The Roots of Unfairness: the Black Swan in Arts and Literature

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1. INTRODUCTION

It is a sad fact that among a large cohort of artists and writers, almost all will struggle (say, work for Starbucks) while a small number will derive a disproportionate share of fame and attention. The same applies to the so-called masterpieces that determine a canon: a few pieces displace others from the lists in a "winner-take-all" effect –all the while the neglected pieces languish and disappear from our literary consciousness.

It is even a sadder condition, and that is the concern of this discussion, that a large share of the success of the winner of such attention can be attributable to matters that lie outside the piece of art itself, namely luck.

Why is such luck invisible to us? Much of the analyses and explanations of the success (and attention) usually focus on the piece itself taken in isolation –the critics usually fail to include the losers, the "cemetery" of unpublished or forgotten works. Often, the failures also have the same "qualities" attributable to the winner, but these are concealed and hidden, tucked away from the observer's scrutiny.

Furthermore, these extrinsic factors are of a different character from the traditional randomness that has been studied historically, say in statistics textbooks. The dynamics of modern luck relate to the "intractable" variety of uncertainty; they produce events that this author categorizes as "Black Swans" (sometimes, more technically, "Type-2 randomness" or, even more technically, "large-impact events with small but incomputable probabilities"). Unlike traditional uncertainty, these unexpected events are both extremely rare, unexpected, yet command a large impact.

There is a remarkable regularity to these ubiquitous Black Swan dynamics. They are visible across disciplines and human activities. They pervasive in biology (pariculariy molecular biology), economics, sociology, linguistics, networks, the stock market, showing similar attributes. Literally anything that contains luck will be subjected to it. The spread of ideas and religions, the success of innovations, and historical events also follow these dynamics. Note here that while the problem is not particularly an economic one, the study of the economics side of things has been extremely useful to understand the phenomenon and perform extensive testing, because of the abundance of data and the availability of testing metrics. Strangely, while (against much of the misconceptions of Protestant ethics) economic life is ruled by a larger share of luck than commonly accepted, intellectual life is even far more unfair –much of the credits and the attributions go to a disproportionately small segment of winners.

There is a similarity between the exaggerated attention given to a particular oeuvre and the financial bubble dynamics that constitute the core pathology of the capitalistic system –indeed every single model of fads and mania can be mapped to its equivalent in intellectual and artistic appreciation.

Note that this paper examines the elements that convincingly exacerbate such unfairness; it does not necessarily imply that every single occurrence of intellectual success is unfair. Finally, we will survey the modern research literature on the subject of concentration across a broad categories of disciplines.

2. BLAME IT ON THE ALPHABET

The occurrence of the Winner-Take-All[2] effect in any form of intellectual production has been accelerating along with the speed of reproduction and communications. This seems to have started with the alphabet. Why the alphabet? The alphabet allowed stories and ideas to be replicated with high fidelity and without an upper limit, without any additional expenditure of energy on the author's part for the subsequent performances. He does not even have to be alive for that. It implies that those who, for some reason, start getting some attention can quickly reach more minds than others, and displace the competitors from the bookshelves. In the days of bards and troubadours, almost everyone had an audience; you had job security as no one from far away would impinge on your terrain. A story teller, like a baker or a coppersmith, had a market and the comfort that few from far away will dislodge him from his territory. Apprentices could wait for older ones to disappear from the scene. Today, just a few take almost everything.

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[2] "These are markets in which a handful of top performers walk away with the lion's share of total rewards." (Frank, 1994)

3. BLACK SWAN

What we call "Black Swan" here differs from what has been often referred to as "Hume's Black Swan" (although David Hume never made reference to the bird). The metaphor of the Black Swan is historically attributed to the difficulty in inductive logic called Hume's Problem of Induction[3], of the complications that lie in deriving general rules from observed facts –and from those facts only. How many white swans does one need to observe before inferring that all swans are white and that there are no black swans? Hundreds? Thousands? The problem is that we do not know where to start –we lack a framework of analysis to know if our *ex ante* estimation is appropriate, which is key in any form of inductive inference. Note that the Black Swan is not just a metaphor: until the discovery of Australia common belief held that all swans were white; such belief was shattered with the sighting of the first *cygnus atratus*.

