

Ways of Seeing

Oscar Reina / @singlecoated
Barcelona Unseminars in Bioinformatics
PRBB. Barcelona. March 2017



The door



The wind



The bird



the valise

Magnritte

Seeing comes before words. The child looks and recognizes before it can speak.

[...] It is seeing which establishes our place in the surrounding world; we explain that world with words, but words can never undo the fact that we are surrounded by it.

[...] The Surrealist painter Magritte commented on this always-present gap between words and seeing in a painting called

The key of Dreams



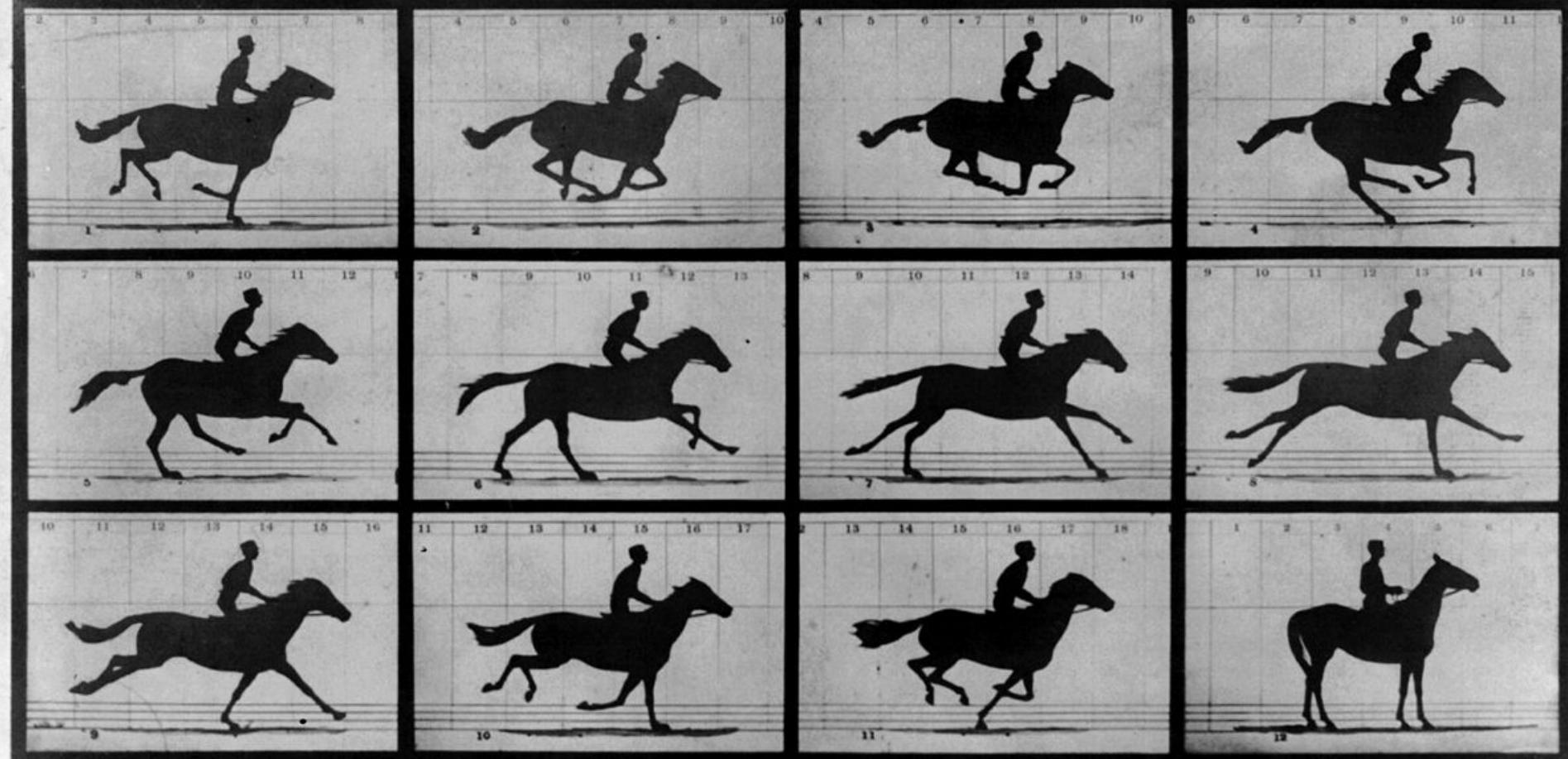
The Key of Dreams
René Magritte. 1930.



Bolivian army officers display the body of Che Guevara on October 9, 1967 - the day after he was executed. © Associated Press.



The Anatomy Lesson of Dr. Nicolaes Tulp. Rembrandt. 1632.



Copyright, 1878, by MUYBRIDGE.

MORSE'S Gallery, 417 Montgomery St., San Francisco.

THE HORSE IN MOTION.

Illustrated by
MUYBRIDGE.

AUTOMATIC ELECTRO-PHOTOGRAPH.

"SALLIE GARDNER," owned by LELAND STANFORD; running at a 1.40 gait over the Palo Alto track, 19th June, 1878.

The negatives of these photographs were made at intervals of twenty-seven inches of distance, and about the twenty-fifth part of a second of time; they illustrate consecutive positions assumed in each twenty-seven inches of progress during a single stride of the mare. The vertical lines were twenty-seven inches apart; the horizontal lines represent elevations of four inches each. The exposure of each negative was less than the two-thousandth part of a second.

The Horse in Motion. Eadweard Muybridge. 1878.



