

Science: the last living example of Medieval Art ?

Alessandro Giuliani



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- ✓ Niccolò MACHIAVELLI
Il Principe (ed. a c. di U. Dotti, Milano, Feltrinelli, 1991 e sgg.); *La Mandragola* (ed. a c. di G. Davico Bonino, Torino, Einaudi, 1992 e sgg.).
- ✓ Torquato TASSO
La Gerusalemme Liberata (ed. a c. di L. Caretti, Milano, Mondadori, 1999 e sgg.): I-VI, XII-XVI, XX.
- ✓ Carlo GOLDONI
La locandiera (ed. a c. di C. Pedretti, Milano, Rizzoli, 2001 e sgg.).
- ✓ Vittorio ALFIERI
La vita (ed. a c. di M. Cerruti e L. Ricaldone, Milano, Rizzoli, 2002 e sgg.); *Saul* (in: *Filippo; Saul*, a c. di V. Branca, Milano, Rizzoli, 2000 e sgg.).
- ✓ Ugo FOSCOLO
I sonetti; I Sepolcri (in: *Sepolcri, odi, sonetti*, a c. di D. Martinelli, Milano, Mondadori, 2001 e sgg.).
- ✓ Alessandro MANZONI
I Promessi Sposi (ed. a c. di E. Raimondi e L. Bottoni, Milano, Principato, 2002 e sgg.).
- ✓ Giacomo LEOPARDI
Canti (ed. a c. di N. Gallo e C. Garboli, Torino, Einaudi, 1994 e sgg.): All'Italia, Ad Angelo Mai, Bruto minore, L'ultimo canto di Saffo, La sera del dì di festa, L'infinito, Alla luna, A Silvia, Le ricordanze, Canto notturno d'un pastore errante dell'Asia, Il tramonto della luna;
Operette morali (ed. a c. di C. Galimberti, Napoli,

Handbook of Physics : Index



Traditional thinking: the issues are independent from their authors

Handbook of Italian Literature: Index



Modern thinking: the authors decide the relevance of the issues

At the molecular level, rearrangements are thought to result from errors in double-strand break repair pathways (mainly non-homologous end joining, but also non-allelic homologous recombination) when simultaneous breaks occur in close proximity in the nucleus (Lupski and Stankiewicz, 2005; Korbel et al., 2007; Meaburn et al., 2007; Quinlan et al., 2010; Zhang et al., 2012), and, to a lesser extent, from fork stalling and template switching during replication (Shaw and Lupski, 2004; Lee et al., 2007; Kidd et al., 2010).



Scientific work: any statement must be justified by reference to previous works, any novelty is accepted if (and only if) fits with an established tradition.

What for Art ??????...The medieval most influential definition of Art is:

Recta Ratio Factibilium (Thomas the Aquinas, Roccasecca, 1225 – Abbazia di Fossanova, 1274)



The right way to manage what could be done

In Middle Ages the different Arts were considered as a unitary system: no qualitative differences among painters, architects, tailors, carpenters..the value assigned to each single 'piece' was decided by its adherence to *standards*.

Artifact: anything made following *art rules* (*a regola d'arte*, in Italian we still use this term for deciding legal controversies on construction works).

Scientific journals follow the same principles (*peer review*) of Medieval *guilds* (in contemporary language '*community*') and the St. Thomas definition of Art (Science), here below a section of the 'art rules' for a scientific paper to be accepted for publication (PLoS Journals, *Italics added*):

Results must be rigorously and appropriately reported, in *keeping with community standards*.

•**Units of measurement.** Clearly define measurement units in all tables and figures.

•**Properties of distribution.** It should be clear from the text which measures of variance (standard deviation, standard error of the mean, confidence intervals) and central tendency (mean, median) are being presented.

•**Regression analyses.** Include the full results of any regression analysis performed as a supplementary file. Include all estimated regression coefficients, their standard error, p-values, and confidence intervals, as well as the measures of goodness of fit.

•**Reporting parameters.** Test statistics (F/t/r) and associated degrees of freedom should be provided. Effect sizes and confidence intervals should be reported where appropriate. If percentages are provided, the numerator and denominator should also be given.

•**P-values.** Report exact p-values for all values greater than or equal to 0.001. P-values less than 0.001 may be expressed as $p < 0.001$, or as exponentials in studies of genetic associations.

•**Displaying data in plots.** Format plots so that they accurately depict the sample distribution. 3D effects in plots can bias and hinder interpretation of values, so avoid them in cases where regular plots are sufficient to display the data.



