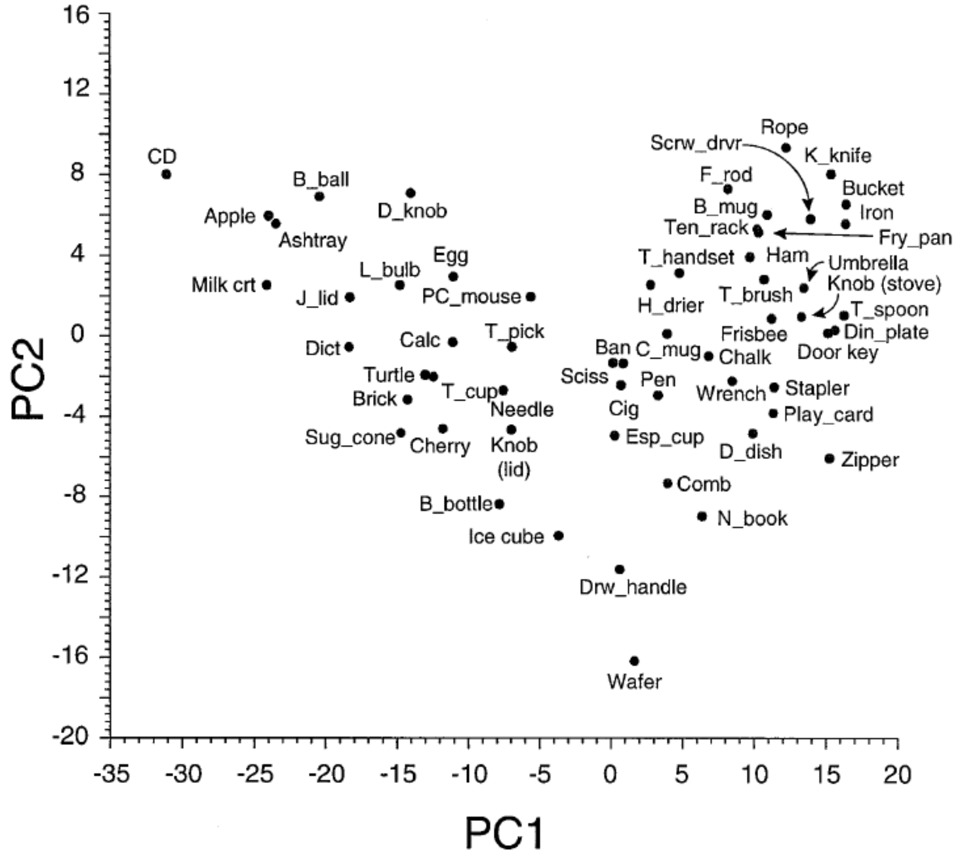
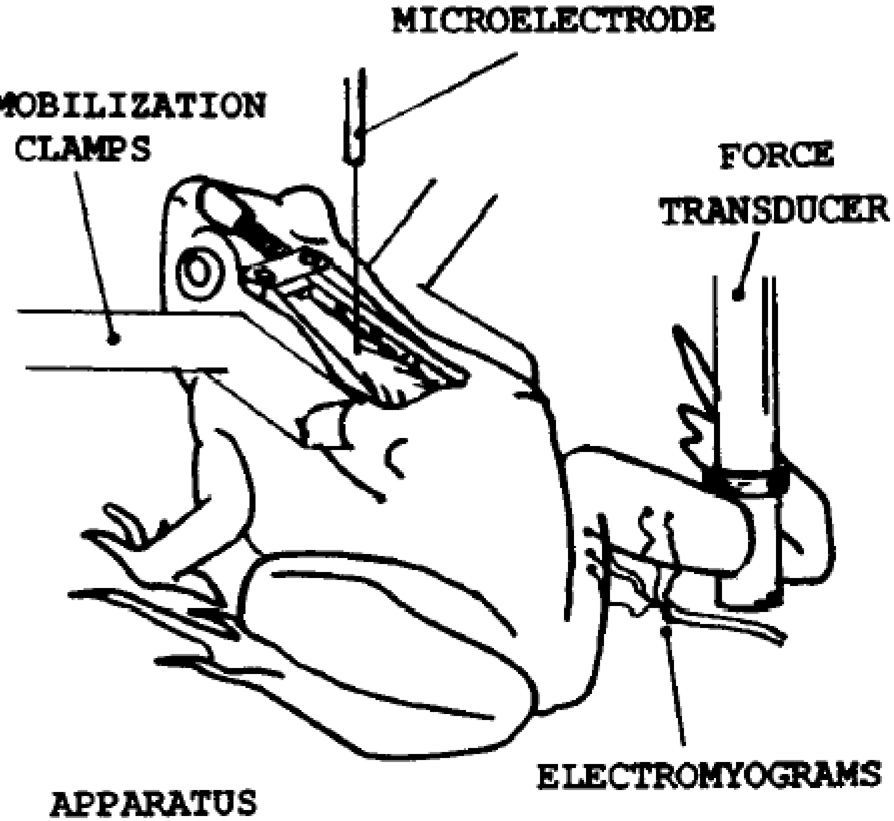


Figure 7. Distribution of hand postures in the plane of the first two principal components. The coefficients of the first two principal components are shown for each of the 57 objects for one subject (M.F.). Note the lack of clustering and the distribution of the coefficients along two main axes.

