Embodied Cognition Theory Applied to the Design of Musical Agents

1. Evaluation & Design
2. Interaction Model

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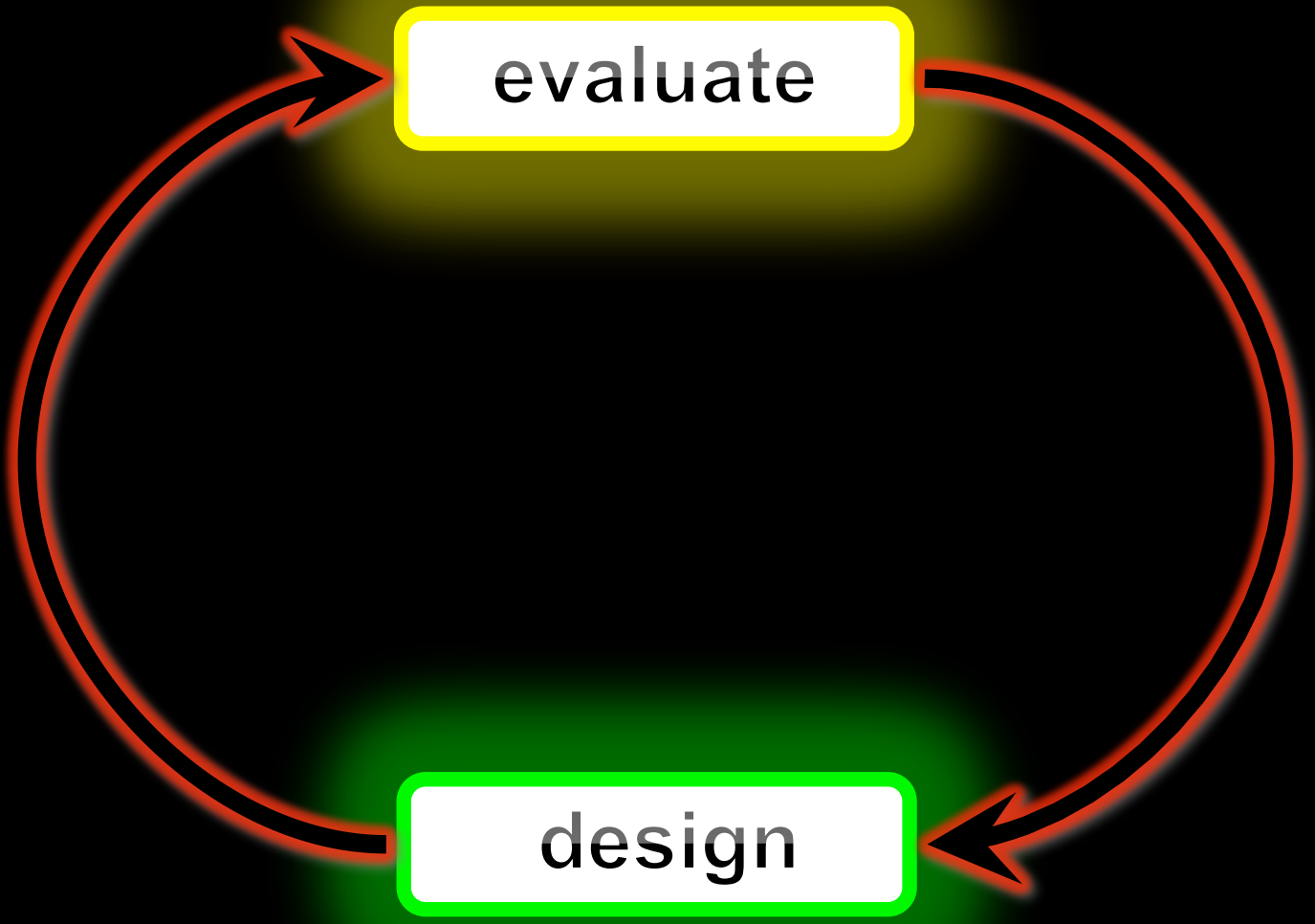
1. Evaluation & Design

Iterative design:

c.f. Cavalieri et al., 2016; El-Shimy & Cooperstock, 2016; Saariluoma et al., 2009



Iterative design:

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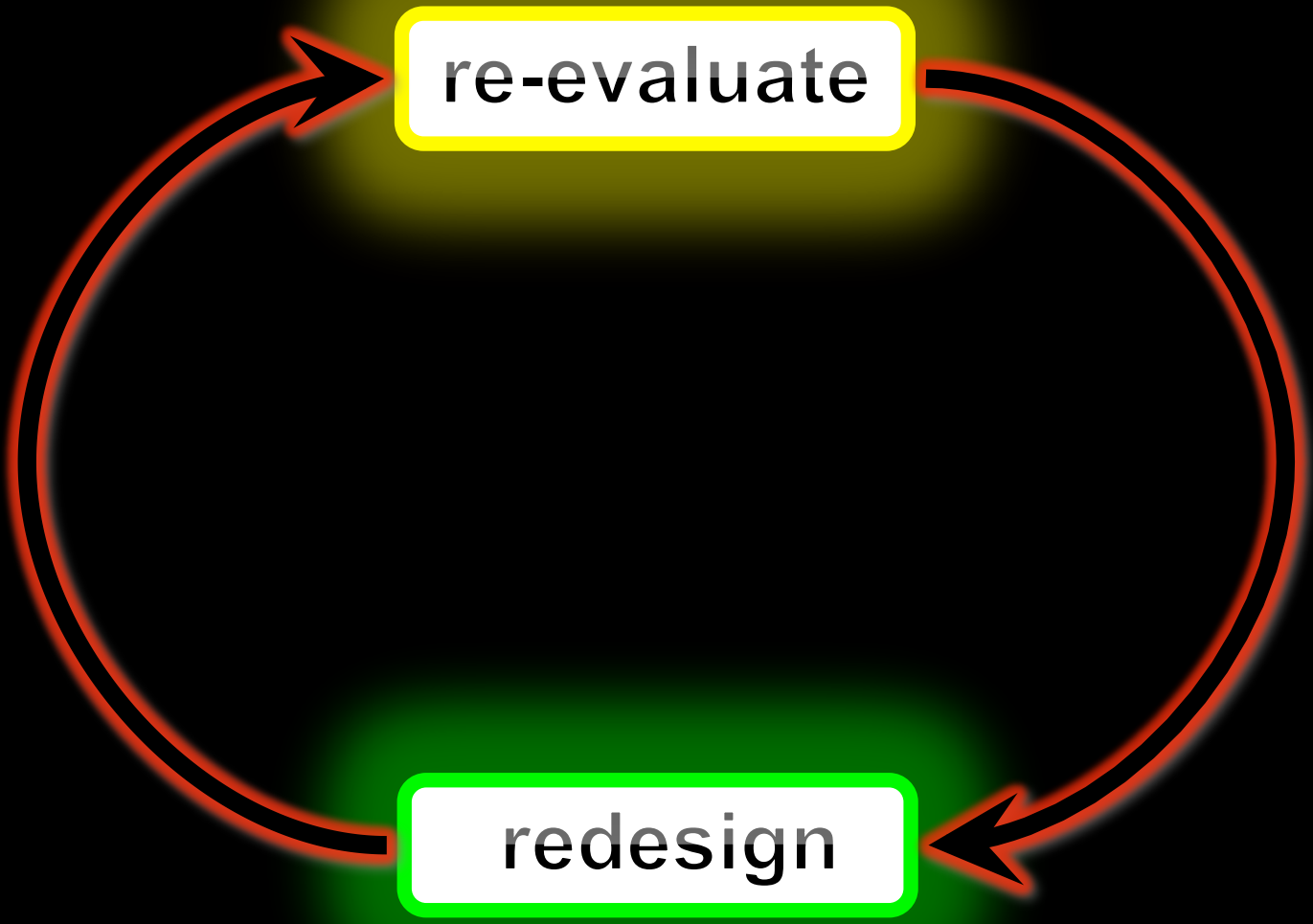


Evaluation

Discover Affordances

What sounds, movements, images, feelings, etc.
can I make, get, evoke, etc.?

c.f. Gibson, 1977

Evaluation

Free exploration

- Involves spontaneous behaviour, social interaction and contextual patterns (Leman et al. 2010)
- Displays the affective dimension (Kiefer, Collins & Fitzpatrick, 2008)
- Allows “Playful Design” (McPherson et al. , 2016, Gaver, 2002)
- Promotes curiosity and exploration (Gaver et al. , 2004)
- Values ambiguity and openness to interpretation (Gaver et al. 2003)
- Leads to appropriation from the ”user” (Dix, 2007).

Exploratory evaluation

- Helps to identify how the problem can be approached in the future (Lazar et al., 2009)
- Is especially useful in situations where there is no previous experience, hypotheses or research questions, where enquiry tends to be an open problem and more descriptive than analytic (Murchison, 2010).

Task-based

- Measure performance of specific engineering solutions.

