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## COMBINATORIAL THEORY OF STOCHASTIC TILING

### *Abstract*

*Stochastic tiles, as described in praevious articles (Lombardo 1994, 2012), make floors (pattern compositions) with continuous drawings, wether the employed tiles are all the same or different. Although the floor drawings are always continuous, different tile compositions make different floor images. A minimal square floor with 4 tiles can generate many different shapes both in the crossings or in the sides of adjacent tiles. Here we analyze all possible combinations of the crossing-shapes, and all possible combinations of the side-shapes. Some minimal compositions of all different crossing shapes, some minimal compositions of all different side-shapes and some other aesthetically relevant compositions are shown as well.*

1- Stochastic tiles, as described in praevious articles (Lombardo 1994, 2012), make floors (patterns) with continuous drawings, wether the employed tiles are all the same or different. Although the floor drawings are always continuous, different tile compositions make different floor images.

2 - Using  $n$  different tiles to fit a floor of  $k$  cells, how many different compositions can we make?

3 - Let us consider a square floor of 4 cells. Each tile can fit any cell in 4 possible orientations: A, B, C, D.

4 - If  $n = 90$  tiles are all different, but not rotatable and not repeatable, a floor with  $k = 4$  cells can be filled in 2.555.190 different ways:

$$k = \frac{n(n-1)(n-2) \dots (n-k)}{k!} = 2.555.190$$

They are as many ways as extracting 4 numbers from the 90 numbers of the Italian LOTTO.

5 – If the different, not rotatable, not repeatable tiles are  $n = 4$ , a floor of  $k = 4$  cells can be filled in  $n!$  ways that are as many ways as mixing a pack of 4 cards:

$$n! = 24$$

6 – If the different tiles are  $n = 4$ , still not rotatable, but now repeatable so that the same tile can be picked many times again, a floor of  $k = 4$  cells can be filled in  $n^k$  ways:

$$n^k = 4^4 = 256$$

7 – If we employ only a single repeatable tile, but now rotatable in  $r = 4$  orientations: A, B, C, D a floor of  $k = 4$  cells can be filled in  $r^k$  ways as well:

$$r^k = 4^4 = 256$$

8 – See in Fig. 2 all the 256 possible 4-cells dispositions of a single tile as schematically designed in Fig. 1a. Here 4 different corner-shapes are schematically represented. See in Fig. 1b a schematic tile in which 4 different side-shapes are represented. The properties of tiles as schematically simplified in Fig. 1 elicit many different floor compositions. A floor of 24 cells using a single rotatable tile can be filled in an incredible number of different compositions:

$$r^k = 4^{24} = 281.474.976.710.656$$

9 – Although all the 256 crossing-shapes in Fig. 2 are different, some of them repeat in 4 different orientations, some repeat in 2 orientations and some never repeat. Let us make analytical lists.

10 – The first and most common crossing-shape group appears 96 times. It is combined of 2 identical corner-shapes adjacent to each other and 2 different corner-shapes adjacent to each other as well. Let us name this group abc. Since all 96 crossing-shapes of this group appear in 4 different orientations, disregarding orientation, the very different crossing-shapes in this group are only 24.

11 – The second most common crossing-shape group appears 48 times. It is combined of 3 identical corner-shapes adjacent to each other and 1 different corner-shape. Let us name this group aab. Since all 48 crossing-shapes of this group appear in 4 different orientations, disregarding orientation, the very different crossing-shapes in this group are only 12.

12 - The third crossing-shape group appears 48 times. It is combined of 3 different corner-shapes, one of which appears twice and in opposite orientation. Let us name

this group  $\underline{abac}$ . Since all 48 crossing-shapes of this group appear in 4 different orientations, disregarding orientation, the very different crossing-shapes in this group are only 12.

13 – The fourth crossing-shape group appears 24 times. It is combined with 2 identical corner-shapes adjacent to each other plus 2 identical corner-shapes adjacent to each other as well. Let us name this group  $\underline{aabb}$ . Since all 24 crossing-shapes of this group appear in 4 orientations, disregarding orientation, the very different crossing-shapes in this group are only 6.

14 - The fifth crossing-shape group appears 24 times. It is combined of 4 different corner-shapes. Let us name this group  $\underline{abcd}$ . Since all 24 crossing-shapes of this group appear in 4 orientations, disregarding the orientation, the very different crossing-shapes in this group are only 6.

15 – The sixth crossing-shape group appears 12 times. It is combined of 2 identical corner-shapes opposite to each other plus 2 identical corner-shapes opposite to each other as well, but different from the first 2. Let us name this group  $\underline{abab}$ . Since all 12 crossing-shapes of this group appear in 2 orientations, disregarding orientation, the very different crossing-shapes in this group are only 6.

16 – The seventh crossing-shape group appears 4 times. It is combined of 4 identical corner-shapes. Let us name this group  $\underline{aaaa}$  (or swastikas). The all 4 crossing-shapes of this group appear only once and they are 4 at all.

17 – See in Tab 1 the full list of the crossing-shape groups:

TAB. 1

Group	Name	Occurrences	Shapes
first	$\underline{aabc}$	96	24
second	$\underline{aaab}$	48	12
third	$\underline{abac}$	48	12
fourth	$\underline{aabb}$	24	6
fifth	$\underline{abcd}$	24	6
sixth	$\underline{abab}$	12	6
seventh	$\underline{aaaa}$	4	4
Totals		256	70

18 – In Tab. 1 we discover that after discarding rotations, only 70 really different crossing-shapes are left over.

19 – Stochastic tiles, when combined to compose floors, do not create shapes only around the tile crossings, but also across the sides of 2 adjacent tiles. A schematically designed tile with 4 different combinable side-shapes is shown in Fig. 1b.

20 – The single repeatable not rotatable tile as in Fig. 1b can fit in rows of 2 adjacent cells, generating 16 different side-shapes. See Fig. 3.

21 - The same 16 different side-shapes occur if the schematic tile in Fig. 1b is fitted in columns of adjacent cells. See Fig. 4.

22 - Simply adding Fig. 3 and Fig. 4, we can list all possible different 32 side-shapes.

23 – Although all 32 possible side-shapes appearing in Figures 3 and 4 are different, they include some identical shapes, in different orientations. Let us make analytical list.

24 – The first side-shape appears 4 times: 2 times in rows AA, CC and 2 times in columns BB, DD. Let us name this group “key-hole”.

25 – The second side-shape appears 4 times: 2 times in rows: AB, DC and 2 times in columns: AD, BC. Let us name this group “glass”.

26 – The third side-shape appears 2 times: one in rows AC, one in columns BD. Let us name this group “butterfly”.

27 – The fourth side-shape appears 4 times: 2 times in rows: AD, BC and 2 times in columns BA, CD. Let us name this group “funnel”.

28 – The fifth side-shape appears 4 times: 2 times in rows BA, CD and 2 times in columns CB, DA. Let us name this group “racket”.

29 – The sixth side-shape appears 4 times: 2 times in rows: BB, DD and 2 times in columns AA, CC. Let us name this group “nail”.

30 - The seventh side-shape appears 2 times: one in rows BD, one in columns CA. Let us name this group “stick”.

31 – The eighth side-shape appears 2 times: one in rows CA, one in columns DB. Let us name this group “eye-glasses”.

32 - The ninth side-shape appears 4 times: 2 times in rows CB, DA and 2 times in columns AB, DC. Let us name this group “tree”.

33 - The tenth side-shape appears 2 times: one in rows DB, one in columns AC. Let us name this group “reel”.

34 - See in Tab 2 a full list of the 10 side-shapes:

TAB. 2

Order	Name	Occurrences	Shapes
First	Key-hole	4	1
Second	Glass	4	1
Third	Butterfly	2	1
Fourth	Funnel	4	1
Fifth	Racket	4	1
Sixth	Nail	4	1
Seventh	Stick	2	1
Eighth	Eye-glasses	2	1
Ninth	Tree	4	1
Tenth	Reel	2	1
Total different combinatorial occurrences: 32. Different shapes: 10			

35 - It is not obvious to construct a minimal floor employing all 32 side-shapes without repetitions. Such a remarkable minimal floor is shown in Fig. 5a. It contains 21 cells, but its perimetral geometry makes it impossible to fit in a periodical tiling. To make it possible a minimal floor with a different perimetral geometry, but employing 22 cells is shown in Fig. 5b. The orientation of the tiles (A, B, C, D) is shown in Tab. 3.

TAB. 3

1 tile, minimal compositions creating all 32 possible different side-shapes, rotations admitted										
D	D	B				D	D			
D	A	A	C	A		D	A	A	C	A
B	A	B	B	D			A	B	B	D
	C	B	C	C			C	B	C	C
	A	D	C	D			A	D	C	D
										B
										A

36 – It is not obvious either to construct a minimal floor in which all 10 really different side-shapes occur, discarding rotations and repetitions. Such remarkable minimal floor compositions are shown in Fig. 6a and Fig. 6b containing 8 cells, 10 side-shapes and 3 crossing-shapes. The orientation of the tiles is shown in Tab. 4 and Tab. 5.

TAB. 4

1 tile, minimal compositions creating all 10 possible side-shapes, no rotations, n. 1														
	A	C			B	D			C	A			D	B
D	A	A		A	B	B		B	C	C		C	D	D
B	C	D		C	D	A		D	A	B		A	B	C

TAB. 5

1 tile, minimal composition creating all 10 possible side-shapes, no rotations, n. 2													
A	D			B	A			C	B			D	C
A	A			B	B			C	C			D	D
B	D			C	A			D	B			A	C
D	B			A	C			B	D			C	A

37 – The tile orientations of a floor composition of 70 cells in which 54 really different crossing-shapes occur only once, discarding rotations, is shown in Tab. 6. See also in Tab. 7 a group of 4 rectangular floors, plotting 24 tiles (6 x 4) forming 15 really different crossing-shapes. The orientation of the tiles is shown in Tab. 7.

TAB. 6

1 tile, 70-cells, 54 very different crossing-shapes, no repetitions, no rotations									
D	D	C	C	D	A	D	C	D	B
B	B	C	D	B	A	A	B	B	B
A	D	B	A	C	C	C	A	B	B
C	C	B	B	A	A	B	D	C	C
B	B	C	D	B	D	D	C	C	A
B	C	A	D	D	D	A	D	A	C
A	D	B	A	C	C	B	B	D	D

TAB. 7

1 tile, 24-cells, 15 different crossing-shapes, no repetitions, no rotations																		
A	D	C	B		C	C	B	D		B	D	B	C		D	D	B	D
D	B	C	C		C	B	C	B		A	B	D	A		A	D	B	D
C	C	A	D		A	A	D	B		D	C	C	B		A	A	D	A
A	C	D	D		A	B	C	A		D	D	B	B		C	A	D	C
A	B	A	B		D	A	C	B		B	A	B	D		C	A	C	D
C	D	A	B		A	D	C	B		B	A	C	A		A	A	C	B

38 – Remarkable compositions of crossing-shapes and side-shapes are also shown in Tab. 8, Tab. 9, Tab. 10, Tab. 11 and Tab. 12 using 1, 2, 3, or 4 different tiles.

TAB. 8

1 tile, 24-cells, 15 crossing-shapes never repeated, 38 side-shapes creating all 32 possible side-shapes, 6 of which are repeated in different rotation.																			
B	B	D	B	C	A		A	A	C	A	B	D		D	D	A	A	C	A
B	C	C	A	A	B		A	B	B	D	D	A		D	B	A	B	B	D
D	C	D	D	A	C		C	B	C	C	D	B		A	A	C	B	C	C
B	A	D	A	C	B		D	D	C	D	B	A		B	C	A	D	C	D

TAB. 9

2 tiles, 12 cells, all 16 possible side-shapes, 1 of which occur twice differently rotated																		
1B	2D	1D	2D		1C	2A	1A	2A		1D	2B	1B	2B		1A	2C	1C	2C
2A	1D	2A	1B		2B	1A	2B	1C		2C	1B	2C	1D		2D	1C	2D	1A
1C	2C	1D	2D		1D	2D	1A	2A		1A	2A	1B	2B		1B	2B	1C	2C

TAB. 10

2 different tiles, 31 (left) and all possible (right) different side-shapes, no repetitions, no rotations													
2C	2D	2D	1C	2B					2C	2D	2D	1C	2B
2A	1D	2B	1D	1C					2A	1D	2B	1D	1C
2C	1A	2C	1B	2B				1C	2C	1A	2C	1B	2B
1C	1C	2D	2A	2B		1D	1D	1A	1C	1C	2D	2A	2B

Tab. 11

2 different tiles, 21 cells, 32 different side-shapes, no repetitions, no rotations														
1A	1C	2B	2B	1D	1B	2B		1B	1D	2C	2C	1A	1C	2C
2B	1B	1C	2D	2B	1C	1B		2C	1C	1D	2A	2C	1D	1C
2B	2C	1C	1A	2C	2D	1B		2C	2D	1D	1B	2D	2A	1C

TAB. 12

4 different tiles, 63 cells, 48 different crossing-shapes, 110 different side-shapes, no repetitions, no rotations								
1C	1A	4B	2B	3C	4C	3B	1D	3C
1A	1A	2A	2A	3A	3A	4A	4A	3A
1C	2A	2C	3A	3C	4A	4C	1A	3B
2B	2A	3B	3A	4B	4D	1A	1B	3C
2C	3C	3A	4C	4A	1A	3A	1A	2B
1A	4D	2A	1C	3A	2C	4D	4D	3A
3D	2A	4D	2D	1A	4A	1C	2C	2B

39 – Many always changing corridors were composed changing tiles and their orientations. Some were shown in praevious exhibitions (Calvesi, Mirolla 1995). See in Tab. 13 and Tab. 14 new corridors never repeating either in side-shapes or in crossing shapes (the different tiles are represented with different numbers). See in Tab. 15 and 16 compositions with 3 different tiles without either side-shapes or crossing-shapes repetitions.

