

## Yet more lessons from complexity - Unity: The key of peace

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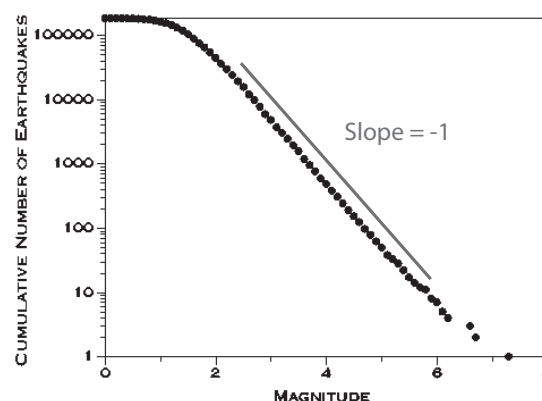
The last few decades have witnessed the development of a host of ideas aimed at understanding and predicting nature's ever present complexity (see for instance, Mandelbrot, 1982; Bak, 1996; Wolfram, 2002). It is shown that such a work provides, through its detailed study of order and disorder, a suitable framework for visualizing the dynamics and consequences of mankind's ever present divisive traits. Specifically, this work explains how recent universal results pertaining to power-laws, self-organized criticality, and space-filling transformations provide additional and pertinent reminders that point us to unity as an essential element for us to achieve peace.

### Power-laws everywhere

The tails of probability distributions of a host of geophysical phenomena associated with natural hazards have been recently found to exhibit power-laws (see for example, Turcotte, 1997; Sornette, 2004; Malamud, 2004; Buchan, 2001):

$$P[X \geq x] \sim x^{-c}$$

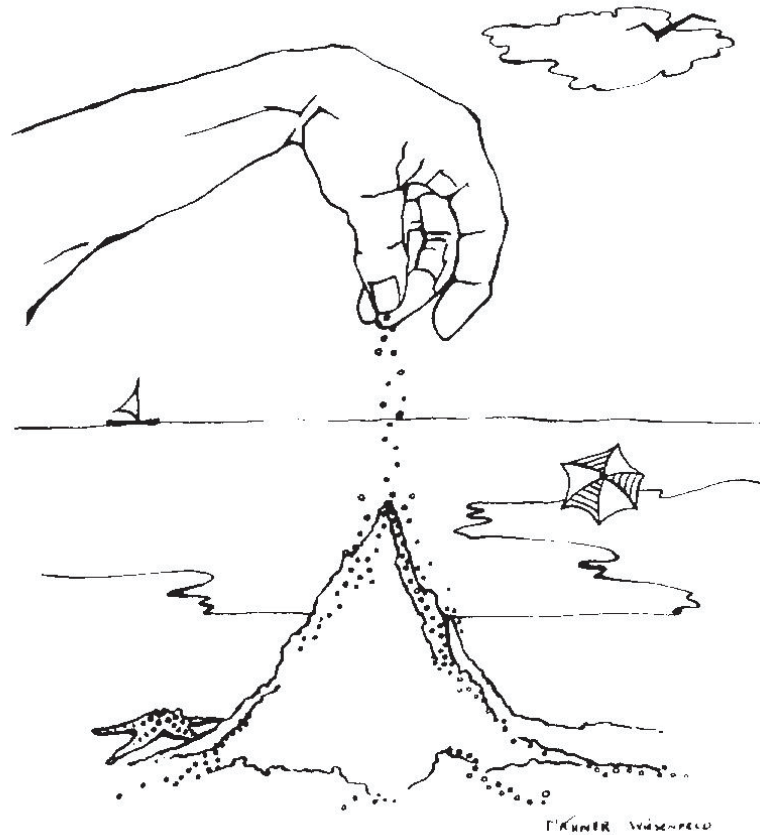
Earthquakes, floods, avalanches, volcanic eruptions, forest fires, etc., despite their extraordinary complexity and utter dependency to details, yield simple and accurate "linear" fits in log-log scales, ubiquitous "heavy tails" which indicate that such processes lack a characteristic scale, as it also happens geometrically on fractal sets (see for example Mandelbrot, 1982; Bak, 1996; Wolfram, 2002) (see Figure 1).