Evaluation Methodology

- Recording of free-exploration evaluation (e.g., video, audio, etc.)
- Observation of Mimetical Relationships Between Bodily Movement And Musical Structure (i.e., musical sound)
- The “unit in time” to measure these relations can be called *Gesture*, which is hierarchical (e.g., gestures that contain gestures as phrases that contain words that contain letters) and multimodal (e.g., visual, kinetic, auditory). The meaning of the gesture can be explained as a metaphor.

For the interested reader:

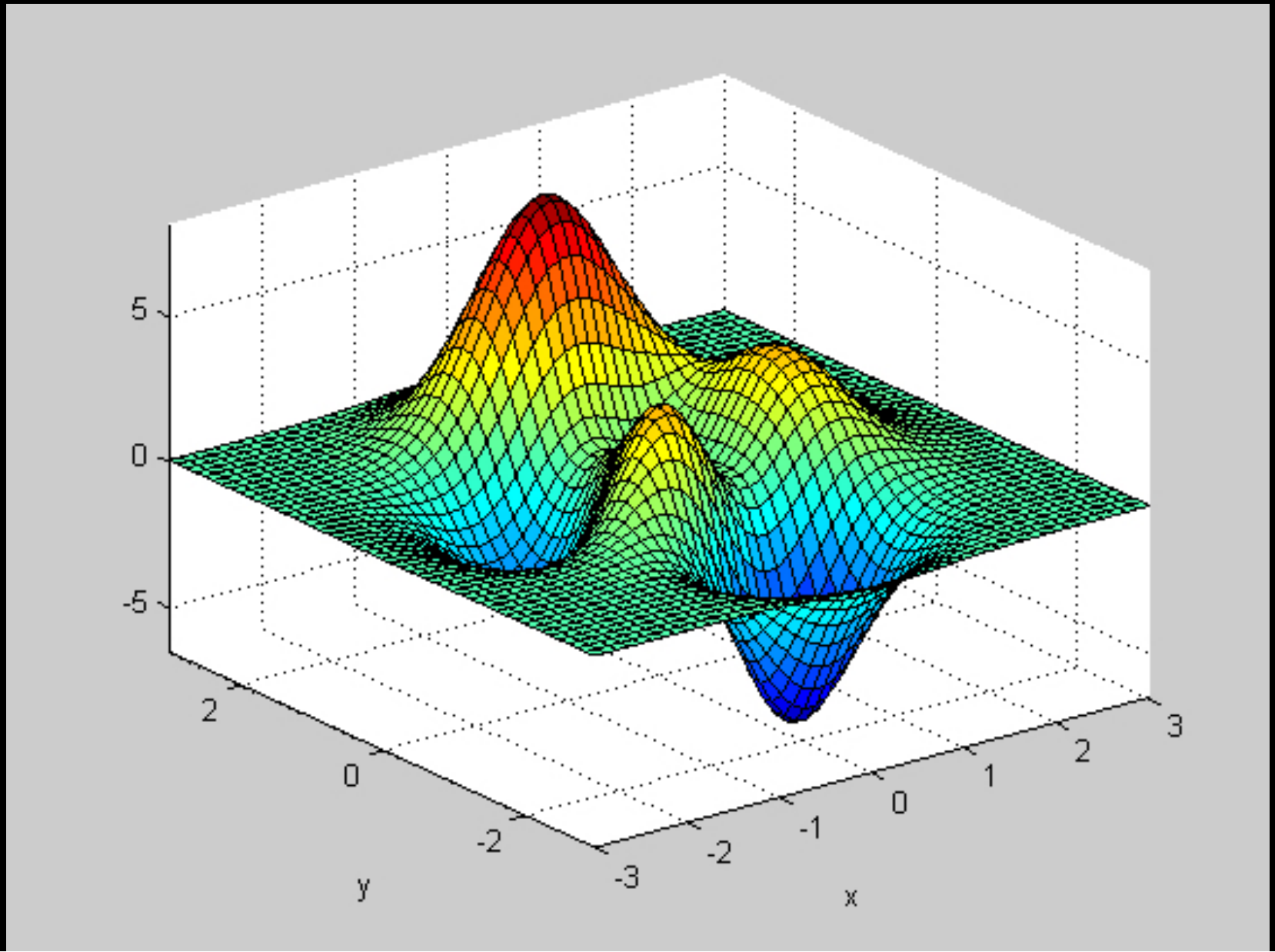
Xambó et al., 2013; MacDougall, 2006; Heath et al., 2010; Jordan & Henderson, 1995; Hagedorn et al., 2008; Stowell et al., 2009; Banister, 2011; Pugliese & Tahiroglu, 2012

Watch this video:
http://users.jyu.fi/~juigmend/video/Mimetic_Relationships_Music_Gesture_SHORT_LQ.mp4

