

CYBERWAR

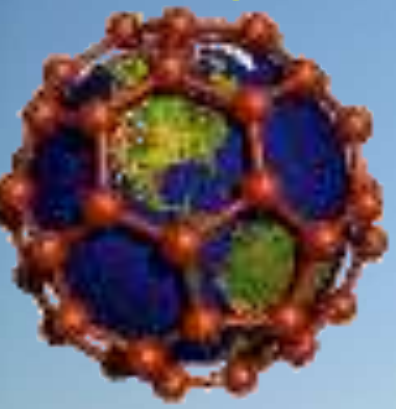
IV ENCONTRO DOS CLUBES DE ESTUDANTES DA AFCEA EM PORTUGAL

UNIVERSIDADE DA BEIRA INTERIOR
COVILHÃ, 31 DE MAIO DE 2019

STUDENT CLUBS:
COVILHÃ
ALMADA
PORTO

F. Carvalho Rodrigues
UBI, 31 May 2019

CYBERWAR: MESSING YOU UP





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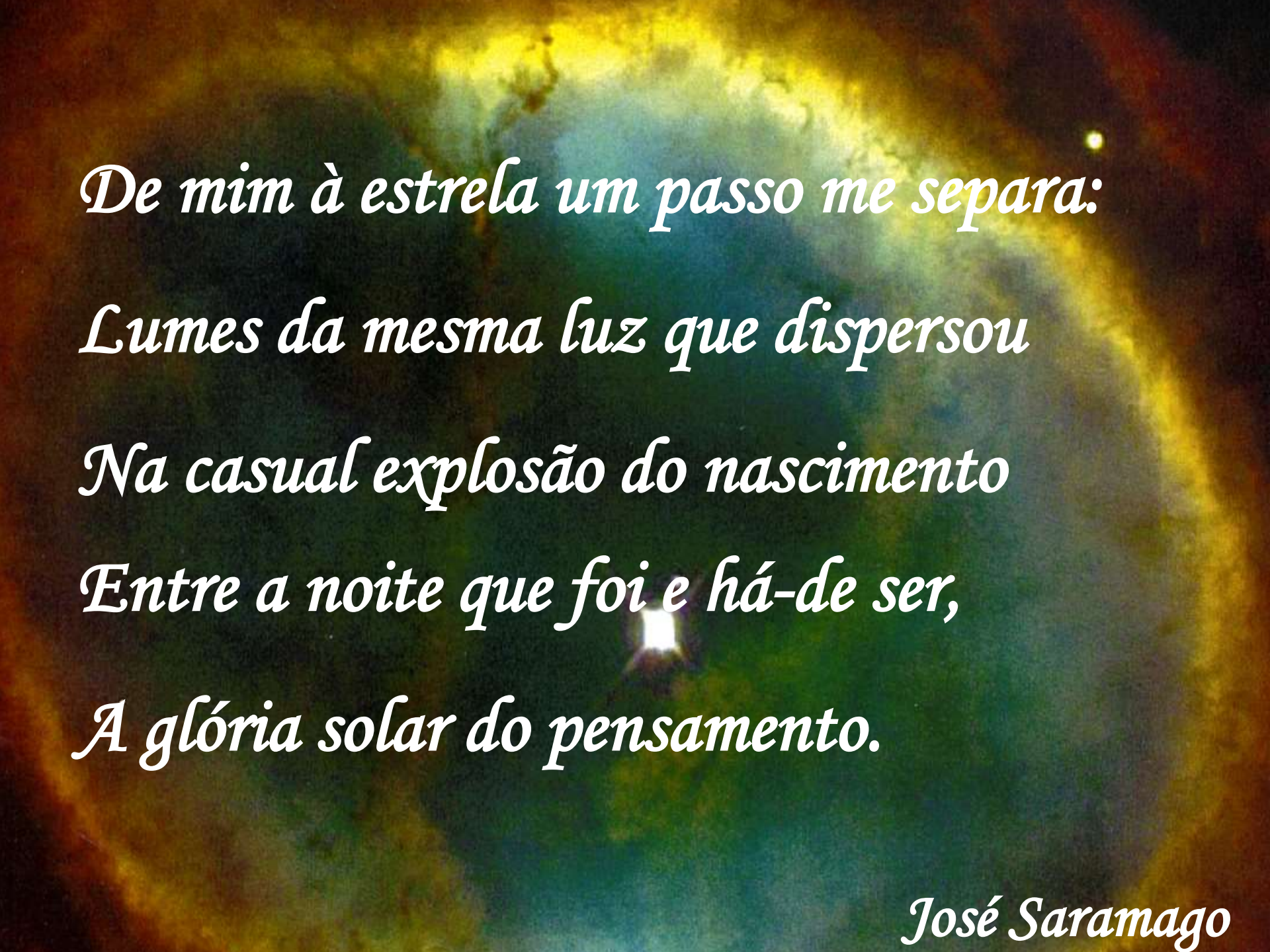
De mim à estrela um passo me separa:
Lumes da mesma luz que dispersou
Na casual explosão do nascimento
Entre a noite que foi e há-de ser,
A glória solar do pensamento.
José Saramago

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Prince Pyotr Kropotkin 1902

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Peter Kropotkin's

MUTUAL AID

A Factor of Evolution



with an Introductory Essay

MUTUAL AID & SOCIAL EVOLUTION

by John Hewetson



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IT IS NOT LOVE, NOT EVEN SYMPATHY, WHAT INDUCES A HERD OF RUMINANTS OR A DROVE, A STIRNG OF HORSES TO FORM AROUND A RING TO FACE OFF AN ATTACK OF WOLVES

IT IS NOT LOVE THAT MAKES WOLVES TO ORGANIZE A PACK TO HUNT.
IT IS NOT LOVE THAT INDUCES KITTEN OR LAMBS TO PLAY TOGETHER OR A DOZEN OF SPECIES OF BIRDS TO FLOCK TO SPEND DAYS OR NIGHTS TOGETHER IN THE AUTUMN.

IT IS A FEELING INFINITELLY MORE AMPLE THAN LOVE OR PERSONAL SYMPATHY

IT IS AN INSTTINCT THAT SLOWLY, SLOWLY DEVELLOPED AMONGST ANIMALS AND HUMANS IN THE COURSE OF A SLOW AND HUGE EVOLUTION THAT TAUGHT ANIMALS AND HUMANS THE STRENGTH
THAT THE PRACTICE OF HELP AND MUTUAL SUPPORT BRING
AND THE IMENSE JOY THAT COMES FROM THEIR PRACTICE

MUTUAL AID

Principe Pyotr Alexeyevich Kropotkin

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COOPERATION

IS

THE MOST ADVANCED METHOD OF EVOLUTION

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Sillicium Being

Evolved like the Carbon beings:

Gains,

- **The most fit**
- **The most cooperative:**

1. **Increasing complexity,**
2. **Mantaining simplicity of data**

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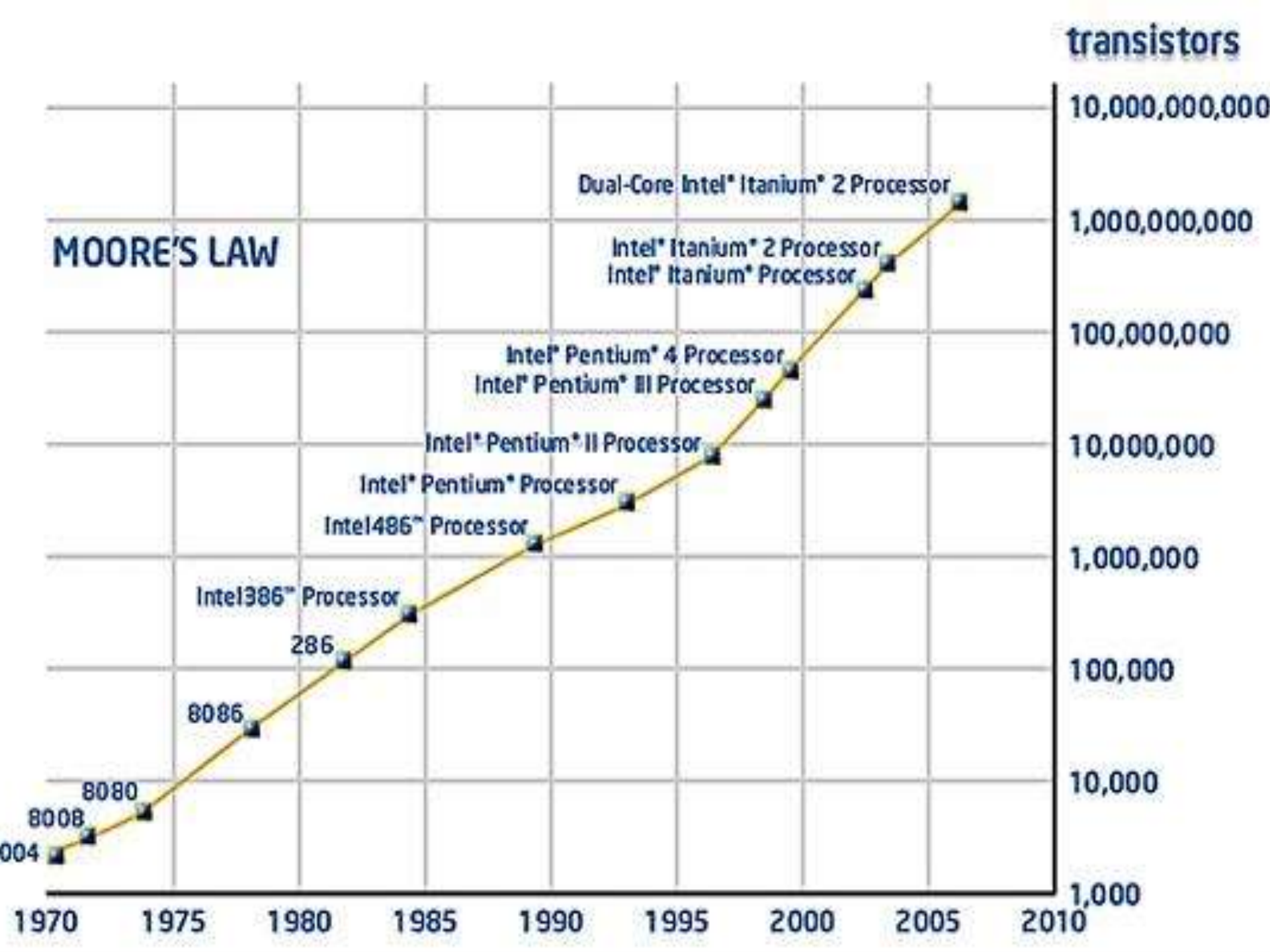
transistors
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Intel® Itanium® 2 Processor
Intel® Itanium® Processor
Intel® Pentium® 4 Processor
Intel® Pentium® III Processor
Intel® Pentium® II Processor
Intel® Pentium® Processor
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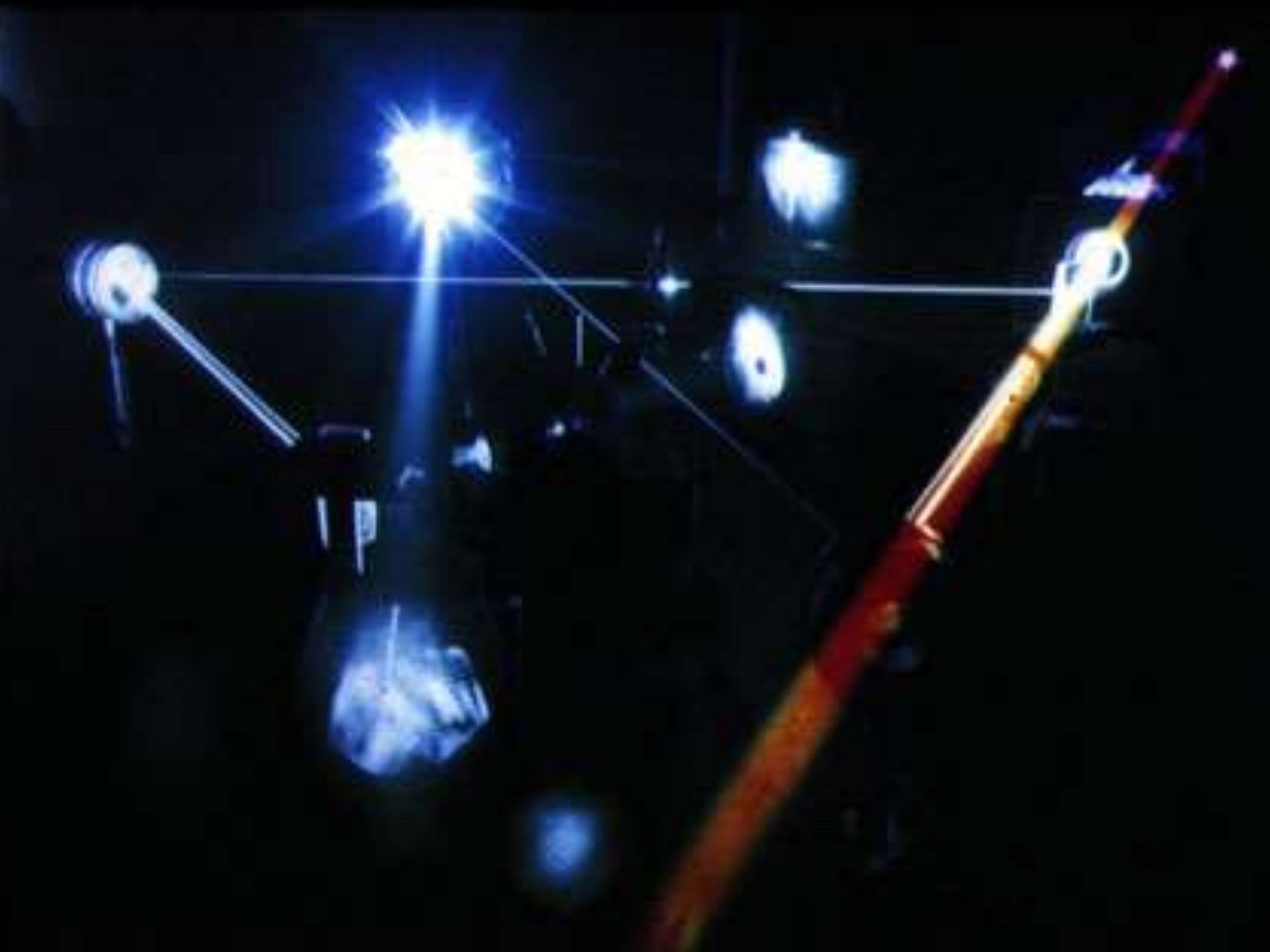

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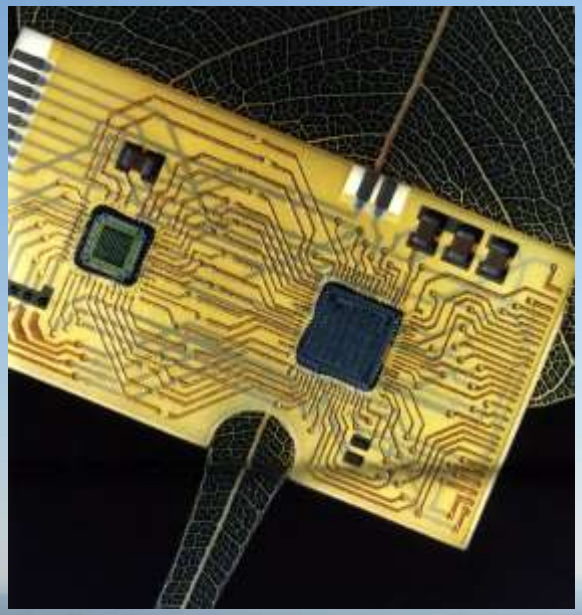

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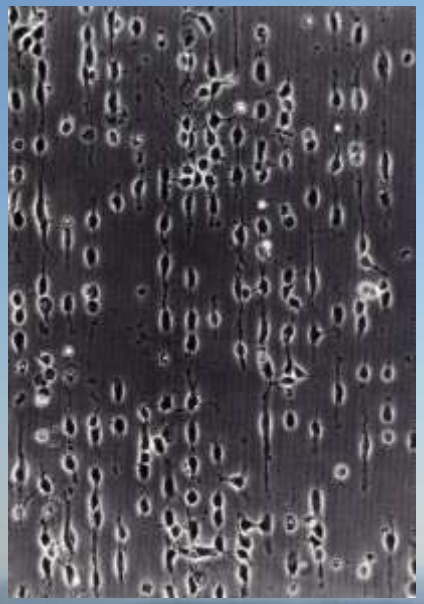

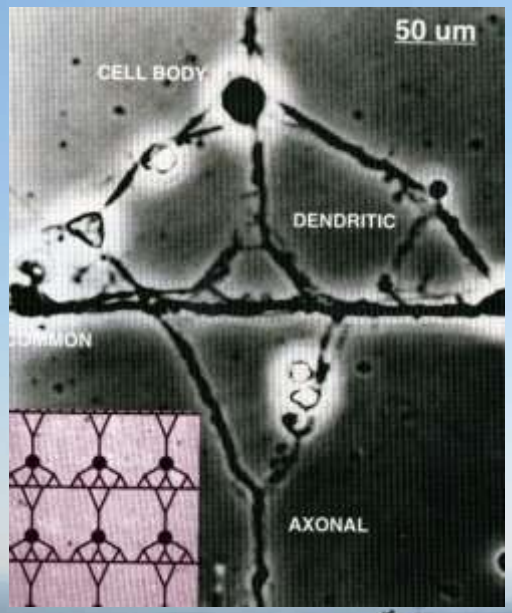

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BORN

U

MANUFACTURED

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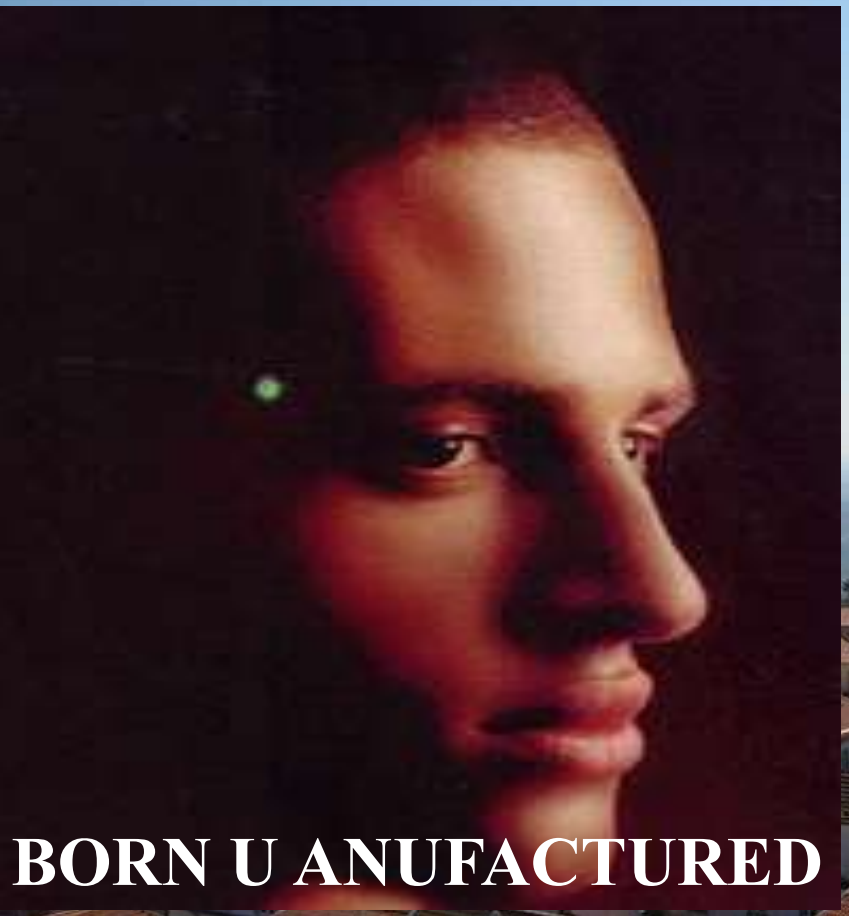
REPRESENTATIONS OF REALITY



BORN U ANUFACTURED

GESTURE
SPEECH
DRAWING
MATHEMATICS

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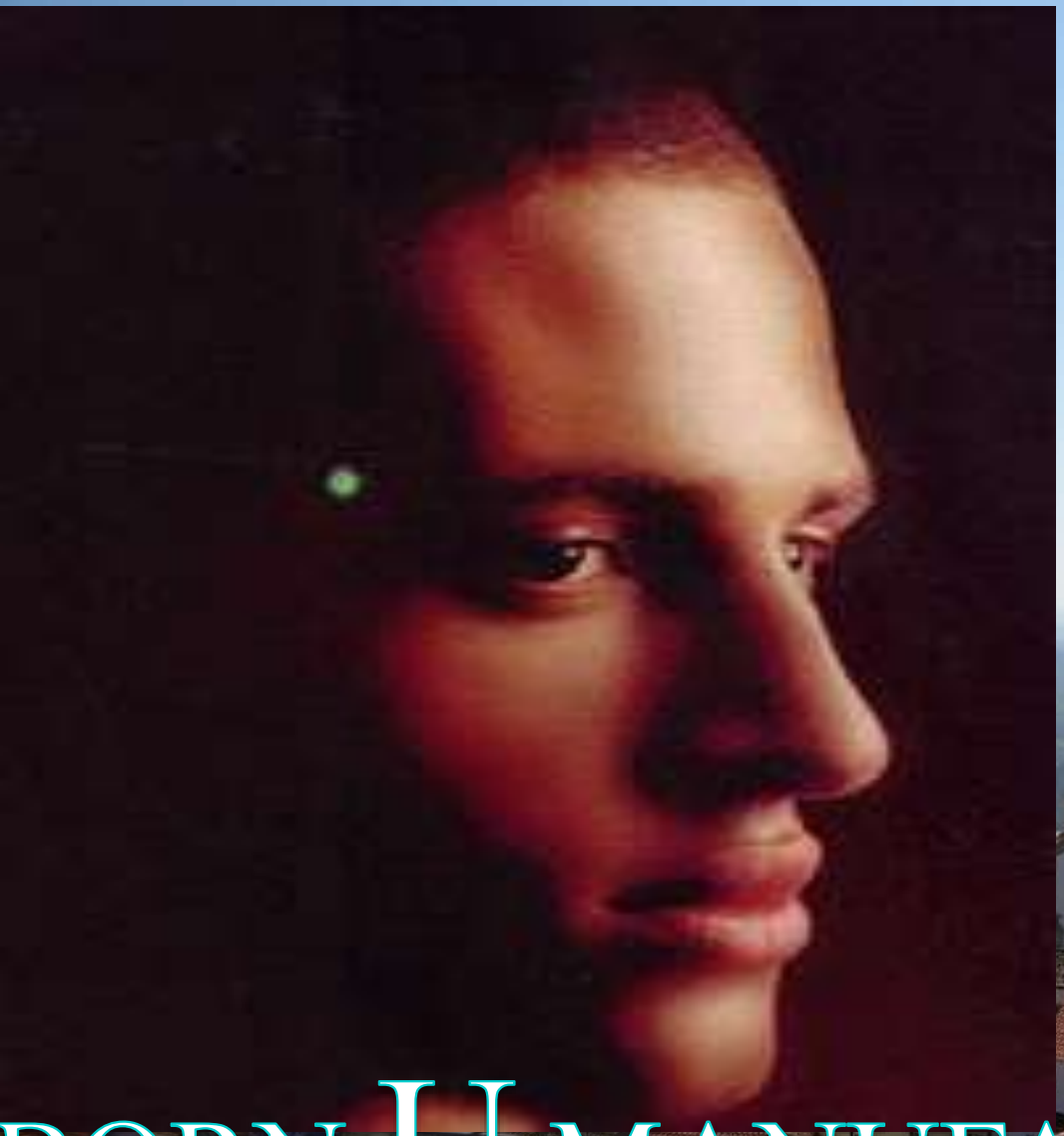

9×10^9 BORN

$1{,}5 \times 10^{18}$ MANUFACTURED

BORN U MANUFACTURED

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Each time, we Human(*BORN*)
Learn on how to mange other Humans(*Born*)



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We transfer
that knowledge to non humans (*manufactured*),



and we give them (*manufactured*)
more and more operational prerogatives

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What is being learned by non humans (*manufactured*)

Is readily transfered to them (*manufactured*) to allow

Humans (born) the atribution of new tasks



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NonHuman(*manufactured*) proliferate

and constitute the fabric upon which New Societies (born U manufactured) are emerging