TAB. 13

Allways changing corridor, neither repeating side-shapes or crossing shapes								
	2B	2B	1C	2A	1B	1B	3C	1A
1D	2D	1A	2A	3D	1D	3A	1A	
	1A	2B	1A	2C	3A	1B	3A	1C

TAB. 14

Allways changing corridor, 5 different tiles, 48-cells, 33 crossing-shapes, 83 side-shapes, no repetitions, no rotations											
2D	1B	2C	1A	1A	3C	3A	4C	3D	4B	4B	5D
1D	2A	1A	1C	3D	1C	4A	3B	4B	4D	5A	4D
2A	1B	2A	3C	1C	3B	3B	4C	3B	5D	4D	5C
1A	2C	3C	1A	3D	1B	4B	3D	5D	4B	5A	4C

TAB. 15

3 different tiles, 24 cells, 38 side-shapes, no repetitions, no rotations																			
1A	2A	3A	1C	2A	1B		1A	2A	3A	1C	2A	3C		1B	2A	3A	1C	2A	3C
3A	1A	2B	3C	1B	1C		3A	1A	2B	3C	1B	1B		3A	1A	2B	3C	1B	1C
2C	3C	1A	2A	3B	3D		2C	3C	1A	2A	3B	1C		2C	3C	1A	2A	3B	3D
1A	2C	3D	1C	2C	3A		1A	2C	3D	1C	2C	3A		1A	2C	3D	1C	2C	3A

TAB.16

3 different tiles, 28 cells (4 x 7), 45 side-shapes, no repetitions, no rotations.						
1D	2A	2D	1B	3A	3D	1D
1A	2A	2A	1C	3A	3A	1D
1C	2B	2D	1D	3B	3D	1C
1A	2B	2B	1B	3D	3B	1C

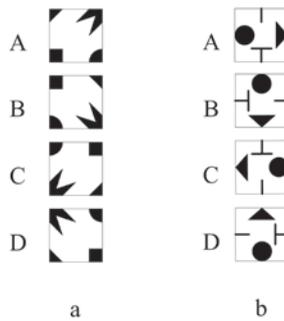


Fig. 1 - a: schematic corner shapes - b: schematic side shapes

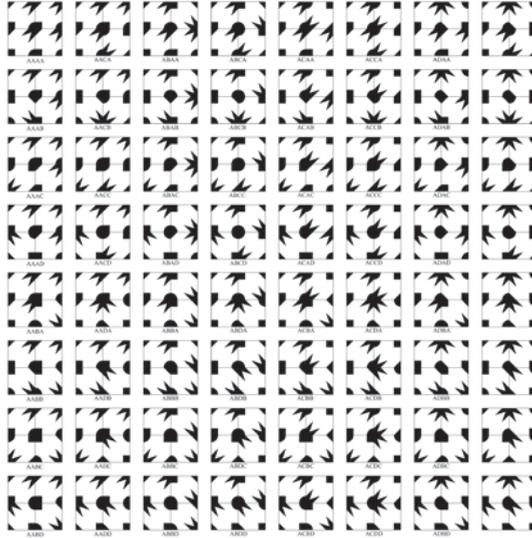


Fig. 2a - all 256 possible tile-crossings (1-64)

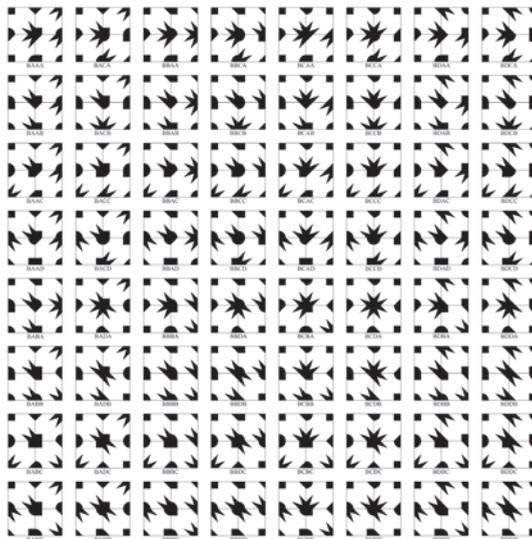


Fig. 2b - all 256 possible tile-crossings (65-128)

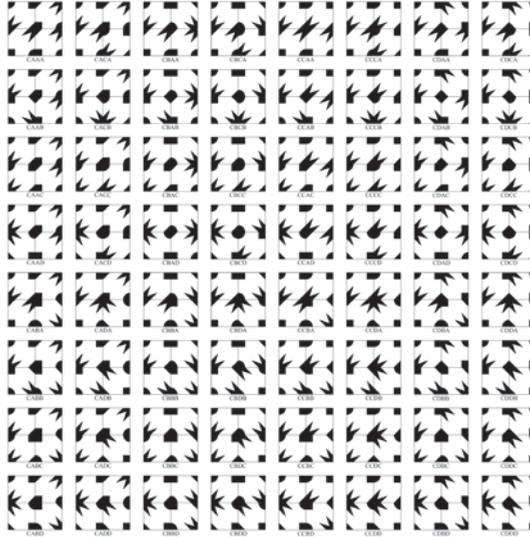


Fig. 2c - all 256 possible tile-crossings (129-192)

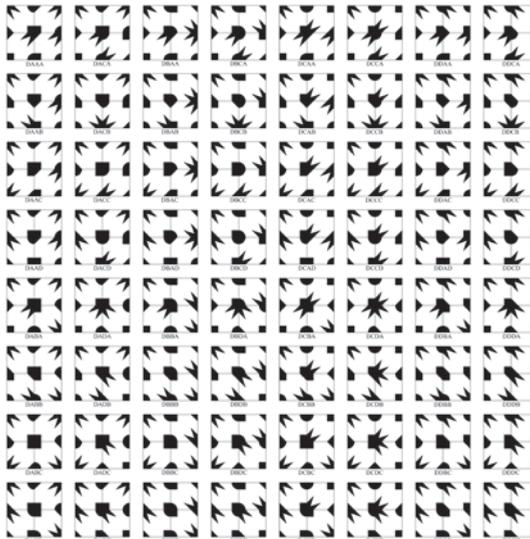


Fig. 2d - all 256 possible tile-crossings (193-256)

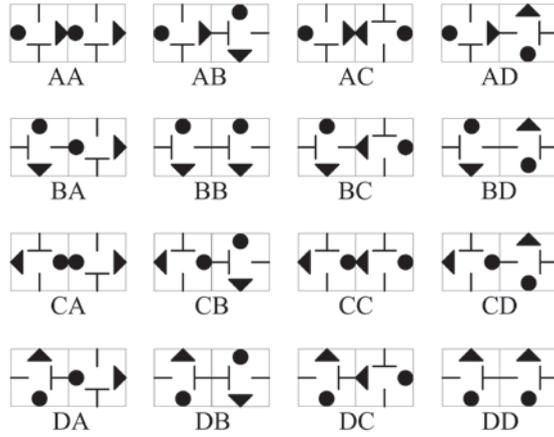


Fig. 3 - all possible side-shapes in rows of 2 tiles

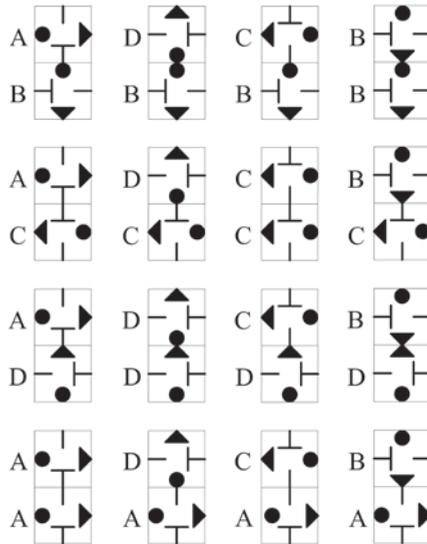


Fig. 4 - all possible 16 side-shapes in columns of 2 tiles

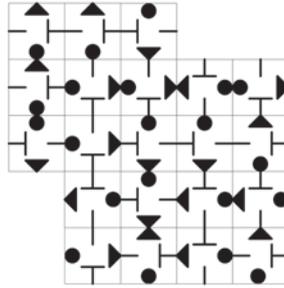


Fig. 5a - all 32 possible different side-shapes in a floor of 21 cells

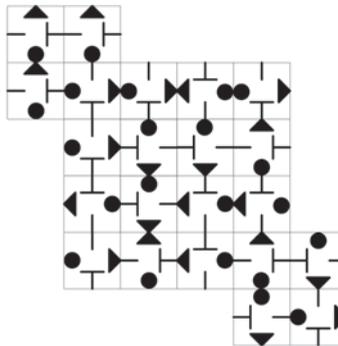


Fig. 5b - all 32 possible different side-shapes in a floor of 22 cells

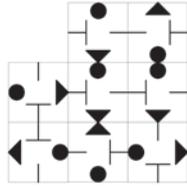


Fig. 6a - all 10 different side-shapes

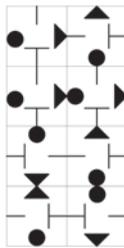


Fig. 6b - all 10 different side-shapes

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## “POP IN ITALY” - CONVERSAZIONE CON SERGIO LOMBARDO AL PHILADELPHIA MUSEUM OF ART

### *Abstract*

*This is the transcription of a talk held in 2016 the 23RD of march at the Philadelphia Museum of Art during the exhibition “International Pop”. After a presentation of Carlos Basualdo, Keith L. and Katherine Sachs Curator of Contemporary Art at the PMA, and an introduction of Erica F. Battle, The John Alchin and Hal Marryatt Associate Curator of Contemporary Art at the PMA, Luigia Lonardelli, Curator of Contemporary Art at MAXXI museum in Rome, talks with Sergio Lombardo, a protagonist of the roman and international artistic scene in the early Sixties. The italian translation was curated by the Unosunove Gallery in Rome.*

CARLOS BASUALDO  
Keith L. and Katherine Sachs Curator of Contemporary Art at the PMA

### **Presentazione**

Oggi sono qui più come un ospite e vorrei dire solo alcune parole prima di Erica Battle, curatrice e organizzatrice dell'allestimento di questa splendida mostra che è “International Pop”. Mi sento molto vicino a questo particolare tipo di conversazioni e sono onorato di poter presentare Sergio Lombardo e Luigia Lonardelli. Sergio Lombardo è uno degli artisti presenti nella mostra International Pop qui ospitata con

un quadro che è una rappresentazione molto potente della figura di J. F. Kennedy. Lombardo è uno dei protagonisti della scena romana degli anni Sessanta e quando in Italia si dice Pop, si dice Roma. Il Pop a Roma è qualcosa di differente rispetto al Pop a New York o a Londra perché questa tendenza viene declinata in un contesto completamente diverso sia dal punto di vista storico che artistico, dove la risonanza della tradizione culturale era molto diversa rispetto a quella delle altre capitali. Basti pensare all'età d'oro del cinema italiano di quegli anni. A quel tempo Sergio fu un protagonista e un agitatore e ci parlerà della maniera originale con cui il Pop è stato inteso in quel contesto così differente. E sarà accompagnato dal suo Virgilio (o Beatrice?), Luigia Lonardelli, storica dell'arte e curatrice di Roma, con cui ho avuto il piacere di lavorare quando ero curatore al MAXXI. In quel periodo ho potuto ascoltare da lei molti racconti sulla storia dell'arte italiana e credo, quindi, che sia la persona perfetta per accompagnare Sergio in questa conversazione, che è un peccato non si possa tenere in italiano. A nome del Philadelphia Museum of Art ringrazio nuovamente Sergio e Luigia per essere qui stasera e lascio la parola a Erica Battle.

ERICA F. BATTLE

The John Alchin and Hal Marryatt Associate Curator of Contemporary Art at the PMA

### **Introduzione**

Grazie a tutti per essere qui oggi e un grazie particolare a Sergio Lombardo, protagonista e agitatore della scena romana, e a Luigia Lonardelli con cui convergerà. La mostra che potete vedere al piano superiore parte da un obiettivo: dare una nuova cornice all'idea di Pop Art allargandola ad altre espressioni locali come, appunto, il "roman vernacular of Pop" che sarà un'emozione poter conoscere oggi attraverso questa conversazione.

[ringraziamenti ad altre istituzioni per la realizzazione della mostra e degli eventi collaterali]

Un po' di informazioni in più su Sergio Lombardo e sul suo background. Lombardo ha una lunga carriera artistica alle spalle che può essere descritta attraverso una programmatica discontinuità. Inizia la sua carriera artistica nel 1958 con i Monocromi e poi si sposta sulla serie dei cosiddetti Gesti tipici nei primi anni Sessanta, opere che prendono spunto dalle immagini degli uomini politici riprodotte dai media. Ne è un grande esempio il J. F. K. esposto in mostra. Alla metà degli anni Sessanta, Lombardo espande i suoi interessi passando dal bianco e nero al colore. Le serie successive su cui Lombardo lavora sono degli studi geometrici per oggetti in legno e progetti concettuali che accolgono il ruolo del caso all'interno del processo. Dovete sapere che Lombardo ha anche studiato Psicologia e il suo interesse nello studio della Psicologia si riflette nel lavoro del centro studi Jartrakor, da lui fondato a Roma nel 1977.