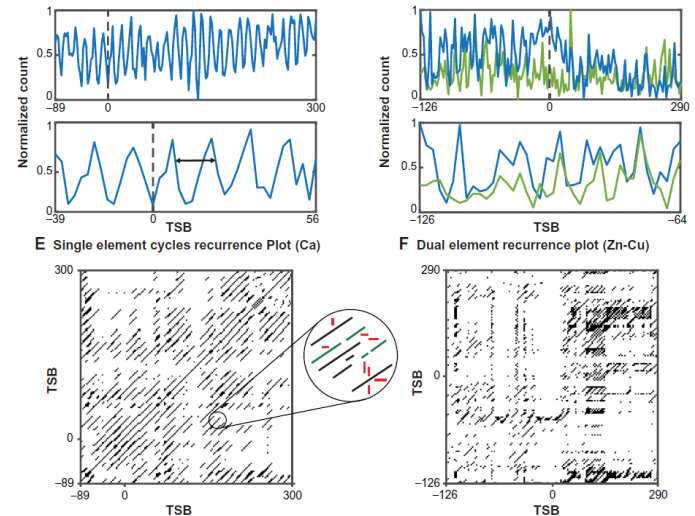
(Padova, Cappella degli Scrovegni)

Dynamical features in fetal and postnatal zinc-copper metabolic cycles predict the emergence of autism spectrum disorder.

(SCIENCE ADVANCES | RESEARCH ARTICLE)

Who did the work ?:

Giotto and co-workers (*Bottega di Giotto*)....



Who did the work ?:

Paul Curtin,^{1*†} Christine Austin,^{1*} Austen Curtin,^{1*} Chris Gennings,^{1*} Manish Arora^{1*†}
 (for the Emergent Dynamical Systems Group), Kristiina Tammimies,^{2,3} Charlotte Willfors,^{2,3}
 Steve Berggren,^{2,3} Paige Siper,^{4,5} Dheeraj Rai,⁶ Kristin Meyering,^{4,5} Alexander Kolevzon,^{4,5}
 Josephine Mollon,^{7‡} Anthony S. David,⁷ Glyn Lewis,⁸ Stanley Zammit,^{6,9} Lynne Heilbrun,¹⁰
 Raymond F. Palmer,¹⁰ Robert O. Wright,¹ Sven Bölte,^{2,3} Abraham Reichenberg^{1,4,5,7†}

Both Medieval Artworks and Contemporary Scientific papers are **Collective** works

Renaissance *breaks (some) old rules:*

1. The most valuable art pieces are 'masterpieces' (works made by a **single** master) individuality overcomes the collective.
2. Painters and Architects flirt with 'Intellectual elites' and separate from Carpenters and Tailors...

...but keeps alive some others:

1. Art plays a crucial social and political role (No *Art pour l'Art* temptations) and thus must adhere to standards (like Science).
2. The '*Committenza*' (Funding Agencies in Science, who puts the money) has a direct influence on the **content** of the work. (No *expressionist* solipsistic temptations).

Protestant Reformation introduces a sharp divide in artistic production, with Catholic world recovering a sort of 'New Universal Medieval Way' and Protestant nations going toward a completely different path.....



*Lucas Cranach: portrait of Martin Luther,
Cranach was the painter most directly engaged in Reformation movement.*



*Michelangelo Merisi da Caravaggio: Magdalene.
Caravaggio was the painter most strictly following the Catholic counter-reformation art standards.*

Theology of Beauty, 1582

The re-birth of a canon in Catholic Reformation (Concilio di Trento)

figurative art = popular culture (Catholic) vs. literature = elite art (Protestant)

Every person must have the possibility to read the Bible (Luther)

Forget reading and look at these beautiful pictures (Paleotti)

GABRIELE PALEOTTI

DISCORSO INTORNO ALLE IMAGINI SACRE E PROFANE

È certo gran meraviglia che, per volere intendere qualche libro, vi sono necessarie sì difficili cose, come la cognizione della lingua, il maestro, l'ingegno capace e la commodità d'imparare, tal che la cognizione loro si restringe solo in pochi, che si chiamano dotti et intelligenti; dove che le pitture servono come libro aperto alla capacità d'ogniuno, per essere composte di linguaggio commune a tutte le sorti di persone, uomini, donne, piccioli, grandi, dotti, ignoranti, e però si lasciano intendere, quando il pittore non le voglia stroppiare, da tutte le nazioni e da tutti gli intelletti, senza altro pedagogo o interprete. Si aggiunge che, con brevità grandissima, anzi in un momento, o più tosto in uno sguardo, fanno capaci subito le persone³³⁶; dove nei libri provano gli eruditi quanto tempo et oglio vi si consuma per intenderli. E quel che più importa è che, non acquistandosi le lettere, o scienze de' libri, se non con gran fatica, travaglio e spesa, dalle immagini siamo ammaestrati con grandissima dolcezza e ricreazione.