E



Convergent Force Fields Organized in the Frog's Spinal Cord

Simon F. Giszter, Ferdinando A. Mussa-Ivaldi, and Emilio Bizzi

Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139-4307

The Journal of Neuroscience, February 1993, *13*(2): 467–491

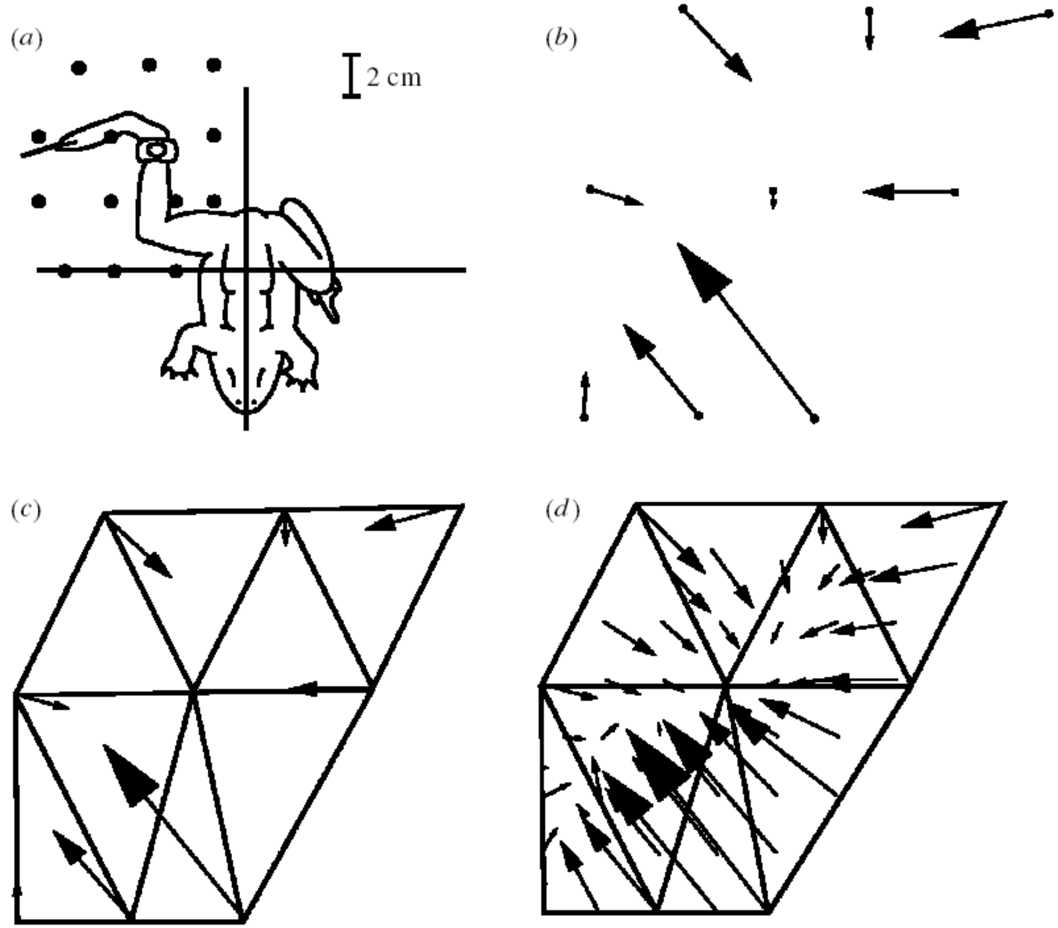


Figure 1. Force fields induced by microstimulation of the spinal cord in spinalized frogs. (From Bizzi *et al*. 1991.) (*a*) The hindlimb was placed at a number of locations on the horizontal plane (indicated by the dots). At each location a stimulus was derived at a fixed site in the lumbar spinal cord. The ensuing force was measured by a six-axes force transducer. (*b*) Peak force vectors recorded at the nine locations shown in (*a*). (*c*) The work-space of the hindlimb was partitioned into a set of non-overlapping triangles. Each vertex is a tested point. The force vectors recorded on the three vertices are used to estimate, by linear interpolation, the forces in the interior of the triangle. (*d*) Interpolated force field.

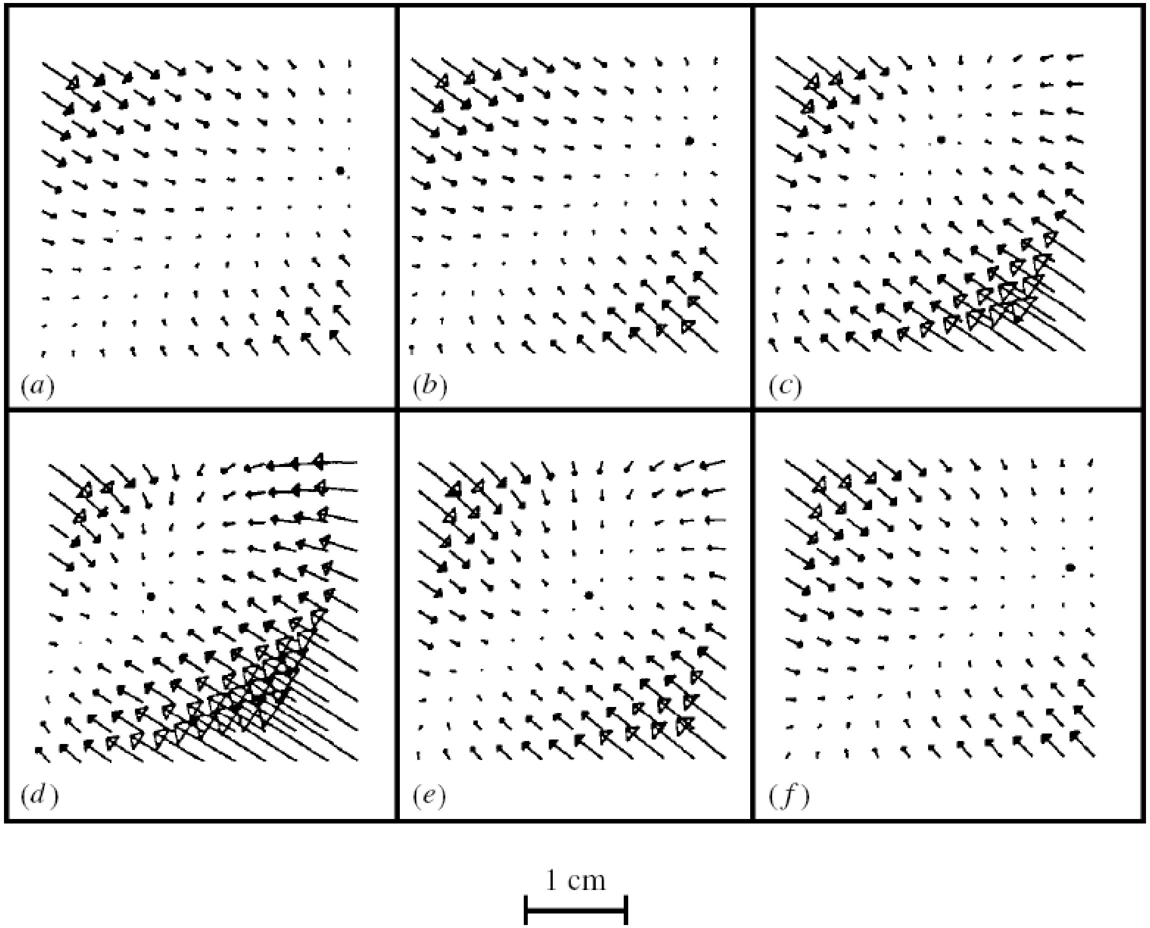
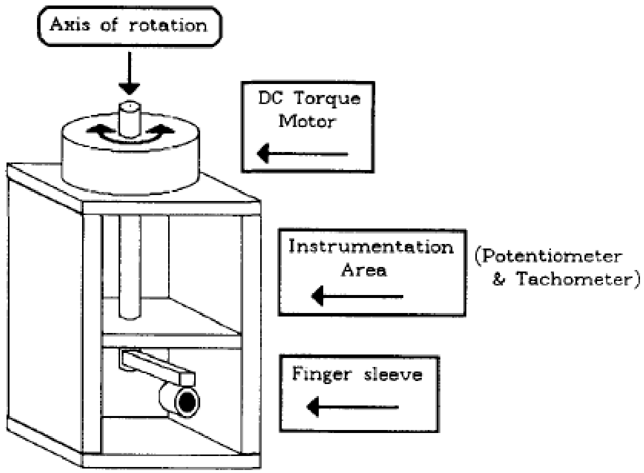
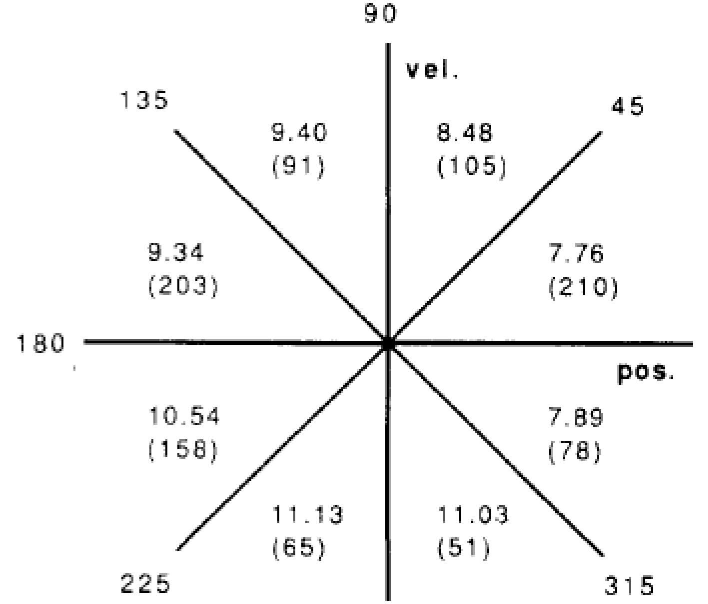
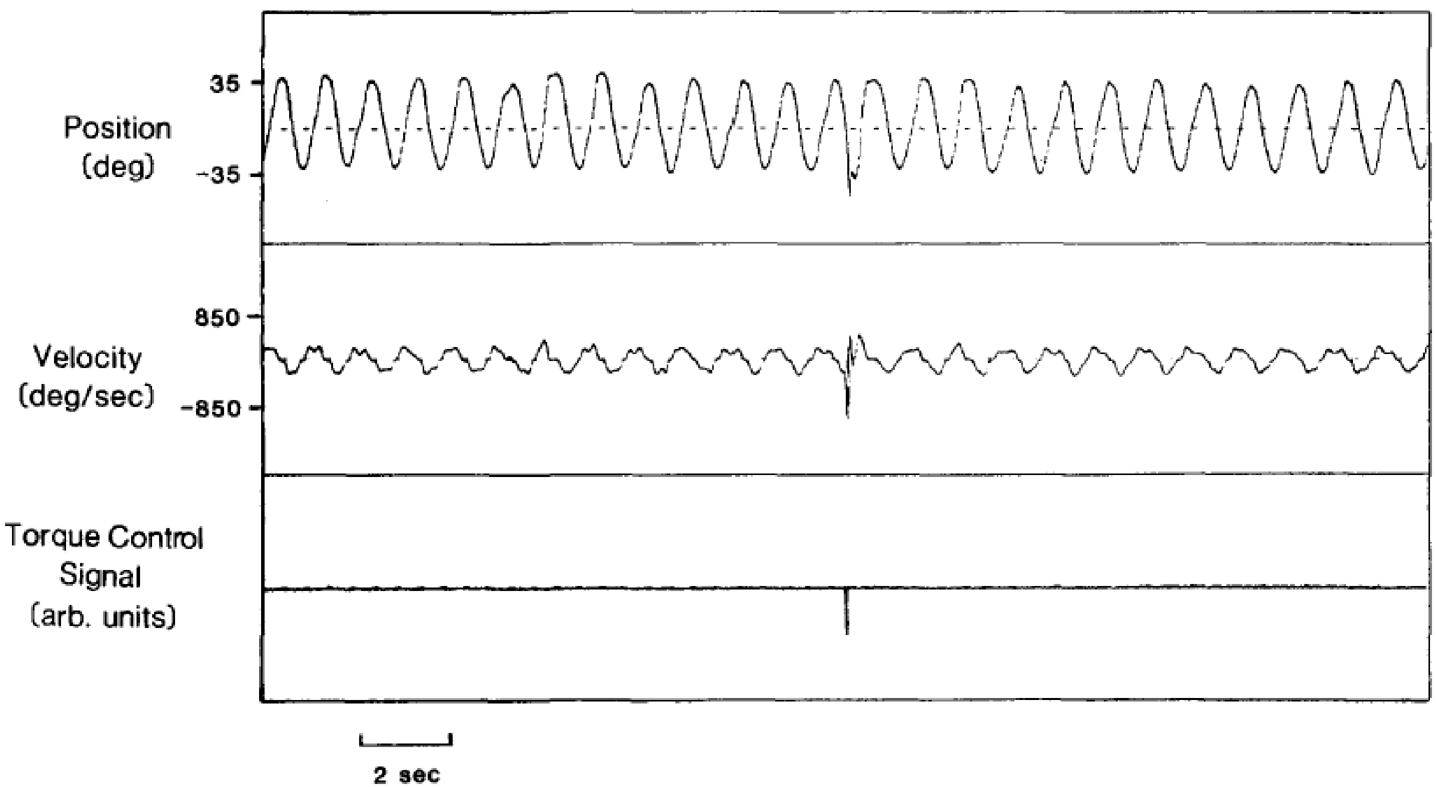