Luigia Lonardelli viene dal MAXXI di Roma. Ha studiato Storia dell'Arte Contemporanea a Firenze e a Siena. È uno dei curatori della Quadriennale di Roma che aprirà nel prossimo ottobre. Dal 2005 collabora con il Mibact e ha partecipato all'inaugurazione del MAXXI nel 2010.

Sono molto emozionata di averla qui stasera per poter parlare dell'ambiente artistico romano e italiano del secondo dopoguerra.

La conversazione durerà circa trenta minuti e saremo poi aperti alle domande del pubblico. Mettetevi comodi e godetevi la conversazione. Grazie mille.

#### LUIGIA LONARDELLI (LL)

Grazie a Carlos e a Erica, dopo questa introduzione ora dovremo per forza dire qualcosa di molto intelligente! Prima di iniziare a parlare con Sergio, vi do alcuni riferimenti sulla situazione storica e sociale dell'Italia, e di Roma in particolare, all'epoca. Pensando all'Italia degli anni Cinquanta dovete immaginare una situazione di dopoguerra in cui erano in atto fondamentali transizioni per lo sviluppo delle condizioni sociali, culturali ed economiche. Ciò di cui parleremo sarà molto legato all'idea di una "identità sociale" del popolo italiano di quel periodo. Il Paese passò improvvisamente a una forma di modernità che, probabilmente, arrivò troppo rapidamente per quel tipo di società. Questo portò alla disintegrazione delle comunità rurali basate sull'idea della famiglia. Tutto virò verso l'attenzione al singolo individuo e ciò avvenne in maniera particolare a Roma. Perché Roma aveva vissuto un vero e proprio periodo di miseria nell'immediato dopoguerra, ma in un paio d'anni questa situazione fu sostituita e rinnovata con lo sbocciare di campagne pubblicitarie legate sia allo sviluppo economico che al nuovo bisogno di beni. Questo portò a una differente percezione della città, delle strade di Roma. Le differenze fra le varie correnti Pop vanno proprio ricercate soprattutto nei differenti contesti sociali a cui si riferiscono e il Pop a Roma va inteso come una reazione attraverso le immagini a questa particolare situazione.

Gli artisti romani di quel periodo, riuniti nella cosiddetta "Scuola Romana", iniziarono ad essere ossessionati dalla nascita di nuovi media e materiali: il nuovo utilizzo dei vecchi mezzi di espressione rifletteva una sorta di conflitto interno, una sorta d'interazione con un altro modo di utilizzare le immagini. Sergio Lombardo era una delle figure più importanti di questa scena romana, probabilmente una delle più eminenti. Egli, come ha accennato Erica, viene da differenti aree di interesse, come la Psicologia, che lo ha portato a costituire un gruppo di ricerca che univa la psicologia sperimentale alle pratiche artistiche. Oggi è ancora un punto di riferimento per le nuove generazioni, anche per aver insegnato Teoria della Percezione, Psicologia della Gestalt e Psicologia dell'Arte all'Accademia di Belle Arti di Roma dall'inizio degli anni Ottanta.



Fig. n. 1 Sergio Lombardo: "Bianco 49" 1960



Fig. n. 2 Sergio Lombardo: "John F. Kennedy" 1962/3

Quindi, partiamo dall’inizio. Nei primi anni Sessanta, prima dei Gesti Tipici, di cui appunto uno è esposto qui per la mostra, hai lavorato per alcuni anni sull’idea del monocromo. In un intervallo di soli due anni vediamo due direzioni della tua ricerca molto differenti. Dunque, la mia prima domanda è: cosa è successo in questi due anni?

SERGIO LOMBARDO (SL)

In realtà questa domanda è legata a un importante problema. Dovrei parlare di tutta la mia teoria estetica, perché dal mio punto di vista la differenza fra i Monocromi e i Gesti Tipici non era così grande. In effetti, io non ho mai voluto mantenere lo stesso stile apparente, ma ho voluto mantenere e sviluppare alcuni principi estetici basilari. In questo caso ambedue i dipinti, dalle serie dei Monocromi e dei Gesti Tipici, contengono gli stessi principi estetici di cui il primo è l’ “astinenza espressiva”. È molto difficile da spiegare perché tutti pensano che l’artista debba esprimere se stesso. Io ho rovesciato il significato della relazione fra il pubblico e l’artista perché non ho mai voluto esprimere me stesso. Ho proceduto più come uno scienziato, o un estetologo empirico, che voleva investigare su cosa fosse o non fosse l’arte. Non ho mai provato a rendere il mio lavoro riconoscibile, non volevo questo. Volevo che il mio lavoro potesse scoprire qualcosa di nuovo sulla scia del Futurismo, cioè sulla scia della creazione di nuovi valori. Già i Futuristi avevano ribaltato la posizione del pubblico e dell’artista, provocando il pubblico con varie strategie. Per esempio, vendevano il biglietto di uno stesso posto a teatro a differenti persone, in modo che si dovesse discutere e lottare per avere il posto. In questo modo erano gli spettatori che esprimevano sé stessi: l’artista era un provocatore, ma un provocatore “scientifico”. Questo distacco scientifico è la fondamentale differenza fra il Futurismo e il Surrealismo, perché i Surrealisti, pur amando e quasi mimando la psicoanalisi, si identificavano però con i pazienti, non con l’analista, e dovevano parlare, parlare, parlare... di tutto ciò che veniva fuori dall’inconscio, arrivando al non-senso. Per i Surrealisti questo esprimere sé stessi in automatico fu giudicato essere arte, il vero compito dell’arte. Al contrario i Futuristi si identificarono con gli scienziati, con lo psicoanalista. Lo psicoanalista è uno scienziato che provoca il paziente, egli non dice niente, sembra quasi non comunicare all’inizio, perché aspetta che sia il paziente a esprimersi. Questo capovolgimento del metodo è avvenuto anche nell’arte e io ho provato a continuare su questa linea.

LL:

Sergio, dicci qualcosa di più su questa idea di un’eredità futurista nella Pop Art italiana e anche di una sorta di minimalismo. Voglio dire, la tua opera qui non ha nessun contenuto e vuole in qualche modo provocare la reazione del pubblico

SL:  
Sì

LL:

Ma parlando del soggetto, che è molto simile ad altri soggetti Pop, possiamo dire che sviluppa un'idea per cui sentiamo la presenza di un essere umano, di una persona viva che utilizza i media, come appunto i politici che usavano i media

SL:

Di solito nella Pop Art il soggetto riguarda un tema legato alla merce, o a oggetti in vendita. Io ero interessato solo alla gente, alle persone reali e ai loro gesti che mi sembravano importanti, così come erano importanti le persone che li compivano: ho guardato agli atteggiamenti dei politici che erano diventati una sorta di vocabolario per tutto il resto della gente. I mass-media hanno cambiato le relazioni fra le persone, perché prima dell'esplosione dei mass-media noi eravamo molto più curiosi verso le altre persone dato che non potevamo indovinare che tipo di persona era una persona che non conoscevamo o che vedevamo per la prima volta. Dopo la nascita della cultura mass-mediatica, guardiamo i gesti o i vestiti e già conosciamo la classe sociale e riceviamo molte altre informazioni riguardanti quella persona. Così non siamo più curiosi, non dobbiamo più parlare con le persone per conoscerle. Questi atteggiamenti, come ad esempio quelli dei politici che ho provato a studiare, erano spaventosi in un certo senso...



Fig. n. 3 Sergio Lombardo nel suo studio nel 1961 (F.to M. Dondero, archivio)

LL:

Perciò tu hai ingigantito queste figure, che sono molto ingrandite, così tanto da essere fuori dalla realtà...

SL:

Molto spesso sono più grandi della realtà, riproponendo in un certo senso la differenza di mole che c'è fra un bambino e un adulto. Nella psicoanalisi gli adulti, i genitori del bambino, sono chiamati “i giganti” proprio per la loro differente mole. Un politico ha una autorità che appare superiore a quella di una persona normale e i suoi gesti perentori sono molto spaventosi e impressionanti. Quindi io ho copiato e enfatizzato questi gesti perché volevo che la gente guardasse i quadri non perché fossero dei bei quadri, ben dipinti. Non ho mai studiato pittura...

LL:

Ho intenzionalmente tralasciato questa informazione perché non ero sicura che Sergio ne volesse parlare, ma ora lo ha detto!

Parliamo un po' della Biennale di Venezia del 1964, una mostra cruciale che da molti studiosi è stata considerata una sorta di shock per gli artisti europei con il successo degli artisti americani come Robert Rauschenberg (che vinse il Leone d'Oro), Jim Dine, Jasper Johns. Lasciami citare una tua affermazione dei primi anni Novanta: il padiglione italiano era «una barriera di canne contro una valanga».

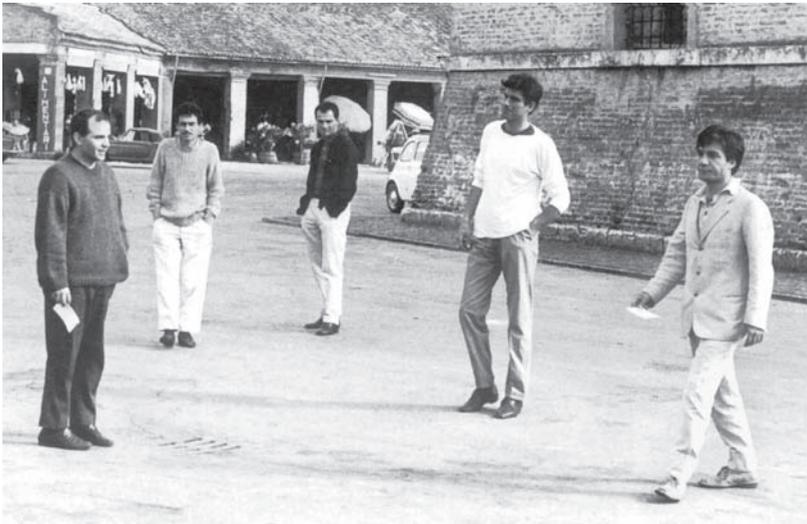


Fig. n. 4 Viaggio di gruppo a Venezia nel 1964. Da sinistra: Mario Diacono, Jannis Kounellis, Mario Ceroli, Renato Mambor e Sergio Lombardo.



LL:

Sergio, lasciami tradurre una frase all’inizio di questo catalogo (*Fig. n. 5*).

Questo testo è di Lombardo: «Ci viene proposto oggi, oltre e attraverso l’esperienza informale, un nuovo rapporto con la realtà e una nuova possibilità per l’immagine». Penso che, di fatto, questo sia lo stesso modo di approcciare la realtà e credo che esistesse a quel tempo uno specifico linguaggio artistico italiano. Tu pensi questo? Dato che abbiamo parlato di nazionalità e di “migrazioni” culturali.



Fig. n. 6 Sergio Lombardo retrospettiva alla galleria Multhipla, Milano 1974.

SL:

Dopo la seconda guerra mondiale in Italia non c’era alcun tipo d’identità, non c’era nessun leader, non c’era nessun ideale da seguire. È per questo che ho provato a iniziare da zero, dall’annullamento, dal nulla. E solo il Futurismo era disponibile...

LL:

...come eredità il Futurismo era l’unica rimasta rispetto a quello che si era detto in precedenza. Pensi ci fosse una differenza più legata agli artisti o più alla società rispetto agli americani?

SL:

La differenza era solamente nel sistema dell'arte e nella politica. Noi eravamo un piccolo gruppo di sovversivi mentre gli americani erano una sorta di artisti di Stato. John Kennedy aveva un dipinto di Rauschenberg dietro la sua scrivania. Questa era la differenza che ci opponeva. Il governo italiano non ci considerava artisti. Posso raccontarvi che nel 1964 ci fu un allagamento nel mio studio che danneggiò alcune tele e persi la causa perché il giudice sentenziò che non erano opere d'arte.



Fig. n. 7 Sergio Lombardo: "Charles De Gaulle" 1961/2 esposto alla galleria Jartrakor.

LL:

Hai avvicinato in qualche modo il sistema americano?

SL:

Si certo. Noi eravamo amici anche con Ileana Sonnabend, che era moglie di Leo Castelli. Lei fece esporre e offrì un contratto a Mario Schifano e provò a entrare in società con Plinio De Martiis, il direttore de La Tartaruga, ma lui rifiutò. Allora Ileana Sonnabend mi chiese personalmente di avere 600 miei dipinti gratuitamente prima di poter iniziare a lavorare con me. Gli americani avevano una scala differente rispetto al mercato.

LL:

E tu cosa hai fatto?

SL:

Ho rifiutato, ovviamente.

LL:

Ciò immagino si riferisse a dei prototipi, perché 600 pezzi...

SL:

600 pezzi gratis, non avrei avuto nemmeno i soldi per comperare le tele!

LL

Sergio, ci hai detto che eri interessato a come personaggi potenti, quali i politici, utilizzavano i media per veicolare i loro messaggi e mi chiedo se i tuoi Gesti Tipici potessero agire da esempi da emulare per gli stessi protagonisti dei quadri. Questo mi rimanda alla tua teoria dell'Eventualismo che si basa sullo studio delle reazioni rispetto ad alcuni tipi di immagini. Pensi ci fosse una situazione particolare nel settore negli anni Sessanta?