In the present discussion, the Black Swan is not simply a problem in logic (in fact the logical importance of the issue is extremely minor), but an empirical matter concerning the occurrence of unusual events: an "outlier" or an exception that have the property of carrying a large impact. Another one of its attributes lies in its character of surprise. In the arts, it can correspond to a piece of work that, unexpectedly, captivates interests, spreads like wildfire, and dwarfs other contributions. Illustrative examples are provided with Mel Gibson's recent movie *The Passion*, Eco's *The Name of the Rose*, Tolstoy's *War and Peace*, The *Harry Potter* series, or even the wild success of The Beatles. What all of these pieces have in common is that they were not necessarily expected to generate any meaningful interest at the time –thus satisfying my empirical criterion of "locally unexpected" as we will see further down. For instance, Proust's *A la recherche du temps perdu* could not find a publisher. Nobody in Roman times expected the accumulated writings of a rebellious tribe to become a dominant book two millennia later –such prediction would have been deemed a lunacy. Nor did anyone in 19th Century France conceive that Japanese investors would obsess over what we call now impressionistic paintings, paying for them several thousand times what the average painting would command. These wild "outliers", are not limited to individual pieces of art; they may correspond to the unexpected appearance and dominance of new schools, genres, even media unconceivable a few years earlier. Consider, for instance, the emergence of the audiovisual or the web as entirely new tools of creative expression.

Rarity and Clustering. The problem with these Black Swans in art and ideas is that they occur extremely rarely, with a totally unknown frequency, yet they carry such a large impact that their contribution to the bulk is extremely large. Consider that, in publishing, less than 1 in 800 books represent half of the total unit sales. The cinema has similar vicious effect --it provided the economist Art De Vany with an excellent laboratory to test for the phenomenon[4].

One would think that it is just the property of commercial success, but it is not. The academic citation system, itself supposedly free of commercialism, represents an even greater concentration, with no meaningful difference between physics and comparative literature[5]. Worse, one would think that a larger size of the population of producers would cause a democratization, but it does not. If anything, it causes even more clustering. As observed by Alfred Lotka 80 years ago, the higher the population of contributors in an intellectual discipline, the higher the concentration, a phenomenon that has been sustained since then. If financial fads are a capitalistic disease, I will show further down that intellectual fads are a mere informational one.

4. OVERCAUSATION

By overcausation we mean the exaggeration of the links between perceived causes and effects; two elements mentioned earlier contribute to the bias: retrospective determinism and the cemetery effect.

Retrospective Determinism This is a vicious mental process, also called the hindsight bias, in which these Black Swans become explainable (less random) after the fact, owing to the unconscious use of posterior information. Assuming the Black Swan effect is real, then art and literature critics tend to necessarily impart overcausative explanations *ex post* that match some traits in the artist to the initial conditions. This makes any explanation bear an *overfitting* component. This is what this author calls the *fooled by randomness*[6] effects of overestimating the analyzable and neglecting the nonexplainable.

The Cemetery Effect & Silent Evidence The Phoenicians, we are often reminded, while inventing

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[3] "*That there is nothing in any object, considered in itself, which can afford us a reason for drawing a conclusion beyond it; and, that even after the observation of the frequent or constant conjunction of objects, we have no reason to draw any inference concerning any object beyond those of which we have had experience*". Hume (1748). Clearly this is a mere statement of logical relations ; and it is an unhappy link that was made when I started calling outliers "Black Swan". The previous name used was "peso problem . A more adequate analogy would be "Solon's unexpected turn of fortune".

[4] De Vany, (2003).
[5] See Katz(1999). He shows that the measures of concentration in academic quotes is more acute than the one usually seen in the movies. In addition he sees no difference between nationalities. See also Glanzel (2003) .
[6] See Taleb (2004)

the alphabet, did not produce any literature. Commentators make inferences about their attributes based on such absence of written legacy –for instance by deriving that their race and culture was more interested in commerce than story-telling. Is it true or could it be that their works have been destroyed and we got someone else's literature? The cause and effect chains that were seen by commentators concerning the attributes of the Phoenicians and the resulting literary expressions are distorted –but distorted in a systematic way: they overestimate causation. So in addition to the preceding cognitive bias, there prevails an information-theoretic one as well, related to the limitations of the information at hand –and the neglect of *silent evidence*. Consider the thousands of writers now completely vanished from consciousness: their record did not enter analyses. We do not see the tons of rejected manuscripts because these have never been published, or the profile of actors who never won an audition – therefore cannot analyze their attributes. To understand successes, the study of traits in failure need to be present. For instance some traits that seem to explain millionaires, like appetite for risk, only appear because one does not study bankruptcies. If one includes bankrupt people in the sample, then risk-taking would not appear to be a valid factor explaining success.