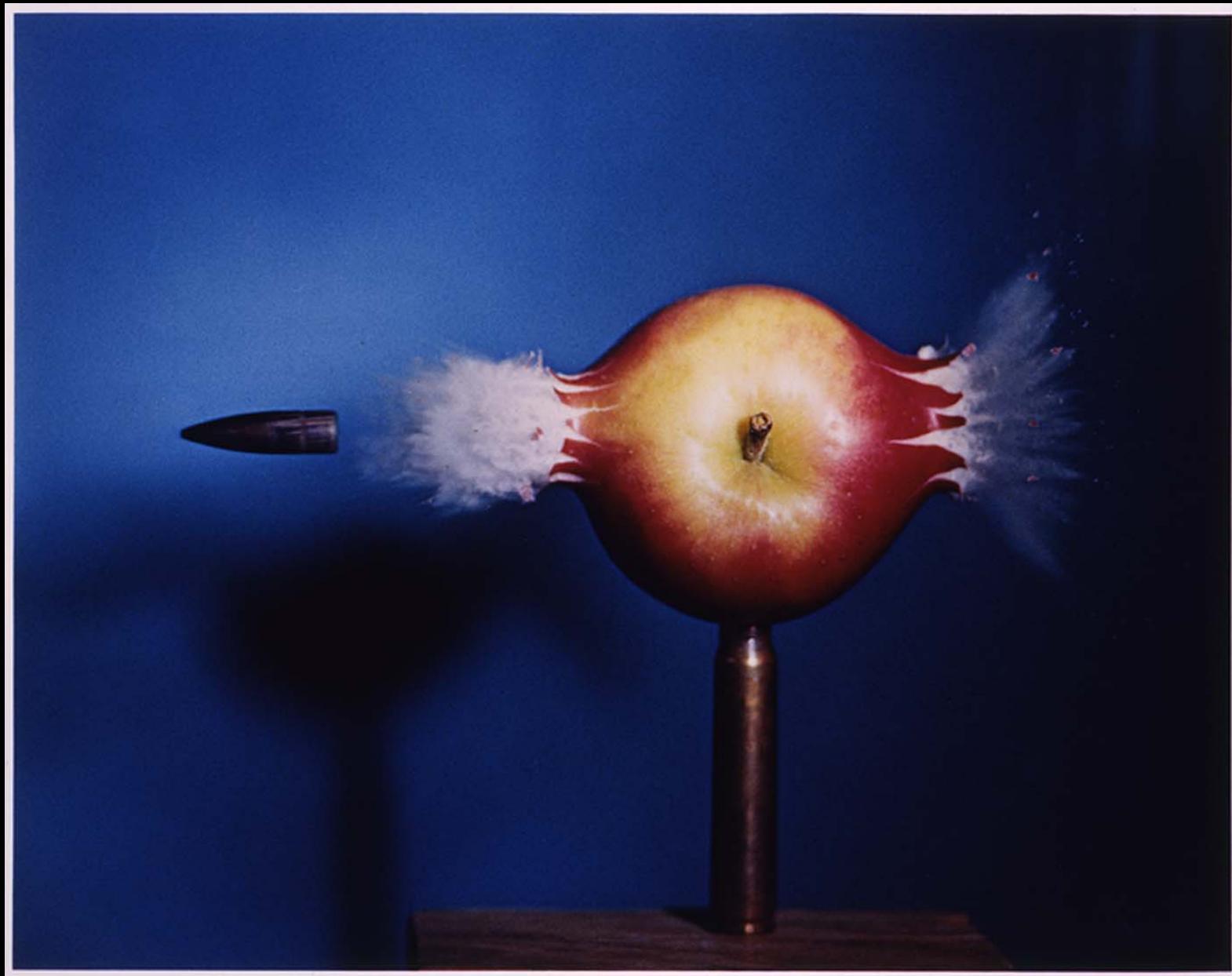
THE HORSE IN MOTION

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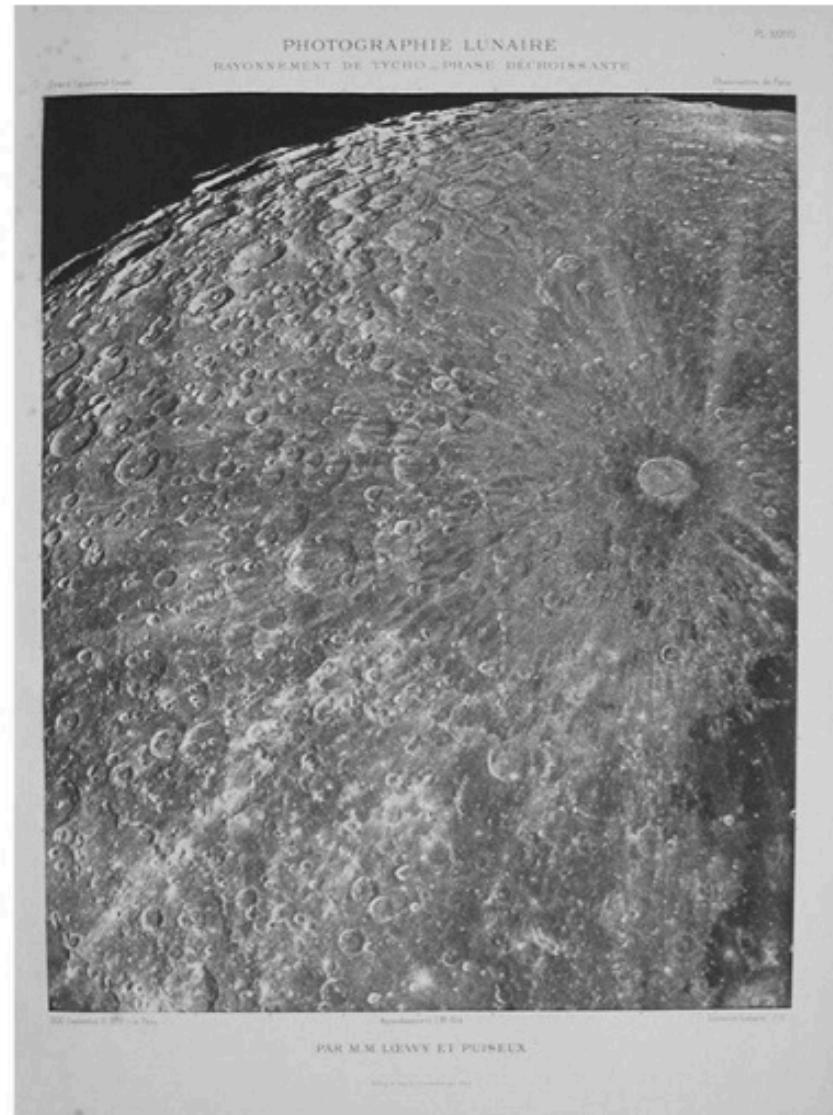
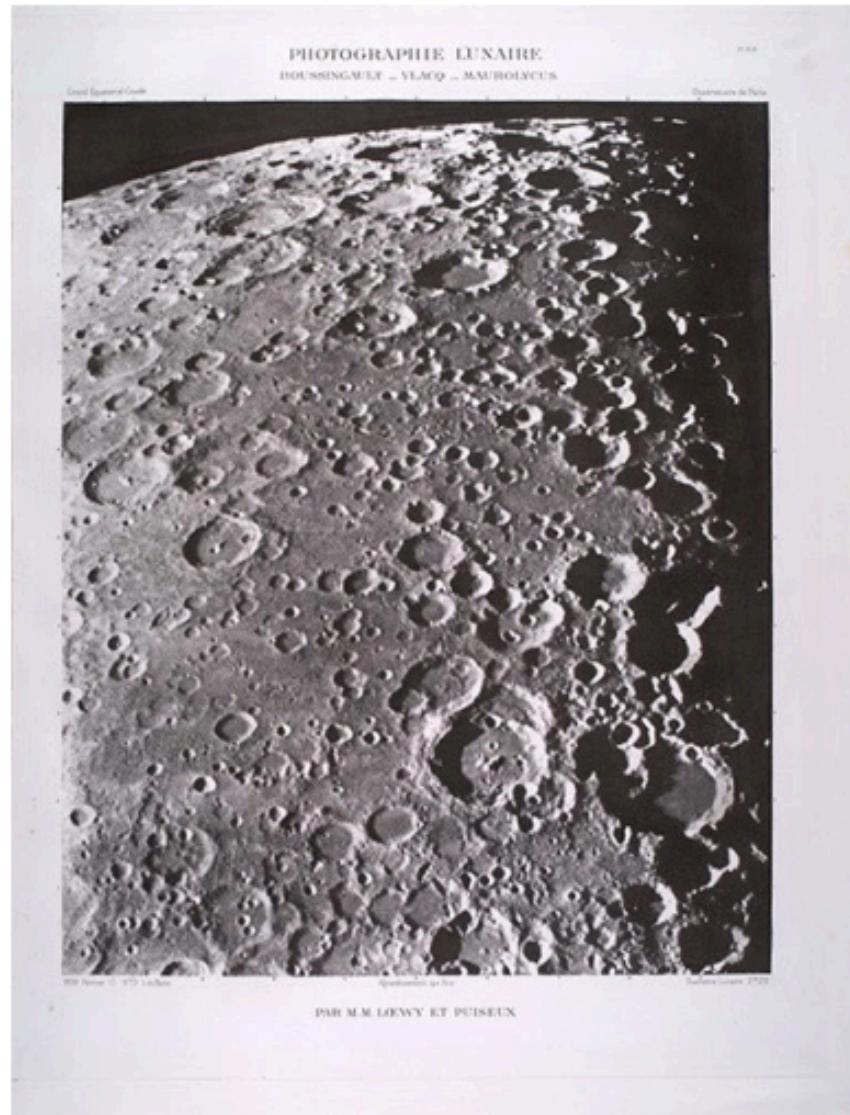
PHOTOGRAPH BY EADWEARD MUYBRIDGE

