

designing for physicality

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TouchIT

cognition connects with computation



when bodies touch technology

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material artefacts and design



the body physiology



space and spatial arrangement



digital artefacts
virtual physicality

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what is physical?

kinds of things
what do you think?
rules of the world

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kinds of things

natural	artificial
<ul style="list-style-type: none"> • landscape • objects: stones, sticks • plants • animals • people • air, water, and fire 	<ul style="list-style-type: none"> • built environment • tools • mechanical • electrical • digital & computational • language • information

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what is physical?

kinds of things
what do you think?
rules of the world

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properties of the physical world

physical

- dimensions
- tangible – feel it
- weight
- laws of physics
- one thing in one place
- social interactions
- no undo
- time

digital

- ????

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what is physical?

kinds of things
what do you think?
rules of the world

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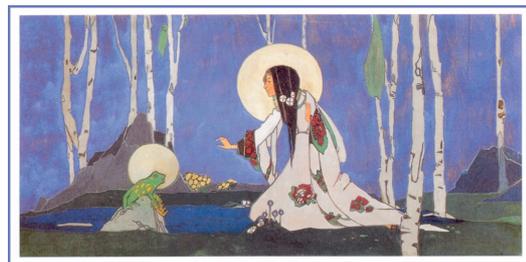
three rules to be broken

- directness of effort
- locality of effect
- visibility of state



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continuity in time and space



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physicality and the body

bodily limitations
the adapted mind
action in the world

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bodily limitations – skin and bone

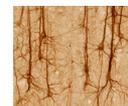
- ergonomics and health
 - keyboards and trackpads
 - car switches
- as a design resource
 - simultaneous switches in nuclear bunker
 - sweets on the high shelf



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bodily limitations – grey matter

- fleeting thoughts – electrical
 - Millers 7+/-2
- long-term memory – physical connections
 - some sums ...
- mood and medium term memory – chemical
 - coping with multiple chat windows



<http://en.wikipedia.org/wiki/File:Sm32neuron.jpg>

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physicality and the body

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usability?

Some people say
a child should be able to use it



I always say
a caveman should be able to use it



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evolutionary psychology

general principle ...

- major transition about 40,000 years ago
 - socio-linguistic eden
- not evolutionarily adapted (significantly) since then
 - neanderthals' within the skull

more contentious

- Cosmides, Toby, Pinker ...
- special purpose intelligences:
 - physical, animal, plant, social
- hard-wired
 - swiss army knife model



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special purpose intelligence

- rational
 - rule: vowel one side => even on other



- social
 - rule: take newspaper => pay for it



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cyborg driving

- understanding the extension of self



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physicality and the body

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action in the world

- Gibson and affordances
- distributed cognition
- the embodied mind

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virtual physicality

in the computer
in our heads

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emulating the physical

VR and
second life



<http://en.wikipedia.org/wiki/File:VR-Heim.jpg>

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making the digital appear physical

direct manipulation
& desktop metaphor



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TOWER – workspace awareness

- virtual 'space'
 - work objects (files etc.) shown as buildings
 - avatars where other people are working
 - built over flexible event infrastructure



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virtual physicality

in the computer
in our heads

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bringing together the swiss army knife mind

- "The Prehistory of the Mind" (Mithen, 1996)
 - uses palaeontological record
- early animals and hominids
 - multiple intelligences there, but separate
 - intellectual development about linkage
- final link ...
 - 40,000 years – multi-part tools, social, artistic
 - N.B. no physiological change

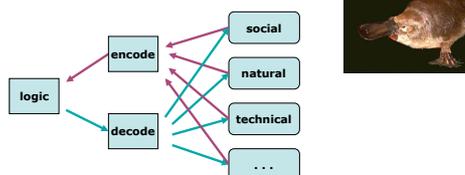


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socio-linguistic Eden

how linked?

- logic and rationality
 - transform everything to propositional form
 - talking to yourself!

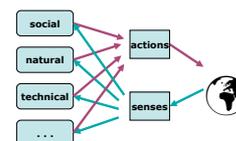


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how linked?

- logic and rationality
- the real world
 - doing things makes the links
 - the world kicks back

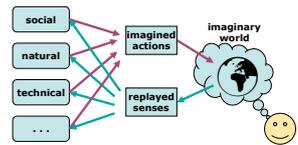
c.f. ...
distributed cognition
situated action



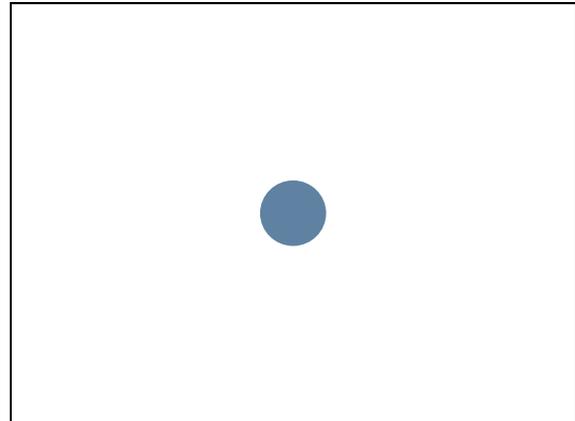
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how linked?

- logic and rationality
- the real world
- imagination
 - just like really doing it
 - it kicks back too!



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physicality of digitality

computation & information

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embodied computation

- always needs a physical substrate
- limits of physicality:
 - limited space => limited memory, limited computation
- the Turing machine is a touring machine



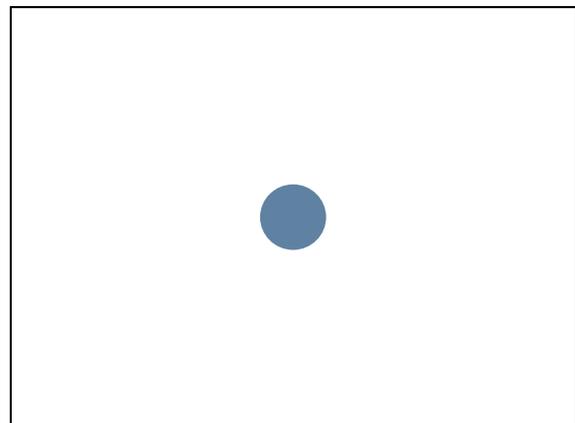
<http://en.wikipedia.org/wiki/File:Cray-1-g1010221.jpg>

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information and representation



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physicality and design

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study the old to design the new

work with Masitah Ghazali & DEPTH project

- look at ordinary consumer devices
 - washing machine, light switch, personal stereo
- why?
 - we are used to using them ourselves
 - they have been 'tested' by the marketplace
 - they embody the experience of designers



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using physicality

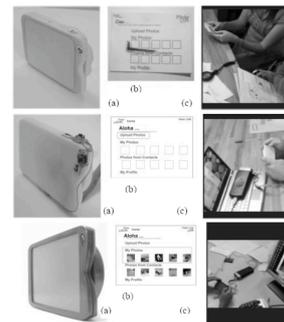
Drift Table (Gaver et al.)
weight drives movement



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levels of fidelity in design

from paper prototype to working mock-up



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