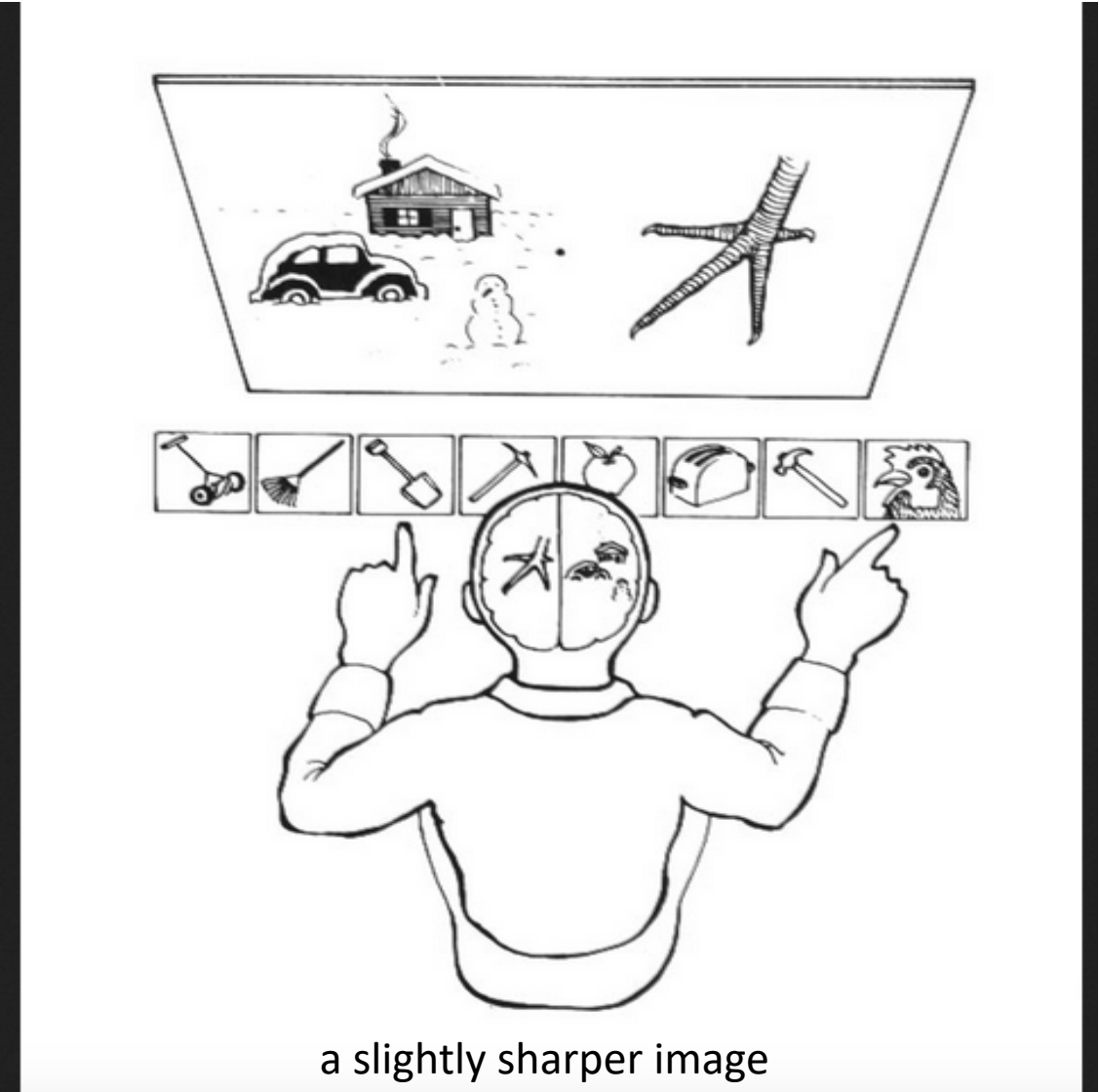
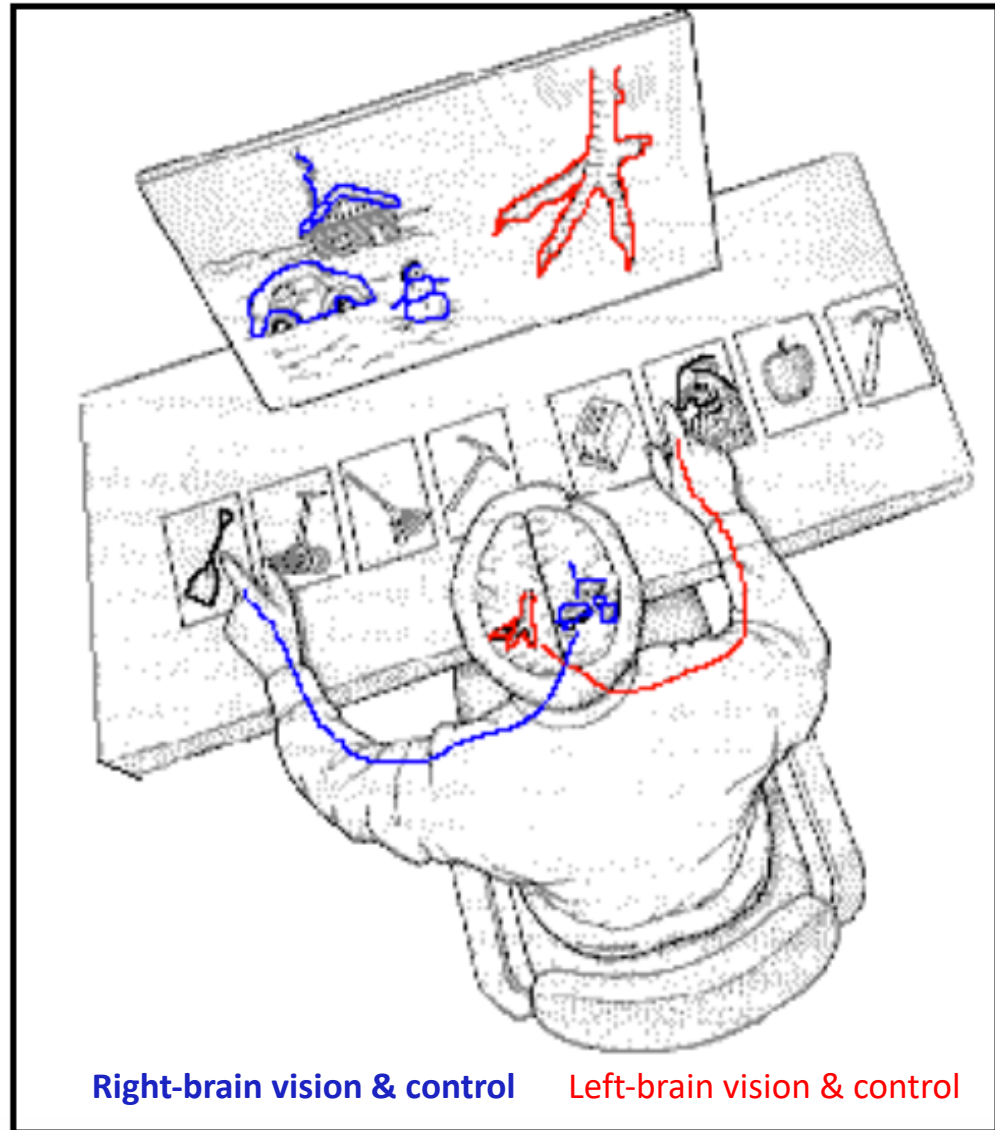