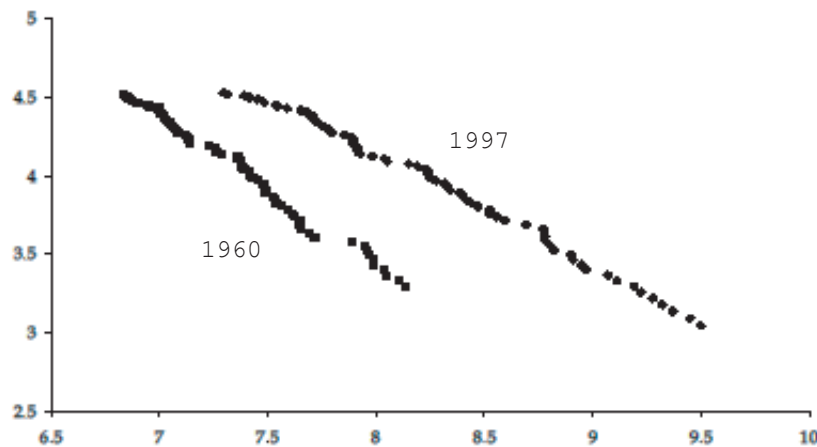
**Figure 1** Gutenberg-Richter magnitude frequency distribution for earthquakes in Southern California. (After Southern California Earthquake Center)

As such behavior about nature's wrath has emerged and piled up; their potential **universality** has led to an effort to understand the genesis of such a surprisingly plain scaling. Amongst the ideas proposed stands the notion of self-organized criticality, **SOC**, which asserts that power-laws may be obtained via small accumulations of energy that drive a system towards a "critical state," always away from equilibrium and always on the verge of disintegration (see for example, Bak, 1996; Sornette, 2004; Malamud, 2004) (see Figure 2).

Given that power-laws are also conspicuously present in several situations associated with human behavior, here it is argued that we, as conscious moral beings, may learn from complexity in order to achieve what really matters to us all, that is, lasting and true peace (Puente, 2006a, 2006b).



**Figure 2** A hand growing a SOC sand pile leading to avalanches. (After Bak, 1996).



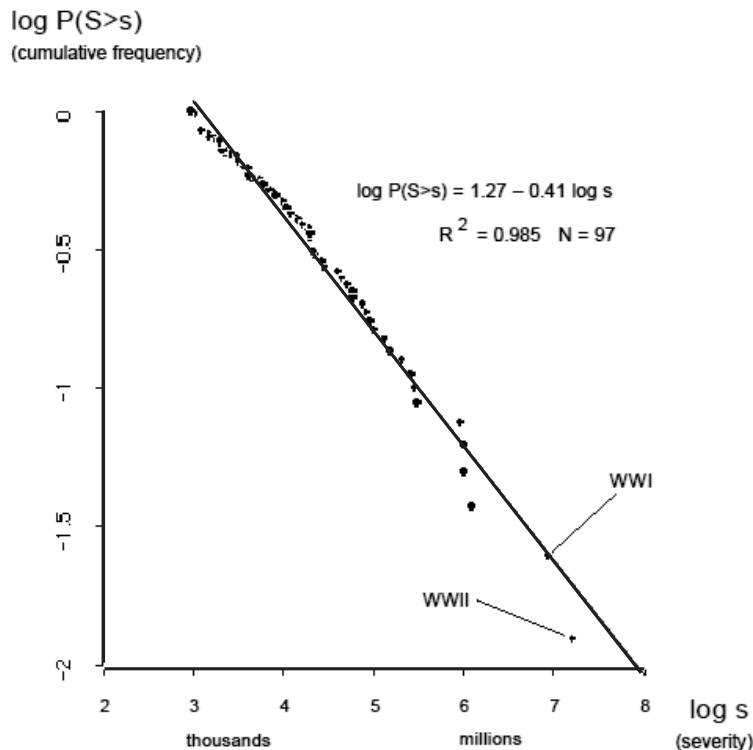
**Figure 3** 30<sup>th</sup> to 85<sup>th</sup> percentiles of the world income distribution (GDP per capita). Plotted is the formula  $\ln i = \ln M + \ln (1 - F(x_i))$ , where  $i$  is the nation's rank,  $M$  is the number of nations, and  $F(x_i)$  is the cumulative distribution function. (After Di Guilmi, et al., 2003).