"We think the representation to be unimpeachable, until we throw all our preconceived impressions on one side, and seek the truth by independent observations from Nature herself."

—Eadweard Muybridge



Bullet through Apple. Harold E. Edgerton. 1964.



Maurice Loewy and Pierre Henri Puiseux. *The Moon (Boussingault, Vlacq, Maurolycus, Puiseux) and The Moon (Radiance of Tycho, Waning Phase)*. 1899/1900. Photogravures, each 22 1/2 x 18 1/4" (57.3 x 46.4 cm). Purchase



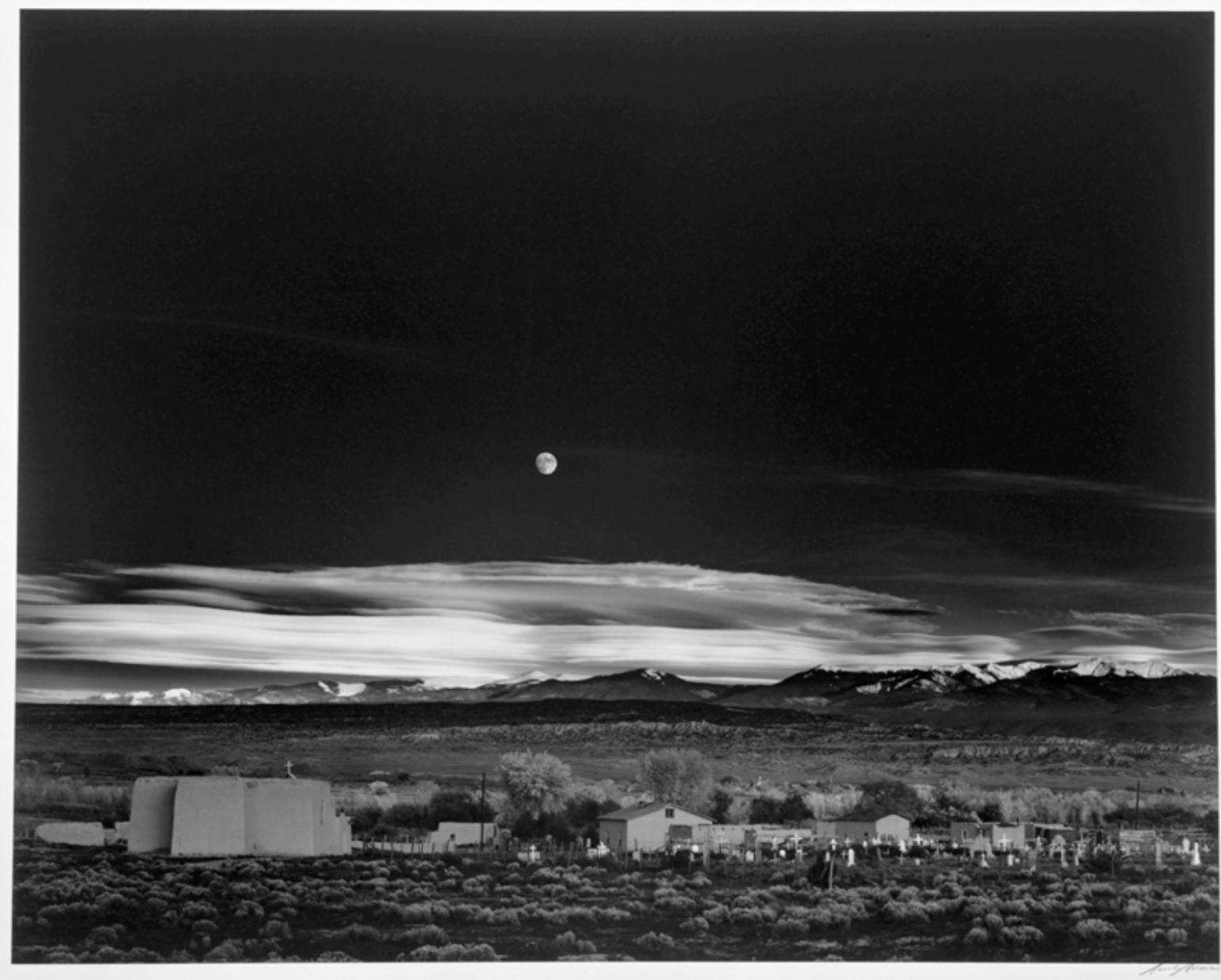
Edward Steichen. The Pond - Moonlight. 1904

DAY 319, SURVEY W-F

U.S. Geological Survey



U.S. Geological Survey and NASA, Surveyor III. *Surface of the Moon, Day 319, W-F. 1967.* Cut and stapled gelatin silver prints with ink and gouache on diazotype, 14 1/2 x 30 3/8" (36.9 x 77.1 cm). John Parkinson III Fund



Moonrise, Hernandez. Ansel Adams. 1975.