Further evidence for neural basis of consciousness:  
Split brains; dreams & drugs

Blackmore pp. 70-72; pp. 99-111

Split-brain experiments by Roger Sperry and Michael Gazzaniga (Blackmore, 70-72):

“Prepare to pick a matching picture”; “Look straight ahead”; [dual images flashed]; [subject places fingers]  
“Why did you pick the chicken?” *“The chicken claw goes with the chicken;”* “Why did you pick the shovel?”  
*“Because you need a shovel to clean out the chicken shed!”* [consider roles of Broca’s, Wernicke’s areas]



# Altered states of consciousness & their neural correlates: Dreaming (pp. 99-104 Blackmore)

**Brain waves, awake:** beta waves (strong, high frequency, irregular, 12.5-30hz)

**NB: In dreams we generate vivid conscious experiences (qualia), w/o sensory input!**

**Stages: (typical sequence is 1, 2, 3, 2, 4; 2, 3, 2, 4; 2, 3, 2, 4; ...)**

1. Light sleep, alpha waves (10hz) + slow, large theta waves (5 hz), (5-10 min.)
2. Deeper sleep, low theta waves + 2sec “spindle” bursts (about 20 min.)
3. Deepest sleep, slow delta waves (0.5-4hz) (sleepwalking occurs in this stage) (about 20 min.)
4. REM sleep, irregular alpha waves, increased brain activity, **dreaming**, muscle paralysis (5-60 min.)

*Active systems:* limbic system, visual cortex, & others, but little frontal cortex activity

**Odd phenomena:** lucid dreaming, false awakening, open-eyed REM paralysis

BTW: Dreaming a lot in a short time is an illusion, contra “Inception” – see David Eagleman



**Functions** (uncertain):

- Rehearsal: fact memory in deep sleep, procedures in REM sleep. (See “*Dreams: Night School*”, <https://www.psychologytoday.com/us/articles/200711/dreams-night-school>); rat experiments;
- weakening of unused pathways (“garbage collection”); related to above?
- scaring us with do-or-die scenarios, to think about when awake (cf., Antti Revonsuo, Wikipedia);
- problem solving, creativity (stages 3 & 4?); e.g., Kekule (benzene ring), Ramanujan (number theory), Paul McCartney (“Yesterday”)

## Altered states of consciousness & their neural correlates: Psychoactive drugs (pp. 104-108 Blackmore);

### **Psychoactive drugs affect the whole spectrum of qualia:**

- **anaesthetics:** unconsciousness, pain insensitivity (nitrous oxide); relaxation; preventing memories ;
- **antipsychotics, tranquilizers:** alcohol, barbiturates, heroin, morphine, codein, methadone -> endorphins;
- **stimulants:** nicotine, caffeine, cocaine, amphetamine;
- **hallucinogens/ psychedelics:** cannabis (pleasure enhancement, STM weakened); LSD (color intensified, object transformations, mystical feelings); psilocybin mushrooms (mystical experiences); etc.

**NB:** Some drugs reduce qualia (e.g., aspirin – pain reduction; propofol – general anesthesia), others enhance, alter or produce them (e.g., cocaine, heroin); cravings in addiction are also drug-induced qualia!

**Neural basis:** broad neurotransmitter/hormone effects; e.g., psychedelics mimic major neurotransmitters (acetylcholine, noradrenaline, dopamine, serotonin); e.g., heroin and morphine mimic endorphins (the body's own opioids), which bind to postsynaptic opioid receptor molecules, inhibiting communication of pain signals.

## Altered states of consciousness & their neural correlates: Unusual experiences (pp. 108-115 Blackmore)

Besides dreaming and drugs ...

- Out-of-body experiences (OBEs)
- Near-death experiences (NDEs)
- Meditation