

# Game Experience Design

Embodiment

Prof. Dr. Jochen Koubek

16.05.2017





# Leib und Seele

Von Platon über Plotin zum  
Jüdisch-Christlichen Menschenbild



# Körper und Geist

Von der Philosophie des Geistes zur Populärkultur



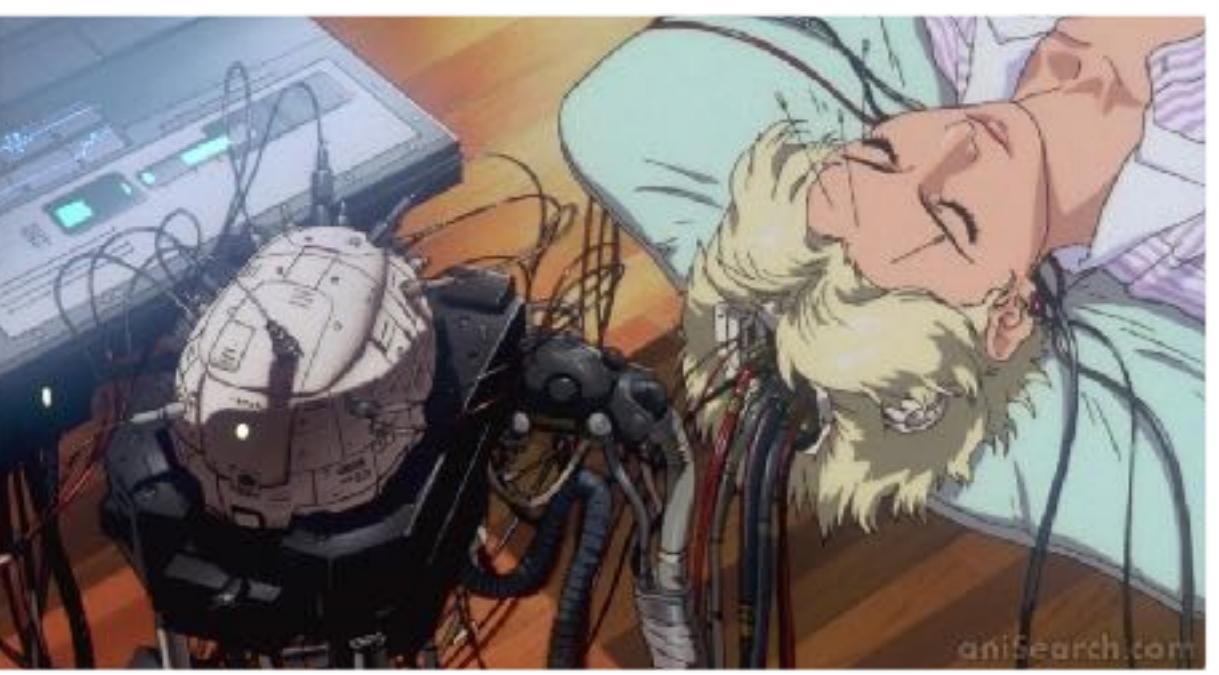
Die Zirbeldrüse als Vermittlerin zwischen  
Körper und Geist bei René Descartes



Zombies als Körper ohne Geist in John Romeros „Night of the Living Dead“



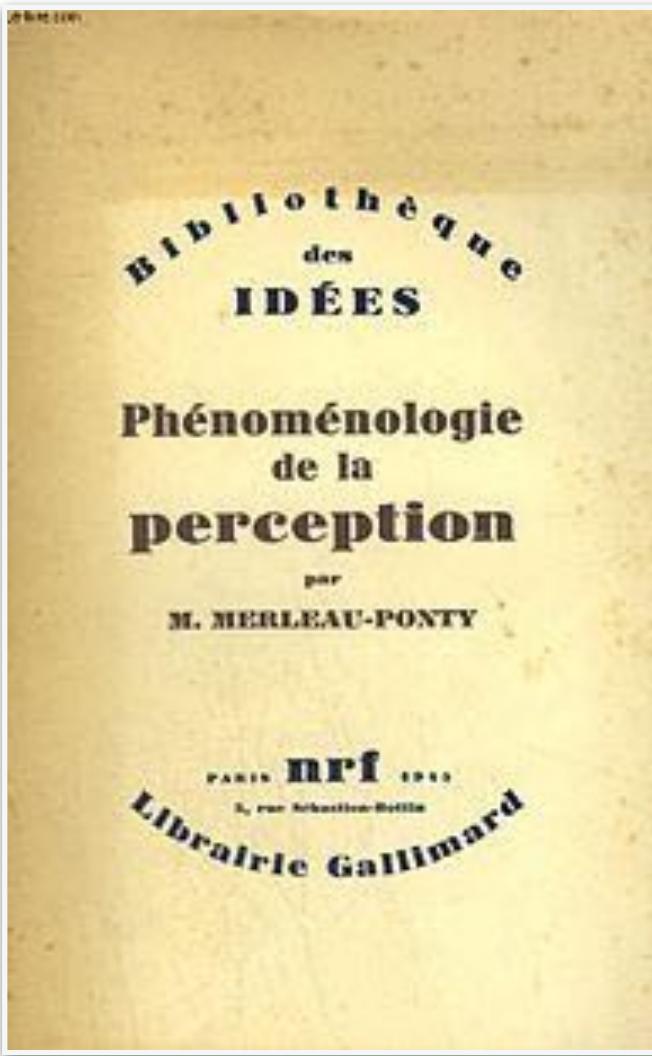
Gespenster als Geister ohne Körper in Jules Dassins „Canterville Ghost“ (1944)



Körper und Geist als Hard- und Software in Mamoru Oshii's „Ghost in the Shell“ (1995)



# Embodied Turn



The body is our general medium for having a world. Sometimes it is restricted to the actions necessary for the conservation of life, and accordingly it posits around us a **biological world**; at other times, elaborating upon these primary actions and moving from their literal to a figurative meaning, it manifests through them a core of **new significance**: this is true of motor habits [sic] such as dancing. Sometimes, finally, the meaning aimed at cannot be achieved by the body's natural means; it must then build itself an instrument, and it projects thereby around itself a **cultural world**.

(Merleau-Ponty 1962: 146)