### Power-laws and our quest for peace

As first studied, respectively, by V. Pareto and L. E. Richardson, income inequalities and casualties from gangs to wars are also quite notorious power-laws (see Figures 3 and 4).

Although our natural bliss in “nailing” yet another power-law, and hence understanding a bit

more about how nature and our nature works is often justified, it is pertinent, I think, for us not to lose sight of the ample havoc and misery produced by natural and man-made hazards that affect not only the fragile environment of our world, but also many real people, folks with flesh and bones, just like you and me.



**Figure 4** Cumulative distribution of severe interstate wars. (After Cederman, 2003).

In this spirit, the intrinsic fury and division in power-laws exposes, I believe, the worst traits present in all of us and reminds us of the inescapable cosmic battle of good and evil that engulfs us. For despite our intrinsic *normal* tendencies for *love* and *friendship*, history, in its unflappable truth, justly records our choices and, unfortunately, our many failings.

All power-laws mentioned herein help us appreciate, I believe, the accumulation of our ultimately misguided options. For despite their high determination coefficients, such laws are just false and incomplete illusions of straightness, remarkable but, at the end, rather ugly “*regressions*” to dissipation and terror that in no way resemble the immaculate and real rectitude to which we are all called.

If we dare to use the yardstick that makes us human and recognize **Love** as key and in addition we translate love’s eternal invitation to unity as “*integration without differentiation*,” we may recognize there other important reminders. As such, we may appreciate the exponential function, with *unity* as its internal derivative, as the antithesis of the *log*[1], and right there we may fully realize, face to face, in its unmerciful minimization of energy, how the untamed selfishness in power-laws is a

plain negation of goodness and hence a manifestation of evil.

Simply put, violent power-laws potentially symbolize what happens to us, individually and collectively, when we lose track of our “inherent scales” and misuse or abuse our prescribed “powers.” The lesson is consistent and straight forward: if we abandon our human consciousness, the laws of nature simply take over and we pay the justly appointed consequences of our cascading avalanches[2]. For even if we are prone to the pervasive accumulation of little effects, as it happens in self-organized criticality[3], and also in the other mechanisms that yield power-laws, such as preferential attachments, multiplicative processes, highly optimized tolerance[4], and self-organized complexity, at the end (and there is such) it is only up to us to see ourselves in the mirror of reality, to recognize our very crooked hands growing disorder, to stop blaming others (even the devil) and to mend what is clearly broken.

These ancient notions are indeed pertinent in this day and age when we have come to accept the indifference of the divisive winds as normal[5], when aggressiveness has increased due to false dogmas of competition, domination, and the “survival of the fittest,” and when the natural stresses

and superfluous distractions in our busy lives have obscured the very reason of our existence. Aren't we playing with fire not paying attention to the tried metaphor, explicit in power-laws, that conflagrations do not know how big they will become before they start?(see for example, Turcotte, 1997; Buchanan, 2001; Sornette, 2004; Malamud, 2004).

I believe that much can be learned from power-laws, very relevant lessons indeed, for although we may be told, again and again, that there is an "axis of evil" out there in the world, such passes, instead, by our very core and hence true peace and prosperity shall not happen unless we all collectively defeat our power addictions[6]. For irrespective of the academy of thought to which we belong, the proper scale, not easily accessible to measurement when we cloud it with pride, lies, undeniably, within each one of us.

### A transformation to friendship

**T**here is only one solution and we know it: to mend our fractal world we ought to let go of the destructive power in the power-laws and accept instead the ultimate power of *powerlessness*[7]. There is no other way: we have to become "childlike" growing our true determination to **unity**, that is, maximizing our energies, so that we all may become **friends** and play together. For as recently found in studying a host of social networks, friendship, even if loosely defined, avoids the heaviness of tails, as it rather aligns with exponential or Gaussian, **normal**, behavior! (Amaral, *et al.*, 2000).

In this regard, it is pertinent to know that there exist rather simple space-filling mathematical transformations capable of universally transfiguring arbitrary spiky sets, with associated power-law distributions and devil's staircases, into smooth and harmonic bells. It is also relevant to know that inside such limiting "beacons of freedom" lie boundless almanacs of beautiful designs that, in their exquisite and playful dynamics, invite us to plenitude (Puente, 2003) (see Figure 5).

