



# Reliving the Life of Louis Bachelier

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Reliving the Life of Louis Bachelier

A Critical Essay

and an Original Epic-Length Screenplay: *I, Bachelier (Invisible Man)*

Philibert Augustus Founthim Kongtcheu

A Thesis in the Field of Literature and Creative Writing

for the Degree of Master of Liberal Arts in Extension Studies

Harvard University

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## Abstract

This thesis is made up of two parts: a critical essay (I) and (II) an original epic length screenplay – 210 pages script plus fifteen pages appendix. The critical essay contains a short essay on The Yin-Yang Creative Writing Art pieces which are part of the screenplay. I term *creative writing art*, art pieces which use only written characters and codified symbols to visually render new artistic impressions.

The screenplay brings to a contemporary audience the life of Louis Bachelier (1870-1946), the first mathematician (French) to use modern mathematics to describe the behavior of financial markets. It lets unfold the prejudices and struggles he had to overcome, as viewed in our time by a young black mathematician of African origin named K., starting in grad school in Paris in the mid-90s, and then on to Wall Street, as a proponent of a new theory of decision making based on a proto-probabilistic concept called BICs (Basis Instruments Contracts) that he has invented. We span Bachelier's life from the death of his parents to his famous thesis in 1900, to the dramas of the Dreyfus affair in France, WW I, up to the death of his ephemeral spouse, and the climactic denial of tenure to him in 1926. The narrative unfolds as K. himself experience similar struggles and prejudices in modern times which lead him from Wall Street to inner city life in Newark, NJ, and then to Beijing China, and back to New York. The intertwined narratives unfold in at least four languages – English, French, Mandarin Chinese, Ghomala – serving as a clinical and scientific examination of the various dimensions of

prejudice, language, deriving analytical insights that bind persuasion, risk, prejudice, rewards and punishments in the decision making process. It also features two heart wrenching love stories that grip hearts and reveal characters of great humanity. This is a universal story of the travails of the misunderstood and unappreciated underdog, who nonetheless keeps on soldiering to usher in a better world.



Louis Bachelier (1870-1946)

(Undated picture here as a young teenager.)



Louis Bachelier (1870-1946)

(Undated picture here a middle-aged man)

# THE SECAUCUS REPORTER

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## Never say never

*Diagnosed with polio in infancy, Secaucus man speaks eight languages, excels in many fields*

By Joseph Passantino  
Reporter staff writer

You might think that being diagnosed with polio at six months of age would make it tough for a person to achieve a lofty goal, not to mention several.

But if you thought that about Philibert Kongtcheu of Secaucus, you would be wrong.

Utilizing philosopher Friedrich Nietzsche's saying, "What does not kill me makes me stronger" as his mantra, Kongtcheu has managed to use his situation to strive for success.

If there really is a "21st Century Man," it might very well be Kongtcheu.

He speaks eight languages; five of them fluently.

He was raised and educated in Paris, France, and received his Aggregation in Mathematics (equivalent to a Ph.D.).

He moved to the United States in 1996 to work as a quantitative mathematician for a bank here.

Because of his background in mathematics, he pioneered the mathematical and financial engineering theory of Basic Instrument Contracts.

He is the owner of PFK Technologies, a financial risk management company.

### Poetry writer

And he is well versed in the creative arts, especially poetry, where he has found his niche.

Kongtcheu participated in The Resident Art Show and Poetry Lounge held in April at the Town Hall. He has published a volume of poems, and has even written one specifically about his adopted hometown.

The Cameroon native lives at the Hudson Manor Health Care Center on County Avenue, and spends much of his day working, learning, problem solving, and creating new ideas, some of which he has patented.

### Child of polio and linguist

"I am a child of polio, and polio defined who I am in terms of character, life experiences, and sensitivities," he said. But he does not let that label define him or stop him from moving forward.

It certainly did not stop him in his linguistic studies. Kongtcheu is fluent in English, French, Mandarin Chinese, Ghomala, and Pidgin. He also speaks Spanish, German, and Italian.

*"This is my way of surviving." – Philibert Kongtcheu*

### Self-healing

"When I came here two years ago, I was seriously weakened from the waist down, with nowhere else to go," he said. "I was in a state of despair and was totally overwhelmed."

But he did not let himself become depressed or allow himself to ease into a state of nonexistence.



**NO DISABILITY – Though treated for polio since 6 months old, Philibert Kongtcheu can move as quickly on crutches as some able-bodied people at regular stride.**

He has used his poetry as a means to self heal.

"Poetry has become the area in which I project and soothe my emotional travails," he said. "I guess I have always had a poetic disposition."

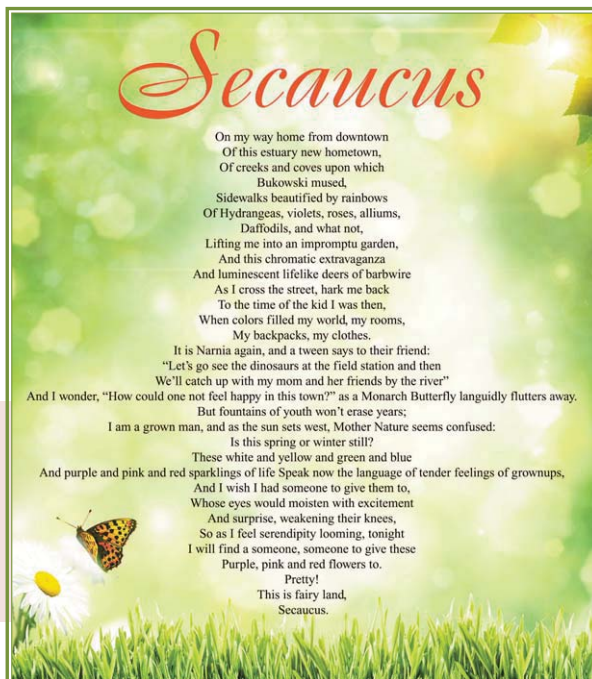
### Rejuvenation

His participation in the town art show re-energized his interest in poetry, giving him a reason to write more and to organize ones he had already written.

He has applauded Mayor Michael Gonnelli and Lee Penna, community outreach coordinator, for fueling that endeavor.

"Thanks to the mayor's support, together with Lee at the library during the art show in April, I organized a few of my poems that were subsequently published in a small book," he said. "I am about to release a second edition of that book."

He said he has also received support from the Secaucus WalMart and The United Way for the work he showcased at those venues.



Poem by Philibert Kongtcheu

### Clothes drive

He has also started a program at his nursing center called "Dress 4 Wellness," which will be distributing clothing to fellow residents who have little family support.

"Being well dressed to me means — especially in these circumstances — that you are still very much cared for, by you or those who are responsible for you," he said.

Kongtcheu lauded the mayor for being supportive of the program with a "significant" amount of new clothes already delivered to the program.

He welcomes more donations, and asked that those wishing to donate to those at Hudson Manor do so by dropping the items off at the United Way at 79 Metro Way, where he volunteers once a week, with his name on it.

### Secaucus as home

He has found joy in his move to Secaucus, feeling the town's hospitality toward him.

"From the kindness of little children on the street when I was in a wheelchair, to the mayor, who has really sought to make things easier for me in any possible way for him," he said. "I am really grateful. My poem to the town is just an encapsulation of that feeling of gratitude."

"This is my way of surviving," Kongtcheu said. "While keeping a positive outlook on life, I have a constantly refreshed sense of the possible."

To comment on this story online visit [www.hudsonreporter.com](http://www.hudsonreporter.com). [joepass@hudsonreporter.com](mailto:joepass@hudsonreporter.com)



**GLASS HALF FULL – Always thinking positively, Philibert Kongtcheu has a laugh in his room at Hudson Manor.**

He said a comment from a reader of his poetry especially struck home.

"It was Franklin Roosevelt Johnson, 79 years old, who tells me that it only ranks next to the Bible in terms of impact on him," Kongtcheu said.

### Book writing

Kongtcheu is also busy writing a book and will be taking courses through the Harvard University Extension's Master in Creative Writing Program in September.

"I want to leverage that experience to produce a piece that showcases the highest levels of literary expression," he said.



## Dedication

As the inspirational title figure of this thesis, this work is dedicated to the memory and achievements of Louis Bachelier, the first person to model the stochastic process now called Brownian motion, which was part of his PhD thesis *The Theory of Speculation*, (1900). His thesis, which discussed the use of Brownian motion to evaluate stock options, is historically the first paper to use advanced mathematics in the study of finance. Thus, Bachelier is considered a pioneer in the study of financial mathematics and stochastic processes. I found great inspiration in the travails, injustices and indignities that Bachelier endured in his time to leave a legacy that endures to this day.

In more personal way, this work is dedicated to the memory of my late father, Jean Founthim, whose sense of the possible has always guided me. His unbinding faith in the value of persistence and hard work, his love of knowledge, his eclectic taste, and his sense of the importance of defining one's own metrics of attainment permeate every page of this narrative

## Acknowledgments

I came to Harvard in the fall of 2013 to deepen my skills as a poet, straight from a nursing home rehabilitation facility in Secaucus, New Jersey. I am ending up as a burgeoning filmmaker with an epic length 210 pages script in hand. The first semester, I commuted from Secaucus every week. I would take the MegaBus bus at midnight at Secaucus Junction, and sleep on the bus to arrive at Boston's South Station at 5:30 in the morning. From there I would head to campus and read and write till class began at 5:30pm or 7:40pm. At 9:40pm, I would rush back to the train station to catch my 10:20pm bus back home, all on crutches. By the end of the summer of 2014, I had completed all the degree requirements for the ALM in literature and creative writing, except for the thesis.

To write this thesis, I gave myself a full year and took two classes that I felt would help my screenwriting proficiency. A class on video field production and a class on acting.

A number of people deserve special thanks for having made this journey possible:

I thank Professor Leo Damrosch for accepting to direct this thesis and for the freedom he gave me to take my time, aim high and write unhinged. His unreservedly supportive comments throughout have challenged me to aim even higher than I originally planned. I am grateful for all I learned from him, starting with the class on with and humor that I took in the fall of 2013.

I thank Professor Brian Price, Director of the Law School's Transactional Clinic for agreeing to take in my project to design the optimal legal production company and the offering prospectus to fund the production of the movie that comes out of this screenplay. Our collaboration enters its third semester now, and I am grateful to him, and to each student he has assigned to work with me, in particular Bianca Harlow in the spring of 2015.

I thank Wayne Wilson who allowed me in the spring of 2014 to enroll in his Advanced Screenwriting class even though I had never taken a screenwriting and barely knew what screenwriting entails. He valued the clarity of the vision that became this thesis, and over the two submissions, provided supportive and constructive criticism that made me believe I could undertake a larger scale project.

I also thank Dr. Susan Steinberg, for her class in cinematic vision and screenwriting for production. She opened my eyes with her filmmaker's perspective on what it actually takes to make a movie, allowing me to develop a 360 degrees view of the movie making landscape.

I thank Remo Airaldi, my acting class instructor, for enlightening me to what acting is all about, the ways in which the actor gives life to a script and turns a fine script line into a great scene.

I do thank Allyson Sherlock for her class in Video Field Production which prepared me to be able to go out there and shoot the movie on my own.

I thank Dean Sue Schopf for initially recommending that I complete my thesis under Professor Damrosch. It was a wise advice for which I am grateful to her.

My thanks also go to Dr. Talaya Delaney, my Research Advisor, for helping me prepare the proposal for this thesis and making sure all steps were met within relatively short time constraints. I also thank her for having initially agreed to serve as my thesis director as well. It was a mark of esteem to which I was and remain very sensitive and grateful for.

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I thank all my instructors in the course of this program:

Dr. Rani Neutill, my instructor in the pro-seminar on *Race and Psychoanalysis*. This class was an eye opener to me multidisciplinary scholarly studies on race, including my term paper as in depth study of Claire Denis' movie *Chocolat*, which was made in Cameroon and the analysis of which triggered the urge to deepen my interest in film as a primary focua. The notions of predator and prey complex that I introduce in that term paper illuminate my treatment of the racial issues the protagonist K. face in the screenplay.

Dr. Vicky Gilpin, Prof. Matthew Kaiser's teaching faculty (TF) in the course *Literature and Sexuality*. This course informed me on the dramatic elements of love and human sexuality and my treatment of the love stories in the narrative could not have been

explored with the same depth without what I learned there and Dr. Gilpin's supportive nurturing pushed me to give more of myself.

Dean Shinagel's *Classic American Novels* in the Spring of 2014 allowed me to delve deeper the study of *Invisible Man*, *The Great Gatsby*, *The Scarlet Letter*, all novels which have helped me shape the characters of K., Bachelier and their love interests Hong Yan and Augustine.

Dr. Daphne Kalotay's *Short Story* class developed my sensitivity on finding *le mot juste* and a minimalist sense when writing a story. "Every detail provided must advance the plot somehow" she used to say. I have tried to do just that in this screenplay.

Nina De Gramont, my instructor in the *Advanced Novel Writing* course in the summer of 2014 helped sharpen my instincts on developing the arc of an epic story.

David Gessner, my instructor in the Advanced Creative Non Fiction, from whom I learned the art of revealing the self in a narrative in a manner that reveals human complexity in an engaging way.

All the staff at the Grossman library and the Church Street Labs for having made all efforts to facilitate my use of their facilities at a time when I had limited capacity for ambulation.

All my therapists at the Harvard University Health Services, in particular my physical therapist Malia Koppin, for having so compassionately accompanied my journey to physical rehabilitation that made the completion of this work possible. In the last year, I would work with her sometimes twice a week, and what she did helped make a difference.

Last, but not least, I wish to thank my partner Erin Anastasi whose support and affection have perhaps inspired me to write some of my proudest lines in the final months of this draft.

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## Chapter I

### Critical Essay

The Critical essay is divided into an overview section and a short essay on the Yin-Yang creative writing art pieces.

#### Overview

When I proposed to write this screenplay, the first roadblock I contemplated was how to engage my viewers into mathematical questions that could prove too laborious to a layperson. The breakthrough biopic on this type of subject material was indeed John Nash's *A Beautiful Mind*. However, although that movie ended up being a significant commercial success, most specialists who understand the mathematical contributions of Nash to economics would be left on their thirst. Aware of that criticism, I wanted to do something that narrated a human story that all could relate to, but with the important mathematical issues deeply blended into the heart of the narrative.

However this created another issue. In *A Beautiful Mind*, we are dealing with a contemporary American character closer to the average American person in time and space, so that the lay of the ground to create the narrative needed not so much work to be established.

Furthermore, the issue that the movie decided to focus on, mental health – here schizophrenia – touched a raw nerve that a contemporary lay public could empathize with. Here in proposing to write the biopic of Louis Bachelier, I was dealing with a

character little known to the general public, who lived in France at the end of 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> century. How could such a character possibly be of any interest to an American audience, if not a global one? To answer such a question, I decided to breakdown the reasons for which the life of Louis Bachelier had caught my interest in the first place, me, an Americanized black man of African origin who went to college in France.

Indeed, it was because Bachelier's story resonated in me as the archetypal story of prejudice with which I was uniquely familiar, a type of prejudice no less damaging to common welfare, that is yet not a part of the public consciousness that sticks out, which I felt nonetheless deserved to be told. In the Advanced screenplay class I took in the spring of 2014, I presented two versions of a half first act. In the first version, I almost exclusively dealt with Bachelier; in the second version, I introduced the character K. as the one mirroring my personal experiences and introducing the readers to the character of Bachelier. The comparatively much intense level of engagement and responses to the second story convinced me that in order for this narrative to catch, K. had to be as much a part of it, if not its central character. This created a new hurdle: how to coherently merge the two stories into one?

Thus I latched on to the idea that prejudice had to be the overarching theme that glued it all together. Prejudice, systematically investigated as the narrative progressed, prejudice, based on age, educational, background, race, national origin, gender, religious beliefs.

As I deepened the manner of synthesizing the arc of forms of prejudice I sought to portray, the connection with the subject matter that was focus of both characters'

professional life clicked. It was all about making decisions in uncertain environments. In all accepted science nowadays, we depend on probabilities' estimates to help make the soundest decisions and manage risks. The emergence of probabilities around Cartesian precepts of rationality - and away from myths and superstition – has been the lynchpin of Western dominance over all other civilizations over the past centuries. However in recent decades, most conspicuously in financial markets, faith in rationality has shown its limitations, if not the systemic perils it may expose the whole economic system to. This has led to the emergence of the field of behavioral economics and finance.

In my own work in mathematics, I have argued that a number of these issues stem from the limitations of existing mathematical tools, and I have proposed the idea of *Basis Instrument Contracts, or BICs* (Kongtcheu) as the proto-probabilistic concepts which can more faithfully ground the process of human decision making, or how we are persuaded to make this or that choice. Rather than being grounded in the traditional concepts of probabilities, I revisit an approach originally intuited by the mathematical economists Arrow and Debreu, to ground the canonical risk encapsulating tool as a *contract* that we decide to buy or sell, thereby rooting our definition in the essence of the phrase, “I don’t buy that,” the common saying used to express that we are persuaded by an argument. I deepen the outlines of the type of contract that can enable a richer representation of the human decision making process. In particular, this richer framework captures the three pillars of human persuasion as articulated by Aristotle: ethos, pathos, and logos. Here, logos is the logical probabilistic analysis that we rely upon to be convinced to do this or that. Ethos and pathos are the tools that we depend upon to prejudge, regardless of

whether we are supported by logical facts. They are in our view in this narrative the two pillars of prejudice.

Ethos is the perceived credibility or the credit worthiness of the one making an argument. In this narrative, both K. and Bachelier are not perceived as having the authoritative credibility to make insights they do. Therefore they are disregarded and their contributions downplayed. In one of the most ironical displays of this situation, I highlight the meeting between Bachelier and the thirteen years younger J.M. Keynes during World War I or the identity misrepresentation used by K. to participate in the conference that is the setup of the finale. In the movie, the conversation at the patent office highlights how the fate of LTCM was decided by changes in the appreciation of their ethos.

Pathos is how much we have invested in, or how we feel or relate to facts or people about whom we must decide. The artist, for one, at his most essential, relies on creating shared pathos to make his point. Indeed even this movie is entirely constructed to appeal to the widest viewership. Through its span in time, geographical locations, variety of characters ethnic backgrounds and level of education, we seek to establish a connection, to find an entry point into every person's heart. In this narrative, it is the scene of the homeless man beaten to death by police officers in NYC which triggers the image of the fable "the animals sick of the plague" introduced at the beginning of the movie, leading to a systematic analysis that cause him to propose a formula of rewards and punishments based on measures of ethos, pathos and logos. That formula is presented in the narrative without too much details, but the artistic bet here is that viewers should

be able to understand at once what is meant in broad strokes, when introduced in those circumstances.

The central issue of prejudice and “fait divers du jour” in Bachelier’s time was indeed “The Dreyfus Affair.” We seed it in the narrative with the introduction of the word Sedan. Sedan is – not a type of car but – where France was soundly and humiliatingly defeated by the armies of the emerging German Empire, leading to the loss of French Alsace and Lorraine. This occurred in the year of Bachelier’s birth and the accusations that were subsequently levelled at Captain Dreyfus can be seen as part of the national desire to find a convenient scapegoat for what had happened. It divided the whole nation and the most prominent intellectuals of the time were compelled to take position. In particular, Bachelier’s thesis director, Poincare was called as scientific expert during one of the trials. That episode is narrated with humor as a flashback in this script. The Dreyfus affair is developed here as a subplot element which enables us to conclude Bachelier’s narrative with his “blackballing in Dijon” where he is denied a tenured professorship, by coining the term being “dreyfused.” At that point, the viewer is sufficiently educated in the issues for us to expect that they will immediately understand what is meant. And here too, one should come to understand why the Dreyfus affair is part of the story.

A central theme and innovation of this narrative is the use of mathematical insights, methods, and quests to both advance plots and derive philosophical wisdom. In this process, I not only rely on existing mathematics, tricks or games, where I innovate by giving them a new interpretation, I also introduce mathematics that I have created, most conspicuously BICs.

Hovering over it all, the use of three (3) as symbol of completeness and personal quirk of K. is repeatedly illustrated throughout the movie to create an intriguing sense of mystic unity. I push the boundaries even further by even making the connection to the Sierpinski triangles, in a manner that creates a new subplot line that create deeper meaning – mathematical or otherwise - to visual artistry.

Indeed the scene in which Bachelier gets his most potent insight, is when he is drunk, seems to walk randomly – erratically- home, but ultimately getting there as a vivid illustration of what will lead to his insight that behind the apparently random market fluctuations: there is a deterministic, probabilistically graspable dimension that controls it all; “Le marché, à son insu, obéit à une loi qui le domine: la loi de la probabilité.” (Bachelier, *Theorie De La Speculation* 70)

A central aspect of using mathematics to derive wisdom is my use of the Monty Hall problem and the algorithm for the solution of the fixed point theorem to advance the theme of change as leading to better in whatever the human quest is. In the case of Bachelier, it is that force, - introduced as his father’s last words - that will move him to Paris after military service, or throughout the provinces in search of a professorship after the death of his ephemeral wife. It is also used to make a daring connection to the three forms of human response to danger: freeze, fight or flight. In the case of K., it is that force which will guide him through the four continents in his existential survival quest seeking “greener pastures.” Here K. is iterating in each new local environment towards his goal, and when he understands that the neighborhood is not propitious, or is “repellant” as one says in the fixed point theorem, he reseeds himself somewhere else, hoping to ultimately find an “attracting” environment.