innate structures, basic general skills, cultural skills

# Kognition (VL 02)

Wahrnehmen und Erkennen

Aufmerksamkeit

Wissen

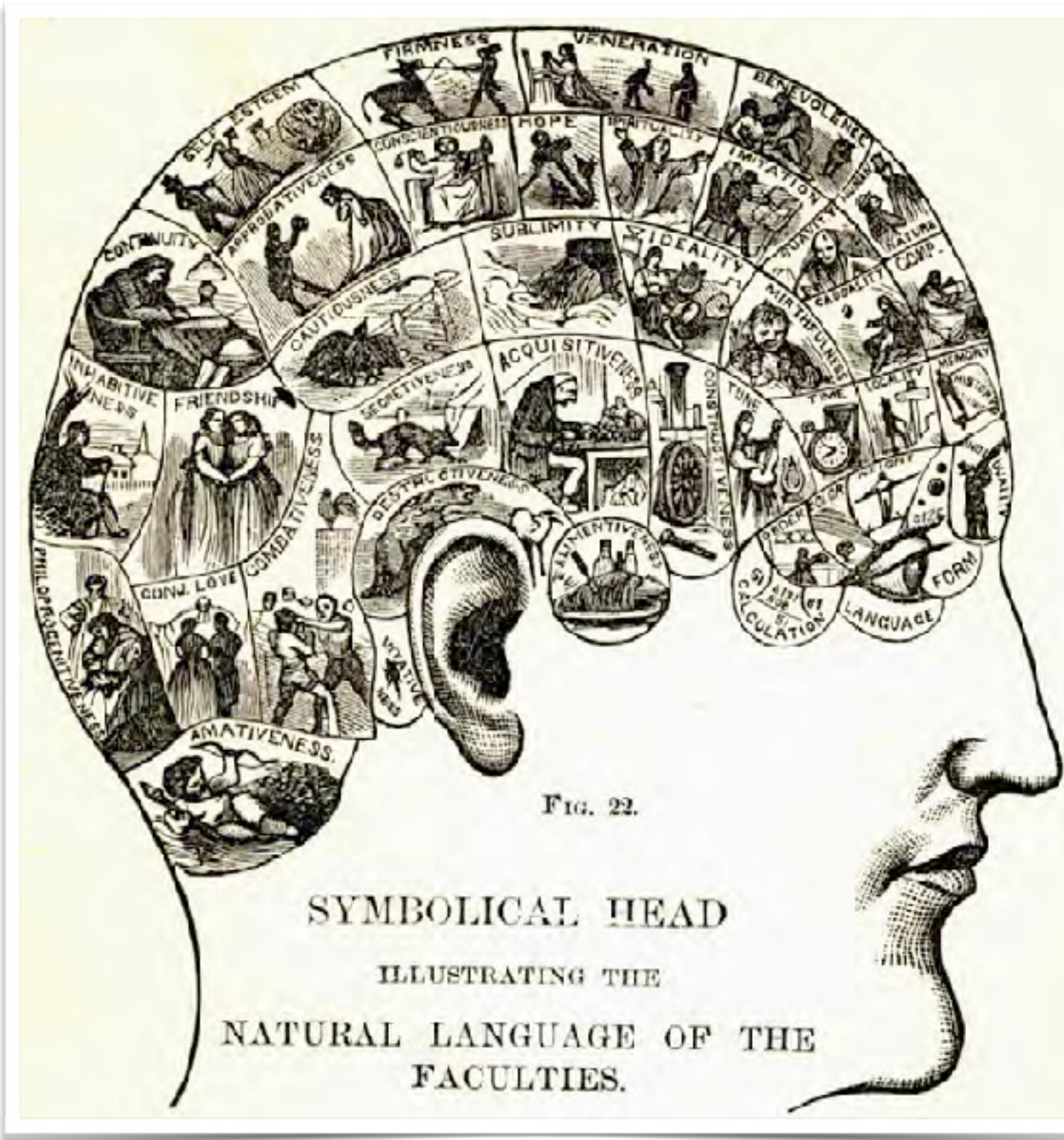
Mentale Modelle

Gedächtnis

Lernen

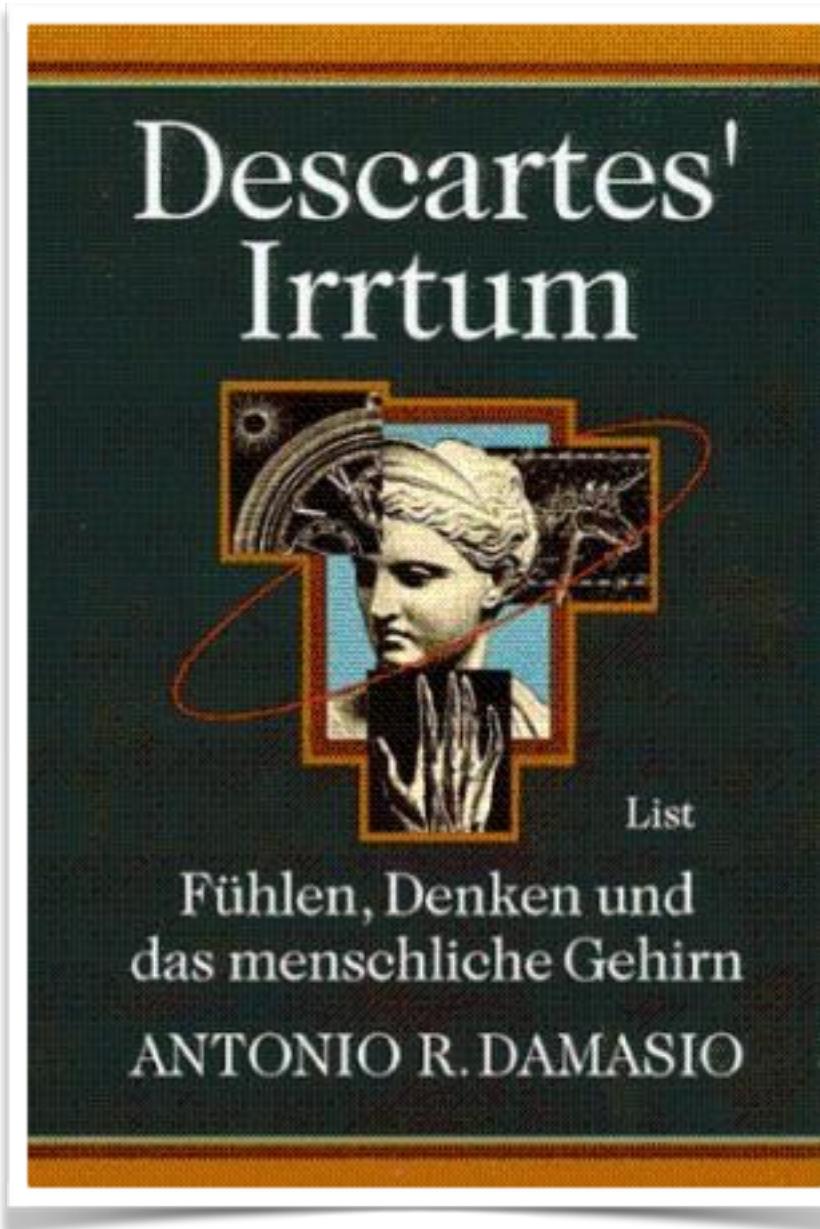
Lesen, Sprechen, Zuhören

Problemlösen, Planen, Begründen, Entscheiden



vgl. Anderson (2015): Cognitive Psychology, 8. Aufl.

# Nicht-Cartesianische Kognitionstheorie



**4E**

Embodied

Extended

Embedded

Enacted

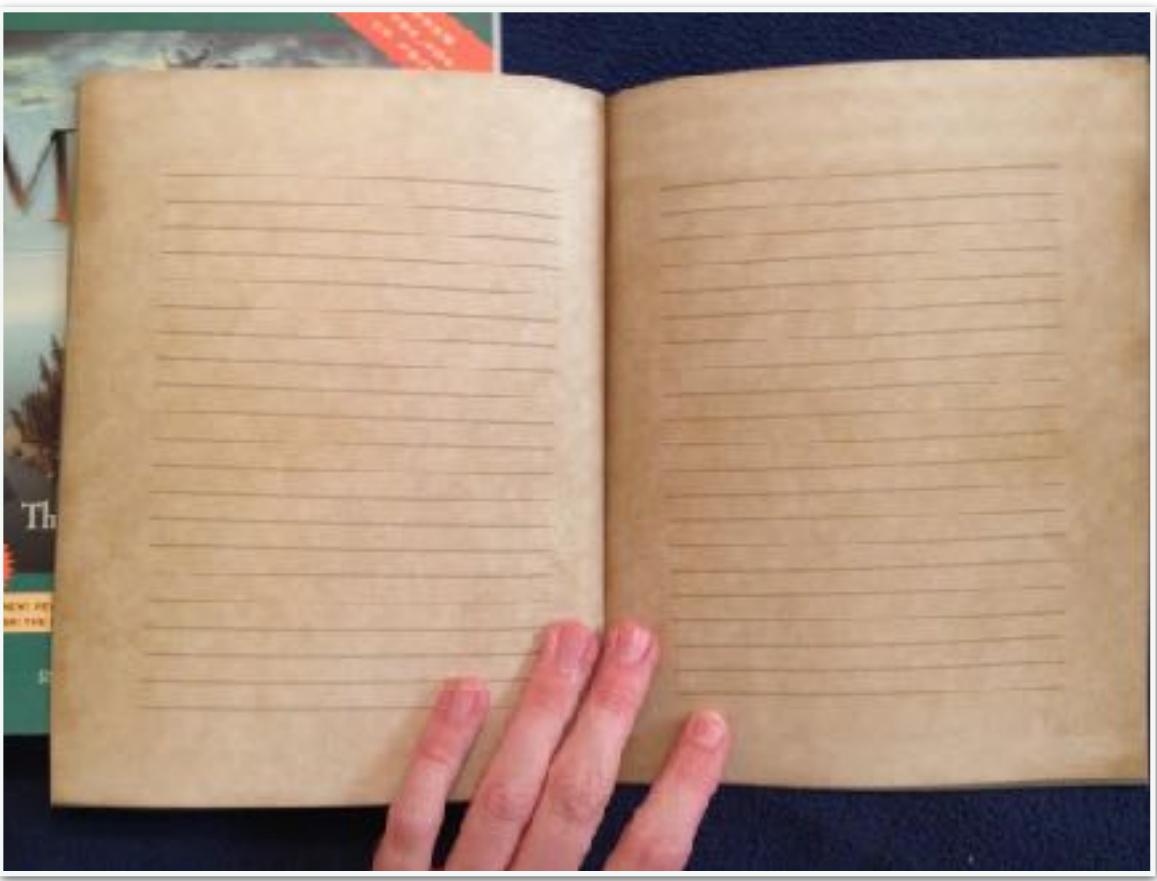


# Embodied Cognition

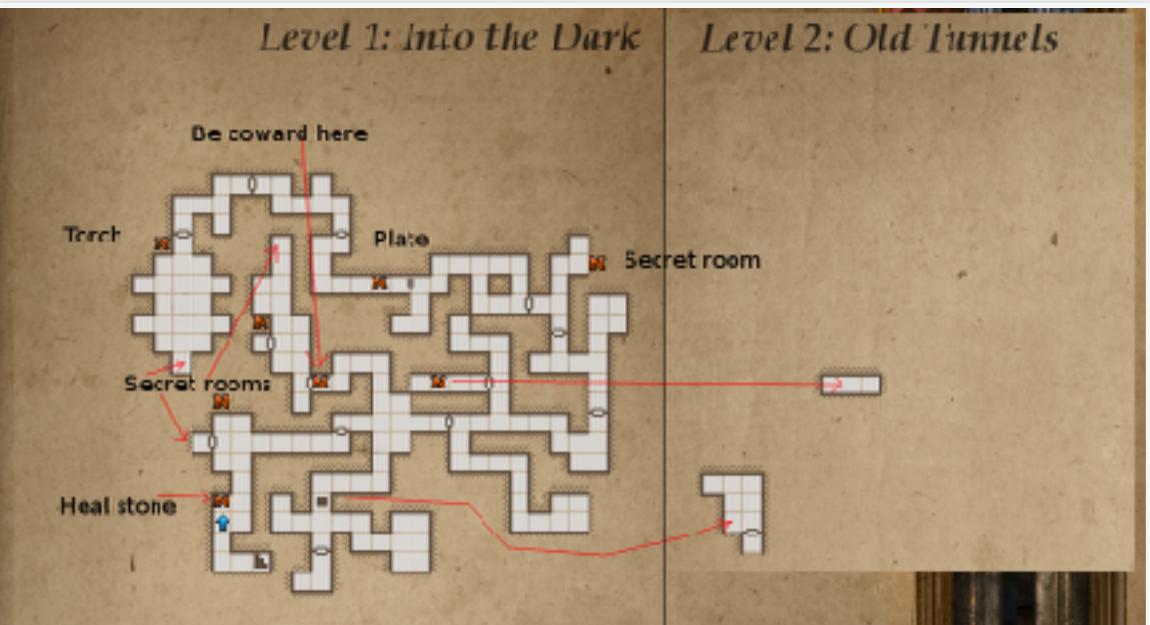
1. Cognition is situated.
2. Cognition is time pressured.
3. We off-load cognitive work onto the environment.
4. The environment is part of the cognitive system
5. Cognition is for action.
6. Off-line cognition is body based.