The new Catholic Medieval Art (*Bibla Pauperum*, the Bible explained to the illiterate) is Baroque, again no qualitative distinctions among Arts: carpenters, tailor, actors, painters, sculptors, architects .. share the same Canonical Prescriptions

Who did this work ?

(Chiesa del Gesù, Roma)

..and where are these churches ?



.. what about Orthodox world ?



(Kazan's Virgin Mary Icon)

...this is a fascinating (but too complex to be told here) story in which the collective, the intimate, the expressionism, the adherence to the standards mix-up in a unique way..... the crucial point is the **Symbol** that makes *Rublev* a strict relative of *Malevich*...



...so let's go back to our science-medieval art parallel ... and make a jump to the end of XIXth century and the beginning of XXth

A scientist worthy of the name,
experiences in his work the same
impression as an artist; **his pleasure** is
as great and of the same nature. ...we
work not only to obtain the positive results
which, according to the *profane*, constitute
our one and only affection, as to
experience this **aesthetic emotion** and to
convey it to **others who are capable of**
experiencing it. (bolded added).



[Jules Henri Poincaré](#) ([29 April 1854](#) – [17 July 1912](#))



Impressionism, the Art of Poincarè times: this famous painting by Claude Monet (1840-1926) echoes the scientist considerations on impression, aesthetic emotion and personal experience.

19th century scientist

I must find the
explanation for this
phenomenon in order
to truly understand
Nature...



21st century scientist

I must get the
result that fits my
narrative so I can
get my paper into
Nature..



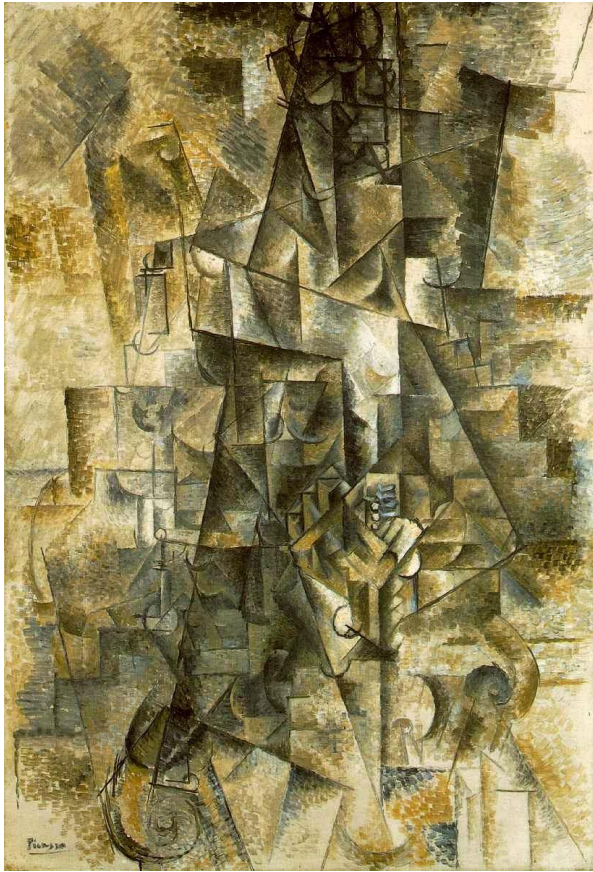
In the beginning of XX century artists and scientists 'sensed' the same crisis: it is the 'cultural transition' fueled by the Second Industrial Revolution:

Science is being transformed into Technology (and **scientists** try to re-affirm their 'master' role by focusing on solitary 'genius' and their unique experience)

Art has no more social role (and **artists** try to re-affirm their 'master' role by focusing on solitary 'genius' and their unique experience)

Art and Science start to consider themselves as esoteric Religions, the *profane* (literally '*who is out of the temple*' in Latin) cannot understand.