There are also a number of smaller mathematical problems, such as the cards games, the Dom Perignon riddle, and the tic-tact-toe game. Each one of those creates a subplot that advances the narrative and re-occurs later in a way that gives deeper meaning that should highlight intelligent design and heighten interest.

From this standpoint, one can see this as an intellectually mathematical lecture that would be a bitter swallow to the layman. I have worked very hard to keep my viewers with me by furthering this as a classical story of underdogs fighting forces of the “system,” personified in human foils – Lerob for Bachelier; Figloo for K.. Their life is made bearable by enabling them as protagonists of two moving love stories. Early on, I introduce the character of Augustine, who is presented here as Bachelier’s muse, and whose ultimately tragic fate is designed to move even the most stone hearted. Likewise, in the story of K., as the narrative of Augustine and Bachelier comes to an end, comes Hong Yan, the Chinese nurse for whom K. falls in love. In the case of Bachelier, we celebrate her here as the one who inspired all his ideas, who allowed him to disseminate them, in short who made him. In the case of K., we present her as the character who allows him to essentially find himself, to claim a distinctive and proud identity as Kong Shu, and shed himself of the undefined identity of K., ready to confront his doubters and affirm the Truth.

K.’s journey to China here is his “Christ in the desert” moment. For those who love love stories, they get two for the price of one. Hopefully this keeps them invested. The arc of the story is therefore that of a mythical epic that borrows from various religious and secular traditions whose overall trajectory should reek of the familiar.

In this vein, in K.'s moment of deep torment, prior to his journey to China, we see him going to a preacher on the streets of Newark, New Jersey, making a mathematical argument for the ontological question of the existence of God – The holistic Theorem – a process of deep soul searching that is subtly reprise with the lyrics of the Beatles “Let it Be.” His subsequent inadvertent consumption of drugs triggers a sort of psychedelic delirium that gives us room to create a narrative break in the form of a summarizing short musical on the altered theme of the Beatles’ “We can work it out.”

Another important aspect of this narrative is the ontological inquest in the intertwining dualities of the real and the imaginary as rendered in mathematics through the equality  $C=R+iR$ , that is to reflect complexity as a combination of reality (K.) and imaginary reality (Bachelier). The late neurologist Oliver Sacks used to say that we see with our eyes and also with our brains, and that seeing with our brains is called imagination. Here the entire narrative of Bachelier is a whole product of K.'s imagination. This theme is recurrent throughout. It may seem delusional to make such propositions, but it is worth mentioning that the most promising explanations of the forces that power our universe in theoretical physics rely on string theory, which simply stated express the idea that at any moment multiple realities - possibly exclusive - may be progressing in parallel.

The narrative also ignites a discussion on the theme of the *discrete and continuous* in the nature of space and time. It is an important epistemological issue that is also at the center of the development of BICs. Here a central insight of K. that leads to his big “aha!” moment is to argue that when we force developments to occur in continuous



time or on a continuous stretch, we have to adjust by oscillating or head into disaster. The more natural progression, K. is advocating, is progression in discrete incremental steps.

I further empathic pathos with the audience here by letting the story glide with poetry and music. I focus on iconic poetry and songs to further the narrative so that even when the viewer may seem lost in the complex technical or epistemological issues being advanced, they can let themselves be carried over by melody that still communicates the essence of the argument being passed. I also supplement classics with poems of my own, or my adaptations of the lyrics of classics, to create better alignment with the narrative goals. I create original works of visual art to sweep wide in the range of possible semiotics.

Likewise, I make extensive use of animations, animations to connect to children and to the child in all of us, animations to let us see what the brain is experiencing, but always animations to make an important point. In this way while we are harking to the past, we are with sci-fi effects projecting back to the future.

One of the difficulties I had to contend with that is unique to this endeavor, unlike other biopics of the genre – *A Beautiful Mind*, *The Theory of Everything*, *The Imitation Game* – is that what K. has to say is not mainstream accepted science at the time he is saying it, his gifts are not recognized, and one of my goals is that as a result of this movie, the ideas that I have presented in the book *BICs 4 Derivatives*, or in the related patents will get notice, scrutiny and ultimate acknowledgment and recognition for their contribution.

In Alexander Grothendieck's obituary in the NY Times (Weber and Rehmeier), to whom K. is likened early on, the journalists summarize Grothendieck's approach to solving a problem as:

...He did not attack the problem directly. Instead, he built a superstructure of theory around the problem. The solution then emerged easily and naturally, in a way that made mathematicians see how the conjectures had to be true.

He avoided clever tricks that proved the theorem but did not develop insight. He likened his approach to softening a walnut in water so that, as he wrote, it can be peeled open "like a perfectly ripened avocado."

In this screenplay, I try to do something similar. I do not come out immediately with the ideas I seek to advance. Rather I create the superstructure that is this narrative; I progressively let the reader/viewer intuitively perceive, through steps small and big, that this character is on to something. I introduce the idea at times in almost comical ways – see for example the Handshake Principle (HP) – and slowly build on them in a way that can keep my audience with me.

I also invest in making this narrative, a multilingual journey. Indeed this helps connect with a wider audience, but it also help build K.'s ethos. The hope is that as the audience gets to see K. engage in so many languages (four) in meaningful ways, it gets persuaded of his compelling intellectual performance. In almost every culture, the ability to communicate in a multiplicity of language has traditionally been regarded as an indicator of intelligence. Most importantly however, it communicates K.'s unique competency in leading the ideas he comes with, going so far as to propose the language of BICs: a new language that enables better communications of ideas of risk, persuasion and decision making. It is a bit a parallel with Alan Turing's need in *The Imitation Game*

to communicate in codes as a gay at a time it was a crime that ultimately make him an unrivalled code breaker; In *The Theory of Everything*, it is Stephen Hawking's interrogations on fate, the ultimate meaning of the universe as he becomes increasingly crippled that lead to his breakthrough theories on the universe.

But on that thread I pair it with the idea of possible madness of K. that may accompany the creative instincts he is demonstrating. The whole narrative of the nut with Karma is to let the viewer/reader confront those questions as well as experience K.'s alienation from the world he is trying to reach out to. It is also a wink to Grothendieck's description of his method in his own words (Weber and Rehmeyer). Indeed, the last words of the script are "I am not crazy. Or anything."

Another semiotic I develop is the significance I place in naming characters, and the pairing redundancy in the dual narratives of K. and Bachelier. K. and Bachelier being played by the same character, except that one is black and the other is white. Augustine and Hong Yan; Figloo and Lerob; etc. What they mean speaks for itself.

This is a 210 pages first draft script developed in over a year's time. It covers material spanning a multiplicity of disciplines and languages. To write it, I have plotted and re-plotted just about every scene, at times every word, to give it particular significance in the narrative. For example, in the introductory scene, when the K. is riding his bicycle down the street in Avignon and we hear a girl singing "Sur le Pont d'Avignon..." this is purposefully inserted there to foreshadow the impending accident to he who knows that the Pont d'Avignon only goes halfway through; and then there is the scene cut in the middle of the accident scene. Just about all the mathematical games in the narrative involve three (3) or some sort of triangle or triangulation. There are many

such games throughout, and the reader/viewer who is familiar with the places, situation or circumstances described, will feel winked at, and hopefully will nod.

The narrative will also be viewed as a piece of socio-political commentary as it covers most of the important events occurring during the times spanned. In Bachelier's times, we have references to the Exposition Universelle, the Dreyfus Affair, and the rise of tensions leading to WWI. In K.'s time we get a glimpse of the rise of anti-immigrant sentiment in France, the dot-com boom and bust of the late 90s, 9/11 the great recession, Obama's election. All of these events are showed as experienced by K. and Bachelier.

To stimulate cinematic vision, I have watched and re-watched over a hundred movies over the past year. I have read perhaps as many articles on the works of Bachelier, screenplays and various mathematics popularizations treatments. This has helped me at times create staked layers of meaning beyond my immediate conscious awareness. Sometimes every sentence or word that I use could deserve an explanatory essay. Here I attach for example short essays that I wrote to explain the Yin-Yang drawings.

At this stage there are still elements to improve in a next draft. For example I am aware that dialog lines are at times too long. I am also aware that there may be better ways to communicate some of the mathematical ideas in less off-putting manner. In the second draft that I am working on at this stage, many of these issues have been addressed and the plot has been further refined to make it more fluid and engaging. But one can already, on this submitted draft get a sense of the promise of what has been done.

So, all I can say is read it, see in it what you will, and make up your own mind.

## Short Essay on The Yin-Yang Creative Writing Art pieces

Here I comment on the two pieces introduced in the screenplay at page 171.

### Creative Writing Art Piece 1: The Yin and the Yang of the Crisis as both danger and opportunity (Appendix 9 to script)

This unique piece of creative writing art - a new form of artistic expression being pioneered by this author- is part of a yin-yang pair that exploits this Daoist dualistic concept to underscore the opposing dimensions of a “crisis,” both as a moment of great opportunity and a moment of perilous danger, as particularly underscored in the Chinese translation of the word: 危机.

The piece is also unique in that it comes across as a drawing that attempts to represent a face, but it is actually made entirely of beautified codified symbols, suggesting a highly compressed form of poetry. The breakdown of the word “crisis” as “cr-is-is,” backhandedly extracts that same ambiguity in the English expression of “crisis” with a recollection of the infamous “It **depends** upon what the **meaning** of the word **'is' is.**” The effort to represent all of this as part of a head emphasizes the idea that “it is all in the head,” with the pupil of one eye shaped as a calligraphic 危 wēi - that even though located in a bright environment of the eye, is in a dark color and relates to the darkness beyond its immediate surrounding light; it connects to its adjacent ear as the calligraphic 险 xiǎn and thus represents the side that sees danger in a crisis. The pupil of the other eye, however, representing in bright color the calligraphically drawn 机,

eschews the immediate darkness surrounding it in the eye to see the brightness on the horizon, connecting to the ear shaped as a calligraphic 会.

The overall effect, stark in black and white, is to challenge the senses, stimulate a more critical mind that is conducive to highly nuanced and creative expression.

TAGS: yīn - yáng, 阴阳, 太极图, tàijítú, 危机, wēijī, crisis, 危险, wēixiǎn, danger, 机会, jīhuì, opportunity, eye, head, “meaning of ‘is’ is”, black and white, creative writing art, abstract art, Chinese, Calligraphy, 书法, shūfǎ, English

Creative Writing Art Piece 2: The Beauty and the beast as Yin and Yang  
(Appendix 8 to script)

This startling piece of creative writing art is part of a yin-yang pair that exploits the Daoist dualistic concept to underscore the opposing dimensions of the beauty and the beast, as celebrated in French literature in Jeanine-Marie Leprince de Beaumont’s *La Belle et La Bête*, and rendered in a multiplicity of English adaptations as *Beauty and the Beast*.

Like its pairing piece themed on the idea of crisis as danger and opportunity this piece is also unique in that it comes across as a drawing that attempts to represent a face, but is actually made entirely of beautified codified symbols, suggesting a highly compressed form of poetry. The representation of the beast, here the bright pupil of the dark eye, turns out, on close inspection, to be a borrowing of a confounding calligraphic spelling of the name of The Monkey King, 孙悟空 Sun Wu Kong, hero of the Chinese Literary Classic Journey to the West, 西游记 xiyouji, man of extraordinary power and brilliance.

The representation of the beauty, here the bright pupil of the bright eye, turns out, on close inspection, to be a borrowing of a confounding calligraphic spelling of the name of “Beautiful Girl” in Chinese, 美丽的姑娘, here too by reference to the damsels of another great Chinese Literary Classic *Dreams of the Red Chamber*, 红楼梦 hongloumeng, characters whose beauty does not shield them from trouble, illustrating the old Chinese saying 红颜薄命 hongyanboming, i.e. beautiful women suffer unhappy fates.

The illustrations with Chinese iconic figures and the associated meanings here therefore turn upside down the traditional interpretations of the beast and the beauty in western culture. Particularly noteworthy is the fact that in French, the word beast, which is “*bête*,” has an adjectival form that is used to designate a mentally challenged person. Putting it in contrast with the beauty, which is commonly seen as correlating intelligence, creates an inversion of perspective challenging to the mind.

In this sense therefore, this artistic piece emerges as a compressed essay in comparative literature contrasting eastern and western perceptions and upending commonly received notions in respective cultures. Just like for its counterpart, the overall effect, stark in black and white inverted, is to challenge the senses, stimulate a more critical mind that is conducive to highly nuanced perceptions and creative expression.

In these two pieces, the truth is seen true the eyes, the eyes of the yin and yang, and what the brain interpret or imagines what is seen to be.

TAGS: yīn - yáng, 阴阳, 太极图, tàijítú, 孙悟空, Sun Wu Kong, 西游记, xiyouji, 红楼梦, hongloumeng, 红颜薄命 hongyanboming black and white, creative writing art, abstract art, Chinese, Calligraphy, 书法, shūfǎ, English, la belle et la bête, beauty and the beast



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## Chapter II

An Original, Feature Length Screenplay, *I, Bachelier (Invisible Man)*

I, BACHELIER  
(*Invisible Man*)

Written by

Philibert F. Kongtcheu

Based on the life of Louis Bachelier (1870- 1946)

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INTRODUCTORY NOTE:

In this script, the main character K. and Bachelier are acted by the same actor. When playing K. The actor's skin color is black. When playing Bachelier, the actor's skin color is white. Throughout the script there will be a double role playing of characters who play similar roles in the characters respective life.

All pictures of K. from the 1990s on are in color matching the color quality of TV productions of the corresponding time. All pictures of Bachelier's time up to the 1940s are in black & white.

The script will involve four languages (English, French, Mandarin Chinese and Ghomala) spoken in various instances of the narrative. In most cases the words used in each one of these languages are extracted from classical poetry, fables, lyrics of iconic songs that have in and of themselves acquired a deeper cultural meaning in the native languages that is not easy to succinctly render in English. As this is meant for an English speaking audience, we are almost always translating into English.

The subject matter of the script forces us to rely on an unusually large number mental visualizations of the mind of the mathematicians referred to here, as a recurring feature, in particular Bachelier's mind, and K's. It is understood that their rendering on screen will be visually very creatively illustrated to help provide an entertaining sci-fi feeling to the narrative.

FADE IN:

EXT. COUNTRYSIDE - DAY

SUPER: "AVIGNON, FRANCE SEPTEMBER 1991"

K., baby faced young black teenager, incoming mathematics sophomore prepping for French "Grandes Ecoles" is riding on a bicycle past the dreamy Provence landscape of chromatically variegated flowers and shrubs. Barely a car goes past.

The screen is edged by an enclosing eggshell supposedly containing K. and the landscape within which he is evolving.

It is the weekend before fall classes resume. Walkman on, he is wearing a sweater with the picture of Einstein and  $E=mc^2$  clearly showing in the back. We see him whistling every now and then. His relaxed pace with head bouncing left and right shows he is elated in the enjoyment of the moment.

He goes past a crossroad and sees another student, a FRIEND walking off in opposite direction, about the same age, white. We see the classmate's facial expression of amazed excitement at the sight of K., who waves and stops. They exchange a few pleasantries and we can hear

FRIEND

(In French with English Subtitles)

Come this evening! There will be plenty pretty freshmen girls that will gladly accept offers of tutorship in maths you know...

(Viens ce soir, je te dis, il y'aura plein de fraiches petites de premiere annee a qui on pourra proposer d'expliquer des maths, tu vois..)

K.

Well... in this case, I will be there!

(Beh,.. dans ce cas, je serai la!)

K. laughs cheerfully and the two friends pounce fists as K. sets to continue on his way.

A bridge comes into view and we hear him singing and bouncing head left and right as he pedals up the bridge, to the voice of "...sur le Pont d'Avignon, l'on y danse, l'on y danse, sur le Pont d'Avignon, l'on y danse tous en rond..." (English Subtitles: "On the Avignon bridge, people dance, people danse., on the Avignon bridge, people dance round and round...") come from the voice of an unsighted young girl in an enclosed compound across the road.

As he starts pedaling down, he lifts his hands off the bike, spreading them against the wind as if he is flying in a state of utter bliss, eyes barely open.

In a nearby compound two boys are playing soccer on the right side of the road. Suddenly one boy kicks the ball and it flies off towards the road. K seeing it approaching in the air, rushes off his bike to block it. We see him leaning forward and raising his hand to block off the ball back towards the boys while remaining on the bike, in an impressive close-up displaying athletic fitness and sharp reflexes.

But the sudden accelerated forward movement has loosened his control of the bicycle speed's.

As he reaches downhill at uncontrollably fast speed, we see a crossroad and hear a car's horn blown from the left. We see K., abruptly tilting the bike to the right to avoid collision, his tire violently hitting the sidewalk elevation.

K. is propelled off the bike and flying towards a concrete and steel wall opening up to a ramp a yard or two away.

At the moment of impact we hear him whispering "my head" and instinctively pulling his left hand to cover his forehead as he smashes against the wall and blood splashes.

A woman screams at the sight of the impact.

CUT TO:

BLACK SCREEN

The screen stays black and everything is still for about ten seconds. Then a crackled voice of K.

K.(V.O.)  
When life nickels  
and dimes you,  
what you need is...  
Change!

Nickels and dimes falling, rotating. Black Screen turning to color.

K.(V.O.)  
But then again,  
Said another wise one,  
The more things change,  
The more they may stay the same.

Returning to black screen and still for a few more seconds.

CHILD (V.O.)  
(singing, in French, as  
illustrative images  
slide, with English  
subtitles -(Appendix 1))  
The rich farmer and his children

INSERT ANIMATED DRAWING - Sample animated drawings in Black & White of a Rich Farmer and Sons on his deathbed, sons gathered by his side.

FARMER  
Work, take pains! It is the form of  
capital least likely to default.



CHILD (V.O.)

A rich farmer, feeling his death  
near, called his children to his  
bedside, and spoke to them without  
witnesses:

FARMER

Beware (Coughs)

CHILD (V.O.)

Said he,

FARMER

(waging his finger)  
Never sell the inheritance our  
forefathers bequeated us!  
A treasure is hidden therein  
(The children nudge closer)

INSERT IMAGE of glistening gold underground in the field in  
the children's imagination.

FARMER (CONT'D)

Wherein exactly, I am not so sure!  
(open arms with a shrug)  
But a bit of dogged hard work will  
earn you the spoils of that soil.  
Start plowing the fields as soon as  
the August harvest is over. Dig,  
clear out, seek. Leave no spot  
unsounded.  
(father breathes his last  
breath and expires)

CHILD (V.O.)

The father dead, the children  
returned to the field, hither and  
dither plowing,

INSERT IMAGE - Sample animated Black & White drawing of "Sons  
at work in the fields"

So much so that by the end of the  
year they had earned aplenty more.

INSERT IMAGE - Sample animated Black & White drawing of  
people paying money for the abundant crops and money piling  
up and up, glistening gold.

CHILD (V.O.)

Yet there was no treasure to be  
found in the ground, for the father  
had been wise to thus teach them  
that hard work in itself yielded  
treasures.

BEGIN FLASHBACK:

Tune "Le Temps des Cerises" by Jean Baptiste Clement playing  
in the background.

EXT. SCHOOL GROUND - DAY

SUPER: Students of "Lycée Francois 1er Le Havre, France,  
December 1888" at at ski outing in the French Alps

We see skiers coming down trails, one in particular seems to  
be enjoying himself on the ice, swinging gracefully through  
steep sloped trails. We see him slowing down and stopping as  
he reaches down slope. A couple friends, arrive moments  
later. As the take off their helmets, we see clearly the face  
of the first one to arrive, It is teenaged LOUIS BACHELIER,  
lanky athletic, eerily reminiscent of K., except that he is  
white, blond

They head into the rest room in the resort. Moments later  
they are sitting on a table in the resort's cafeteria,  
playing cards. Among them is Bachelie, now here clearly  
having a good time. On another table a few yards away, a  
pretty young girl is discretely watching, with a couple of  
friends. Bachelier has noticed her. A new boy - LEROB - nerdy  
looking but with know it all cockiness, approaches the group  
playing cards.

LEROB

What amuses our showy mister here?

Bachelier turns to Lerob.

LOUIS BACHELIER

There he is! Lerob, smart boy!  
Believe in magic?

LEROB

Magic? What nonsense are you up to  
now, Bachelier?

LOUIS BACHELIER

I'll bet a hundred francs against your ten Francs that I will play a magic trick on you, and you won't have a clue.

LEROB

So full of yourself!

Bachelier shuffles cards and pulls out the top one which he shows to Lerob - A king of hearts - but does not look at it and puts it back on top. Other students look.

LOUIS BACHELIER

Now I am going to take this top card which I just showed you and put it inside wherever you want. Where do you want me to split the deck?

Lerob hesitates.

LOUIS BACHELIER (CONT'D)

Well split it yourself. Take it and split where you want.

Lerob splits at about three quarters and one quarter. Bachelier takes the top cards and puts it inside where Lerob split and closes. He hands the deck to Lerob and closes his eyes.

LEROB

So what's the magical trick?

LOUIS BACHELIER

I am going to bet a hundred Francs against ten that I will pick the card that I just showed you in just a single try. Game?

Lerob hesitates again.

LEROB

How about a hundred against five francs?

LOUIS BACHELIER

Come on Lerob, I have a hundred on the line.

(beat)

I'll tell you what. Two hundreds against ten, that's what you want right?

