

Wad's systems approach

Patrick Bateson

Pity the poor graduate students

They must publish to get jobs after their higher degrees

To publish early they must be given tractable problems to solve

They will become analytical rather than synthetic

Wad's systems approach will not be congenial to them



Alexander Bogdanov 1873-1928

Tektology



Ludwig von Bertalanffy 1901-1972

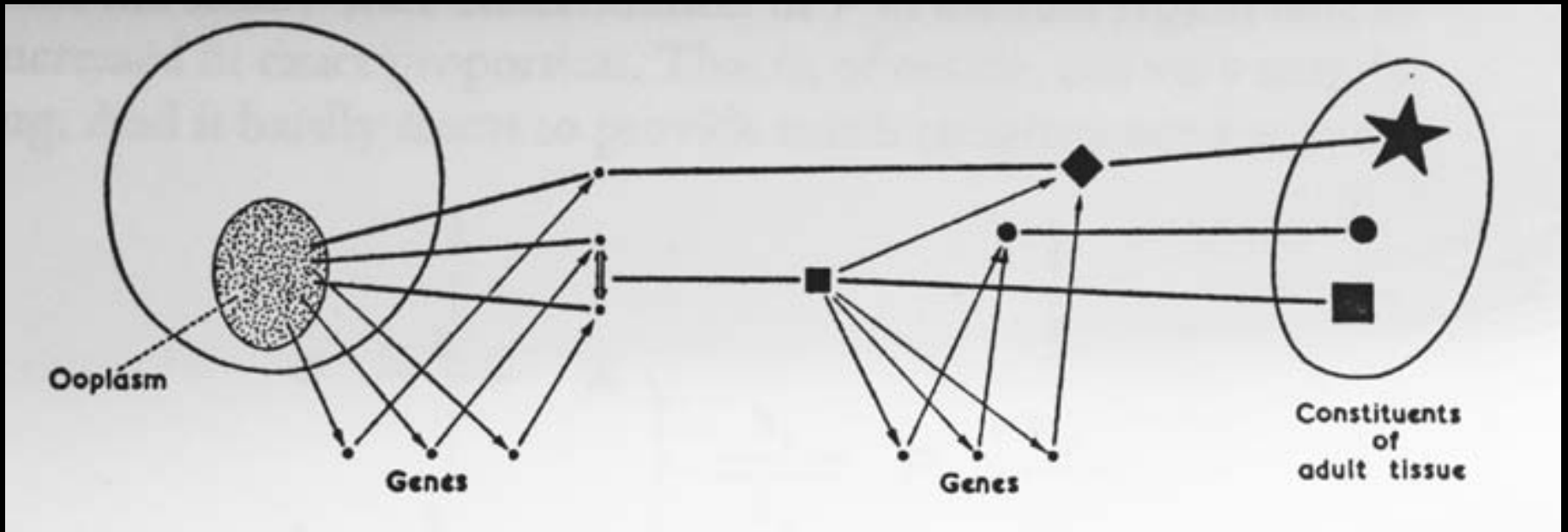
General Systems Theory

A mathematical discipline, in itself purely formal but applicable to the various empirical sciences



Alfred North Whitehead
1861-1947

Whitehead rejected the idea of separate and unchanging bits of matter as the most basic building blocks of reality, in favor of the idea of reality as interrelated events in process. He conceived of reality as composed of processes of dynamic "becoming" rather than static "being".