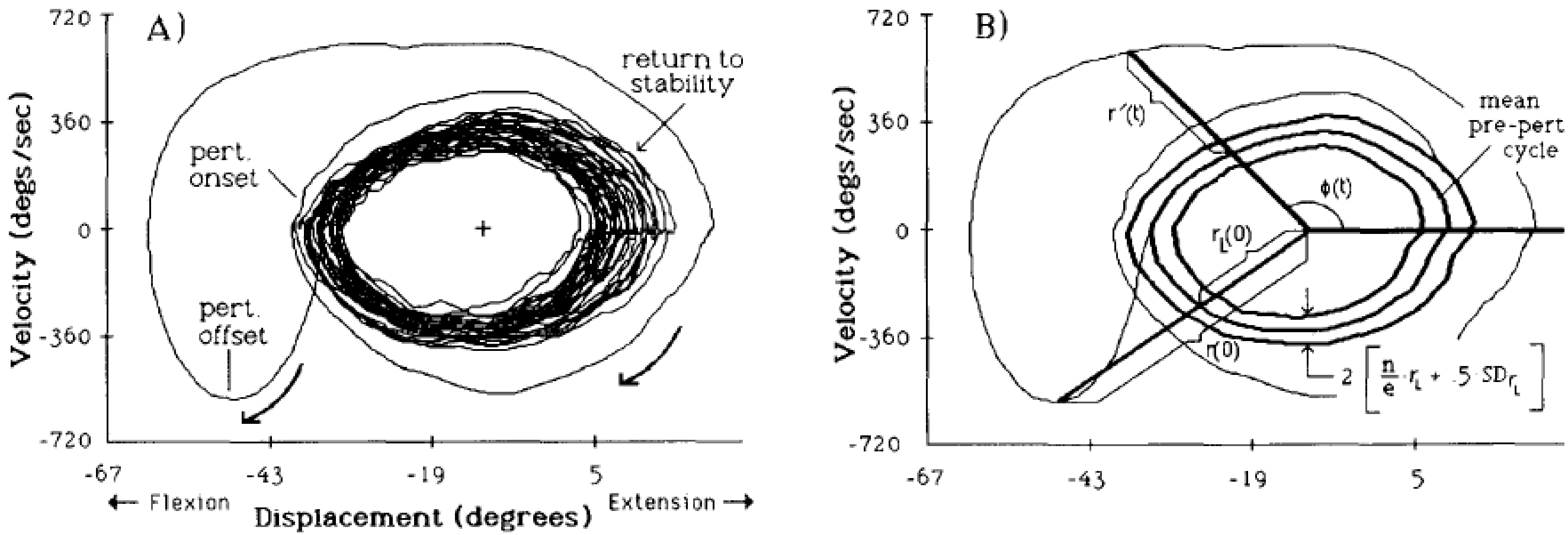
Figure 2. Temporal evolution of a spinal force field. Following the stimulation of a site in the spinal cord, the force vectors change in a continuous fashion. The result is a mechanical wave, described here by a sequence of frames ordered by increasing latency from the onset of the stimulus. The frames are separated by intervals of 86 ms. The dot indicates the location of the static equilibrium point (where the estimated force vector vanishes) in each frame. (From Mussa-Ivaldi *et al.* 1990.)


stable
instable


Axis of rotation
DC Torque Motor
Instrumentation Area
(Potentiometer & Tachometer)
Finger sleeve


90
vel.
45
135
0
180
pos.
225
315
9.40 (91)
8.48 (105)
9.34 (203)
7.76 (210)
10.54 (158)
7.89 (78)
11.13 (65)
11.03 (51)