A STUDENT

Come on Lerob don't be a wimp. You are a smart guy, if you think there is a trick, show it, otherwise put up.

The girls at the other table start giggling. Both men notice them.

BACHELIER

Come on Lerob, your girl is looking. Be a man. Two hundred against ten.

LEROB

OK, Game. Show me the card!

Bachelier takes the deck of cards, flips it in his beck. And then puts it on the bench and opens the top card. It shows the king of hearts.

LOUIS BACHELIER

Was it not the King of hearts?

A STUDENT

Yes, it was!

A GIRL AT THE OTHER TABLE

Whoa!

INT. UNIVERSITY CLASSROOM - DAY

SUPER: "PARIS, SEPTEMBER 1994"

PROF EL ARI, female Caucasian, 50, silver haired, tall and imposing is lecturing a class of graduate students in Mathematics. We see K., now noticeably scar faced, sitting in the center column, first row.

PROFESSOR EL ARI

(clearing his voice)

The market unbeknownst to itself, is ruled by laws that constrain it,

(beat)

Which laws?

(beat)

Anyone?

A STUDENT

Political laws?

PROFESSOR EL ARI

Yes, well..

(chuckle)

It was a flustered De Gaulle who wittily and memorably, using the term 'corbeille' in 1966 said that France's policies were not made by the markets. At the time it seemed very clever.

INSERT

Short footage of De Gaulle's conference where he utters those words and journalist in attendance spontaneously applaud.

RETURN TO SCENE

ANOTHER STUDENT

Now, Mitterrand knows that France's policies are controlled by the markets

Burst of laughter in the class.

ANOTHER STUDENT (CONT'D)

But he won't say it...

Another burst of laughter

PROFESSOR EL ARI

That's when silence is golden.

Laughter continues.

PROFESSOR EL ARI (CONT'D)

All right, now back to the original question. Which force constraints markets?

STUDENT 2

Market regulations?

PROFESSOR EL ARI

Indeed market regulations constrain markets, but that is not unbeknownst to the market itself, is it?

K.

The laws of probability?

Professor El Ari is walking towards the back of the classroom and can no longer see students in front.

PROFESSOR EL ARI  
Right, that's right!

Professor El Ari turns around and notices that it is K. who said it and poses as if surprised. K.'s expression is focused and intense.

PROFESSOR EL ARI (CONT'D)  
Right, but why?

K.  
Through laws such as the law of large numbers or the central limit theorem, the laws of probability point to the specific ways that random events can be aggregated to yield deterministic patterns.

PROFESSOR EL ARI  
And?

K.  
Well, this is the essence of most laws of probability and in financial markets, I guess aggregate computation of random market fluctuations must exhibit deterministic patterns that thus deterministically constrain them. No?

PROFESSOR EL ARI  
Well said! Very eloquent. 'The market, unbeknownst to itself, is ruled by laws that constrain it, the laws of probability.'

A STUDENT  
Sounds almost like poetry.

PROFESSOR EL ARI  
But someone, Monsieur, beat you to that insight. Nearly a century ago, before Einstein, a student here, just like you, observed this phenomenon to lay down the foundations of the field now known as financial mathematics upon which the derivatives industry, the largest market in the world runs.

A STUDENT  
Who was he?

PROFESSOR EL ARI  
Ah, another great Louis!

A beat

STUDENT 2  
Ah Oui?

PROFESSOR EL ARI  
Invisible man in his time  
(beat)  
Bachelier!

A STUDENT  
Why do you call him "Invisible  
Man"?

PROFESSOR EL ARI  
Because nobody paid him any mind.

A STUDENT  
You mean he was hidden in plain  
sight?

PROFESSOR EL ARI  
Yes, indeed.  
(beat)  
At least here in France.

A STUDENT  
Why?

PROFESSOR EL ARI  
Well, he had the wrong profile. An  
original sin, or accident like  
Victor Hugo's Valjean dogged him  
for the rest of his life.

K.  
How so?

Professor El Ari looks at him quizzically, letting out an  
equivocal smile.

INT. HALLWAY - DAY

K. with s alight limp walks along the hallway. A black man is  
sweeping the floor, and K. patiently waits behind him, until  
at last he notices him.

K.  
Excuse me sir, do you know where  
the department's secretary office  
is?

The man points finger at a door in the hallway without a word, looking at him skeptically.

K. (CONT'D)  
Thank you. Have a great day.

K. walks away and knocks at the indicated door. A female voice inside says "Come in!"

INT. SECRETARY'S OFFICE-DAY

BLACK SECRETARY, mid thirties on the phone - picture of a younger Whoopi Goldberg - gestures to K. as he is walking in to wait outside. He nods and exits smoothly closing the door behind him.

EXT. SECRETARY'S OFFICE HALLWAY -DAY

We see K. reading notices in the hallway. He marks with a pencil three notices, organized almost as triangle, one of which reads "Offres de stages/emploi en salle de marches a New York." (Subtitle: "Internships/job opportunity in trading room in NY"). As he starts taking notes, he overhears voices in an adjacent office the Dean's office, one of which is Professor El Ari.

INT. DEAN'S OFFICE-DAY

DEAN VERIT, grey-bearded, late 40s, sitting at his desk.  
Professor EL ARI standing before him, a hand on his table.

PROFESSOR EL ARI  
Who's the black kid in the program?

DEAN VERIT  
Oh, K. the one with the scars?

PROFESSOR EL ARI  
Yes.

DEAN VERIT  
Hungry, and with brains.

PROFESSOR EL ARI  
"Un certain je ne sais quoi"  
Grothendiecksque.



DEAN VERIT

Ha!

PROFESSOR EL ARI

I was thinking he could be our perfect candidate for the fellowship to Chicago.

DEAN VERIT

Uhm...That would still be trouble. I mean, It would make waves, and in this political climate, you can't just do that.

PROFESSOR EL ARI

Oh, he's got the resume to back it up?

DEAN VERIT

For sure.

PROFESSOR EL ARI

How about merit? He has a very promising profile. He is also at the business school in Jouy. He was even at the summer School in Saint Flour. Don't we want to showcase our best?

DEAN VERIT

Well, you have to keep it reasonable though. For an African kid to be doing a maths PhD here is already not so bad!

PROFESSOR EL ARI

Come again? What are you really trying to say?

DEAN VERIT

I just don't want to pick a fight with anyone right now. At this time he is just not the type of face we want to showcase out there as representative of the best of France.

PROFESSOR EL ARI

But he has a very solid grounding in Mathematics and what no one else here have: a greater understanding of the business world. Economics, finance. That makes him unique.

(MORE)

PROFESSOR EL ARI (CONT'D)

The financial mathematics that we do must serve finance, and he understands that very intuitively, better than anyone.

DEAN VERIT

In his application essay, he states: "As someone who has been on the receiving end of random misfortune, I am intensely interested in developing rational expertise that will help me conquer the adverse effects of uncertainty, and to achieve that goal, mastery of probability theory is a must--"

PROFESSOR EL ARI

You see--

DEAN VERIT

For the little I have seen of the kid, I know his interest in the field is almost cathartic, that there is a missionary dimension to his interest that is uniquely promising. But that's not the point.

PROFESSOR EL ARI

Nuts! Nuts! I didn't know you were into this nonsense Verit? Where is "Liberte, egalite, fraternite" when we need it? Are we a meritocracy or what?

DEAN VERIT

It's about looking at the big picture. I have nothing against the kid and would have selected him to be one among the many. But we are where we are! There is only one spot and picking him would make him the lead. With Le Pen polling at 15% and all this Balladur government pandering veiled xenophobic policies, I just don't want to make waves with something like this.

PROFESSOR EL ARI

If this kid goes to Chicago, with the options exchange there, he can come up with stuff, you know, and he will make us look good!

DEAN VERIT

Come on, this is not Utopia! In this place and time, the idea of us grooming a black Einstein is almost oxymoronically dissonant. You know I am not prejudiced, but this is to put my head at risk and yet might set the kid up to a sisyphian task.

PROFESSOR EL ARI

So, you doom him beforehand?

DEAN VERIT

No, not me, our society does. Even if he were to greatly achieve, he would have a hard time getting people to take him seriously. So he needs to learn to have a thick skin.

PROFESSOR EL ARI

Well you are the one who knows all about Bachelier, aren't you?

DEAN VERIT

Bachelier had a thick skin. Trying to promote that kid here by easily giving that fellowship spot won't help us. And perhaps not even him. Have you ever heard about the Peter Principle?

INT. SECRETARY'S OFFICE-DAY

K. is attentively listening to the conversation in progress in the adjacent room, mechanically drawing a triangle around the three notices that had earlier caught his attention when he hears the secretary calls for him. His flustered facial expression indicates that what he has gleaned has upset him.

BLACK SECRETARY (O.S.)

Come in!

K. walks in.

INT. SECRETARY'S OFFICE-DAY

K.

Hmmm, good morning. Can I get some information about...

BLACK SECRETARY  
What are you doing here?

K.  
I am a student.

BLACK SECRETARY  
You seem upset!

K.  
No, it's not much. Someone just  
broke my heart.

BLACK SECRETARY  
When?

K.  
A few minutes ago.

BLACK SECRETARY  
Sorry. I know what you must feel.  
But it will pass. You'll find  
another one, . You know, if you  
look hard enough... somewhere else  
the grass is greener. Promise.

INSERT

Secretary visualization of K. coming in her office all happy,  
hand in hand with a beautiful new girlfriend.

RETURN TO SCENE

K.  
Really? Thank you.

INSERT

IMAGE OF K.'s hope of sitting in a trading room in NY  
designing new mathematical models, with an image of the NY  
stock exchange in the background.

RETURN TO SCENE

BLACK SECRETARY  
Don't worry. You're still very  
young. Now, which program are you  
enrolled into?

K.  
Probabilities and financial  
mathematics

BLACK SECRETARY  
The graduate program?

K.  
Yes.

BLACK SECRETARY  
What's your name?

K.  
K.

She starts looking for an item on her desk and, stretching her hand to reach for one folder, inadvertently bumps on another folder whose contents splash on the floor.

BLACK SECRETARY  
Oh, merde!

K. Immediately kneels and start picking up.

BLACK SECRETARY (CONT'D)  
Thank you, young man. You are a gentleman.

K.  
It's all right.

BLACK SECRETARY  
Now where were we again? K...K.  
There you are! Okay, how can I help you?

K.  
I am trying to get some information about a mathematician named Louis Bachelier, more on the historical side of who he was.

BLACK SECRETARY  
Well, we have the departmental library here, but if you are looking more for information of a historical nature, I'd try the bibliotheque nationale.

Knock on the door. The head of a man, looking like a foreign visitor in his early fifties shows through the door.

BLACK SECRETARY (CONT'D)  
Oh, Prof Duff! Welcome. Let me go and let Dean Ver that you are here.

She walks out, as K exits. She knocks on Dean Ver's door and peeks through.

BLACK SECRETARY (CONT'D)  
Prof. Duf from Chicago is here.

DEAN VER  
Oh, yes, Duff. Show him in.

EXT. OUTSIDE BIBLIOTHEQUE NATIONALE DE FRANCE - DAY

K. is walking towards the entrance of the library absorbed in thoughts. Every few yards, he halts to read notes on index cards in his hands.

We hear K's voice over screen as we see the notes he is reading

K. (V.O)  
A derivative contract is a contract whose payout at maturity(T) is derived from (or in other words is a function of) the future values of an observable underlying (such as a stock price, a stock index, a currency's price,).

As he reads and flips the cards, the screen shows an index fluctuating on a graph with a horizontal time axis "t" and a vertical "S=underlying" axis. Two vertical bars highlight a "t0=contract agreement time," and "T=maturity," and the fluctuations are indicated with "St."

K. (V.O) (CONT'D)  
There are many types of derivatives traded in financial markets, often with very exotic names.

We see names such "American Options," "Asian Options," "Barrier options," "No Touch," "Double No Touch," "Basket options," "Rainbow options" popping on screen, with graphic representations of their payouts, the last one lingering on screen being two parallel lines headed by "Double No Touch."

K. (V.O) (CONT'D)  
Usually, when people are talking about derivatives, they are talking about Calls or Puts, and sometimes Forwards, also called Futures when traded on exchanges.

Image of traders gesticulating around a pit and computer screens as a commentator announces closing prices of S&P Futures on the Chicago Mercantile Exchange.

K. (V.O) (CONT'D)

A Call is an insurance contract which grants you the buyer the right and not the obligation to buy at a specified time in the future, called maturity(T) a given underlying at a given price, which is called the strike(K)price. When I buy a call, just as for car insurance, I must pay a premium.

Image of a graph that illustrates the payout of a Call with the underlying as horizontal axis and the payout as vertical axis. The graph shows a blue colored line matching the horizontal axis and starting to rise at a 45 degree angle from the point indicating the strike price K.

K. (V.O) (CONT'D)

For example, If I buy a six months Call struck at 1800 on the French CAC 40, I mean that in six months time, I will have the right to buy the CAC 40 index at 1800 francs. Of course, if on that day the CAC 40 is trading below 1800, I will choose not to exercise my right since I can buy the index cheaper in the market. Therefore these contract.

On the graph, the strike K is now replaced by 1800 and the horizontal axis indicates CAC 40. We see K.'s mind playing with the fact that  $1800=2^3 \cdot 3^2 \cdot 5^2$ , emphasizing each instance of the number 3. It seems the number 3 has particular significance to him.

K. (V.O) (CONT'D)

A Put is very similar to a Call, except that the right to buy is replaced now by a right to sell. A Forward is also similar in description except that you have now the right and the obligation to buy or sell.

The graphs of the payouts of a Put is now represented on the same graph as the Call was, but in red. Then we see the straight line for the Forward, all on the same graph. A repeat of the drawing for Call, Put and Forward, further emphasizes the three different payouts.

K. (V.O) (CONT'D)

The notional amount of derivatives traded exceeds the world's GDP and there are new types of derivatives contracts created everyday. When you think about it, almost any agreement where you have to deliver or pay out something in the future is a derivative contract. If I make a bet that the NY Yankees will win the world series this year, I am buying a derivatives contract whose payout will depend on the outcome of the world series.

K. Puts the notes and starts contemplating. A LADY passes by with her friend and K. overhears her saying:

A LADY

--and I guess I have to buy her a present for her birthday since she sent me a nice gift last year on my birthday--

And we see him more pensive as his thoughts are heard in voice over

K. (V.O.)

It is a cause and effect game where we try to apportion the fair cause that will justly lead to a desired effect! So, When I treat a person fairly today, I am buying a future reputation for fairness and the more likely hope that the fairly treated person will continue to invest into a system that treats him fairly.

He returns to reading his notes.

K. (V.O.)

The tricky issue about these derivatives contracts is how much one should be willing to pay now to receive the future payout, and that is called pricing. An even trickier question is if one has sold such a contract that creates an uncertain future obligation, how one should hedge it so that we can have today some certainty about our future gains or losses



He stops again and we hear him speaking apparently to himself, self unaware

K.

Now how much would you be willing to pay on a bet that I will receive a fellowship to Chicago? What is my best hedge?

The various graphs are still lingering around him in the center heading towards the entrance.

INT. BIBLIOTHEQUE NATIONALE DE FRANCE - DAY

K. walks inside the library. A Black security officer checks him in. As he approaches a REFERENCE DESK LIBRARIAN, a middle aged blond lady greets him.

REFERENCE LIBRARIAN

Good afternoon, sir. How may I help you?

K.

I am looking for more information about the life of a mathematician named Louis Bachelier. At Jussieu, they suggested I check here.

REFERENCE LIBRARIAN

Bachelier? Sounds familiar.

(beat)

Oh, I remember. There's been a lot of inquiry about him in recent years.

K.

Oh, then you must have materials about him handy.

REFERENCE LIBRARIAN

Indeed. Wait a moment please.

K.

Sure.

K. gazes at the decor of the library as he waits, losing himself in the contemplation of its size, impressive murals and domes, he notices an intricately drawn triangle seemingly infinitely subdividing itself into smaller triangles, the details of which totally absorb him.

REFERENCE LIBRARIAN

Fascinating isn't it?

K.  
(just noticing the  
presence)  
Oh! What?

REFERENCE LIBRARIAN  
Fascinating isn't it?

K.  
Whoa? I--I first thought it was a  
drawing of the Louvres pyramid, but  
it isn't quite that, is it?

REFERENCE LIBRARIAN  
From a distance yes, perhaps. But  
this is mathematical art. Temporary  
exposition. Fractal triangles also  
known as Sierpinski triangles. Used  
in church designs in Italy since  
the thirteenth century, long before  
anyone knew of fractals.

K.  
I want to live here.

REFERENCE LIBRARIAN  
Ha! I bet you would. You could  
spend a lot of time on them. So  
let's get to what brought you here.  
Here's what you need about  
Bachelier. I read a bit about him.

K.  
You did?

REFERENCE LIBRARIAN  
I am into history of sciences.  
Quite an amazing story!  
Unfortunately not so widely known.  
Here, for you to explore.

K.  
Thank you! If you have related  
material in other mediums, I'd glad  
to take a look as well.

REFERENCE LIBRARIAN  
Well, you can take a look at  
archived films.

INT. ARCHIVED FILM ROOM - DAY

K. Is watching various archival material

FULL-SCREEN ARCHIVAL FOOTAGE(1966)

INSERT - TITLES

Title " La Corbeille"

Quick clip that gives some background history on the 'Corbeille' in France and the end of the system in 1987 to be replaced by electronic trading.

Title - "La politique de la France ne se fait pas a la corbeille"

PRESIDENT DE GAULLE  
 (In French with English  
 subtitles (Appendix 2))  
 The stock market in 1962  
 was excessively good, in  
 1966, it is excessively  
 bad, but you know, French  
 policy is not decided by  
 the markets.

Room full of journalists, all clapping.

1990s PANEL

Panel of contemporary commentators opining on the historical footage

COMMENTATOR #1  
 Another age, indeed. Nowadays, no  
 credible politician would find this  
 witty nor dare say such a thing.

COMMENTATOR #2  
 Times have really changed. Now the  
 operating word is "reassuring the  
markets."

COMMENTATOR #1  
 Well, France, with its strong  
 catholic tradition as "the elder  
 daughter of the church," has always  
 looked suspiciously at the idea of  
 financial dealing for profit.

## COMMENTATOR #2

So that there has been this bias implying that 'decent' people should not be involved in monetary speculation, either as a business or even as an item of laudable academic inquiry.

## COMMENTATOR #1

The father of modern Mathematical Finance, Louis Bachelier as I remember reading recently, suffered here in France, in part because of that.

## COMMENTATOR #3

Well Jesus did drive the Money Changers out Of The Temple, didn't he?

## FLASHBACK BACHELIER

## INT. CLASSROOM - DAY

First term results announcement. Advanced Mathematics Preparatory class post high school. A MATH TEACHER, a bearded man in his mid thirties, is handing out class reports to students. Louis Bachelier is seated in the center column, first row.

## MATHEMATICS TEACHER

Before handing out this first trimester's report cards, I would like to single out one of your classmates for superior competence and originality in his analytical approach to mathematics. He demonstrates deep understanding of the practical use of mathematics. He is at times confusing for sure,  
(beat)  
but then, there seems to always be something less trivial that he is getting at.

(handing out a report card)  
Bachelier!

## A STUDENT

But what practicality can anyone of us give to these abstractions?

MATHEMATICS TEACHER

In physics, astronomy, mechanics,  
the air you breathe to do your work  
follows mathematical rules, the  
water you drink flows according to  
mathematical principles.

(beat)

ANOTHER STUDENT

But these are not areas that create  
problems that we normal students  
can advantageously use mathematics  
to navigate practically in daily  
life...

MATHEMATICS TEACHER

Well, uh...

LOUIS BACHELIER

How about probabilities?

MATHEMATICS TEACHER

Precisely right, Bachelier! Every  
decision we make in daily life is  
directed by our estimation of  
probabilities, consciously or  
unconsciously. Probabilities, as a  
field of mathematics, helps us make  
better estimates, hence better  
decisions. Probabilities permeate  
every aspect of life.

Bachelier smiles proudly.

EXT. HAVRE HARBOR - DAY

Louis's sister CLOTILDE, 20, is standing in front of rows of  
racks containing bottled wine shipped for the family  
business. BACHELIER & CO imports and sells various wines and  
spirits to and from the area. At the opening of the scene,  
she is seen at a distance, arguing with a PORTER, scratching  
her head as she inspects the rows as Louis walks in towards  
her. The conversation becomes more audible as Bachelier  
approaches.

PORTER

Weighing all this is going to cost  
more money, and who is going to  
carry all this?

CLOTILDE

And I can't spend any more money on  
this!

PORTER

I am alone here today, and this is going to give me more work than I need.

CLOTILDE

Are you trying to take advantage of me because my father is not here and you think I can be played for a fool?

PORTER

(waving his hand up in the air)

Ah, no Miss, the money does not go into my pockets. That's company policy and the money is for the owners.

LOUIS

Hey Clo! what's going on here?

CLOTILDE

Ah Louis, here you are! Come over here for a minute.

She takes Louis by the hand to the side.

CLOTILDE (CONT'D)

This porter got wines mixed up here and he wants me to spend more money to fix the mess. I think it's trick to get more money from me.

LOUIS

What's the problem?

CLOTILDE

You see, the Dom Perignon and the Muscadet are in the same casings. I can't tell which row is supposed to be Dom Perignon.

LOUIS

So how do you want to sort it out then?