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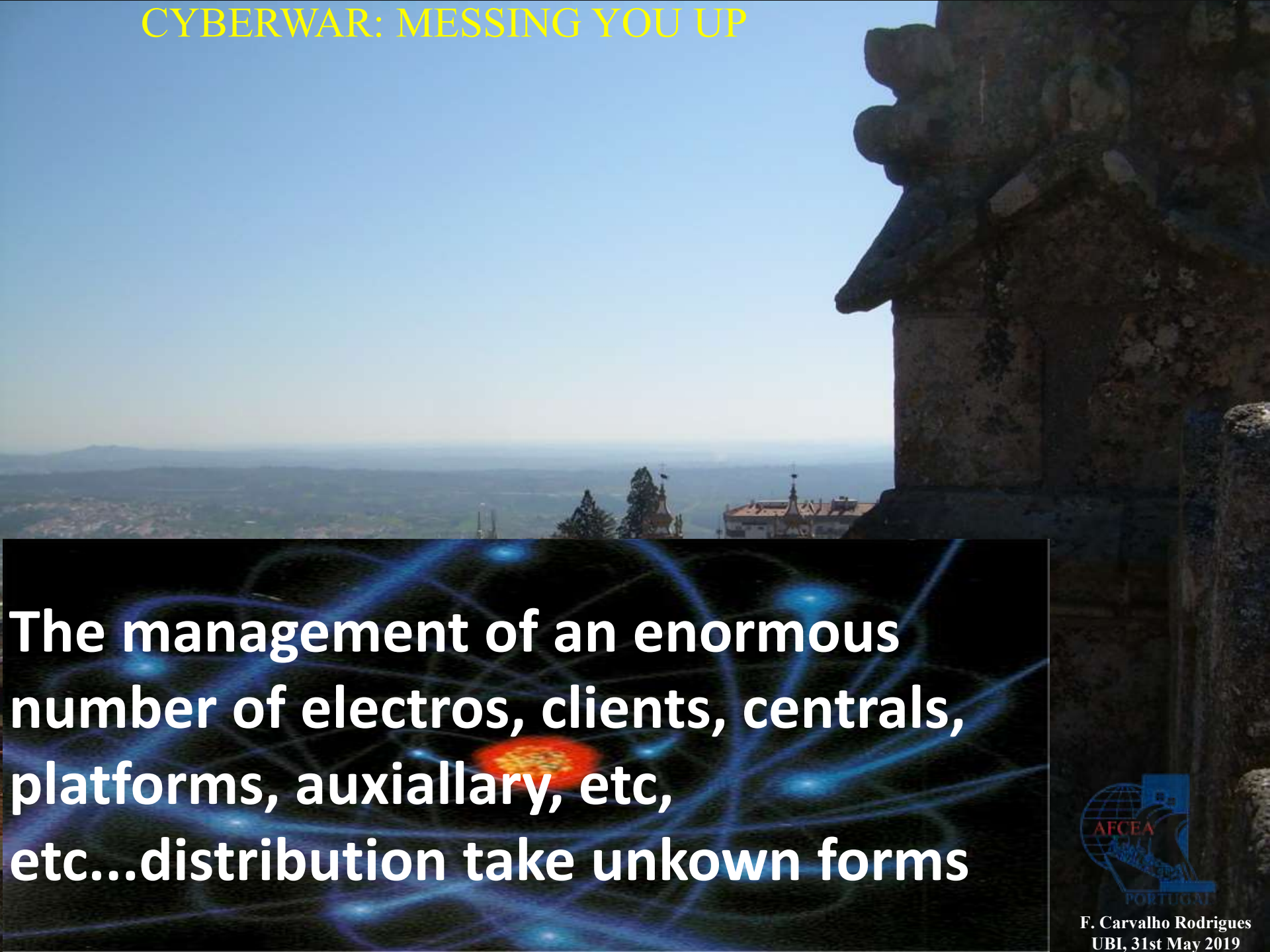

The management of an enormous number of electros, clients, centrals, platforms, auxiallary, etc, etc...distribution take unkown forms

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A new Society exists and it is ever changing;



But it is not socially constructed.

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Born and manufactured

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COOPERATION IS THE MOST ADVANCED METHOD OF EVOLUTION

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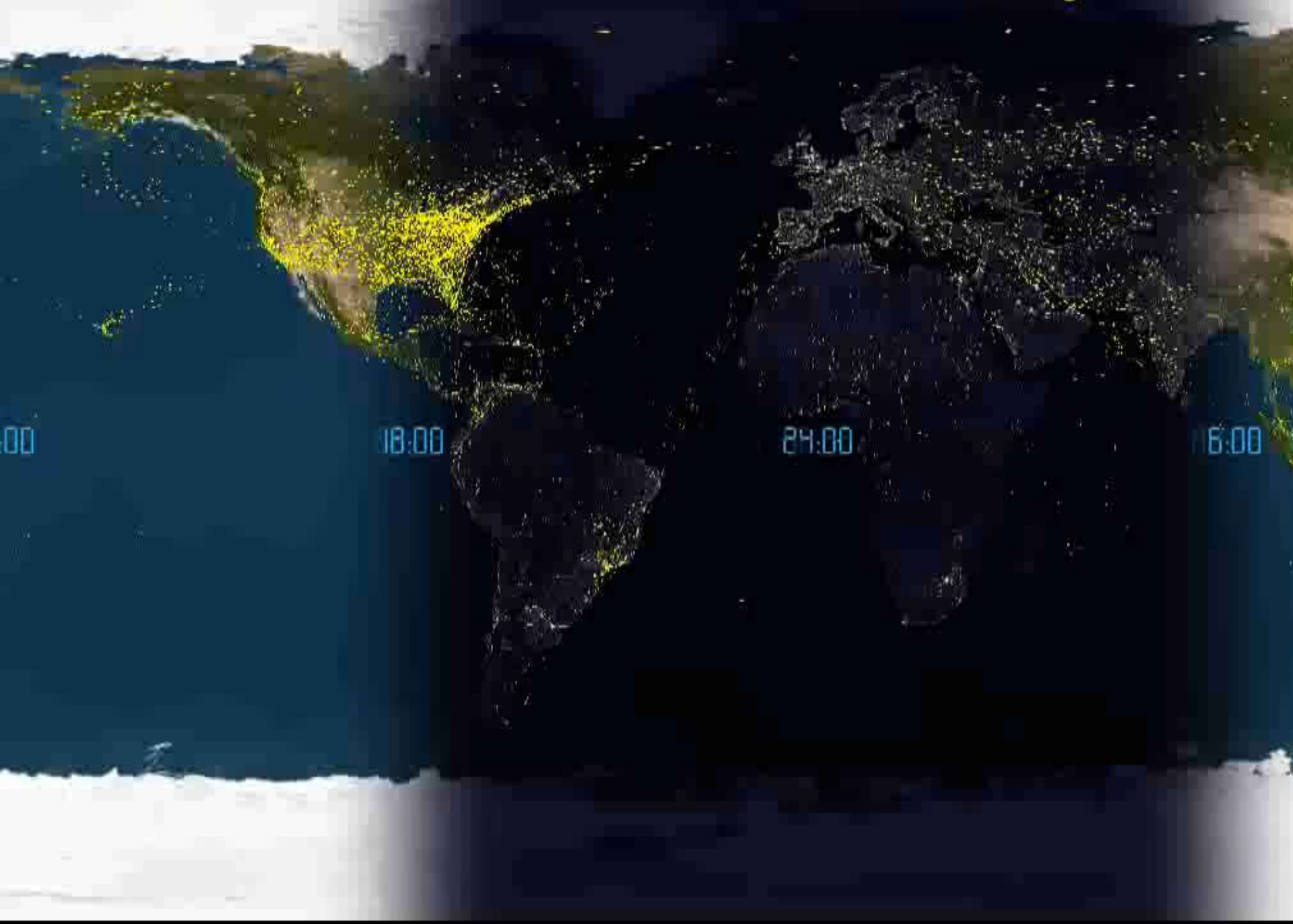
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COOPERATION IS THE ENGINE OF COMPLEXITY

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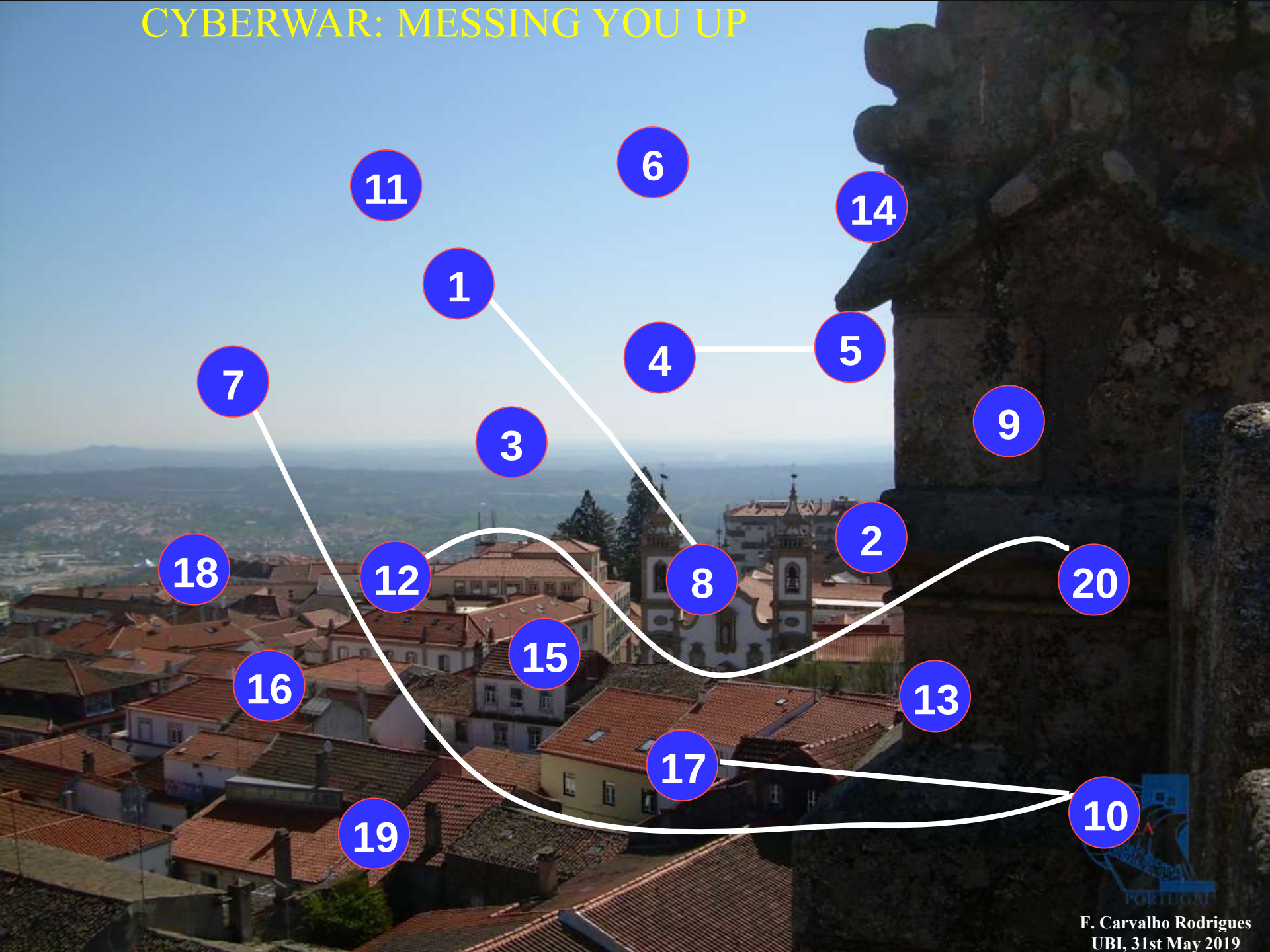

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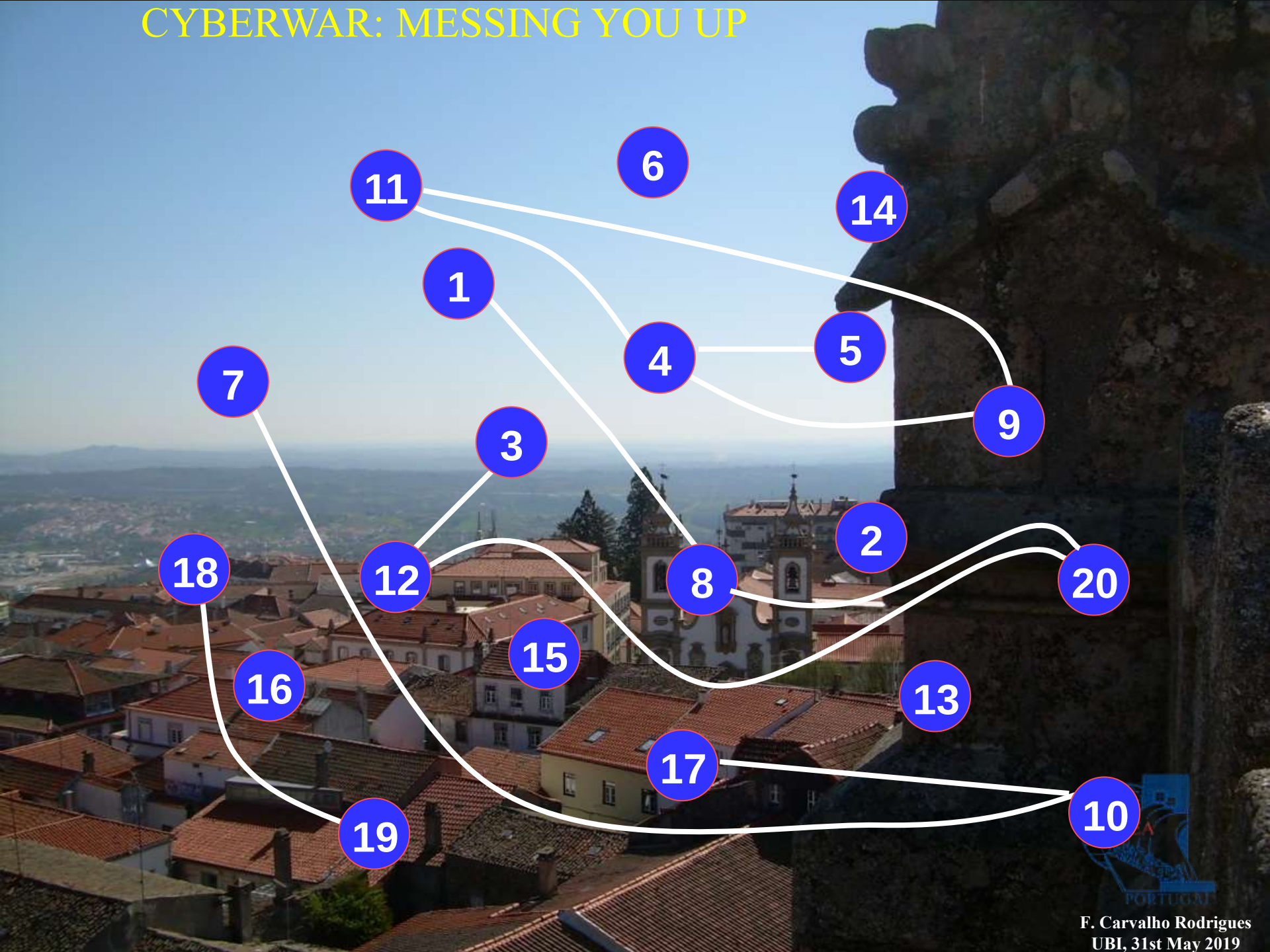

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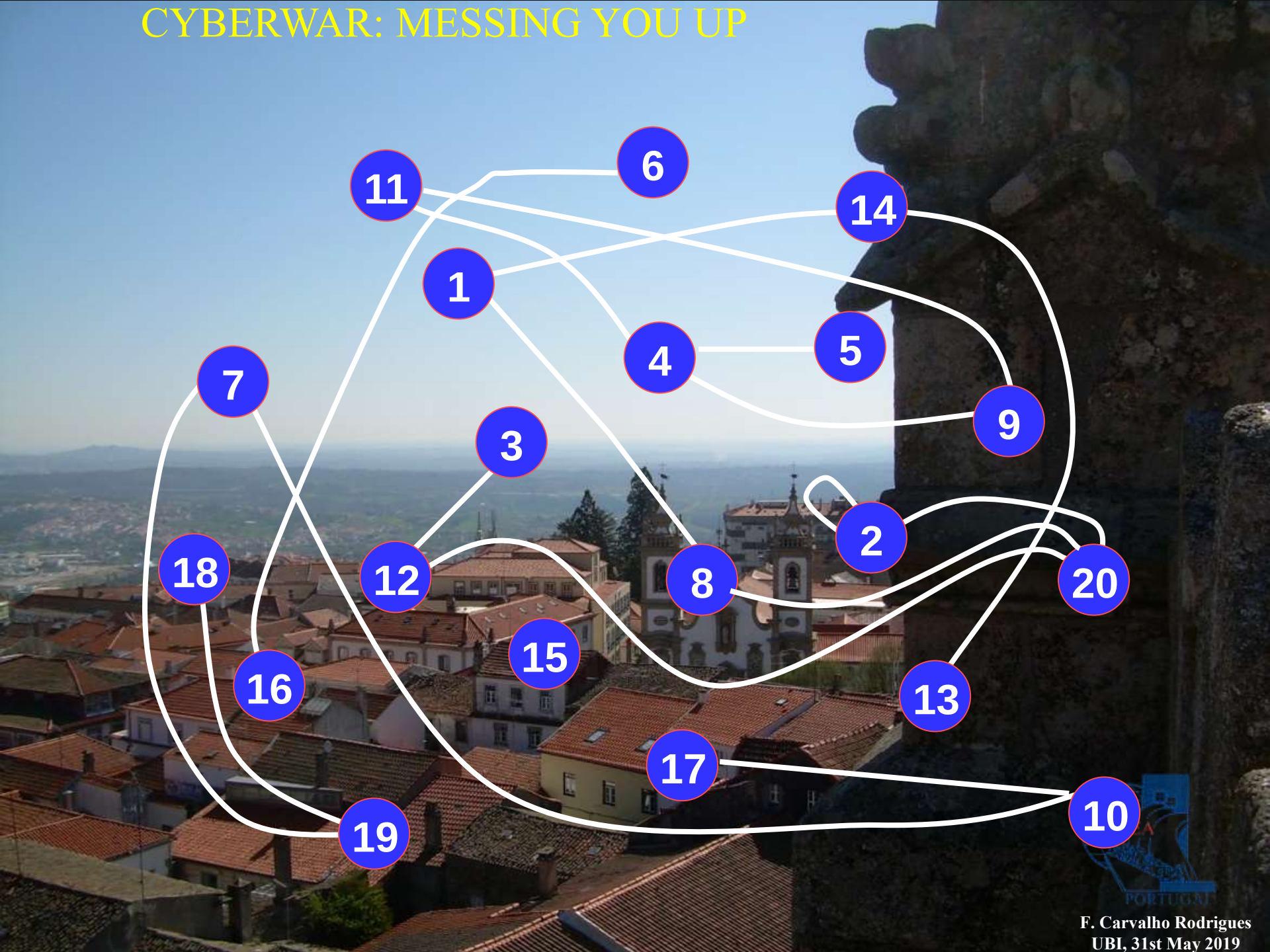

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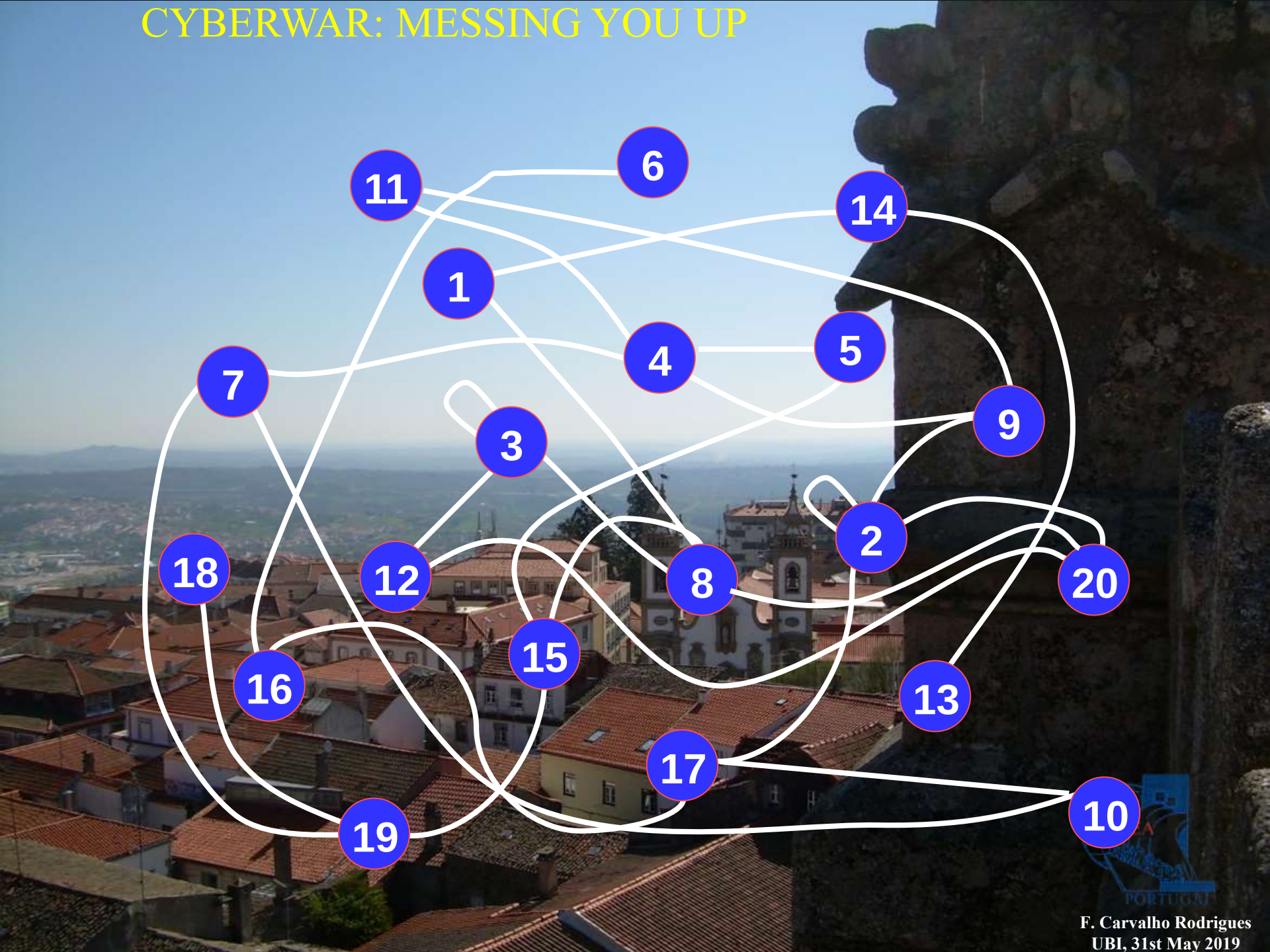

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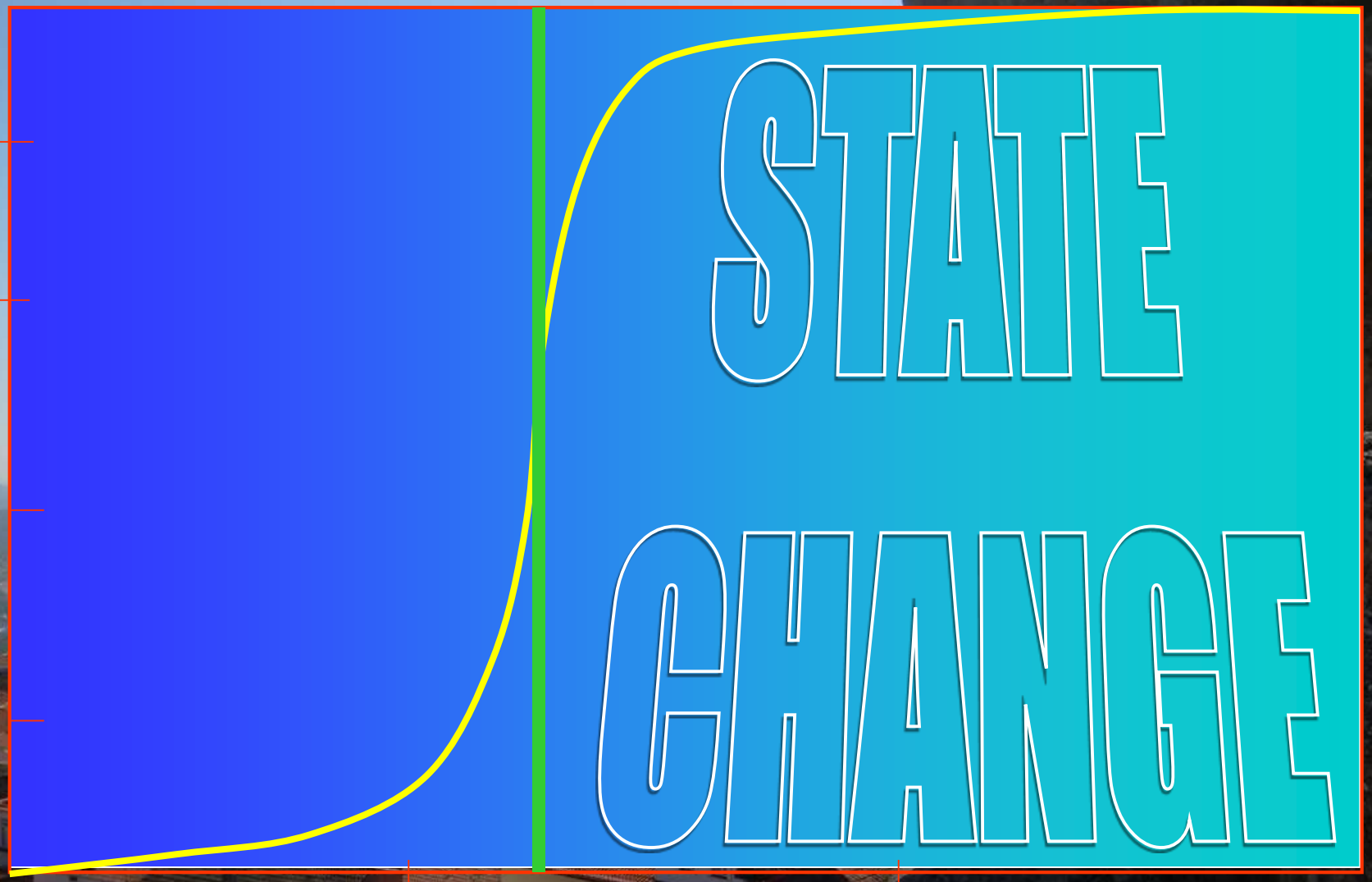

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THE NEW STATE

IN ITS LIMITS IS EITHER

ORGANIC AND FUNTIONAL

OR

CAHOTIC

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p. 460. Henderson cites F. Y. Edgeworth, *Mathematical Physics*, London: Kegan Paul, 1881, p. 117 as an early source.