These are indeed good news for such results reaffirm that truth, beauty and love co-exist, for such remind us that the origins of order emerge within a central limit. Such surprising results point us also to our very essence and purpose, for they shows us how, in the embracing affinity of love, advection and dissipation are transmuted into dif-

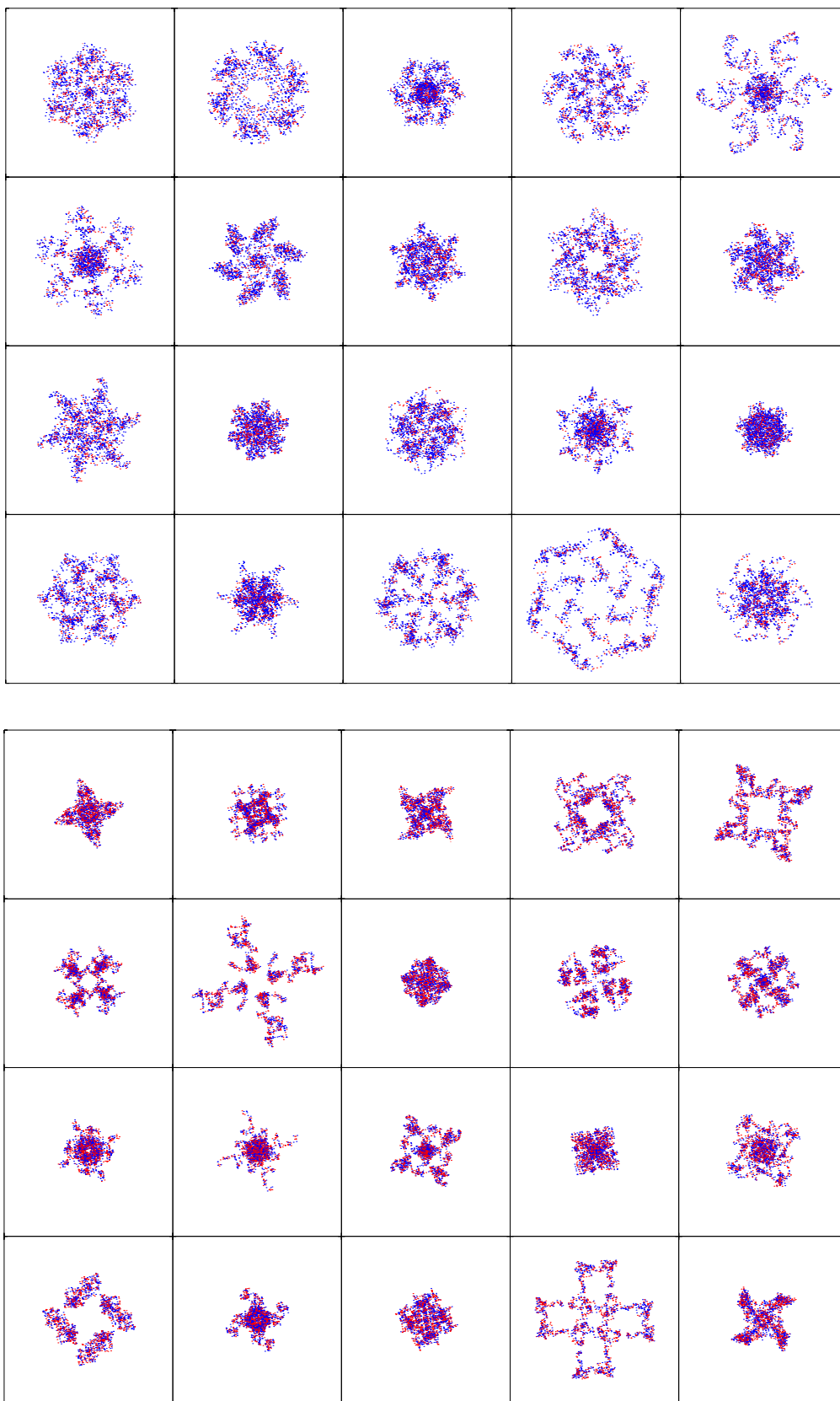
fusion and conduction. These notions also pierce our egos as they remind us that our best options are always guided by our hearts.