Any form of analysis of art that does not take into account the *silent initial population* becomes close pure verbiage.

The line of argument in the remaining segment of the paper is to further weaken the causative explanations by showing the prevalence of extrinsic attributes, as opposed to intrinsic ones, those not embedded in the piece to be analyzed. The role of these extrinsic attributes (say social contagion or informational cascades) implies that the piece was successful for reasons that lie outside its own qualities, and that, accordingly, explanations by the critics are proportionally weaker than face value.

5. EPISTEMOLOGICAL OPACITY, INCOMPUTABILITY, AND THE LIMITS OF STATISTICS

Black Swans are a serious epistemological quandary – they were used by this author to attack the firmness of the results derived from modern statistics; they are truly and *nonmeasurably* unpredictable in the sense that, conditional at the times of occurrence, they do not seem to carry any measurable probability[7]. Absence of measurability implies weakness of our statistical methods. While the point is technical, it can be summarized as follows. Owing to the absence of laboratory experiments, we simply don't quite understand the causes of these successes. This author's

approach comes from the standpoint of structural randomness, free of any attempt to define precise dynamics to it, and even freer of forecasting machines. We are plagued with epistemological opacity.

This said, there are methods inspired from a collection of sciences that have examined the properties of *concentration*, providing a remarkable regularity across sciences with the *scaling laws* and *attractors* that we will see next. Note that these laws can generate Black Swans, but not necessarily so. In addition, I believe that these mechanisms may sometimes be measured (i.e., used quantitatively) in the physical sciences, but they should only be used qualitatively in the social ones. While scientific modelers believe that their models have predictive value, we will be using their arguments to show that the system is too complex to measure quantitatively; all we can do is gauge the existence of wild luck. In a word, scientists who brought complexity theory believe that they have a way to compute the world and predict. I use the Black Swan theory to show that such prediction is nearly *impossible*.

6. FRACTALS AND SCALING LAWS

We will next turn to what scientists call "scaling laws" – words that are not yet present in the literary vocabulary; but their aesthetics are well known under its visual side-effects manifestation: "fractals". In fact people in the arts are extremely familiar with them – Mandelbrot's fractals is only one example. Matters that were a few years ago bundled in the category called "chaos theory"also qualify. I will next try to make the connection between them clearer.

By some remarkable feat of unity of science, these scaling laws seem to work ubiquitously, from fractal geometry, to biology, to geophysics, to the spread of ideas, to the distribution of wealth, to artistic success. Someone entranced by the aesthetics of the Mandelbrot set would be using the same mathematical framework as the one for these pockets of concentrated successes. Note that, in spite of Mandelbrot's efforts, these have not been acknowledged by the finance establishment. Scaling laws for instance have never been accepted by the finance and economics establishment –mostly because they disturb Wall Street.

A history of the ideas is as follows. These "self similar" laws were first mentioned by Vilfredo Pareto in economics (distribution of income) towards the end of the 19th Century. They were later rediscovered by Yule in biology. They were intuitively (though not formally) presented by George Zipf[8] on the distribution of words in the vocabulary. His idea is that people aim at

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[7] Taleb and Pilpel (2004).

[8] Zipf (1949).

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minimizing efforts in retrieving words; they are lazy and remember words that they have used in the past, so the more a word is used, the more likely it is going to be used in the future, causing some snowball effect. This causes concentrations in the vocabulary, with words far more frequent than others.

Modern biology pioneers, Slavador Luria and Max Delbrück witnessed a similar clustering phenomenon, with the occasional occurrence of extremely large mutants in a bacterial colony, larger than all other bacteria[9]. The cognitive scientist, Artificial ntelligence pioneer, and Nobel economist Herb Simon is credited for modeling Zipf's idea under the "preferential attachment" theory[10]. All the while, in his seminal doctoral thesis, the father of fractals Benoit Mandelbrot showed that such concentration effects came from a far more general and ubiquitous process. Without being technical, he connected it to information theory, itself issued from thermodynamics.

The intuition of the mechanism is as follows. Someone writes an academic paper quoting 50 persons –assume for the sake of simplication, that all of them are of equal merit. Another researcher working on the exact same subject will randomly picks 10 of those in his bibliography. Another researcher reading the latter's piece selects 3 authors to quote. These three authors will be given cumulatively higher and higher exposure.

The sociologist of science Robert K. Merton's[11] discusses "Matthew effects": the rich getting richer, the famous getting more famous. These scalable laws were already discussed in the scriptures!