Margaret Wilson (2002): *Six views of embodied cognition*

# Extended Cognition



Das *Myst*-Journal sah explizit Platz für eigene Notizen vor



*Legend of Grimrock* zeichnet eine Karte im Pen&Paper-Stil

# Externes Gedächtnis

Kann auch vom Spiel übernommen werden

Notizen

Protokolle

Karten

Controller Schemata

# Spielhinweise



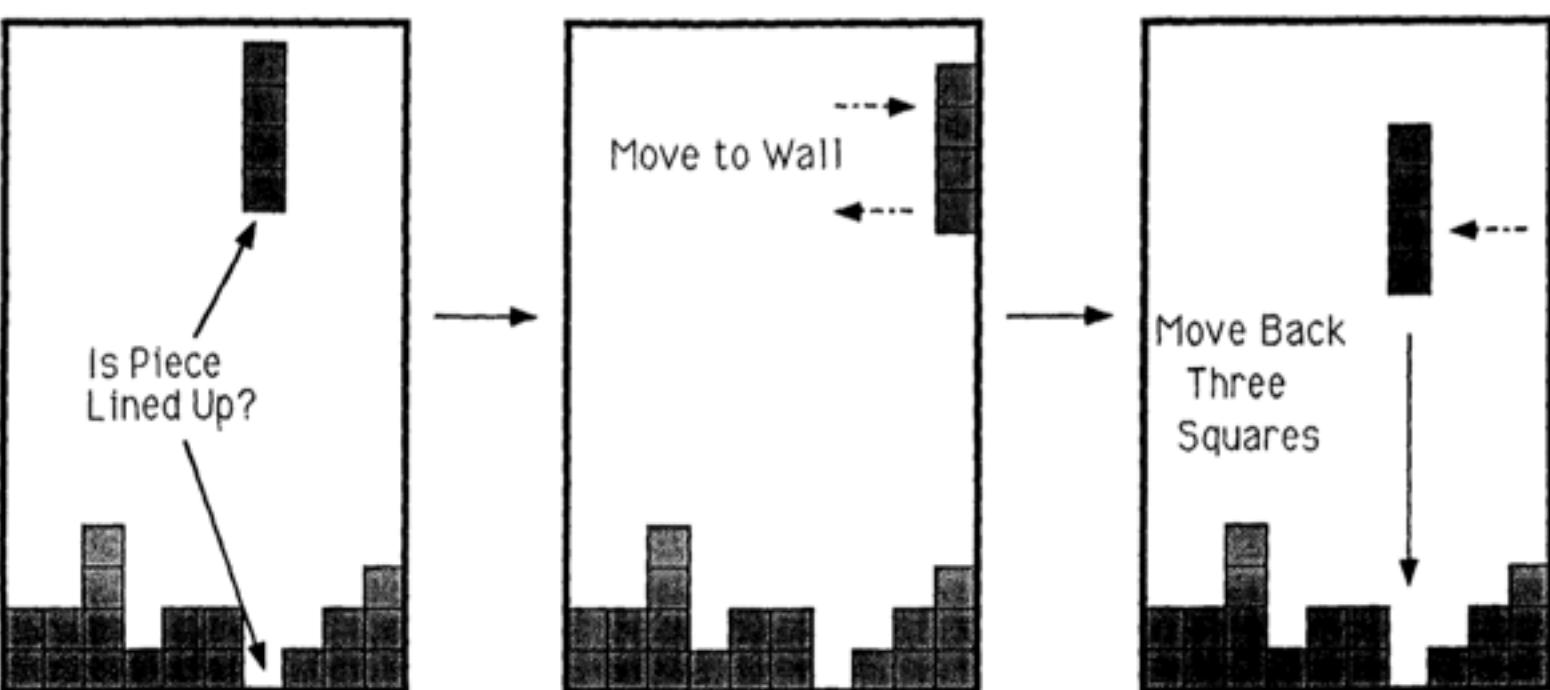
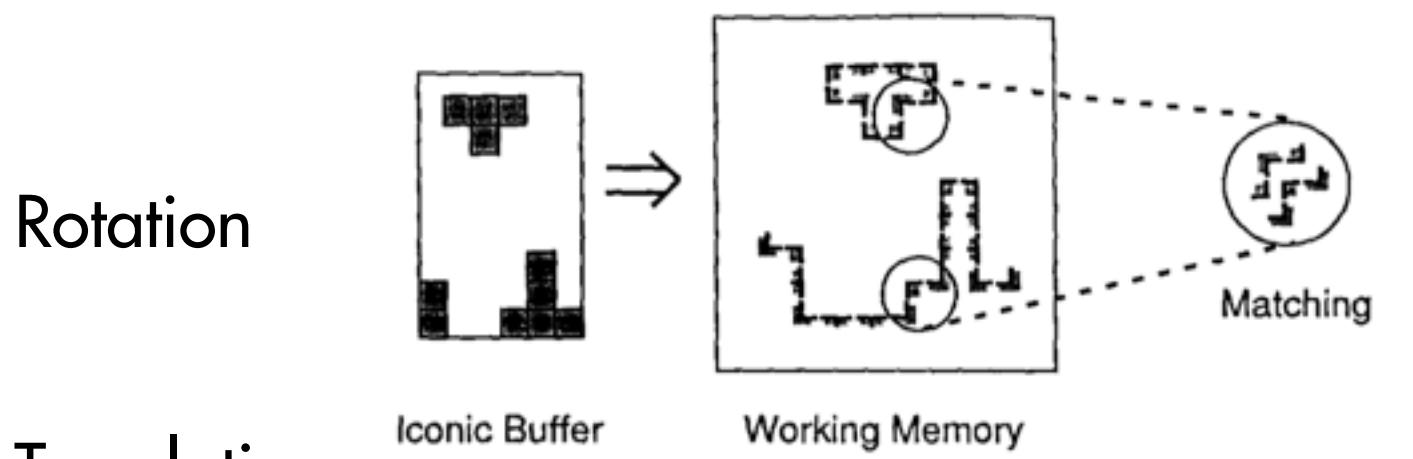
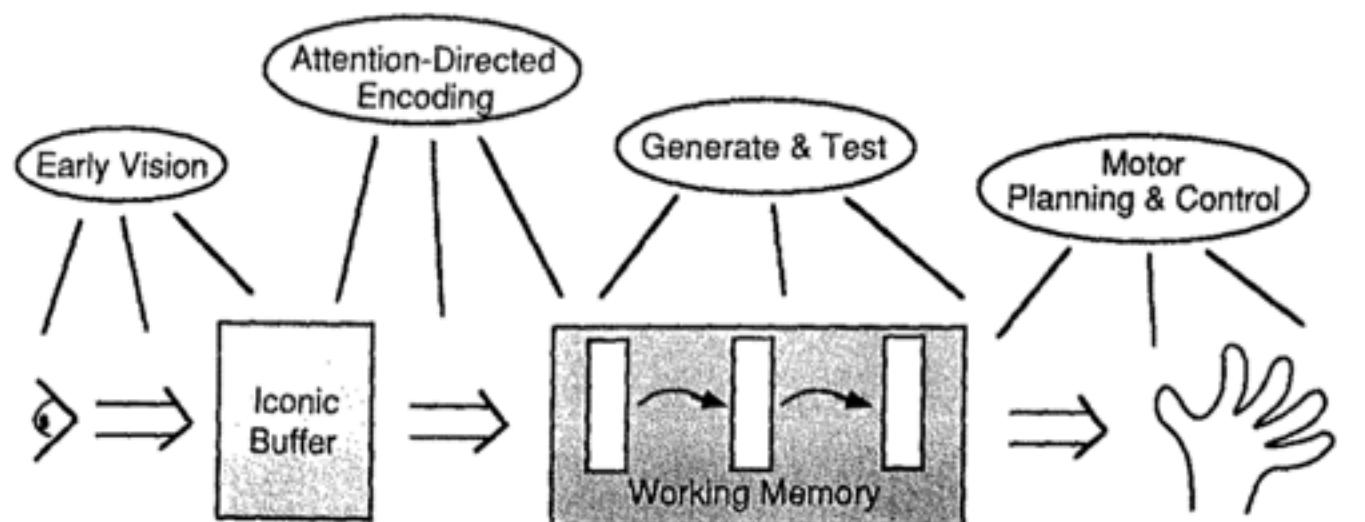
Hilfreich: Hinweise zur kontextabhängigen Steuerung  
in Assassin's Creed



Lästig: Nicht-deaktivierbare Hinweise zur Standard-  
Steuerung in The Last Guardian



# Epistemic Actions



1. reducing the memory involved in mental computation, that is, space complexity;
2. reducing the number of steps involved in mental computation, that is, time complexity;
3. reducing the probability of error of mental computation, that is, unreliability.

Goldener Apfel	
	
Kategorie	Nahrung
Regenerierung	 
Goldener Apfel	 Absorption (2:00)  Regeneration II (0:05) <b>Goldener Apfel (Verzaubert)</b>  Absorption IV (2:00)  Regeneration II (0:20)  Feuerschutz I (5:00)  Resistenz I (5:00)
Effekt	
Grillbar	Nein
Stapelbar	Ja (64)
Einführung	Siehe Geschichte golden_apple
Datenwert	dez: 322 hex: 142
Metadata	Goldener Apfel: 0 Goldener Apfel (Verzaubert): 1
NBT-Daten	Siehe Gegenstandsdaten

# Crowdsourcing: Goldener Apfel

Vorlage · Diskussion · Inhalt

[einklappen]

 Nahrung	
Tiere	 Fisch (  Roher Kabeljau •  Roher Lachs •  Clownfisch •  Kugelfisch •  Gebratener Kabeljau •  Gebratener Lachs) •  Gebratenes Hammelfleisch •  Gebratenes Hühnchen •  Gebratenes Kaninchen •  Gebratenes Schweinefleisch •  Kaninchenragout •  Milch •  Rotes Hammelfleisch •  Rotes Hühnchen •  Rotes Kaninchen •  Rotes Rindfleisch •  Rotes Schweinefleisch •  Spinnenauge •  Steak •  Verrottetes Fleisch
Pflanzen	 Apfel •  Borschlsch •  Brot •  Chorusfrucht •  Giftige Kartoffel •  Goldene Karotte •  Goldener Apfel •  Karotte •  Kartoffel •  Keks •  Kuchen •  Kürbiskuchen •  Melone •  Ofenkartoffel •  Pilzsuppe •  Rote Beete
Überblick	<a href="#">Ackerbau (-Anleitung)</a> • <a href="#">Crafting-Rezepte</a> • <a href="#">Datenwert</a> • <a href="#">Gegenstand</a> • <a href="#">Hunger</a> • <a href="#">Viehzucht (-Anleitung)</a>

Nahrung > Pflanzen > Goldener Apfel

Beide goldenen Äpfel regenerieren 4 Hunger- und 9,6 Sättigungspunkte, wobei letztere eine schnelle Regeneration zusätzlich unterstützen.

Der normale goldene Apfel gibt dem Spieler Absorption für zwei Minuten, was 4 Absorbierungs-Gesundheitspunkte verursacht, und Regeneration II für fünf Sekunden, was 4 Gesundheitspunkte heilt.

[http://minecraft-de.gamepedia.com/Goldener\\_Apfel](http://minecraft-de.gamepedia.com/Goldener_Apfel)