Natural hazards scare us for they reflect the madness of untamed violence and terror and for they expose the ultimate enemy of death that lurks around us and falsely tells us that there is no escape. To this end, it is very soothing to know that there is a peculiar space-filling transformation, built by successive mid-point *positive additions* of geometric powers of  $z$  tending to 1, a remarkable mirror in which to see our souls, that raises even spiky sets over Cantor dusts into a resounding bell without entropy and concentrated at infinity! For as  $z$  tends to 1, the mean and the variance tend to infinity, but the coefficient of variation tends to zero (see Figure 6).

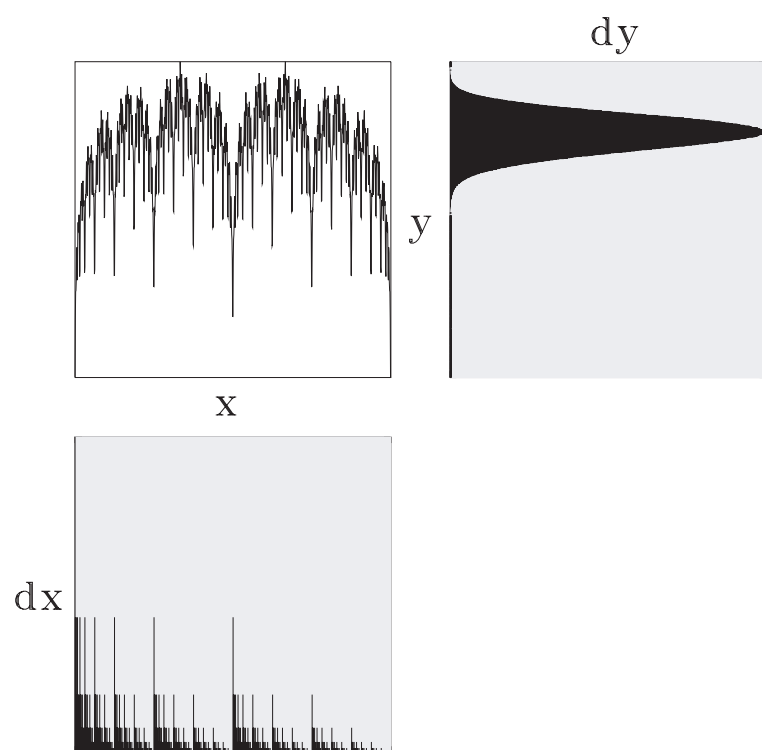
This is a rather powerful concept for it allows us to visualize the universal antidote against chaos and disorder, a mighty promise that rightfully sustains our dreams. How wonderful it is to see, in the exquisite unitive joy of "cloud 9"[8], the final defeat of power-laws in the connectedness of serenity and equality, for in such a case one may comprehend why the ancient and improbable Trinitarian story rings a bell, and why, in the light that triumphs over darkness, it is forever proclaimed "glory to God in the highest and peace on earth to all people!" (see Figure 7).

### Acknowledgments

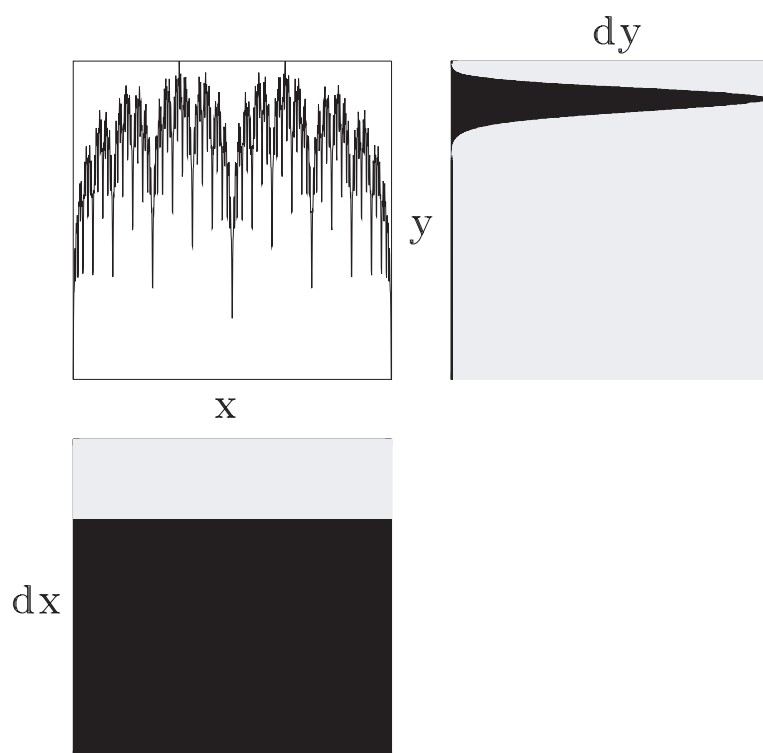
This work is dedicated to Alvaro and Elizabeth Aldama, my beloved mentors, who pointed me, by their own experience, to taste the flame of the ever positive transformation that leads us to normality.