TRAPPIST-1 System

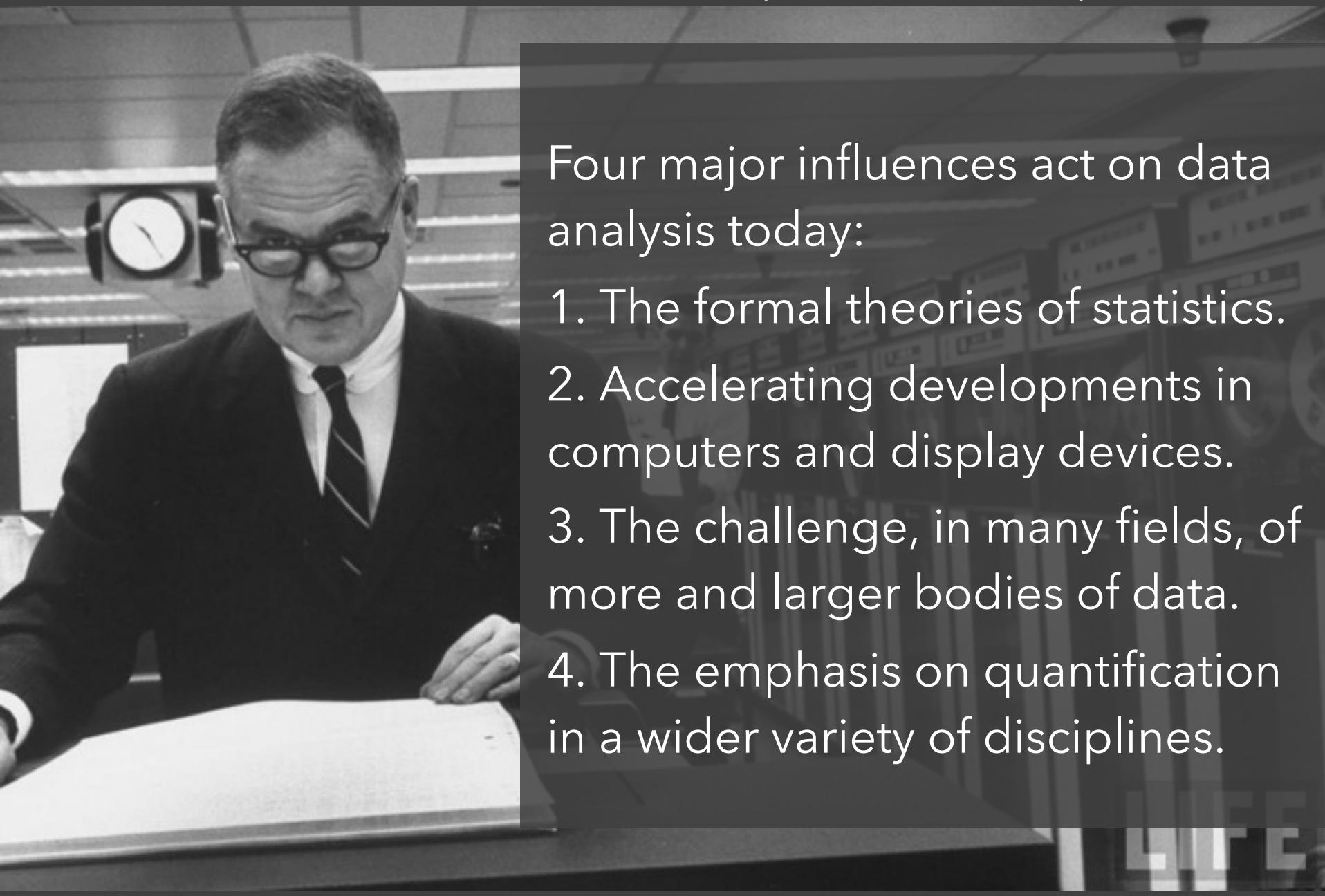


Illustration

NASA/JPL-Caltech

An artist's illustration of what TRAPPIST-1's seven planets might look like.

TRAPPIST-1. NASA. 2017.



Four major influences act on data analysis today:

1. The formal theories of statistics.
2. Accelerating developments in computers and display devices.
3. The challenge, in many fields, of more and larger bodies of data.
4. The emphasis on quantification in a wider variety of disciplines.

Visual Language is a Sign System



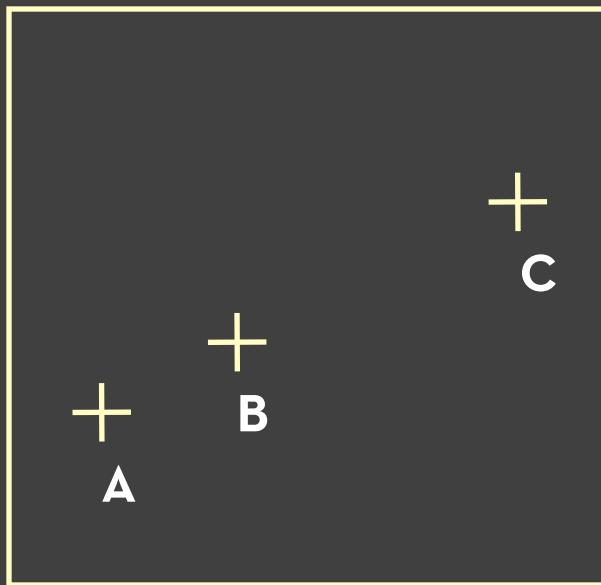
Jacques Bertin

Images perceived as a set of signs
Sender encodes information in signs
Receiver decodes information from signs

Sémiologie Graphique, 1967

Jacques Bertin (27 July 1918 – 3 May 2010[1]) was a French cartographer and theorist, known from his book *Semiologie Graphique* (*Semiology of Graphics*), published in 1967. This monumental work, based on his experience as a cartographer and geographer, represents the first and widest intent to provide a theoretical foundation to Information Visualization.[2] (Wikipedia).

Bertin's Semiology of Graphics



1. A, B, C are distinguishable
 2. B is between A and C.
 3. BC is twice as long as AB.
- ∴ Encode quantitative variables

"Resemblance, order and proportion are the three signfields in graphics." - Bertin

LES VARIABLES DE L'IMAGE

	POINTS	LIGNES	ZONES
XY 2 DIMENSIONS DU PLAN	x x x	1 2 3	15 9 14 1 16 21 14 15 16 1 1 2 18 2 1 15 1 1 2 9
Z TAILLE	— — —	— 1 2	— — —
VALEUR	— — —	— 1 2	— — —