THE "SINGLENESS OF THE SUPERLATIVE"



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$$r \times f = C$$

HUMAN BEHAVIOR

AND

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An Introduction to Human Ecology

by

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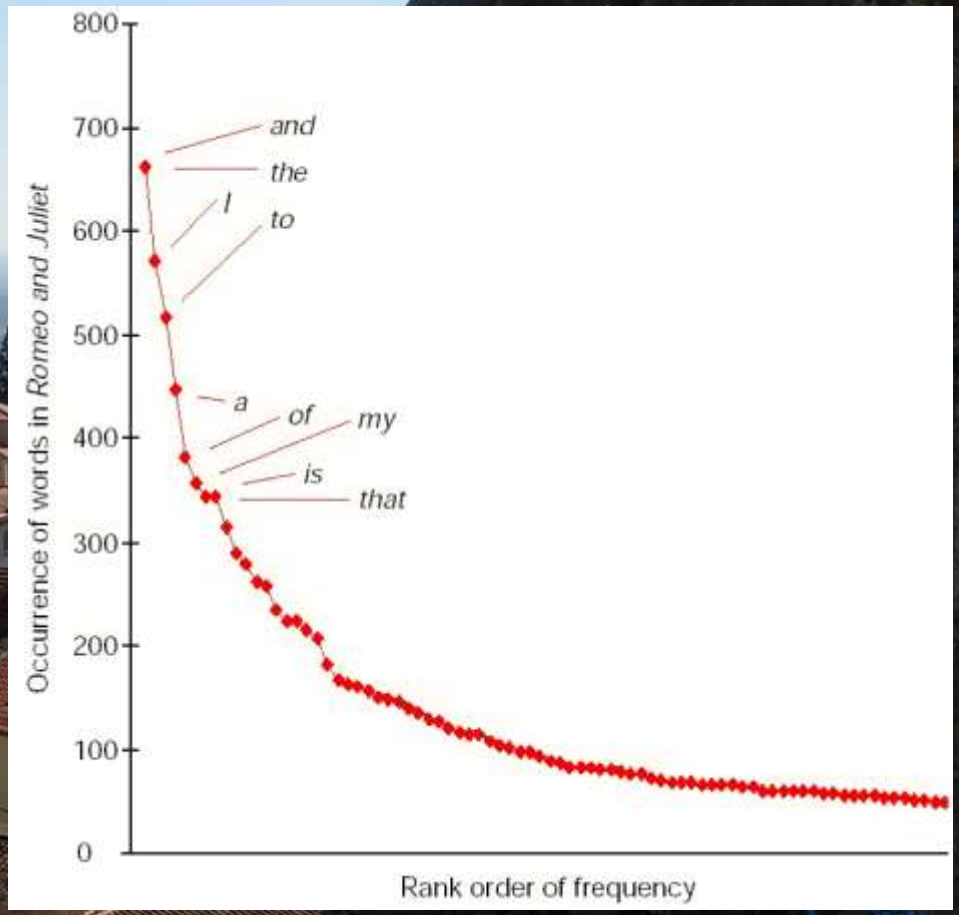
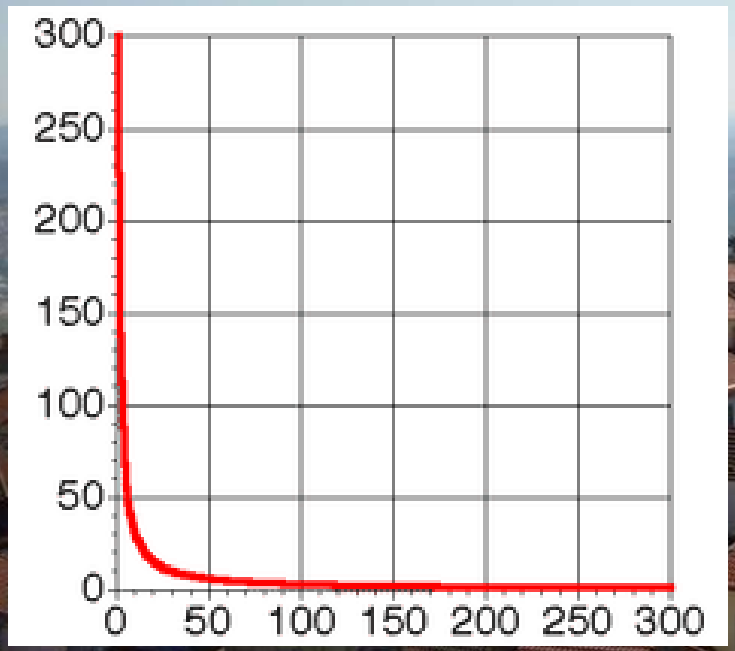
Zipf Distribution

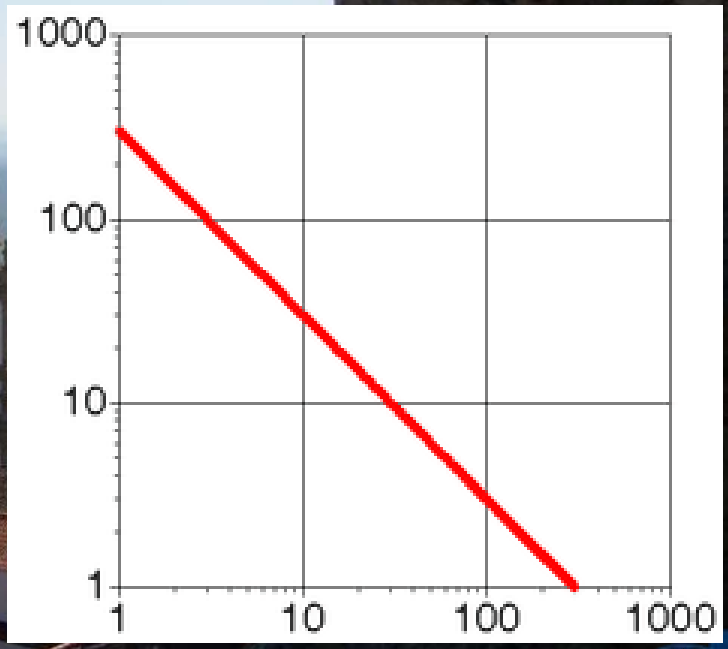
The product of the frequency of words (f) and their rank (r) is approximately constant

Rank = order of words' frequency of occurrence



Zipf Distribution
(Same curve on linear and log scale)





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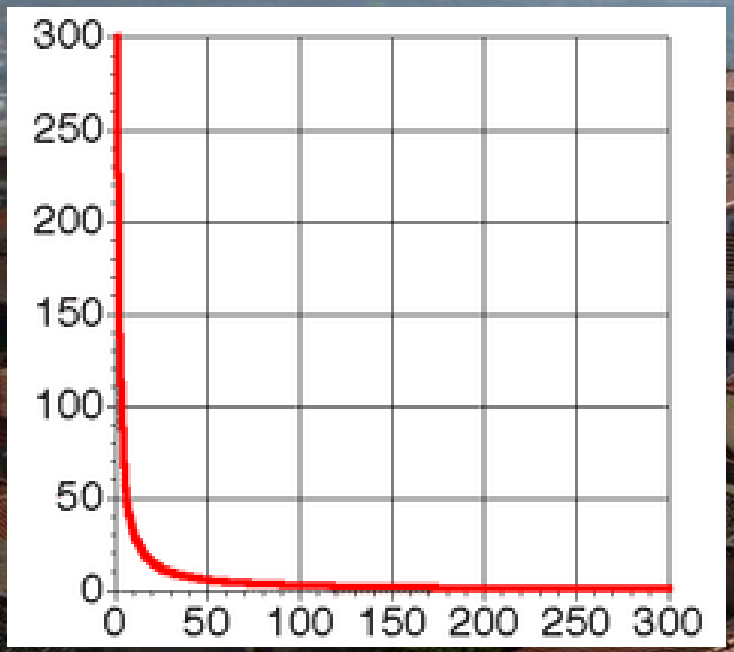
(Boltzmann - Zipf – Pareto)

(Atomic Energy Levels – Words in a Text- Property)

(the same distribution)



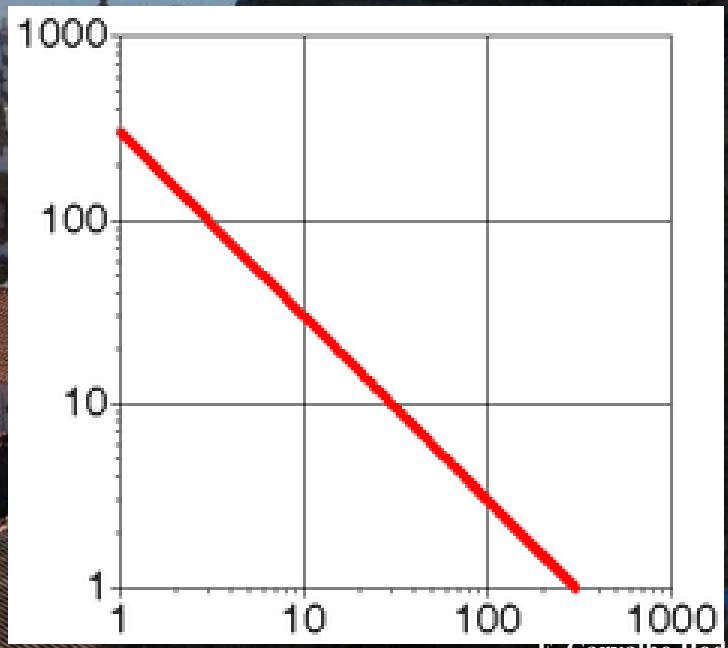


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TABLE 2–1

Arbitrary Ranks with Frequencies in James Joyce's *Ulysses* (Hanley Index)

I Rank (r)	II Frequency (f)	III Product of I and II ($r \times f = C$)	IV Theoretical Length of Ulysses ($C \times 10$)
10	2,653	26,530	265,500
20	1,311	26,220	262,200
30	926	27,780	277,800
40	717	28,680	286,800
50	556	27,800	278,800
100	265	26,500	265,000
200	133	26,600	266,000
300	84	25,200	252,000
400	62	24,800	248,000
500	50	25,000	250,000
1,000	26	26,000	260,000
2,000	12	24,000	240,000
3,000	8	24,000	240,000
4,000	6	24,000	240,000
5,000	5	25,000	250,000
10,000	2	20,000	200,000
20,000	1	20,000	200,000
29,899	1	29,899	298,990

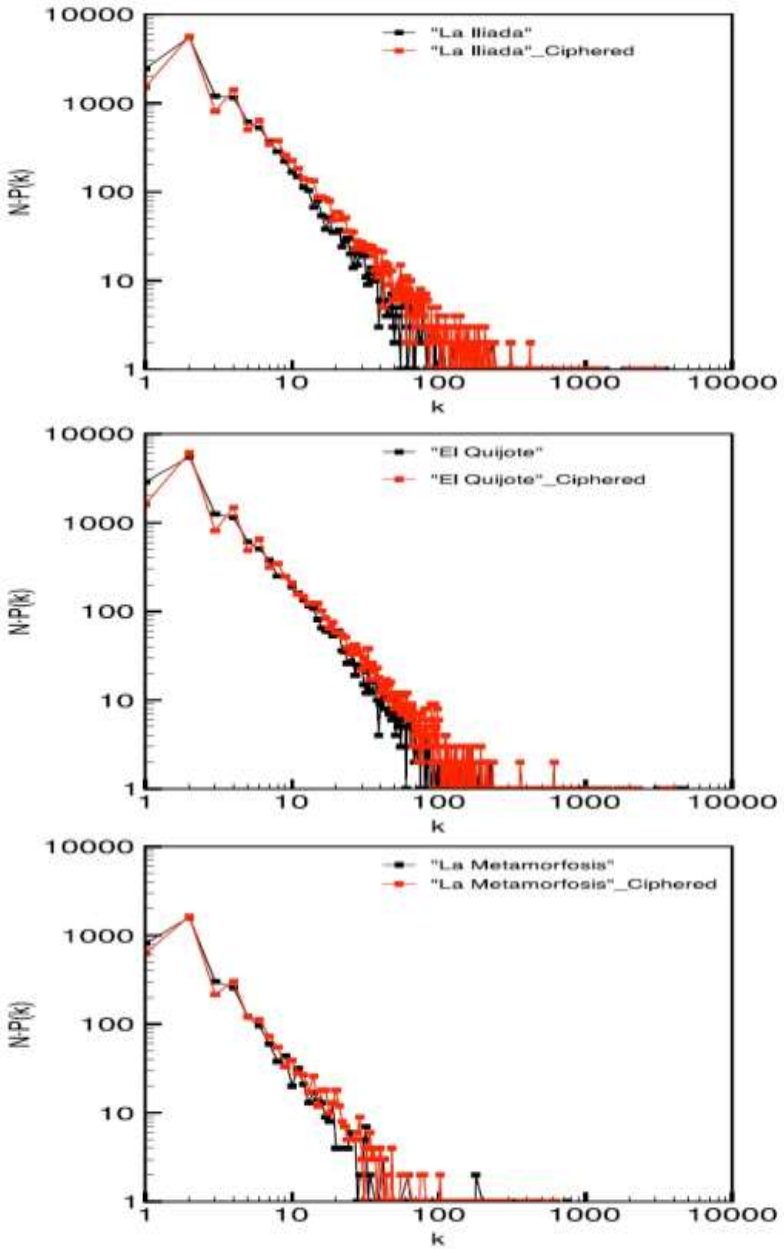

Fig. 4. Distribution of the number of words with k connections, $N \cdot P(k)$, for the texts. Top: "*La Iliada*" ($W = 3895$) by Homer. Mid: "*El ingenioso hidalgo don Quijote de la Mancha*" ($W = 3895$) by Miguel de Cervantes y Saavedra. Bottom: "*La Metamorfosis*" by Franz Kafka ($W = 3895$). Original text in black squares and ciphered version in red squares. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

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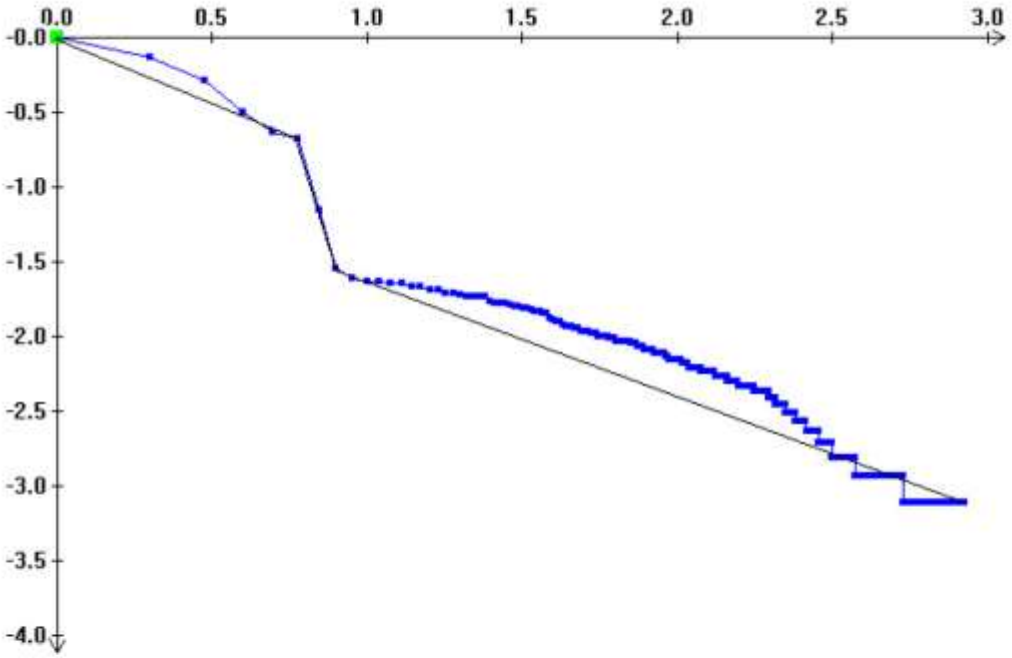



Fig. 5. Example of an initial letter and its Zipf plot where are indicated the different straight zones extracted

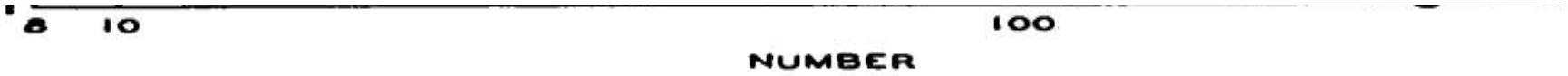

Fig. 2–4. The interval-frequency relationship. The number of different intervals of like size (in pages) between the repetitions of words occurring five times in Joyce's *Ulysses*.

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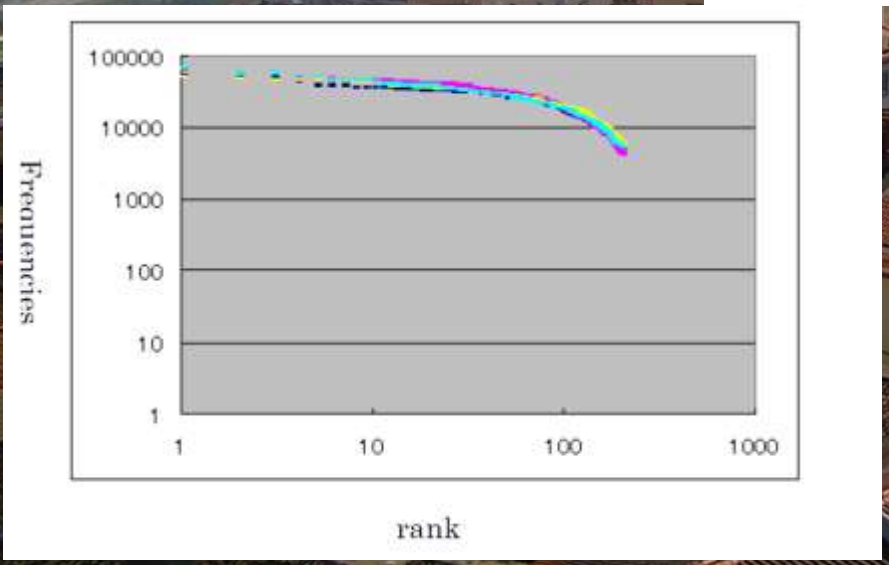
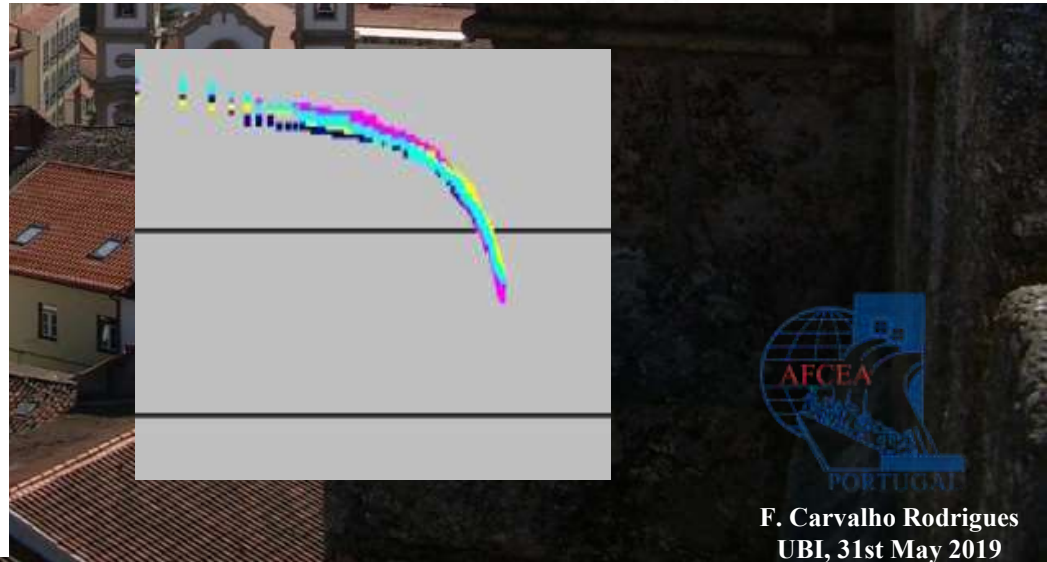
Fig2 Color distribution of each image of Fig.1





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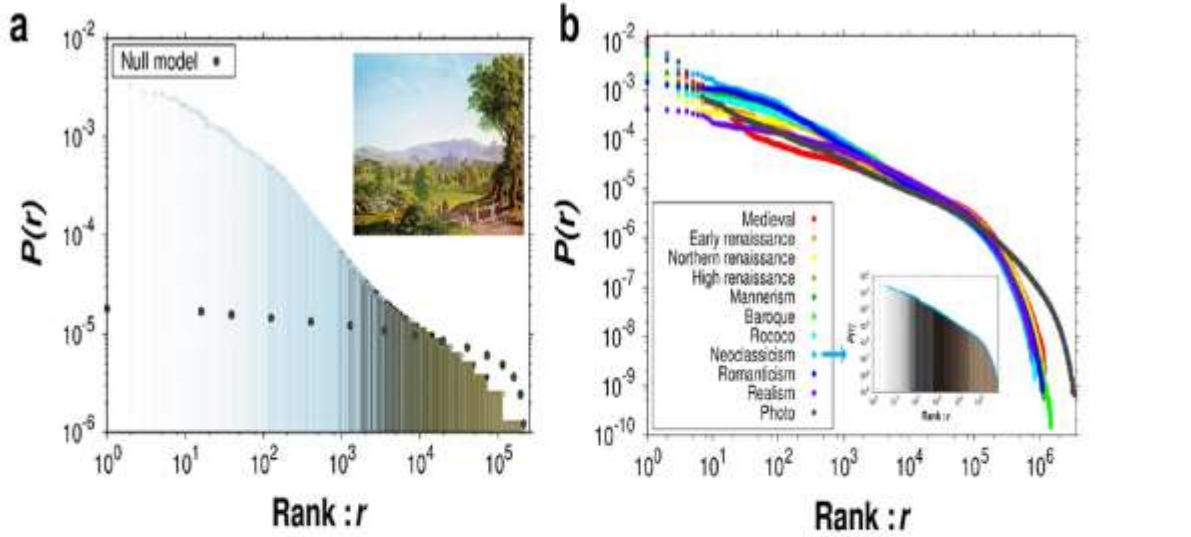

Figure 1 | Rank-ordered color-usage distributions for an image and periods. (a) Fraction distribution of each color in a descending rank order for the art work of German painter Johann Erdmann Hummel (1769-1852), *"Schloss Wilhelmshöhe with the Habichtswald"* (This image is out of copyright.). The horizontal axis indicates the rank of a color in frequency and the vertical axis denotes the proportion of a color in an image. The most (least) used color is located at the leftmost (rightmost) position on the horizontal axis. The black dots represent color choices from the same palette uniformly at random. (b) Rank-ordered color-usage distributions (RCDs) of the 10 periods and photographs. Note that the distribution of photographs clearly shows a different tail. Inset: RCD for the neoclassicism period. The displayed color corresponds to its rank. Note that the fraction is normalized by the image size and the number of paintings in each period.