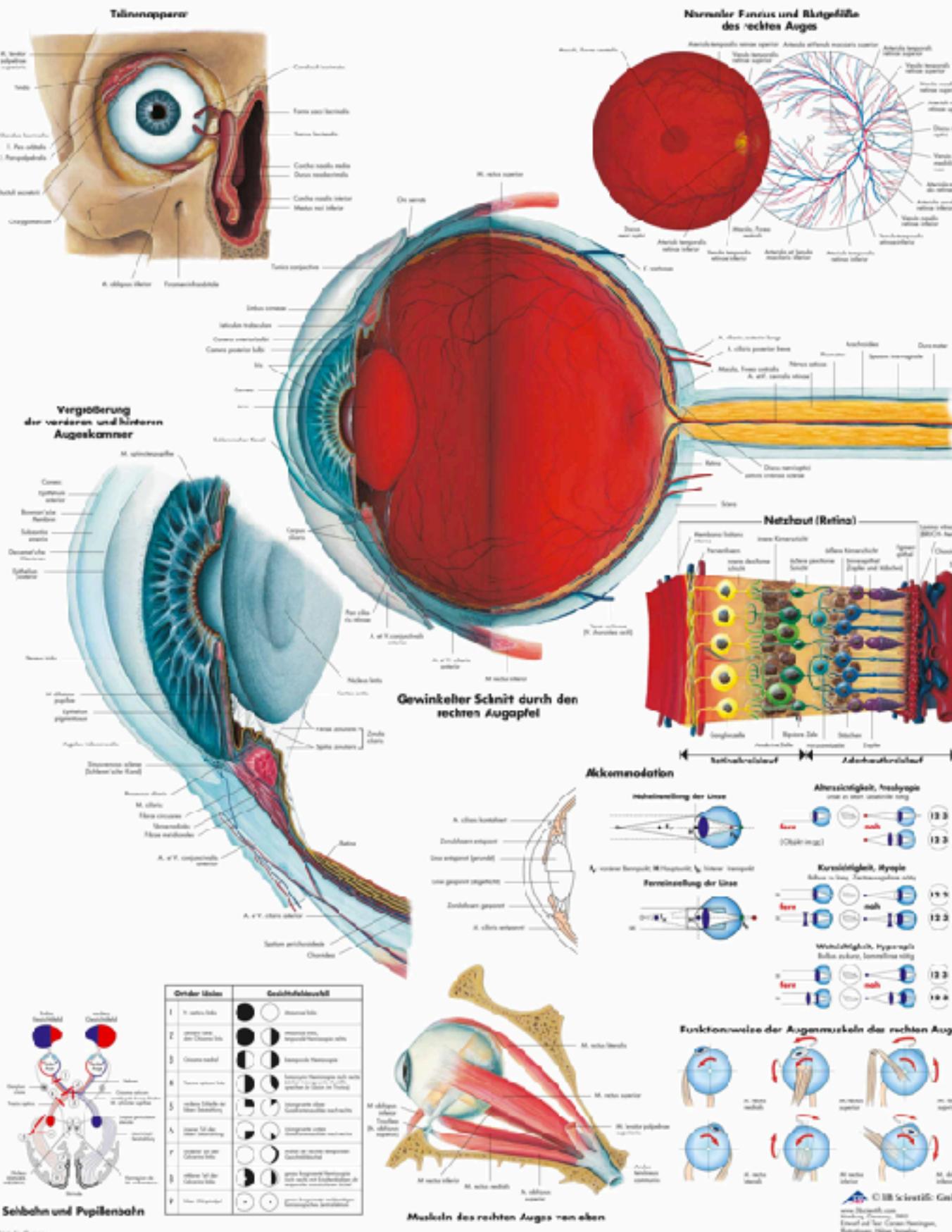
<https://ed-td.space/en/25/3D+Systems+Map>

Diskutieren Sie das Konzept der externen Kognition  
in Bezug auf Computerspiele

# Wahrnehmung

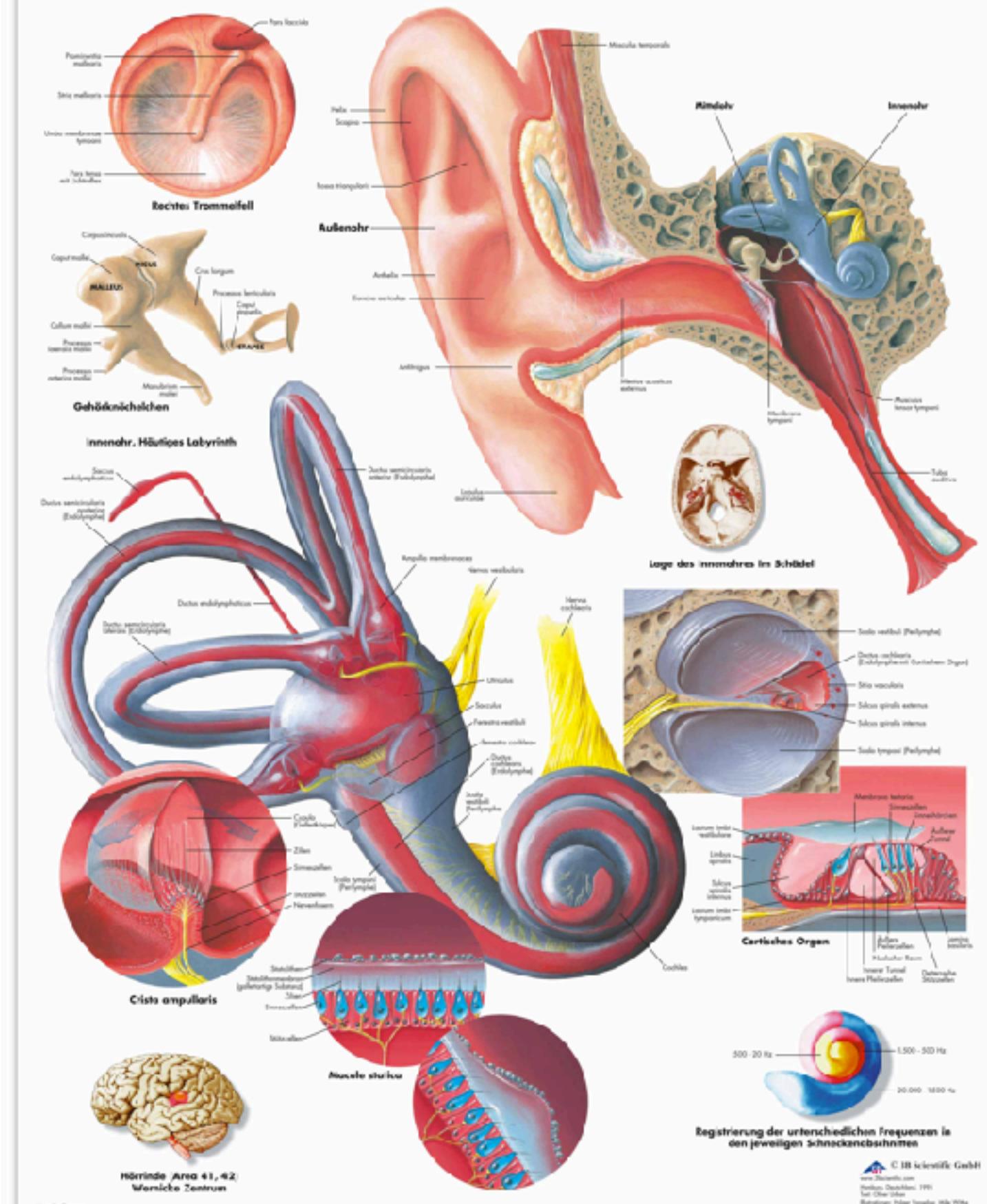
Nichts ist im Verstand, was nicht vorher in den Sinnen war  
(John Locke)

# Das menschliche Auge



[https://www.3bscientific.de/thumblibrary/VR0226UU/VR0226UU\\_01\\_3200\\_3200\\_Lehrtafel-Das-menschliche-Auge.jpg](https://www.3bscientific.de/thumblibrary/VR0226UU/VR0226UU_01_3200_3200_Lehrtafel-Das-menschliche-Auge.jpg)

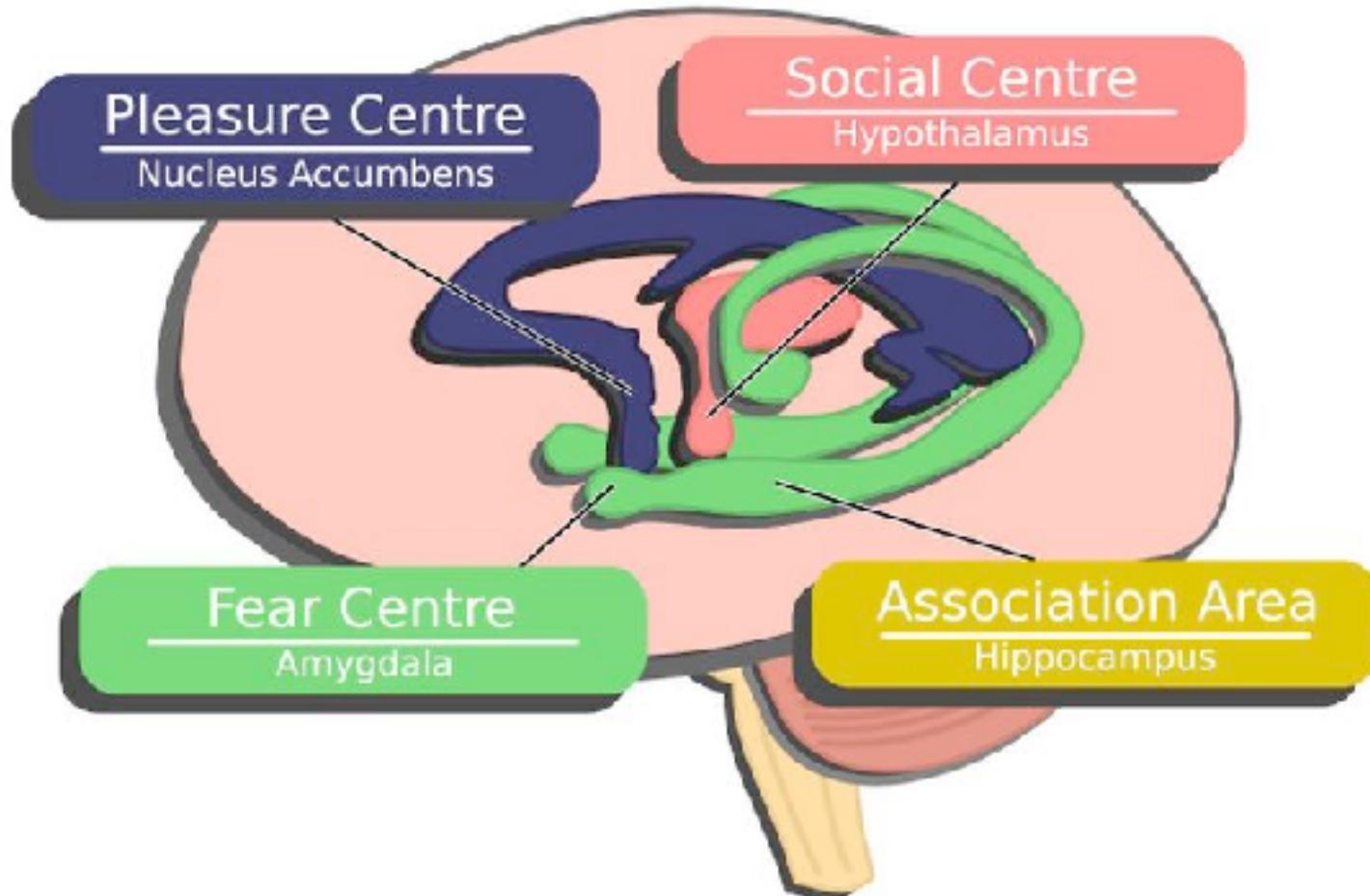
# Das menschliche Ohr



[https://www.3bscientific.de/thumblibrary/VR0243L/VR0243L\\_01\\_3200\\_3200\\_Lehrtafel-Das-menschliche-Ohr.jpg](https://www.3bscientific.de/thumblibrary/VR0243L/VR0243L_01_3200_3200_Lehrtafel-Das-menschliche-Ohr.jpg)



# Emotionen und Gefühle



<http://blog.ihobo.com/2009/02/why-you-play-games.html>

Dopamin

Endorphin

Adrenalin

Oxytocin

Vgl. VL 02 Emotion

Damasio unterscheidet zwischen Emotion und Gefühl: Emotionen sind Änderungen im Gehirn und im Körper (sog. somatische Marker), Gefühle sind kognitivie Wahrnehmungen dieser Veränderungen.