Position (deg)
35
-35
Velocity (deg/sec)
850
-850
Torque Control Signal (arb. units)
2 sec



Journal of Experimental Psychology:
Human Perception and Performance
1991, Vol. 17, No. 1, 183–197

0096-1523/9

Steady-State and Perturbed Rhythmical Movements: A Dynamical Analysis

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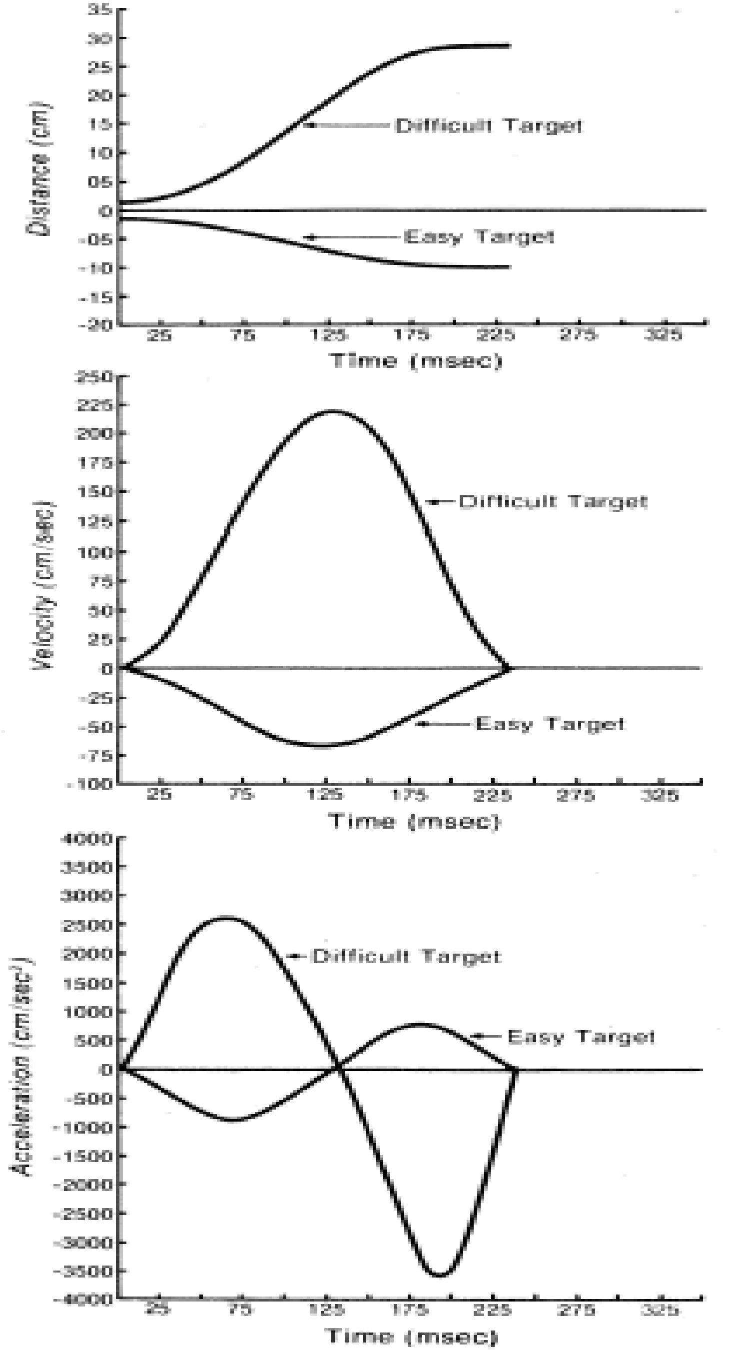
Massachusetts Institute of Technology

Elliot L. Saltzman
Haskins Laboratories, New Haven, Connecticut

J. A. S. Kelso
Center for Complex Systems
Florida-Atlantic University

Deux cibles simultanément avec les deux mains

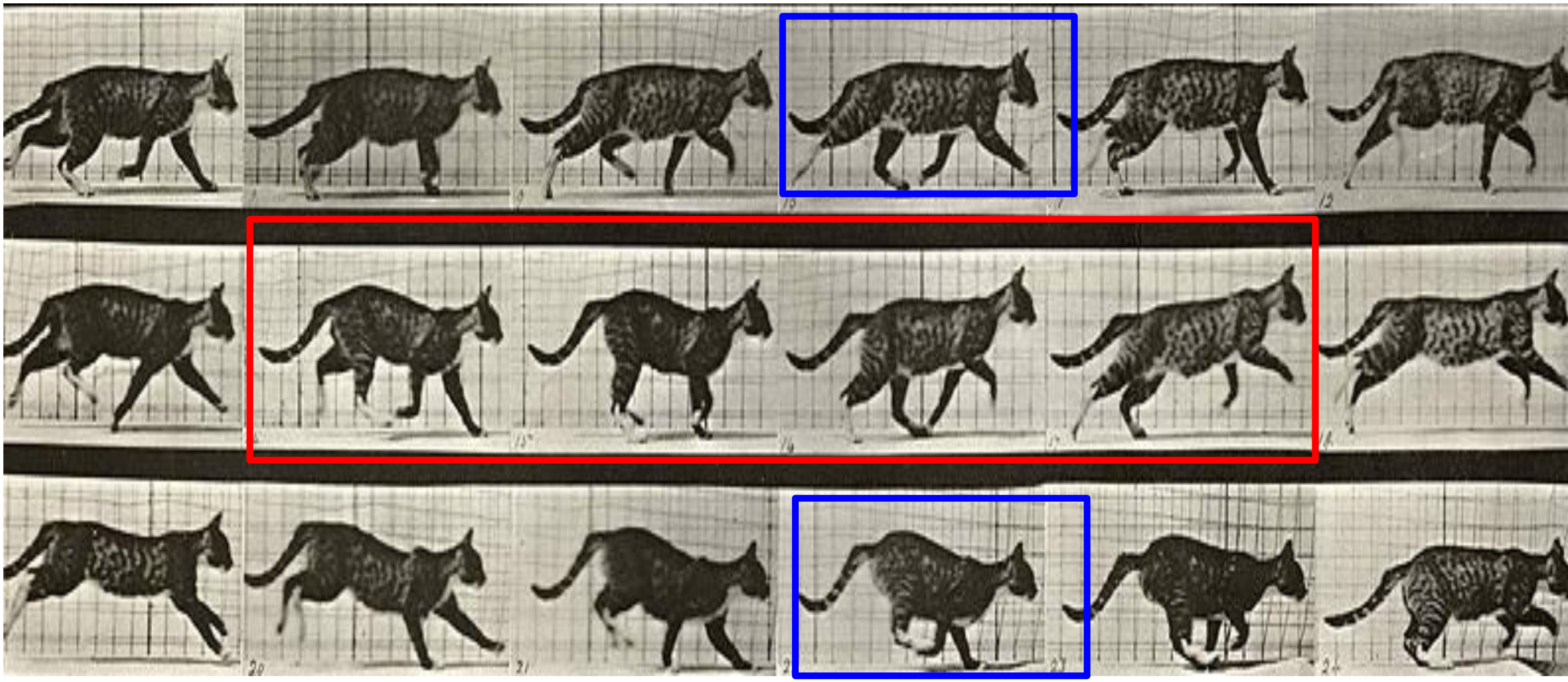
Movement Time	Reaction Time	Left Target	Home Keys	Right Target	Reaction Time	Movement Time
			• •	1	218	159
151	220	2	• •			
82	205	4	• •			
			• •	3	218	78
89	219	6	• •	5	224	85
166	237	8	• •	7	240	169
155	238	10	• •	9	246	133
140	243	12	• •	11	240	158