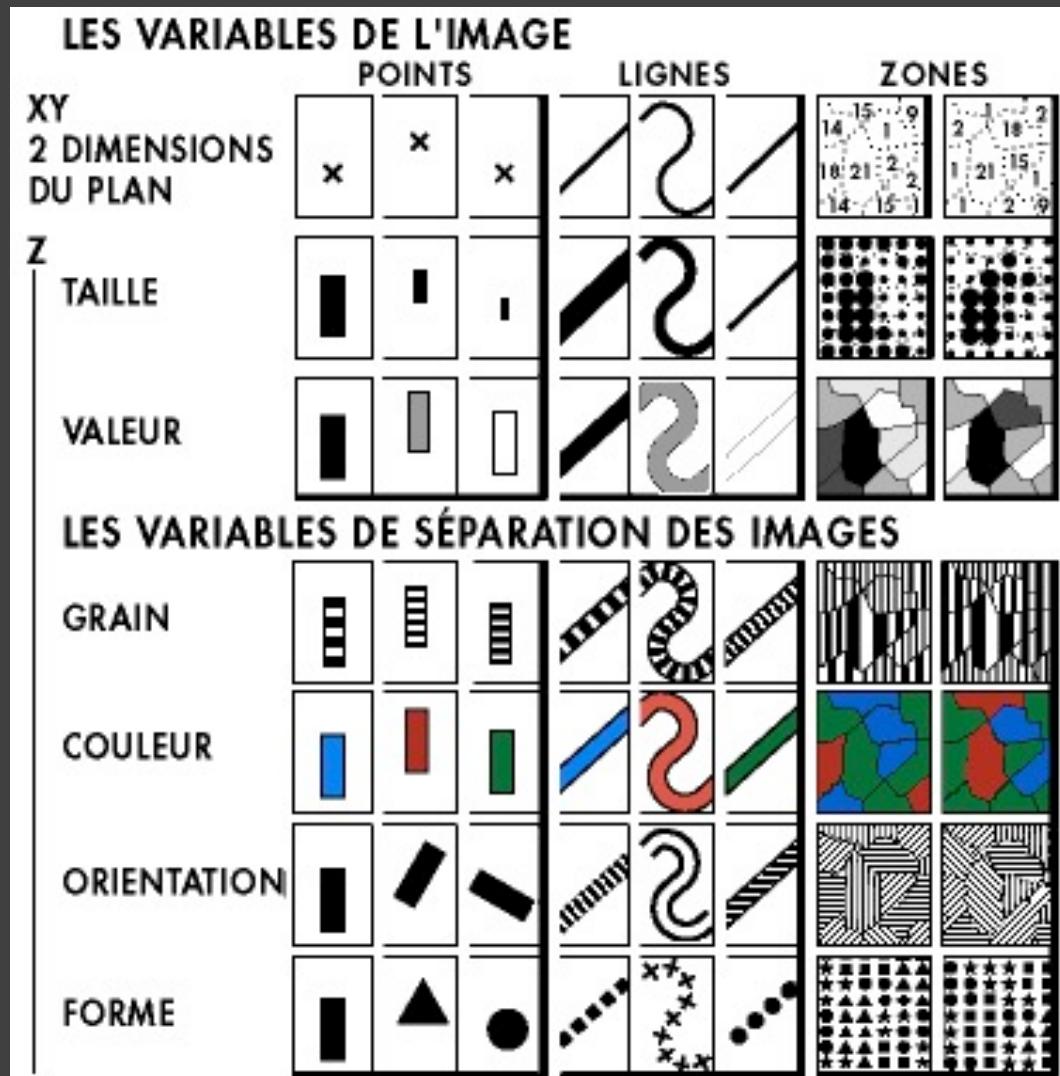
LES VARIABLES DE SÉPARATION DES IMAGES

GRAIN	— — —	— — —	— — —	— — —	— — —	— — —	— — —
COULEUR	— — —	— — —	— — —	— — —	— — —	— — —	— — —
ORIENTATION	— — —	— — —	— — —	— — —	— — —	— — —	— — —
FORME	— — —	— — —	— — —	— — —	— — —	— — —	— — —

Visual Encoding Variables

Position
Length
Area
Volume
Value
Texture
Color
Orientation
Shape
Transparency
Blur / Focus ...

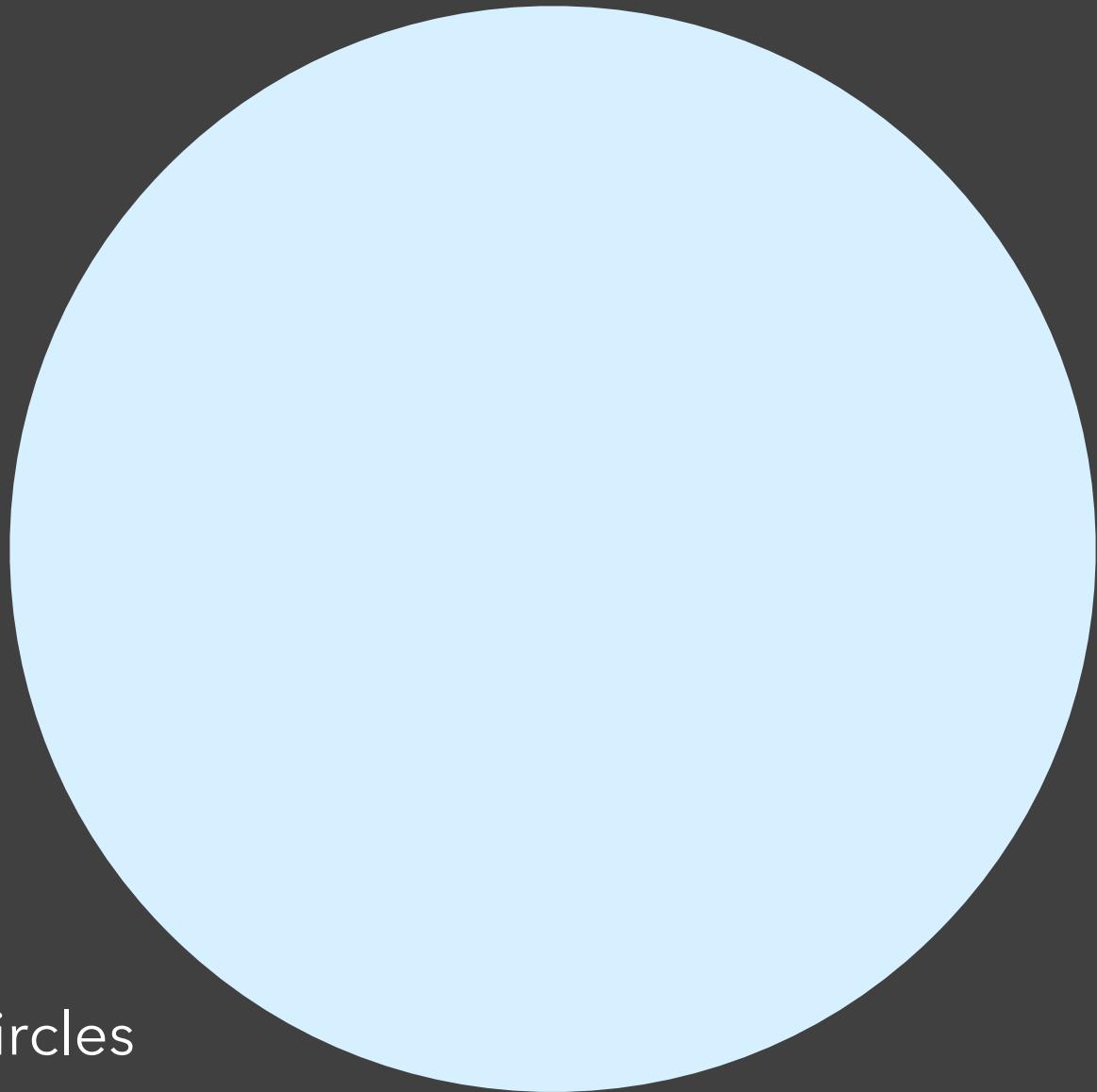
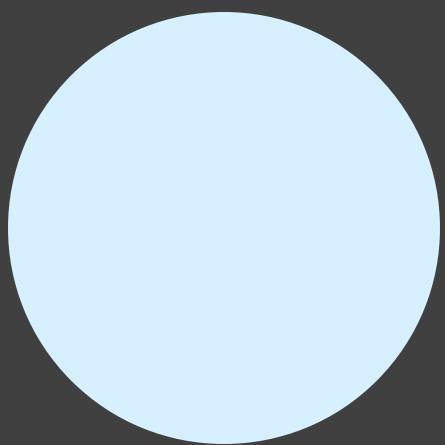
		LES VARIABLES DE L'IMAGE			
		POINTS	LIGNES	ZONES	
XY 2 DIMENSIONS DU PLAN	Z	x	x	x	
	TAILLE	-	-	-	
	VALEUR	-	-	-	
		LES VARIABLES DE SÉPARATION DES IMAGES			
		GRAIN	LIGNES	ZONES	
		-	-	-	
		COULEUR	-	-	
		-	-	-	
		ORIENTATION	-	-	
		-	-	-	
		FORME	-	-	
		-	-	-	