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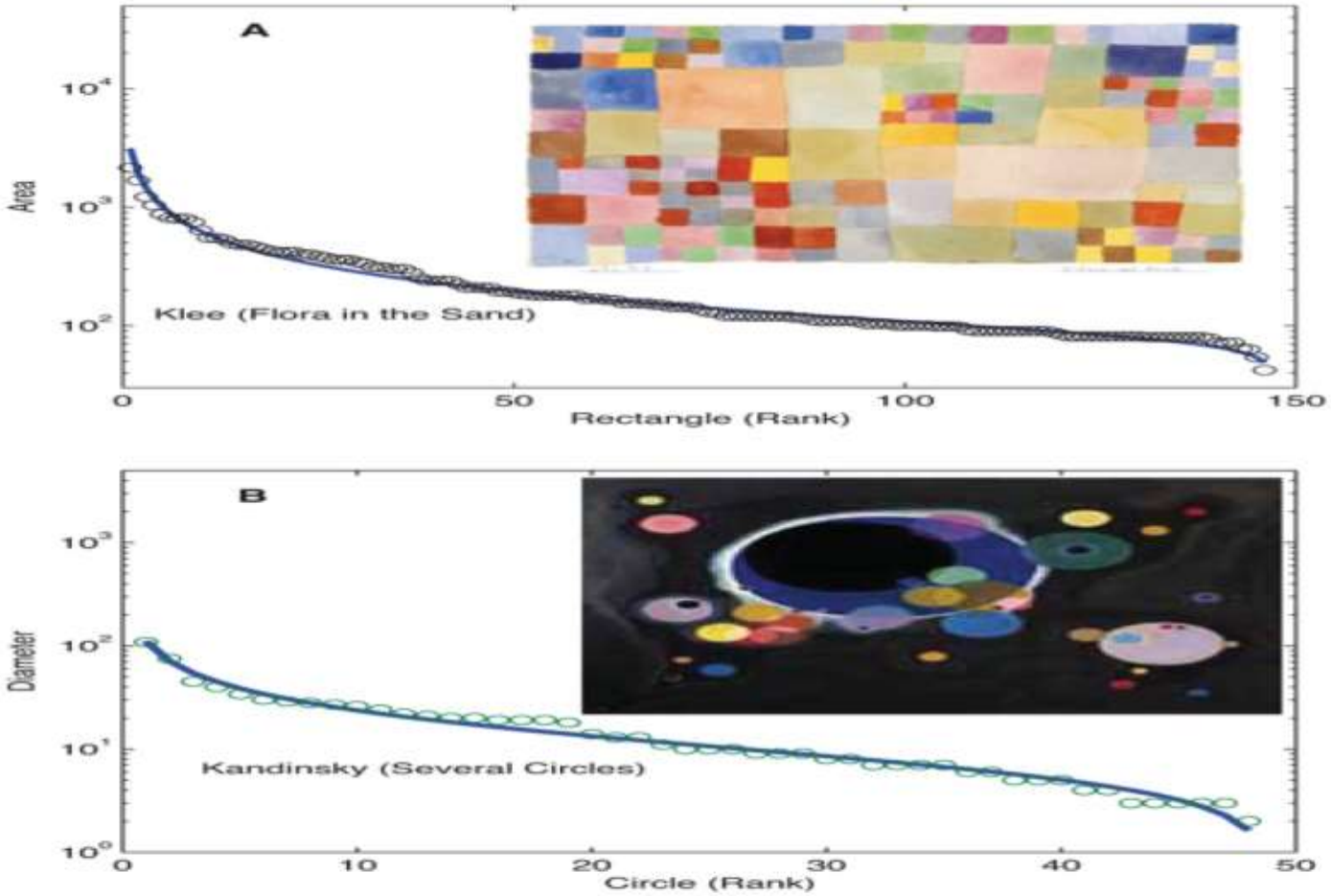

Figure 3. Size-ordered distributions in abstract paintings. (A) Plot of rectangle relative sizes in arbitrary units shown in decreasing order appearing in Klee's painting "Flora in the sand". Bold line is the DGBD fit with $(a,b,R^2) = (0.70, 0.14, 0.999$. **(B)** Plot of circle relative areas expressed in arbitrary units present in Kandinsky's "Several Circles" arranged in decreasing order, here the bold line fit has $(a,b,R^2) = (0.62, 0.32, 0.978)$.

doi:10.1371/journal.pone.0004791.g003

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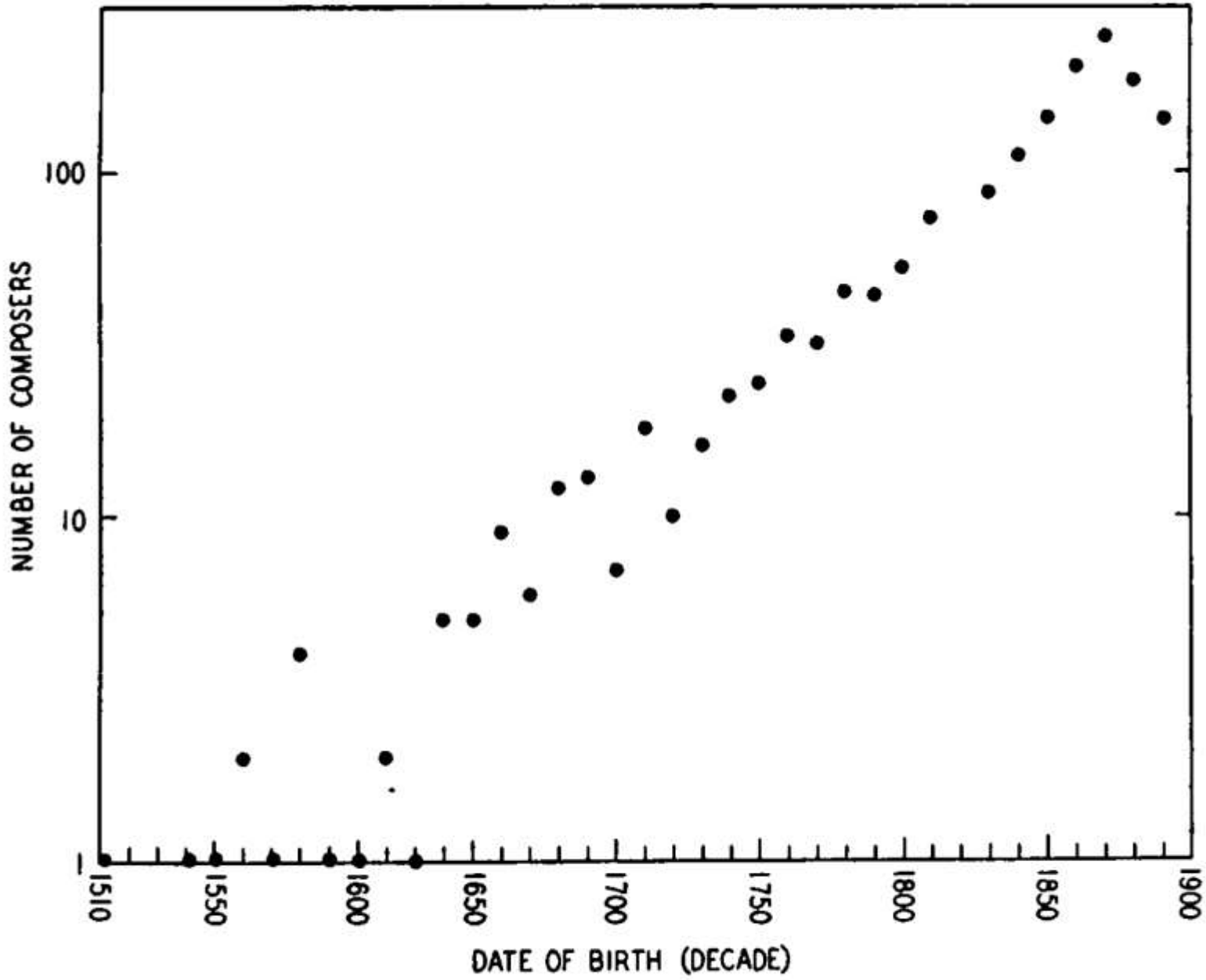

Fig. 12–1. Number of composers of chamber music, according to date of birth (1510–1900).

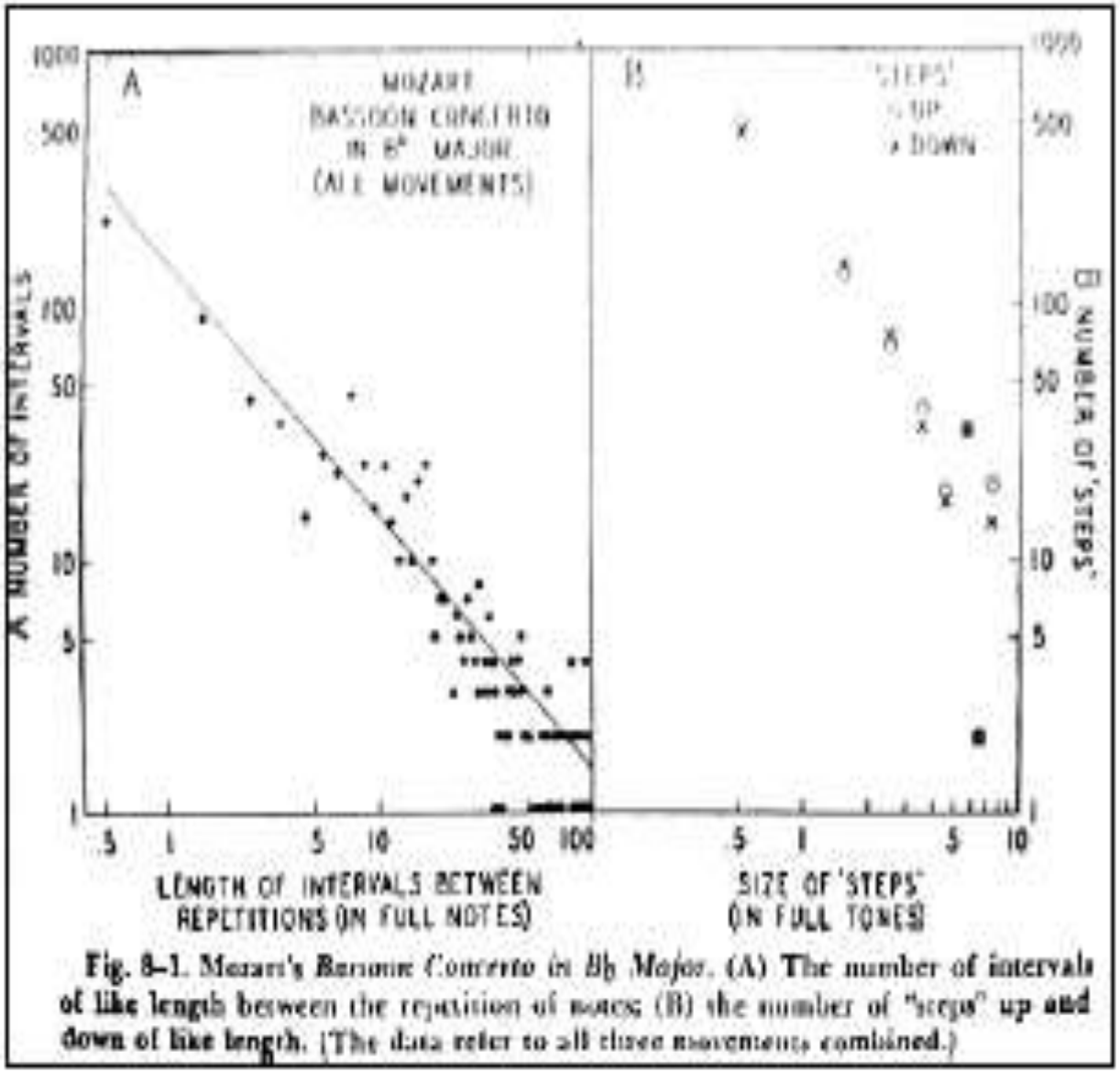

Fig. 8–1. Mozart's *Bassoon Concerto in B♭ Major*. (A) The number of intervals of like length between the repetition of notes (B) the number of "steps" up and down of like length. (The data refer to all three movements combined.)

Figure 3.5: Zipf's analysis of *Mozart's Bassoon Concertio*

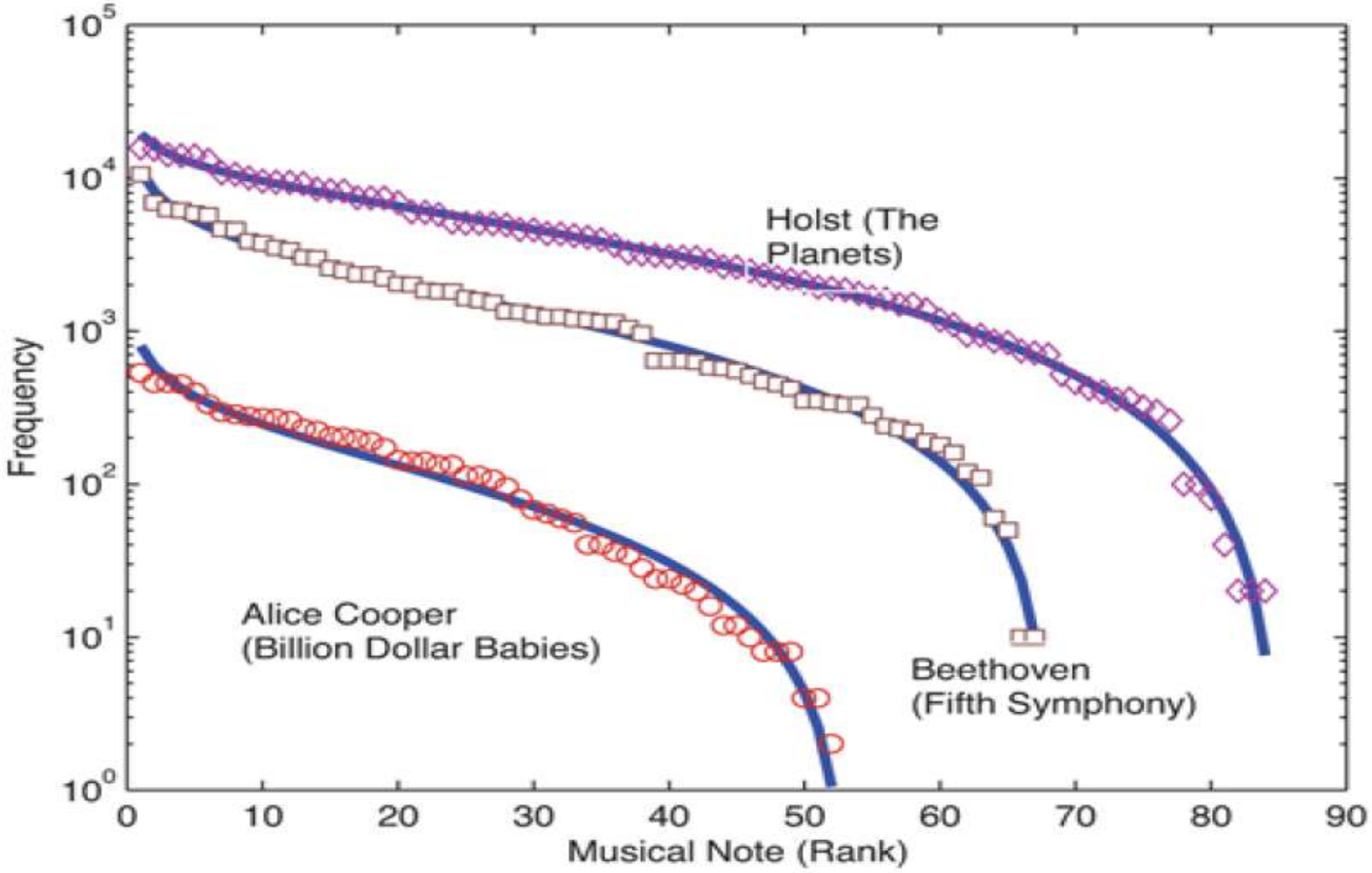

Figure 2. Frequency-rank distributions for musical scores. Plot of the occurrence of musical notes, ordered decreasingly, in the scores of Holst's "The Planets", Beethoven's first movement of the "Fifth Symphony" and Alice Cooper's "Billion Dollar Babies". Solid lines are DGDB fits with $(a,b,R^2) = (0.23, 1.54, 0.988)$, $(0.42, 1.25, 0.987)$, $(0.71, 1.06, 0.978)$.

doi:10.1371/journal.pone.0004791.g002

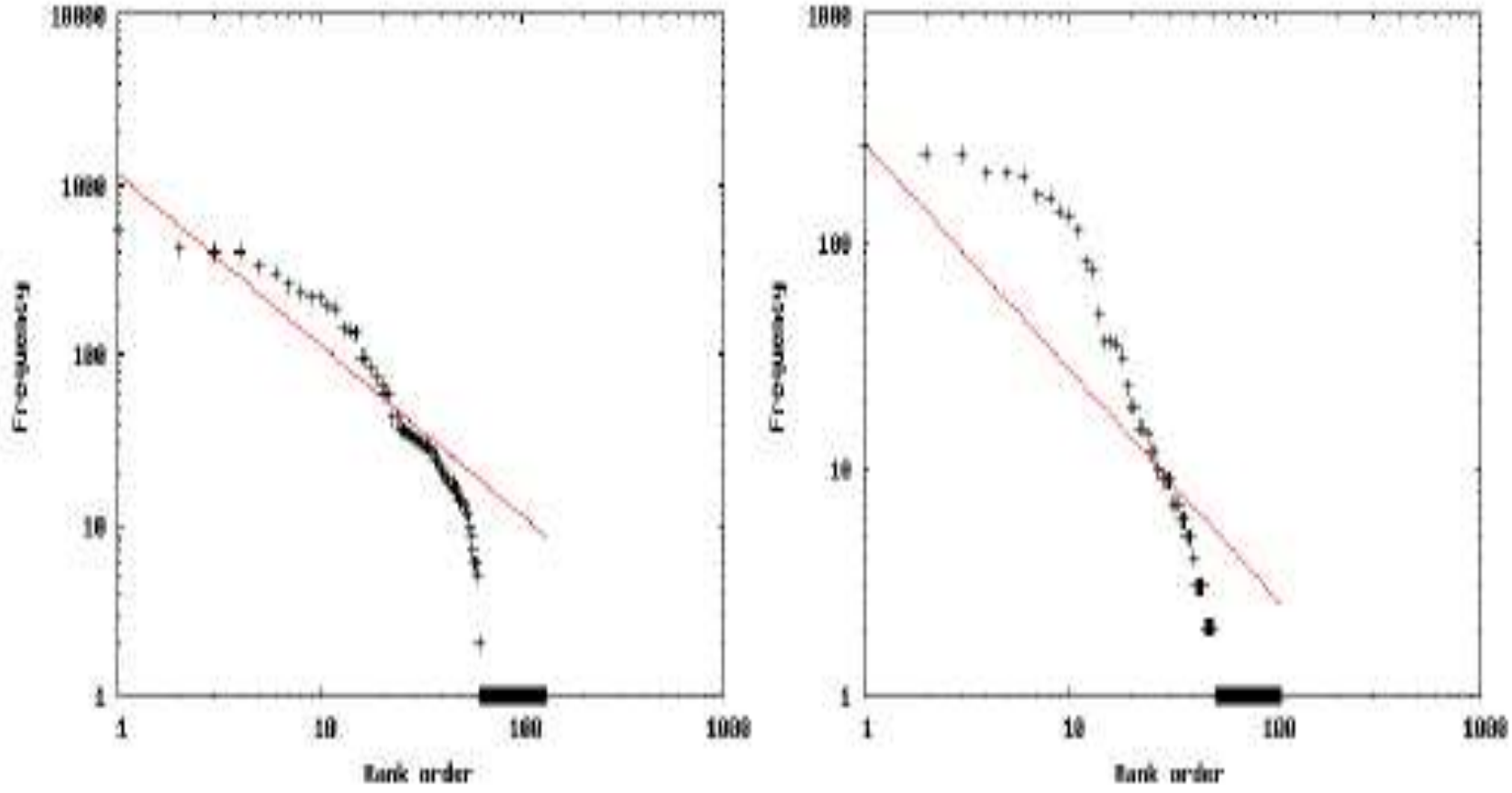

Figure 3.6: Frequency-rank distribution of *Beethoven's Piano Sonata No. 29, Mvmt. 1* and *Chopin's Etude Op. 10, No. 12*

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HUMAN BEHAVIOR

AND

THE PRINCIPLE OF LEAST EFFORT

An Introduction to Human Ecology

by

GEORGE KINGSLEY ZIPF, Ph.D.
Harvard University

ADDISON-WESLEY PRESS, INC.
CAMBRIDGE 42, MASSACHUSETTS
1949

$$r \times f = C$$

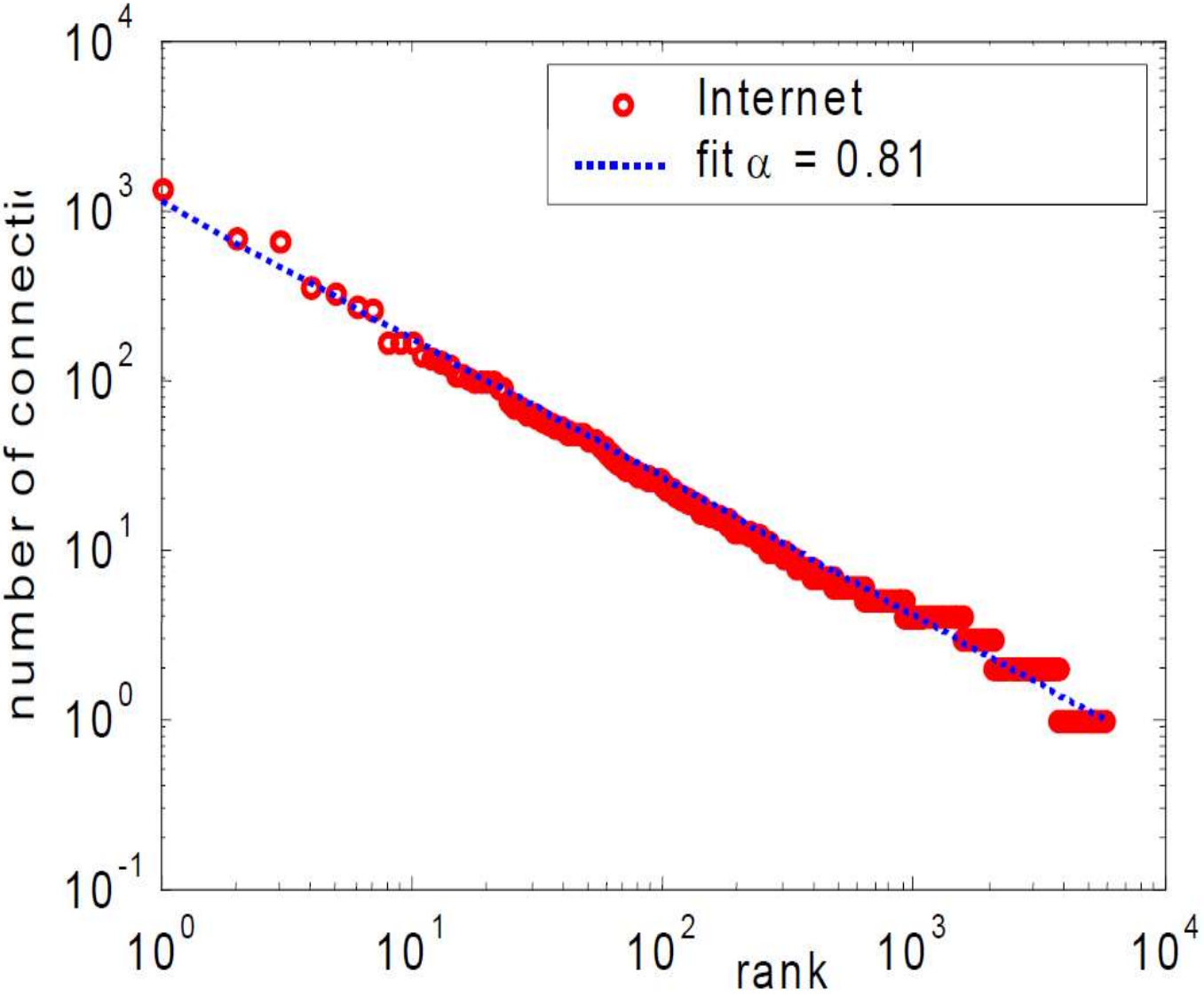


Figure 3. The connectivity of the internet backbone at the autonomous system (AS level). Each AS is itself a network corresponding to a single ISP, business entity or educational institution.