vgl. Damasio: Descartes Irrtum, Kap. 7



# Spiegelneuronen und Motor Interference



„observing other agents who perform bodily actions tends to activate parts of one's own motor system—and if the observing person also performs a motor action herself, the movements may be congruent or incongruent; the latter phenomenon is usually called motor interference“

Gregersen; Grodal (2009): Embodiment and Interface, S. 68

# Embodied Knowledge

# Handlungsmäßige Repräsentation

Erwerb von Sachwissen durch handelnden Umgang mit Dingen.  
(Edelmann/Wittmann, S. 133)



Halos Pistole ist visuell und narrativ wenig eindrucksvoll aber ludisch überaus mächtig:  
„The pistol has big ammo, does heavy damage per hit, and is actually a fairly effective sniping weapon due to a small zoom ability“

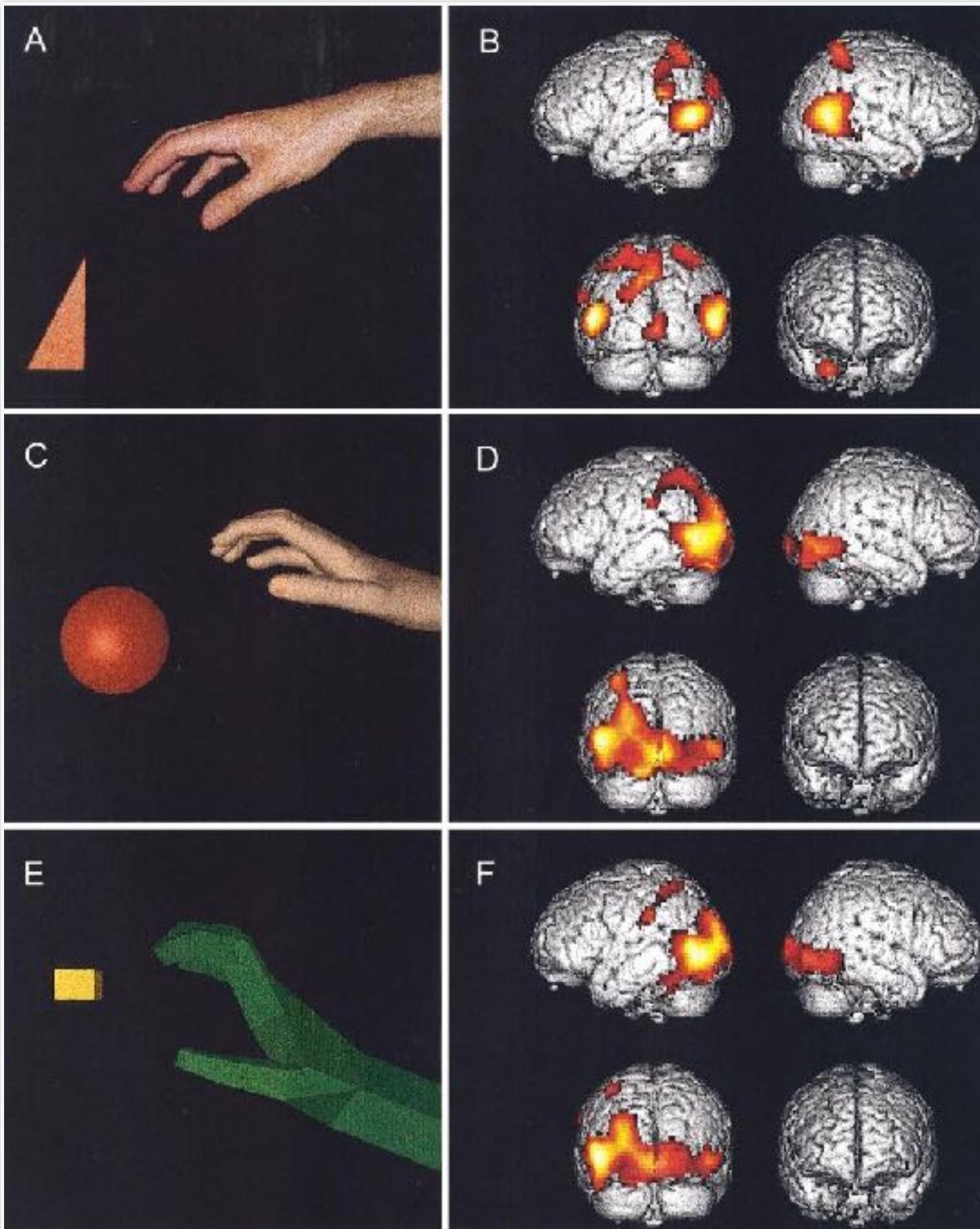
Die Bedeutung eines Wortes ist der Gebrauch des referenzierten Gegenstands.

Die Reglementierung dieses Gebrauchs ist damit immer auch eine implizite Bedeutungszuweisung bzw. eine Steuerung des zu erwerbenden Wissens.

Der Gebrauch eines Game Objects lässt sich audiovisuell zeigen, narrativ erklären, ludisch in das Spielsystem einbetten und performativ zugänglich machen.



# Body Representation



Grafik ist wichtig:

„only perception of actions in reality maps onto existing action representations, whereas virtual-reality conditions do not access the full motor knowledge available to the central nervous system.“

D. Perani, F. Fazio, N. Borghese, M. Tettamanti, S. Ferrari, J. Decety & M. Gilardi. Different brain correlates for watching real and virtual hand actions. *NeuroImage*, 14: 749–758, 2001.



# Affordance



The player now wants to leave the room and she perceives information about possible actions, possibilities relative to her/Guybrush's action capabilities and the situation at hand. She sees the door with a plate on its right side, and perceives it as 'approach-able', 'push-able', and possibly 'pass-throughable'.

# Embodied Memory

# Muskelgedächtnis



Inside Tokyo's Long Love Affair with 'Dance Dance Revolution'  
[https://wn.com/dance\\_dance\\_revolution](https://wn.com/dance_dance_revolution)



# Aufbau von Handlungswissen



Beobachten Sie den Aufbau von embodied knowledge in Bennett Foddys QWOP (2008)  
<http://www.foddy.net/Athletics.html>

<http://www.giga.de/webapps/qwop/tipps/qwop-tipps-und-tricks-fuer-das-schwierigste-spiel-ever/>

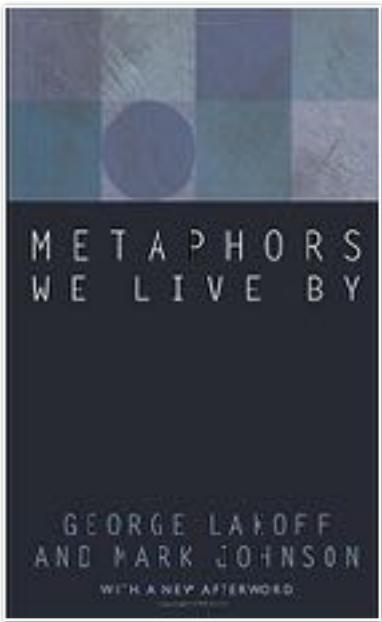


From Masher to Master: Street Fighter  
<https://cs4730.cs.virginia.edu/materials/FightingGamePrimer.pdf>

# Image Schema



# Cognitive Linguistics



Conceptual/Cognitive Metaphor  
(George Lakoff and Mark Johnson. *Metaphors We Live By*, 1980)

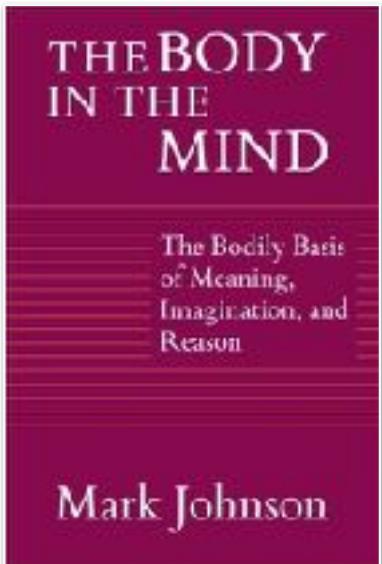
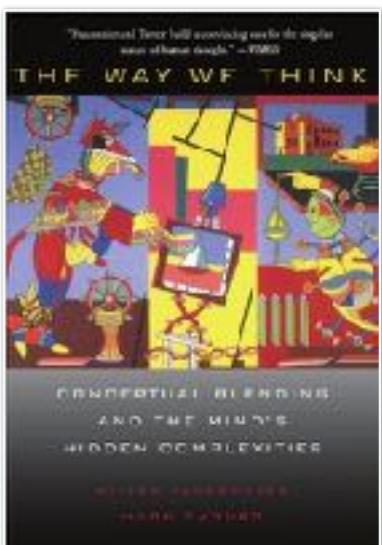


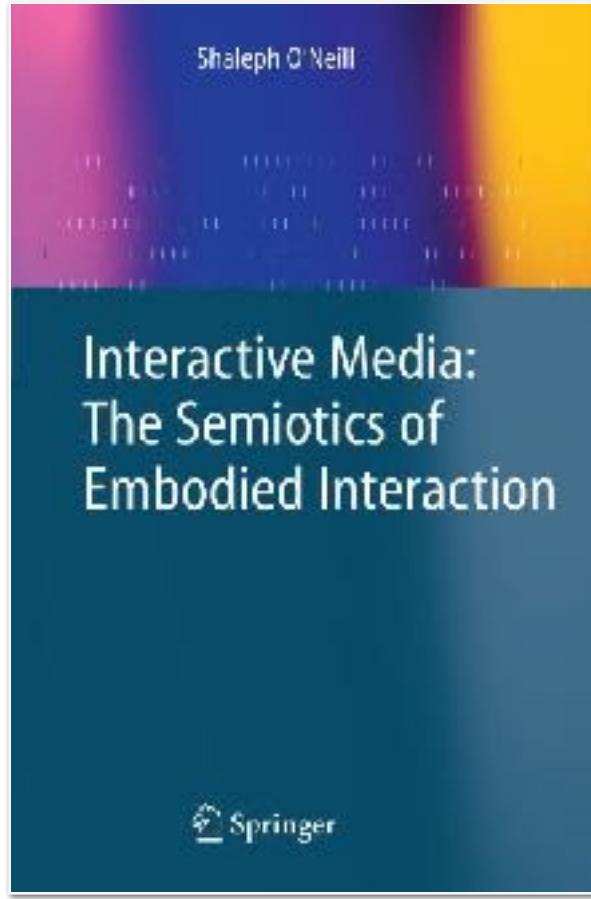
Image Schema  
(Mark Johnson: *The Body in the Mind*, 1987)



Conceptual Blending  
(Gilles Fauconnier; Mark Turner: *The Way We Think: Conceptual Blending And The Mind's Hidden Complexities*, 2003)



# Embodiment



„What Lakoff and Johnson essentially propose is an understanding of cognition that not only relies on having a body to move around and perceive a world, but more radically, a cognition that is fundamentally related to the sensory motor capacity of the human body as a basis, not only for perception, but also for conceptualization (Brandt 2000). They propose that it is the same bodily structures that move us around and allow us to act in the world that allow us to think.“

O'Neill S. 147.