CLOTILDE

I guess we have to weigh casings in each row.

LOUIS

Oh, the Muscadet and Dom Perignon casings have different weights?

CLOTILDE

Yes. Thank God I remembered that!

LOUIS

(Scanning the rows of  
racks)

Twenty rows of racks, huh!

CLOTILDE

And each weighing costs twenty centimes. I don't have enough money. Weighing the twenty casing would cost four francs!

LOUIS

Can you lump them together and weigh at once for the same price?

CLOTILDE

Yes. Twenty centimes per weighing, no matter the weight. But it is not much help here since weighing them all at once you would not be able to differentiate. Would you?

LOUIS

(smiling cockily)

Ah?

CLOTILDE

Well, each casing of Muscadet weighs twenty pounds. Each casing of Dom weighs twenty one pounds. So if you lump them together, one from each rack, you'll get four hundred pounds right?

LOUIS

Yes, well actually four hundred and one pounds, since one of the casing will be a casing of Dom.

CLOTILDE

Right, right. But you still won't know which row has the Doms? Would you?

Louis smiles even more cockily.

LOUIS  
Guess what? This is your lucky day.

CLOTILDE  
What do you have in mind, Louis?

LOUIS  
Watch, and watch closely. Porter?

The porter approaches.

PORTER  
Yes?

LOUIS  
I'd like to take one case in the first row, two casings in the second row, and so on up to twenty casings in the twentieth row and put them together.

PORTER  
Yes I can do that.

LOUIS  
Then weigh all of them at once.

Moments later.

PORTER  
Four thousand two hundred and seven pounds.

LOUIS  
(To Clotilde)  
Open the seventh row casings now.

Clotilde breaks open a casing in the seventh row. She takes out a bottle of Dom Perignon.

CLOTILDE  
Wow! Louis, how did you figure that out?

LOUIS  
(gloating)  
You owe me three Francs and eighty centimes.

EXT. DOWNTOWN STREET DAY - DAY

Clotilde, Louis and young brother JEAN about three years old are walking on the street. Louis is playing tricks with Jean.



CLOTILDE

Well Louis, I am scared of your brains.

LOUIS BACHELIER

So, do you think I should choose "Normale Sup" or "X" next year?

CLOTILDE

I don't know how many Freshmen in all France who would dare casually assume such a choice will be theirs to make.

LOUIS BACHELIER

Any doubts about me?

A young couple crosses the street towards the Bachelier's side. It is Lerob and his girlfriend. She first sights Bachelier and hails.

THE GIRLFRIEND

Hey, it's your friend. Hello!

LOUIS BACHELIER

Hey Lerob! What's up.

LEROB

Hi.

LOUIS BACHELIER

Lerob! Pretend at least that you are as happy to see me as I am happy to see you! Let me introduce you to my sister Clotilde and my brother Jean. This is Mademoiselle?

THE GIRLFRIEND

AUGUSTINE!

EXT. COUNTRYSIDE LANDSCAPE - DAY

SUPERIMPOSE: December 31, 1888

Carriage drives across the countryside, cutting through snow covered wheat fields. Over the horizon, the sea can be sight. Inside the carriage, Louis, Jean and Clotilde. Jean is reciting joyfully ABCs and one-two-threes as brother and sister cheer on. Jean just finished counting to twenty

LOUIS

Now additions!

CLOTILDE

He can't do that! He is not even three years old yet!

LOUIS

If he can count to twenty he can do start doing additions. Jean, if I say a number plus one equals one what? Just tell me the number that comes after that OK? What comes after two?

JEAN

Three!

LOUIS

So two plus one equals

JEAN

Three!

Louis claps Jean's palm in cheer as a gated isolated compound is now in view, and the carriage progresses towards its entrance gate and a SECURITY GUARD

LOUIS BACHELIER

Good afternoon, Sir.

SECURITY GUARD

Good afternoon young man. Who are you going to see?

LOUIS BACHELIER

Mr. Bachelier, Sir. We are his children.

SECURITY GUARD

(checking a list)

Does he work here or is he a patient in the sanatorium?

LOUIS BACHELIER

A patient, a patient sir. And I think my mother is with him right now.

SECURITY GUARD

(face brightening)

Oh, Mr. Bachelier! Of course I see. Please come in.

(Gates open)

INT. HALLWAY - AFTERNOON(LATE)

Bachelier and sibilings, led by a nursing nun walk through the corridor to knock on the door of the room, where their FATHER is

FATHER (V.O.)  
 (faintly shouted)  
 Come in

The nurse walks in, followed by Louis and sibilings.

The room appears lavishly appointed. On the right side, a bedside armoire with five tea cups in a plate, and an assortment of exotic tea bags on the side. The father, ALPHONSE BACHELIER a gaunt looking man in pyjamas, in his late forties is laying on the bed, unruly hair and beard several days old showing.

The MOTHER, CECILE a noticeably pretty lady in her late thirties is sitting on a posh recliner by his side, visibly uncomfortable. They are separated from visitors by a plastic curtain. Upon hearing the word 'children' the man haltingly lifts himself up from the elbow into a seated position on the bed.

On the walls are the drawings of three illustrated poems from LaFontaine hung in triangular fashion. The top one says "Le Laboureur et ses enfants" and shows an old man with his children by his bedside. The one down left says "Les animaux malades de la peste" and shows animals gathered together. The one down right says "Le corbeau et le renard," and shows a crow up a tree letting a piece of food of his mouth and a fox opening his mouth to grab it. As view focus on them, subtitles indicate "The rich farmer and his sons", "The animals sick of the plague" and "The crow and the fox," respectively.

LOUIS BACHELIER  
 (A shocked expression on  
 his face)  
 Dad! Wow!

Little Jean rushes to embrace his parents. Louis and Clotilde remain standing on the same spot as the nursing nun tries to stop Jean from crossing through the curtain.

NURSING NUN  
 (Holding the child in her  
 hand)  
 (MORE)

## NURSING NUN (CONT'D)

OK Children, mom and dad are very happy to see you, but they are a little weak to grab you in their hands now. Stand here I'll bring chairs for you to sit on.

The nursing aide drags a chair from the dining table, followed by Bachelier who grabs a chair for Clotilde as he remains standing in the middle as each other sibling is seated on his left and right, forming an arc about four feet away from the father's bed. Bachelier sits on one end, nearest to his father and the bed armoire. The mother is seated on another chair at the bottom end of the bed. The father waves and the nursing aide leaves the room.

## FATHER

Children! So glad to see you again!

## LOUIS BACHELIER

Oh, Dad, I can't, I am... speechless!

## FATHER

All right, all right. I know.

## LOUIS BACHELIER

When I came back from the school dorm last week, the house seemed so strange, and they said we could not visit you yet, but nobody told me what was really going on!

## FATHER

I did not want you to be alarmed.

## MOTHER

We are plagued! Look at me!

## FATHER

Not now, will you please darling? How was school this trimester, son?

## CLOTILDE

He's been asking me which school he should choose next year, "Normale Sup" or "X"? Do I need say more?

## FATHER

That's my boy! As the son of a scientist, his genes must drive him to rise up to the POINCARES in his time. Easy decision, I say "X", more practical, in Poincare's footsteps.

LOUIS AND CLOTILDE

(in unison)

That's why you both have to get  
better quick, OK!

FATHER

No matter what, you have to make  
the best choice to be prepared to  
rid France of the stench of Sedan  
that soiled your seed on this  
earth.

CLOTILDE

Dad the Dreamer! Sweet talker,  
amateur scientist, explorer, and  
what else, I've lost track.

LOUIS BACHELIER

Who is Poincare?

FATHER

Oh, just the greatest mathematician  
of our time. He just solved the  
three-body problem.

LOUIS BACHELIER

The three-body problem?

CLOTILDE

Dad, you're all over the place!

FATHER

Wherever there is something  
interesting...

MOTHER

...Your father has to be.

FATHER

I am an unconstrained explorer, I  
feel alive freely exploring where  
lesser mortals wouldn't dare go to  
find the truest truths.

MOTHER

By taking inconsiderate and foolish  
risks!

FATHER

(now visibly annoyed)

I am the vice-consul of Venezuela.

(MORE)

FATHER (CONT'D)

I represent that country in all this region. I needed to know the country I represent, didn't I?

MOTHER

You always seize on any pretext to take on a new adventure.

FATHER

But ma cherie, you know a little bit of change is sometimes good, don't you?

MOTHER

Well, if trekking from the Andes to the Amazon is a little bit--

She illustrates with her thumb and forefinger.

MOTHER (CONT'D)

-- of change, I just don't know what regular change would look like.

FATHER

Cherie, please not in front of the kids, please not at this time.

MOTHER

Well, I am the one who is sick now from whatever you got from wherever that place is and I did not choose to go anywhere!

FATHER

Who could resist such beauties?

MOTHER

Now, you don't even try to hide that you were frolicking with your 'beauties'

FATHER

I don't mean it that way, Cecile. You know I can't live without you.

MOTHER

Old Fox, that's no reason to want to die with me!

FATHER

Oh, darling I understand you're upset. I am not happy we are both sick.

(MORE)

FATHER (CONT'D)

Look at me, you saw how those children's face when the came in, didn't you.

(to the children)

Please don't pay any attention to this. Your mother is just a little bit unwell.

MOTHER

(making an effort to stand up, a cane in he hand)

I have always been your crow, have I not?

Mother pointing finger at the drawing of "Le Corbeau et le Renard."

MOTHER (CONT'D)

I am sick of this, you know! I am sick of being sick.

Sorry children, I am so glad to see you. And ....This is not fair to you, to any of us, oh!

(beat)

Excuse me. I just need to get out for a minute.

She slowly walks out of the room into the corridor. Jean follows her. Clotilde grabs him, and lifts him up to her hips.

JEAN

Mom, Mom..

LOUIS BACHELIER

(Lifting Jean from Clotilde unto his shoulder)

Come here, big boy!

CLOTILDE

Dad, your condition is now putting all of us at risk. Louis won't be able to fullfil your big dreams for him for sure if you don't get well soon.

FATHER

Son, I know. You can't afford to miss a bit for these two years until you are at "X."

LOUIS BACHELIER

Don't worry Dad, there is still plenty of time.

FATHER

You think so, don't you?  
 (beat)  
 But, probably not for me.

LOUIS BACHELIER

What do you mean, Dad?

Father shrugs with a fatalistic expression and coughs. He uses a handkerchief to wipe his mouth, strains of blood show and he hastily hides it from view, throwing it in a can on the other side of the bed. He clears his voice and attempts to pose cheerfully, pointing towards the drawing of "Le laboureur et ses enfants."

FATHER

Louis, do you remember that Fable from La Fontaine about the yeoman farmer and his children that I use to read to you at bed time?

Jean cheers up suddenly from Louis' shoulder and Louis takes him down.

JEAN

Yes, I do. Yes I do. We sang it with Clotilde. Do you want to listen?  
 (sings)  
 Travaillez, prenez de la peine:  
 C'est le fonds qui manque le moins.  
 Un riche laboureur, sentant sa mort  
 prochaine  
 Fit venir ses enfants, leur parla  
 sans témoins  
 "Gardez-vous", leur dit-il, "de  
 vendre l'héritage  
 Que nous ont laissé nos parents :  
 Un trésor est caché dedans.

Father, Clotilde and Louis clap their hands, thoroughly amused.

FATHER

Bravo!, Bravo, my young little  
 cuddly thing! Flawless!  
 (beat)  
 Now Louis, put three tea cups on  
 the rolling bed table in front of  
 me.

Louis does so. The father takes a large shiny gold coin from a small safe box near his bed and puts it on the table. Father turns the cups upside down.



FATHER (CONT'D)  
Now turn around children.

The children all turn around. The father puts the coin under the cup on his left.

FATHER (CONT'D)  
Now turn back towards me. I have put the coin under one of these cups. Louis point to the cup you think is the one with the coin hidden under it.

Louis points to the cup in the center.

FATHER (CONT'D)  
Now, I am going to remove one cup and open it. That cup does not contain the coin, OK?

He removes the right hand cup and opens it up.

FATHER (CONT'D)  
Now my question to you is this: you have only two cups left; the one you just selected

He gestures towards the center cup still closed.

FATHER (CONT'D)  
And this one!

He further gestures towards the left cup still closed

FATHER (CONT'D)  
Which one would you select? Will you stick with your original choice or will you change your original choice.

LOUIS BACHELIER  
Does it matter?

FATHER  
There is a choice, if repeated and over again, is demonstrably better even if in a specific instance it might lead to the wrong choice.

LOUIS BACHELIER  
What do you mean, Dad?

FATHER  
Probabilities.

LOUIS BACHELIER

Really?

FATHER

A treasure, son, is hidden in the correct answer.

Outside someone approaches with a cart and knocks on the door

FATHER (CONT'D)

(in a low voice to Louis)

End of fun time!

(more loudly)

Come in!

A Nurse pushes a cart in.

INT. CLASSROOM - DAY

Math class in session

MATHEMATICS TEACHER

The hyperbolic tangent can be obtained from the tangent function by observing that the tangent of a given number  $x$  is equal to the hyperbolic tangent of that same number multiplied by the imaginary number  $i$ . Now, reciprocally, how do you obtain the hyperbolic tangent from the expression of the tangent?

INSERT - BLACKBORARD TEACHER WRITING

$\text{Tan}(x) = -i \cdot \text{Tanh}(ix)$ ;  $\text{Tanh}(x) = \underline{\quad}$ ?

INSERT - BACHELIER'S WRITING - FANTASIZING ON HIS NOTEPAD

Writing  $\text{Tanh}(x) = -i \cdot \text{Tan}(ix)$ ;

Plotting  $\text{Tan}(x)$  and  $\text{Tanh}(x)$

Writing "Tan = Father, first; Tanh= Mother, later extracted from father"

playing with the plotted curves as they oscillate around the vertical and the horizontal axis respectively, stretching until they collapse to the vertical and horizontal axis respectively forming the image of a cross. He stares at the cross.

RETURN TO SCENE

Knock on the door. The teacher steps outside.

MATHEMATICS TEACHER (O.S.) (CONT'D)

Oh, my God! Poor Kid.

The teacher, clearly disturbed, returns to the classroom.

MATHEMATICS TEACHER (CONT'D)

Bachelier, can you come out a moment please?

LOUIS BACHELIER

Sure.

They head out. Moments later, Louis, eyes reddened comes back in and start packing all the material on his table into his book bag, biting his lips, and hurriedly hushes out.

EXT. CEMETERY - AFTERNOON

January 14, 1889. Bachelier and siblings are all dressed in black, standing in front of a coffin atop freshly unearthed burial ground. The mother is seated on a wheelchair, apart. A crowd numbering in the hundreds surround them. A PRIEST is standing in front, a bible in his hand.

PRIEST

...We are all gathered here to say  
farewell to a dear father, husband,  
friend, man of many talents,  
benefactor to this community ,  
called too early back to our  
Lord...

All of a sudden, Louis turns and runs towards the nearby wooded area.

INT. CLASSROOM - DAY

Math class in session

MATHEMATICS TEACHER

There are several ways of deriving  
the Taylor expansion of a function  
depending on how regular ...

Knock on the door. A person sneaks their head in and calls the teacher out. They can be heard exchanging words in a hushed voice.

MATHEMATICS TEACHER (O.S.) (CONT'D)  
 Wow! Losing the father and now the  
 mother in these circumstances might  
 kill him! I don't know how to break  
 this type of news.

Teacher back into the class.

MATHEMATICS TEACHER (CONT'D)  
 Bachelier, would you come out a  
 moment please?

Louis lifts both arms horizontally in the sign of the  
 crucified, speechless.

They head out. The bookbag stays and all the material remain  
 on the table.

INT. CLASSROOM -DAY (LATER)

The bell rings. Students start heading out for the break.

A STUDENT  
 Is Bachelier coming back? He left  
 everything on the table.

MATHEMATICS TEACHER  
 Isn't he in the hallway?

Student peeks out, and walks back into the class.

A STUDENT  
 Nope. No where to be found.

MATHEMATICS TEACHER  
 Poor kid. I Will take care of it.

INT. CLASSROOM - DAY

Math class in session

MATHEMATICS TEACHER  
 We will be doing some practice  
 exercises today on Taylor  
 expansions. Bachelier, on the  
 blackboard.

Bachelier stands up and heads to the blackboard, a bit  
 despondently, and picks up the chalk and the eraser.

## MATHEMATICS TEACHER (CONT'D)

Can you work out the expansion for exponential of minus a positive constant  $c$  over  $x$  square? Around zero?

Bachelier starts writing exponential of minus one over  $x$  square on the board, and then hesitates.

INSERT

Bachelier writing on the board "  $\text{Exp}[-c/x^2]=$  "

LOUIS BACHELIER  
(mumbling to himself)  
Nothing..nothing..nothing

RETURN TO SCENE

LEROB  
(whispering)  
Turns out Mr. Bachelier is not so able to go beyond the 'bachelier' high school graduate stage.

SPECIAL EFFECTS Tears of chalk start flowing out of the characters Bachelier has written on the board, as if dripping wet paint.

Bachelier throws the chalk on the board. He is now screaming.

LOUIS BACHELIER  
So what? What do I care? What do I care?

He also throws the eraser away and walks out of the class

LOUIS BACHELIER (CONT'D)  
What do I fucking care?

INT. WINES & SPIRIT BACK OFFICE - DAY

Bachelier is sitting on a chair on an office table. Facing him is his maternal GRANDFATHER, Mr. FORT MEU, holding in his hand a book titled: "Anthologie of New American Poetry".

LOUIS

I don't think you should touch those cedulas, Grandpa. It's a sucker's game.

GRANDFATHER

Son, all the big banks are on it. It's not easy to get hands on those. Sure winners. If they crash, a lot of mighty people will be crashing too. So governments won't allow it.

LOUIS

That's rushing with the mob grandpa.

GRANDFATHER

But all these contacts I have nurtured in Latin America, I can use them to tell me what is worth putting money into.

LOUIS

Grandpa, since you've been mentioning those trades, I've done some thinking, much less risky money makers. Just listen, OK? Why don't you use those contacts to make easy money on coffee trading.

GRANDFATHER

What's that?

LOUIS

You lend a bit of money to coffee growers against a discount pricing of their future crops as compared to trading futures of the same maturity in Amsterdam. Sure money, virtually no risk.

GRANDFATHER

Wow, wow, wow! Easy now, son, easy.

LOUIS

If three months coffee futures are at 100 francs a ton in Amsterdam, you use your contacts to reach out to small financially strained growers that you pay 10 francs per ton, cash now. When they deliver in 3 months you make a gross 90 per ton.

GRANDFATHER

That's gross margin though.

LOUIS

Net you could still end up with more than 50 per ton. That is a safer trade than someone who owns a bank and has contacts in Latin America should profitably be involved in.

GRANDFATHER

Wait a minute, let me make sure I follow...

Knock on the door. A store CLERK walks in.

CLERK

Sir. I have two customers who want to make a large order for a celebration in Paris and they requested to speak to the General Manager.

Louis follows him to the store. AUGUSTINE's parents, Mr. MAILLOT and Mrs. MAILLOT are waiting by the counter. Bachelier recognizes them and hurries obsequiously to them.

LOUIS

Oh, Oh, Good morning, Mr. And Mrs. Maillot! Welcome

MR. MAILLOT

Louis! It is nice to see you again.

MRS. MAILLOT

Doesn't he look grown-up and handsome in that business suit?

Bachelier smiles politely as they shake hands warmly.

LOUIS

How have you all been?

MR. MAILLOT

Not too bad. I see your holding up the family business nicely. Good young man. We need wine and spirits for an occasion.

MRS. MAILLOT

Augustine is getting married in Paris to a gentlemen from a very good family. She insisted we buy wine from you.

LOUIS

Ah! Congratulations to her!

MRS. MAILLOT

She never really told us why you broke up. I hope you will give us a decent price

LOUIS

Most certainly!

FLASHBACK

EXT. TOWN PARK - NIGHT

A few months after Louis' mother passing. Louis and Augustine outside, in a heated argument.

AUGUSTINE

I left Lerob for you. He was nice to me. He is going to Normale Sup. He may even be a minister someday. Even though you left school, I know that

LOUIS

So what? You can still go back to him...

AUGUSTINE

I know it is tough on you and that you feel lost But you have to go on living. I am here for you. Even though you quit school, I know once you go over this, you will do very well at whatever you put your mind do. I still love you, very much, Louis.

LOUIS

I just don't care, about nothing.

AUGUSTINE

Louis, I can't go on like this if you don't let me in.



LOUIS  
nothing, nothing you hear me?

AUGUSTINE  
I am leaving then.

LOUIS  
Good night, then.

AUGUSTINE  
(sobbing)  
No, I am leaving, I am leaving you,  
I am leaving this town, forever. I  
am at the end of my rope too.

Bachelier hesitates for a moment, then:

LOUIS  
Farewell, then.

Augustine rush away in tears

END FLASHBACK - RETURN TO SCENE

Louis hands a cash and receipt to the brothers of Augustine.  
He appears shaken by the news.

LOUIS (CONT'D)  
Your receipt and change, gentlemen.

MR. MAILLOT  
Thanks Louis for the discount on  
the price. Augustine was right to  
tell us to buy at your store.

LOUIS  
(eyes reddened, forcing a  
smile)  
My modest token to wish her the  
best. Rest assured we are not  
making a cent on this order. We  
will ship your order by end of day  
today.