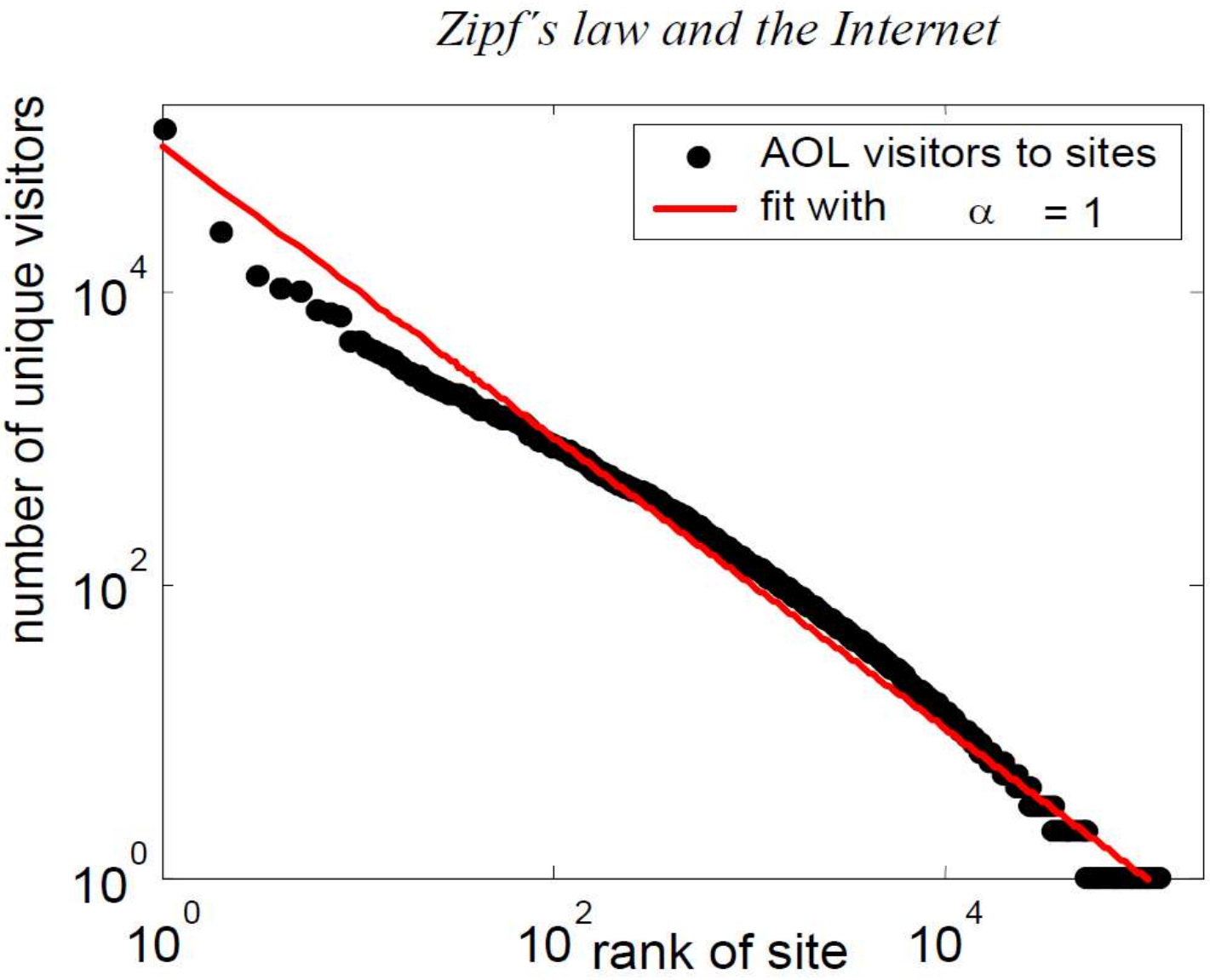


Figure 2. Sites ranked by the number of unique AOL visitors they received Dec. 1, 1997. AOL (America Online) is the largest Internet service provider in the United States. The fit is a Zipf distribution $n_r \sim r^{-1}$

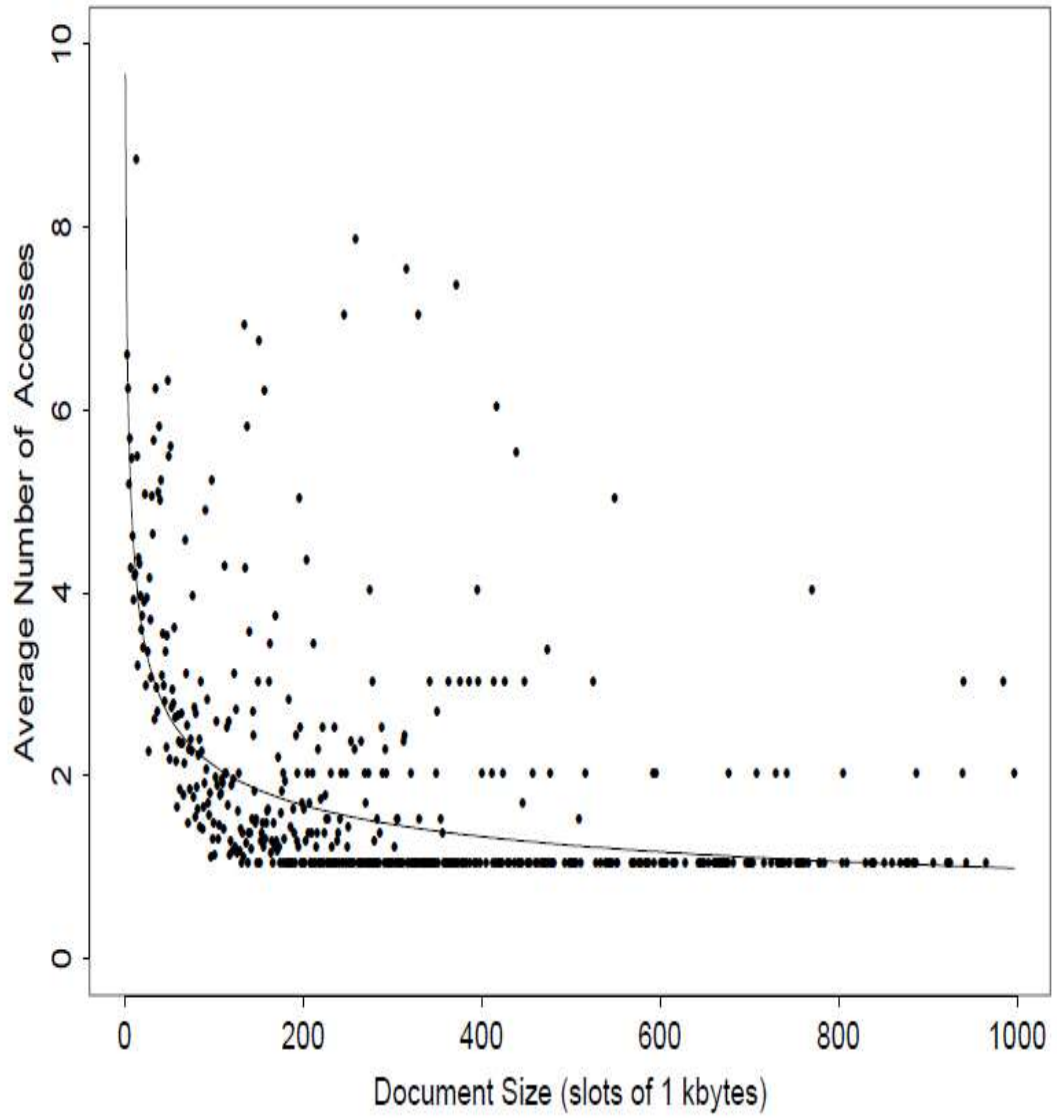
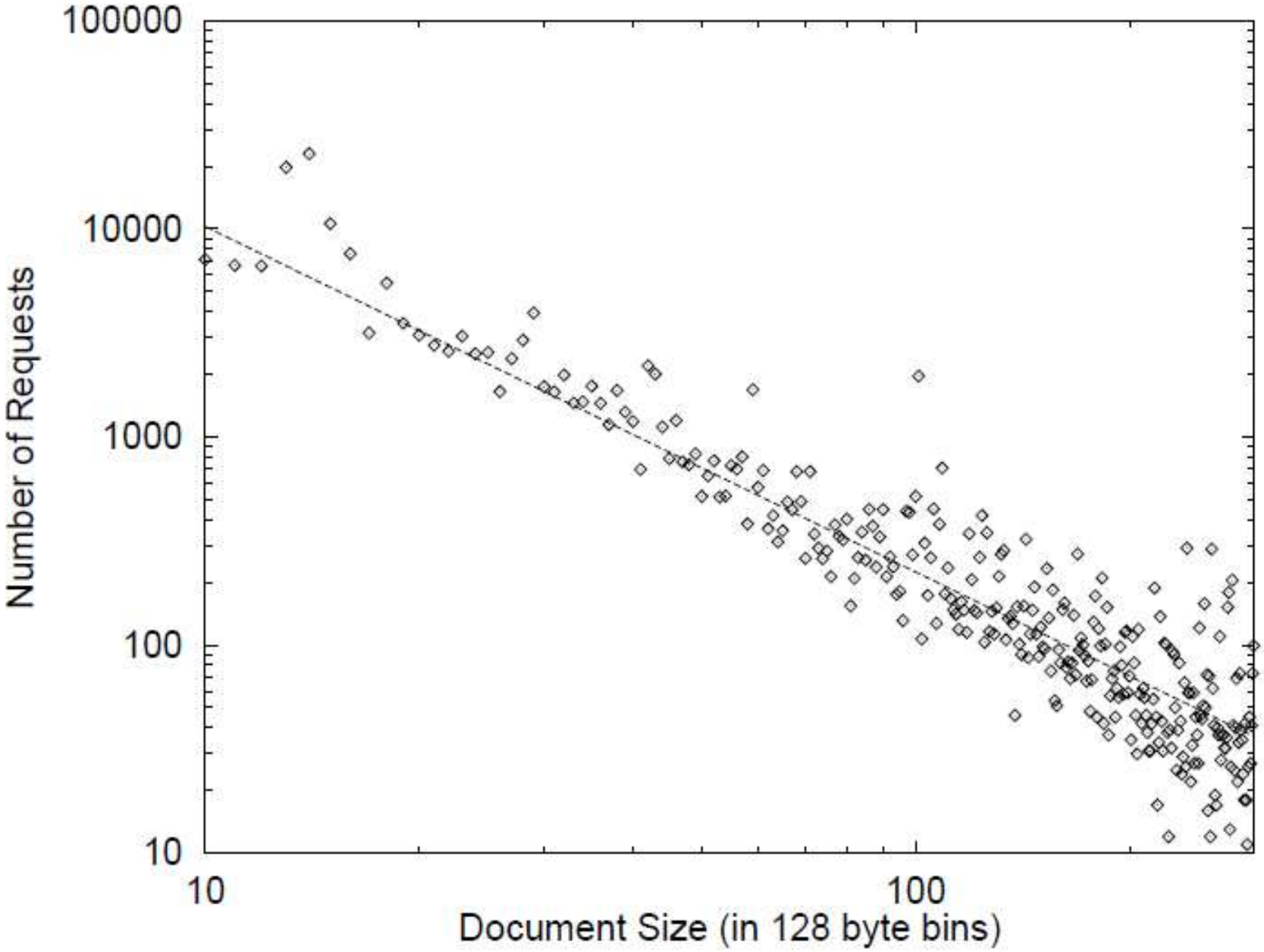


Figure 6: Distribution of Average Number of Requests by File Size.


100000
10000
1000
100
10
Number of Requests
10
100
Document Size (in 128 byte bins)

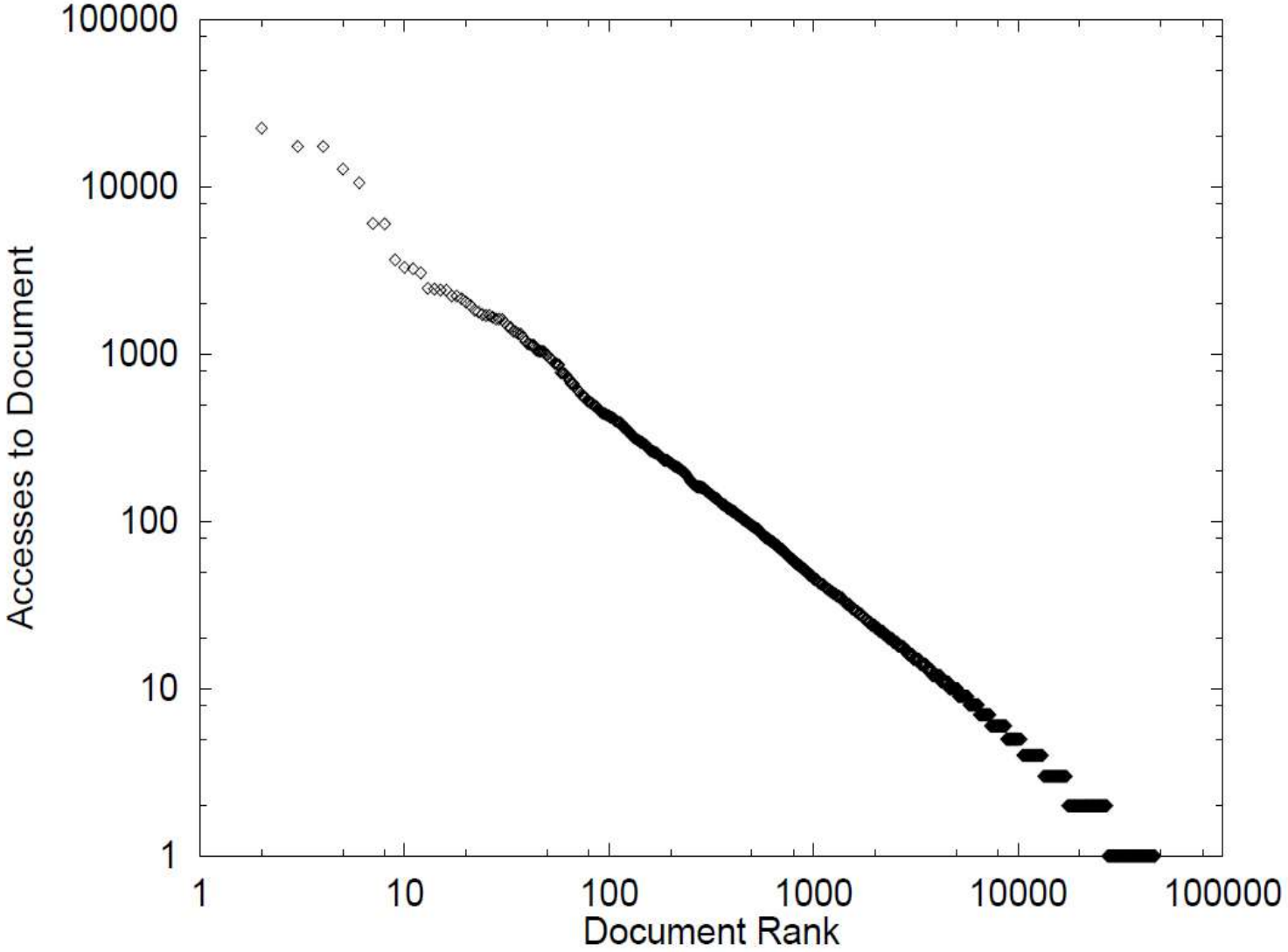


Figure 8: Zipf's Law Applied To WWW Documents

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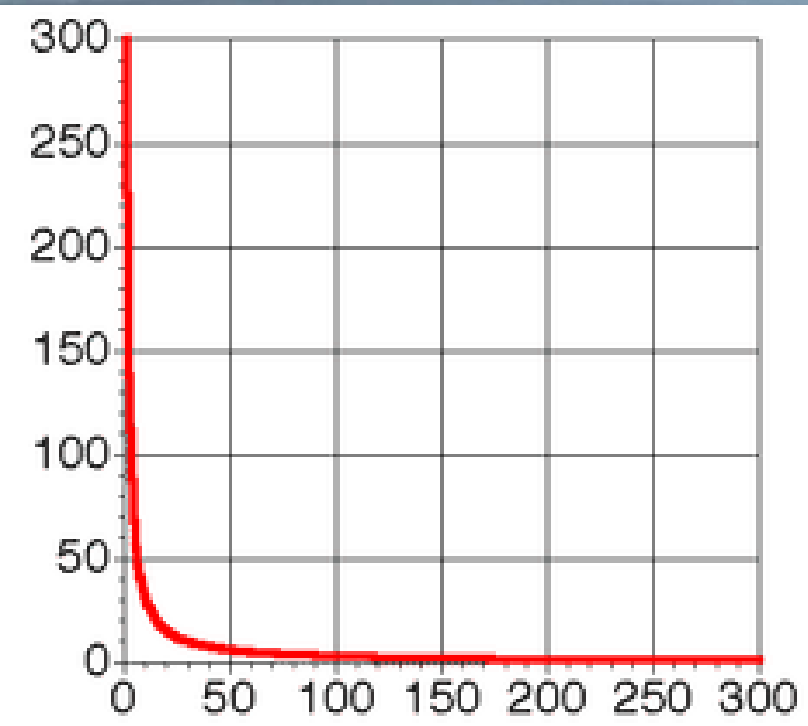
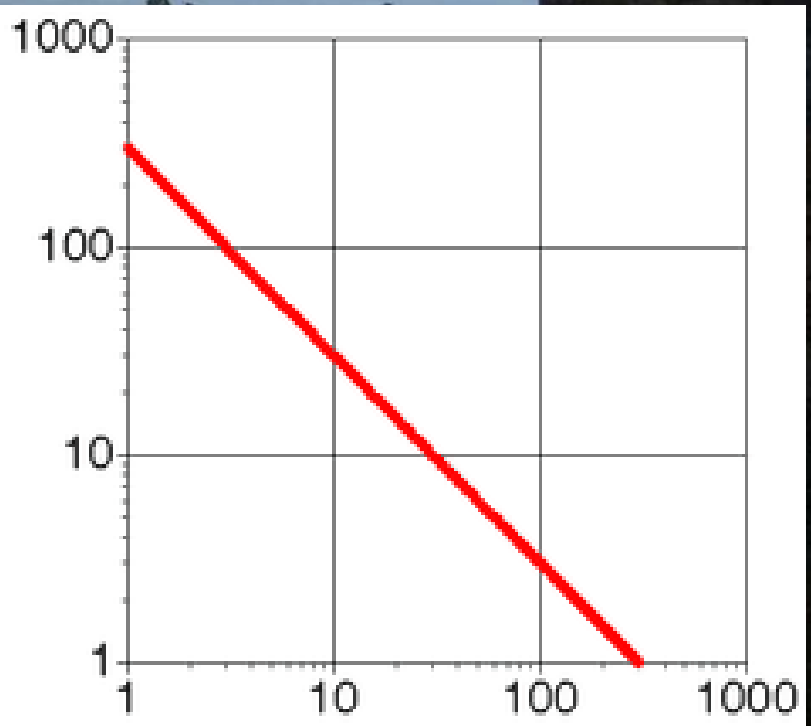
(Boltzmann – Pareto – Zipf)

- Atomic Energy Levels
- Words in a text
- Property in space
- Property in time
- Property in Cyberspace

The same distribution





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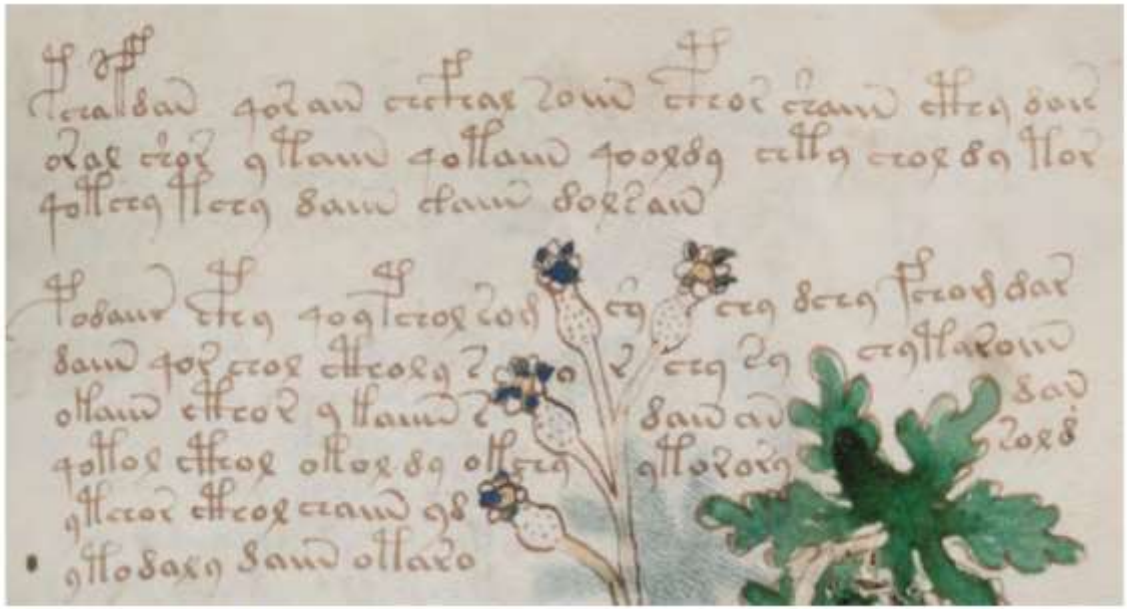

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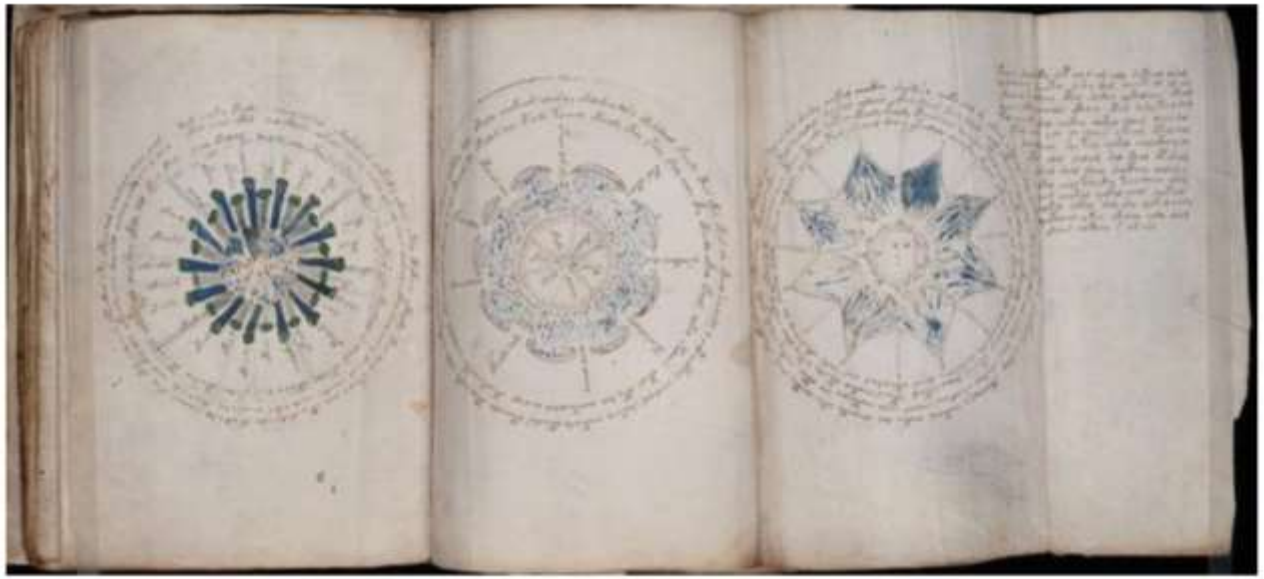