SL:

I Gesti Tipici non vanno guardati in contemplazione, come per gustare la bellezza di un'opera d'arte. Erano inseriti all'interno di una situazione reale e la cambiavano, influenzavano le persone in modo che non fossero più le stesse vicino ai Gesti Tipici perché si sentivano osservate. Questi dipinti non furono fatti per rappresentare un mondo virtuale, per mostrare una “finzione artistica”, ma per entrare nella realtà e quindi per cambiare la vita reale. L'Eventualismo come teoria afferma che l'evento è un'esperienza fatta da uno spettatore che non è più uno spettatore passivo, in quanto non riceve i contenuti preconfezionati dell'artista, ma diventa un “usatore”: egli usa l'opera d'arte come un utensile, uno stimolo a cui reagire, creando così un involontario vissuto e un comportamento che è interessante studiare.

LL:

Mi hai raccontato che alcuni visitatori ebbero delle reazioni rispetto a queste figure.

SL:

Sì, questo era un effetto che conoscevo a quel tempo ma che studiai più tardi. In psicoanalisi si chiama “effetto Poëtzl”. Quando vedi qualcosa, per un breve momento, che non afferra subito, hai un effetto subliminale che ti porterà a sognarla. Se quell'immagine la contemplassi non la sogneresti. Il fatto che i Gesti Tipici non sono dipinti per essere qualcosa di “artistico” da contemplare permette la possibilità per il pubblico di sognarli. Molti anni dopo ho usato questa regola per creare un'altra opera, uno Specchio Tachiscopico per cui le persone che lo usavano sognavano la notte successiva la loro “vera” immagine. L'ho fatto nel 1979.



Fig. n. 8 Sergio Lombardo, installazione del “Supercomponibile” alla galleria La Salita nel gennaio 1968.

LL:

Alla metà degli anni Sessanta, hai continuato a lavorare su questa idea di provocare una reazione con i cosiddetti Supercomponibili. In qualche modo anche qui possiamo notare una certa discontinuità in termini di “azione” rispetto ai tuoi primi lavori: il risultato è diverso ma il processo è lo stesso.

SL:

Sì, perché ho dato al pubblico degli elementi minimali da combinare. Le combinazioni creavano installazioni sempre diverse. Questo è l’allestimento fatto alla Galleria La Salita nel gennaio 1968. Un altro progetto di questi venne esposto a New York nel 1968 per la mostra “Young Italians” al Jewish Museum, dove i moduli erano curvi, mentre qui [a La Salita] erano angolari. Il pubblico doveva costruire un’installazione ma questo compito era molto difficile.

LL:

Per il pubblico o per l’artista?

SL:

Per il pubblico!

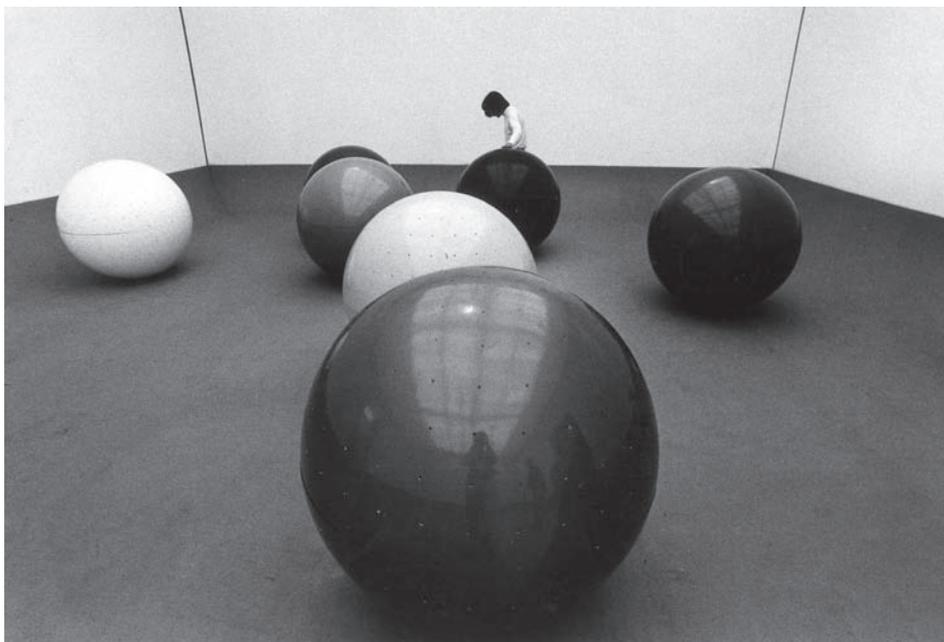


Fig. 9 La sala personale di Sergio Lombardo alla Biennale di Venezia del 1970.

LL:

Poi hai cercato nuove maniere di chiedere reazioni al pubblico...questo fu esposto alla Biennale di Venezia del 1970. Amo molto questa foto in cui una donna cerca di interagire con queste sfere, perché si potevano muovere... ce lo puoi spiegare questo processo, questo sistema?

SL:

Queste sono le Sfere con sirena. Le ho esposte alla Biennale di Venezia, alla Biennale di Parigi e alla Galleria La Salita. È stato strano perché a Venezia spaventarono il pubblico e molta gente scappava. A Parigi ci fu una discussione con Palma Bucarelli...

LL:

...che era direttrice della Galleria Nazionale

SL:

Una sfera era alta poco più di un metro, un metro e quattro centimetri. Questo diametro era perfetto perché venissero spinte con le mani. La sfera quando era spostata dalla sua posizione iniziale emetteva un suono di sirena d'allarme che poteva essere percepito nel raggio di un miglio.

LL:

Beh, ora capiamo perché la gente si andava a nascondere...

Abbiamo parlato tanto ma comunque è importante segnalare che Sergio continua ancora a lavorare sull'idea di creare reazioni, ma in una maniera che definirei più scientifica. Ti stai avvicinando all'idea di essere realmente uno scienziato?

SL:

Sì, ora sto lavorando sulla "Teoria dei Grafi" con l'uso di "Processi Stocastici".

LL:

Spieghiamo cosa significa stocastico, perché la prima volta che Sergio mi ha parlato di questo io non capivo. È un modo per dire "casualmente"...

SL:

In un certo senso. Sono processi che non sono lineari, non prevedibili. Non si può conoscere il passo successivo di una serie, come nel lancio dei dadi. Lavoro con tavole di numeri casuali per creare figure e oggetti impossibili attraverso l'uso di "tessere" ricombinabili. In questo modo la gente che guarda il quadro non può stabilizzare la visione e inizia a vagare con lo sguardo vedendo figure immaginarie come attraverso un'allucinazione.

LL:

Quindi stai ancora lavorando sull'inconscio.

SL:

Certo. Quando vedi queste forme che non esistono nella realtà, dopo un po' inizi a interpretarle proiettando i tuoi contenuti inconsci su di loro. Quindi è come una terapia, un'auto-terapia.

LL:

Bene. Grazie per aver condiviso con noi questi racconti.

Iniziano le domande del pubblico



Fig. n. 10 Invito della mostra del gruppo romano alla galleria La Tartaruga del 5 marzo 1964.



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## VIBRATO-LIKE PROCESSES IN ART, CULTURE, AND SOCIAL LIFE: INFORMATIONAL MODEL, EMPIRICAL VERIFICATION, AND FORECASTING

### *Abstract*

*Various periodical processes (especially dealing with stylistic changeability of art and intensity of artistic life), are well known: e.g., 50-year cycles, and other ones observed by C.Martindale, S.Maslov, and G.Lemarchand. Nevertheless, till now we have neither their fundamental theoretical model, nor reliable data concerning their co-ordination with each other. Meanwhile, in the framework of the systemic-informational approach, it occurred possible to deduce main kinds of periodicity – as well as long-term monotonic trends – proceeding from the “principle of the information maximum.”*

*The parameters showing pulsation, can be connected both with hemispheric prevalence (left or right) and dominating type of ‘neural strength’ (weak or strong). Mutual attraction of different features (including belonging to ‘high’ pole or ‘low’ one, mass or elitist culture and so on), results in formation of stable ‘alloys’ between which ‘vibrato-like behavior’ takes place – in the socio-political ‘climate,’ style of painting, music, poetry, etc.: oscillations with growing wings, against the background of monotonic trends. Sometimes such dynamics may be concluded with catastrophic end (e.g., in cases of some social systems). These processes were retraced on various sets of empirical data, dealing with cultural and social life of Russia, USA, Japan, and West Europe. The possibility appears to use these evolutionary regularities for middle-range and long-range forecasting of the behavior of various systems.*

**Keywords:** art, culture, style, devices, vibrato, information, changeability, hemisphericity, neural strength, social life, internationalism, patriotism, war, forecast.

So Time, that is o'er kind  
To all that be,  
Ordains us e'en as blind,  
As bold as she.  
R. Kipling

There is a specific kind of dynamics common for various spheres: *oscillations* with growing wings, against the background of a certain *monotonic trend*. The best example of such increasing oscillations is the phenomenon of “vibrato” in music; that is why we shall designate them as ‘*vibrato-like processes*’ (though the area of their existence is much broader than acoustics). This phenomenon occurs very *important*: sometimes it threatens the very existence of certain systems, and possibly even the existence of the entire our life! We shall start our consideration namely from the simplest examples of vibrato-like processes, then we shall turn to theoretical analysis of their informational roots, and finally we shall come to the possibility to forecast our future – in the light of this phenomenon.

Vibrato ‘per se’: simple acoustic phenomenon

and some slightly more complicated examples

Traditional way to deduce purely logically – in the framework of the *systemic-informational approach* (see, e.g., Golitsyn & Petrov, 1995, Petrov, 2005) – all the diversity of *means and devices of art*, is based on the so-called ‘*principle of the information maximum*.’ Its essence is nothing else than the best *agreement* between the system’s behavior – and the features of the system’s environment. In turn, in the case of such system as the *subject*, it is desirable to ‘train’ the subject’s informational system, i.e., to make it more perfect (in order to come to better agreement with the environment). The best way to realize such training is to perceive *works of art*. All the *devices* used by art, can be divided into *two classes*: those which are based on *simple repetition* of a certain event – and its *partial repetition*. (In general, the very principle of focusing on the phenomenon of repetition – when considering the devices of art, follows traditions of Russian formalist school of 1920’s.)

Examples of devices based on *simple repetition*, are: contrast, identity, meter, symmetry, – whereas the class of *partial repetitions* is presented by such devices as nuance, similarity (proportions), rhythm, equilibrium, *etc.* Devices belonging to the first class, are more adequate for passing through the *first stage* of the subject’s interaction with any object perceived: the main task of this stage is to overcome the recipient’s threshold of perception. [This stage is accompanied with recipient’s negative emotion, so it is desirable to make this stage as short as possible.] On the contrary, devices based on partial repetition, are suitable to prolong the *second stage* of subject’s perception (because this stage is accompanied with recipient’s positive emotion).

Sometimes both classes of devices can be used *together*, and one case of their combining is such *musical device* as “vibrato.” The typical picture of the development of sound when using vibrato, is shown by Fig. 1. [Here the role of the parameter showing appropriate ‘combined’ behavior, may be played either by the loudness of the sound, or its frequency.] The sound begins as ‘straight’ and even (simple repetition), because it takes some time for this new sound to overcome the threshold, to be perceived and identified by the listener. But soon such *simple continuation* of the sound becomes ‘boring,’ uninformative. Slight *deviations of parameters* of sound (i.e., partial repetition) arise, the *amplitude* of these deviations *increases*, and at last

the life of this sound occurs *completed* – it should be *replaced by another sound*. In such a case, further effective perception of the given work of art is provided.

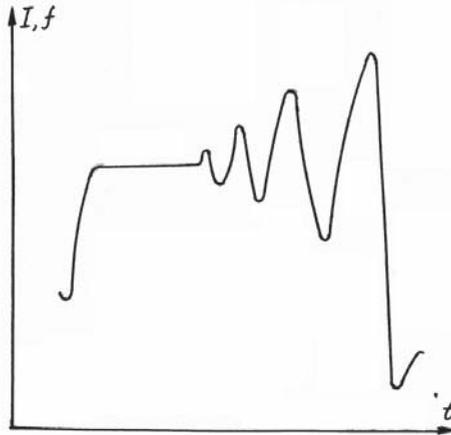


Figure 1. Development of sound in the case of musical device “vibrato” (Golitsyn, 1997)

Perhaps, it might seem to be strange, but quite similar behavior – though maybe sometimes with slight modifications – occurs *typical for dynamics of many fields*, even those ones which do not deal with any aesthetic matters. (This mysterious situation will be explained below.) Besides, the *temporal scales* of the periods of oscillations observed, can vary in a rather wide range: from several seconds – to several years, or even decades. As well, the *parameters* subdued to periodical changes, can be also very diverse.

At Fig. 2, upper curve presents the periodic behavior of such specific parameter as the ‘*style of the socio-political climate*’ in Russia – a fragment of the evolutionary dependence built by famous Russian mathematician – and specialist in cultural studies, and dissident – Sergey Maslov (1983). He resorted to the help of expert estimations of various historical events included in several encyclopedias. Each event fixed, was treated as evidence in favor either of ‘analytic’ or ‘synthetic’ style of thinking, i.e., prevailing *left-hemispheric mentality* or *right-hemispheric* one. The resulting curve shows the behavior of the “*index of hemispheric asymmetry*”: rather featured regular *periodical ‘switches’* between dominating left- and right-hemisphericity. [At this Figure, positive values of the index respond to left-hemispheric prevalence, in agreement with traditions, – whereas negative indices relate to dominating right-hemisphericity.] Here only the periodical component of the evolution is shown; it is capable of varying in the diapason from  $-1$  to  $+1$ , i.e., from ‘absolute prevalence’ of

right-hemisphericity – to ‘absolute left-hemisphericity, respectively. [So, this curve does not reflect the monotonic trend of the parameter in question, as well as absolute sizes of amplitudes of oscillations observed.]