They shake hands and the Maillots exit as Bachelier walks to  
the back of the store to meet back his grandfather reading  
aloud from the book and can be heard as Bachelier approaches.

GRANDFATHER  
Give me your tired, your poor,  
Your huddled masses yearning to  
breathe free, The wretched refuse  
of your teeming shore. Send these,  
the homeless, tempest-tost to me,  
(MORE)

GRANDFATHER (CONT'D)

I lift my lamp beside the golden door!

LOUIS

Now, what's that!

GRANDFATHER

An American poem from my anthology called "The New Colossus." Ah! what you just said makes a lot of sense. That's fine mind a of a financier you have there son.

LOUIS

Oh!

GRANDFATHER

I've got contacts at the Corbeille, and you can start learning the ropes there. You can add finace to this business and expand it to another level!

Bachelier remains silent, brooding.

GRANDFATHER (CONT'D)

What's up son? Something happened with the clients?

LOUIS

Grandpa, I am tired of all this, I want to leave this place!

GRANDFATHER

What's the matter? To go where?

LOUIS

Anywhere, I don't know, the Army! I must leave this place at once!

INT. BIBLIOTHEQUE NATIONALE DE FRANCE - DAY

K.

Is it true that both his mother and father died within four months of each other when he was in his late teens?

REFERENCE LIBRARIAN

Yes, absolutely true. He dropped out for a few years.

(MORE)

## REFERENCE LIBRARIAN (CONT'D)

When he came back, he could no longer go to any of the 'Grandes Ecoles'. It dogged him for the rest of his career.

K.

Unfortunate accident..

## FLASHBACK - REPLAY OF K.'S ACCIDENT

Picking up where the cut occurred in the bike accident at the beginning.

Sound of breaking bones against flesh, blood spill,

We see K. lifting his head and arm up as if to hail someone, revealing a face and body covered in blood, broken teeth, left arm broken and bones protruding, mumbling though blood off his mouth "Merde! I must --"

## INSERT

Image of K. Writing a Taylor series of the tangent and a hyperbolic Tangent on the blackboard, the graphic representations crossing each other at the origin, redolent of a cross.

## RETURN TO SCENE

A woman hastily off a car sees his face and screams.

K. passes out.

Sound of sirens in the distance.

## SERIES OF SHOTS

A) Ambulance workers lifting bloodied and unconscious K. onto a gurney into the ambulance. IV dipping fluids through K.s hand.

B) Doctors operating on K's face and arms in an operating room.

C) K. lying in a hospital bed, face almost entirely bandaged, left hand and right leg in a cast. He lifts his left hand to wipe his face, revealing tears streaming on both sides of his face. He is shivering, as tears continue to flow. The room slowly darkens. In the background, the Berlin Wall falls

END SERIES OF SHOTS - END FLASHBACK

K. (CONT'D)

I cannot be like this guy. I cannot  
be like this guy--.

REFERENCE LIBRARIAN

What?  
What do you mean?

K.

(Coming back to himself)  
Ha? What? Oh sorry, sorry. I got...

Picks up his bookcase and hurriedly walks out.

EXT. ROADSIDE - 1894 - DAY

Background playing "Le pere La victoire" of Lucien Delormel  
and Leon Garnier.

Bachelier walking along the roadside dressed in military  
fatigues and carrying a military backpack, just having been  
discharged from military service.

He arrives at an intersection. One points towards Le Havre  
and the other one towards Paris. He stops indecisively for a  
moment and then takes the path towards Le Havre. A Carriage  
arrives and blocks the road from which he came. He watches  
hesitantly.

INSERT

The image of Bachelier's father with the three cups of tea,  
and then removing one.

BACK TO SCENE

Bachelier rushes back and now takes the path towards Paris.

BACHELIER (V.O.)

Change! Poincare!

A few hundred yards ahead, a carriage passes by. He hails it.  
At a distance we see him conferring with the driver and then  
hopping in.

INT. INTERVIEW ROOM - DAY

SUPER: "1990s"

"At the trading offices of GlobalX a global investment bank  
in Paris"

K. has come to apply for the quantitative trading position advertised in the blackboard on campus. We see a strongly built TRADER vigorously shaking the hand of K. as he is led into the interview room. The vigor of the trader's handshake against his awkward grip causes him to pause.

TRADER

(Reading over K.'s resume)

It looks like you are all over the place, maths, economics, finance. Can't make up your mind on what to focus on?

K.

Actually these interests complement each other. They give me the skills to be the best trader/quant in derivatives you could be looking for. Math is the tools, finance provides the wiring and plumbing and business awareness helps keep the big picture of how it all fits together in building a nice house.

TRADER

Beautifully said, but this is an era for specialists. Pick one thing and do it better than everyone else. How's being all things make us money? We just want to hire a junior trader who can hustle. Can you?

K.

With my mind I can certainly try. I can break down complex issues to their simplest most resilient essence and help you efficiently hedge risky contracts taking into account factors that simple mathematical models such as Black Scholes don't.

TRADER

Oh, what do you know about Black Scholes' flaws

INSERT K's visualizations

K. (V.O)

Now I have to be ready if he thinks I don't know what I am talking about. What's is the Black Scholes Model again?

(MORE)

K. (V.O) (CONT'D)

where does it come from?

The Black Scholes Model, also called the Black Scholes Merton model is a model that describes the dynamic evolution of underlyings through time. The assumptions in that description are used to derive formulas for the prices derivatives contract, in particular Calls and Puts.

The mathematical description flashes on a virtual screen graphing what the Black Scholes models is in layman's terms as K.s voice is overheard in voice over.

The description in particular states that the incremental returns relative changes over an infinitesimally small period of time  $dt$  are made up of the sum of two terms: a deterministic term which is the product of a constant term and the increment and a random term that is the product of a constant term multiplied by the square root of the time increment  $dt$  and a random variable which is a random walk.

The description pops in screen corners superposed on the room environment in a way that is explanatory to the interested viewer, while thrilling to the senses, even if one does not understand what it means. Al this surrounds K. and the trader at the center of the screen.

RETURN TO SCENE

K. (CONT'D)

Well for one thing that is wrong with Black Scholes, you don't hedge Call or Put options by rebalancing your position continuously-- and then the normal assumption--

TRADER

Oh, you have theories about that?

K.

Not a complete theory. But my intuition is to rely on mathematical probabilities grounded in reality. Last year I did a Masters thesis on stochastic differential equations driven by jump measures and--

TRADER

What?

K.

Well, to state it simply, the bottom line is that the smooth way using only the underlying to hedge derivatives contracts doesn't work. Especially when you need it to work.

TRADER

Like when?

K.

When there is an unexpected event, prices jump, liquidity dries up, spreads widen.

TRADER

What do you do?

K.

Well, I go back to basics.

TRADER

Which basics?

K.

What I call the "handshake principle." Because it is such an ancient principle, it can be the backbone of a more robust approach to hedging and risk management.

TRADER

The "handshake principle?"

K.

Yes. For millenia, accross cultures, nothing has been more meaningful than a perfect handshake to seal a deal.

TRADER

Come again?

K.

Well, when you trade a risky security, you look for the most opportune matching securities whose risk profile is opposite yours, so that what you loose on one hand, you gain on the other hand.

(MORE)

K. (CONT'D)

When you shook my hand here, if I did not match your handshake, you would have lost a bit of balance, wouldn't you?

INSERT

Hand vigorously extended. Person losing balance when no matching hand.

Hand vigorously extended. Awkward when not matched by adequate opposing grip.

Hand vigorously extended. Equally strong and matching opposing grip.

RETURN TO SCENE

TRADER

So?

K.

To find your right candidate, you scan a lot of candidates, you try their hand and you select one or a few to whom you make an offer. Sometimes you pick the one with the smooth handshake, others the one with the rugged one. A continuous time model like Black Scholes gives you always the smooth choice. When you go back to basics, you also think of when you'll need a rough hand.

INSERT

Fast paced.

Black dots of asset price fluctuating as if on a computer screen. Strong Dip. Red alarm. Red "Bankruptcy" sign

Black dots of asset price fluctuating as if on a computer screen with green dots of roughly opposing fluctuations  
Strong Dip of black fluctuations, roughly matched by green.  
Red line combining both with very reduced fluctuations.

RETURN TO SCENE

TRADER

OK, OK, so what do you enjoy doing when you don't have to do anything.



K.

Well, I enjoy a lot of things, and variety, even for work, entertains. But one thing is for sure, I love history and I love a good, good story!

TRADER

Why?

K.

There's the sheer the pleasure of traveling through time and space, to loose myself in someone else's shoes. It keeps me grounded and a sense of perspective on human nature and its possibilities.

TRADER

What story have you read recently?

K.

Louis Bachelier.

BEGIN FLASHBACK:

INT. UNIV OF PARIS FACULTY OF SCIENCES - 1895 - DAY

Professor HENRI POINCARÉ is writing on the blackboard, lecturing an amphitheater full of students. On the front row sits Louis Bachelier, eyes on the lecturer, as he sparsely takes notes

HENRI POINCARÉ

Before we take a short break, let me give you something to entertain your brains on.

A STUDENT

Entertain!

HENRI POINCARÉ

So we have a contest with 16 players, it can be anything competitive: tennis, soccer, arm wrestling, whatever. 16 Contestants OK?

Students in the class nod quizzically.

HENRI POINCARÉ (CONT'D)

Now they are paired in one on one games in which the loser is eliminated and the winner advance to the next round and they are paired again and so on until a single victorious player emerges as champion.

A STUDENT

Can there be a draw?

HENRI POINCARÉ

No draw. Only win or lose.

A few students nod.

HENRI POINCARÉ (CONT'D)

Now my question to you all is, what is the probability that two given players will play against one another?

INSERT - BACHELIER DRAWING

Bachelier draws down a triangular shaped progression of eight, four, two to a top dot.

RETURN TO SCENE

LOUIS BACHELIER

Are players all equally strong?

HENRI POINCARÉ

Yes.

A FEW MINUTES LATER...

The class is back from its break.

HENRI POINCARÉ

Any answer?

INSERT - BACHELIER'S MENTAL VISUALIZATION

Projection to a corner of the room of The original triangle lighted with eight dots. Layers being pulled and aggregated to form a triangle with four dots at its base"

RETURN TO SCENE

LOUIS BACHELIER  
One eighth?

HENRI POINCARÉ  
Correct! That was quick. Can I see  
how you got that?

Bachelier hesitantly tears out a sheet of paper from his scribbled notebook notes.

INSERT - BACHELIER'S NOTES

The original triangle with eight dots at its base with an arrow pointing to triangle with four dots as base, an edge in bold and a scribbled " $1/2^{(n-1)}$   $n=4$ "

RETURN TO SCENE

Poincaré's perplexed expression.

INT. UNIV OF PARIS DINING HALL - DAY

Students eating in groups in the dining hall, among them Bachelier. A visibly younger pimpled faced classmate, GUEBESLE approaches bachelier.

GUEBESLE  
Can I sit?

LOUIS BACHELIER  
Sure. You are in my class right?

GUEBESLE  
Yes. What yo did in class today was cool! I have not seen you before at the School. Are you at X?

LOUIS BACHELIER  
No. I am just an old man consumed by maths.

GUEBESLE  
How's that?

LOUIS BACHELIER  
Well I dropped out for four years, paid my dues to the army, you know, getting ready for next time against the bosh and all that..

GUEBESLE

And maths?

LOUIS BACHELIER

Oh, I'm back to school here at the Sorbonne to help me sort some confounding probability problems we face in the markets.

Guebesle face shows an amused mocking expression, and he becomes a bit more animated.

GUEBESLE

Oh, I see. You speculate at the "Corbeille!" and you use maths to make even more money. Are you Jewish?

LOUIS BACHELIER

Does it matter?

GUEBESLE

But it must be hard for you to start a career in mathematics so old, isn't it?

LOUIS BACHELIER

Not really. Some may want me to feel so and even get vested in my failure to be proven right in their prejudice. But I am hooked.

GUEBESLE

Prejudice?

LOUIS BACHELIER

Prejudice means prejudging based on a few indicators that generally imply a particular conclusion but not always so. It is an act of human induction.

GUEBESLE

But then it must be a reasonable inference that allows humans to function most effectively. If I take your example, there are not many great mathematicians who started back college at your age, right?

LOUIS BACHELIER

Yes, so?

GUEBESLE

So, it is reasonable for me to doubt your chances of doing so well in mathematics, right?

LOUIS BACHELIER

How about a bit more broad minded?

GUEBESLE

Well, if we had to agonize over all small probability events, Nobody would ever make any decision!

LOUIS BACHELIER

This is a very interesting probabilistic problem, because you are both right and wrong.

GUEBESLE

Really!

LOUIS BACHELIER

It all depends on cost of being wrong. If the small probability event of making the wrong inference leads to very costly consequences, that shifts the calculus. I learned that lesson very dearly at the exchange.

GUEBESLE

What do you mean?

LOUIS BACHELIER

Well, there was this trading house which was very active in Latin American bonds. They had this great trader who for many years had made his trading strategy to copy what Barings bank was doing. He said "they know what is going on for sure, and they are too big to fail in any case."

GUEBESLE

It seems sensible enough. What's the catch?

LOUIS BACHELIER

Well, he bought all the Argentine Cédulas his friends at Barings would tip him on, and every year the house made money and he had a nice life and every body wished they were him. And then you know what happened?

GUEBESLE who has just gobbled food from his plate gestures.

LOUIS BACHELIER (CONT'D)

Well, one day people woke and felt the Argentine Cédulas were bonded on near worthless land, and overnight their value collapsed. Their friends at Barings were rescued by the British government. But by the time things calmed down, the trader's firm had been wiped out. I guess they were not big enough not to fail.

GUEBESLE

But it is just that they failed to refine their analysis.

LOUIS BACHELIER

True. Prejudice is always based on some form of intellectual laziness. And you want to train people so that they instinctively refine their analysis, and look beyond superficial cues.

GUEBESLE

But, as Lafontaine taught us, if the crow had been prejudiced and distrusted the fox, it might not have lost its cheese you know? Anyway, does this proves you have a chance to make it here?

LOUIS BACHELIER

Nothing proves I don't. And I am wondering if you are like Barings now. The system will protect invest in your survival at all costs, giving you even more chances to succeed. The apt metaphor here is not the "Crow and the Fox," but perhaps the "The Animals sick of the plague."

GUEBESLE  
That's, that's..

END FLASHBACK

Back in the trading room interview meeting room between K.  
And the interviewing trader.

The Jean Jacques Goldman's "La Bas" tuned down plays in the  
background (<https://youtu.be/zFwaRmpzvjo>)

The trader starring at K. intensely. K. matching his gaze,  
politely smiling.

TRADER  
Now Mr. K., how do I perfectly  
match your hand?

K.  
How about you sending me to New  
York?

Trader and K. stand up and extend a perfectly matched  
handshake.

The scene closes as Jean Jacques Goldman's "La Bas" starts  
playing in the background (<https://youtu.be/zFwaRmpzvjo>)

INT. AIRPLANE - DAY

K. Is seen listening to music and we can hear through the  
earplugs the sound of Sinatra's "New York" coming through. He  
is seen watching the window as plane flies past the statue of  
Liberty.

INT. JFK AIRPORT IMMIGRATION - DAY

K. Advances towards the IMMIGRATION OFFICER, a black man, mid-  
thirties.

IMMIGRATION OFFICER  
Passport.

K. Hands it over to him.

IMMIGRATION OFFICER (CONT'D)  
Is it your first time in the US?

K.  
Yes.

IMMIGRATION OFFICER  
What brings you here

K.  
Work

IMMIGRATION OFFICER  
What kind of work

K.  
Foreign Exchange Derivatives  
trading

IMMIGRATION OFFICER  
What is that?

K.  
The trading of instruments that  
companies and people use to hedge  
against the fluctuations in  
currencies' exchange rate

IMMIGRATION OFFICER  
Oh, like insurance? Or, is that  
what that guy does, he has a big  
accent too, uhm, ....yes, Soros

K.  
Yes, it can be insurance, and some  
people, like Soros, use it to  
speculate. Yes.

IMMIGRATION OFFICER  
Well, welcome to America 'Brother.'

K.  
Thank you.

INT. MANHATTAN TRADING ROOM - DAY

SUPER: A FEW MONTHS LATER - FAST PACED SCENE

It's been a couple weeks since K. has started working at Global X in New York under DEAN SAVOIE, head of complex Foreign Exchange(FX)derivatives products at Global X in New York, late 30s, cherubic face with a thick Staten Island accent which K. thinks is a foreign accent. He is in a conference room overlooking the trading floor of a high rise building in midtown manhattan. As usual, he is flanked with NICK EDDAN, a Lebanese senior quantitative trader with a French and light Middle Eastern accent who seems more important than his title suggests.



They are standing in front of a drawing board in a conference room with a few JUNIOR QUANTS AND TRADERS, among whom K.

Each time a technical term is used, whether it is Black Scholes, Greeks, Second Chance options, Delta Volatility, Volatility Smile, etc. There is a corresponding illustration on screen to make it intelligible and entertaining, either via a sci-fi futuristic or comical superposition.

DEAN SAVOIE

Our sales guy in Hong Kong wants us to quote a price on this payoff structure.

NICK EDDAN

What is that?

DEAN SAVOIE

A bet that the yen will stay within a given range, but if that range is breached, having a second chance feature that sets a new range.

He draws the payoff: a rail, two parallel horizontal lines, each line surrounded by narrower width dotted horizontal lines. He starts making explanatory gestures and explains what it is by adding a

Additional details on his drawing.

NICK EDDAN

Why do they need it?

DEAN SAVOIE

Well, they'll embed it in an enhanced principal guarantee deposit account product for investors looking to improve yields on their yen deposits. I've asked FIGLOO to use his models to check it out, but I wanted us to think it through as well.

BORIS, mid 30s, is one of the junior quant traders. Stocky, tending on the cherubic, with a thick Russian accent.

BORIS

How do you price that? I don't think we have a formula for pricing these yet.

DEAN SAVOIE

So a lot of people don't have a formula too.

(MORE)

DEAN SAVOIE (CONT'D)

If we could do it quick we could charge a very wide spread on that. We need to move fast.

NICK EDDAN

FIGLOO will take quite some time. He thinks in research paper's time. Let's see if we can run Monte-Carlo simulations with Black-Scholes to see where the prices are.

INSERT - K'S VISUALIZATION

On screen K,'s mental visualization and internal dialogue.

K. (V.O)

Oh, sh... What's Monte Carlo again?

Monte Carlo? Images in the background of the French Riviera, the ward of Monte Carlo in Monaco. Rich men flaunting riches, gambling at the Place du Casino--

K. (V.O) (CONT'D)

Oh, no, fool, not that Monte Carlo, the geek one!

Scribbling on screen - visible to K. Only:

Monte Carlo is a Method for pricing derivatives contracts that works by simulating the possible paths of the underlying (like the stock price) according their assumed frequency and aggregating the payout in each simulated path and dividing the sum by the total number of stimulation.

Sample simulated path running through the drawings with one "cling" when it stays in range and a tap when it goes out and then counting the total clings over the total number of simulations

RETURN TO SCENE

K. (CONT'D)

And how do you hedge?

BORIS

(heavy Russian accent)

Delta hedge? How's our Monte Carlo going to help with that?

DEAN SAVOIE

Even if it did, what about Greeks? delta hedging is useless near barriers.

NICK EDDAN

Yeah, the volatility smile and surface, vega convexity, yeah, we need some work on this

K.

(heavy French African accent)

But if we focus on securities in the market that closely match the payoff, we can act fast and on target. For example, we can buy a simple bet that the two barriers will not be breached. The market price of those gives us a minimum price and a maximum price.

NICK EDDAN

Oh, yeah, you mean the price has to be more than this one and lower than that one, right?

Nick gestures on the board, making his understanding somewhat clearer as he explains.

DEAN SAVOIE

Now the spread may be too wide, no? But it takes care of the volatility surface and vega convexity at once. Hum-- is that's the "handshake principle" you sold at the interview to Mike in Paris?

K. smiles, a bit embarrassed.

K.

In some cases, yes the spread might be wide, but not so sure.

DEAN SAVOIE

Can you put that in a spreadsheet?

K.

OK. I'll do with the standard analytical pricing formula. Bachelier had a great 1941 paper we could use to get analytic formulas.

NICK EDDAN

And from there we'll see if it makes sense.

K.

There may be some tricky situations there. How can we know when the second chance kicks in and hedge for that?

Dean Savoie smiles, as if he is thinking about something mischievous.

DEAN SAVOIE

Do the Black Scholes pricing and the Greeks on a spreadsheet. Put your handshake boundaries too. We'll see for the rest.

INT. TRADING ROOM - DAY

Dean Savoie and Nick Eddan are sitting side by side in front of computers and trading screens. It is a Friday afternoon with very light trading activity. K. Is sitting on a set of computer screens a few dozen yards away in the same trading room.

DEAN SAVOIE

Nick, you see where the Yen's at?

NICK EDDAN

119.80?

Gesturing to PETE, a trader on the spot Foreign Exchange floor.

DEAN SAVOIE

Hey, Pete, can I sell fifty yen?

PETE

Fifty is yours at 120.10.

DEAN SAVOIE

Enter spot at 120.10. Knock out the Second Chance.

NICK EDDAN

That's illegal you know.

DEAN SAVOIE

What? We just made a Million dollars. You don't like it?

NICK EDDAN

If the Feds start sniffing around, please be sure to stand up.