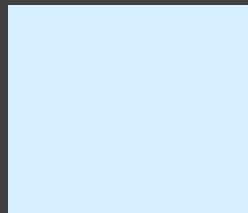
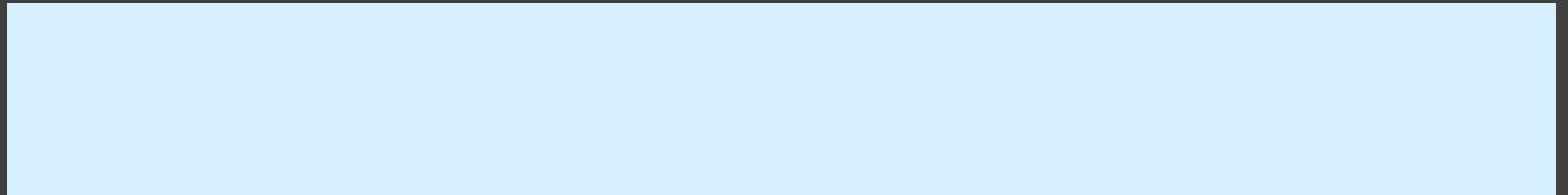
Design Principles *Translated*

Tell the truth and nothing but the truth
(don't lie, and don't lie by omission)

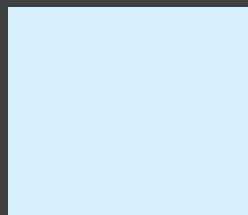
Use encodings that people decode better
(where better = faster and/or more accurate)



Compare area of circles



Compare length of bars



Compare length of bars

Relative Magnitude Estimation

Most accurate



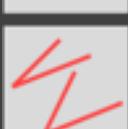
Position (common) scale



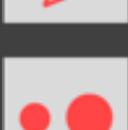
Position (non-aligned) scale



Length



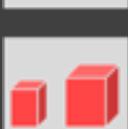
Slope



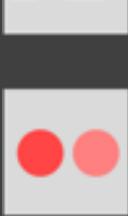
Angle



Area



Volume



Color hue-saturation-density

Least accurate

Our Focus: Visual Encoding

task
questions, goals
assumptions

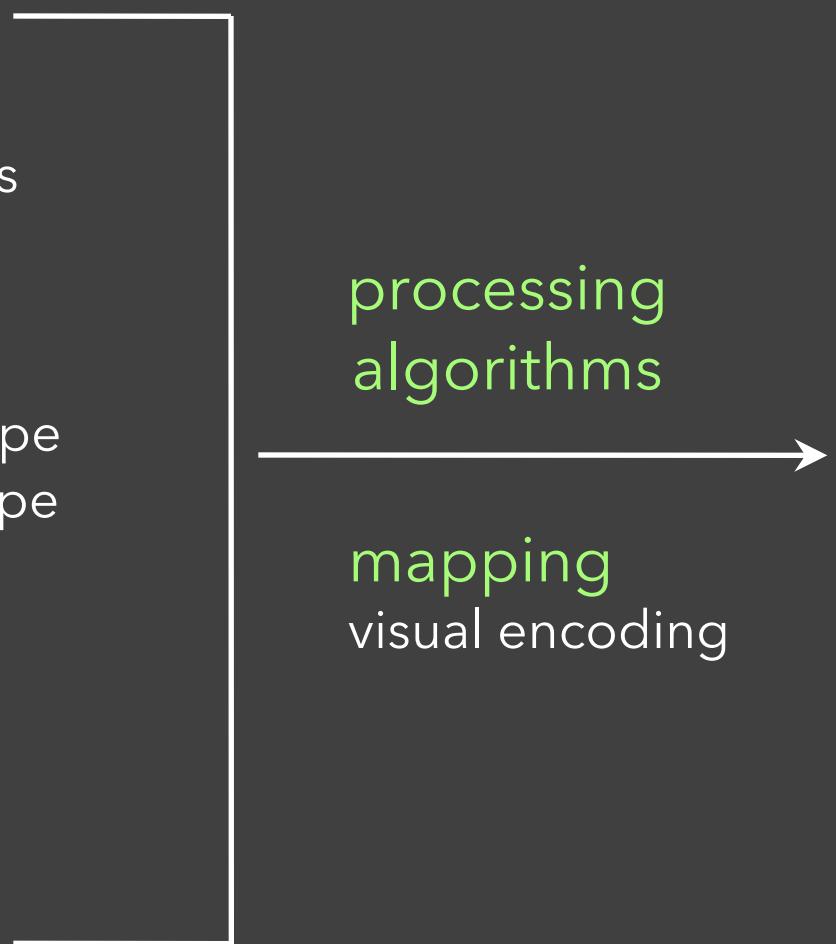
data
physical data type
abstract data type