Wad's initial view of development

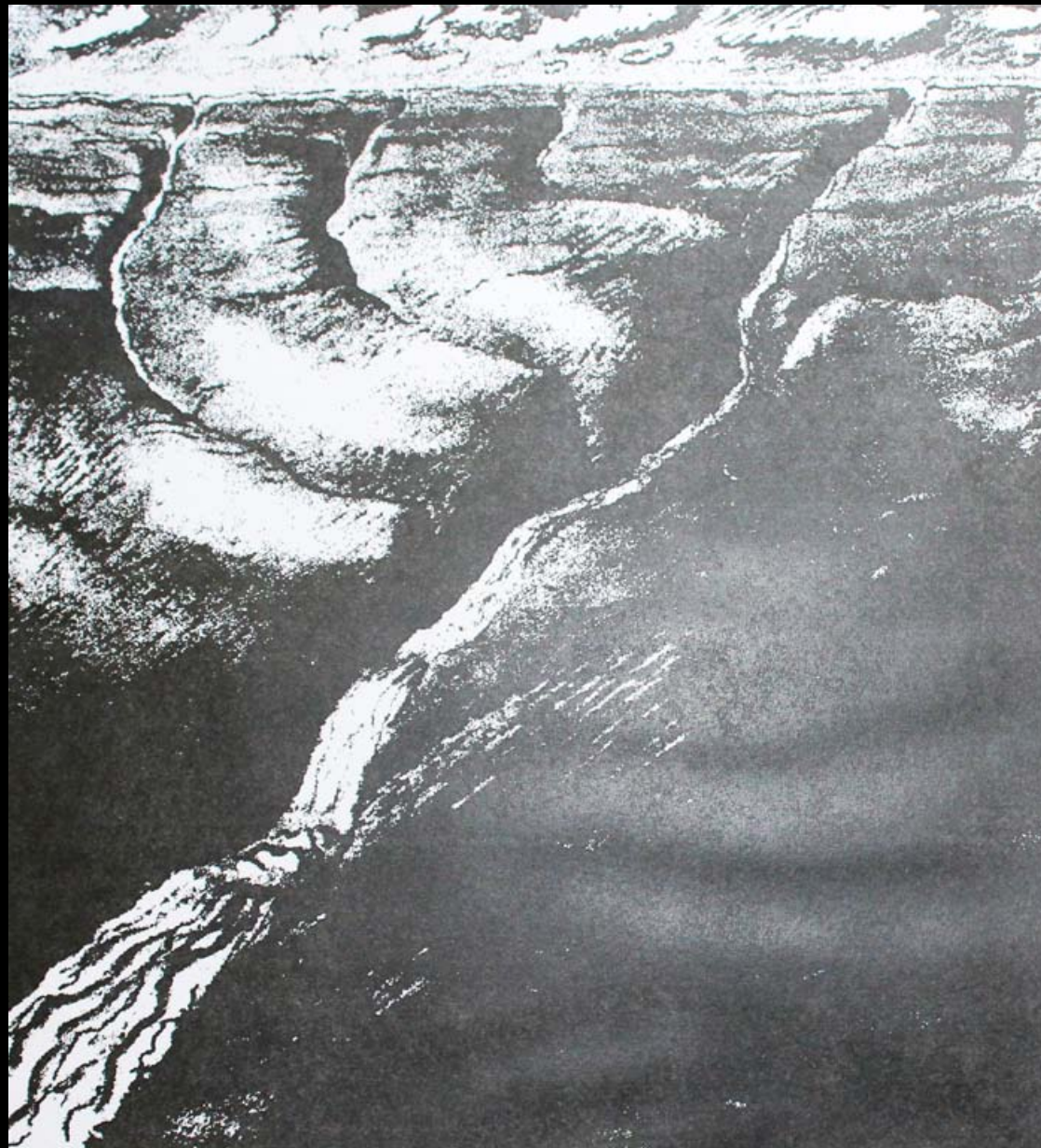


Norbert Wiener (1894-1964) and Cybernetics

Number of papers dealing with epigenetics

1960	1970	1980	1990	2000	2010	2015
4	4	13	48	415	3577	6112

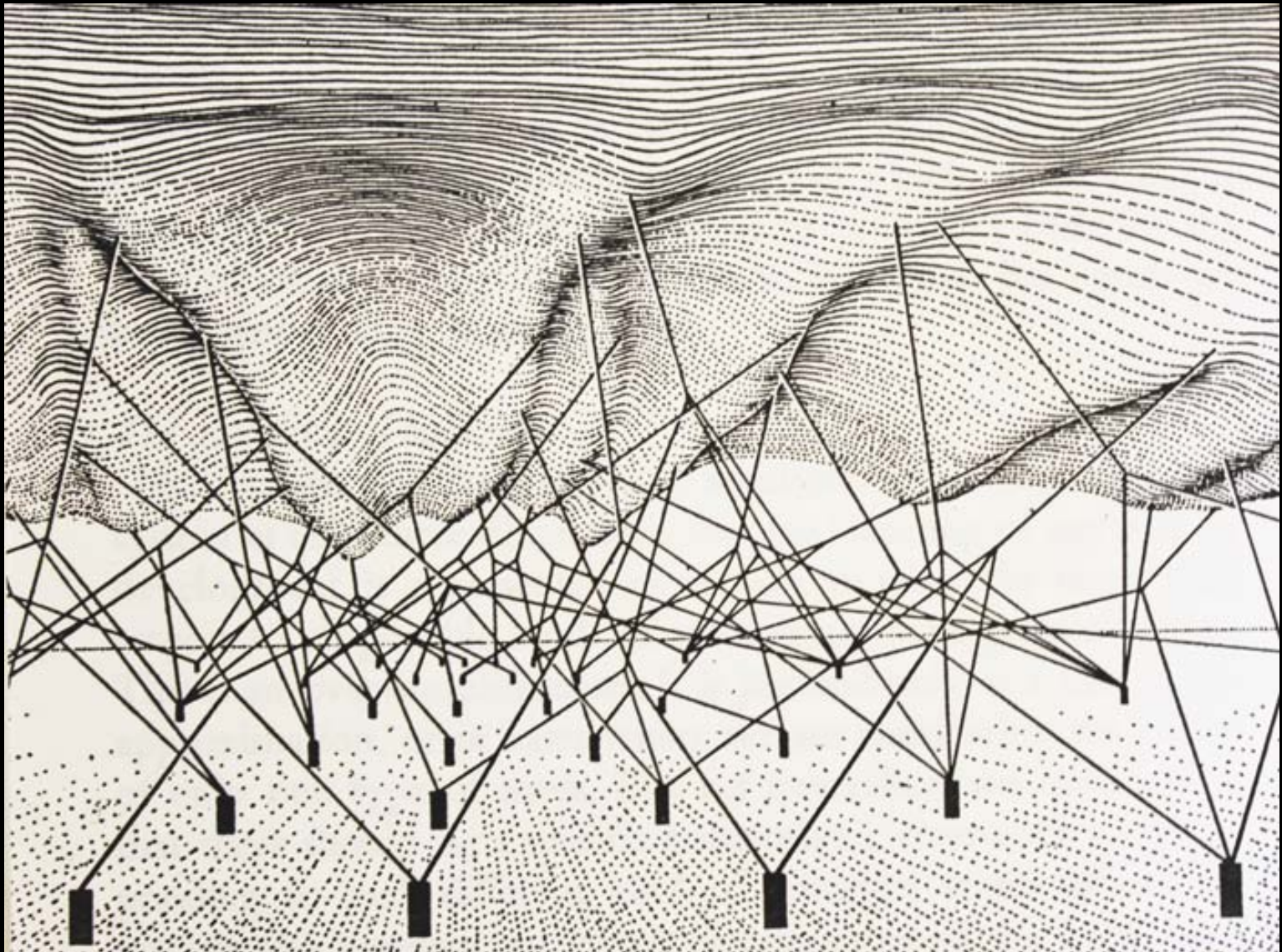
Yearly totals



John Piper's first version of the epigenetic landscape
From CH Waddington (1947) *Organisers and Genes*

