Navigation Practice

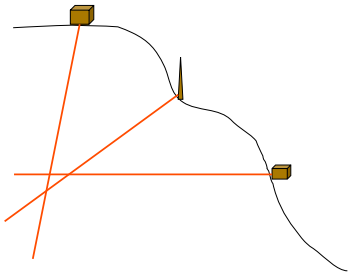
Culture, cognition, & navigation

- A long history of cultural practices of navigation
- characterized by the gradual crystallization of the residues of activity
- leads to the development of complex cognitive ecosystem
- in which individual navigators
- use very simple cognitive processes
- in interaction with one another and with tools
- to perform complex computations.

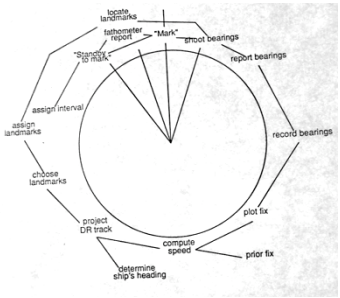
Distributed Cognition's methodological advantage

- Cognitive science explains cognition by describing networks of representations and processes.
- By taking the navigation team as our unit of analysis for cognitive study
- we can actually step right inside the cognitive system
- and observe and record representations and processes.

Position Fixing by Visual Bearings



The Fix Cycle

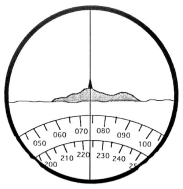


Time 30: the movie

Computation via the propagation of representational state.

- Ship position plotting

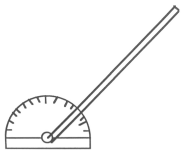
View through the Alidade



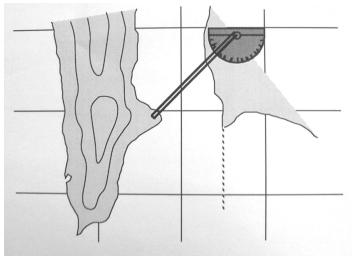
The Bearing Record Book

	Tower	Hotel	Pier	Depth
13:25		008		23
13:28		006	148	27
13:31		006	146	32
13:34		005	143	29
13:37	205	004	139	30
13:40	211	004	135	35
13:43	218	003	130	24
13:46	**224**	003	122	26

The Hoey



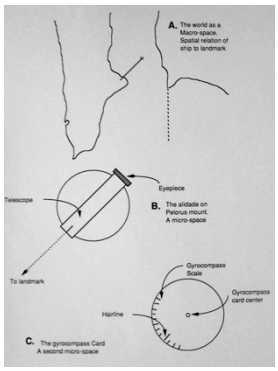
Hoey in Coordination with the Chart



An interesting observation by a student

- "the way you've described navigational computation and representation on p.65 of CITW, it's basically a version of a PSS.
  - Computation encoded Representation via Analog to Digital (World of Events and Things becomes Representations of that World)
  - Then Implementation is Digital Manipulation (Formal Operations)
  - Then comes back Digital to Analog to decode on Chart (Back to World of Events and Things)"

Situated Seeing in the coordination of three spaces

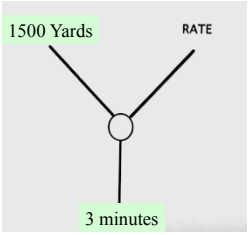


Tools transform cognitive processes

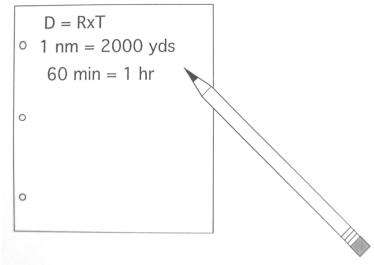
A common navigation problem

A ship travels 1500 yards in three minutes. What is the speed of the ship in nautical miles per hour?