Kelso et al 1979 Science

The phenomenon of pattern transition

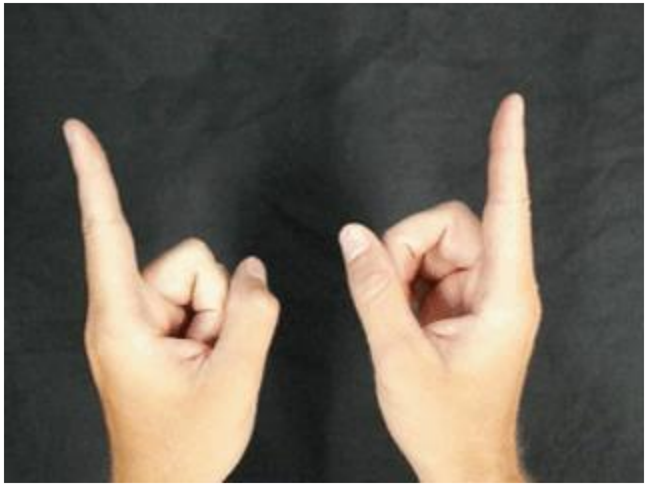
What's coordination?



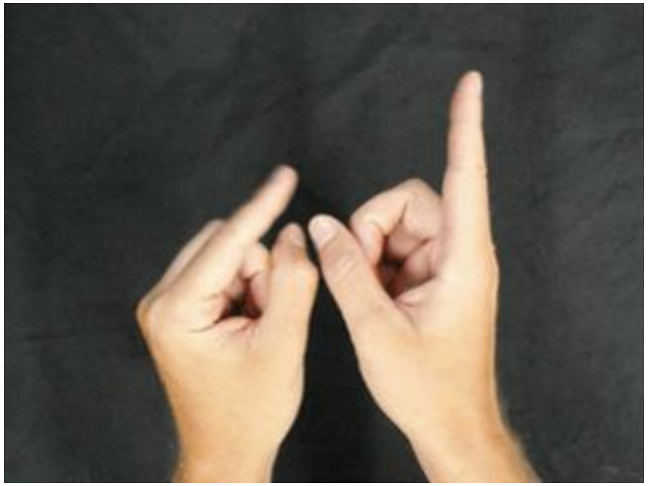
(Muybridge, Animals In Motion, 1899)