The modern formulation is now called the Pareto-Lévy-Mandelbrot processes, providing their own class of statistical modeling. Consider wealth in America. The number of people with assets worth more than $2 million will be around a quarter of those with more than one million. Likewise the number of persons with wealth in excess of $20 million will be approximately the same in relation to those with more than $10 million. This relation is called a scaling law because as it is retained at all levels, no matter how large the number becomes (say two billion in relation to one billion). Now think of waves of one meter tall in relation to waves of 2 meters tall. The same law applies. To see how things can be held to be "self-similar" at all scales, consider the coast of England. I looks the same whether seen from an airplane or using a magnifying glass.

Consider, in contrast, the well known "bell curve" that is the foundation of statistical method in the social sciences. Most observations hover around the mediocre, and deviations either way become increasingly rare, to the point of there being events of an impossible occurrence. The bell curve is not scaling in the sense that the ratios between higher numbers become increasingly small. Take the number of adults heavier than 300 lbs and those heavier than 150 lbs. The relation between the two numbers is not the same as the one prevailing between 600 and 300lbs. The latter will be considerable smaller. Take the ratio of those heavier than 1200 lbs over those heavier than 600 lbs. There will be no persons weighing over 1200 lbs.

Deviations in the bell curve from the norm decrease very rapidly, to the point where some high number becomes literally impossible. A human weighing a ton is not a possibility; but someone may conceivably have twice the sales of today's highest selling book author.

Clearly we have no clue about the underlying process; so far a collection of separate models provide candidate and cosmetically credible explanations but there are some puzzles. Nothing can explain why the success of a novelist (quantified and measured, say in mentions in the scholarly and literary press) bears similarity to the bubbles and informational cascades seen in the financial markets. One may claim intellectual contagion –as we will later. Then why does it resemble the behavior of electricity power grids?

While these scaling laws provide excellent explanations, and can be helpful in thinking about the attributes of the process and the unfairness it generates, we will be always facing the impossibility to find _exact_ calibrations. In other words we knowthat the process is unfair, but _how unfair_ is beyond our reach.

7. CONTAGION EFFECTS

Clearly people may discuss a book because 1) they heard about it, 2) their friends like it, 3) they are genuinely impressed with it. The first two are extrinsic reasons and seem to partake of general social contagion effects. These have been examined in a collection of disciplines.

I will next outline ideas from the variety of disciplines that deal with the process.

Informational Cascades and Herding. Economists[12] and biologists[13] have studied the process of imitation and thought contagions –the economists focusing on the pathologies of the process. An informational cascade is simply a process where a purely rational

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[9] Mandelbrot (1997)

[10] Simon (1955) stuck to the **preferential attachment** theory, now used in networks: such a distribution emerges automatically from a stochastic growth model in which new units (say vocabulary) are added continuously and attach themselves preferentially to existing ones, with probability proportional to the size of the target node.

[11] Merton (1965). See also De Solla Price(1970).

[12] See Bildanchani, Hirshleifer and Welsh (1992) as the seminal paper on informational cascades.

[13] Kirkpatrick and Dugatkin (1994)

agent elects a particular choice ignoring his own private information (or judgment) to follow that of others. This leads to imitation chains, causing stock market bubbles or formation of massive cultural fads. These mechanisms can be applied to the emergence of ideas and religions, like, say the rapid emergence of Islam in the 7th Century. Clearly iy is efficient to do what others do instead of having to reinvent the wheel every time.

Biologists have taken a look at it from another standpoint, typically mate selection. Animals prefer to mate with those that are seen mating with others on grounds that "hey, she may know something". This is a potent informational transmission by watching other people.

Networks and Cascades in Natural Science Surprisingly, a fact that shows the unity of science, there seem to be cascades _without imitation_ in the so called unstructured, scale-free networks. The "Google effect" of rapid self-feeding dominance is echoed in power grids, leading to very rare, yet probable massive power failures[14]. The same extends to areas such as molecular biology where we see the same results as imitation –but without any shade of imitation. Synchronization[15] effects have also been studied. These are ubiquitous: from random networks to neurobiology (the way neurons synchronize to fire in unison), crowd behavior, sleep patterns, the self-organizing behavior of species, and bird flocks.

Critical Phenomena[16] Consider that the dynamics of epidemics, whether intellectual or medical, are full of surprises. There are critical points above which the interest in an author spreads like wildfire and below which the interest dies down.