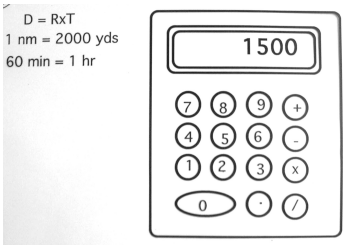
Distance, Rate, and Time Constraint



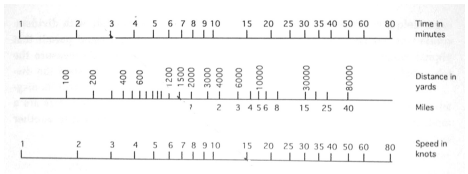
Paper and Pencil



Calculator



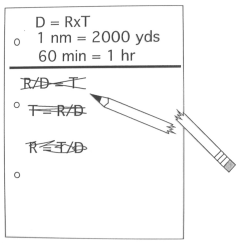
Three Scale Nomogram



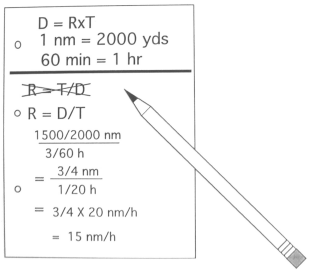
Three Minute Rule

- (Impossible to state the problem in this method without showing the solution.)

Paper and Pencil Solution



Paper and Pencil Solution



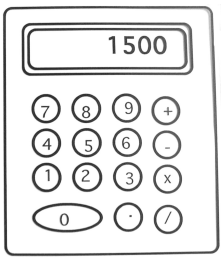
Calculator Solution

D = RxT
1 nm = 2000 yds
60 min = 1 hr
R = D/T

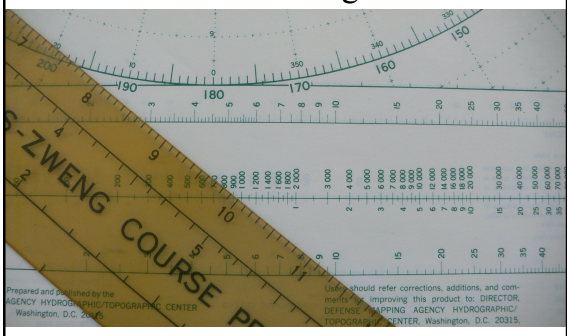
$$\frac{1500/2000 \text{ nm}}{3/60 \text{ h}}$$

$$= \frac{.75 \text{ nm}}{.05 \text{ h}}$$

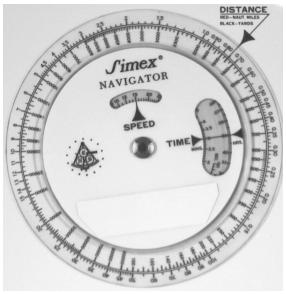
= 15 nm/h



3-scale nomogram



Nautical Sliderule



Using the Three Minute Rule

1500 yds in 3 minutes

15 00 knots

100 yds = 1/20 nautical mile

3 minutes = 1/20 hour

100 yds in 3 minutes = 1 nautical mile per hour

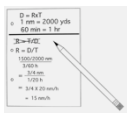
N x 100 yds in 3 minutes = N knots

Spanning a distance

Reading a distance or a speed

Functional Systems

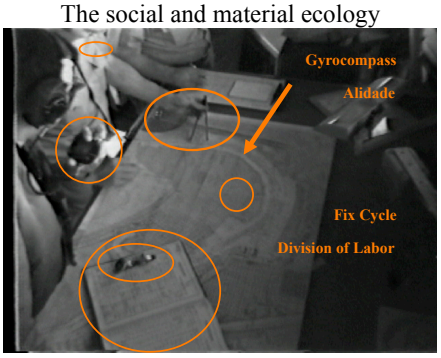
- Each method implies a different functional system.
- Each functional system uses a different arrangement of representational structures and a different set of cognitive processes.



1500 yds in 3 minutes

15 00 knots

The social and material ecology



Cognitive Implications

- Three minute rule substitutes robust perceptual processes for complex conceptual processes. You "see" the answer by "looking" at the problem statement in a particular way.
- You do not have to know why the three minute rule works in order to use it.
- You do not have to know why it works in order to discover it.

Precomputation

- Redistribute cognitive workload
- Transform the tasks performed
- As a window on the cultural process