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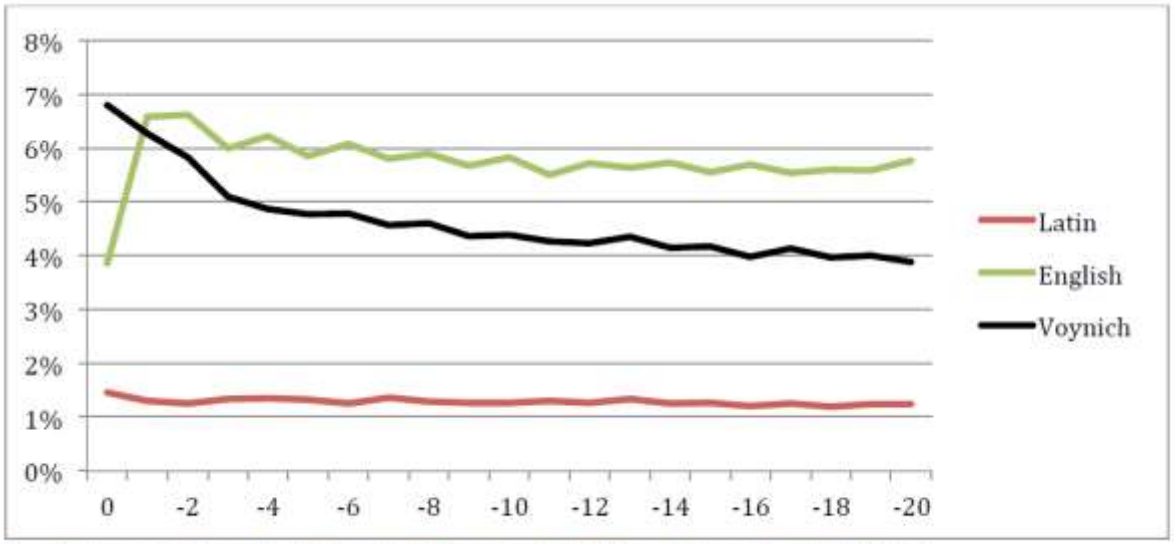

Graph 4: repeated words within the 20 lines for the VMS an Latin and an English text

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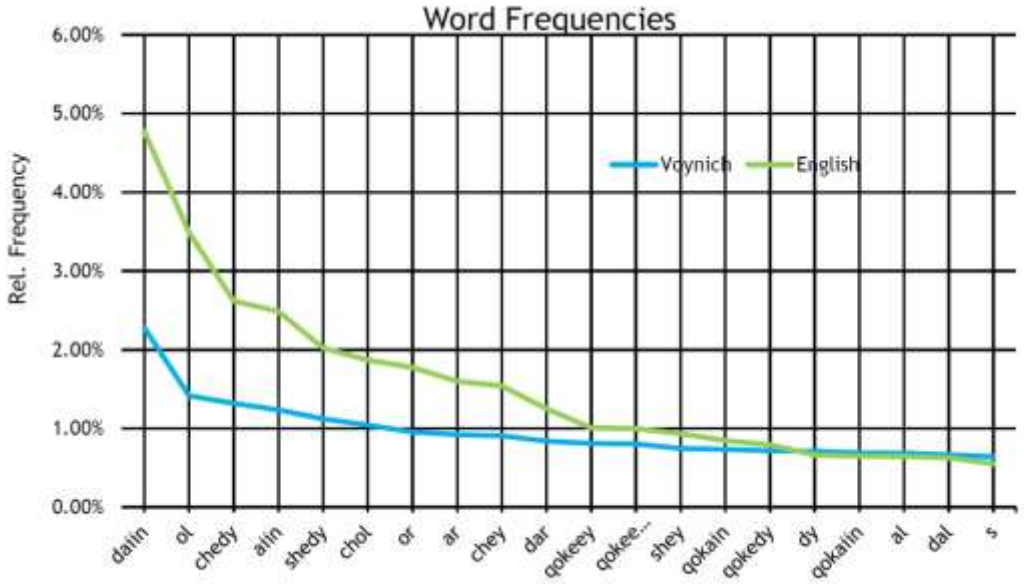

Figure 2-3: Word Frequency Distribution





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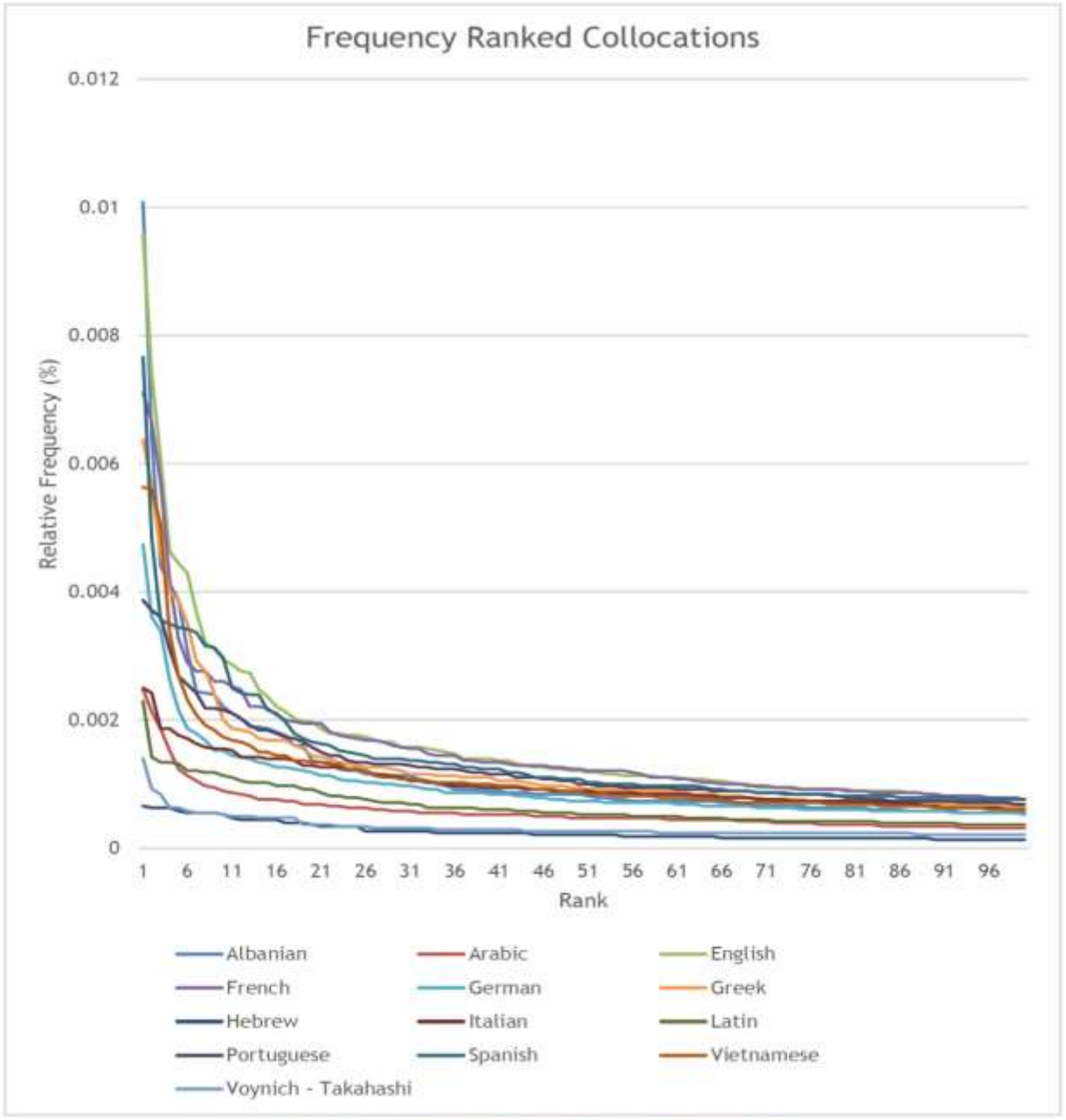
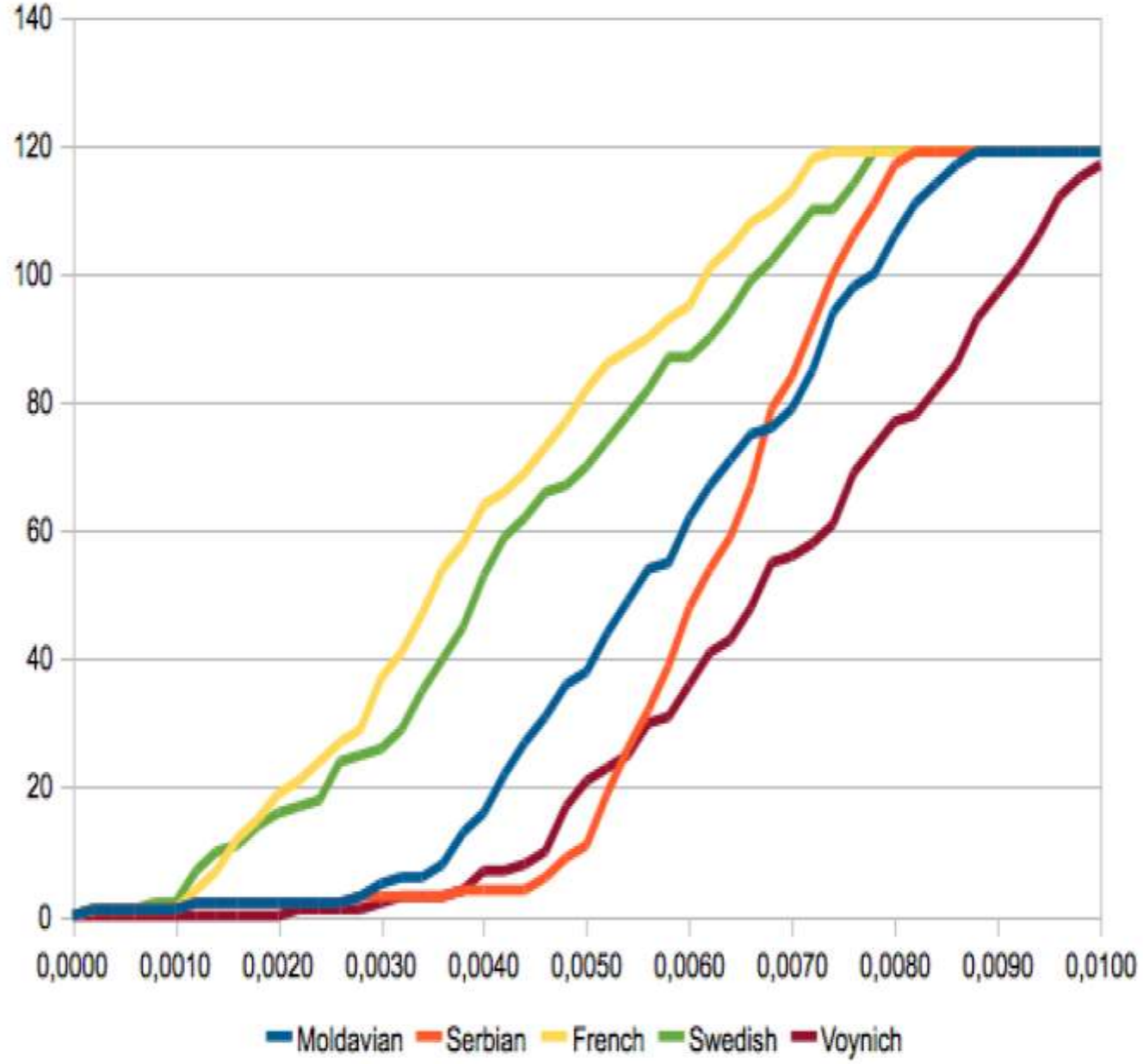


Figure 5-1: Frequency Ranked (1-100) Collocations


140
120
100
80
60
40
20
0
0,0000
0,0010
0,0020
0,0030
0,0040
0,0050
0,0060
0,0070
0,0080
0,0090
0,0100
Moldavian
Serbian
French
Swedish
Voynich

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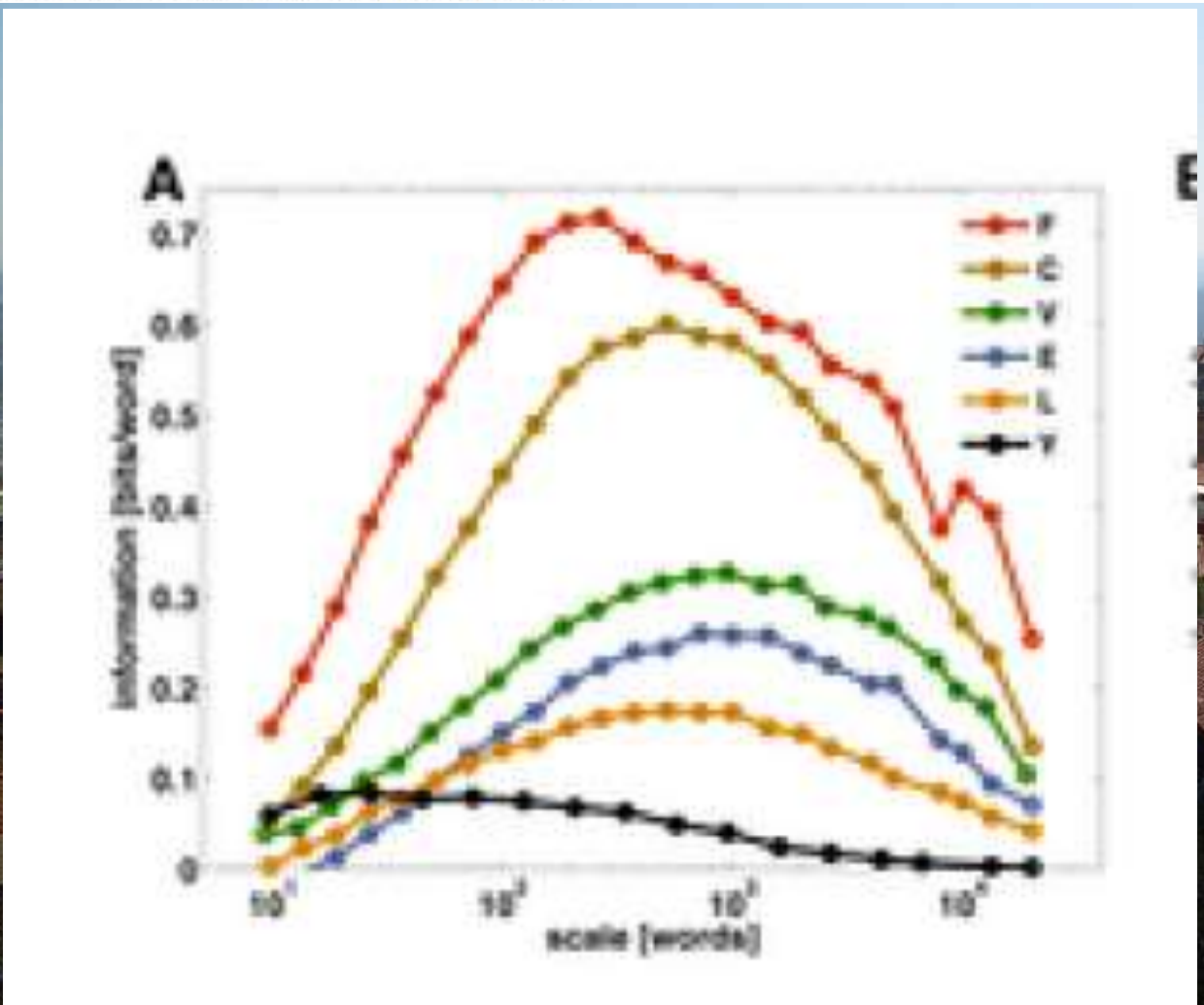
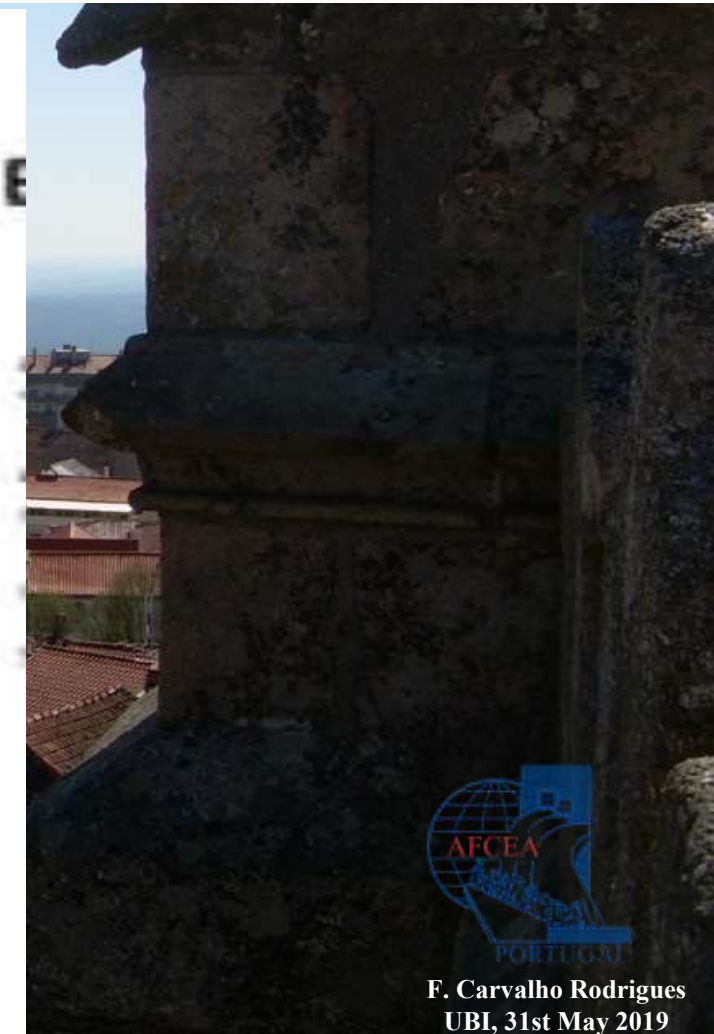
A) Information in word distribution as a function of the scale for the Voynich manuscript compared to other five language and symbolic sequences (F: Fortran; C: Chinese; V: Voynich; E: English; L: Latin; Y: yeast DNA). The number of words in all sequences was equal to that of the Voynich text; if the original sequence was longer, the additional words were not considered. B) Scale of maximal information for the sequences considered in A (see Materials and Methods for more details on the language and symbolic sources).
doi:10.1371/journal.pone.0066344.g001





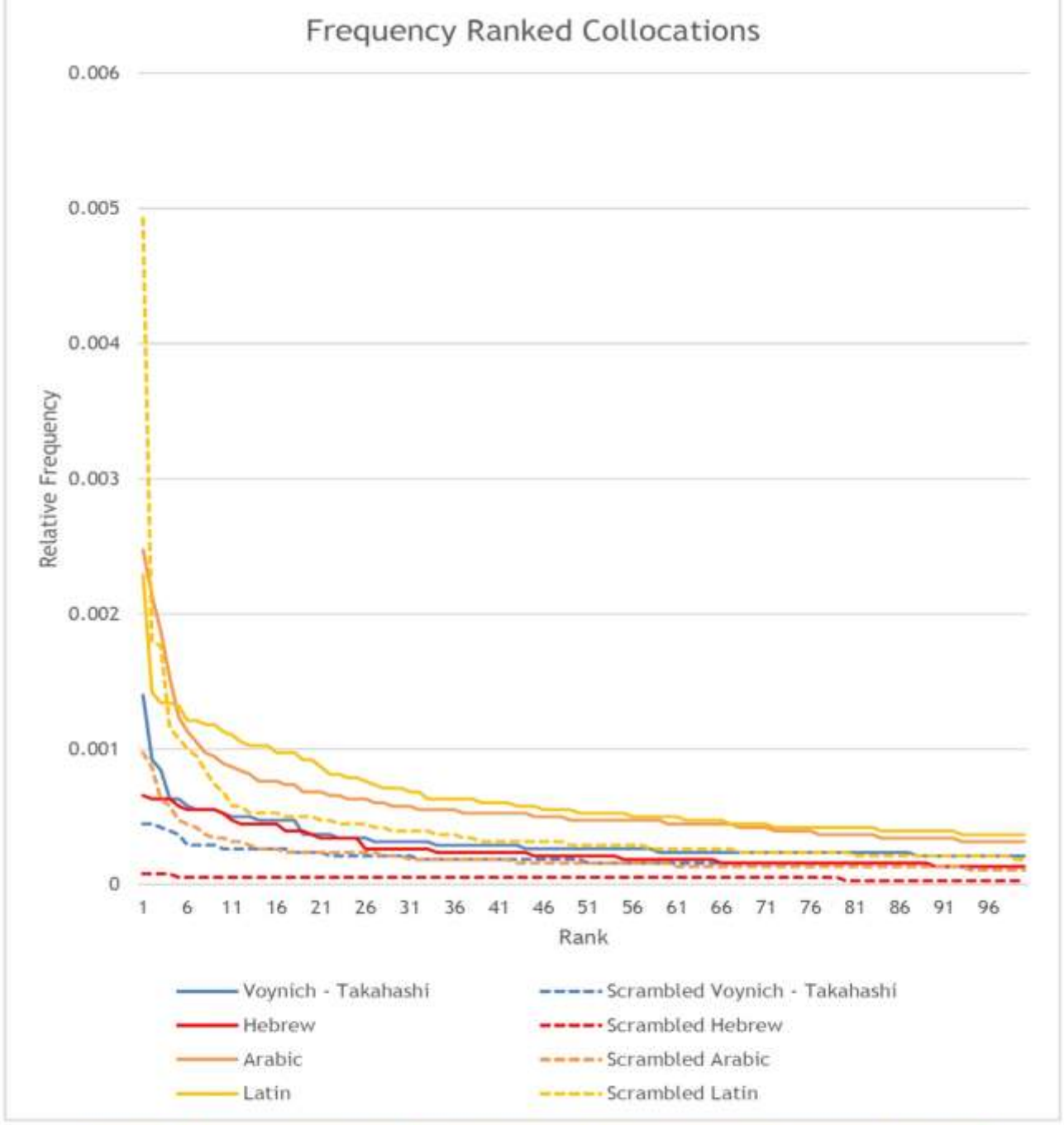
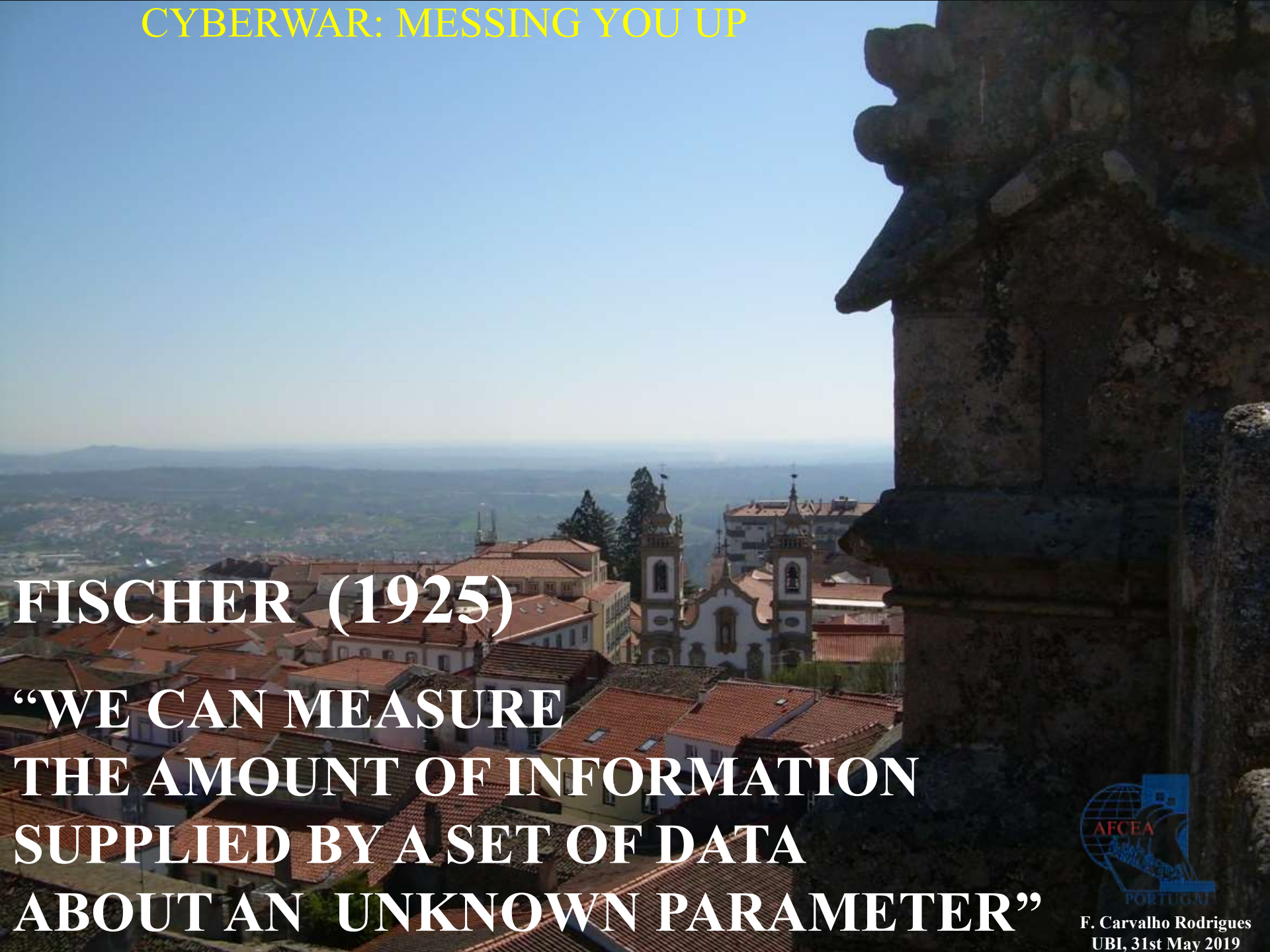