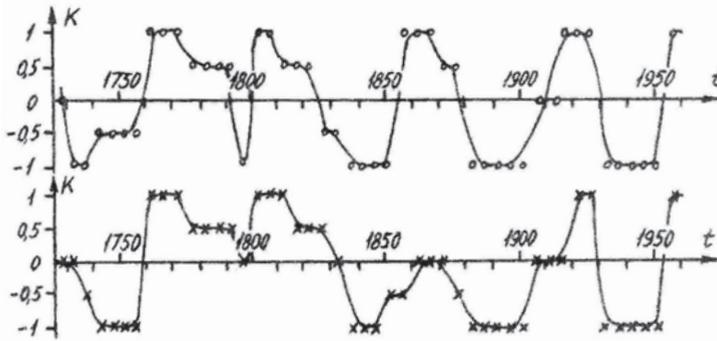


Figure 2. “Index of hemispheric asymmetry” – evolutionary curves (Maslov, 1983):  
 – socio-political climate in Russia (upper curve);  
 – style of Russian architecture (lower curve).

At the same Figure we also see (lower curve) the evolution of the “index of hemispheric asymmetry” (its periodical component) for the *style of Russian architecture*. [This curve is also based on Maslov’s data: expert estimations of buildings over several special scales which dealt with left- or right-hemispheric features; again positive and negative values of the index relate to left- or right-hemisphericity, respectively.] Both curves show *synchronous waves* possessing the full duration of cycles about 48-50 years. Such duration is explained very simply (Maslov, 1983; Petrov, 2008), being caused by the alternation of generations: as it is well known, each generation usually dominates the socio-psychological life about 25 years, so the full cycle of alternations of left- and right-hemispheric generations lasts about  $25 \cdot 2 = 50$  years. As for the synchronism observed, it is in full agreement with theoretical conclusions of the systemic-informational approach (see also below) – all the switches (in various fields) are subdued to due changes in the socio-psychological sphere.

In *poetry* analogous ‘genuine’ vibrato-like dynamics was observed by Martindale (1990). He used computerized content-analysis of the massif of 522 000 words – texts written during 13<sup>th</sup> – 20<sup>th</sup> centuries by eminent British poets. Among several *stylistic parameters* investigated, we see, e.g.:

- *index of stylistic variability*; it is based on the data concerning percentage of new words introduced, and words deleted from usage;
- ‘*primordial*’ constituent of the texts, which is calculated by means of a set of scales applied to each word.

Fragments of evolutionary curves for both parameters are presented by Fig. 3(a, b). In addition to undoubtedly *vibrato-like behavior* of each parameter, we see their rather perfect mutual co-ordination, meaning synchronism of the waves, as well as growing wings of oscillations. Both kinds of co-ordination are in good agreement with Martindale's model of cultural evolution – *contraposition of 'primordial' and 'conceptual' processes*.

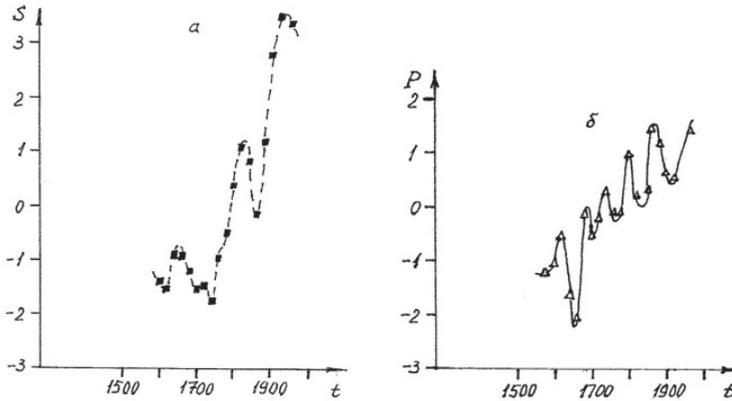


Fig. 3. Evolution of two parameters of British poetry (according to Martindale, 1990):  
 a) index of stylistic variability;  
 b) 'primordial' constituent of poetical texts.

We might enumerate numerous other examples of vibrato-like processes in various fields: from 'fashion' on symmetry in compositions of Japanese woodcuts 'ukiyo-e' – to speeches in English parliament (see, e.g., Petrov, 2004, 2008a). Most of them are characterized by such *principal peculiarities* as:

- *co-ordination* of waves in the evolution of *different parameters* describing each given class of objects;
- *co-ordination* of waves relating to *different classes of objects* (branches of cultural life) which coexist in the given socio-cultural system.

Though in each case there exist its *own motives* for periodical behavior of definite parameters (and sometimes even of vibrato-like processes), however it seems reasonable to consider this phenomenon purely *theoretically*, proceeding from the very *fundamentals* of the systemic-informational approach.

## 2. Two principal tendencies as genuine roots of vibrato-like behavior

Once upon a time, great mathematician Leonhard Euler (1707-1783) proposed rather ambitious project: to construe all the regularities of the Universe, proceeding from the *only initial postulate* and using purely *deductive logic*. It was proposed 'to come to the regularities of Nature not "from the bottom," i.e., by induction, or generalization

of empirical facts – but “*from the top,*” by deduction, i.e., proceeding from certain extremal principles’ (Golitsyn & Levich, 2009, p. 60). In other words, this project consisted in deducing the structure of the Universe “as logical necessity” (according to Albert Einstein), concerning the features of Nature, Culture, mentality, social life, art, *etc.* However, though this project seems to be rather promising, ‘neither Euler nor his followers could realize it’ (op. cit., p. 61).

Meanwhile, recently the situation started to change, and there exists an opinion that “in contemporary science some presuppositions appeared – ideas and explorations – to revisit Euler’s project” (Levich, 2010). Attempts were made to realize such ‘ideal construing,’ at least in application to some fragments of the Universe, which relate to theoretical physics. As well, promising attempts are connected with the *systemic-informational approach* which was applied in the wide range both of sciences and the humanities. Among phenomena which were theoretically deduced in the framework of this approach, we find the so-called Zipf’s ‘principle of least efforts’ (determining various kinds of social behavior), avalanche processes in physical systems and social ones, cyclic processes in social life and art, semantic mechanisms of languages and their phonetic structures, features of women’s beauty, and so on (see, e.g., Golitsyn, 1997; Golitsyn & Petrov, 1995, 2005, 2005a, 2007, Petrov, 2007).

As it was mentioned above, the basis of our approach is the so-called ‘*principle of the information maximum*’ which is valid for any system, be it an animal, a forest, language, kind of art, and so forth. In any case, the system interacts with its environment, and the above principle describes these interactions – as the system’s ‘responses’ (reactions) to ‘stimuli’: “*the system aspires to choose such response  $y$  which provides the maximal valuable information about the given stimulus  $x$* ” (Golitsyn & Petrov, 1995, p.10).

It was shown that such maximization of ‘*mutual information*’ between the system and its environment can be achieved by *maximization of a certain value* – the so-called ‘*Lagrangian*’:

$$L(X, Y) = H(Y) - H(Y/X) - \beta R(X, Y) \rightarrow \max,$$

where  $H(Y)$  is the entropy of the system’s states,  $H(Y/X)$  the entropy of the system’s errors in responses,  $R(X, Y)$  the average resource expense for the system’s states  $Y$  and the environmental states  $X$ , and  $\beta$  the indicator of the deficit of the resource ( $\beta = 0$  when the system possesses unlimited resource, and  $\beta = 1$  when strong resource deficit). The role of resource can be played by different ‘substrates’: in economics it might be money, in mechanics – energy, in chemistry – substance, in sociology and cultural studies – the number of active (or creative) persons in the society, *etc.*

As far as the sum of *three items* is to be maximized, we have *three fundamental tendencies* of the system’s behavior:

**A. Expansion** – the aspiration to increase the number and the variety of the states of the environment in which the system can exist. This is made possible by the corresponding increase in the variety of the system’s responses  $H(Y)$ . This tendency is often named ‘*search behavior*.’

**B. Idealization** – the aspiration to increase the ‘exactness’ of the system’s responses, i.e., to decrease the entropy of the system’s behavioral errors  $H(Y/X)$ . This tendency is sometimes called ‘*conservative inclination*.’

**C. Economy of resources.** This item contains *two* multiplied *constituents*. Hence, it can be expressed either in the choice of the system’s states responding to *minimal average resource expense*  $R(X, Y)$ , or in the aspiration to decrease the deficit of resource  $\beta$ , i.e., to *increase resource supply*.

This set of tendencies – how does it work in relation to the *structure of the system* considered? Of course, usually these three tendencies are tightly connected, interwoven. However, possibly in some situations these tendencies may have certain ‘*specialization*’ in relation to the system’s structure?

First of all, evidently only the *first tendency (A)* and the *second one (B)* deal *immediately with the system’s states*, whereas the *third tendency (C)* is capable of influencing upon these states only *indirectly*, via the resource requirements. That is why it seems reasonable to proceed from the *first tendency and the second one* – to come to some *purposes* concerning the nature of the behavior of the system’s parameters. [We should remind that when speaking of the system, we may deal with any kind of its ‘substance’: the system might be an animal (or even a worm), a man, language, art, society, *etc.*] So, perhaps certain ‘*separation of labor*’ exists in functioning of these two tendencies?

The very idea of separation, or possible *specialization*, appears not occasionally in our consideration. Of course, it is ‘in tune’ with the whole *Zeitgeist* of contemporary mentality. But besides, here we are also ‘pushed’ by additional, quite concrete argument – one of the most influential concepts of the entire contemporary science: the concept of *divergent development* of any rather advanced system. The essence of this fundamental concept (once upon a time it was derived in biology, mainly by Pierre Teilhard de Chardin, 1959) is in the following. When the system comes to its rather *mature stage*, the process of ‘*splitting*’ starts within the system: it occurs to be divided into two or several ‘branches,’ which show mutual ‘*repulsion*’ (see in detail: Petrov, 2007a). Each branch possesses its ‘*specialization*’ – on a definite *own kind of activity* (or on a definite own set of kinds, e.g., dealing with food, i.e., living in a certain ecological niche). We observe numerous examples of this phenomenon – in various spheres.

Thus, in *biological sphere* we see at least two situations responding to ‘key moments’ of the evolution, which are accompanied with the phenomenon of divergence. *First situation* responds to *gender specialization*: each more or less developed species, occurs split into two halves – males and females, realizing *different informational functions*, because males are carriers of genetic innovations, whereas the destination of females is to carry constant genetic information (see, e.g., Geodakyan, 1983). The *second ‘key situation’* is the *splitting of all kinds of mental activity* – into *two classes*, one of them being realized by *left hemisphere* of human brain, another by our *right hemisphere*. [After such specialization, left hemisphere occurs responsible for

rationality, speech, and reflexion, whereas right-hemispheric processes deal mostly with intuition, sensuality, images, and so forth.] However, the last situation responds to the borderline between biology and psychology (considered together with some phenomena ascribed to sociology and cultural studies).

Within the realm of ‘*genuine human sciences*,’ the phenomenon of divergence is literally flourishing! Here we see several rather impressive situations of ‘splitting,’ besides connected with segregation of our *two fundamental tendencies*. Here the priority belongs to formation of *concepts of Everyday Space and Everyday Time* – on the basis of our first (*A*) tendency and the second one (*B*), respectively (see, e.g., Petrov, 2008). This precedent inspires us: we can hope that exactly such ‘*binary splitting*’ would be valid when ‘construing’ the *dynamics* of rather advanced *social and cultural systems*, including a particular version of dynamics – vibrato-like behavior?

[Besides, several other situations of binary splitting were earlier observed in the humanities. We mean, for instance, the above mentioned hemispheric specialization – of human beings, their kinds of activity, style of art, ‘tonality’ of the entire socio-psychological sphere, *etc.* – see, Petrov, 2001; later we shall return to this phenomenon. Another example of ‘binary splitting’ (though it is partly connected with the previous one) concerns the division of prose into two directions: ‘transparent’ branch and non-transparent one (Petrov, 1994, 2007a). Of course, this phenomenon takes place when the literary system comes to the stage of its maturity – then the system starts ‘branching’: “non-transparent” direction (dealing mainly with right-hemispheric activity) specializes on appealing to concrete reality depicted, sensual images, and so on. On the contrary, the specialization of “transparent” branch (which deals with left-hemisphericity) consists in focusing on certain abstract structures, it is ‘devoid of flesh,’ and so forth.]

So, our hypothetical *specialization of two tendencies* (*A* and *B*) – being applied to socio-cultural dynamics – is supported by results of several previous investigations. This specialization – how can it be realized? – The answer is almost trivial:

- the tendency of *expansion* (*A*) determines the *main direction* of the system’s development – meaning the inclination to shift current values of its parameters;
- the tendency of *idealization* (*B*) results in *attempts to find ‘due values’* of the system’s parameters – by means of trials and attempts, i.e., *deviations* from current values – either forward or back (each time, after exhaustion of the potentialities of this given attempt, the system returns to its previous situation – or even back, i.e., to the past); such behavior means nothing else than *oscillations*.

Hence, we have a *superposition* of two processes: *oscillations* against the background of a *monotonic trend* [Besides, the rate of oscillations should be at least several times faster than the changes of the monotonic trend: otherwise the oscillations would not fulfill their function – to provide due corrections into the entire course of the parameter’s dynamics]. Such trajectory is nothing else than the full picture of *vibrato*. It realizes the movement towards the *progress* (monotonic trend), accompanied with attempts to make the trajectory of movement more *exact* (oscillations). Sometimes

such trajectory responds to *short-range retreats*, or *regress* (when backward movement). However, there exists a danger of *destroying* the entire system – if a wing of oscillations becomes too large.