DEAN SAVOIE  
How about letting Handshake  
principle do it?

NICK EDDAN  
You are truly an S.O.B.

DEAN SAVOIE  
I know! In this world nice guys  
finish last. Speaking of S.O.B's,  
let's say goodbye to Figloo.

NICK EDDAN  
You are just heartless.

DEAN SAVOIE  
It's just business. Can't pity him.  
He's tenured faculty.

NICK EDDAN  
Can't we keep him a little longer

DEAN SAVOIE  
Well, 'Handshake Principle' boy is  
doing a better job at less than 10%  
of FIGLOO's cost, is a heck of a  
fall guy hedge, He gives me no  
headache with his volatility  
models, I mean--  
Hey HP boy, we're trading your  
product!

K.  
With which hedging strategy?

DEAN SAVOIE  
We buy the a no-touch with the  
first barriers.

As he speaks a double band shows, illustrating the concept as  
K. Is visualizing it.

K.  
And?

DEAN SAVOIE  
Nothing.

K.  
Well if the second chance no touch  
barrier is activated.

DEAN SAVOIE  
We make sure it gets de-activated.

K.

How?

DEAN SAVOIE

The underlying crosses the barrier.  
Supply and demand in a shallow  
market.

K.

Really? What are the mechanics?

DEAN SAVOIE

(Smiling broadly)

I could tell you, but then I'd have  
to--

NICK EDDAN

(Slapping K.s back,  
protectively)

O.K, Kid. We won't do that. We like  
you. We're bringing you out  
tonight, see. You must learn to  
have some fun here in New York!

INT. TRADING ROOM - DAY

Professor Figloo, a mathematical finance expert who was  
working as consultant for the Foreign Exchange derivatives  
group greets K. on his last day at work. It is the first day  
the two have met.

PROFESSOR FIGLOO

So, I hear I am losing my gig  
because of you?

K.

Me? I was looking forward to  
learning from you! My old teacher  
professor is coming soon for a talk  
at your seminar.

PROFESSOR FIGLOO

Oh, El Ari?

K.

Yes, when is she coming?  
Professor Figloo  
Next month.

K. (CONT'D)

It really is a pity you have to  
leave. I heard about your work on  
volatility models.

PROFESSOR FIGLOO

Oh, you know about it! These guys have no clue what the value of their portfolio is.

K.

I heard their problem with it was that your models messed up Greeks and their P&L

PROFESSOR FIGLOO

I told them that if you are interpolating the volatility smile the Greeks must change!

K.

Really!

PROFESSOR FIGLOO

Of course! Any way, I am out of here. Good Luck!

K.

I'll come when Professor El Ari comes.

INT. NY DANCING BAR-NIGHT

Savoy, Eddan, K. and Boris are at the bar. Savoy seems particularly happy, showering K. with signs of friendliness. It is a strip tease bar with a young woman with a well endowed chest contortioning her body around a pole, slowly ditching out her clothes, as excited and groups of men throw money at her, inciting her to reveal even more. Every now and then she comes close to one of the yelling customers, allowing him to detail her even more closely as he puts money inside her bra, lightly feeling her breasts.

DEAN SAVOIE

Are you having a good time or what?

K. visibly disoriented by the spectacle, tries to focus on discussing work related stuff

K.

I think the project on volatility that Figloo was working on should be continued.

DEAN SAVOIE

Oh, the shit that was messing our Greeks and P&L? I don't want anything fancy that messes P&L.

K.  
Working on that too.

DEAN SAVOIE  
Relax, you are the head of our  
brand new New Products Development  
unit. How do you like Boris working  
under you now?

(Singing, badly. )  
Volare, oh, oh,  
Cantare, oh, oh, oh.

INSERT

On Screen K. Visual representation of Lafontaine's "Le  
Corbeau et le Renard." with a fox and a crow.

RETURN TO SCENE

K.  
Figloo was using normal spline  
method to interpolate since you  
have to reverse the black sholes  
formulas.

DEAN SAVOIE  
Well, when I sell an at the money  
vanilla, I want my delta, gamma and  
vega to be that of a of an at the  
money vanilla. You understand? The  
curve has to be smooth and flat at  
the money.

K.  
But-

DEAN SAVOIE  
You see that baby up there? Look at  
her breasts, ain't they nice and  
smooth?

K.  
What?

He takes a \$100 bill out of his pocket and gestures to the  
dancer.

DEAN SAVOIE  
Come here baby, show me what you  
got.

(To K.)

(MORE)



DEAN SAVOIE (CONT'D)

You see, you want it to be smooth and nice like this, and when you touch, it smoothly curves, see. No swings. Natural intuitive. I hear at LTCM they are trying to do the same.

INSERT K.'s visualization as Savoie speaks.

Curve circling the two breasts, intersecting between the breasts, like the tangent and hyperbolic tangent functions.

The two functions tossed, shifted and meshed as the dancer flashes her assets in his face, creating a hilarious spectacle.

RETURN TO SCENE

INT. TRADING ROOM - DAY

K. Comes near Dean Savoie as he is looking at his screen. Nick Edan nearby.

K.

I think we have the interpolation solution that keeps the Greeks of any trading instrument according to original model, smooth and well behaved, you know, like the dancer's boobs.

DEAN SAVOIE

Really? You means the Greeks are no longer a problem?

K.

Well, it seems so.

DEAN SAVOIE

Show me.

K.

OK, let me bring the disk.

DEAN SAVOIE

Wait. We'll check it later. Got to focus here.

He gets out of his desk and walks out.

K.

Oh-

NICK EDDAN  
Watch out kid-

INT. TRADING ROOM - EVENING

We see Savoy going to K.s Desk inserting a disk in his computer, downloading files. He then goes to his computer and insert the disk in.

We see a Profit & Loss row which is showing a green 15 million. He then does a simulated P&L based on new model and the screen shows a red 55 million loss.

He brings both of his hands in to his face as a low voiced "Holy shit!" Is uttered. He quickly closes the screen, takes out the disk, and shuts down the computer.

INT. NEW YORK UNIV - DAY

Prof Ari speaking in a seminar room full of listeners. K. Peering in through the door window.

EL ARI  
..And this brings me to the end of  
this lecture.

K. walks in the room as some attendees walk to the speaker and others slowly walk out.

K.  
Great talk! Remember me, Professor  
El Ari?

EL ARI  
Of course! K., Right? I was  
wondering where you'd ended up when  
Figloo e-mailed me asking about  
you.

K.  
I was ashamed of having left Paris  
without noticing anyone.

EL ARI  
I know. I know. Say no more.  
(Turning to a black man in  
the audience.)  
There is MANDEMBA. He is deep in  
"the concentration of measure"  
phenomenon. Former student too.

She waves to him and turns to greet him as he approaches.

K. Stays behind as if unwilling to make the acquaintance. We see Figloo joining them and they start mingling, walking towards the exit as K. stays at a distance.

We hear K. Internal thoughts as voice over.

K. (V.O.)

Who's that guy spoiling my need to be the special only one? Oh, shame on me. Shame on me for what? Oh...

EXT. NEW YORK UNIV - NIGHT

El Ari noticing that K. is not joining in, checking the room.

EL ARI

K. Come over here. What a small world! Figloo what do you think of my boy?

K. (V.O.)

OK. Let's go and be nice to my Brother.

FIGLOO

Well, ha! He took my gig. But, that's OK, I've got another one. I guess they needed to add some color to their staff.

MANDEMBA

Ouch!

K.

I have solved your problem of higher order Greeks not matching Black Scholes when interpolating volatility.

FIGLOO

Isn't he colorful?

K.

Trivially.

FIGLOO

No splines?

K.

No Splines. Want to bet?

EL ARI

All right. Mandemba, how's making money with "concentration of measure theory" going?

MANDEMBA

Well, I can't get my foot in the door.

EL ARI

K. Is in maybe he can give you an angle.

K.

Ha! I don't know. All I know is to try to make it plain.

MANDEMBA

Maybe I can say this theory explains how money, power and everything tends to get concentrated in the hands of the few.

FIGLOO

But then, you have to show how to use that theory to give a shortcut to become one of that few, like "how to be come a millionaire," get rich quick books do.

K.

The power of exponentials. Like the power of compound interest.

MANDEMBA

Yes! Man I need your contact.

INT. OUTSIDE BAR NEAR NYU CAMPUS - NIGHT

El Ari and K. walk out of a bar where they just had a drink.

EL ARI

Well K., It's been nice seeing you again. I see you're having no regrets here.

K.

Well--

EL ARI

But I saw you as having great promise as a mathematician

K.

That idea from Paris came to sound very depressing. And yet, somehow, I am starting to get restless here at Global X too.

EL ARI

Sehnsucht?

K.

Sehnsucht?

EL ARI

Yes, or what is also called anomie. It is a bit of a restless melancholic state in which you yearn for something that you cannot precisely define.

K.

There's this sense I am becoming a social parasite, caught into cultural fights that mean little to me.

EL ARI

You can't escape what you are perceived to be.

K.

I chose to be a mathematician because I wanted to confront universal issues. Not ethnic politics or whatever--

EL ARI

Welcome to the real world!

K.

And there's this sense that something is not right there at Global X. And I feel trapped like a caged bird--

EL ARI

Where would you go?

K.

Perhaps start a company with a more uplifting purpose.

EL ARI

You've barely arrived here!

K.

There is a brave new world emerging online. When I was a child, we used to play a game where I learned that claiming central stage in a new field gives you the best chance of survival. Look-

BEGIN FLASHBACK

K. As a six year old or thereabouts in Africa on playground, in a squatting position, with a group of YOUNG BOYS roughly the same age.

On the ground is drawn a square with a square with two perpendicular lines inside crossing at the center. (See Appendix 14) YOUNG K. is first watching other boys playing, sort of struggle to take advantage of each other. Then all of a sudden his face lightens up. Each player holds a set of three stones. The goal is to first align a player's three stones along a line.

YOUNG K.

I tell you. If I play first, I win.

(Ga bo sing o, dam ze tam, bo fu.)

A YOUNG BOY

Play.

(Tam la)

Accelerated sequence of multiple scenario of games. Each time YOUNG K. Showing how to win.

The YOUNG BOY at the score of twelve against nothing, perplexed, starts crying.

A YOUNG BOY (CONT'D)

You are cheating!

YOUNG K.

No!

A YOUNG BOY

You are a sorcerer. I am not playing with you no more. Sorcerer! Sorcerer! You have a "gris-gris"

(O ba gain see. Pa da ping tam pe wo. O bo foch wock)

YOUNG K.

No. It is just about claiming the center as soon as possible.

YOUNG BOYS  
Sorcerer!

K.  
No. The center!

YOUNG BOYS  
Sorcerer! Sorcerer! Sorcerer!

As the image gets darker, we faintly see Young K. tears in his eyes, showing the possibilities, transitioning into the adult showing the game to El Ari.

Black Screen. Multiple scenario playing...

EL ARI (O.S)  
Well that seems to me like the seed  
of a mathematical theory of first  
mover's advantage.

K.  
What?

EL ARI  
Yes, you just need to translate  
that into smart looking equations,  
et voila... you get the Nobel  
Prize...

K.  
Ha, ha, ha! Very funny.

EL ARI  
Or a Bachelier Jr.

END FLASHBACK

EXT. PARIS STREET - DAY

Louis Bachelier on the street. Passes by news kiosk. Notices  
a newspaper headline

INSERT

Affaire Dreyfus: Le redan d'Alphonse Bertillon presente au  
conseil de guerre de 1994 en question.

RETURN TO SCENE

Bachelier buys a copy of the paper

INT. UNIV OF PARIS POINCARÉ'S OFFICE - DAY

HENRI POINCARÉ

Oh, Mr. Bachelier, sorry for keeping you waiting. Please have a seat anywhere you can. I am sorry my office is a mess. But no worries, I know where every thing is. Please sit, please sit.

LOUIS BACHELIER

Thank you, sir.

HENRI POINCARÉ

So what can I do for you? You are the one who gave me the answer on the 16 players contest, right.

LOUIS BACHELIER

Yes Sir. I hope you liked it. And that is why I coming to see you about a possible thesis advisor.

HENRI POINCARÉ

Good. We have a few young professors who are looking for students I might recommend to the young and eager Prof. Lerob, you might do interesting things with him

LOUIS BACHELIER

Lerob?

HENRI POINCARÉ

Yes, he is doing interesting work on integration that may provide great foundations for probabilities analysis.

LOUIS BACHELIER

Thank you, sir. But I was thinking more of you as my thesis advisor, and I think I would be worth your time.

Poincaré scans through a folder as Bachelier speaks

HENRI POINCARÉ

Well, your grades are not impressive, as you know. Why do you thing you'd be of interest to me?



LOUIS BACHELIER

Sir I thought you'd see in the originality of my approach to the contest problem some potential.

HENRI POINCARÉ

Well, I am not sure what you did there. I merely saw a pyramid. But I assumed you knew what you were since scribbled a general answer to the problem

INSERT - POINCARÉ'S MENTAL VISUALIZATION

Projection to a corner of the room of  $x_k = 1/(2^{k-1}) + (1/2)^{2*(1-1/(2^{k-1}))}x_{(k-1)}$   $\rightarrow x_k = 2^{(1k-k)}$

RETURN TO SCENE

LOUIS BACHELIER

Sir, I thought with the pyramid you could see that by looking at the outcome of contests, you could see that the scenario of two players is just one path of the one step up pyramid.

INSERT - POINCARÉ'S MENTAL VISUALIZATION

Projection to a corner of the room of  $x_k = 1/(2^{k-1}) + (1/2)^{2*(1-1/(2^{k-1}))}x_{(k-1)}$   $\rightarrow x_k = 2^{(1k-k)}$

And projection to another corner of the room of The original triangle lighted with eight dots. Layers being pulled and aggregated to form a triangle with four dots at its base

HENRI POINCARÉ

(smiling)

I see.

INT. PARIS' BAR - NIGHT

Various groups of men are drinking, having a good time, playing cards. Bachelier chatting with OLD CLASSMATES FROM LE HAVRE, A young woman comes in.

OLD CLASSMATE FROM LE HAVRE

Oh, there she comes..

Bachelier turns around and looks. It's Augustine, his old girlfriend from high school. Bachelier gulps a drink, lowers his head, stroking his back hair and pulls to a corner of the bar as Augustine starts greeting everybody.

AUGUSTINE

Well this looks like a high school reunion to me. Now Bachelier, are you going to greet me or what?

LOUIS BACHELIER

Hello Madame. I hear you are a Madame now isn't it?  
(turns towards the bartender)  
Bartender another Cognac, no, two.

AUGUSTINE

Well Bachelier. Shan't we let bygones be bygones and be good friends?

LOUIS BACHELIER

For the record, I have nothing against you. You ..

Bachelier gulps the first cognac and readies the second one.

AUGUSTINE

You know..

LOUIS BACHELIER

You went where the grass was greener. My old man was right: when life nickels and dimes you, change is what you need. Lerob went out of the running. I was messed up. So you married the first man who showed up. Isn't that it?

INSERT - IMAGES OF FATHER'S TEACUPS AT THE SANATORIUM

RETURN TO SCENE

AUGUSTINE

I thought you were getting me a drink.

LOUIS BACHELIER

Bartender, another cognac.

He hands over to Augustine what he was about to drink.

LOUIS BACHELIER (CONT'D)

There you are.

Augustine takes his drink, and slowly sips it in while looking at him.

AUGUSTINE

I missed you.

The bartender hands over the drink to Bachelier who promptly gulps it.

LOUIS BACHELIER

You did the smart thing!

Bachelier grabs a deck of cards. Pulls out a deuce, a four and an eight of hearts. He shows the cards to Augustine, leaving the four in front of her and turning over the two other cards on their back. He then takes one out, which might be the deuce or the eight of hearts.

LOUIS BACHELIER (CONT'D)

Now Augustine, let me show you what I mean. If you pick this four, I will give you four francs.

AUGUSTINE

Bachelier, stop. You're not making it easy for anyone of us, you know.

LOUIS BACHELIER

If you pick this hidden card. I'll give you whatever number's on it in Francs, that is, two francs or eight francs.

AUGUSTINE

What do you mean Louis?

LOUIS BACHELIER

What do you choose? Damn it! The four, right here in front of you, or this unknown card that might be a deuce or the eight?

AUGUSTINE

I'll stick with the four?

LOUIS BACHELIER

Here's your four francs. But that was the wrong choice. Change is what had to do, like you did before.

AUGUSTINE

Maybe this time it was because I just didn't want to let you go.

He pulls the hidden card. It's the deuce of hearts.

LOUIS BACHELIER

Merde!

A trio of pretty girls comes in, and passes by. Bachelier hails the prettiest, in the middle.

LOUIS BACHELIER (CONT'D)

Hey beautiful, want a drink?

She turns around and takes a look at Bachelier, and then noticing Augustine, gives him a quizzical look.

LOUIS BACHELIER (CONT'D)

Oh, her. Never mind, she is nobody to me.

ONE OF THE GIRLS

Sh.. Let's go. He sounds like a loser.

ANOTHER ONE OF THE GIRLS

Too bad. He's kind of cute.

The girls walk away. Bachelier acts more and more unsteady

LOUIS BACHELIER

That's right. I am a loser. I am a loser. What would you do with a loser!

AUGUSTINE

Louis!

LOUIS BACHELIER

Don't pity me. I am a misfit and that's fine. At my job at the exchange, my mind is on mathematics, at the university no one wants to hear about finance. They take me for an idiot. And your Lerob is the rising star!

AUGUSTINE

(Rolling her eyes)  
My Lerob?

He starts looking at the clock that just sounded 2:00 am.

LOUIS BACHELIER

And they are right. My thesis is a mess.

(MORE)

LOUIS BACHELIER (CONT'D)

And you here reminds me what a  
looser I am. Thank you madame. I  
must bow out.

As he starts walking towards the door, his pace unsteady, the  
clock seems to swing even faster back and forth, almost like  
the motion of stock prices.

LOUIS BACHELIER (CONT'D)

Random walk down the street,  
Madame. Random walk down the  
street.

Bachelier walks out. His drunken pace unsteady. Augustine  
follows him to the street, shouting.

AUGUSTINE

Louis, no, wait. No, wait. I came  
here today just because I hoped to  
see you again, Louis...

LOUIS BACHELIER

Lady, you leave me alone, OK? Leave  
me alone, please. You won! At all  
levels.

AUGUSTINE

Sometimes these things happen  
independently of each other,  
randomly, going one way or the  
other, like particles in the air.  
Forces that control our actions are  
sometimes beyond our grasp, you  
know.

LOUIS BACHELIER

Oh, yeah?

INSERT - BACHELIER'S MIND

A line, randomly switching back and forth. A random walk

RETURN TO SCENE

LOUIS BACHELIER (CONT'D)

(Singing)

I am a looser, I am a  
looser...Random walking down the  
street.

"Le Temps des Cerises" playing in the background as Bachelier  
slowly disappears in the night, leaving Augustine by the  
sidewalk.

INT. BACHELIER'S BEDROOM - NIGHT

Bachelier rolling back and forth in bed as if having a nightmare

INSERT - BACHELIER'S MIND

A line, randomly switching back and forth. Market prices switching back and forth.

RETURN TO SCENE

Bachelier, in bed turning left and right, wakes up covered in sweat. Jumps out of bed, turns the light on and goes to his desk.

He starts writing feverishly.

SERIES OF SHOTS - BACHELIER'S DRAFTING OF HIS THESIS

A) Bachelier writing frantically and standing every now and then to jump. The room is cold. He draws on a board motion that seem as random as that of a drunken math on the street.

INSERT TEXT "FIRST DAY"

B) Second Day: Bachelier still writing frantically and standing every now and then to kick left and right. Suddenly he screams: "It's the heat equation. It's the heat equation. It's the heat equation."

INSERT TEXT "SECOND DAY"

C) Bachelier still writing frantically and standing every now and then to punch left and right. Wall full of pasted scribbled papers.

INSERT TEXT "THIRD DAY"

END SERIES OF SHOTS INSERT TEXT "FIRST DAY"

INT. POINCARÉ'S OFFICE - DAY

Poincaré by his desk reading and flipping pages while Bachelier waits anxiously.

HENRI POINCARÉ

Well, Mr. Bachelier, nobody in this University will accept this as an acceptable thesis in Mathematics.

LOUIS BACHELIER

But Sir it is you and Professor APPELL who are publicly arguing in the Dreyfus affair that mathematics must engage social and public issues.

HENRI POINCARÉ

The Dreyfus affair I should point out is a legal issue, not a financial issue.

LOUIS BACHELIER

The whole argument being made there is that the military court incoherently applied the laws of probability, is it not? When a judge or jury renders a guilty verdict in a legal matter, they are estimating that based on all the facts presented, the probability that the defendant has not committed the crime he/she is accused of is insignificant, that is what they call "reasonable doubt" being absent. In civil matters, when they say "preponderance of the evidence"...

FLASHBACK - INSERT visuals of Poincaré testifying at the Dreyfus trial

Poincaré on the stand, drilled by a PROSECUTOR.

HENRI POINCARÉ

No logos would convict Captain Dreyfus. All we have here is pathos and ethos.

PROSECUTOR

Professor Poincaré, can you put it simply. This court's Greek may not be as fluent.

HENRI POINCARÉ

Would you depend on the time you read on a clock that has stopped incrementing time?

PROSECUTOR

No, of course not.

HENRI POINCARÉ

Why?