Lower frequency, two stable behaviors

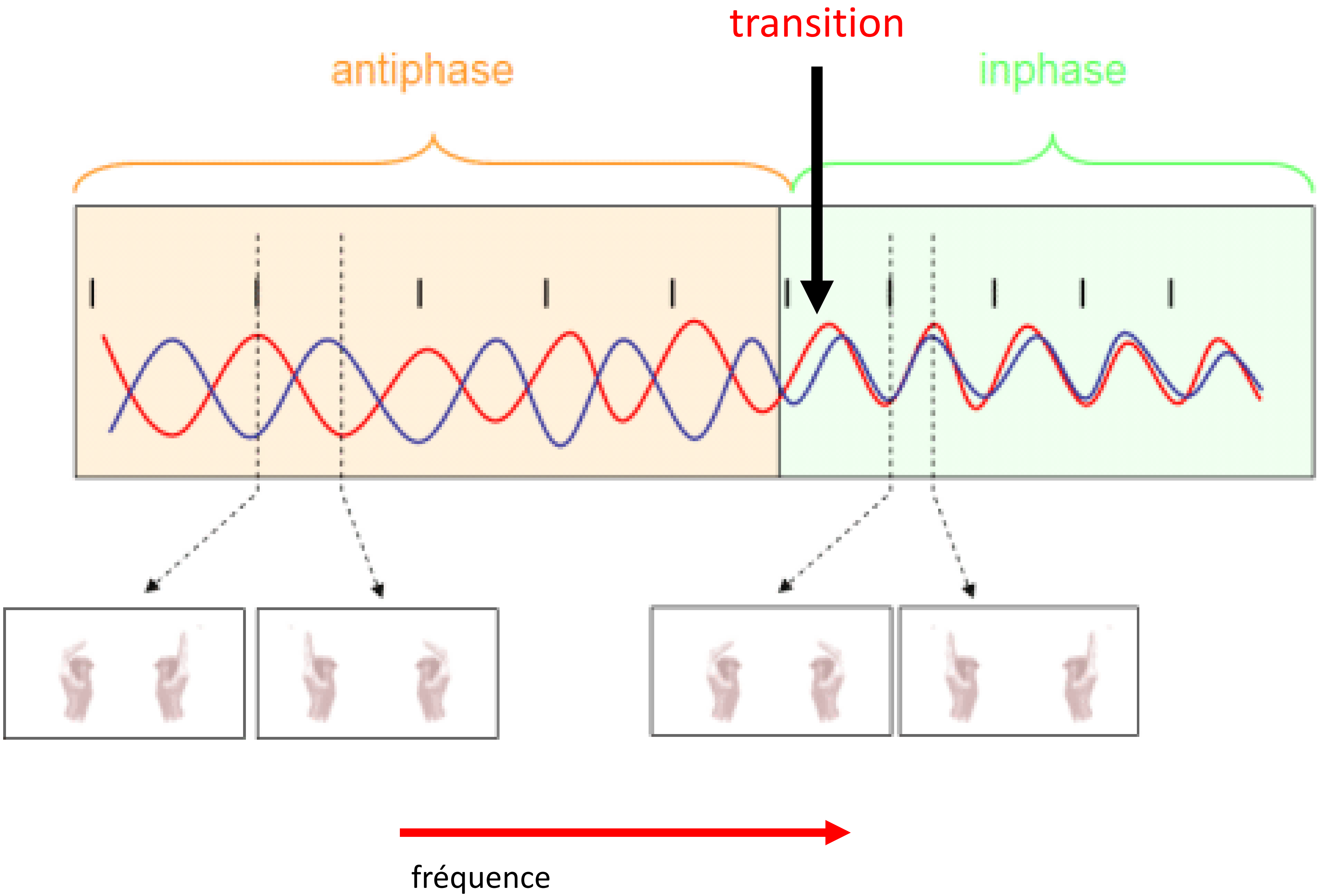
- en phase



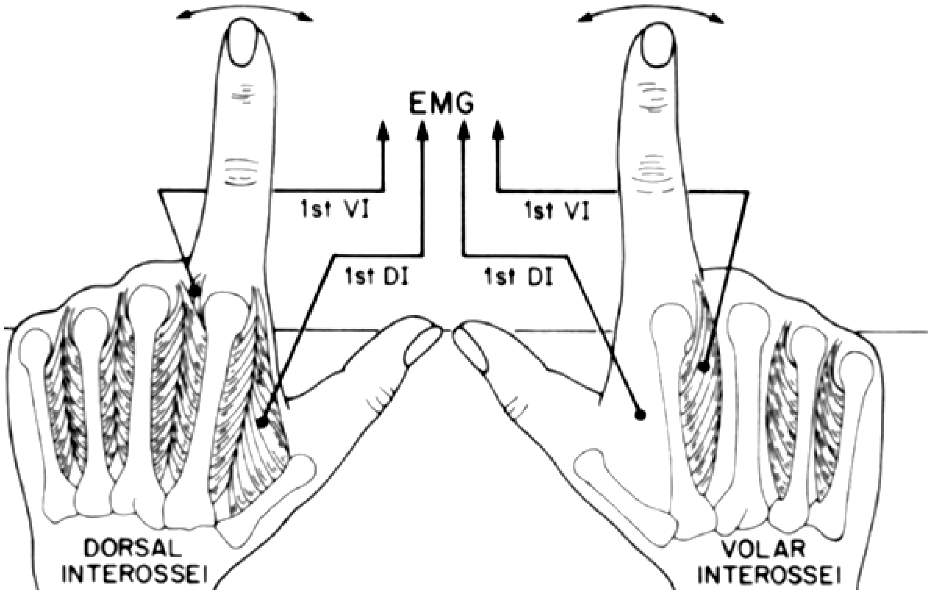
- antiphase

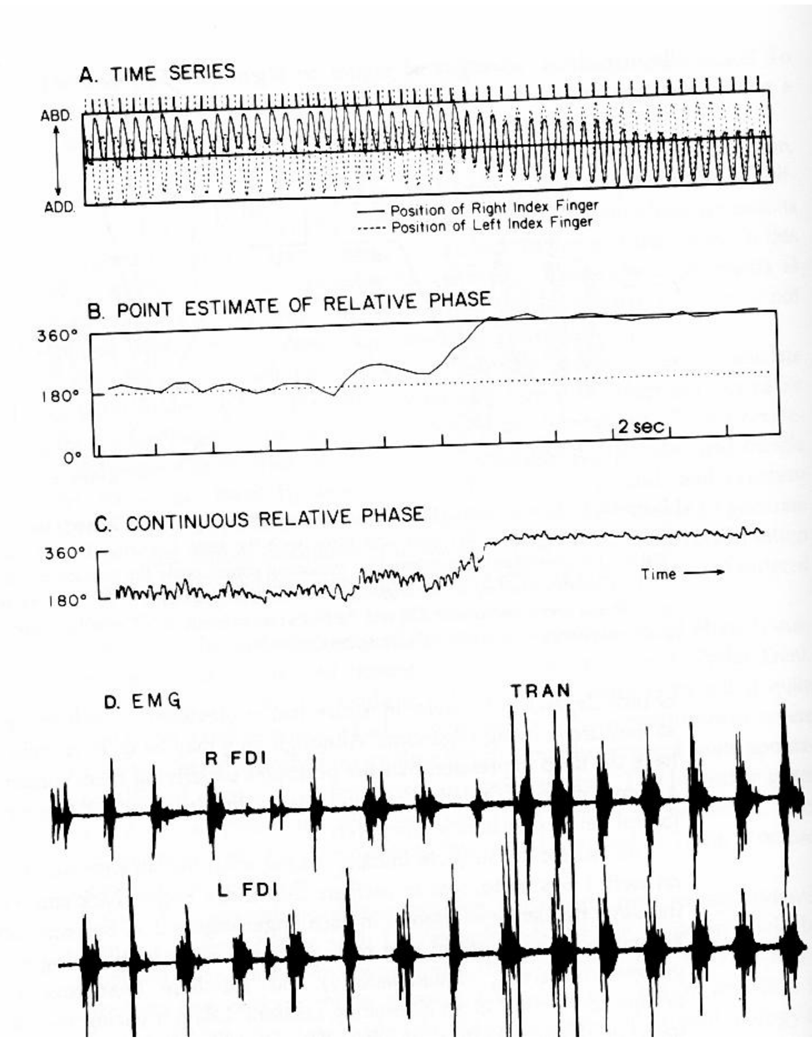


(Control parameter (Ω) < 2 Hz)



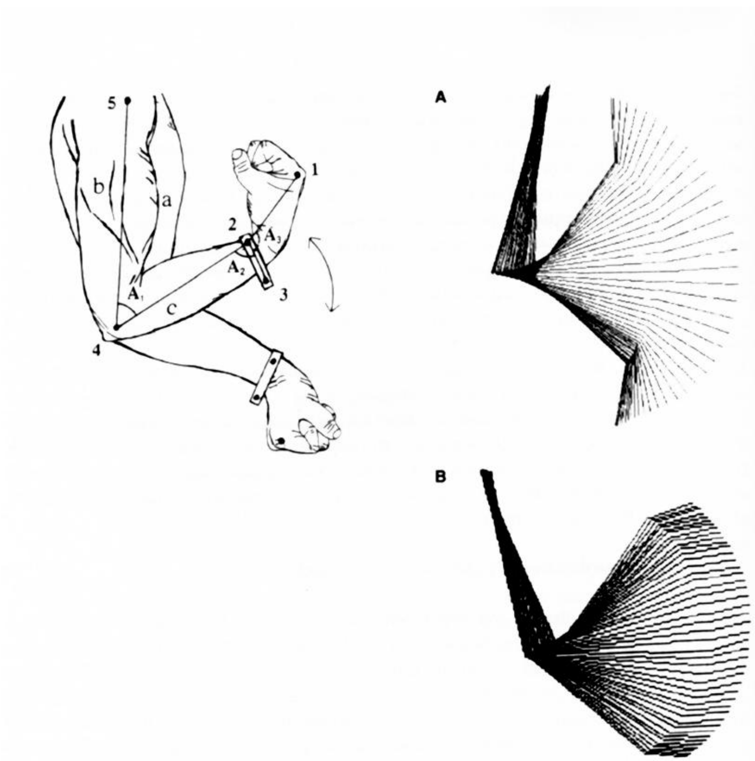
Kelso 1984

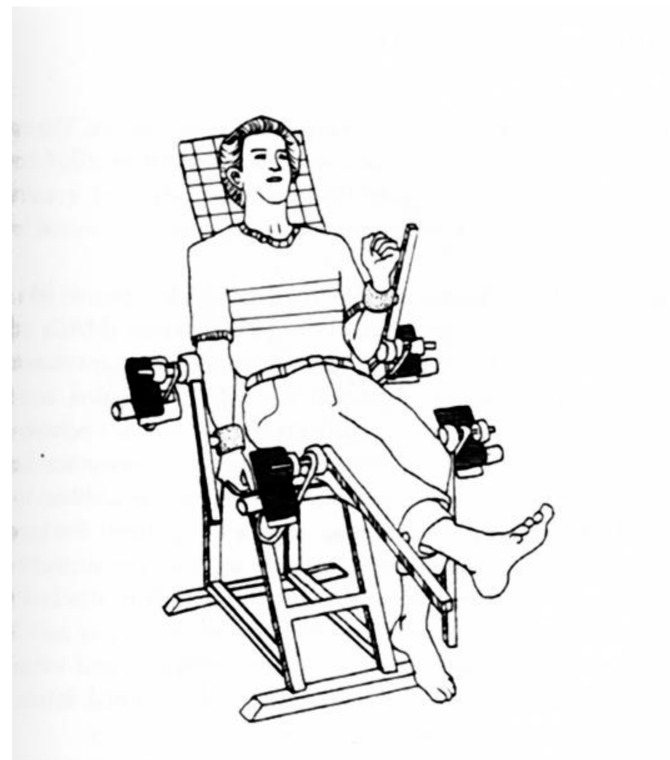

EMG
1st VI
1st VI
1st DI
1st DI
DORSAL INTEROSSEI
VOLAR INTEROSSEI


A. TIME SERIES
ABD.
ADD.
Position of Right Index Finger
Position of Left Index Finger
B. POINT ESTIMATE OF RELATIVE PHASE
360°
180°
0°
2 sec
C. CONTINUOUS RELATIVE PHASE
360°
180°
Time
D. EMG
TRAN
R FDI
L FDI