The first question (involving both Science and Art) is...**who is the profane ?**



Pablo Picasso: Harmonium Player



Michelangelo Merisi da Caravaggio: The Seven Works of Mercy

..and the second (related) question is : **There is a continuum going from the 'illuminate' to the 'profane' or an unsurmountable divide ?**



Frank O'Gehry, Bilbao Library
XXI Century



Francesco Borromini, San Carlino alle Quattro Fontane
XVII Century

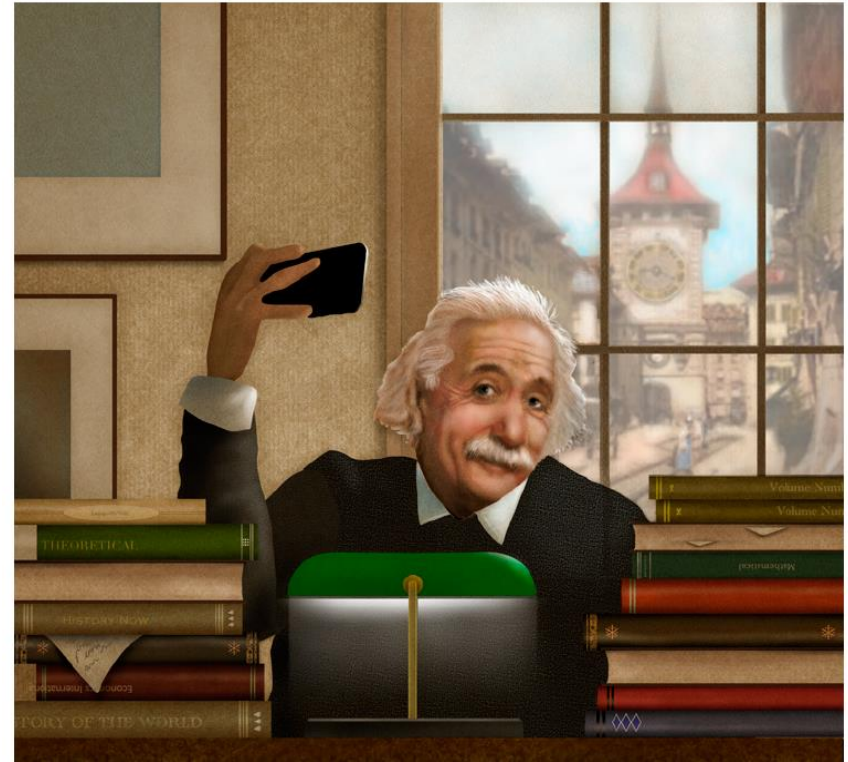
Science in the age of selfies

Donald Geman^{a,1} and Stuart Geman^{b,1}

9384–9387 | PNAS | August 23, 2016 | vol. 113 | no. 34

A time traveler from 1915 arriving in 1965 would have been astonished by the scientific theories and engineering technologies invented during that half century. One can only speculate, but it seems likely that few of the major advances that emerged during those 50 years were even remotely foreseeable in 1915: Life scientists discovered DNA, the genetic code, transcription, and examples of its regulation, yielding, among other insights, the central dogma of biology.

Some of these advances emerged from academia and some from the great industrial research laboratories where pure thinking was valued along with better products. Would a visitor from 1965, having traveled the 50 years to 2015, be equally dazzled?



Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

Table 4. PPV of Research Findings for Various Combinations of Power ($1 - \beta$), Ratio of True to Not-True Relationships (R), and Bias (u)

$1 - \beta$	R	u	Practical Example	PPV
0.80	1:1	0.10	Adequately powered RCT with little bias and 1:1 pre-study odds	0.85
0.95	2:1	0.30	Confirmatory meta-analysis of good-quality RCTs	0.85
0.80	1:3	0.40	Meta-analysis of small inconclusive studies	0.41
0.20	1:5	0.20	Underpowered, but well-performed phase I/II RCT	0.23
0.20	1:5	0.80	Underpowered, poorly performed phase I/II RCT	0.17
0.80	1:10	0.30	Adequately powered exploratory epidemiological study	0.20
0.20	1:10	0.30	Underpowered exploratory epidemiological study	0.12
0.20	1:1,000	0.80	Discovery-oriented exploratory research with massive testing	0.0010
0.20	1:1,000	0.20	As in previous example, but with more limited bias (more standardized)	0.0015

Jorge Luis Borges: El Rigor de la Ciencia (On the Exactitude in Science)

.. In that Empire, the Art of Cartography attained such Perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those Unconscionable Maps no longer satisfied, and the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided point for point with it. The following Generations, who were not so fond of the Study of Cartography as their Forebears had been, saw that that vast map was Useless, and not without some Pitilessness was it, that they delivered it up to the Inclemencies of Sun and Winters. In the Deserts of the West, still today, there are Tattered Ruins of that Map, inhabited by Animals and Beggars; in all the Land there is no other Relic of the Disciplines of Geography.”