Besides, naturally, possible are various ‘degenerated’ versions of vibrato: either absence of monotonic trend (‘pure oscillations’) – or absence of deviations (‘pure monotonic trend’). As for the character of oscillations, they can be either periodic or irregular; as well their amplitude (‘wing’) may be either increasing or not – it depends of the system’s sensitivity to deviations, and the properties of the system’s memory.

The above interpretation can be illustrated with an example of the evolution of such poetical device as *rhyme*. Fig. 4 shows fragments of the results of the evolutionary study of *Russian poetry*, which involved 6000 poems published in literary journals of Moscow and Saint Petersburg between 1800 and 2000 (Shepeleva, 1989). Mean values of *three parameters* are presented: depth of the rhyme, its wealth, and deviation from exactness.

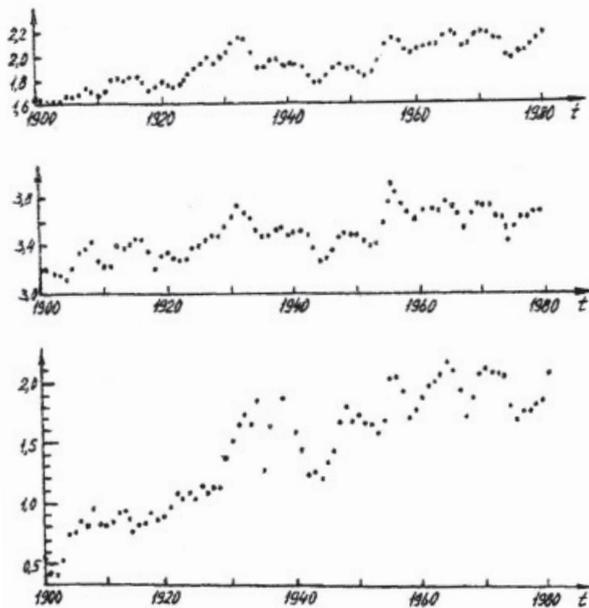


Figure 4. Evolutionary curves for three parameters of rhymes in Russian poetry:

- a) depth of the center of the rhyme consonance – its distance from the right edge of the line, averaged over both lines connected by the rhyme; this parameter is measured in the number of phonemes;
- b) wealth of the rhyme, i.e., the number of phonemes coinciding in both lines;
- c) deviation of the rhyme consonance from exactness; this parameter is also measured as the number of phonemes distinguishing one member of the consonance – from another.

Each curve reveals *periodical oscillations* against the background of *monotonic trend* – growing mean value of the parameter. The *monotonic trend* seems to be quite natural – it responds to the tendency of *expansion (A)*: most poets have an inclination to master new zones, more and more remote from the current situation. And it is really the *progressive development* of this device! As for *oscillations*, they realize the tendency of *idealization (B)*, i.e., the *search for corrections* concerning the *form of the evolutionary trajectory*: some poets try to shift the value of the given parameter (e.g., to deepen the rhyme); nevertheless, their attempts may be not very successful (not accepted positively by recipients), and they – or some other poets – being disappointed, turn to previous values. But sooner or later, the need for novelty (because ‘archaic’ rhymes are perceived as dull) appears again, so certain cyclic oscillations take place. This treatment of both constituents of the evolution (as consequences of the above two fundamental tendencies) seems to be quite natural, as well as the co-ordinated evolution of all three parameters.

Meanwhile, we invaded into the problem field of *inter-parametric relations*, which require separate consideration.

### 3. ‘Alloys’ of features: harmony of inter-parametric relations in various systems

We shall start the analysis of *inter-parametric co-ordination* while evolution of the system, from the above *example* of the evolution of *rhyme*. In fact, the mean value of such parameter as *deviations from exactness* – can it show statistical growth when the *wealth* of rhymes decreases? – Of course, it is impossible – at least because namely ‘rich’ rhymes provide the basis for more or less large deviations. Hence, evidently it is not occasionally that the changes of both parameters do really show *synchronism* – meaning both the behavior of their monotonic trends and oscillating constituents (see Fig. 4).

Another example of features’ co-ordination, relates to our *everyday life*, which possesses the regularity partly reflected by sociological and psychological investigations. In Russia, when speaking about a man which cruelly (and regularly) beats his wife, widespread is the proverb: “*Byot – znachit liubit!*” (*If beats – hence loves!*) – and here a ‘bitter drop of truth’ does really exist. Why? – The matter is in *statistical links* between some features of personality: possibly, here certain ‘third variable’ is involved, e.g., the man’s type of the nervous system (the concentration of adrenaline can strongly influence both upon sexual activeness and aggressiveness). So, something like a ‘*stable alloy*’ of several *features* can be formed, with their ‘*mutual attraction*’ (and even ‘*sympathy*’ – though sometimes revealing itself in cruelty!), and possibly with its ‘*due structure*’ – which would provide the most advantageous variant of their successful *joint functioning*.

It is necessary to note that when speaking of the alloys mentioned, we proceeded namely from the *features*, i.e., objects’ *parameters*, – but not from objects (or subjects?) themselves: the last ones are grouping ‘*ad hoc*,’ their concrete members are ‘secondary,’ appropriate clusters being dependent of the features chosen for uniting. [For instance, exactly the concentration of adrenaline permits to form groups of ‘beating’

and ‘non-beating’ husbands – but there doesn’t exist ‘primary grouping’ based on the fact of beating – and hence, causing the difference in adrenaline concentration.] Such *logic of formation* of ‘alloys’ is inherent to every system, at *early stages* of its functioning (when the system is not so strong, that it could rule its own functioning. Later we shall turn to some other situations typical for rather ‘strong and mature’ stages of the system’s development.

The idea of a certain specific ‘*harmony*’ – which may occur advantageous for the system’s functioning – seems to be trivial. (Though sometimes such trivial ideas help in solving rather non-trivial tasks!) Till this moment, this idea concerned *usual situations*, common for most fields and stages of their development. However, when considering *evolution*, it seems reasonable to single out those *features*, which are *substantial namely for dynamics*.

[Sometimes there exist certain parameters which are ‘indifferent’ for the evolution – but only during its definite stages, – whereas some other evolutionary stages are marked with substantial role of these parameters. For instance, in Japanese art, while the evolution of woodcuts ‘*ukiyo-e*’ (see Koptsik, Ryzhov, & Petrov, 2004), such a device as compositional symmetry/asymmetry, was a substantial perceptual parameter before 1745. So periodical oscillations of the percentage of asymmetrical prints took place around ‘due average value’ – about 63%. (This percentage was deduced theoretically, proceeding from the ‘principle of the information maximum.’) However, after 1745, the techniques of color printing was invented in Japan, and the device of compositional symmetry/asymmetry lost its perceptual importance, because the recipients’ attention became focused mainly on color properties of prints. That is why periodical oscillations took place around another ‘due average value’ (also deduced theoretically) – close to 50%.]

Why namely ‘*singled out parameters*’ – which are important for the evolution – may be considered as *important also for forming ‘stable alloys’* in question? – Evidently, the heart of the matter is in focusing the recipients’ attention – on the *role of changes* which are capable of causing either positive or negative emotions. Really, if the innovative shift of the rhyme consonance towards the bottom of the line, results in success of the entire poem, – the parameter of the depth of the rhyme occurs important for recipients, and this parameter can be included in the ‘alloy of substantial features’ (or even becomes the center of the system of poetic devices). So, in every kind of art (or its genre) there may exist some specific features – especially ‘sensitive’ to possible interactions with other parameters, in relation to forming appropriate ‘stable alloys.’ Let’s try to find at least some of these features – desirably more or less universal, common for various fields and hence, penetrating at once them altogether, – which are capable of participating in these alloys. Possibly we can find various *grounds* for forming the above stable alloys, i.e., those poles between which the vibrato-like trajectory can take place. And of course, these grounds would respond to certain *peculiarities* of that class of systems which the given system belongs to. But in any case, the ground in question should reflect some rather important aspects of the sy-

stem's functioning. In most situations, the concrete ground occurs chosen, because it is something like a '*focus of contradictions*,' inherent to the development of each given class of systems.

For instance, in most systems dealing with human psychic life, the principal contradiction is caused by the above mentioned *distinction between* mental processes which are localized in *left and right hemispheres*. Exactly this ground may become the core for two poles, or stable alloys – something like 'centers of crystallization' for other features, e.g., gender peculiarities (because men's mentality possesses more pronounced inclination towards left-hemisphericity), type of nervous system (weak or strong type – see Golitsyn, 1997, 2015), *etc.* That is why namely *between* such *two poles* – vibrato-like behavior should be observed. And really, in several kinds of art, the evolutionary left-right waves were fixed.

Moreover, quite similar 'alloys' – and appropriate evolutionary behavior – can be found at the levels much higher than separate kinds of art. For instance, as it was mentioned above, the *Zeitgeist of the entire culture* of a separate country, may occur subdued to oscillations between these two poles, revealing themselves, e.g., in the tendency towards *aggressiveness* – or, on the contrary, *peaceful inclination* of the country. In another version (but very close to the standpoint mentioned) it might be inclination to *patriotism* versus *cosmopolitan* orientation. Thus, in *Japan* just after Meiji restoration, the *Zeitgeist* of the 1870's was marked with 'cosmopolitan' attitudes, and many students were sent abroad in search for knowledge – afterwards they returned back, carrying appropriate attitudes, *etc.* However, in 1890's, a retreat tendency occurred prevailing, being expressed in patriotism accompanied with aggressiveness. This alloy caused a series of wars, firstly in China, then – against Russia, and afterwards – in the entire Pacific Ocean, including USA. And only after catastrophic defeat in 1945, again the general progressive trend started its prevailing in Japan, devoid of patriotism (alloyed with aggressiveness) – though of giant payment for this change – numerous victims. The life of the previous political system was completed, and the country turned to another situation. [It's a pity, now we have no space and time to dwell upon the problem of the theory of end of the system's existence – it should become the topic of a separate paper.]

In general, *concrete faces* of vibrato-like behavior can be rather diverse (though the essence of real contradictions possess, in most cases, much in common). Thus, in an investigation devoted to *Soviet political life* of Stalin and post-Stalin era (Mazhul & Petrov, 2014), an alternation was retraced, concerning the seasons of birth of top political leaders – months of their birth. [Please, don't perceive this approach as astrological one!] The seasonal regularity obtained, reflected periodical (oscillating) changes in the "mood" of the entire socio-psychological life. Quite similar is the well-known alternation in political life of the *U.S.A.*: 'switches' between dominance of Republican and Democratic parties. Analogous periodical switches are typical for political life of some other developed countries.

However, from the beginning of the 20<sup>th</sup> century, mainly *genuine informational*

*grounds* (i.e., socio-psychological ones) are becoming more and more substantial for social dynamics (instead of economic motives, which were prevailing while previous epochs) – we mean both the processes of forming the above stable alloys and oscillations between these poles. In *Russia*, appropriate oscillations started even in the second half of the 19<sup>th</sup> century, revealing themselves both in ‘*progressive*’ long-range *monotonic trend* (towards democracy, openness, western orientation, and other left-hemispheric features – see Maslov, 1983) and *oscillations*, both forward and back (short-range retreats, though sometimes very hard, and with growing wings). The era of rationality and left-hemisphericity of the 1860’s, was followed by the epoch of quite opposite *Zeitgeist* inherent to 1880’s (characterized by the inclination to patriotism, aggressiveness, and other typical right-hemispheric features). Then again this ‘right bar’ was replaced by a new ‘progressive,’ i.e., left wave in the very beginning of the 20<sup>th</sup> century, again being completed with the retreat – in the form of the revolution of October 1917. [In general, concrete psychological content – and procedures of realization of such oscillations – may vary, depending on actual conditions. Thus, both the retreat of the 1880’s and the revolution of 1917 were simply reactions of giant conservative peasants’ masses – against innovations responding to Western style of mentality and other left-hemispheric features.]

Another, new type of social changes appeared in the very beginning of the 21<sup>st</sup> century: the so-called ‘*violet revolutions*’ which took place mainly in several countries of *southern Europe* and *northern Africa* (see in detail Petrov, 2014). Here also non-economic motives (and even anti-economic ones) – but mostly the ‘prestige’ motives, and other genuine informational phenomena – occur decisive, and first of all the *contradiction* between the ‘creative minority’ and ‘consuming overwhelming majority.’ The heart of the matter is in very *inhomogeneous distribution of creativity*. [Exactly creative processes constitute the real basis for the existence of all developed countries.] In every creative field (be it science, or art, or techniques, *etc.*), 50% of the total creative production, usually responds to results of activity of less than 5% of those who are engaged in the given field. [In studies of science, a regularity is known for this share of the creative minority:  $S = \sqrt{N}$ , where  $N$  is the total number of members of the given field – see, e.g., Petrov & Yablonsky, 2013.] Nevertheless, usually the ‘consuming majority’ requires at least ‘equal share’ of the common wealth – or sometimes they wish to receive even higher shares than that for ‘creative members.’ But what is more important, ‘consumers’ often require high social prestige, and in general, they desire to support those social hierarchies which do not respond to subjects’ creative merits. However, appropriate ‘violet revolutions’ are obliged to use – as their “fuel” – wide masses of participants with ‘non-due’ psychological attitudes. Hence, to attract these wide masses, it may occur necessary to resort to the help of certain ‘non-genuine,’ false slogans (e.g., nationalistic, or patriotic ideas – which are the most advantageous in most situations). But sooner or later, the situation becomes clear – even for stupid members of ‘deceived masses.’ Wide masses become disappointed, and they change their behavior. That is why contemporary revolutions *very rarely* come to

those *results* which have been their initial purposes. [Moreover, sometimes the results obtained – occur quite opposite to the expectations of the initiates of the revolutions.] Ascending higher, to the next level of our consideration, we may find there nor ‘glued features,’ – but first of all, certain possible *conglomerates of countries*. Evidently, here the *procedure* of the formation of alloys should inevitably be changed: such giant agglomerates seem to be rather ‘*strong and mature*’ (or at least such may be their self-estimations). Hence, namely giant masses may occur capable of *dictating* those *features* which would be used for uniting; these features chosen, are simply ‘secondary’ for the procedure of uniting. Moreover, exactly such uniting can influence even upon the *internal processes* in each of these countries. For instance, the above binary contraposition of weak and strong types (“*l’esprit et le bras*” as it was designated by Alexander Dumas in his novel “*Vingt ans apres*”) can be realized in the form of the Russian proverb: “*Sila yest’ – uma ne nado!*” (*If we have force – hence, there is no need for intellect!*). In other words, the formation of a ‘mighty alloy’ of several countries, is capable of *shifting* the psychological attitudes *within each country* – towards the pole of force, aggressiveness, anti-intellectualism, *etc.* And this shift would be supported by real growth of the entire force which is at the disposal of the new conglomerate of countries.