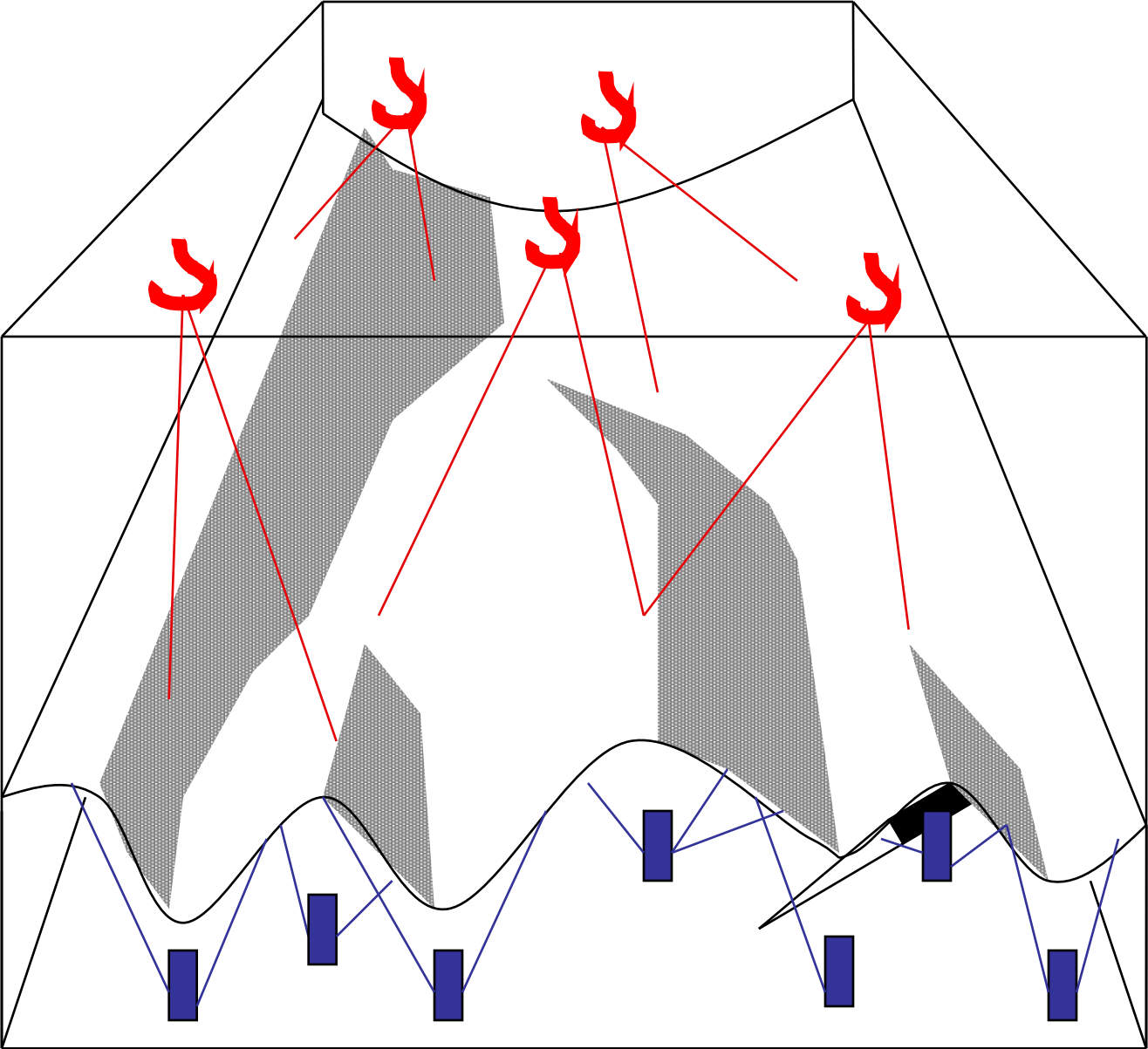


Painting by Yolande Sonnabend after Spello meeting, 1993



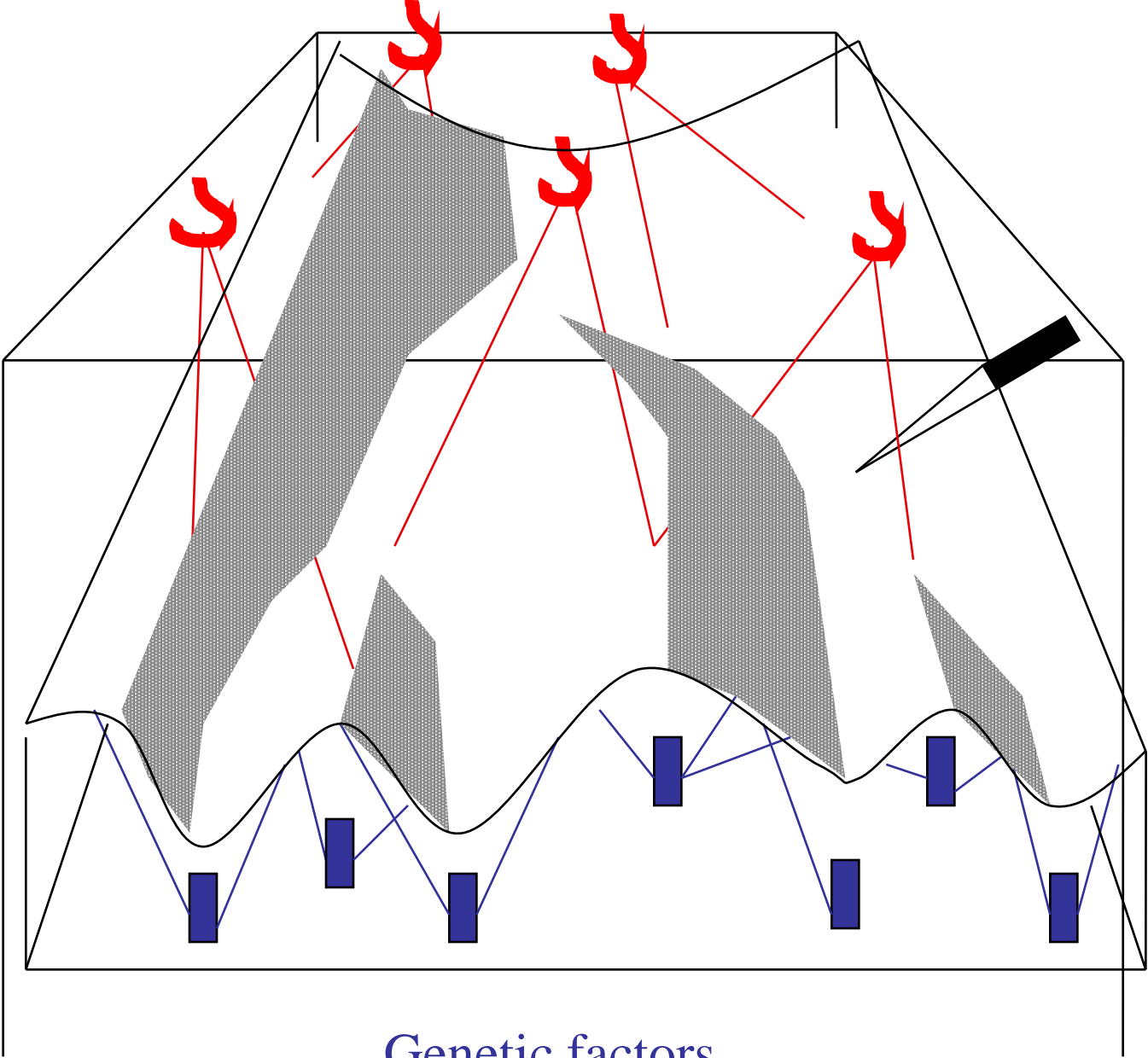
Underneath the Epigenetic Landscape