purportedly from Suárez Miranda, Travels of Prudent Men, Book Four, Ch. XLV, Lérida, 1658

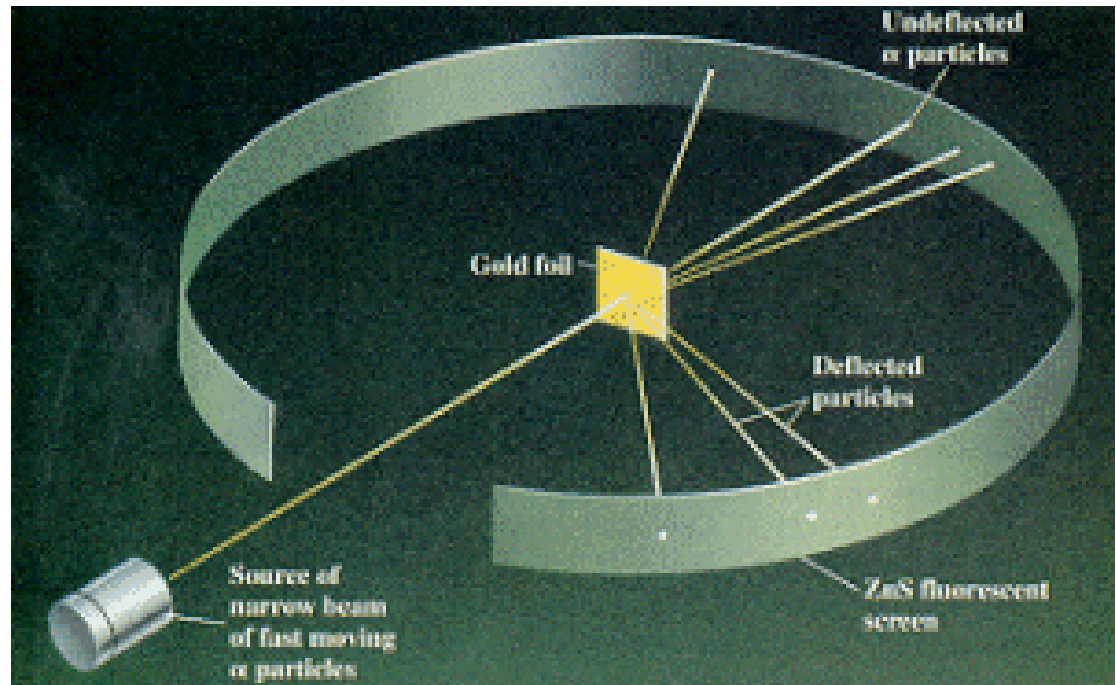
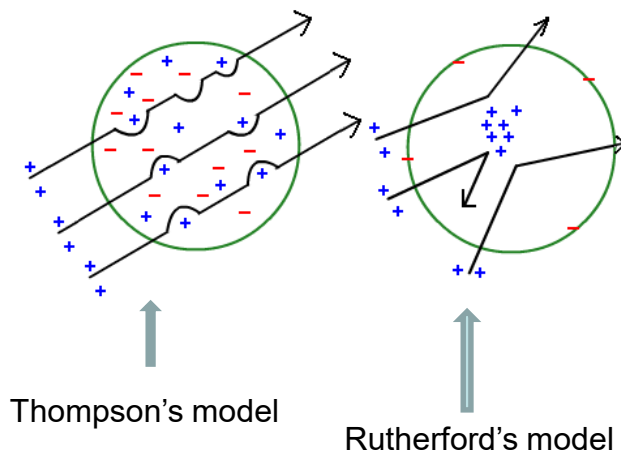
Science as Theater: Too Obvious to Be Appreciated