Figure 5-2: Frequency Ranked (1-100) Collocations of Scrambled Texts closest to the Voynich



FISCHER (1925)

"WE CAN MEASURE THE AMOUNT OF INFORMATION SUPPLIED BY A SET OF DATA ABOUT AN UNKNOWN PARAMETER"

F.Carvalho Rodrigues
1989

AMOUNT OF INFORMATION (H)

GENERATED BY ONE EVENT WITH A CHANCE p OF HAPPENING;

$$H = \ln 1/p$$

CYBERWAR: MESSING YOU UP

F.Carvalho Rodrigues
1989

AMOUNT OF INFORMATION (H) GENERATED BY AN EVENT WITH A CHANCE p OF HAPPENING;

CHANCES MULTIPLY : $p = p_1 x p_2$

INFORMATION ADDS:

$$H(p = p_1 x p_2) = H(p_1) + H(p_2)$$

AMOUNT OF INFORMATION (H)

AFTER m EVENTS WITH CHANCE p

$$H = - m \ln p$$

F THE MAXIMUM NUMBER OF SUCH EVENTS IS n

$$p = m / n$$

$$H_{norm} = - p \ln p$$

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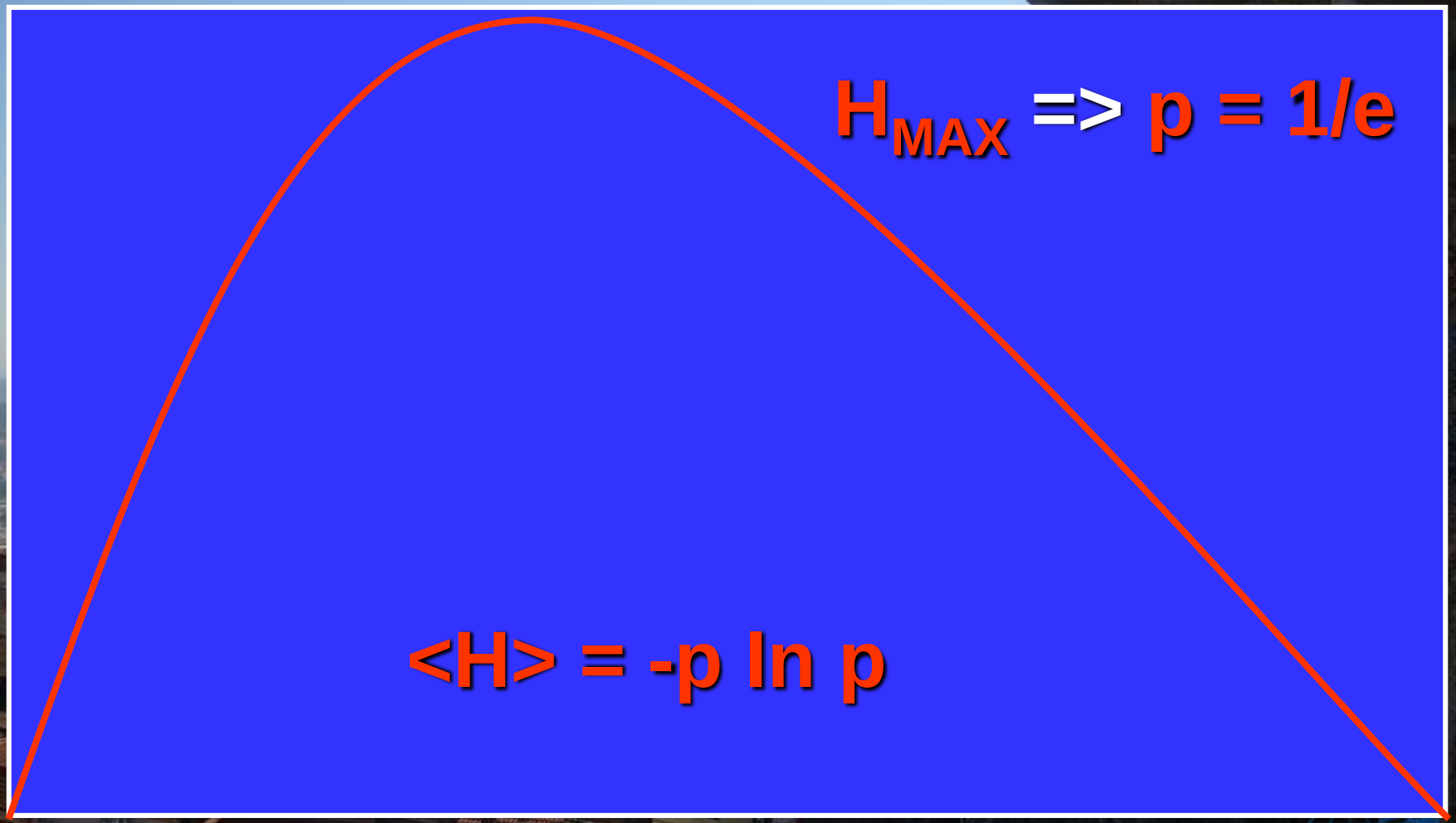
1989



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1989



CYBERWAR: MESSING YOU UP

ARTIFICIAL WAR



Multiagent-Based Simulation of Combat

Andrew Ilachinski

3.5.5.1 *Casualty-Based Entropy*

Carvalho-Rodriques [Carv89] has recently suggested using entropy, as computed from casualty reports, as a predictor of combat outcomes. Whether or not combat can be described as a complex adaptive system, it may still be possible to describe

*See discussion on *self-organized criticality* in section 2.2.8, page 149.

it as a dissipative dynamical system. As such, it is not unreasonable to expect entropy, and/or entropy production, to act as a predictor of combat evolution. Carvalho-Rodriques defines his casualty-based entropy E by:

$$E_i = \frac{C_i}{N_i} \log \frac{1}{C_i/N_i}, \tag{3.1}$$

where C_i represents the casualty count, in absolute numbers) and N_i represents the force strength of the ith adversary (either red or blue). It is understood that both C_i and N_i can be functions of time.

Figure 3.3 shows a plot of the functional form $E(x) = x\log(1/x)$, where $x = C_i/N_i$. Notice that the curve is asymmetrical and has a peak at about 0.37. One could interpret this to mean that once $x = C_i/N_i$ goes beyond the peak, "it is as if the combat capability of the system ... declines, signifying disintegration of the system itself."*

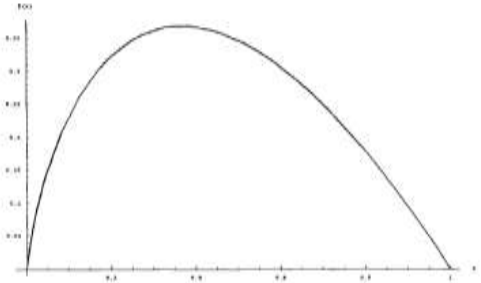

Fig. 3.3 A plot of entropy E(x) = x log (1/x); see text.

Woodcock and Dockery [Dock93b] provide strong evidence that casualty-based entropy is a useful predictor of combat. They base this on analysis on both time-independent and time-dependent combat data derived from detailed historical descriptions of 601 battles from circa 1600 to 1970, exercise training-data obtained from the National Training Center and historical records of the West-Wall campaign in World-War II and Inchon campaign during the Korean war.

They find that plots of E_a (attacker entropy) versus E_d (defender entropy) are particularly useful for illustrating the overall combat process (see figure 3.4):

- *Region I:* a low entropy region corresponding to low casualties and ambiguous outcomes. Initial phases of a battle pass through this region, with the

*See [Dock93], page 197.

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The *Carvalho-Rodrigues Combat-Entropy* is also computed (see *Data Visualization*). Note that this flag is the only flag that is set by default, and force size data is kept track of even if the overall data collection is toggled *off*.

ARTIFICIAL WAR



Multiagent-Based Simulation of Combat

Andrew Ilachinski

Carvalho-Rodriques [Carv89] has suggested using entropy, as computed from casualty reports, as a predictor of combat outcomes. Whether or not combat can be described as a complex adaptive system, it may still be possible to describe it as a dissipative dynamical system. As such, it is not unreasonable to expect entropy, and/or entropy production, to act as a predictor of combat evolution. Carvalho-Rodriques defines his casualty-based entropy E by

$$E(i) = \left(\frac{c_i}{N_i}\right) \log\left(\frac{c_i}{N_i}\right),$$

where c_i represents the casualty count (in absolute numbers) and N_i represents the force strength of the ith adversary (either red or blue). It is understood that both c_i and N_i can be functions of time.

Figure E.60 shows graph of combat-entropy.

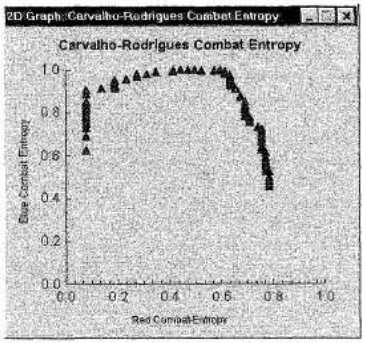

Fig. E.60 Screenshot of a sample *Carvalho-Rodrigues Combat Entropy* graph.



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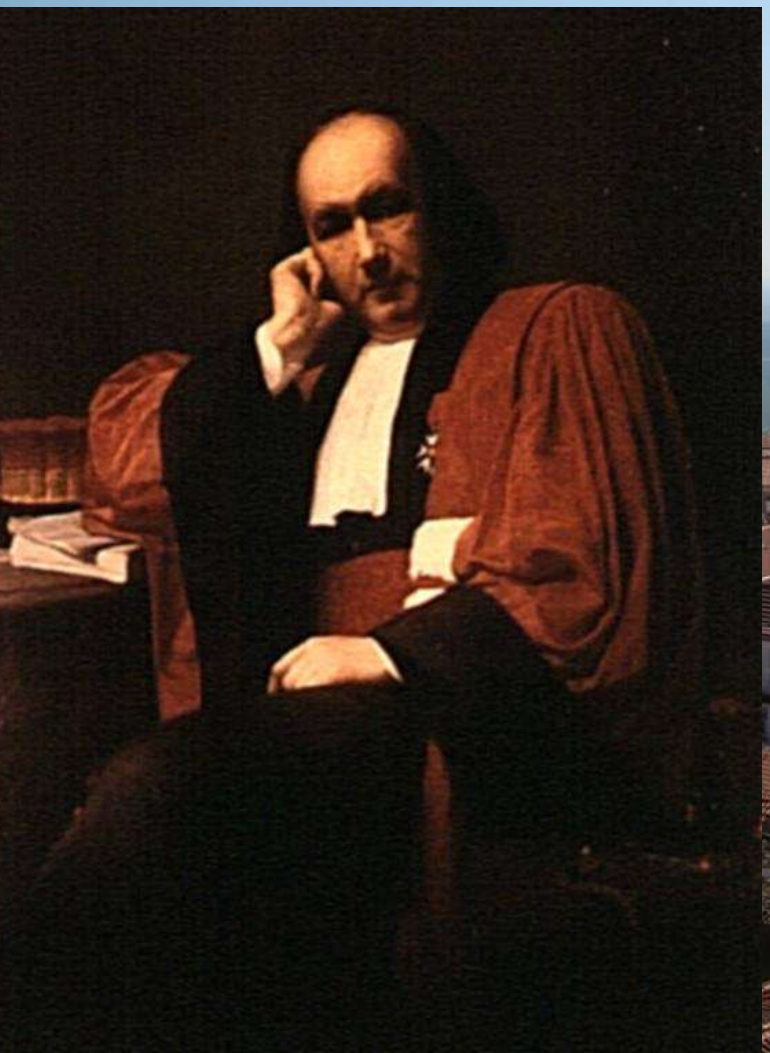

CLAUDE BERNARD
1870

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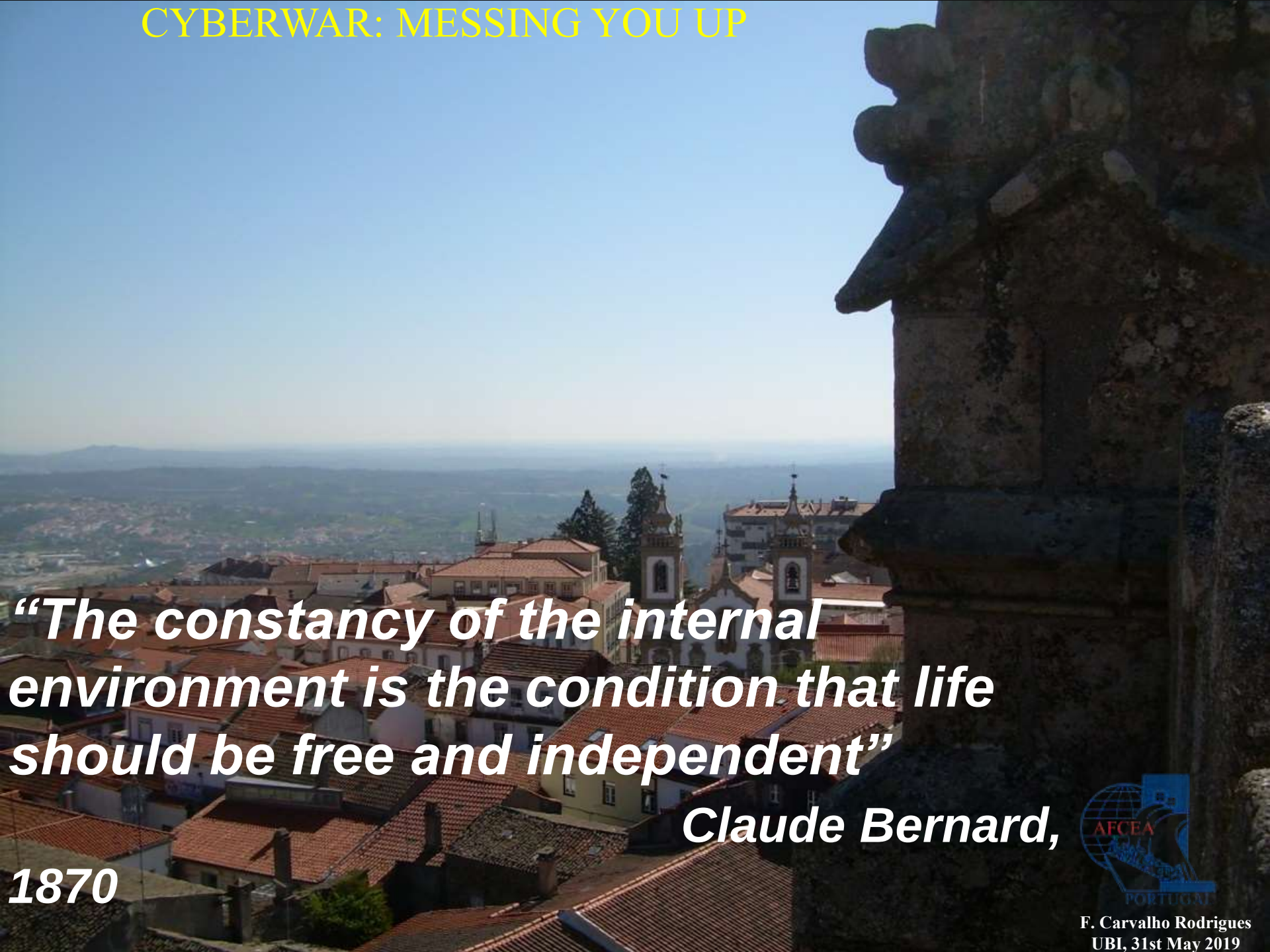

"The constancy of the internal environment is the condition that life should be free and independent"

Claude Bernard, 1870

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MAXIMUM ENTROPY

LEAST ACTION

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IN ITS LIMITS THE NEW STATE

1 . ORGANIC AND FUNTIONAL = COMPLEX BUT FEW DATA NECESSARY (COMPLEX + SIMPLICITY OF DATA)

2 . CAHOTIC = COMPLEX AND LOTS OF DATA NECESSARY (COMPLEXITY + COMPLICATION OF DATA)

CYBERWAR: MESSING YOU UP

FISCHER (1925)

**"WE CAN MEASURE
THE AMOUNT OF INFORMATION
SUPPLIED BY A SET OF DATA
ABOUT AN UNKNOWN PARAMETER"**

WHEN

**THE STRUCTURE OF THE SYSTEM
HAS SIMPLICITY OF DATA,**

A MINIMUM

NUMBER OF ELEMENTS IN THE DATA SET

GENERATES

THE MAXIMUM AMOUNT OF INFORMATION

ABOUT THE SYSTEM IS OBTAINED

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FISCHER (1925)

**"WE CAN MEASURE
THE AMOUNT OF INFORMATION
SUPPLIED BY A SET OF DATA
ABOUT AN UNKNOWN PARAMETER"**

WHEN

THE STRUCTURE OF THE SYSTEM
HAS COMPLICATION OF DATA,

NO MATTER HOW LARGE THE
NUMBER OF ELEMENTS IN THE DATA SET
IT GENERATES
UNSUFFICIENT AMOUNT OF INFORMATION
ABOUT THE SYSTEM IS OBTAINED

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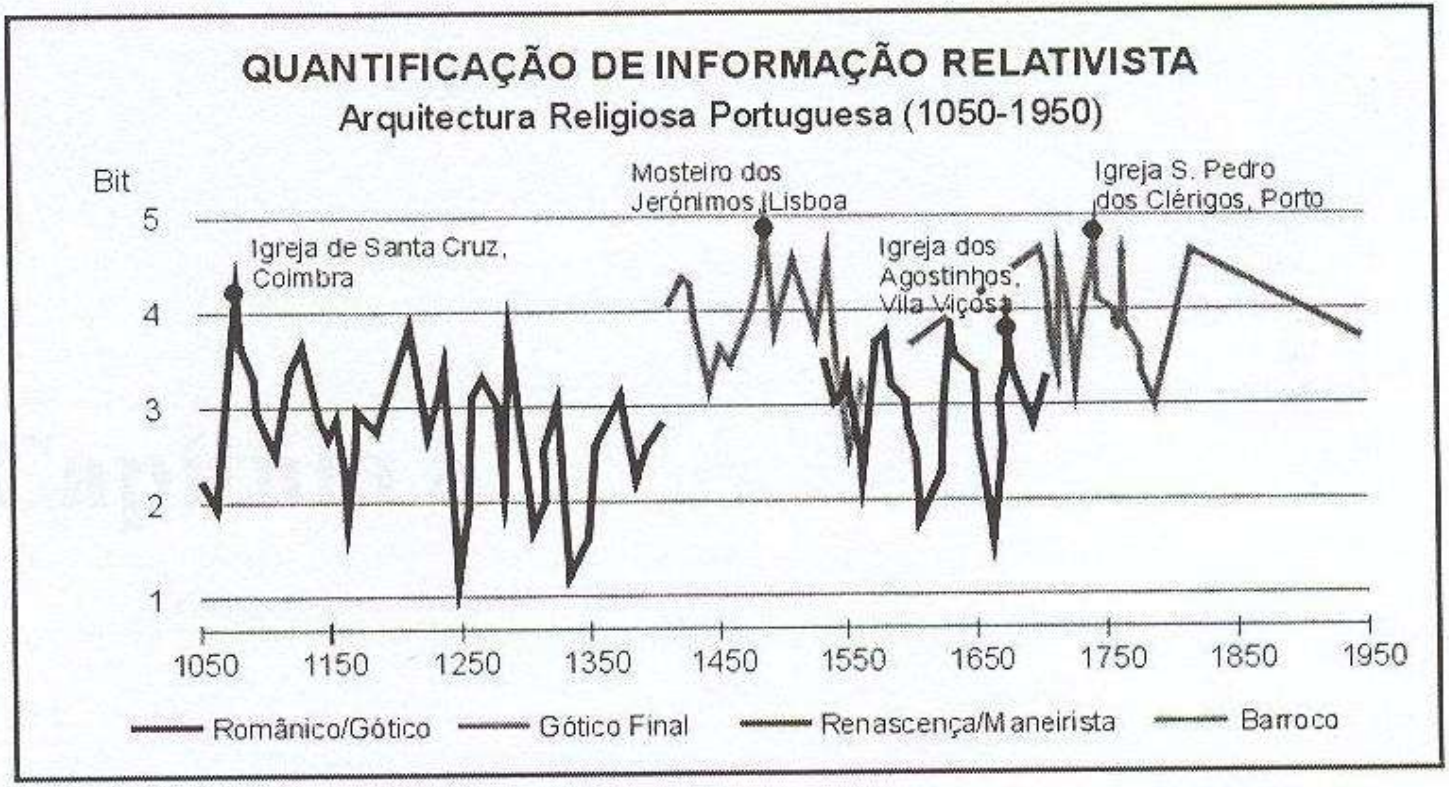

Figura 45 – Quantidade de Informação Relativista de alguns Monumentos Nacionais.




GUESS
FORECAST
FORESEE
BEING CERTAIN

CYBERWAR: MESSING YOU UP















Bernoulli

AFCEA PORTUGAL

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UBI, 31st May 2019

JACOBI BERNOULLI,
Profeſſ. Baſil. & utriuſque Societ. Reg. Scientiar.
Gall. & Pruſſ. Sodal.
MATHEMATICI CELEBERRIMI,

ARS CONJECTANDI,

OPUS POSTHUMUM.

Accedit

TRACTATUS
DE SERIEBUS INFINITIS,

Et EPISTOLA Gallicè ſcripta
DE LUDO PILÆ
RETICULARIS.



BASILEÆ,
Impenſis THURNISIORUM, Fratrum.
clɔ Iɔcc xiii.