Environmental factors

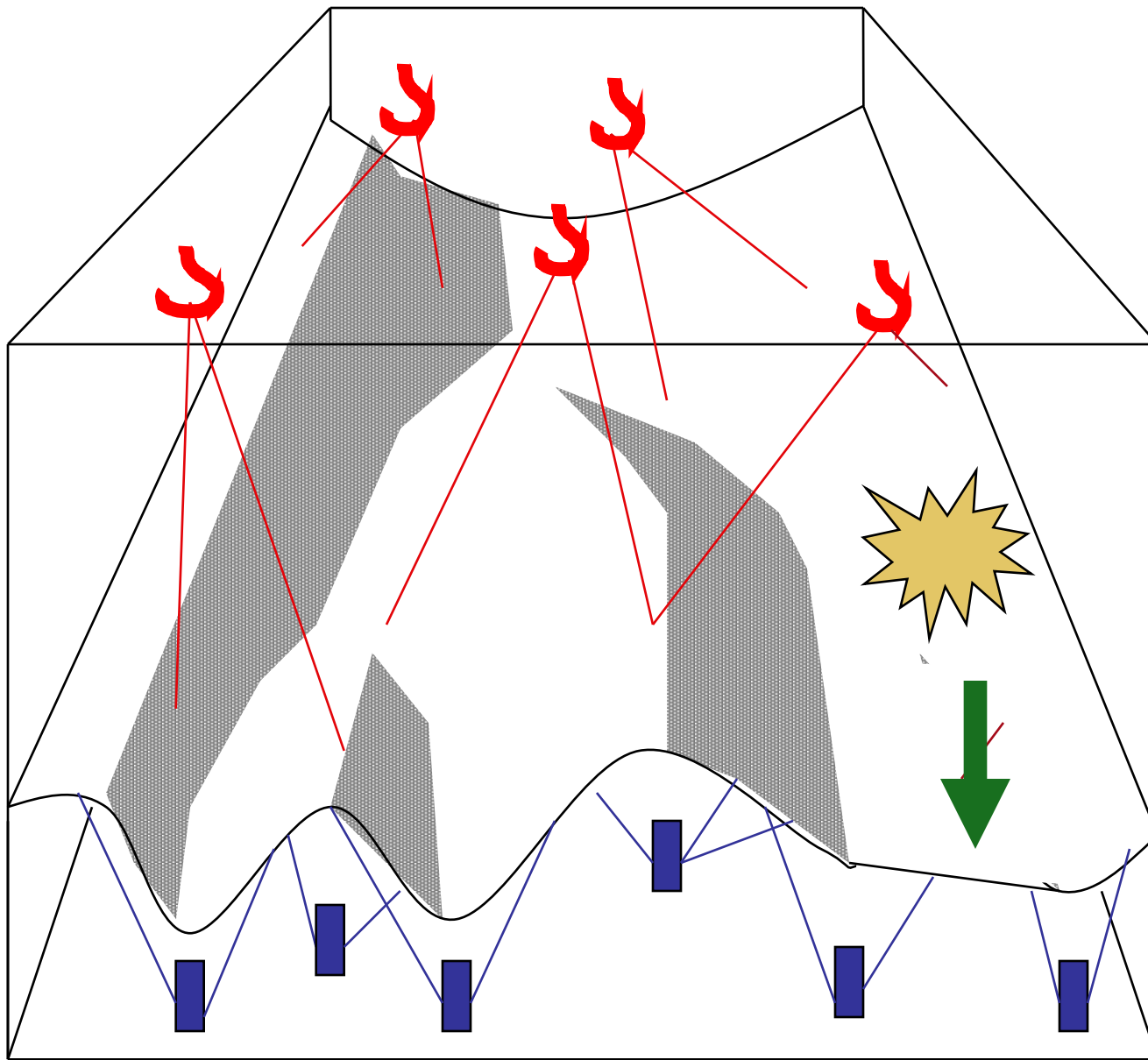


Genetic factors

Environmental factors



Genetic factors



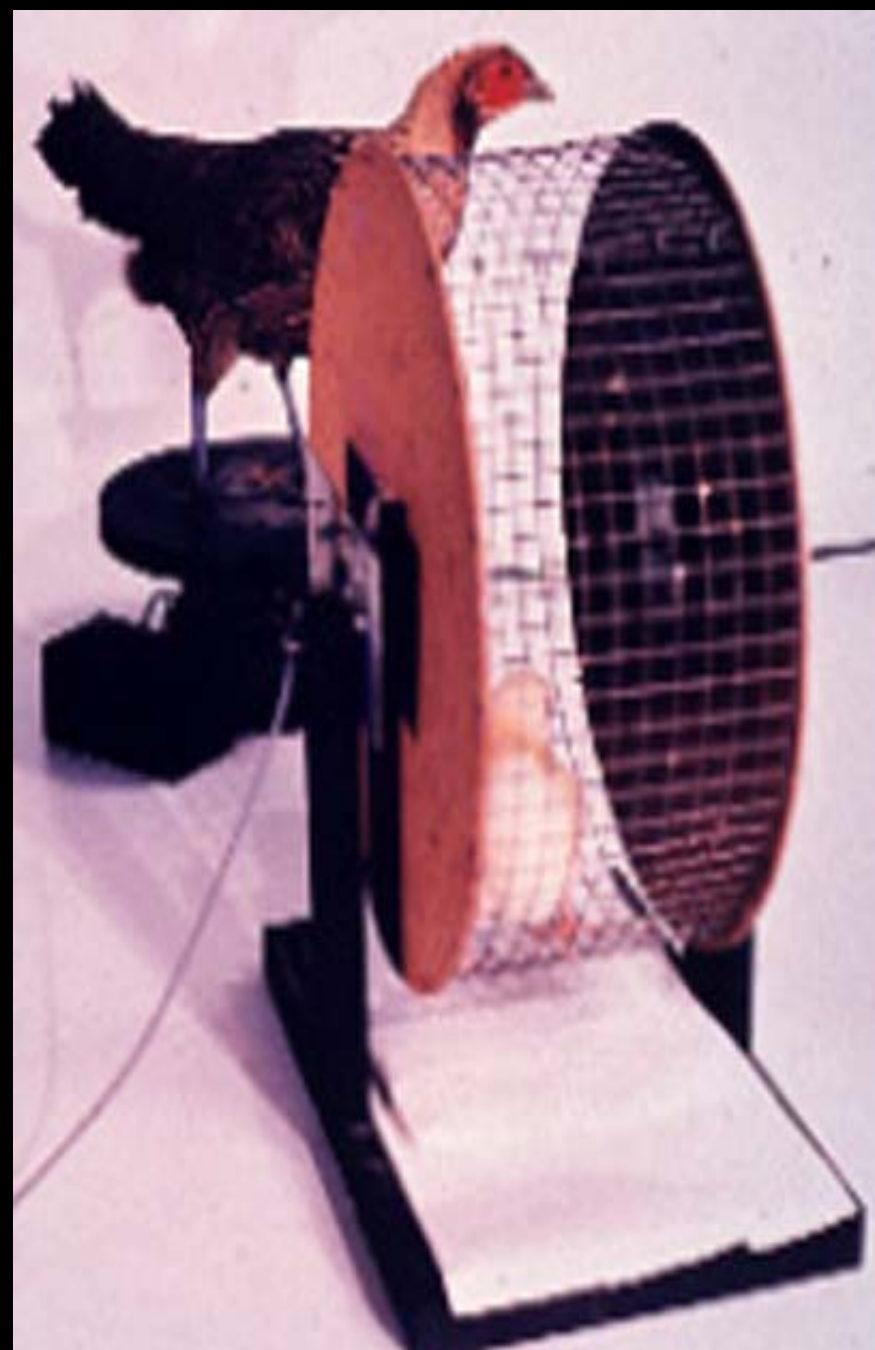