PROSECUTOR

Are you mocking this court  
Professor Poincaré.

HENRI POINCARÉ

Who mocks whom would be an  
interesting question to debate.  
That clock reads the correct time  
twice a day. The argument against  
the defendant rests on a  
conditional assumption that has  
even less likelihood.

END FLASHBACK

HENRI POINCARÉ (CONT'D)

Thus spoke Zara..oops, Bachelier. I  
had no idea you were a legal  
expert, Monsieur. Probabilistic  
analysis in legal matters are not  
usually on a scale that warrants  
scholarly mathematical  
investigations.

LOUIS BACHELIER

Here there is an interesting  
logical issue at stake. The  
suspicion on Dreyfus, working in  
the General Staff being up to no  
good, was conditional on him being  
a Jew. That fact in the eyes of the  
prosecution and the jury, raised  
the estimation of probability of  
culpability beyond reasonable  
doubt. A rigorous mathematical  
analysis could lead to procedural  
reforms that nullify the  
possibility of such cognitive  
biases...

HENRI POINCARÉ

Now Mr. Bachelier, if I remember  
correctly, your thesis is about  
financial markets, isn't it?

LOUIS BACHELIER

(with excitement)  
Yes sir, but...



HENRI POINCARÉ

(waving his hand to  
interrupt)

When the spark causes the body to  
burn with excitement, the trick is  
to tame that fire so that it can  
last through the harsh winter,  
burst again in the spring to shine  
in the Summer.

(beat)

You will have to hunker through the  
harsh winter, Bachelier, but I will  
support this thesis.

INSERT Image of a buffalo hunkering in the snow near a  
flickering flame.

INT. BACHELIER'S THESIS DEFENSE ROOM - DAY

Bachelier is presenting in a 50 students capacity room before  
a jury of three faculty members: J. BOUSSINESQ, PAUL APPELL  
and HENRI POINCARÉ. The room is full of his demonstrations on  
a blackboard. We can see "HEAT EQUATION" before the heat  
equation partial differential equation.

LOUIS BACHELIER

Market prices fluctuations  
therefore can be reduced to  
continuous independent and random  
fluctuations up and down, much like  
random walks. Thus, gentlemen, the  
market, unbeknownst to itself,  
appears ruled by laws that  
constrain it, the laws of  
probability.

Poincaré claps had most enthusiastically. Lerob is seen over  
the window, exchanging a complicit eye wink with Professor  
Appell.

HENRI POINCARÉ

We should have this type of  
investigations at the "exposition  
universelle."

APPELL

But is this math or is this  
financial speculation?

HENRI POINCARÉ

Is the heat equation math enough  
for you?

BOUSSINESQ

If Poincare is OK with it, I'll give it a pass.

APPELL

Imagine a newspaper headline "The Sorbonne is supporting so-called mathematical work to learn how to con honest and hardworking citizens through speculation on exchanges"

BOUSSINESQ

OK. I see that Appell hates this and Poincare loves it! What do we do? Mr. Bachelier would you excuse us for a moment as we deliberate?

MOMENTS LATER

Bachelier returns to the room

APPELL

Mr. Bachelier, after conferring among ourselves, I have settled on granting you the title of Doctor of Sciences of the University of Paris with honors.

BACHELIER

No Jury congratulations?

HENRI POINCARÉ

What's the message to posterity? Don't try anything different?

INT. TRADING ROOM - DAY

Dean Savoie and Nick Eddan are buying coffee at the "Au Bon Pain" in the ground floor of their building.

DEAN SAVOIE

This kid is starting to work too hard in the wrong direction--

NICK EDDAN

What? His volatility models with Tangents? Are you scared that our "funny money" is going to evaporate?

DEAN SAVOIE

I quietly checked it last week and it scared the hell out of me. We've been making a lot of funny money, and what he's done may show that we're quite deep in the hole.

NICK EDDAN

Where does that come from?

DEAN SAVOIE

Some shitty old positions, man.

NICK EDDAN

But he likes what he did there.

DEAN SAVOIE

I am trying to make him feel it is not really important and get him to move onto something else.

NICK EDDAN

Man, I am hearing rumors that LTCM is drowning. Their Nobel prize seems not to be helping.

DEAN SAVOIE

This is a hot one. I got to be cool on how I handle it. Time to start propping up Boris. That should calm him down a bit.

NICK EDDAN

Oh, that's the game. And if someone finds out? We have a Fed audit next month, remember?

DEAN SAVOIE

What do you think?

Savoie smiles mischievously, rolling eyes, and they start expressing in eye and facial motion coda.

NICK EDDAN

No, no. You fucking, disgusting S.O.B. Oh, my God.

Savoie keeps smiling, eyes winking.

NICK EDDAN (CONT'D)

And throw him under the bus if anything goes wrong?

Savoie keeps smiling.

NICK EDDAN (CONT'D)

But selling K. as our new wiz kid got us the street cred to establish this new product development unit which is spitting cash for us now.

DEAN SAVOIE

We just want to seem like trading on rigorous scientific research.

NICK EDDAN

I forgot. Appearance is reality.

INT. TRADING ROOM - LATER

We see K. Standing by Savoie's desk engaging him in a coolly tense discussion. A copy of the Wall Street Journal. "LTCM tanking. Feds to the rescue. A consortium of banks summoned to invest to head off systemic failure."

K.

My bad, each time we try to check this volatility surface model, something else always came up. Is this just random?

DEAN SAVOIE

Maybe a sign that we shouldn't be rolling the dice. Think about cans of worms. You're tackling an important and complex problem.

K.

I have made it much, much simpler. And I think it is just a an intermediary solution until we have a more general framework for all derivatives.

DEAN SAVOIE

That's the thing. You see, the more laws are complex and intricate, the more lawyers can make money. The more tax rules are complex, the more accountants make money. Complexity is the money making opportunity of the educated white collar. If you simplify laws too quickly, a lot of lawyers will be out of a job. Are you getting my point here.

K.

Not sure.

DEAN SAVOIE

We are sort of in the same kind of business. We fuzzy it up like everybody else. Better be wrong with everyone else, than mess yourself up being right alone. Our business model is not about sticking our neck too far away.

K.

And Occam's Razor?

DEAN SAVOIE

What's that?

K.

Don't make things more complex than they need to be. That's the natural law of evolution. If we don't do it, someone else will. Creative destruction-

DEAN SAVOIE

-can be avoided. In this business, we care about year end bonus. You know, in the long run, we'll all be dead. Keynes and all.

K.

(To himself)

Oh boy!

(To Savoie)

He meant that in a time of crisis, it is essential to survive first.

Dean starts to show signs of annoyance.

DEAN SAVOIE

You know, Boris has been taking care of a lot of things we actually need.

K.

Quick and dirty-

DEAN SAVOIE

That's right.

K.

House of cards.

DEAN SAVOIE

A lot gets done that way, and it makes us money, quick. Being busy is the essence of business. It adds to GDP. It means growth.

K.

And Broken windows fallacies.

We see Boris smiling. Chest opened, hands folded behind his back, whispering as if singing:

BORIS

Tangent, Hyperbolic Tangent, Tan  
Tanh, Tam Tam in the jungle!

Image of a native african man beating on a drum in a seemingly primitive setting in the background.

K.

Well Boris, you got it. But If I were you, I wouldn't be so relaxed.

Screen darkens and we continue to hear the voices OS.

DEAN SAVOIE (O.S.)

Are we looking for greener pastures here?

K. (O.S.)

Maybe.

DEAN SAVOIE (O.S.)

Who do you think you are? Einstein?  
Bachelier?

INT. PUBLISHER'S HOUSE - DAY

SUPER: 1906

Bachelier is meeting with the PUBLISHER of Gauthier-Villars about the publication of his book.

PUBLISHER

Mr. Bachelier we read the manuscript. We think your ideas are very interesting. But one of our reviewers, prof. Lerob seriously questioned the op--

BACHELIER

What else can i do?

PUBLISHER

Not much. But if you had savings or family members to help pay for publication costs, we could help you self publish--

BACHELIER

(packing to leave)

Too bad for me then, hein?

He walks out towards a cafe.

EXT. CAFE-DAY

We see bachelier scribbling on a sheet of paper as Augustine approaches from behind. She watches the scribbling as bachelier unaware continues.

INSERT IMAGE BACHELIER SCRIBBLE

See appendix

RETURN TO SCENE

AUGUSTINE

I didn't know that the great mathematician bachelier-

BACHELIER

Oh, its you.

(She sits next to him. )

Oh, well. Feel free to mock me.

AUGUSTINE

Don't always be so sensitive. That's actually very cool. To the waiter coffee please.

BACHELIER

Well I don't feel like joking now. They won't publish the book! Nine years of work!

AUGUSTINE

Why?

BACHELIER

Lerob!

AUGUSTINE

Again?

BACHELIER

Well--

AUGUSTINE

Forget about him. Can I collect this piece of art?(Appendix 3) Is it a head or writings?

Bachelier shrugs.

BACHELIER

My ramblings about human nature and mathematical expressions. C like the set of complex numbers equal. Human complexity can only be rendered through reality and imaginary reality. The dichotomy in humans between the prosaic and the poetic, what we imagine, and the realities we must face...

AUGUSTINE

Ok--You know Dreyfus is free and rehabilitated. Imagine perhaps that you had been told the book was coming out. Imagine... that all this was nothing--

INSERT PICTURE OF NEWSPAPER

Reporting Dreyfus' rehabilitation. With picture of Dreyfus.

RETURN TO SCENE

EXT. AUGUSTINE'S HOUSE - DAY

Augustine in front of her porch overlooking a fenced garden. A messenger rings the bell. We see her rushing to the gate. She is opening a package containing a letter, a book and a framed drawing. And then she is reading a letter:

BACHELIER (O.S.)

Gauthier Villars is going to publish my book! A mysterious lady, the publisher said, had come to the store and offered to pay for the Book of a certain Louis Bachelier and had asked her actions to be kept secret! Anyway, I am starting as a lecturer at the Sorbonne next month. It seems, though, that all that was ever august in me flowed through an Augustine.

(MORE)



BACHELIER (O.S.) (CONT'D)  
 So, to the benevolent muse of this  
 seeking soul, I dare send these  
 little, in the hope that they may  
 amuse her.

We see Augustine checking the framed drawing, a perfected  
 version of the one from the cafe.

INT. E-STARTUP OFFICES IN ONE OF THE WORLD TRADE CENTER  
 TOWERS - DAY

We see K. and about a half dozen twentysomethings PROGRAMMERS  
 in a small conference room, a couple sitting on chairs others  
 on the conference room table, and one scribbling on the  
 blackboard, pizza slices around. Informal and intense. We see  
 one written on a board.

1. We have a first mover advantage. We can claim center stage  
 in a brand new world

INSERT FLEETING IMAGE OF CHILDHOOD GAME IN THE BACKGROUND.

2. That new world is The internet. The internet allows us to  
 trade from anywhere, anytime and cut on brokers' fees.

INSERT IMAGE OF A STAR NETWORK WITH DESKTOP OF ISOLATED  
 TRADERS PASSING ORDERS TO THE e-STARTUP NETWORK IN THE  
 BACKGROUND.

3. Our proprietary edge is our ability to offer consistent  
 volatility surface pricing across strikes and maturities  
 based on quoted market prices.

INSERT IMAGE OF VOLATILITY SURFACE WITH TANGENT FUNCTIONS  
 LINKING QUOTED VOLATILITIES IN A SMOOTH NATURAL FASHION IN  
 THE BACKGROUND.

A PROGRAMMER  
 Can we do it?

SEVERAL PROGRAMMERS  
 We'll do it!

K.  
 So, Let's do it.

SERIES OF SHOTS

A) Programmers of e-STARTUP at their desks coding well into  
 the night. Images of a fully lighted manhattan and the twin  
 towers. A clock showing midnight. Intense discussions,  
 arguments, scribbling, drawing, testing.

B) Image of page of website online.

A PROGRAMMER  
It's working!

High fives. Cheers!

SEVERAL PROGRAMMERS  
We did it!

K.  
Yes!  
(To himself)  
For now. The math still need some  
work--

C) Press Coverage

"First online trading of Foreign Exchange derivatives goes live."

An ASSISTANT calling K., phone in hand.

ASSISTANT  
The Wall Street Journal wants to  
interview you!

K. Receiving award, making speech, before a large crowd.

ASSISTANT (O.S.) (CONT'D)  
We need to be making money though,  
because money is starting to get  
tight.

INT. K.'S APARTMENT LIVING ROOM

Hip. Upscale.

SPLIT SCREEN

K. on the phone over speakers on the left screen window. On the right side, K.'s father in a hospital bed, next to him K.s Mother and K.s Sister holding a toddler, in a setting eerily redolent of Bachelier's father deathbed scene. A similarity heightened by the fact that the characters are the same, except that here they are all black.

K.  
I really cannot send you any money  
right now, all I've got is invested  
in this company I have started, and  
we are on a tight rope.

K.S MOTHER

Why did you have to quit? You had a nice job, you were making money that was helping all of us.

K.

I just could not keep on. This means more to me.

K.S MOTHER

And if it does not work out, how about your family?

K.S FATHER

(Smiling)

In the arena. That's my boy--

K.S MOTHER

(To her husband)

But you ought to know better. The wise man you are should advise that only fools rush in. He is a kid in a new country he barely understands. He is about to leap in its wildness... who is to support the family, with you being this sick!

K.S FATHER

But he can't help falling in love--

K.S MOTHER

With?

K.S FATHER

His ideals.

K.S MOTHER

How about reality? We need to send his sister there to New York to give him a reality check. This is--

K.S FATHER

It may get very tough, I know. But, son, if you keep at it, you'll solve the equation. Keep on that fixed point. You may make plenty of mistakes. Learn from each one and build from them. Keep trying till you get it. Leave no stone unturned.

EXT. CENTRAL PARK - DAY

K. Sitting on a bench alone, seemingly lost in contemplation or thought in an isolated area of the park. We see leaves have started to fall, it looks a little chilly End of September weather.

He puts his hands in his pocket and takes out a cell phone and checks messages. MESSAGES start being read in voice over.

MESSAGE 1

We've tried to reach you all day.  
Where are you? Father. Your father  
is dead.

It starts raining and K. does not seem to notice as wind blows and he gets drenched into water.

The tune "La pluie de Jules Cesar" by French singer Michel Sardou starts playing in the background.

MESSAGE 2

Cash flow is very low. Luminescent  
ventures called to discuss  
investing. They are our big hope of  
saying afloat. Can't afford to  
miss.

MESSAGE 3

The doctor says you need to  
schedule a follow up visit asap

A fish swims in an adjacent pond, oscillating left and right forward, on a sinusoid trail.

MESSAGE 4

The Wall Street Journal called  
again. They want an interview

MESSAGE 5

Are you going to Paris to receive  
the award?

Another fish leaps in and out. A frog jumps to the side.

Rain pours even more intensely, and wind blows even stronger, drowning remaining messages, as the Sardou tune plays even more distinctively.

In the background superposed with the image of K. in the park we start seeing images of the infant K. learning to stand up and walk under his mother's guidance without much success in an open yard, looking much like a park, with trees and dogs and cats wandering around.

We see his father arriving and starting speaking although we do not hear his voice. We only see words being printed on screen as the father starts exhortations:

“Walking is  
for those  
who think  
thinking  
for those  
who walk  
going places  
to change the world  
as it is  
to make it  
what it could be”

Then the father points to the trees and the grass:

“Those plants  
would not think  
they have no brains  
their roots  
are dug  
underground  
not seeing  
much  
not thinking  
much.”

Then little K. Starts to crawl on four legs towards his father:

"Those four legged  
they have brains  
smaller brains  
they can only see  
so far  
they can only think  
so far  
they cannot  
imagine."

Then the father points his hands up:

"Rise  
and see  
over  
the rainbow  
the seas  
that promise  
what could be."

And then K. manages to stand up. Both parents start smiling.

"Move  
there  
and there  
and there  
to let be  
in truth  
in this world  
what could be."

And then K. Starts making a few steps

"Change

as you walk

in your mind

what is

you'll see

it'll soon be here

before your eyes

what could be."

And then, as K. moves more boldly, he trips and falls, and we read the father:

"Try

again

and again

and again

and someday

you'll wake up

into

what could be."

As the song comes to an end, the scene darkens to a close on a lonely figure of K.

#### SERIES OF SHOTS

A) We see K. alone packing furniture from his apartment in the Upper West side. A nice one. We also see him packing computers, servers and furniture as a stern landlord stands at the door.

B) We see him driving a U-Haul truck down the Holland tunnel, away from the downtown Manhattan high rises into New Jersey, passing through blighted streets of Newark, unpacking into a cheaply painted old industrial warehouse with a newly installed ramp adjacent to the stairs up to a second floor.

C) We see him taking the ramp upstairs, unpacking into a bare room. He is notably more disheveled in appearance and more hunched and limping in his walking.

D) Image of Bill Clinton praising the decoding of the human genome by Celera Genomics' Craig Venter and NIH.

INT. E-STARTUP OFFICE IN NEWARK-DAY

K. On speakerphone. Nick Eddan on the other end of the phone in an office overlooking the Hudson Rive in one of the Twin Towers.

NICK EDDAN

Hey man, what happened? I've been looking for you! I've left Global X and I am in the same building as you in the Twin towers, doing some consulting.

K.

Well I am no longer in Manhattan.

NICK EDDAN

Where are you?

K.

A hideout here in New Jersey. Taking a break from the rat race.

NICK EDDAN

Man, you've got to come back. Do you know that broker X is now offering a trading system with a volatility surface engine that looks a lot like yours?

K.

Really!

INSERT FLASHBACK

Image of K. Making a presentation to the HEAD OF FX DERIVATIVES at Broker X.

HEAD OF FX DERIVATIVES

We want to invest in this system! How did you do that?

K.

Oh, a combination of Tangent functions.



END FLASHBACK

NICK EDDAN

You've got to sue them!

K.

Where would I take the money for that?

NICK EDDAN

Yeah, the DotCom bubble has burst. Even if you wanted to sell what you built now, the price would be at a huge discount from a few months ago, man!

K.

Who cares!

NICK EDDAN

Got to survive. Anyway, we should get out sometime. How about checking out skiing some weekend?

K.

I can't ski

NICK EDDAN

Isn't it exciting? You'll learn something new!

INT. K.'S APARTMENT - DAY

K is preparing a sandwich to put in a backpack. His sister is at her bedroom door, addressing him. A very modest apartment

K.S SISTER

I mean, how can you accept to live in such conditions why don't you try at the very least to get a job like what you had before back.

K.

Did they send you here to lecture me?

K.S SISTER

Well, what's the point of being smart and work hard, if it is to end up like this?

K.  
Well I am a looser, all right. So  
what?

EXT. SKIING TRAIL NEW ENGLAND-DAY

On a hazy snow covered trail

K. Going down a slope, pretty fast as if out of control,  
tailed by Nick Eddan.

NICK EDDAN  
No, no. Stop.

K. bumps at an angle and falls on the ice. Just a small  
ruffle.

NICK EDDAN (CONT'D)  
You can't go straight. You'd kill  
yourself! Yu have to swing left and  
right if you want slope down  
continuously. That's how you remain  
in control.

K.  
Like a sinusoid?

NICK EDDAN  
What? Yes like a snake, like an S,  
you know.

K.  
I am having trouble with my legs.

NICK EDDAN  
OK. You do it one step at a time.  
One hundred yard. Stop. Regroup and  
again. Like when you are walking  
you do it one step at a time right?  
Step by step you get there, safer,  
but also quicker.

EXT. IN FRONT OF E-STARTUP BUILDING.

We see K. walking up the ramp, and then going down the  
stairs. And then time himself going up both ways.

He sees that it is much faster for him to slowly going up the  
steps than climbing up the ramp.

He smiles his eyes showing great excitement.

INT. UNIV OF PARIS FACULTY OF SCIENCES - DAY

Bachelier is free lecturing on the applications mathematics to stock market analysis, to a sparsely populated class, made up mainly of professional adults.

A STUDENT

But Sir, you argue for continuous probabilities and processes, which assumes continuous trading. Isn't that utopic?

BACHELIER

Does the market trade continuously? Will it ever trade continuously in a mathematical sense?

A STUDENT

No.

BACHELIER

But that assumption is an imaginary trick that allows us to begin to unpack this mysterious world and peer into a future we can shape.

A STUDENT

Like what?

BACHELIER

The distribution of changes looks like a bell curve.

INT. K.S APARTMENT - DAY

Fast paced. We see K. in bed, agitated, turning left and right. Images of a skier sloping left and right down a ski trail. We see going down and up stairs, and taking the ramp.

We see him waking up, Siting on his desk. Starting to write on the board next to it.

Basis Instruments Contracts. Then an equilateral triangle with angles named B, and C respectively.

Then we see stairs drawn with various heading signs. He is staring at it all smiling. His sister come out of a room and looks at the board

K.'S SISTER

What is that?

K.  
The theory of everything.

K.'S SISTER  
 Ha!

K.  
 The theory of everything for making  
 decision under uncertainty.

She shakes her head and walks away.

Moments later...

K.'S SISTER  
 Are you OK?

K.  
 Did you hear what I said?

K.'S SISTER  
 Did you hear what you said?

K.  
 You don't believe me, do you?

K.'S SISTER  
 Look at you!

K.  
 Now, what's wrong with me?

K.'S SISTER  
 Poor lark.

K.  
 What?

K.'S SISTER  
 For everyone out there, you are a  
 lackey!