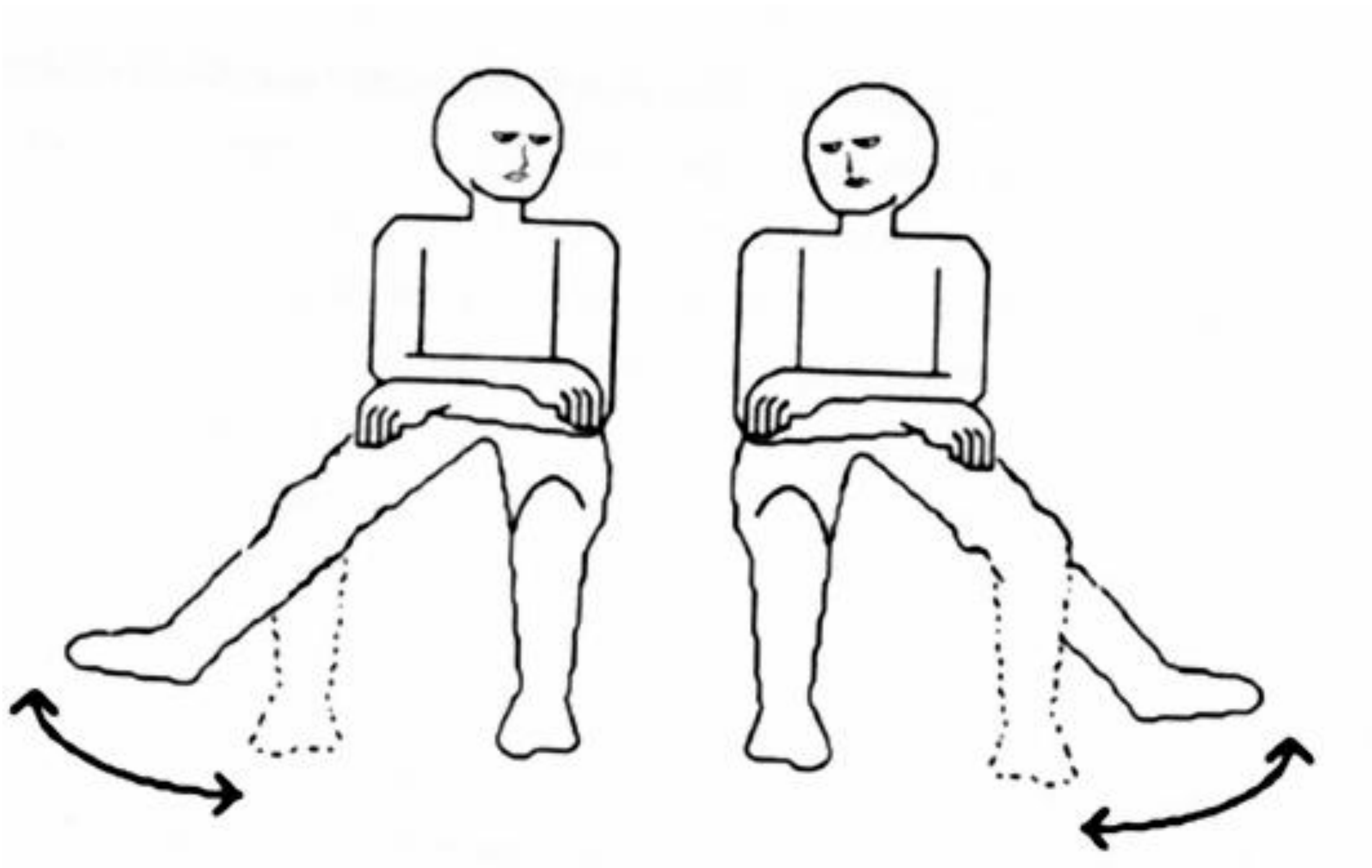
Généralisation du modèle HKB

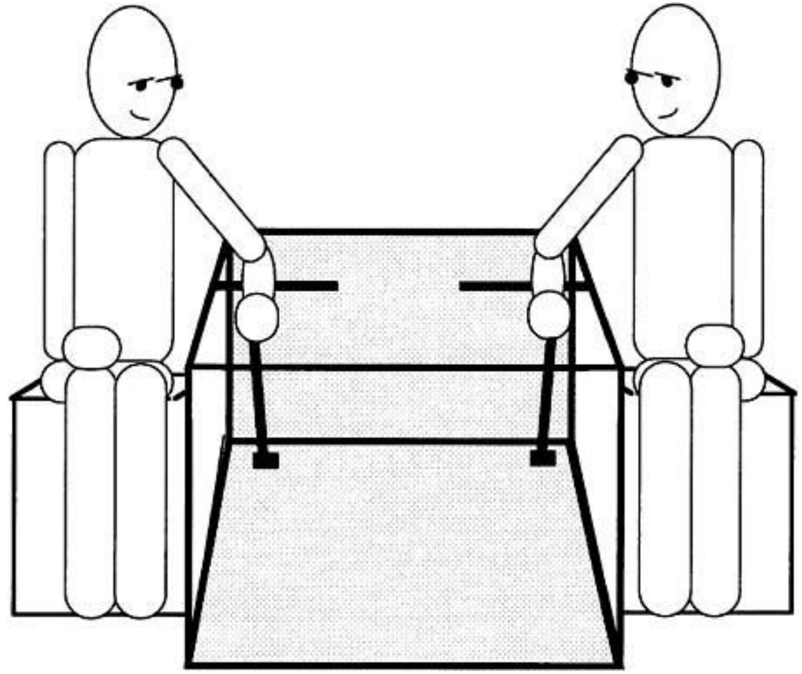
- au couplage entre 2 ou 4 segments pluri-articulés