A ARTE DE CONJECTURAR

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CHANCE

PROBABILITY

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CHANCE

NOT PART

OF MY KNOWLEDGE

IT IS A PROPERTY OF THE OBJECT

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CHANCE

IT
IS
NOT
POSSIBLE
TO FORECAST OR FORESEE

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PROBABILTY

IT IS A MEASURE OF HOW CERTAIN I AM

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PROBABILTY

IT IS OBTAINED

THROUGH

COMBINATION OF ARGUMENTS

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PROBABILTY

PROBABILITY IS DETERMINED WHEN FOR EACH ARGUMENT THERE IS A WEIGHT

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PROBABILTY

THE SET OF PAIRS ARGUMENT AND ITS WEIGHT IS A BELIEF SYSTEM

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WHEN
THE ARGUMENT IS OBTAINED THROUGH AN IMAGE OR THROUGH A MODEL
I CAN FORECAST

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WHEN

ONE OF THE ARGUMENTS

IS AN EQUATION

AND THE PROBLEM IS OF A SUPERLATIVE

THEN I CAN FORESEE



IF

IN THE BELIEF SYSTEM
I HAVE AS ARGUMENTS
(IMAGE, MODEL AND EQUATION)
I CAN BE CERTAIN

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CYBERWAR: MESSING YOU UP

Reality



Model



F. Carvalho-Rodrigues and J. Dockery, "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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X



F. Carvalho-Rodrigues and J. Dockery, "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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P:X



F. Carvalho-Rodrigues and J. Dockery, "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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$P:X \rightarrow S$



[1] **F. Carvalho-Rodrigues and J. Dockery,** "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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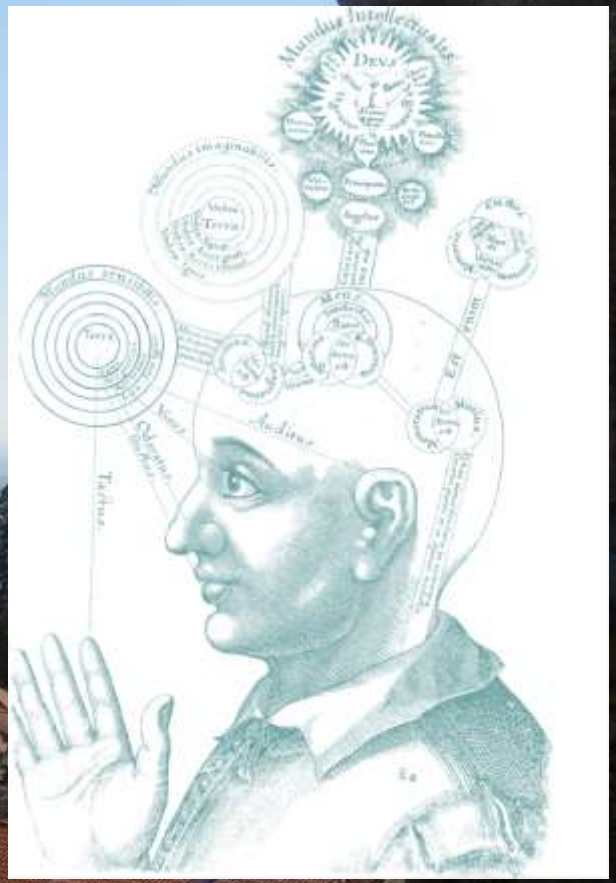

$m:(P:X)$

[1] **F. Carvalho-Rodrigues and J. Dockery,** "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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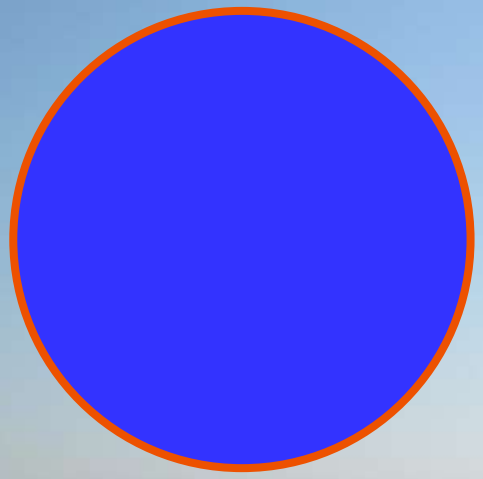


m:(P:X)

Arguments and Weights

Knowledge

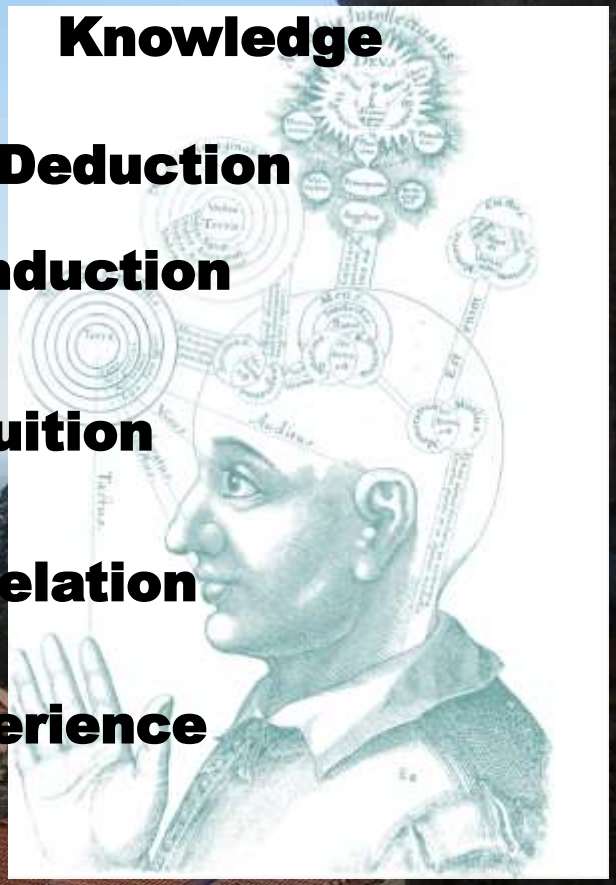
Deduction

Induction

Intuition

Revelation

Experience



[1] **F. Carvalho-Rodrigues and J. Dockery,** "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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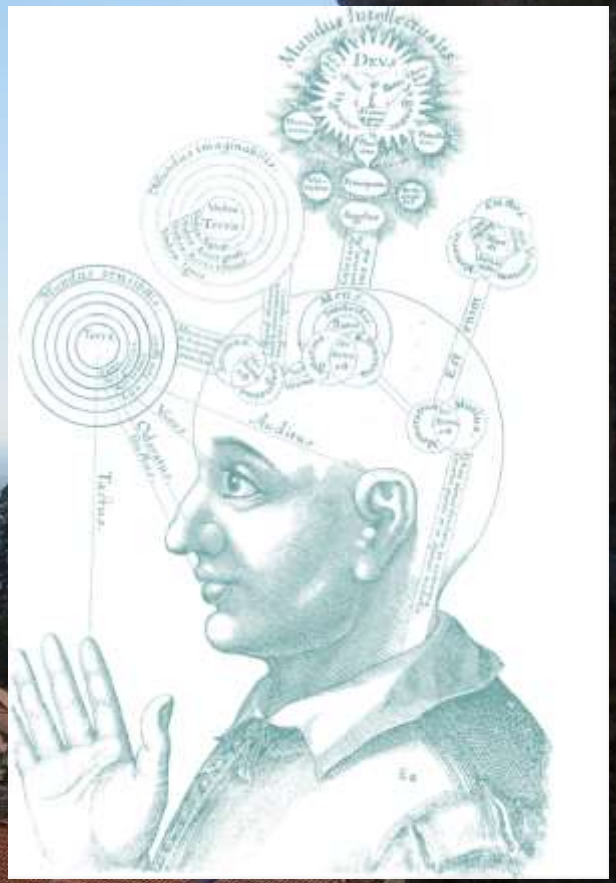
$$m:(P:X)\rightarrow q$$



[1] **F. Carvalho-Rodrigues and J. Dockery,** "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

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$Pcl : X \rightarrow Scl$ $\quad Pds : X \rightarrow Sds$

$mcl : (Pcl : X) \rightarrow qcl$ $\quad mds : (Pds : X) \rightarrow qds$

$mcl : Scl \rightarrow qcl$ $\quad mds : Sds \rightarrow qds$

Reality **Model**







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Distance as Measure of adherence of the Model to Reality

$$\Delta^2 = \sum (q_{cl} - q_{ds})^2$$

Reality



Model

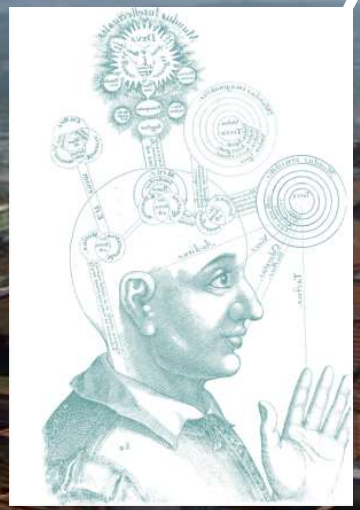


F. Carvalho-Rodrigues and J. Dockery, "Defining systems based on information exchange: structure from dynamics," *Biosystems*, vol. 38(2–3), pp. 229–34, 1996.

Distance as Measure of adherence of the Model to Reality

$$\Delta_{,}^{2} = \lim_{i \to \infty} \sum (q_{,i}^{cl} - q_{,i}^{ds})^2$$

Reality **Model**



$$m_{cl,i} : (P_{,i}^{cl} : X) \rightarrow q_{,i}^{cl}$$

$$m_{ds,i} : (P_{,i}^{ds} : X) \rightarrow q_{,i}^{ds}$$



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$$m_{cl,i} : (P_{cl,i} : X) \rightarrow q_{cl,i}$$

$$m_{ds,i} : (P_{ds,i} : X) \rightarrow q_{ds,i}$$

$$\Delta_{,i}^{2} = \lim_{i \rightarrow \infty} \sum (q_{cl,i} - q_{ds,i})^{2} = 0$$

GENERAL EQUATION FOR THE CONJECTURE OF REALITY



$$\Delta_{,i}^{2} = \lim_{i \to \infty} \Sigma \, (qcl_{,i} - qds_{,i})^{2} = 0$$

POWER LAWS MAXIMIZE ENTROPY IMPOSING A CONSTRAINT

GENERAL EQUATION FOR THE CONJECTURE OF REALITY

$$m_{cl,i} : (P_{cl,i} : X) \rightarrow q_{cl,i}$$

$$m_{ds,i} : (P_{ds,i} : X) \rightarrow q_{ds,i}$$

$$\Delta_{,i}^{2} = \lim_{i \rightarrow \infty} \sum (q_{cl,i} - q_{ds,i})^{2} = 0$$

GENERAL EQUATION FOR THE CONJECTURE OF REALITY

CYBERWAR: MESSING YOU UP



THE OBSERVABLE DATA
IS OBTAINED
BY CONVOLUTION
OF THE BELIEF SYSTEM
WITH THE UNIVERSAL SET OF DATA

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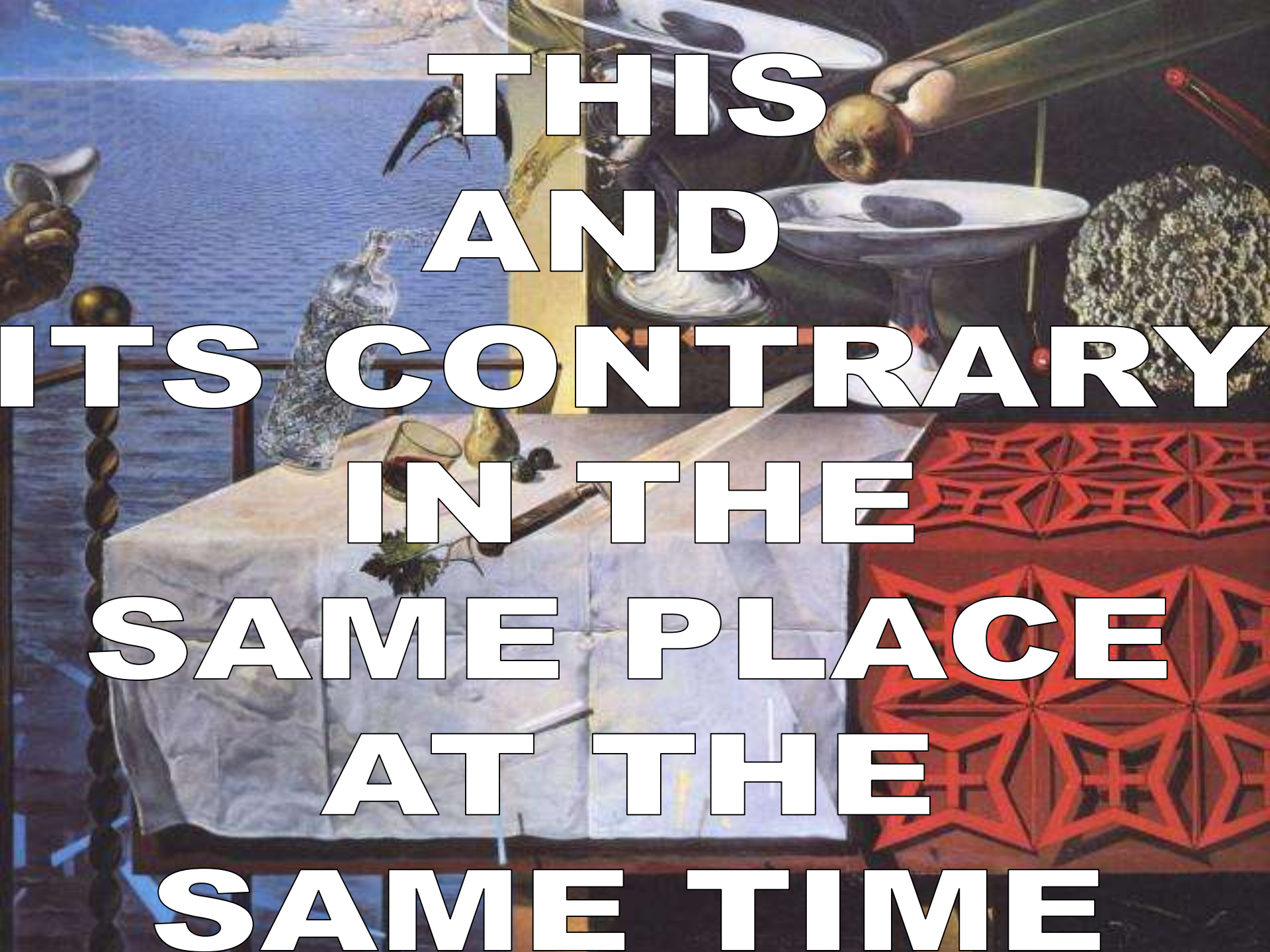
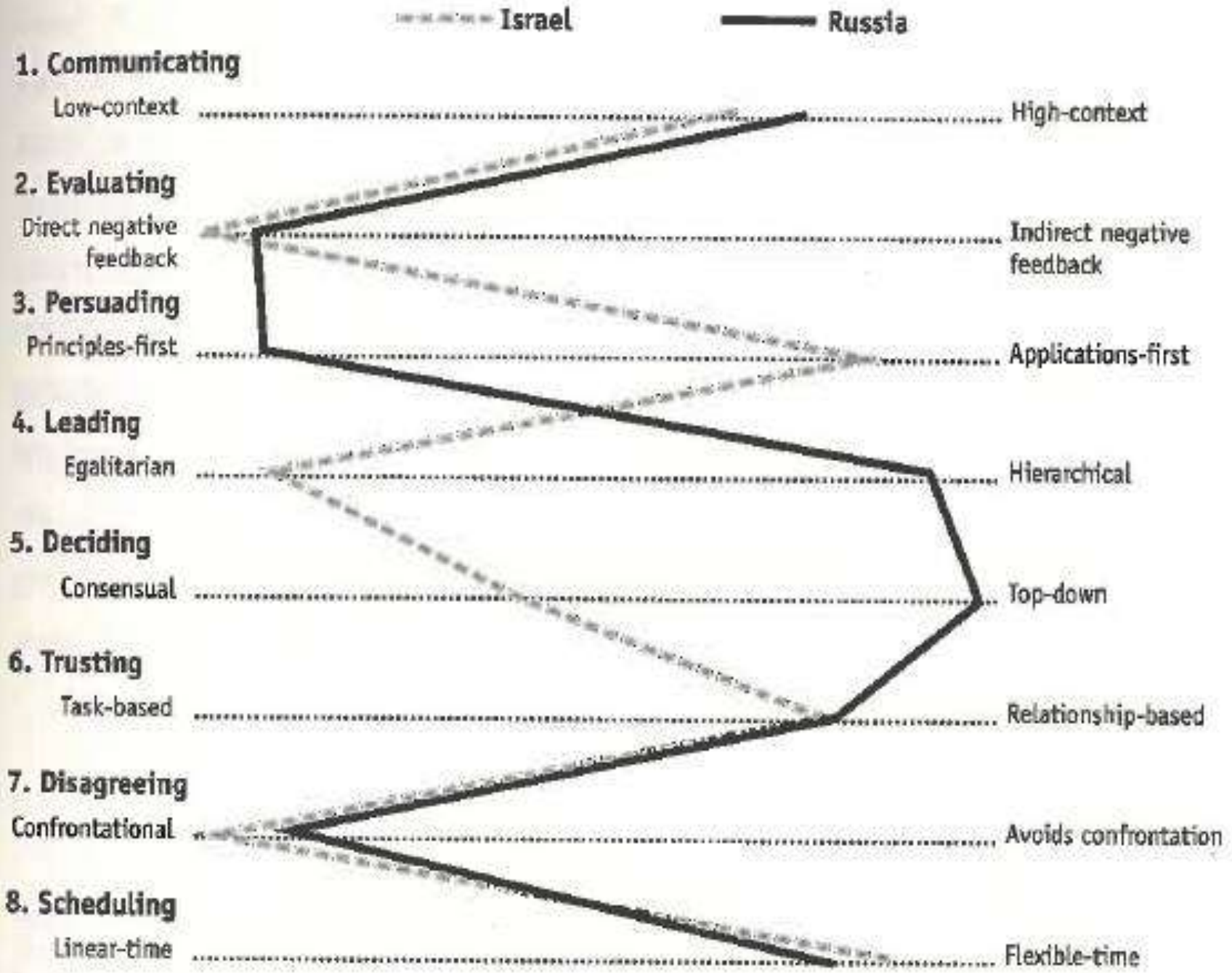
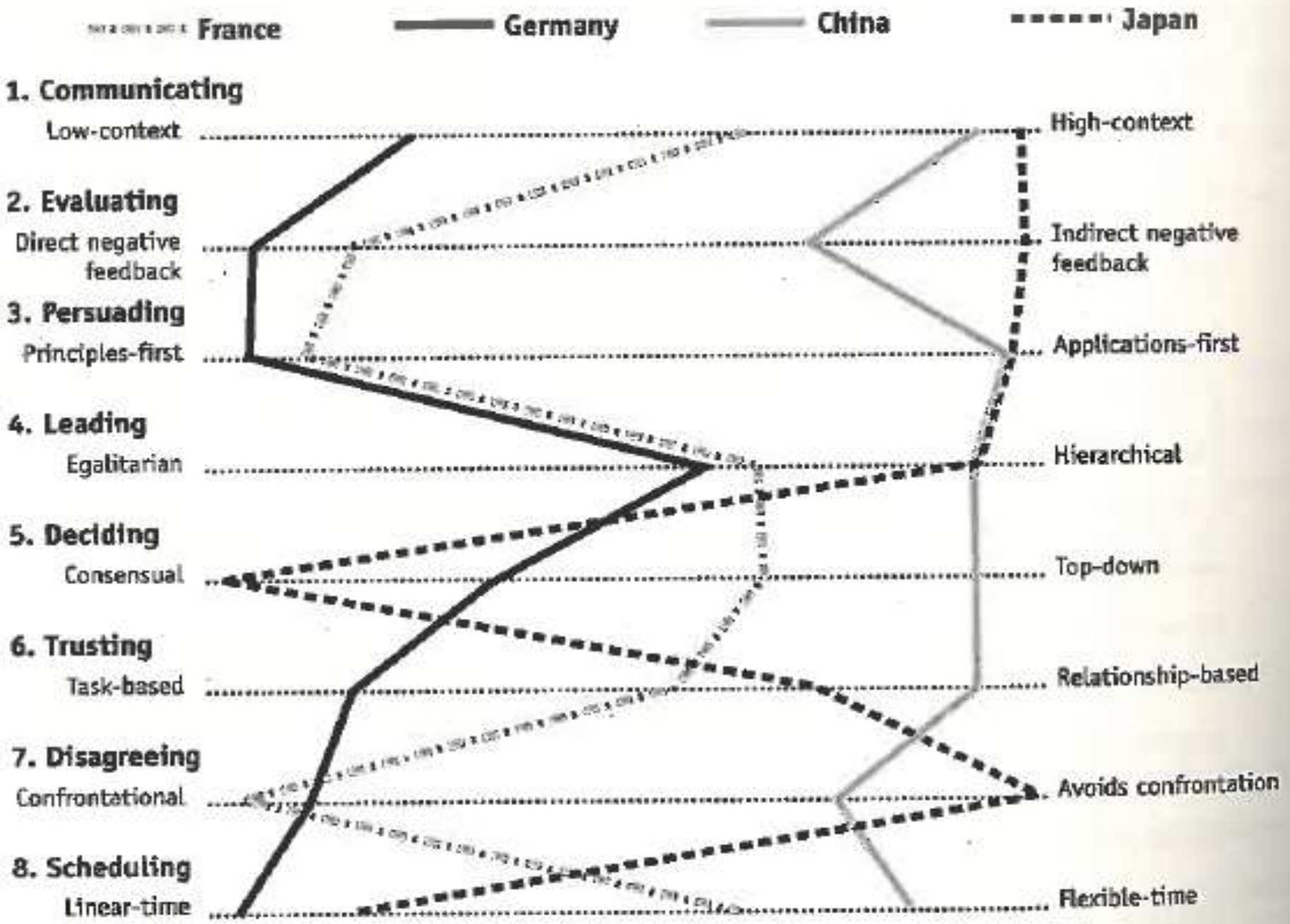
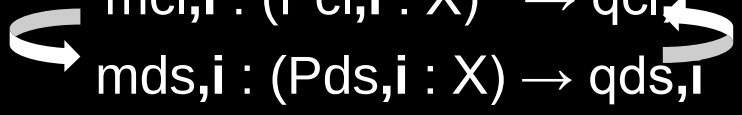

THIS
AND
ITS CONTRARY
IN THE
SAME PLACE
AT THE
SAME TIME


Israel
Russia
1. Communicating
Low-context
High-context
2. Evaluating
Direct negative feedback
Indirect negative feedback
3. Persuading
Principles-first
Applications-first
4. Leading
Egalitarian
Hierarchical
5. Deciding
Consensual
Top-down
6. Trusting
Task-based
Relationship-based
7. Disagreeing
Confrontational
Avoids confrontation
8. Scheduling
Linear-time
Flexible-time


France
Germany
China
Japan
1. Communicating
Low-context
High-context
2. Evaluating
Direct negative feedback
Indirect negative feedback
3. Persuading
Principles-first
Applications-first
4. Leading
Egalitarian
Hierarchical
5. Deciding
Consensual
Top-down
6. Trusting
Task-based
Relationship-based
7. Disagreeing
Confrontational
Avoids confrontation
8. Scheduling
Linear-time
Flexible-time

GENERAL EQUATION FOR THE CONJECTURE OF REALITY



$$\Delta_{,i}^{2} = \lim_{i \to \infty} \Sigma \, (qcl_{,i} - qds_{,i})^{2} = 0$$

IN EACH ITERATION
NEW DATA
GENERATES INFORMATION
THAT PROMPTS CHANGE
IN THE BELIEF SYSTEM

GENERAL EQUATION FOR THE CONJECTURE OF REALITY



$$mcl,\mathbf{i} : (Pcl,\mathbf{i} : X) \rightarrow qcl,\mathbf{i}$$

$$mds,\mathbf{i} : (Pds,\mathbf{i} : X) \rightarrow qds,\mathbf{i}$$

$$\Delta,i^{2} = \lim_{i \rightarrow \infty} \Sigma \, (qcl,_{\mathbf{i}} - qds,_{\mathbf{i}})^{2} = 0$$

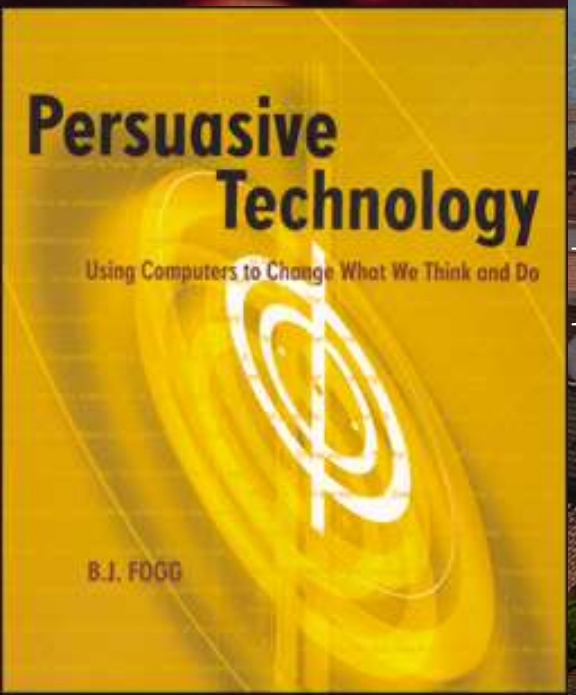
MANIPULATE

DEGRADE

DESTROY

CYBERWAR: MESSING YOU UP





BORN

U

MANUFACTURED

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GENERAL EQUATION
FOR THE
CONJECTURE OF REALITY

CYBER WAR OPS
ELECRTONIC WARFARE
SEPCTRUM MANAGEMENT

$$mcl,\mathbf{i} : (Pcl,\mathbf{i} : X) \rightarrow qcl,\mathbf{i}$$

$$mds,\mathbf{i} : (Pds,\mathbf{i} : X) \rightarrow qds,\mathbf{i}$$

$$\Delta,i^{2} = \lim_{i \rightarrow \infty} \Sigma \, (qcl,_{\mathbf{i}} - qds,_{\mathbf{i}})^{2} = 0$$

MANIPULATE
DEGRADE
DESTROY

GENERAL EQUATION FOR THE CONJECTURE OF REALITY

$$mcl,\mathbf{i} : (Pcl,\mathbf{i} : X) \rightarrow qcl,\mathbf{i}$$

$$mds,\mathbf{i} : (Pds,\mathbf{i} : X) \rightarrow qds,\mathbf{i}$$

$$\Delta,i^{2} = \lim_{\mathbf{i} \rightarrow \infty} \Sigma \, (qcl,_{\mathbf{i}} - qds,_{\mathbf{i}})^{2} = 0$$

CYBERWAR

WHILE PROCESSING DATA IT IS MESSING UP YOUR MIND AND YOUR REALITY

F. Carvalho Rodrigues
UBI, 31st May 2019



CYBERWAR

IV ENCONTRO DOS CLUBES DE ESTUDANTES DA AFCEA EM PORTUGAL

UNIVERSIDADE DA BEIRA INTERIOR
COVILHÃ, 31 DE MAIO DE 2019

STUDENT CLUBS:
COVILHÃ
ALMADA
PORTO

F. Carvalho Rodrigues
UBI, 31 May 2019