Goodale and Humphrey (1998)  
(see Milner & Goodale, 2008, for hedges)

- “Duplex” roles of vision
  - Construct internal model of external world [ventral]
    - Recognize objects, understand their interrelationships
    - Corresponds to “conscious” perception
    - Similar to “constructivist” views of perception (D. Marr)
  - Guide control of object-directed action [dorsal]
    - Evolutionarily older
    - Cortical mechanisms build on top of (older) subcortical mechanisms
    - Similar to “direct” perception (J.J. Gibson); “affordances”

"the visuomotor modules within the action system transform sensory information directly into motor output rather than using reconstructions of visual scenes."
Even though...[ventral] higher-order representational systems permit the formation of goals and the decision to engage in a specific act without reference to particular motor outputs, the actual execution of an action may nevertheless be mediated by dedicated [dorsal] visuomotor modules that are not dissimilar in principle from those found in frogs and toads. (p. 185)

Information about object attributes, such as size, shape, orientation, and spatial location, are processed by both streams but the nature of that processing is very different. (p. 187)
Neisser (1989, 1994)

Recognition systems mediate the identification and classification of objects through the accumulation of evidence in relation to stored representations. Recognition is always defined as a relation of present input to the past, i.e. in relation to stored information about objects.

Following Gibson (1979) the direct perception system provides information about where we are, where objects are, and what physical actions those objects can afford – information that is provided as the animal moves through the world and interacts with it.

Neisser suggests that our perception of the spatial location of objects and their relations is dependent on the direct perception system. In our scheme, the visuomotor modules that make up the action system do not participate in the construction of perceptual representations of the layout or disposition of objects for cognitive purposes. (Goodale & Humphreys, 1998, p. 194)

Patient DF (Goodale et al., 1991)

- 35 yr old female
- Brain damage from severe carbon monoxide poisoning
  - Ventro-lateral occipital cortex (BA18,19 / V2,V3)
  - Parasagittal occipito-parietal region (sparing BA17/V1)
  - Basal ganglia (motor system)
- Severe “visual form agnosia”
  - Unable to discriminate even simple geometric figures
  - Use of color, texture, shading (mostly) intact
  - Not attributable to basic sensory deficit (field cut)

DF's lesions (vs. Lateral Occipital Complex; LOC)
Grasping irregular shapes

Orientation: Judgment vs. action

Size scaling in reaching by normals
(Aglioti, Goodale, & DeSouza, 1995)
Allocentric vs. egocentric frames

DF vs. optic ataxia: Grasping vs. manual estimation

Are DF’s “dorsal” functions normal? (Himelbach, Boehme & Karnath, 2012)
Two (cortical) visual systems

(Creem & Proffitt, 2001, JEPHPP)

Interaction of “what” and “how”
(Creem & Proffitt, 2001, JEPHPP)
Milner and Goodale (2008)

The key contribution of the perceptual mechanisms in the ventral stream is the identification of possible and actual goal objects—and the selection of an appropriate course of action to deal with those objects. But the subsequent implementation of that action is the job of the dorsal stream. This stream plays no role in selecting appropriate actions, but is critical for the detailed specification and online control of the constituent movements that form the action, making use of metrical visual information that maps directly onto the action in the ‘here and now’.