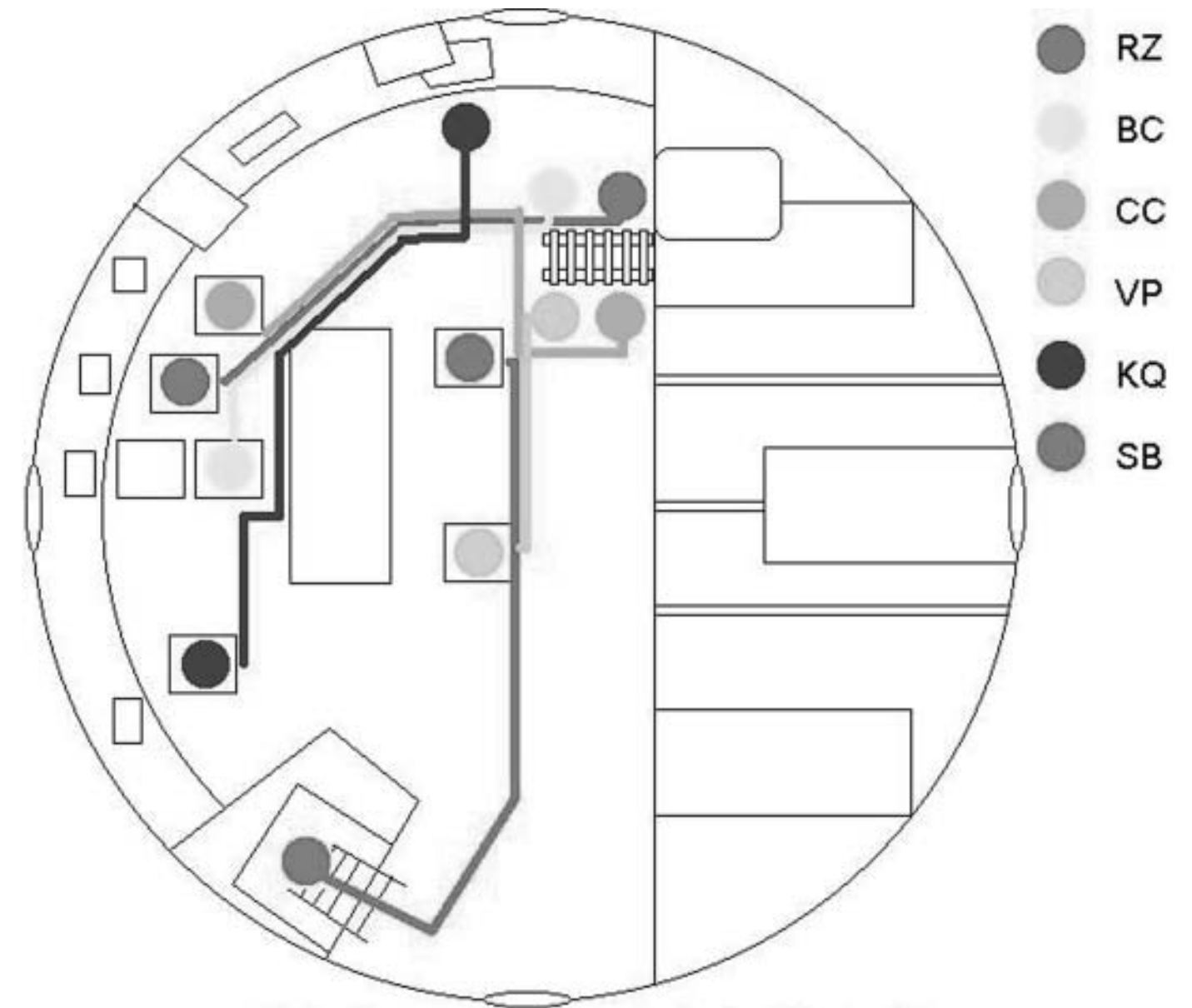
What are some example models?

RZ requests weather info from **BC**. (They need it to decide whether to go for EVA).

BC gets *up* from his **chair**, *walks* to workstation area, to his **laptop** (in a subarea), and checks weather report (for ~7 min; *sitting* facing **laptop**). After

BC is done, he *walks back to* wardroom table area, approaches his chair area, and *sits down* on his **chair**. He then communicates the weather data to **RZ**. Shortly after **BC** goes to check the weather, **RZ** gets *up* from his **chair**, *walks* to water tank area, *climbs* the **water tank ladder**, and *checks water level* (by looking into the **water tank**—standing on the ladder at the upper rim of **water tank** level, facing it).

```
workframe CheckWaterLevel
when (unknown(current.timeToFillWaterTank))
detectable DetectWaterLevel {
  detect((WaterTank.waterLevel = 0))
  then continue;}
do { Getup();
  Walk(GalleyLadderArea);
  Upladder(WaterTankArea);
  CheckWaterLevel();
  Downladder(GalleyLadderArea);
  Walk(WardroomTableArea);
  conclude((current.waterLevelChecked = true)); }
```



⁹Clancey et al., 2006, Cognitive Modeling of Social Behaviors

Discussion Questions

- >> What models have you observed?
- >> How can we use these models?
- >> What are limitations of these models?
- >> ...