This new situation is opposite to the one typical for previous, not-matured stage – when as it is well known, “foreign policy was simply the continuation of domestic matters, though realized by other means.” For instance, the inclination to left- or right-hemisphericity (or to weak or strong type, or to ‘high’ or ‘low’ pole of mentality – see Petrov, 2002) in the socio-psychological ‘climate’ of a definite country, should be coordinated with the processes in other countries included in the given conglomerate. [*Apropos*, similar co-ordination of waves in the socio-psychological life of different countries which possess informational contacts with each other, took place even in the previous epochs – see, e.g., Maslov, 1983.]

Evidently, the *grounds* for linking different countries with each other, should deal with some of their ‘*global properties*.’ Here one of the parameters capable of pretending to play the ‘key role’ (perhaps, it is the best candidate for it) is the *number of population*, especially if it is simply giant! (Though of course, when the number is negligible – the gluing is also possible, but it is not substantial for the behavior of the entire alloy.) Serving as the ‘center for crystallization,’ this ground can attract some other ‘global features,’ e.g., the *level of economic development*. [The role of one of other glued features, can be played, e.g., by the above mentioned type of neural strength: colossal number of the population – is better combined with physical force (strong type), than with something ‘refined.’] So, at the map of the world, *two poles* can appear:

- a group of countries with large amount of population – but low economic level;
  - a group of countries possessing not so large population – but high economic level.
- [And, of course, there may exist some countries which do not belong to these groups.]  
What might be the relations between these two poles?

In principle, while dynamics, each group can either strengthen its peculiarities, or diminish them – in order to find its own ‘*genuine niche*’ in the world, i.e., due role in the ‘separation of labor.’ However, it is practically difficult to realize appropriate dynamics (especially fast oscillations) in relation to the number of population – because it is not very mobile (being capable only of rather slow changes). Nevertheless, some other parameters (‘glued’ with the above center of crystallization) can show due *fast changes*, e.g., towards aggressiveness – or, on the contrary, towards peaceful intentions.

Nowadays, we see a very interesting practical attempt to form *two contrastive groups*, exactly of the above mentioned type:

– alliance of Brasil, Russia, India, and China – to which later South Africa joined; this group is now named “BRICS”; each of these countries (except South Africa) is marked with large number of population, low economic level, and ‘overtaking’ intentions;

– some other developed countries, which are head by U.S.A.; here we see also Japan and most of developed countries of West Europe, possessing high economic level.

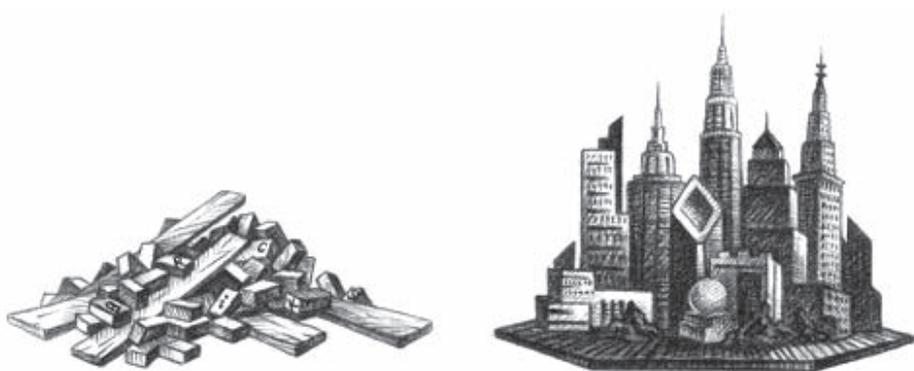


Figure 5. Scheme of contemporary bipolar world (drawing by Kseniya Mazhul)

According to hopes of founders of BRICS, these two groups would form a ‘*bipolar world*.’ Though, in general, bipolar structures are not economically advantageous for any developed system based on a single resource, and hence, this way – leads to a deadlock (blind alley), – but perhaps, a decision – maybe non-optimal – would be found even in this vague situation? (It is illustrated with Fig. 5 – drawing by Kseniya Mazhul). Besides, the population belonging to these poles, embraces more than a half of the world population!

Summarizing our analysis of vibrato-like processes in various spheres, we come to *two principal conclusions*. Firstly, in most contemporary situations, we deal, as a

rule, with *contraposition of 'high' and 'low' poles*, or elitist and mass culture, and related binary oppositions – see, e.g., Petrov, 2002. [In Russia, there exists even a special word “*bydlo*” for the low pole mentioned, relating to wide masses, greedy and aggressive – something like “*cattle*.” So, most contemporary conflicts are nothing else than a contradiction between creative minority – and ‘*bydlo*.’] As far as usually the second pole is much stronger (physically) than the first, – some problems arise concerning the character of changes while vibrato-like processes, as well as the direction of these changes, and maybe even the *very existence* of the entire system: a giant menace can be caused either by growing wings of oscillations, or absence of a new object capable of replacing the previous one. In social systems (including international relations), such conflicts can result in a *new world war*, and hence, they can *destroy* all the civilization, and even *all the life!*

Such can be results of ‘innocent’ alloying both features and countries. While previous epochs, the menace described, possessed a ‘patriotic face,’ though in the framework of any systemic standpoint, the very idea of patriotism seems to be absurd and very dangerous. Being proclaimed in each country and expanded to many countries, it inevitably leads to the war! Now the face of this menace looks as ‘international’ (and exactly inter-country links caused the majority of war conflicts – in previous epochs as well as in contemporary reality). Meanwhile, during several last decades, we were several times at the threshold of a new world war! But this menace would become a topic of another paper. [Perhaps, it was not without reason that at Fig. 1 only three large oscillations were presented: sometimes (in the case of war conflicts) exactly the third one may occur decisive – resulting in the finish of the system’s existence – but let God save us!]

Secondly, the described *regularities* of vibrato-like processes, can be used for *forecasting* (both short-range and middle-range) the development of various systems: from separate kinds of art – to colossal social agglomerations.

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## TIME FOR POETRY IN THE MODEL OF THE CLOCK OF THE PHOENIX. THE TEMPORAL ASPECT OF POETIC CREATIVITY

### *Abstract*

*How can time, chronology and poetry be interwoven in an original view of temporality? Based on extensive data over the past 3000 years, The Clock of the Phoenix (Levin, 2013&2014) examines the connections between time and the history of poetry. This study shows that at the end of every long-term cycle (with periodicity of about 493 years) the world of poetry comes to its critical junction of disruption, so-called "The Hour of the Phoenix." The passionate generations born during these radical periods of transition (ranging in our epoch from 15 to 30 years) are motivated by an urgent need for new rhythms and paradigms to be introduced and for new social structures to be built. Following this discovery, a new model of historic time is introduced.*

*Keywords: time, temporology, chronology, Silver Age poetry, the Clock of the Phoenix.*

### **Introduction**

The poet does not know – often he will never know –  
whom he really writes for.

*Eugenio Montale*

It is widely believed that physics has nothing to do with poetry. This article suggests that time can connect these different realms of human endeavor.

Rhythmicity is one of the most fundamental features of poetry as well as of the vast number of physical, biological and historical processes. A structural analysis of history, as seen through its poetical expression, reveals a rather complex, but nevertheless remarkably rhythmic temporal pattern, which is partially cyclical (like days or years) and partially linear (like Eddington's arrow of time). It shows that the poetic creativity does not flow at an even rate, but has its peaks of acceleration and of intermissions. Those oscillations are accompanied by the corresponding changes in the birth rates of significant poets, as well as in their favorite styles and topics. Furthermore,

these regularities are shown to be correlated with the astronomical Neptune-Pluto planetary cycle (which I called the Year of the Phoenix), enabling the assignment of structure to narratives of cultural development, providing a different way of dividing up historical time and constructing a chronological mapping of the poetic creativity, the so-called model of the Clock of the Phoenix (Levin, 2016).

The name of this model is taken from the ancient mythology. It symbolizes both an endless stream of life and its long-term cyclic nature. All over the world the Phoenix is widely known as an immortal creature. Instead of dying, every 500 years this bird is reborn in flames. In the Roman Empire, the Phoenix denoted an eternal cycle of blessedness. Since the days of Marcus Aurelius (second century AD) it was even suggested that “time is born like the Phoenix in a great cyclical cataclysm” (Dowling, p. 178).

The proposed model of the Clock of the Phoenix has been successfully applied to the chronological analysis of ancient Egypt and Judea, Greece and Rome; to the survey of the European Renaissance and to the history of the national poetries. Significantly, many puzzling and meaningful parallels were found and discussed cross-culturally and across historical epochs. It appears that understanding of poetic creativity depends mostly on the phase of the Year of the Phoenix. In addition, special attention was paid to the history of Portugal, including its language, its poetry and its legendary Prince Henry the Navigator, known as the main initiator of the Age of Discoveries. Such mapping of historical narratives of one specific country is especially important because the history of Portugal is well documented and extensively studied over the past thousand years. As a result, the qualitative and speculative theories of Francis Bacon, Johann Gottfried Herder or Oswald Spengler, which have predicted periodicity in birth and decline of civilizations, suddenly turn out to be tangible, quantitative and measurable.

Given the multifaceted nature of both time and poetry, this work uses original interdisciplinary approach to construct bridges between scientific methods and poetical visions, between “time” as it is seen in physics and “time” as it appears in human history and creativity. Unfortunately, contemporary sciences establish no connection at all between these two kinds of time. The differences between the physical linear arrow of time and the actual historical developments are so profound that the historians complain: “Ironically, the rise of the modern timeline coincided with the decline of academic chronology. <...> Chronology, a field of study that once claimed plausibly to be the very “soul of historical knowledge,” was left little more than a skeleton” (*Cartographies*, p. 138). In *The Clock of the Phoenix* the problems of chronology gained a new perspective and the historical narratives came to be understood as sequences of long-term cycles and their logically related developmental phases.

This article is in two parts. The first part will mention different aspects of time and introduce a generalized concept of time, common for both “ordinary” physical and

“complex” sociological and cultural systems. This concept of generalized time enables to comprehend both physical and creative processes within one framework and provides a common ground for discussion of the temporal laws governing our material world and our lives. The article’s second part is a synoptic view of *The Clock of the Phoenix*. It fits well Bohm’s eloquent prediction “on the importance of poetry and art in our search for healing (= wholing), i.e. the importance of metaphor” (Bohm, p. 228).

#### A Word about Time

*Time travels in diverse paces with diverse persons.*  
*Shakespeare*

Today it is widely accepted that there has been persistent difficulty in understanding the nature of time and that time remains a fundamental concept in physics (e. g. Levich). Since the days of Aristotle, physics connects time with motion in a tautological way: motion is measured by time, though motion also measures time. Even today we find that “a clock is a device for measuring time, it is one whose law of motion is known. But we must be aware of circular statement; after all, we may say that time is what is measured by a clock” (Holland, p. 5). A contemporary manual of time measurement states plainly: “Let us admit that we do not know what time is” (Audoin & Guinot, p. 1). Furthermore, part of the trouble and misunderstandings in the dialogues among scientists, philosophers, historians and poets stem from the fact that the word “time” has widely different connotations and is used in several different senses. Poets or writers will claim that human time implies a denser and more complex hierarchic structure than a physical linear arrow and that from a scientific point of view time is completely unpredictable or even chaotic.

Historically, there were linear and cyclic models of time. Whereas some philosophers and scientists have imagined time as eternal, boundless and/or sacred, others have tried to calculate the ending of time. In some cultures time was regarded as standing still, while in others it was experienced as a flowing river. For Galileo time was a straight line, while for Isaac Barrow it was either a straight or a circular line. Later Newton declared that time was abstract, linear, uniform and continuous and it was connected with motion in such a way that time became redundant in physics. From then on, there is an implicit assumption both in classic and quantum mechanics that “time may be represented by a real variable,  $t$ , so that time is like the real line” (Raju, 1994, p. 139). As a result, for physics history became a pattern of timeless moments. Putting this in Einstein’s words: “For us, practicing physicists, the division into past, present and future is merely an illusion, albeit an obstinate one.”

This concept is profoundly different from a geological or biological point of view presented, for example, as early as in 1929 by the eminent Russian scientist Vladimir Vernadsky, for whom biological time was vitally connected with life, with history and with cosmos. In 1983 this line of thought was further developed by Ilya

Prigogine, who complained in his discourse *The Rediscovery of Time* about “the necessity of a tragic choice between the mechanical view of classical physics and our daily experience of the irreversible and creative dimension of life.” On that opportunity Prigogine also declared that “science is rediscovering time.”