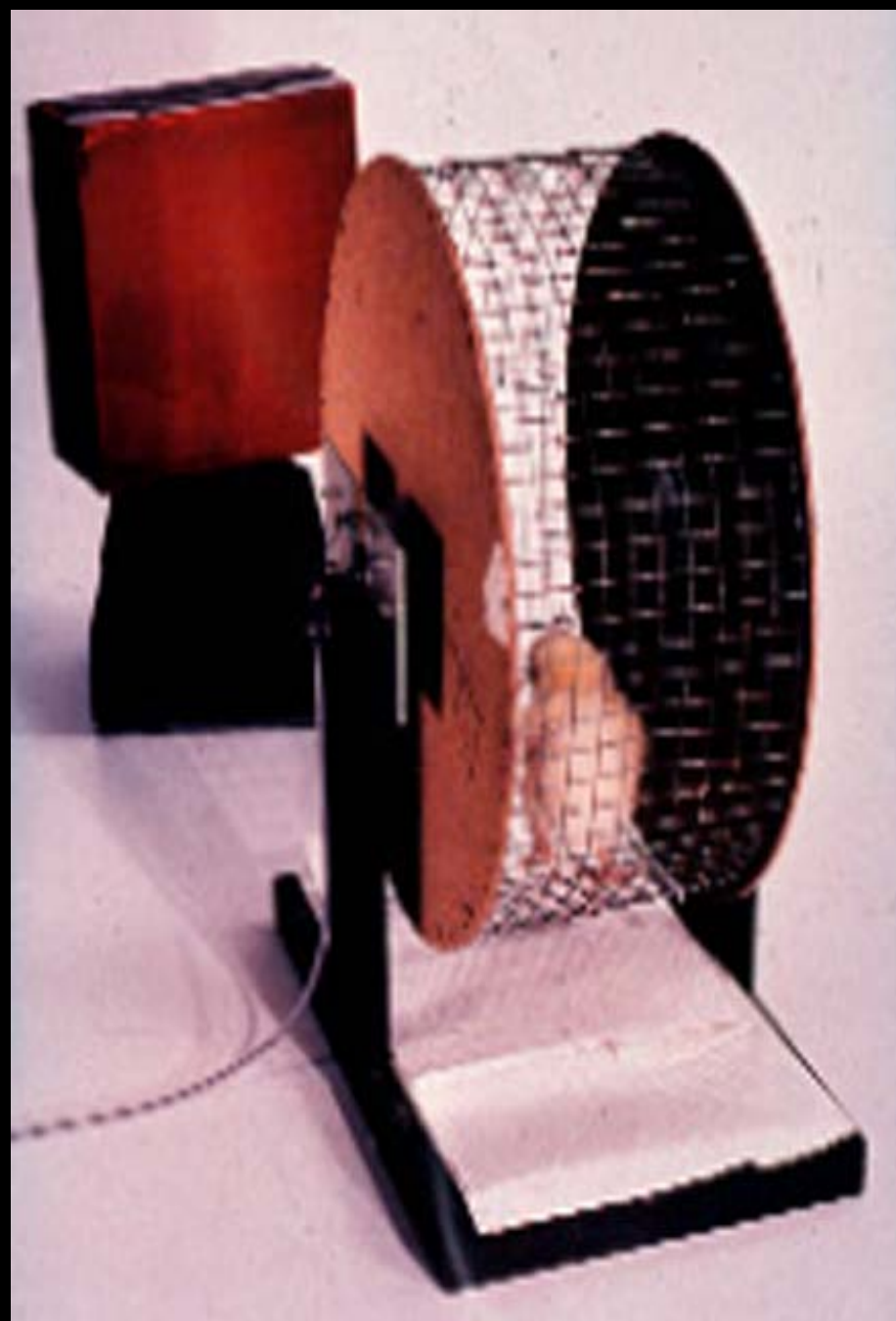
The phenotype may change dramatically when a previously stable factor alters

Epigenetics not simply concerned with the regulation of when genes are expressed.