# Image Schema

*A schema is a recurrent pattern, shape, and regularity in, or of, these ongoing ordering activities.*  
Johnson 1987, S. 29

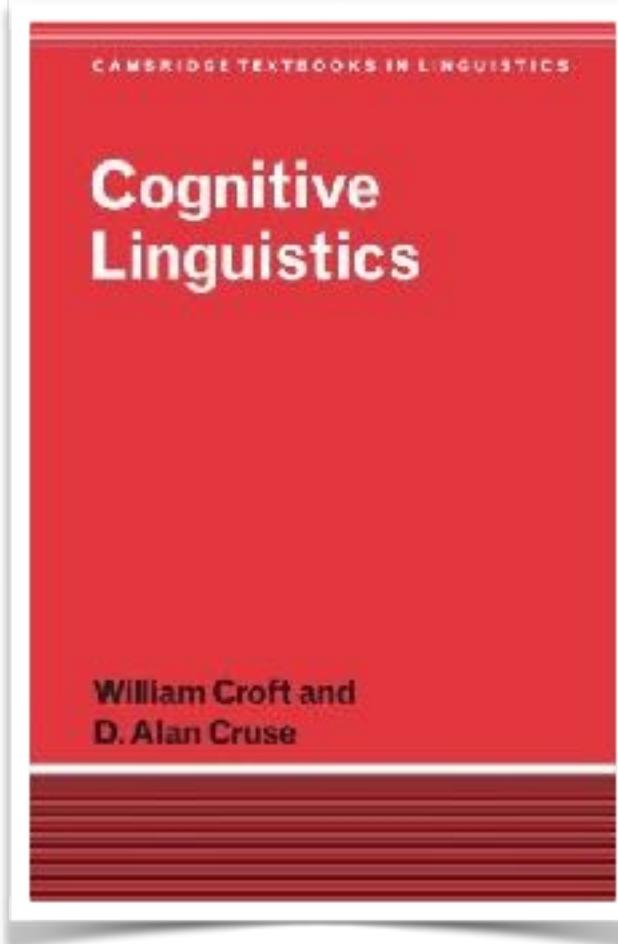


Image schemas are defined as schematic versions of images.

Images are representations of specific, embodied experiences

They represent schematic patterns arising from imagistic domains, such as containers, paths, links, forces, and balance that recur in a variety of embodied domains and structure our bodily experience

Image schemas are also not specific to a particular sensory modality

Image schemas structure our bodily experience, and they structure our non-bodily experience as well, via metaphor.

Croft; Cruse, S. 44 f.

# Image Schemata

**Space:** Up-Down, Front-Back, Left-Right, Near-Far, Center-Periphery, Contact

**Scale:** Path

**Container:** Containment, In-Out, Surface, Full-Empty, Content

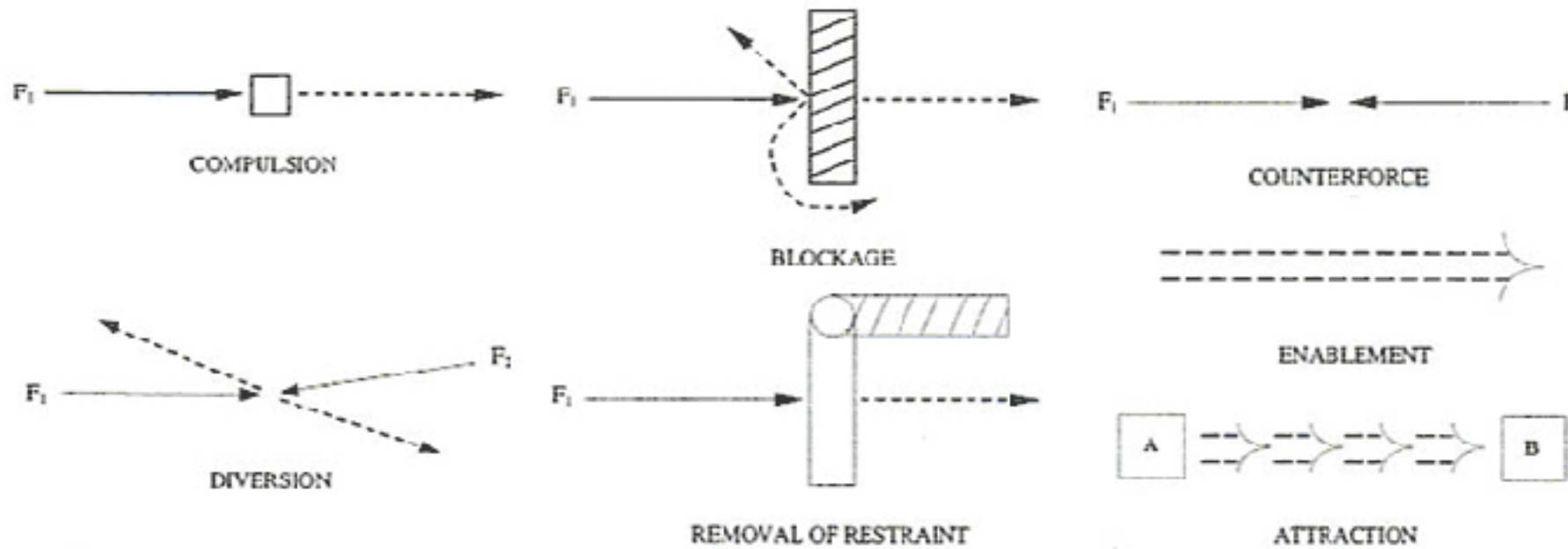
**Force:** Balance, Counterforce, Compulsion, Restraint, Enablement, Blockage, Diversion, Attraction

**Unity/Multiplicity:** Merging, Collection, Splitting, Iteration, Part-Whole, Mass-Count, Link

**Identity:** Matching, Superimposition

**Existence:** Removal, Bounded Space, Cycle, Object, Process

Croft; Cruse, S. 45 f.



Johnson (1987): The Body in the Mind, S. 45 ff.

Active	Approach	Attack	Attract	Bear	Bond	Break
Build	Bring	Can't	Capture	Carry	Cause	Clamp
Close	Clutch	Collect	Compel	Control	Cut	Deliver
Detain	Dive	Do	Drag	Endanger	Enlarge	Fall
Find	Fetch	Get	Go	Grab	Grapple	Grasp
Hold	Hug	Hunt	Immerse	Imprison	Influence	Interact
Jam	Join	Liberate	Limit	Make	Meet	Move
Obtain	Open	Operate	Overcome	Perpetrate	Penetrate	Pick
Power	Press	Provide	Pull	Push	Raid	Reach
Refrain	Resist	Restrict	Retain	Seize	Shake	Snatch
Start	Squeeze	Stay	Stick	Stop	Take	Tense
Try	Tug	Wake	Withhold	Wound	Wrench	Wrestle

# Force

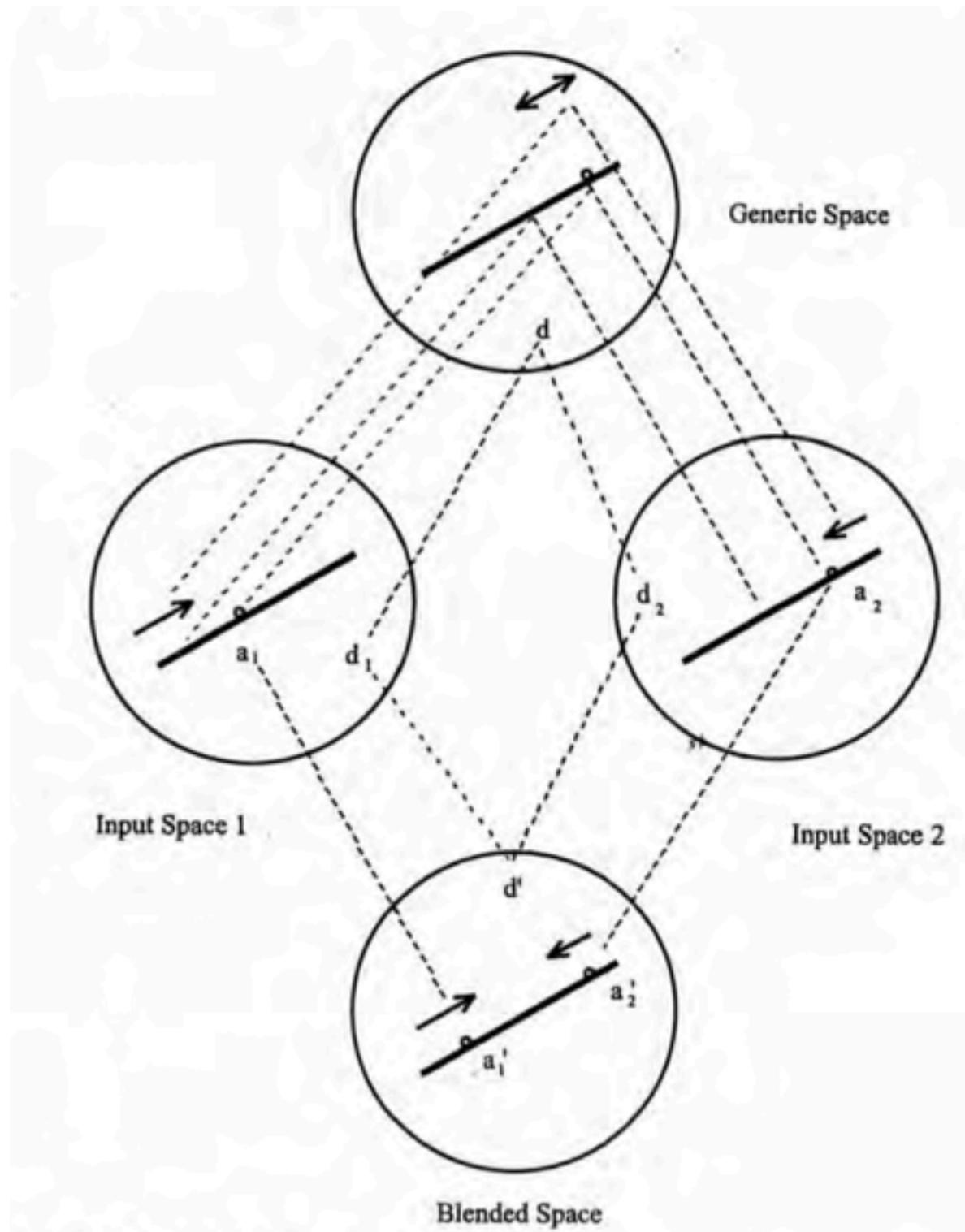
„playing a game is the voluntary attempt to overcome unnecessary obstacles.“  
Suits (1978): The Grasshopper. , S. 41

Examples of verbs that indicate a FORCE embodied schema:

<http://www.cleanlanguage.co.uk/articles/articles/245/2/Embodied-Schema-The-basis-of-Embodied-Cognition/Page2.html>



# Blending



A Buddhist Monk begins at dawn one day walking up a mountain, reaches the top at sunset, meditates at the top for several days until one dawn when he begins to walk back to the foot of the mountain, which he reaches at sunset. Make no assumptions about his starting or stop- ping or about his pace during the trips. Riddle: Is there a place on the path that the monk occupies at the same hour of the day on the two separate journeys?