**Figure 5** Treasures inside a limiting bell found iterating simple affine maps. (After Puente, 2003).



**Figure 6** *From an arbitrary multifractal measure to an amazing bell*



**Figure 7** *Mighty symbols: from equilibrium to a bell concentrated at infinity*

## THE AMAZING BELL

(Carlos E. Puente)

*By the mystery of science  
graciously shines a state,  
an all-embracing alliance  
adding liberty a shape.*

*One day, as if by chance,  
boldly there was such gem,  
as the shadow off a wire  
that fills completely space.*

*As the ideas hint above  
enduring a lasting zest,  
here is probable code  
in the ever precious bell.*

The bell peals silent, oh oh  
reflecting its peace,  
and inside it gathers  
lovely masterpiece.

Symmetric pure beauty, oh oh  
oh mighty delight,  
this limit in fullness  
stores life's designs.

Such vessel contains, oh oh  
alephs of all tastes,  
diatoms and crystals  
including DNA.

But there is a case, oh oh  
reason to this song:  
the forward selection  
that raises it all.

There is clear choice  
that rotates the 8.

**By loving sincerely  
we surely converge.**

Notice, this is cogent:  
the bell's central theme.

**By living in freedom  
one fulfills the dream.**

There is transformation  
that kindles the heart.

**By loving in plenitude  
we become smart.**

For love mends the spiky  
and takes to the clouds.

**By living the present  
one joins blessed crowd.**

Oh see, this is truthful:  
the plus all the way.

**By loving the enemy  
we learn how to play.**

Dimensional growth,  
oh essence of life.

**By living in harmony  
one nails normal plan.**

Oh notice the symbols,  
oh irrational might.

**By loving simplicity  
we experience the light.**

Oh listen, you colleague,  
let's go out the cave.

**By living in unity  
we all shall prevail.**

Oh notice, my friend,  
the plea from a bell.

**By loving and loving  
joy will have no end...**





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## Notes

- [1] To log means to cut down, but not just trees; and the log is not just a cylindrical piece of wood but, quite accurately, what we commonly have in our eyes that prevent us from helping each other.
- [2] How **natural** it is to strike back rather than to turn the other cheek!
- [3] I say that **SOC** when applied to us humans should be named **SOS**, self-organized stupidity, for such exposes our silliness and reminds us that we do need help.
- [4] The implied greed in playing the "markets" of money and sex appear to be "*hot*," but such power-laws bring with them awful consequences. For a case study on sex-

ual promiscuity see Liljeros, *et al.* (2001).

[5] How pervasive are power-laws and what an awful selfish spiral and number captures the degree of disconnectedness induced by the "invisible hand."

[6] Cutting the word Pareto in Spanish and reading it with a Caribbean accent means "stop it all." Isn't that what we all should just do?

[7] The required algorithm for abandonment to outer (irrational) love, symbolized by the expression:

$$e = \lim_{x \rightarrow \infty} (1 + 1/x)^x$$

is found in Jesus' famous allegory regarding the vine and the branches, as recorded in the 15<sup>th</sup> chapter of the Gospel according to John.

[8] Notice how number 9 contains the same outer movement of *e* and how its poetry in motion helps us visualize a fully grown web and a maximally organized cluster, 1 = 0.999...

## Choices

Powerlessness  
Meekness  
Normality  
Conduction  
Plenitude  
Light  
Maximize  
Love

Power-laws  
Stubbornness  
Criticality  
Dissipation  
Solitude  
Darkness  
Minimize  
Else