domain
metadata
semantics
conventions

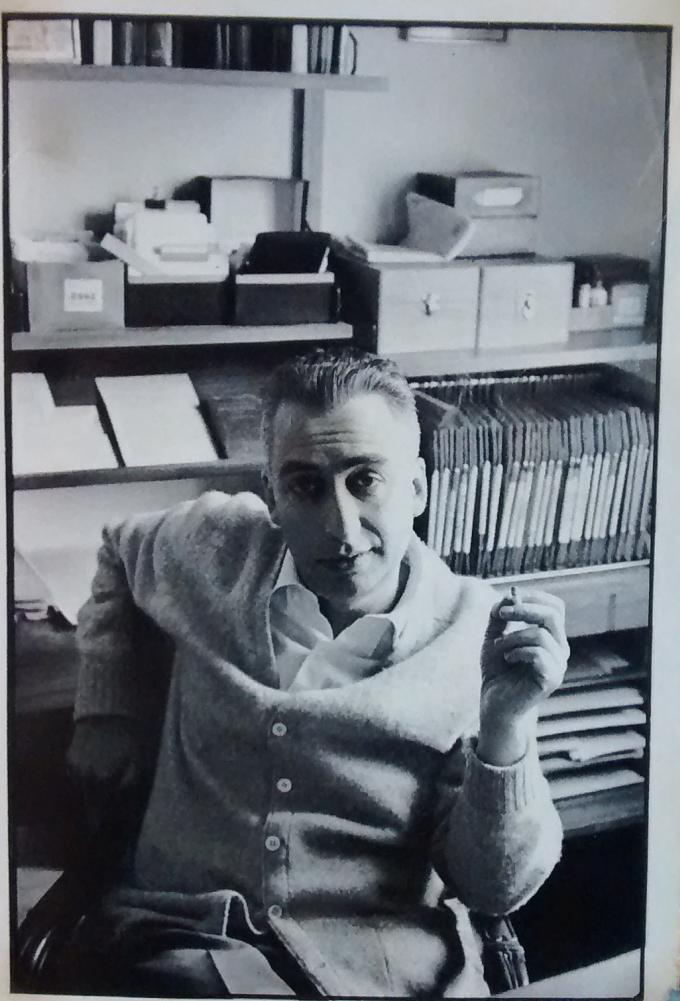
processing
algorithms

mapping
visual encoding

image
visual channel
graphical marks



Pablo Picasso, 1946



Roland Barthes, 1968

ROLAND BARTHES

Camera Lucida

Reflections on Photography



TRANSLATED BY RICHARD HOWARD



Roland Barthes

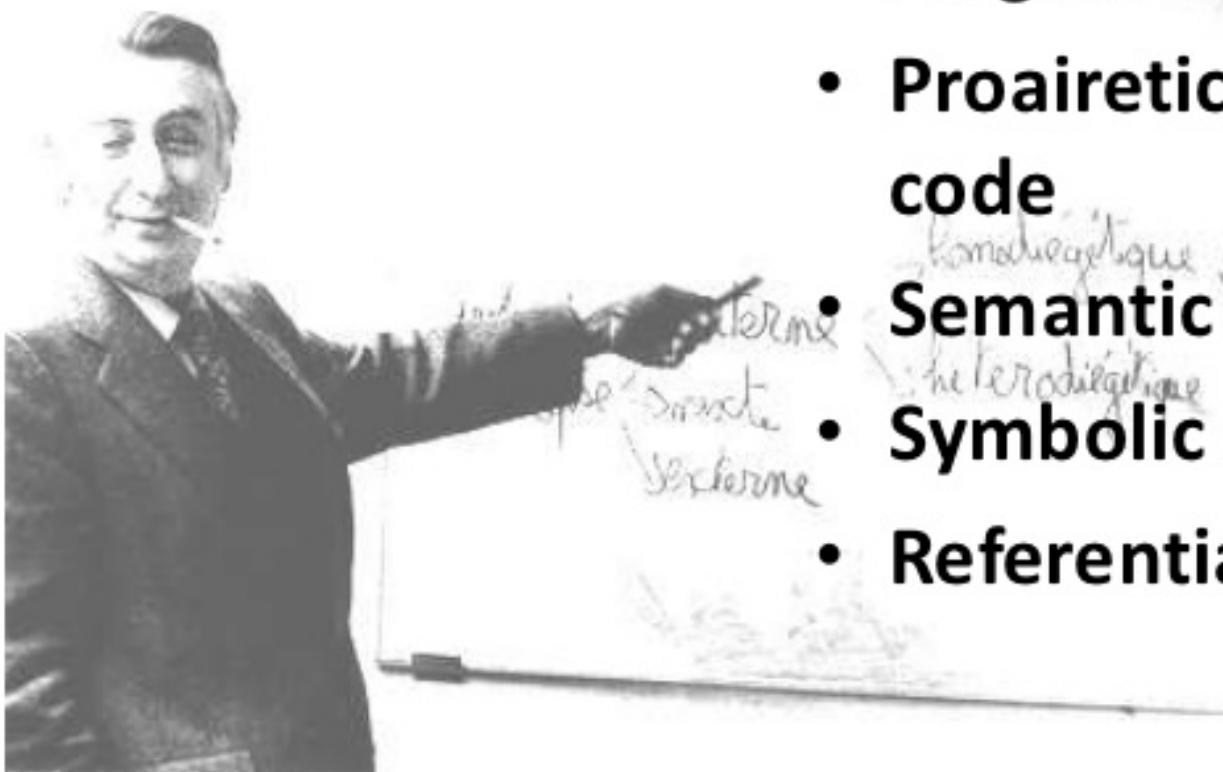
(Basic Info)



Roland Barthes was born on the 12th November 1915 and died at the age of 64 on the 25th March 1980. He was a French literary theorist, philosopher, critic, and semiotician (study of cultural signs and symbols). He explored a diverse range of fields and he influenced the development of schools.