# Körper und Raum

## Affective Design

Die vertikale Struktur von Lordran kann als körperliche und kulturelle Metapher verstanden werden – vgl. Lakoff/Johnson (1980): *Metaphors We Live By*, Ch. 4

- HAPPY IS UP; SAD IS DOWN I'm feeling up. That boosted my spirits. My spirits rose. You're in high spirits. Thinking about her always gives me a lift. I'm feeling down. I'm depressed. He's really low these days. I fell into a depression. My spirits sank.  
Physical basis: Drooping posture typically goes along with sadness and depression, erect posture with a positive emotional state.
- CONSCIOUS IS UP; UNCONSCIOUS IS DOWN Get up. Wake up. I'm up already. He rises early in the morning. He fell asleep. He dropped off to sleep. He's under hypnosis. He sank into a coma.  
Physical basis: Humans and most other mammals sleep lying down and stand up when they awaken.
- HEALTH AND LIFE ARE UP; SICKNESS AND DEATH ARE DOWN He's at the peak of health. Lazarus rose from the dead. He's in top shape. As to his health, he's way up there. He fell ill. He's sinking fast. He came down with the flu. His health is declining. He dropped dead.
- HAVING CONTROL. Or FORCE IS UP; BEING SUBJECT TO CONTROL Or FORCE IS DOWN I have control over her. I am on top of the situation. He's in a superior position. He's at the height of his power. He's in the high command. He's in the upper echelon. His power rose. He ranks above me in strength. He is under my control. He fell from power. His power is on the decline. He is my social inferior. He is low man on the totem pole.
- MORE IS UP; LESS IS DOWN The number of books printed each year keeps going up. His draft number is high. My income rose last year. The amount of artistic activity in this state has gone down in the past year. The number of errors he made is incredibly low. His income fell last year. He is underage. If you're too hot, turn the heat down.



Find a Way Down



90  
AK-47



AUTO

59



2390  
+200



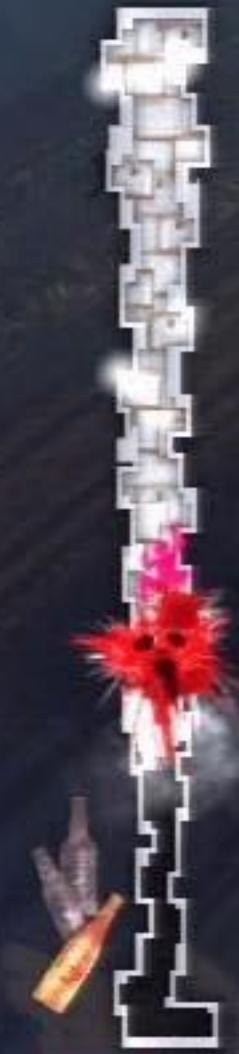


5790

Retry  
15

2780

12 x STEP

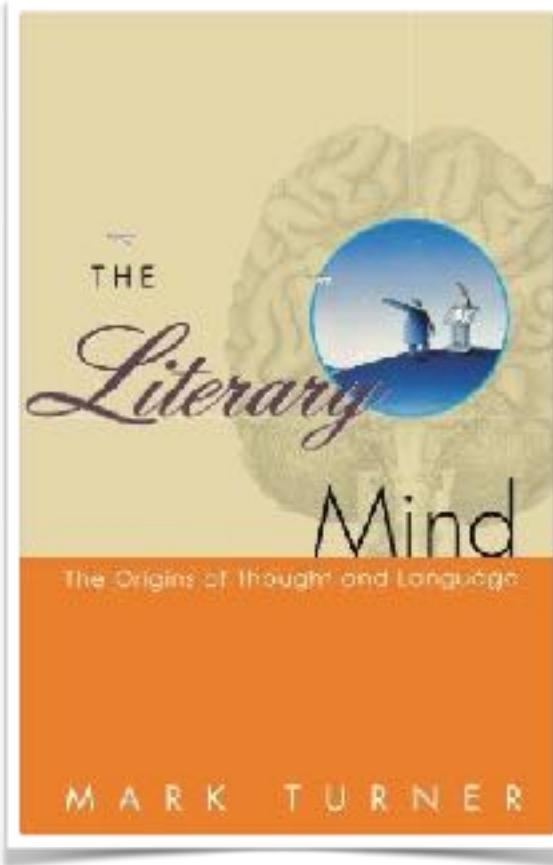


START MENU  
SELECT UNDO

GAMERSYDE



# Parabel



„Abstract reasoning appears to be possible in large part because we project image-schematic structure from spatial concepts onto abstract concepts. We say, for example, "Shame forced him to confess," even though no physical forces are involved. Forms of social and psychological causation are understood by projection from bodily causation that involves physical forces. This is parable.“

Turner 1996, S. 18.

Metaphorical Projections of Image Schemata  
aka *Conceptual Metaphor*  
aka *Conceptual Blending / Mapping*  
aka *Ideesthesia*  
aka *Analogy*

A perspective view of a hallway with light-colored walls and a light-colored floor. There are two sets of double doors. In the foreground, two doors are open, revealing a hallway. In the background, another set of doors is also open, leading to a similar hallway. The ceiling has several rectangular recessed lights.

„When Stanley came  
to a set of 2 open  
doors, he entered the  
door on his left.“

# Containment

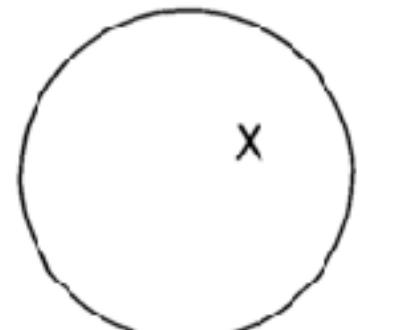
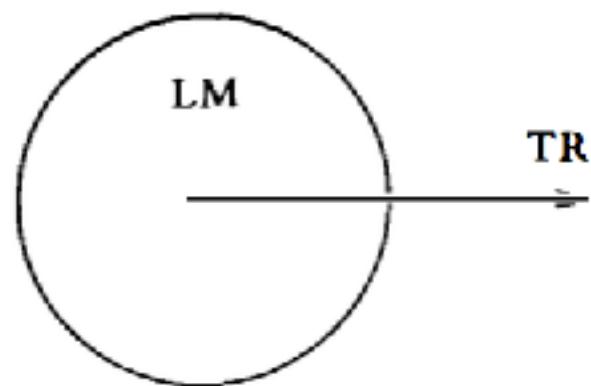


FIGURE 2. CONTAINMENT



FIGURE 3. PATH



„a boundary distinguishing an interior from an exterior. The container schema defines the most basic distinction between IN and OUT“ (Lakoff 1987, S. 271

Containment ist ein spatial embodied image schema (Conceptual Metaphor), das auf räumliche Story-Ereignisse projiziert werden kann (Conceptual Blending)

Beispiele für Container sind: Körper, Kopf, Haus, Raum (Johnson; Lakoff/Johnson; Turner)

Vom Container-Schema hängen weitere Schemata ab, z.B. In, Out, Through, Across, Surface, Source-Path-Goal



# Source-Path-Goal

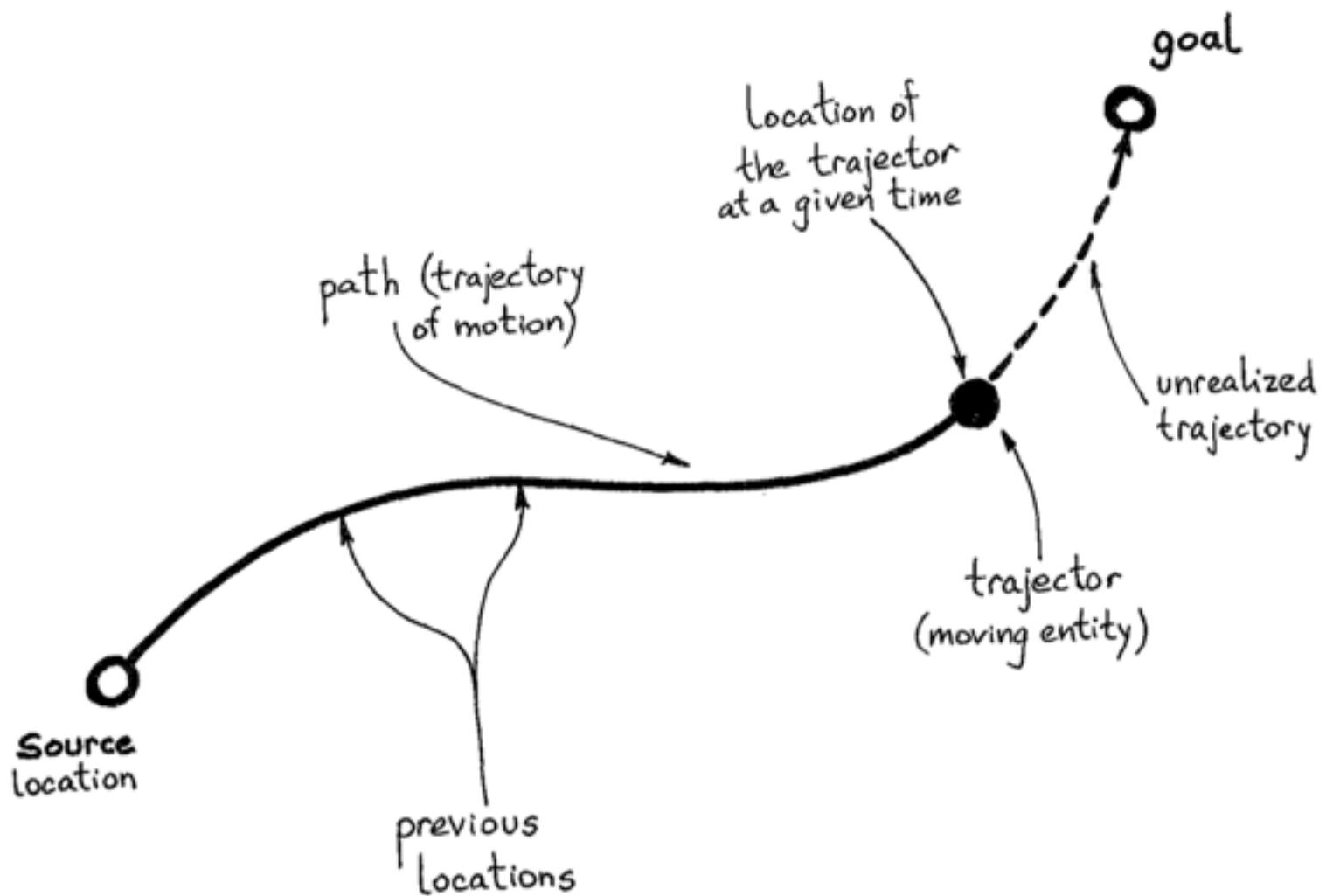


FIGURE 2.2 The Source-Path-Goal schema. We conceptualize linear motion using a conceptual schema in which there is a moving entity (called a trajector), a source of motion, a trajectory of motion (called a path), and a goal with an unrealized trajectory approaching that goal. There is a logic inherent in the structure of the schema. For example, if you are at a given location on a path, you have been at all previous locations on that path.