Researchers, notably Thomas Schelling[17], have studied what became popular under the name "tipping points" mechanisms (after the title of the popular book _The Tipping Point_ by the Malcolm Gladwell) where processes transit through critical levels and change in attributes. Per Bak studied the sandpile effect "self organized criticality"[18]. The geophysicist and one of the pioneers of the new field of econophysics (the mixture of physics and social science), Didier Sornette, did similar work from earthquakes to finance and, most recently, in an influential study of "endogenous" and "exogenous" effects impacting book sales. The endogenous effect is the word-of-mouth, while the endogenous onecorresponds to a book review or a more general The physical equivalent to the tipping point is the phase transition (say, the noncontinuous switch from liquid to solid) –but social processes are not so clear and easy to calibrate. Contagious diseases spread wildly above a certain minimum level, or die down below it.

In the same vein, the economist Art De Vany describes the process in the cinema as a Bose-Einstein dynamics (after the Bose-Einstin condensate). It eliminates the possibility of lukewarm reception: the outcome is polarized into two possibilities: either large success or pure flop.

Role of the Media These mechanisms of contagion are accelerated by the media. Pierre Bourdieu [19] detected the link between the increase in concentration and globalization. More formal mathematical models[20] show that under which conditions (how sparse the connectivity in a given network and the level of threshold of action on the part of agents) a cascade will form.

Why Art? By its very nature of word-of-mouth art is extremely prone to these processes. Still very little is known about the formation of choices and the structure of imitation but it seems to follow situations of acute randomness.

For an anecdotal example of the clustering of book reviews, see _Fire the Bastards_ by Jack Green in which he goes systematically through the reviews of William Gaddis' novel _The Recognition_. Green shows clearly how book reviewers anchor on other reviews and are severely influenced in their wording of the discussions

8. CONCLUSION: JUSTICE CONSIDERATIONS

Fairness Some researchers, like Frank (1999), see arbitrary and random success by others as no different from pollution, which necessitates the enactment of a tax. DeVany, Taleb and Spitznagel (2004) propose a market based solution to the problem of allocation through the process of self-insurance and derivative products.

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[14] See Barabasi and Albert(1999) ,Watts (2002).
[15] See Strogatz (2001,2003).
[16] Sornette (2004), Sornette et al (2004).
[17] Schelling (1971), Schelling (1978).
[18] Bak (1996).

[19] Bourdieu (1996)
[20] Watts (2002)

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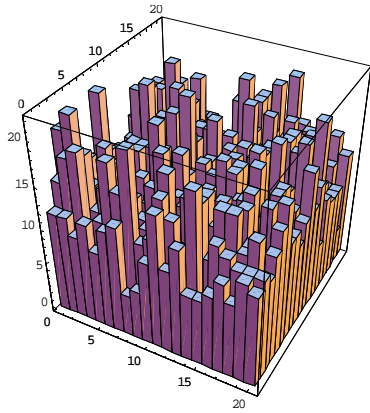
APPENDIX: THREE STAGES IN AN UNFAIR PROCESS
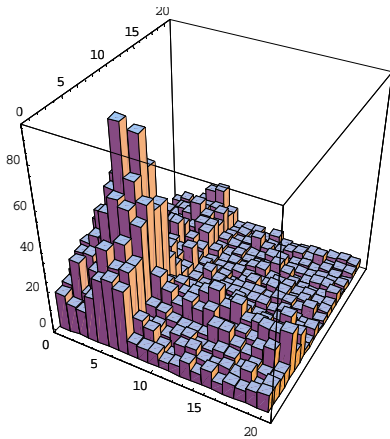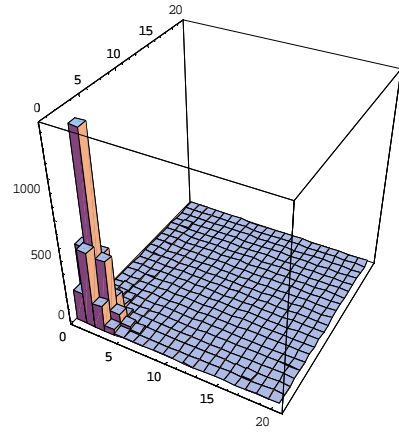

Figure 3 Extreme inequality shows up. Note the similarity with fractals: the unfairness is the same at all resolutions. It is "self-similar". If you cut the graph in, say 4, 8, 16 parts the sub-segments will exhibit as much relative concentration as the whole.

Figure 1 A start with a random population of beginners.

Figure 2 After a few iterations

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