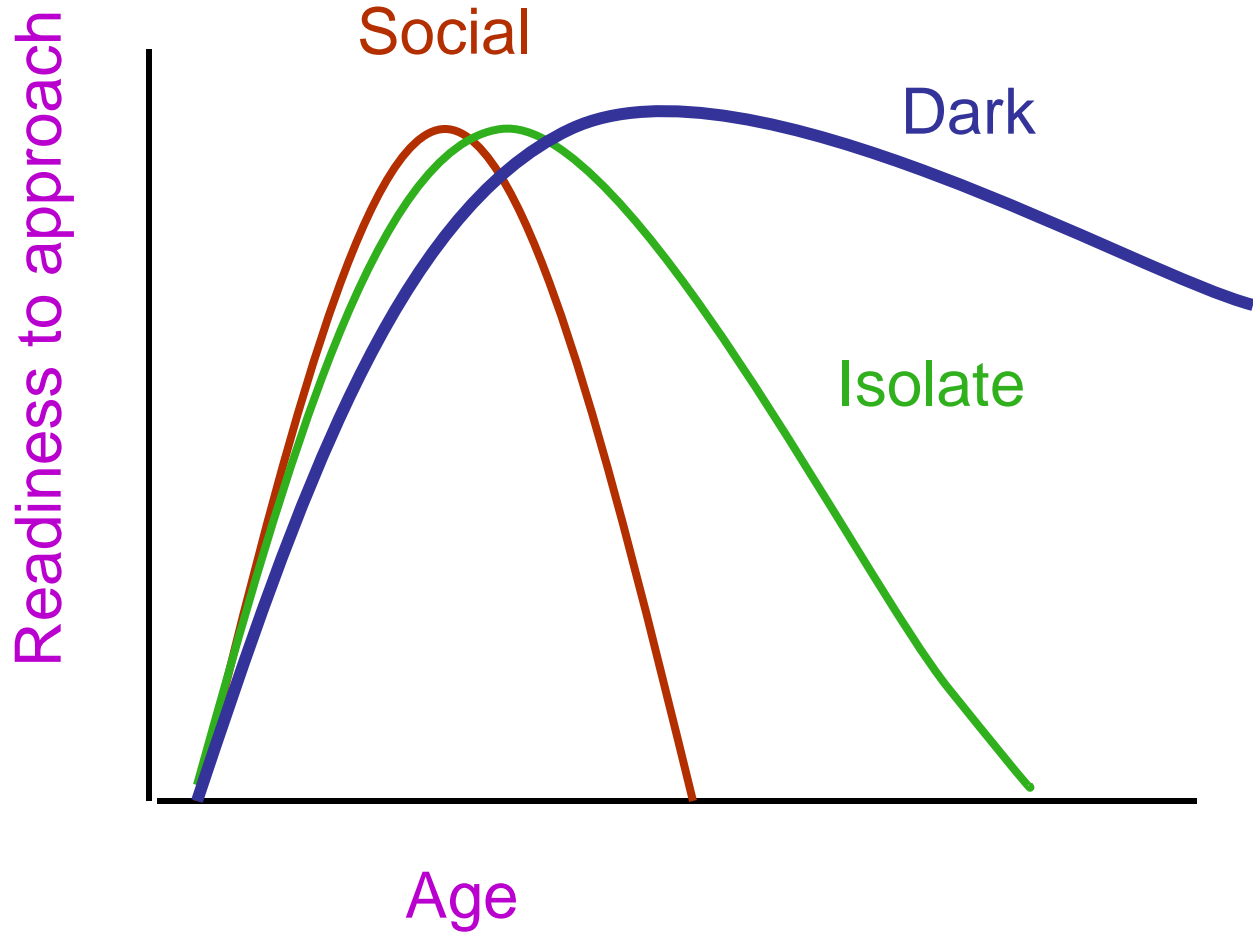
Many important events in development occur at the level of the whole organism