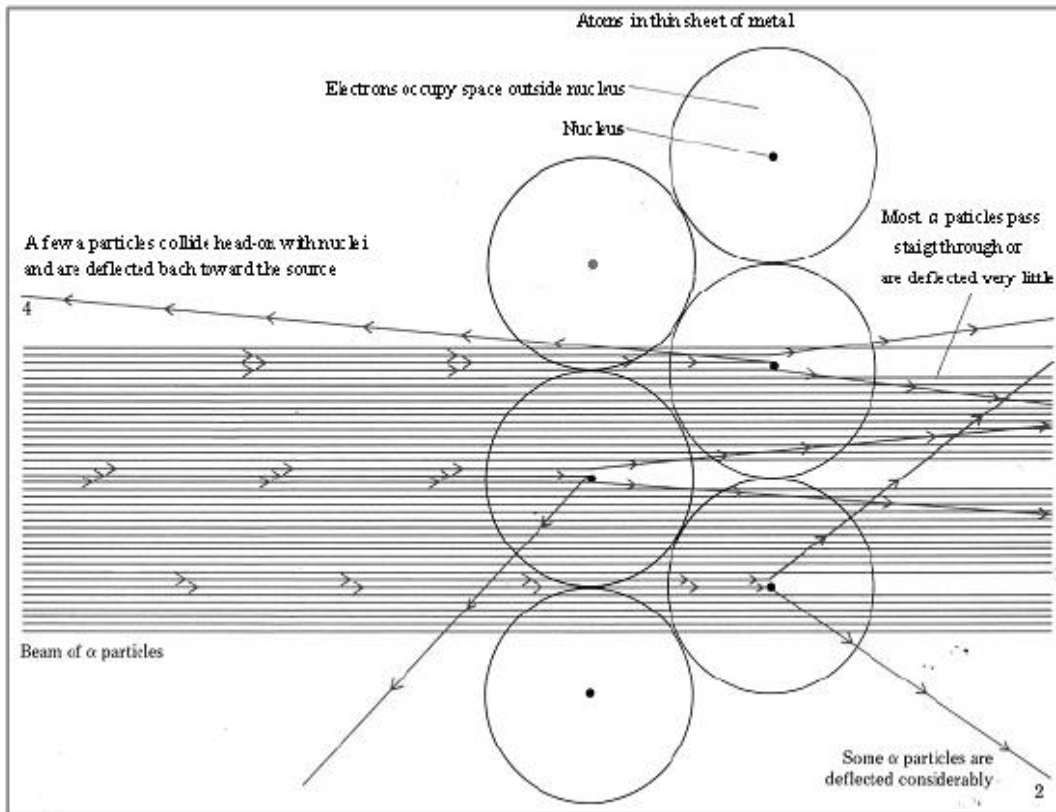
Alessandro Giuliani

Pavel Florenskij points our attention to the fact ‘magic shows’ follow a path very similar to the foundation of ‘Scientific Truth’



Both in Science and Illusionism we give for granted the existence of shared material experiences we do not investigate further. This is 'pure magic show', probably the most genial scientific experiment of all times, in 1911 Ernst Rutherford shows us the structure of atoms...





It was the most incredible event in my life:
incredible as shooting a cannon ball against a
piece of paper and looking at the ball coming back
and hitting me. .

Ernst Rutherford on his 1911 experiment...