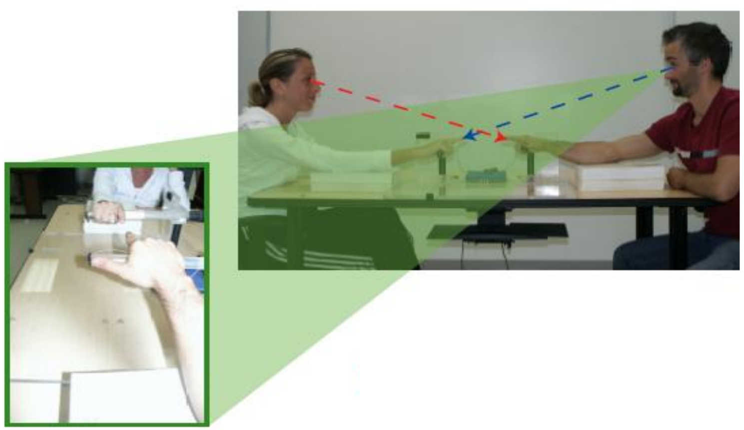


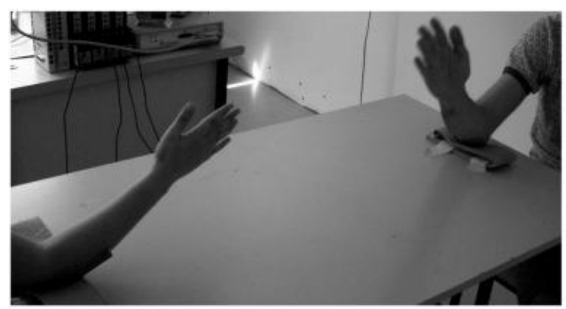


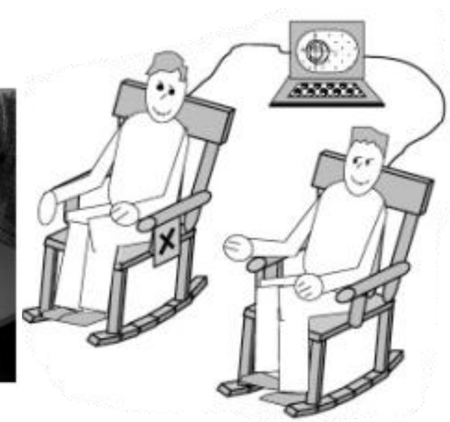
Couplage entre 2 personnes



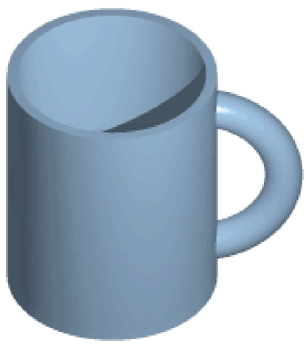








Etats perceptifs



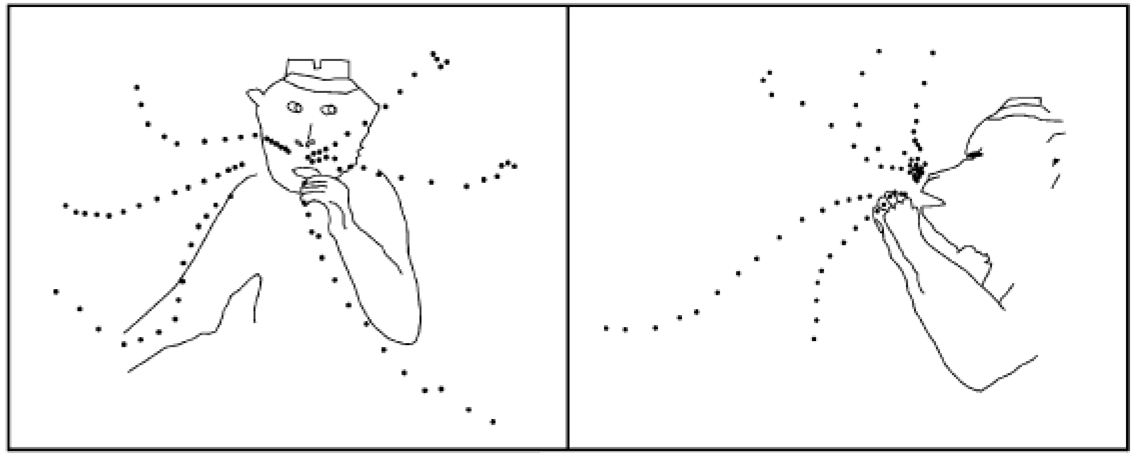


Figure 1. An Example of a Complex Posture Evoked from Monkey 1 by Microstimulation of Precentral Cortex

When this site was stimulated the left hand closed into a grip posture, turned to the face, moved toward the mouth, and the mouth opened. Stimulation was for 500 ms at 100 μA and 200 Hz. Drawings were traced from video footage acquired at 30 frames per second. The 11 dotted lines show the frame-by-frame position of the hand for 11 different stimulation trials. Each dot shows the part of the video image of the hand that was farthest from the elbow. The start point of each trajectory was distant from the mouth; the end point was at or near the mouth.

Complex Movements Evoked by Microstimulation of Precentral Cortex

Michael S.A. Graziano,[1] Charlotte S.R. Taylor, and Tirin Moore
Department of Psychology
Princeton University
Princeton, New Jersey 08544

Neuron, Vol. 34, 841–851, May 30, 2002,

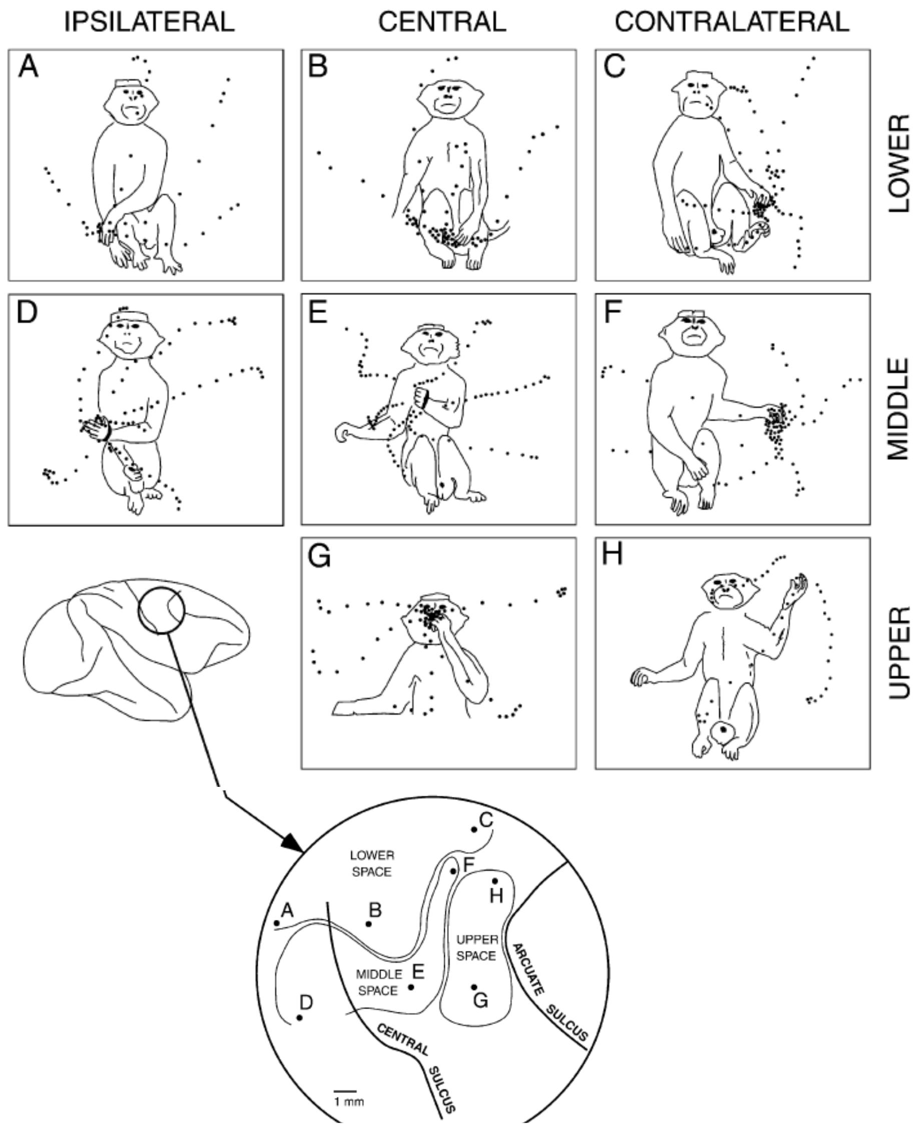


Figure 5. Eight Example Postures Illustrating the Topographic Map Found in Precentral Cortex of Monkey 1

A similar map (not shown) was obtained in monkey 2. The circle on the brain shows the area that could be reached with the electrode. The magnified view at the bottom shows the locations of the stimulation sites. The area to the left of the lip of the central sulcus represents the anterior bank of the sulcus. Stimulation on the right side of the brain caused movements mainly of the left side of the body. Postures of the right arm shown in these traced video frames are incidental and not dependant on the stimulation. For the evoked movements shown in (A) and (G), stimulation was at 50 μA. In (B)–(F) and (H), stimulation was at 100 μA. For all sites, stimulation trains were presented for 500 ms at 200 Hz.