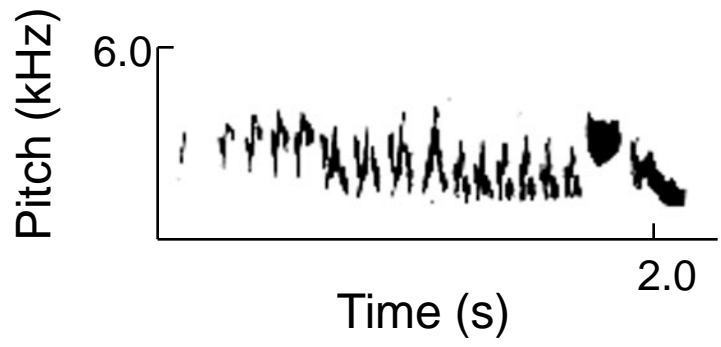
Konrad Lorenz with imprinted geese



Sensitive Period for Imprinting

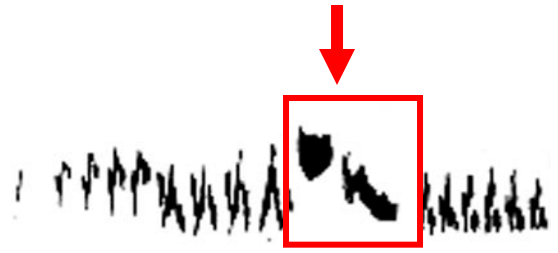






Wild Chaffinch
song

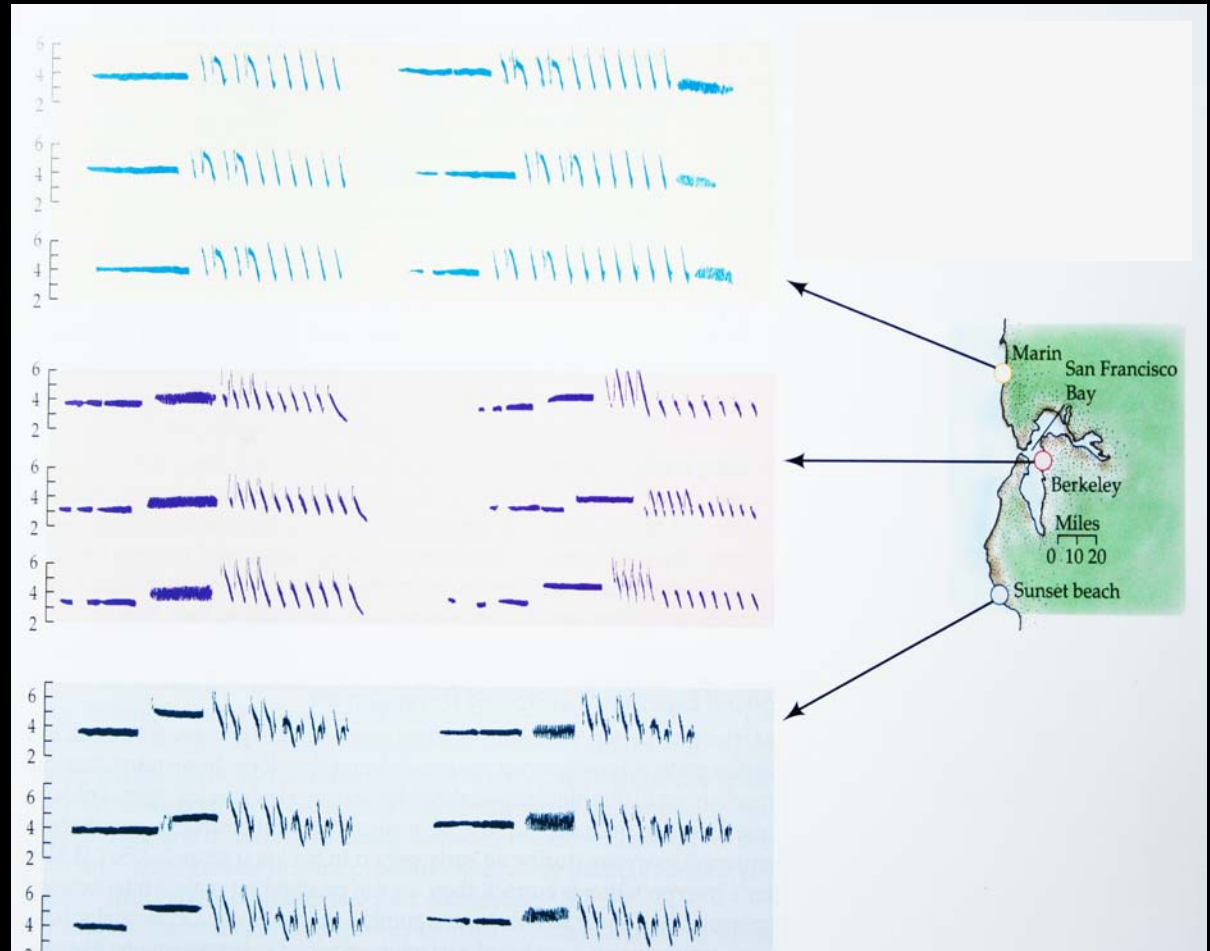
Bill Thorpe



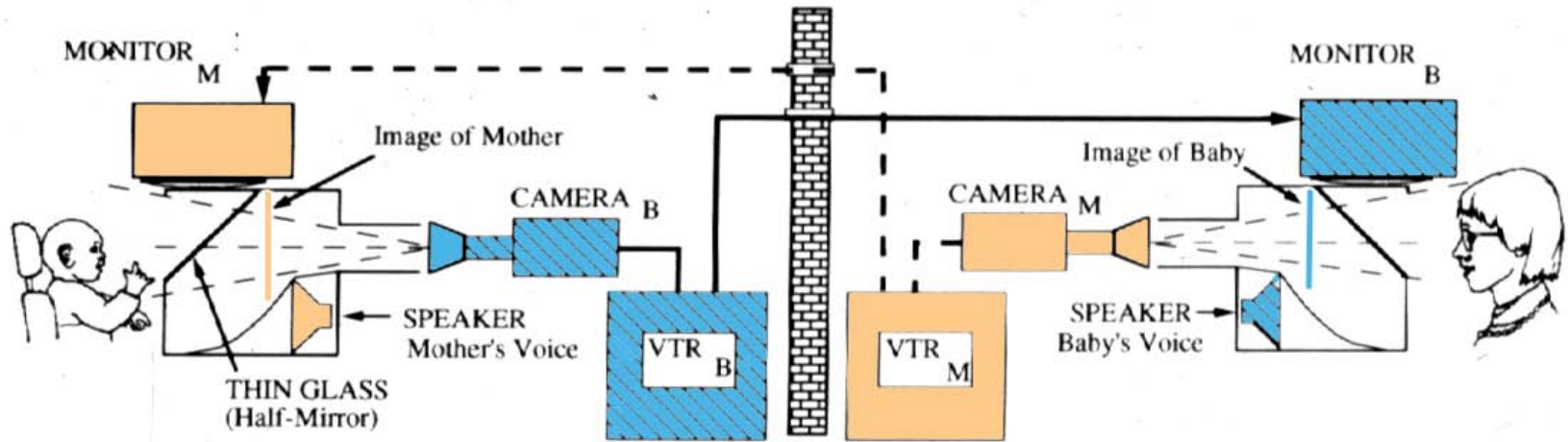
Rearticulated
recording



Song of
Hand-reared bird



Peter Marler - Dialects in song of the white-crowned sparrow



From Lynne Murray and Colwyn Trevarthen



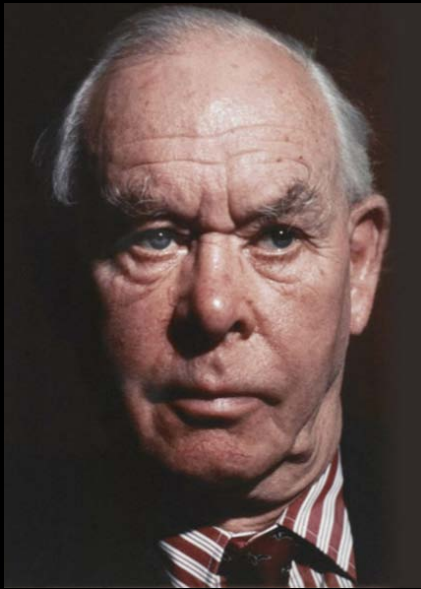
Searching
for contact

Panic!