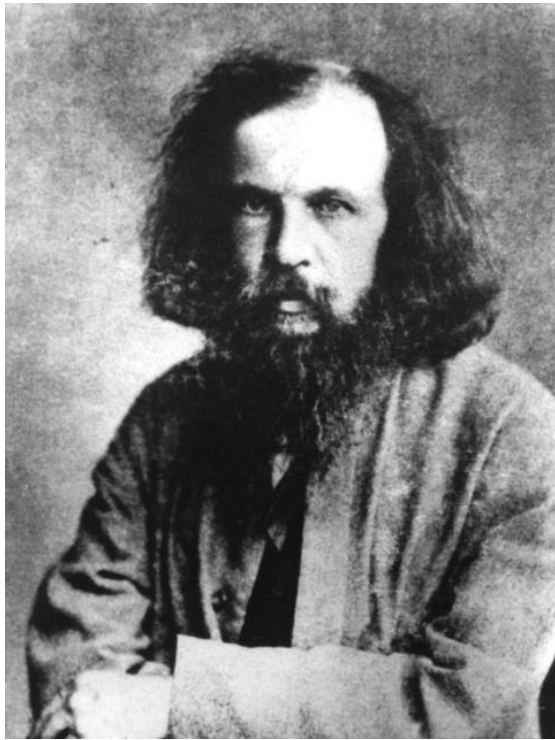


TAVOLA PERIODICA DEGLI ELEMENTI

	1																		18
	I																		VIII
1	idrogeno 1 H																		elio 2 He
2	litio 3 Li	berillio 4 Be																	neon 10 Ne
3	sodio 11 Na	magnesio 12 Mg																	argon 18 Ar
4	potassio 19 K	calcio 20 Ca	scandio 21 Sc	titanio 22 Ti	vanadio 23 V	cromo 24 Cr	manganese 25 Mn	ferro 26 Fe	cobalto 27 Co	nichel 28 Ni	rame 29 Cu	zinc 30 Zn	galio 31 Ga	germanio 32 Ge	arsenico 33 As	selenio 34 Se	bromo 35 Br	cripton 36 Kr	
5	rubidio 37 Rb	stronzio 38 Sr	ittrio 39 Y	zirconio 40 Zr	niobio 41 Nb	molibdeno 42 Mo	tecnizio 43 Tc	rutenio 44 Ru	rodio 45 Rh	paladio 46 Pd	argento 47 Ag	cadmio 48 Cd	indio 49 In	stagno 50 Sn	antimonio 51 Sb	tellurio 52 Te	iodio 53 I	xenon 54 Xe	
6	cesio 55 Cs	bario 56 Ba	lantano 57 La	afnio 72 Hf	tantalio 73 Ta	tungsteno 74 W	renio 75 Re	osmio 76 Os	iridio 77 Ir	platino 78 Pt	oro 79 Au	mercurio 80 Hg	tallio 81 Tl	piombo 82 Pb	bismuto 83 Bi	polonio 84 Po	astato 85 At	radon 86 Rn	
7	francio 87 Fr	radio 88 Ra	attinidi 89 Ac	rutherfordio 104 Rf	dubnio 105 Db	seaborgio 106 Sg	bohrio 107 Bh	hassio 108 Hs	meitnerio 109 Mt	damstadtio 110 Ds	roentgenio 111 Rg								
			LANTANIDI	cerio 58 Ce	praseodimio 59 Pr	neodimio 60 Nd	promezio 61 Pm	samario 62 Sm	europio 63 Eu	gadolinio 64 Gd	terbio 65 Tb	diprosio 66 Dy	olmio 67 Ho	erbio 68 Er	tulio 69 Tm	itterbio 70 Yb	lutetio 71 Lu		
			ATTINIDI	torio 90 Th	protattinio 91 Pa	uranio 92 U	nettunio 93 Np	plutonio 94 Pu	americio 95 Am	curio 96 Cm	berkelio 97 Bk	californio 98 Cf	einsteinio 99 Es	fermio 100 Fm	mendelevio 101 Md	nobelio 102 No	laurenzio 103 Lr		

Dimitrji Ivanovic Mendeleev
(1834-1907): *Periodic Table
of Elements*

A discrete and finite set of ‘rules’(‘performant symbols’ according to the most genuine ‘Russian Way’) gives rise to an infinite Universe of configurations..*like Music*

The middle way

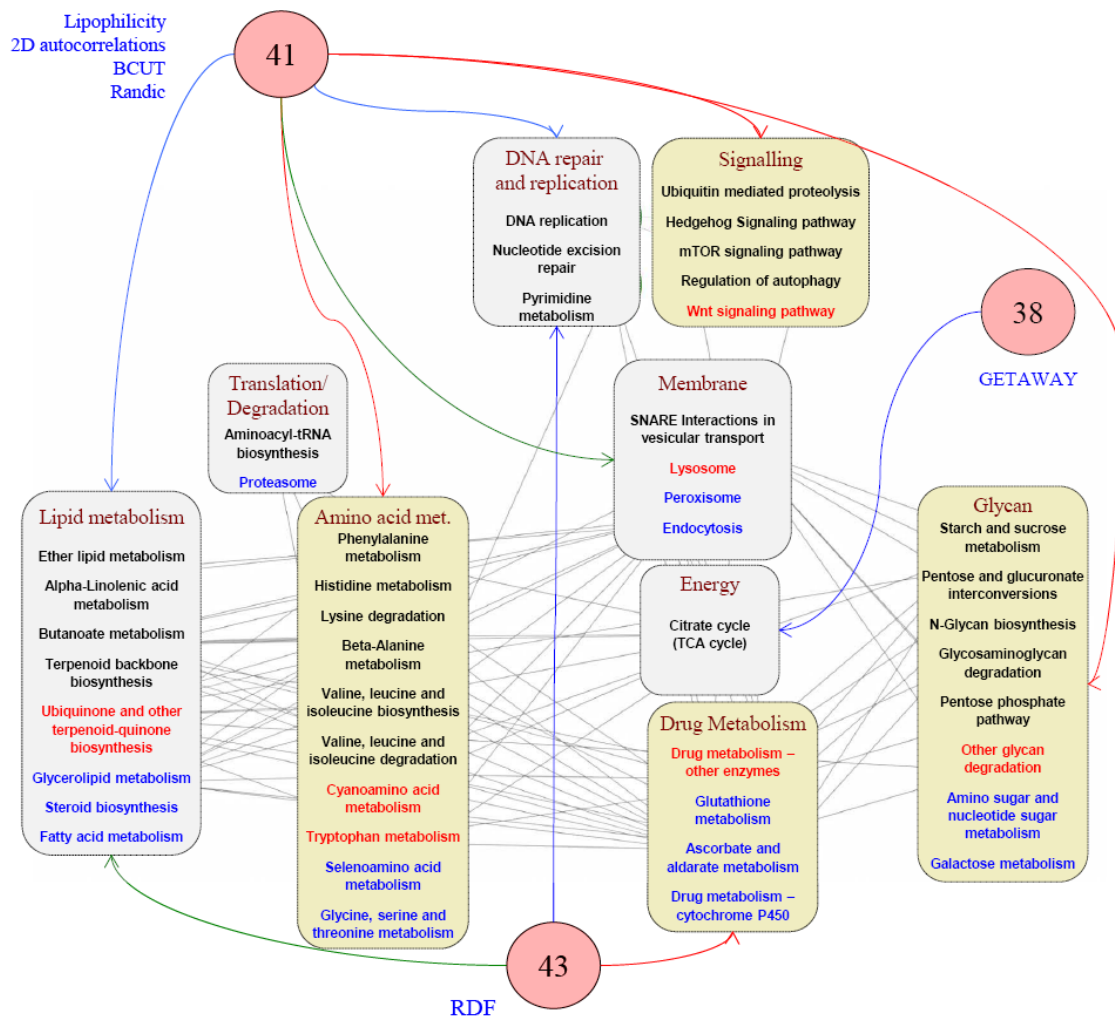
R. B. Laughlin*, David Pines^{†‡§}, Joerg Schmalian[¶], Branko P. Stojković^{||**}, and Peter Wolynes^{††}