Nowadays it is obvious that the notion of time in physics is far from the notion of mundane time in daily life. Despite the ever growing ability of modern timekeepers to design complicated atomic clocks able to measure the tiniest parts of the second, our life is governed by the most ancient universal clock: the quasi-cyclic motion of the celestial bodies. Physicists are surprised that the atomic measurement of time has still not really become familiar: “Could this be due to a deeply ingrained habit of measuring out our everyday existence by the movements of the celestial bodies? Or could it be a reaction to the lack of poetry in atomic clocks, or their inscrutable accuracy?” (Audoin & Guinot, p. 1).

Yet, perhaps this should not surprise us at all, since the rhythm of our human existence is governed by seasonal and annual changes, by solar and lunar cycles and by rhythmic oscillations between days and nights. Strictly speaking, while physics deals not so much with bodies as with trajectories of the bodies, for biologists time is tightly connected with cycles in general and with circadian rhythms in particular. Since circadian rhythms are a fundamental property of eukaryotic organisms, it is believed that “biological clocks” reflect the metabolic cycles and are synchronized with the astronomical environment. The basic need to synchronize our lives with the universal processes is so strong that despite the everlasting efforts to ban the cyclic notion of time, “cyclic” time “has reappeared phoenix-like in general relativity and quantum gravity” (Raju, 2003, p. 47).

In his *Comments on Ilya Prigogine’s Program* David Bohm agreed with Prigogine’s revolutionary suggestion that “the study of complex systems (including, for example, biology and the human sciences) may reveal features of natural law that are just as fundamental as are those disclosed by physics and chemistry in the study of simple systems” (Bohm, p. 261). To make these laws compatible with the laws of physics Prigogine had to introduce the idea of two different (though related) kinds of time: “age time” (or “internal time”) and “ordinary time” (or “watch time”). While Newton’s equations portray reversible dynamical features of a system, the “internal time” of the same system should reflect its irreversible historical aspects.

The same acute need for two different kinds of time was previously expressed by Goethe. In *The Poetry and the Truth* he described the differences between one’s time of birth as the zero point of one’s own aging (internal time) and one’s birth date in relation to one’s historical epoch (external or watch time). Trying to analyze a man in relation to the features of his time, Goethe came to a very strong conclusion, that “any person born ten years earlier or later would have been quite a different being, both as regards his own culture and his influence on others” (Goethe, p. 17).

Following Goethe we may say that “the spirit of the time” would be felt differently by those who were born at different historical epochs, and sometimes it would be

enough to be born ten years earlier or later to belong to other “times.” In 2006 a further step in understanding of the nature of internal time was taken when the experimental data connected with the Effect of Celestial Twins (ECT) were published (Levin). This effect demonstrates that even though each human being is unique, there is an isomorphic matching between the biographical data of members in each and every group of celestial twins – people who were born “simultaneously” (defined for this purpose as being born within the interval of time shorter than 48 hours). In other words, people, who were born simultaneously tend to experience (under certain conditions) seemingly non-causal synchronic correlation of their life paths throughout the entire span of their existence. As a result, it was suggested that the factor of birth time (or “Theta-factor”) is an important temporal factor, which in addition to heredity and environment influences patterns of human development.

Further studies of the properties of the Theta-factor open new possibilities to relate quantitatively the times of an individual life to the corresponding historical times of “the world”. Impressively, the obtained results matched Joseph Priestley’s observations that historical narrative is not linear but rather cyclic (*Cartographies*, p. 20). In Priestley’s *Chart of Biography* birth dates of two thousand famous historical figures were systematically registered across three thousand years in “universal time.” As a result, the great periods of history were framed in quantitative terms, and the charts showed clearly the differences between the uneventful dark ages (e. g. the medieval period) and the ages of science and art (e. g. the Renaissance). Although Priestley was interested in individual biographies, the resulting chart depicted history in the broadest terms, showing meaningful interconnections between the internal times (birth dates, Theta-factor) and the universal times (external watch time).

As a science of dates, chronology should have a quantitative dimension. The idea to apply Priestley’s principles to the history of poetry led to the discovery of the meaningful 493-year periodicity correlated with the Neptune-Pluto cycle (The Year of the Phoenix). Significantly, this periodicity is also compatible with Lev Gumilev’s ethnogenesis theories as well as with J. B. S. Haldane’s evaluation of the time scale needed for the study of historical processes. (In 1955 Haldane introduced and defined proper referent scales for the study of various biological processes, such as molecular, physiological, ontogenetic, historical and evolutionary).

I shall not enter here into the fundamental philosophical issues, but shall just briefly mention that elsewhere (Levin, 2012) I proposed a definition of the generalized time as being of a two-fold nature. Generalized time is a way to order events into processes (e. g. internal times) and/or coordinate between phases of various processes (e. g. external or watch-times). Such a definition implies a possibility to employ different processes as our reference clocks. As a result, time is seen as an operator or an algorithm interconnecting different parallel processes. Depending on the processes involved it might be a one-dimensional physical linear time or alpha-numerical strings of the calendar’s data (so-called time-codons). Such a concept of time enables us to construct diverse scales or algorithms by means of which the individual existence could be

integrated in the larger schemes of terrestrial, cosmic or social systems of the external world. Knowing whether a certain model of time matches the reality depends solely on revealing the true nature of the processes involved.

The Hour of the Phoenix  
*I am the Phoenix; only in the fire I sing.*  
 Marina Tsvetaeva, tr. by Nina Kossman

Between 1885-1900 two distanced celestial lights, Neptune and Pluto, seemingly converged in the skies, a rare planetary conjunction, which takes place once every 493 years. A generation born all over the Earth during this Hour of the Phoenix felt as if their lives were not part of the slow time of the daily or annual routine. This generation witnessed the emergence of something unpredictably new and took part in a genuine and incontrovertible revolutionary transformation and becoming. One of the prominent poets of this generation Anna Akhmatova wrote that “no other generation in history experienced such a fate, and perhaps, there was no other generation like it” (Akhmatova, p. 12).

Everything – life and death, poetry and power, time and space, social and cognitive patterns, scientific laws and artistic tastes – had to undergo a radical shift and was given a new meaning. The children of this generation felt themselves belonging to a new epoch and did not want to remain in the previous millennium. Most of them wrote their brilliant works barely having reached maturity. Many had a strange premonition of the coming disasters. Literary critics and historians are frequently at a loss to explain the difference between the volcano-like eruptions of new ideas during such short decades and the previous sleepy barren uneventful centuries marked by the absence of any significant thought.

Every Hour of the Phoenix is a moment of cosmic change, a rupture. The world completes its previous cycle and subsequently steps into a new epoch. It is both like a full stop in time and like a seminal point, establishing a time frame for an exploration of new paradigms. The very name “The Hour of the Phoenix” reflects an ambivalent nature of this zero-phase in the beginning of each Neptune-Pluto cycle. Many of the paramount events in the human history (both civic and creative) matched up repeatedly over multiple (493-year) cycles. These periods included, for example, the foundation of Caesar’s kingship in the first century AD, the fall of the Roman Empire in the fifth century, Karl Jaspers’s first (sixth century AD) and second (fifteenth century) Axial Ages. Frequently they were seen as the times of very painful crises followed by violent revolutions, which constituted a sort of a natural “zero point” for social and creative narratives of many types, including poetry.

It has been stated that “the special intensity of poetry, its sensual and prophetic nature, has a much greater influence on man than do other arts or sciences” (Mandelstam, p. 120). Poetry has always played a vital role in the history and the evolution of cultures. According to Schiller, the poets are citizens not only of their country, but

of their times. Whatever occupies men in general, will interest poets still more and will make them the spokesmen of their generations. In a way, one of the chief functions of poetry is to serve as a kind of evolutionary clock and to instruct people how to tune in the intrinsic time of individuals and entire societies with the extrinsic times of cosmic processes. In particular, the representatives of the previous Hour of the Phoenix (1885-1900) included such prominent poets as Anna Akhmatova, Thomas Stearns Eliot, Boris Pasternak, Velimir Khlebnikov, Osip Mandelstam, Marina Tsvetaeva, Nikolay Gumilev, Vladimir Mayakovsky, Eugenio Montale, Giuseppe Ungaretti, Federico García Lorca, Isaac Rosenberg, Rupert Brooke, Robert Desnos, Paul Eluard, Hart Crane, Ernest Hemingway, Ezra Pound, Nelly Sachs and Berthold Brecht. Most of them are often seen as tragic figures, the symbols and the chroniclers of the lost generation born on the edge of the coming new epoch and experiencing a spiritual crisis. Bloodshed, famine, inconsolable grief, political and cultural purges and innumerable graves accompanied their life paths. On the other hand, they felt themselves to be makers of history. Their mission was “keeping up faith in humanity, in its ability to be resurrected, to repent, and to begin a new life (Mandelstam, p. 103). Akhmatova lamented “people of our generation are not threatened by sad returns – we have nowhere to return to” (Akhmatova, p. 9). Yet she also admitted: “I am happy that I lived during those years and witnessed events unlike any others” (Akhmatova. p. xvi).

Were these events indeed unlike any others? In 2009, inspired by Pyotr Vail’s insightful interviews with Joseph Brodsky, a composer Yuri Edelstein suggested to me that it is no coincidence that the prominent Russian poets of the Silver Age (Akhmatova, Pasternak, Tsvetaeva and Mandelstam) have many parallels with the greatest ancient Latin poets – Virgil, Horace, Ovid and Catullus. Both groups of poets participated in enormous political and cultural transformations. For those born in the Roman world in the beginning of the first century AD, the changes were marked by the end of the Republican democratic government and the creation of a kingship. Those, who were born in the 1890-s in Russia lived in crucial times of the end of the Russian Empire and the coming age of the Dictatorship of the Proletariat. Both groups of poets witnessed the violent outbursts of civil wars and both believed that the end of these wars would be followed by a new golden age for poets and artists. Both were born simultaneously with the rare cosmic phenomenon of a Neptune-Pluto conjunction. Both were marked by enormous ability and urge to change the very essence of the existing poetry. Both cases vividly illustrate how poetic perception can precede and predict historical events. Their poetry embodied a speedy temporality, while the acute feelings of suddenness, novelty and shock were instantaneously reflected in their poems. Indeed, it is difficult to understand the multiple parallels between both poetic dramas without reference to notions of historical cycles on a cosmic scale.

Further enquiries revealed striking correspondences between the Neptune-Pluto cycle and the rate of birth of significant poets. On the one hand, the structure and relative durations of the phases in this cycle are reminiscent of solar and lunar cycles.

On the other hand, they are correlated with processes in societies at large. As a result, it is possible to construct a corresponding poetical calendar and to talk about the “seasonal” changes in human culture. It appears that in poetry, the use of current language and notions radically prunes the number of possible topics, expressions and metaphors that the poet can use and the reader can understand. Great poets are not born in arbitrary historical periods, but rather their birth dates create meaningful temporal order. Seen in this way, the birth dates of the representative poets present an essential structure. The following phases of each Year of the Phoenix are reminiscent of the traditional seven stages of human life, and each phase has its own unique set of “gifts” for humanity.

The opening stage is The Hour of the Phoenix – the zero point, or the emergence of the main ideas of the cycle. Then:

- The first phase is the time of infancy and childhood. It deals with innovative experiments in hope to transform the world and make it a better place to live.
- The second phase is the phase of adolescence and youth. Typically, it refers to the upheaval that happens when passionate tendencies prevail in various social, political, cultural or religious causes.
- The third phase is the phase of early adulthood, the time to take on multiple responsibilities.
- The fourth phase is the “mid-life crisis.” It is a phase in which existing beliefs, theories, practices and frameworks offer no good guidance. Those are the times when the initial ideas are often challenged by disasters, wars and sudden crises.
- The fifth phase is the period of mature adulthood. This phase is the period of the golden age of enlightenment. The initial ideas are proudly entering the academies.
- The sixth phase is the crisis of the onset of old age. The initial ideas become weary, yet they still are not ready to give place to new tendencies.
- The seventh phase heralds a stage when the initial ideas exhaust their potential. Their ability to keep up with the ever-changing world comes to an end. They can either decline into oblivion or represent the source of ancient wisdom for the young generations.

Although the duration of each phase is unique to each cycle, the order of alternation is maintained during all the Years of the Phoenix. Usually these phases are seen as a series of different, discrete historical periods. However, understanding the principles of the Year of the Phoenix allows treating them as a consistent temporal progression of the same idea, launched during the Hour of the Phoenix. Although each culture and each Year of the Phoenix dynamically produces poetry in its own way, certain commonalities can be drawn for each phase. Although each great poet is a unique star, there is a link between his individual creativity and collective consciousness during a given epoch.

The model of the Clock of the Phoenix presented here, however, does not concern itself merely with poetry. A close multi-centuries analysis of the philosophic schools,

scientific ideas and technological developments shows that many developments can be explained and reassessed from this temporal point of view.

## Conclusions

*Maybe yesterday's rhyme  
Was for yesterday's time  
Neil Diamond*

In their essence, time and poetry have similar functions: both are intended to synchronize the actions and the thoughts of individuals. Both not only derive from society but also are shaped by it. Poetry, produced by the people born during the Hour of the Phoenix resembles a storm of values and plans. It can be seen as a prologue to the coming epoch of half a millennium and, for that reason, be used by the following generations as the proper navigational equipment in their search for ways and means of dealing with all this abundance of ideas.

In conclusion, I would like to stress that my pioneering ideas are meant mainly as proposals for inquiry. I hope that these data provide a basis for further studies.

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