Comfort
& contact

Joyful
recognition





John Bowlby (1907-1990)



Test of Attachment in a Strange Situation

1. Mother with Child
2. Child on own
3. Mother returns

Mary Ainsworth (1913-99)

0:07:22:6



0:07:25:4



Toward(s) a Theoretical Biology edited by C.H. Waddington

Vol 1. *The Origins of Life* (1967)

Vol. 2 *Sketches* (1969)

Vol. 3 *Organization, Stability & Process* (1970)

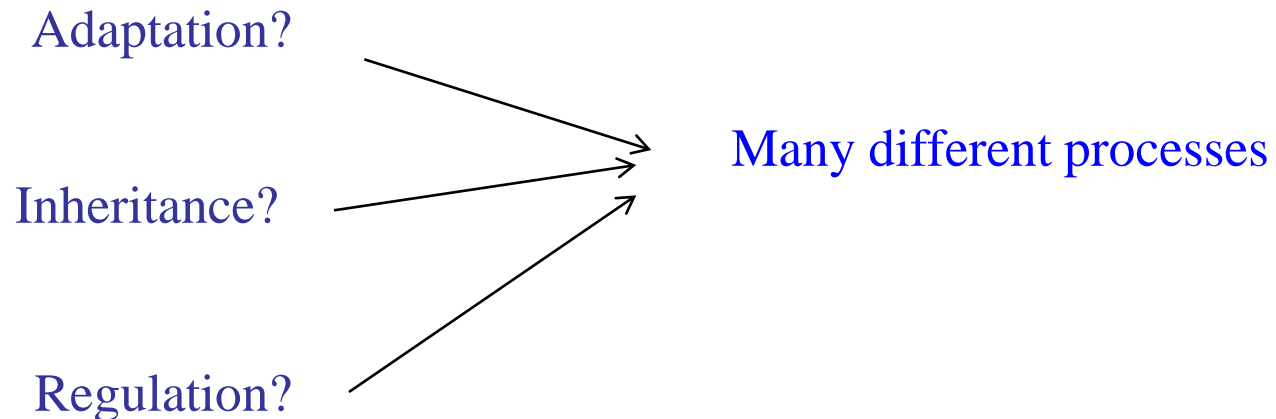
Vol. 4 *Biological Processes in Living systems* (1972)

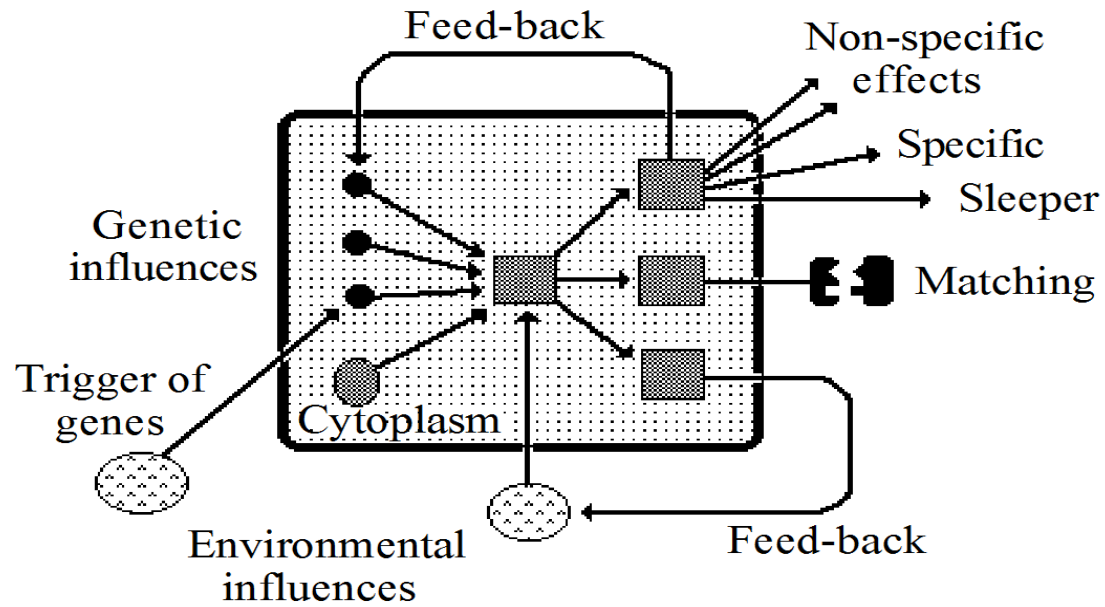
Some of the participants

Michael Arbib, David Bohm, Jack Cowan, Francis Crick, W.M. Elasser,
Brian Goodwin, Richard Gregory, Marjorie Grene, Stuart Kauffman, Edward Kerner,
Dick Levins, Dick Lewontin, Christopher Longuet-Higgins, John Maynard Smith,
Howard Pattee, René Thom, Lewis Wolpert, Christopher Zeeman

Wad' s epilogue to the fourth volume of *Toward a Theoretical Biology*

“... the will-o' the wisp ... should probably not have been labelled Theoretical Biology in the first place. A better name would have been Theory of General Biology.”





A Post-Wad Systems View from the 1990s

Plasticity

Many different types of plasticity are recognised

Distinction between conditional plasticity and adaptability plasticity

Adaptability can occur at all levels of analysis from the molecular to the social