32–37 | PNAS | January 4, 2000 | vol. 97 | no. 1

Mesoscopic organization in soft, hard, and biological matter is examined in the context of our present understanding of the principles responsible for emergent organized behavior (crystallinity, ferromagnetism, superconductivity, etc.) at long wavelengths in very large aggregations of particles. Particular attention is paid to the possibility that as-yet-undiscovered organizing principles might be at work at the mesoscopic scale, intermediate between atomic and macroscopic dimensions, and the implications of their discovery for biology and the physical sciences. The search for the existence and universality of such rules, the proof or disproof of organizing principles appropriate to the mesoscopic domain, is called the middle way.



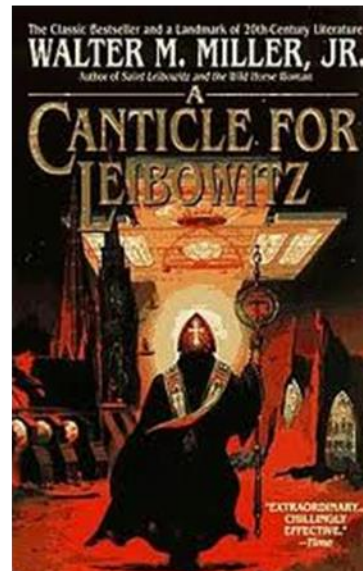
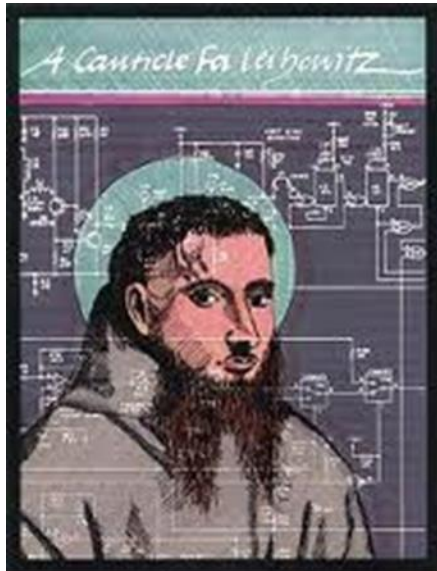
$\log(\text{LC50}) = -0.8438 \log(\text{Kow}) - 2.3078$. (validated on hundreds of molecules)



can be applied to 24 molecules

In order to save Science from thermal death we must dare to give up with ultra-experts and try to re-establish a 'continuous spectrum' from avant-garde to simple persons (*Bibla Pauperum* ?) Taking inspiration from Medieval Art.

Short-Cuts like 'Citizen Science' can only accelerate the Apocalypse





Thanks for your attention !!!!!!!!!!!!!!!!!!!!!!!

(and anxious to know your ideas about..)