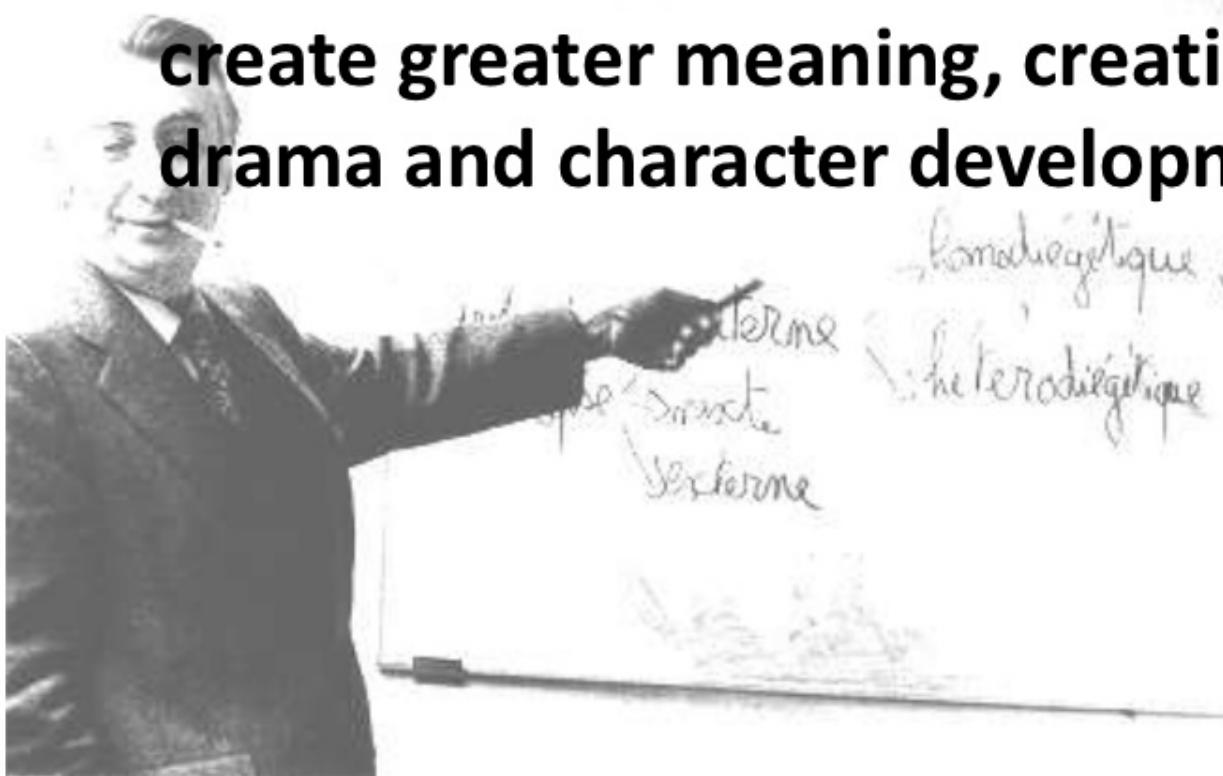
The 5 codes

- **Hermeneutic / Enigma code**
- **Proairetic/Action code**
- **Semantic code**
- **Symbolic code**
- **Referential code**



Symbolic code

- This code is about symbolism within the text.
- It exercises opposites to show contrast and create greater meaning, creating tension, drama and character development.



Barthes's theory (1980)



STUDIUM

- It makes a photograph interesting
- It is chosen by the photographer
- It is the same for all viewers
- Objective



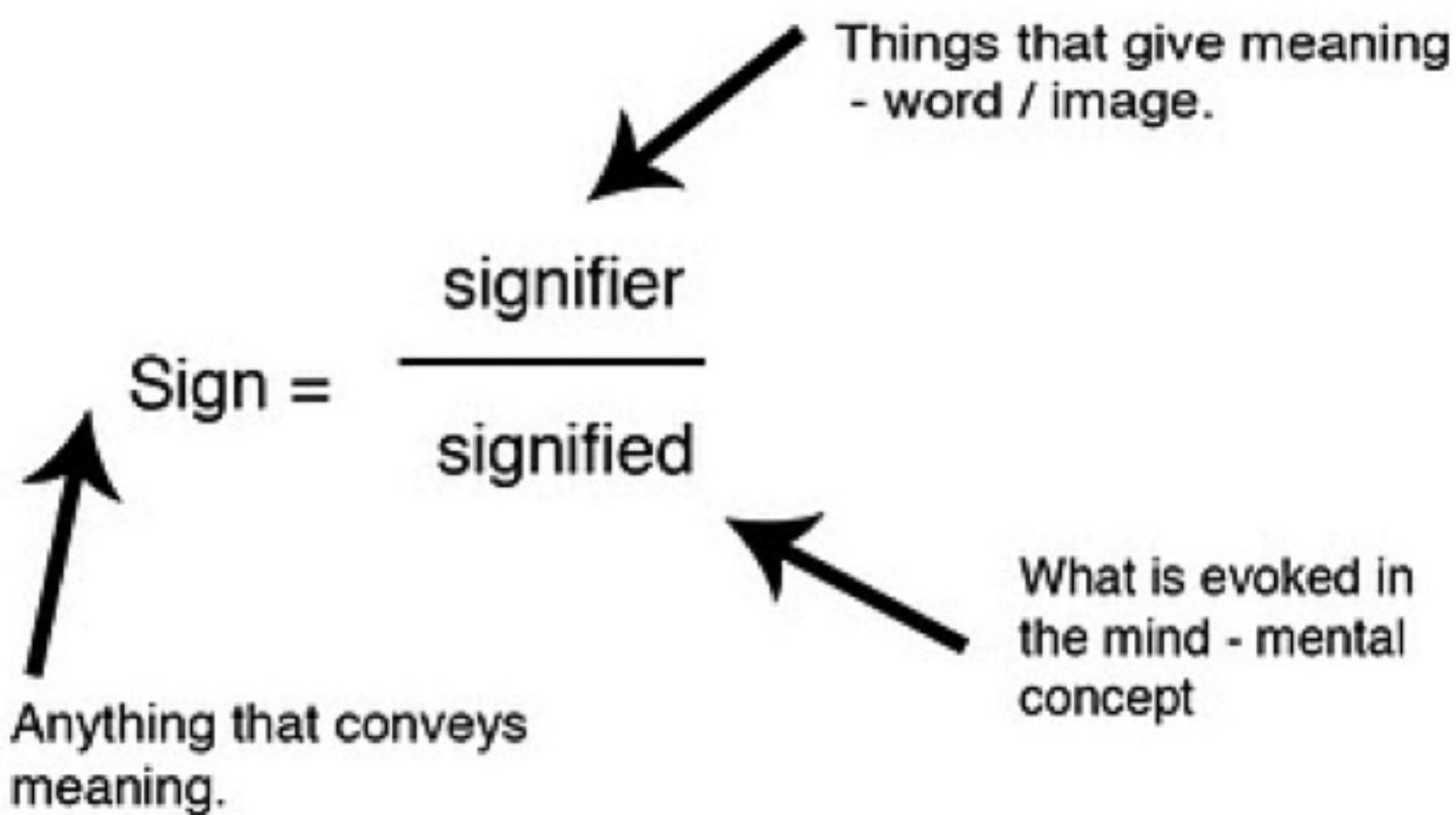
PUNCTUM

- Wound
- Beyond
photographer's
control
- Subjective

(Bordini, 2008)



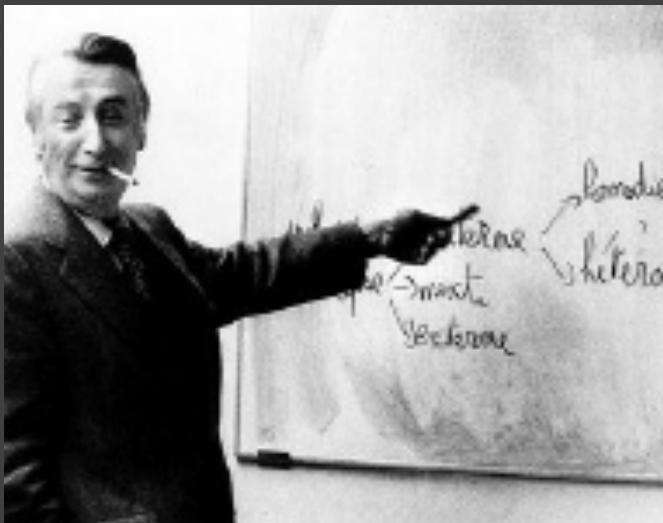
Bolivian army officers display the body of Che Guevara on October 9, 1967 - the day after he was executed. © Associated Press.



Visual Language is a Sign System



Jacques Bertin



So, choose them
carefully