2. Interaction Model

Gesture Topology

(Mazzola & Andreatta, 2007)



Signal Flow

stages in terms of *devices*

- Control: Sensors
- Mapping: Software
- Sound Production: Software and Loudspeakers

Signal Flow

stages in terms of *cartesian mind*

- Control: Perception
- Mapping: Cognition
- Sound Production: Action

The Sandwich Model

(Hurley, 2002, p. 401)

Signal Flow

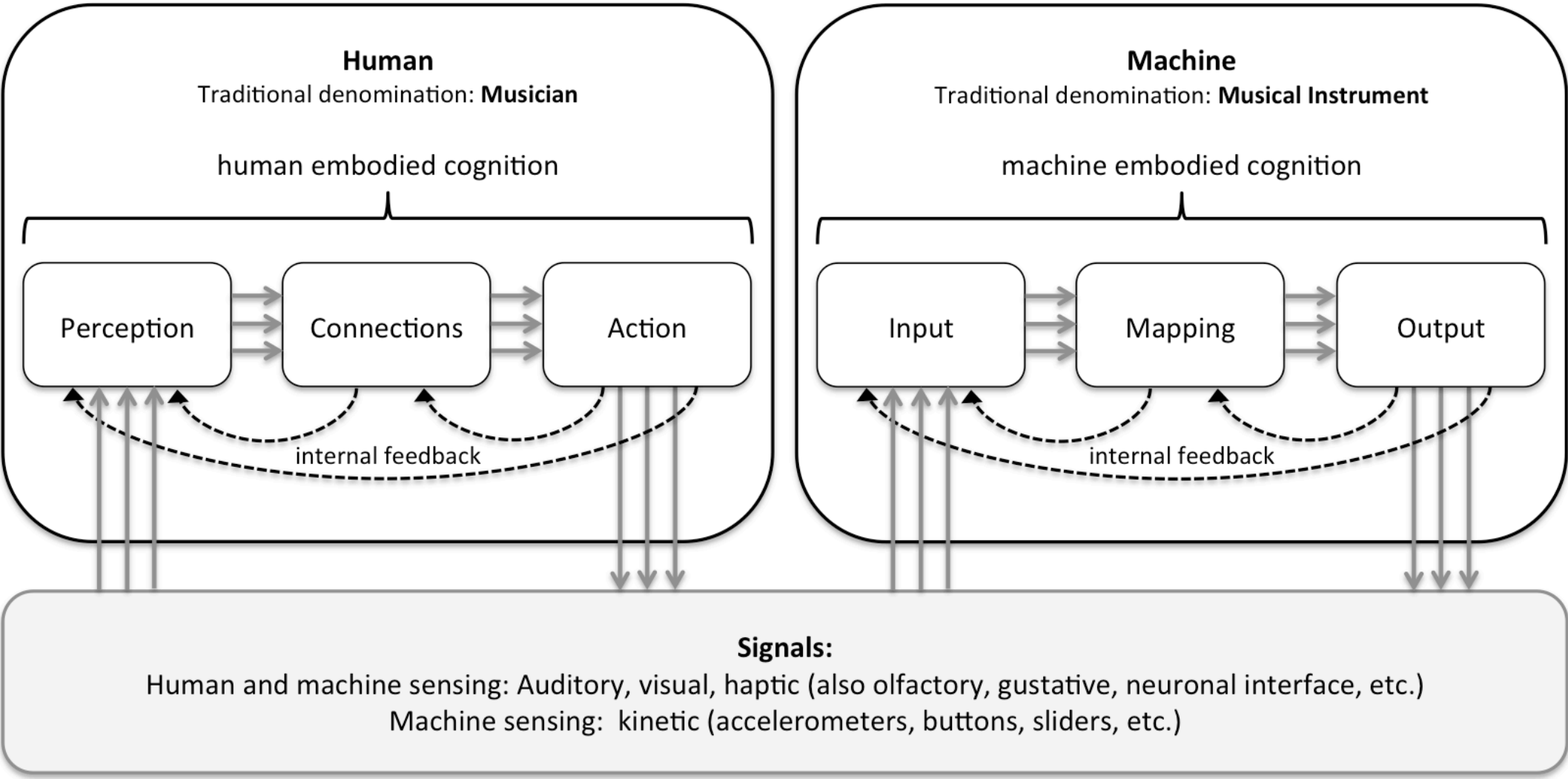
stages in terms of *cartesian mind*

Flow is enactive
(towards action)

- Control: Perception
- Mapping: Cognition
- Sound Production: Action

Human-Machine Embodied Musical Interaction

(Mendoza & Thompson, in press)



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