The human body sports two legs, and typically moves forward rather than backward or sideways. The head on top of that body has two eyes that can cover a range of some  $180^\circ$ . In combination with the fact that the human neck can turn some  $180^\circ$ , too, we visually cover an area of, say,  $290^\circ$  – but we cannot look behind us without turning around. We have one mouth and one nose, both located on the front of our face, which further makes whatever is before us more accessible than what happens behind us. We also cannot just burrow ourselves into the ground (as some insects can), and while we can jump up a little, we cannot fly (as most birds can). All these bodily facts of life mean that the front-back orientation is crucial for us – indeed they explain that we have a front-back orientation in the first place. (S. 6)

R. Kromhout, C. Forceville (2013): *LIFE IS A JOURNEY: the source-path-goal schema in the videogames Half-Life, Heavy Rain, and Grim Fandango.*



Death is a Journey

Grim Fandango 1998

## BE, MOVE, AND DO!

BY JAMES KOCHALKA

SUPER MARIO BROS.  
is really just a  
highly reductive and  
extremely focused  
simulation of the  
human experience.

We are beings who  
move through space,  
overcoming obstacles...

Trying to  
get stuff  
we want.

The world is crazy-complex.  
Art tries to make sense  
of the cacophony by  
clarifying and highlighting  
the truths of our experience.

Super Mario Bros.  
seems to accomplish  
this effect  
effortlessly!

The interactivity makes  
it so much more  
direct and PERSONAL.

Plus... it reminds us  
that life is FUN.

I can't come  
close to beating  
the game but I  
don't care. I'm  
happy just to  
Replay the first  
few levels. Life  
isn't about WINNING  
anyway.

It's a JOY  
just to BE.  
To move,  
and to  
DO STUFF.

THE END

James Kochalka's Super  
Mario comic for Kill  
Screen #2



# Embodied Game Design



TIME IS AN OBJECT  
„Sich die Zeit nehmen“



TIME IS A MOVING OBJECT  
„Die Zeit zurückdrehen“

- Man nehme eine metaphorisch ausdrückbare Erfahrung (Redewendung)
- überlege, auf welche Image Schemata sie sich projizieren lässt
- suche passende Verben
- und gestalte dazu passende Handlungsmöglichkeiten



Warum aber erleben Spieler die Handlungen als körperlich ihre („ich bin gerannt/gesprungen/ geklettert“) und nicht als Drücken von Knöpfen oder Bewegen von Thumbsticks („ich habe dafür gesorgt, dass Mario gesprungen ist“)?



# Body Schema



Phantom Limb Illusion  
Brothers: A Tale of Two Sons



Modified Body Schema in Action  
<https://www.youtube.com/watch?v=Xr7aI0RqtXc>

A body image consists of a system of perceptions, attitudes and beliefs pertaining to one's own body. In contrast, a body schema is a system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring. (Gallagher, S. 24)

The Body Schema is the Minds internal representation of the body.

„Playing a video game transforms and „re-engineers“ our body schema in a unique and powerful way that does not occur when we experience books, films, or table-top role-playing games (but it is similar to the experience of driving a car)...“ „...because only video games create an instantaneous, real-time bidirectional biocybernetic feedback loop between our mind and a (virtual) environment, which we sense and manipulate by means of our „new“ cybernetic game-body, which the game provides.“ (Matthew E. Gladden: Cybershells, Shapeshifting, and Neuroprosthetics, <https://www.youtube.com/watch?v=Ruu52x28jjg> 47:55)



# Extended Embodiment



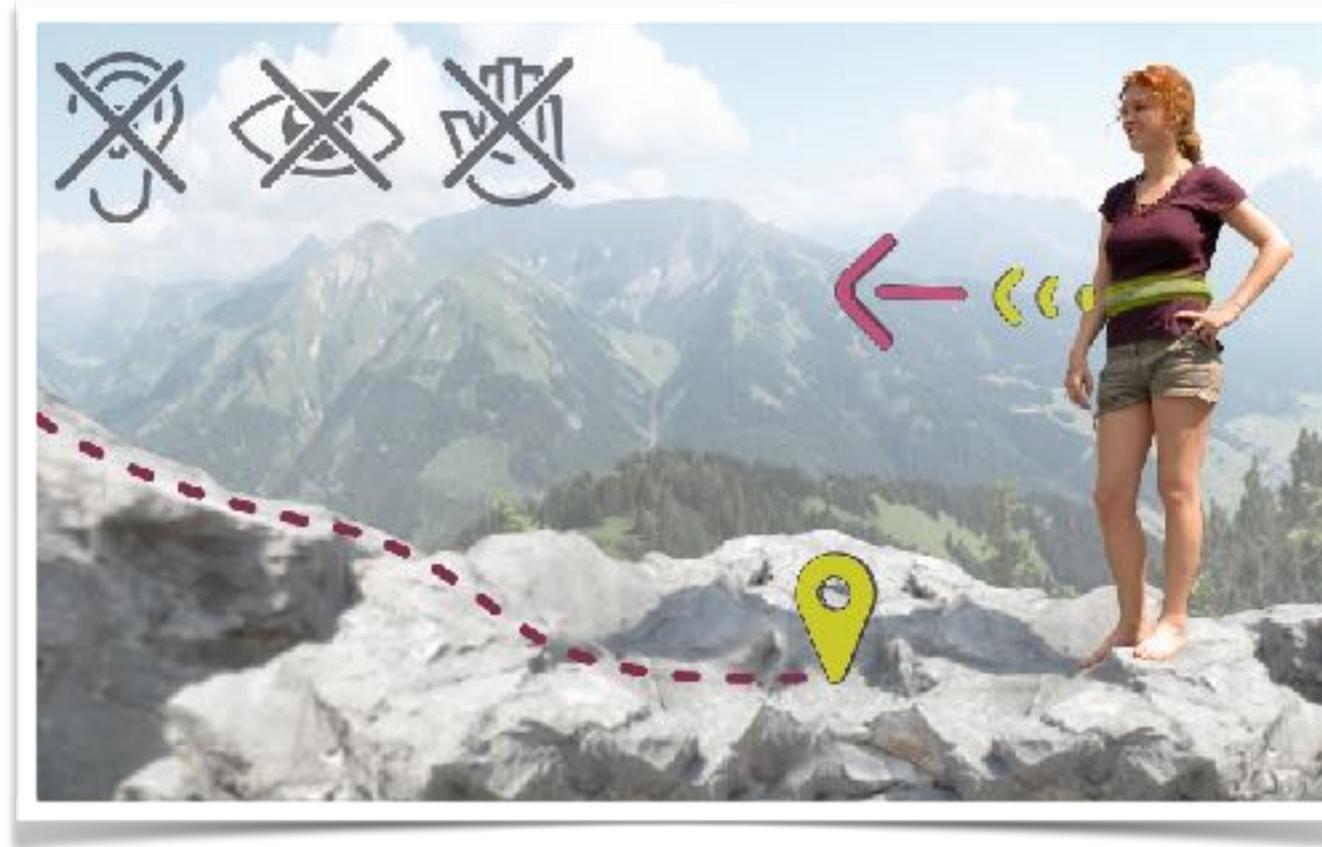
WiiMote

„interacting with video games may lead to a sense of extended embodiment and sense of agency that lies somewhere between the two poles of schema and image—it is an embodied awareness in the moment of action, a kind of body image in action—where one experiences both agency and ownership of virtual entities.“ (S. 67)

Gregersen/Grodal: Embodiment and Interface. In:  
Mark P. Wolf (Hrsg.): Video Game Theory Reader 2.



# Body Schema Extension



„What moves together belongs together“  
Köhler (1929)

„anything that comes into contact with  
the surface of the body and remains  
there long enough will be incorporated  
into the body image“  
Grosz, (1994, S. 80)

<http://www.feelspace.de/>



# Body Incorporation



## Rubber Hand Illusion

<https://www.youtube.com/watch?v=q3eKy-ZG-tk>

Matthew Botvinick; Jonathan Cohen  
Rubber hands 'feel' touch that eyes see  
Nature 391, 756 (19 February 1998) | doi:10.1038/35784

The rubber hand is incorporated into our body schema, and becomes a physical part of our body to the extent that our brain takes ownership over it, and our body schema is altered. Extension, on the other hand, is the feeling of non-mediation between ourselves and the world through the use of a tool or technology

Helena De Preester & Manos Tsakiris : *Body-extension versus body-incorporation: Is there a need for a body-model?* Zitiert in Collins: *Making Gamers Cry*



# Body Extension



Outlast

„...the video game intensifies the emotional experience of the horror genre and how all those monstrous bodies and the player character's body in the horrific game-worlds are needed to capture the imagination of the gamer's mind and to affect his own body. People playing survival horror games remain thrill-seekers. The survival horror is indisputably an extended body genre.“

(Bernard Perron: The Survival Horror. In: Horror Video Games, S. 141)

[https://www.youtube.com/watch?v=BKXjWmJ\\_mLI](https://www.youtube.com/watch?v=BKXjWmJ_mLI)



# Head Bobbing



Basically what headbob really feels like

„In most contemporary FPS games headbob is either completely eliminated, mostly reduced or only used in situations (such as sprinting) where the player's perception is meant to be distorted.“

„First Person Controllers offer no native support for head bobbing. Whenever a human or biped moves by walking, the overall “kinematics” of the legs and body in motion typically causes the head to move involuntarily up and down. This motion is not included in the default First Person Controllers, but it can add an extra level of believability and realism to a game.“

Thorn (2014): Pro Unity Game Development with C#, S. 150



# Body Image

Overall, the current research sought to determine if playing a video game that emphasized the ideal male body would cause negative body-images in male participants, and if playing a video game that emphasized the ideal female body would cause negative body-images in female participants. Across both studies, the results showed that after playing such video games [Skyrim] male and female participants had a decrease in their body esteem. [...] this adds to the existing literature by showing that yet another mass media format (video games) can contribute to negative body-images in males and females.

Christopher P. Barlett & Richard J. Harris (2008): *The Impact of Body Emphasizing Video Games on Body Image Concerns in Men and Women*