K.  
 But it is true!

K.'S SISTER  
 You're sinking deeper, brother!  
 Don't you remember the story Dad  
 used to tell us as kids?

K.  
 Which story?

K.'S SISTER  
The Elephant and the lark--

INSERT ---ANIMATED ENACTMENT---

We hear:

The voice of an old man, K.'s father voice, with prophetic undertones.

K.'S FATHER(O.S)  
 Once upon a time, back in Africa,  
 when in the animal Kingdom all  
 living creatures talked to one  
 another.

We see:

EXT. AFRICAN SAVANNAH LANDSCAPE - DAY

A savannah landscape with a multitude of animals going about their business and busy engaging each other. Slowly rising musical score on an African rhythm - ZANGALEWA SOUNDTRACK.

A rising sun at the horizon, reaching its zenith, peaking in intensity.

K.'S FATHER(O.S) (CONT'D)  
 It was a sweltering day. The sun  
 was at its zenith during the peak  
 of the dry season.

Animals rushing to the shadows of sparse trees. Landscape evolving towards the border of a river backwater, with surrounding marshes.

K.'S FATHER (O.S.) (CONT'D)  
 On the bank of a river backwater a  
 tiny LARK was leisurely feasting on  
 a worm ...

A lark on the bank tearing a worm to pieces, and swallowing.

LARK  
 (Warbling)  
 Pip, pip, pip

All of a sudden, the ground begins to shake, and a large cloud of dust forms on the horizon, the thundering roar of an ELEPHANT.

All animals watch out.

The Elephant emerges, hurrying towards the marshes backwater to take a shower. The lark by the bank takes off to make way for the elephant and lands on a nearby baobab tree, a just captured worm sideways on its bill.

The elephant hops in the water and begins to frolic. The lark watchfully feeds on its prey. As the elephant splashes water left and right with its trunk, it trips on uneven ground on the river's floor. The left eye pops out from its socket and falls into the river.

The elephant, panicked, begins to search for it frantically inside the water. The clear water all around starts to turn muddy.

LARK (CONT'D)

Pip, pip, pip. My dear great friend  
Elephant. What so suddenly bothers  
you?

ELEPHANT

My eye! My Eye! Pfsst..My Eye!  
Pfsst..Pfsst..

The elephant splashes water left and right, further muddying the water. The lark flies closer.

LARK

Pip, pip, pip. Don't you see? You  
are making matters worse, my dear  
Elephant.

ELEPHANT

Pfsst..Pfsst..Seeing? Damn fool,  
pinheaded species! I am looking for  
my eye! Pfsst..

LARK

Pip, pip, pip. Indeed! But then,  
why don't you simply get out of the  
water and take a rest break? You  
are in a deep hole, stop digging!

The elephant raises his head in disbelief, displaying even more startingly the hole in its eye socket and, widening the opening of its trunk, splashes water with renewed energy back and forth, left and right, further thickening water all around.

ELEPHANT

Pfsst..Pfsst..Who are you little  
lackey lark to dare tell me what to  
do? Pfsst..

LARK

Pip, pip, pip. What does my being little have to do with anything?

ELEPHANT

Pfsst..Pfsst..I have always been able to throw my weight around and get it my way. Pfsst..

LARK

Pip, pip, pip. So you think size makes you right?

ELEPHANT

Pfsst..Pfsst..In this jungle, might makes right! You bet!

LARK

Not here my friend. This is a matter of clear thinking! And you need to clear that river!

ELEPHANT

Pfsst..Pfsst..I have the biggest brain. I have all the intelligence I need. Pfsst..

LARK

Calm down my friend, for your own sake!

ELEPHANT

Pfsst..Pfsst..Knuckleheaded beast that you are! My eye fell into water and you want me to get out to let it be lost? Insane!

LARK

Oh, dear friend! Who is truly insane? Your mind is getting just as messy as the water.

The elephant raises his head in indignant agitation, opening his mouth agape, displaying even more scarily the hole in its eye socket and, widening the opening of its trunk. The opening of the three frontal holes makes a frightening picture. The lark flies off reach. The elephant splashes water with renewed energy back and forth, left and right, up and down unsuccessfully searching for its lost eye.

ELEPHANT

Pfsst..Pfsst..Get lost! Pfsst..

The elephant advances to chase away the lark, who flies left towards the baobab. Then realizing the lark can't see him in that angle, gets an idea. Light bulb over his head.

LARK

Pip, pip, pip. Time for jiu-jitsu,  
you shallow beast.

The lark starts ticking the elephant around the left eye socket, setting off the elephant in blind left-sided pursuit.

ELEPHANT

Pfsst..Pfsst..Heartless prick,  
taking advantage of a blind! Wait  
till I catch you! Pfsst..

The elephant is now in hot pursuit of the sound of the lark out of the water, who entices him to follow towards the baobab.

LARK

Pip, pip, pip. Now he who said  
might is right is the first to  
whine. What a brat!

ELEPHANT

Pfsst..Pfsst..You, you, wait till I  
catch you! Pfsst..

Boom!. The lark flies off and perches off the baobab. The elephant in hot pursuit knocks its head off it and passes out. When he wakes up an hour later, the river water is clear again.

LARK

Pip, pip, pip. Come here now my  
friend.

ELEPHANT

Pfsst..Pfsst..You mean beast. Ah my  
head hurts! Pfsst..

LARK

Pip, pip, pip. Look!

ELEPHANT

Pfsst..Pfsst..my, my eye! my eye!  
Pfsst..

LARK

Pip, pip, pip. Listen now to me if  
you don't want any more trouble!



ELEPHANT  
 Pfsst..Pfsst..OK,OK.  
 (lifting its trunk  
 submissively)  
 Whatever you say, my great friend  
 lark. My eye! Pfsst..

LARK  
 Pip, pip, pip. Now walk slowly into  
 the water!

ELEPHANT  
 Pfsst..Pfsst..OK,OK, my great  
 friend lark. My eye! Pfsst..

LARK  
 slowly, stop! No shaking the water.

ELEPHANT  
 Pfsst..Pfsst..OK,OK, my great  
 friend lark. Like this? Pfsst..

LARK  
 There you go! You see? Now pick it.

ELEPHANT  
 Pfsst..Pfsst..OK,OK,my great friend  
 Pfsst..

The elephant bends its trunk down and picks up the eye. With  
 the lark's help he lifts it left towards the empty socket.

LARK  
 Pip, pip, pip. Here. Right. Now  
 push it in.

ELEPHANT  
 Pfsst..Pfsst..OK,OK, my great  
 friend lark. Pfsst.

LARK  
 Pip, pip, pip. See?

ELEPHANT  
 Pfsst..Pfsst..OK,OK, Yes! I can see  
 again. You are truly my best  
 friend, Lark. Pfsst.

The elephant lifts the lark by to the tip of its trunk,  
 pointing towards the worm rich areas of the river, so that  
 the lark can feed effortlessly.

The final image is the elephant lifting up its trunk highest, with the lark at its highest tip, as if crowned above all animals. ZANGALEWA soundtrack playing as the elephant parades the lark and the scene darkens.

K. (O.S.)

It ended well for the lark, didn't it?

K.S SISTER (O.S.)

But you are too square!

INT. NICK EDDAN AND K.S OFFICE - DAY

K. And Nick Eddan on speakerphone, each in their respective offices.

K.

So, the first insight of BICs is on the discrete vs. continuous representation of time and space in mathematical philosophy as applied risk.

NICK EDDAN

(Raising eyebrows)  
Philosophy?

K.

Yes. I am questioning existing axioms for very practical aims, you will see. And I am saying that the continuous is but an approximation of reality that is discrete.

NICK EDDAN

How do you make money here?

K.

Well, the basis of my theory creates value by challenging the existing mathematical infrastructure for managing risk.

NICK EDDAN

How?

K.

The BICs analysis rest on the idea that time and space are discrete rather than continuous. It creates a business opportunity by reducing costs and improving safety.

SUPER: image of The BIC lighter brand. Nick lighting it. Superimposed on the progressing action, in the background.

NICK EDDAN

Now put a picture there for me, so that I can sell it for you. Simple. Like your "Handshake principle" thing, remember?

K.

Well actually the BICs framework perfects the handshake principle.

NICK EDDAN

(Smiling and shaking head)

You are--

K. starts gesturing, face showing great animation, and hands moving to match words.

K.

Don't laugh, listen! When you extend your hand, this system will discretely 3-D map it and use the basis instruments that are my "BICs" to recompose your hand, so that when I extend mine to meet yours, there is a perfect match.

SUPER: In the background, simulation of a hand being extended and a 3D imprint being made, small blocks being assembled to create a replica of a matching hand that goes and shakes the extended hand.

NICK EDDAN

Oh, boy!

K.

This creates safety and reduces costs.

INT. UNIV OF PARIS- 1911

Bachelier lecturing.

BACHELIER

The scientific establishment looks with moral skepticism efforts to make financial dealing a respectable field of scientific inquiry. Money changers are bad, and all that.

A STUDENT, lightly touching the back of his head with his palm to suggest a kippah.

A STUDENT

They are.

BACHELIER

The road to hell is sometimes paved with good intentions and cynical greed, well organized can yield great social good.

A STUDENT

Like when?

ANOTHER STUDENT

Adam Smith's invisible hand.

BACHELIER

Precisely! The competition among selfish and greedy suppliers, yield better quality products at even more affordable prices for consumers, you and me.

A STUDENT

But what is specific to finance?

BACHELIER

Well, finance is the oxygen that powers all economic activity. You cannot see it with your bare eyes. Yet, without finance you can't, survive, you can't even wage wars. Had the Boches' stock market not lost 30% on a single day during Agadir, we might have already been at war.

A STUDENT

So?

BACHELIER

The healthier the financial sector,  
the more vigorous the economy and  
national might. Therefore the  
scientific study of speculation is  
indeed, ecology to protect the  
purity of the air we breathe.

SUPER: in the background, as scene darkens. Image of people  
locked in a room, suffocating without fresh air, till a door  
opens and air full of oxygen, in the form of micro  
speculators, flows into lungs, carried by blood, reviving  
life.

INT. NICK EDDAN'S OFFICE - DAY

Nick is on the phone with his advising LAWYER. Split screen  
with lawyer.

NICK EDDAN

So, if we sue Broker X for theft of  
the volatility model we can get how  
much.

LAWYER

The way I see it, if this goes to  
trial and we play sympathy for the  
victim, we can get an eight figure  
verdict on this. But anything can  
happen at trial.

NICK EDDAN

How long would it take?

LAWYER

These things can take years.

NICK EDDAN

Can we force them to settle?

LAWYER

We're always angling for that. But  
it still takes a while for them to  
come to numbers we can live with.  
If you seem too eager, they'll  
squeeze you.

NICK EDDAN

Oh, shit!

LAWYER

What?

NICK EDDAN  
I need the money quick.

LAWYER  
Well, in that case I have a lawsuit  
financing company that can advance  
us 2 million.

NICK EDDAN  
Man you are a genius!

LAWYER  
That's what I bill you pay for.

Nick hangs up the phone. Pace in his office for a little  
while.

INT. NICK EDDAN'S OFFICE - DAY

Nick on speakerphone with K. Split screen of both talking.

NICK EDDAN  
Hey kid, this is your lucky day.

K.  
What?

NICK EDDAN  
I've been making calls. Nobody on  
the street even wants to listen to  
what your BICs revolution might be  
about, but if you talk nice to me,  
I will bet a million on it.

K.  
If you'd do that, I'd shine your  
shoes anytime.

NICK EDDAN  
But here's the thing. I get 25% of  
the company.

K.  
Anytime.

NICK EDDAN  
All right when can you come to my  
office to go over the paperwork.  
How about Tuesday at 10 am?

K.  
Deal. Where are you again?

NICK EDDAN  
The North Tower, eightieth floor.

EXT. OUTSIDE K'S NEWARK OFFICE - DAY

Tuesday, about 8:30 am. K.'s Walking downstairs in a business suit when his cell phone rings. He picks it up. It is Nick.

NICK EDDAN (O.S.)  
Hey Kid, are you on your way?

K.  
I am on my way out.

NICK EDDAN (O.S.)  
Great! Just one other thing, you know the lawsuit against Broker X?

K.  
Yes--?

NICK EDDAN (O.S.)  
It's a minor thing but I need to get you to transfer all rights of recovery through litigation to me.

K.  
I don't care. You do what you want with it.

NICK EDDAN (O.S.)  
You're really a square guy!

K.  
Well, What's the point of wasting time on time yesterday's technology?

NICK EDDAN (O.S.)  
Tell me kid, how did you come up with this?

K.  
Well, it built up one thing adding to another, one step at time, and so on. You remember when we went skiing. When you said I had to swing and go step by step?

NICK EDDAN (O.S.)  
Well, yeah, but--

K.

Something sort of clicked something in my mind, adding to other things, gelled the idea of discreteness as way to go.

NICK EDDAN (O.S.)

How about the idea of basis instruments contracts?

K.

You know, Mendeleiev's periodic table took out alchemy out of chemistry. And it sort of made sense to use a base decomposition to take faith out of finance. And the thing is when you decompose like this, while there is a very large number of BICs, about three of these BICs can help recompose about 95% of all derivatives, just like Hydrogen, Oxygen and carbon perhaps make up more that 95% of all living beings--

NICK EDDAN (O.S.)

Holy crap! Oh my--

K.

Yes,

Loud, deafening bang. Line break-

K. (CONT'D)

Nick! Nick! Are you OK? Do you hear me? Nick!

We see K. rushing back to his office. Dialing with the office phone. Getting out looking around.

Images of falling and fallen WTC towers, people running in panic women sobbing, rescuers poring through the debris, dark clouds over the horizon. The screen slowly darkens as the national anthem starts playing in the background.

K. (O.S.) (CONT'D)

What just happened here?



EXT. MANHATTAN - NIGHT

We see K., dust covered, in line with volunteers to donate blood at an emergency blood donation center, ahead of him is a man is a SICK MAN with traditional Sikh garb and beard. They advance past a SECURITY OFFICER

SECURITY OFFICER  
Sir, we are not dealing with you guys for now.

K.  
Excuse me?

SECURITY OFFICER  
I am talking to that man.

K.  
Yes, is something wrong with him?

SECURITY OFFICER  
We are being attacked by Muslims.

K.  
Are you sick or what?

SECURITY OFFICER  
Excuse me?

K.  
He's a Sikh, not a Muslim!

SECURITY OFFICER  
We're all seeking

SICK MAN  
It's OK. Feelings are high, lay low.

EXT. SKI RESORT FRENCH ALPS - DAY

SUPER "1912"

We see Bachelier and Poincare sloping downward on a snow trail, swinging left and right. To a stop. They head into the warm rest hall, taking off helmets. A book is pointing out of a bag that seems to be Bachelier. We can see the title: "Calcul des probabilites." On a nearby chair Augustine is sitting.

POINCARÉ

"Probabilities' computations" is finally here, and it looks like it is going to be a hit!

BACHELIER

Thank you Sir for all your support. It would not have been possible without you.

POINCARÉ

You are the one who did all the work. We can not let some ideologues decide which mathematics are worth pursuing.

BACHELIER

I was told Lerob was again against my appointment.

POINCARÉ

(brushing off with hand gesture)

Prejudice is like food. It cuts both ways. For most of history, prejudice like food, allowed the living to survive and thrive. With good prejudice, you make good decisions fast. But now, like food, too much of it makes you sick. And academia is not impervious to it. Anyway, as long as I am here, we'll get you there.

BACHELIER

I really want to expand applications of mathematics to real life issues.

POINCARÉ

Don't worry. We'll change things, one step at a time. You, have to want it enough and keep at it long enough. That's your persuasive pathos and ethos. I've got you all set for a permanent position pretty soon. Ah!, Ah--

BACHELIER

Sir! Are you OK? Are you OK? Are you OK?--

We see Poincaré holding under his belly as if in pain, falling on the floor. Confusion.

As Augustine approaches, it looks like a replay of the scene at the sanatorium with Bachelier's father looking like Poincare, and Augustine like Bachelier's mother. The parallel prompts the recollection in Bachelier's mind in the form of a projection on screen. He pulls back horrified.

INSERT NEWSPAPER HEADLINE: " Henri Poincare(1854-1912), the Greatest mathematician of our time, is dead!"

EXT. STREETS - DAY

Fast paced images.

SPLIT SCREEN

SUPER: "PARIS STREET - FALL 1914"

People celebrating in the streets of Paris, in nationalistic fervor, chanting the onset of the war: "Vive la France!", "A Bas les Boches"

SUPER: "BERLIN STREET - FALL 1914"

People celebrating in the streets of Paris, in nationalistic fervor, chanting the onset of the war: "Lange Lebe Die Deutsche Kaiserreich"

END SPLIT SCREEN

Cannons fired. French and British Flags falling Trenches dug, German flags falling. American flags. Smoke, snow.

EXT. FRANCO-BRITISH TRENCH - DAY

At a party hosted in honor of British officials visiting soldier trenches. Among them is a relatively YOUNG BRITISH CIVILIAN British officer, in his thirties. They are mingling in with soldiers, as beer flow and impromptu music is being played.

Louis Bachelier, now SERGEANT BACHELIER, and comrades, in a mixed Franco-British platoon are enjoying the rare festive occasion, goofing around, unaware of a nearby British officials, chatting. Some french soldiers attempt to speak in English and vice versa. At a distance, we can hear a few soldiers mimicking the melody of the "Chanson de Craonne"

A SOLDIER

Fucking war!

He discretely gives a few coins to Bachelier who quietly passes a joint of suspicious composition.

SERGEANT BACHELIER

Do you want to listen to the ultimate meaning of this war, it's supreme "it?"

A SOLDIER

And the sergeant has another theory to share.

ANOTHER SOLDIER

He wants to riddle our brains.

SERGEANT BACHELIER

That's right! And I am sure our English friends here will like it. Pardon my English. The "it" of this war.

A SOLDIER

So what is it, Sergeant!

SERGEANT BACHELIER

The word has four letters in French, and seven letters in English, I think. OK?  
 (index finger dotting)  
 -- preceded God.  
 (index finger dotting)  
 -- is greater than God.  
 (index finger dotting)  
 -- is more evil than the Devil  
 Very poor people have--.  
 (index finger dotting)  
 Very wealthy people need--.  
 If you eat --,  
 (index finger dotting)  
 you will die. What is it?

Everybody scratches their head.

SERGEANT BACHELIER (CONT'D)

Didn't you get it? Well, you see--  
 this war turns into--

Suddenly a Voice in the back is heard

YOUNG BRITISH CIVILIAN

Full of sound and furry, signifying-

The British soldiers, all at once, then yell:

"Nothing!"

YOUNG CIVILIAN

Clever one, Sergeant!

They burst into laughing.

A BRITISH GENERAL, part of the delegation asks

BRITISH GENERAL

What's your name again Sergeant?

SERGEANT BACHELIER

Louis Bachelier. Sergeant Louis Bachelier, Sir.

YOUNG CIVILIAN

Ah, I know a great French Mathematician, who recently published a deep work on continuous probabilities. "Calcul des probabilities" and "Le jeu, la chance et le hasard."

SERGEANT BACHELIER

Oh yeah, you could read them?

YOUNG CIVILIAN

I dabble into probabilities as a mathematician, for use in economics.

SERGEANT BACHELIER

So, you're not a soldier?

YOUNG CIVILIAN

My name is John Keynes. Adviser to the Treasury. On a mission from the PM's office on the economics of this war. I hope I got the gist of that Bachelier's work right. Have you heard of him?

SERGEANT BACHELIER

Yes, that's my cousin Louis. He is detached to the Army Chief of staff.

YOUNG CIVILIAN

Very well. I will inquire about him  
in Paris and will tell him about  
his other clever cousin.

After they leave, and the scene darkens, we see Bachelier  
seating alone in a corner, looking at a picture of Augustine  
and the wordless melody of the "Chanson de Craonne" closes  
the scene.

LOUIS BACHELIER (V.O.)

What was that, Bachelier. Why  
didn't you tell him who you were?

INT.

Recruiting SERGEANT on the phone with MAJOR at an Army  
recruitment outpost on Times Square.

SERGEANT

I have this black male of foreign  
origin who is looking to the army  
for use of applications of a new  
theory--

MAJOR

Oh boy!

SERGEANT

Excuse me sir?

MAJOR

Please continue.

SERGEANT

So the theory that he claims to  
have developed, originally for  
finance applications, allows to  
make decision in a way that  
naturally integrates human factors,  
prejudices and all available  
information seamlessly in decision  
making--

MAJOR

What does that have to do with the  
Army?

SERGEANT

Everything, he says. From the  
decision to go to war to which  
targets to engage or not engage.

MAJOR  
Where is he?

SERGEANT  
In the next office.

MAJOR  
Can I have a visual?

SERGEANT  
Yes, Sir.

K. Appears on a video screen. K. looking around, waiting for the Sergeant, checking a book on the desk titled: "A Rumor Of War." Not impressive looking.

MAJOR  
Sergeant, we are overwhelmed these days by all sorts of wacko, coming with all kinds of theories, and proposals--

SERGEANT  
Sir--

MAJOR  
We already have a lot going on, reaching out to the best and brightest mathematicians and social scientists we know.

SERGEANT  
But, Sir he said he just wanted a chance to be introduced to the right person in the Army's research units--

MAJOR  
Did he mention Behavioral Economics?

SERGEANT  
No.

MAJOR  
Prospect theory?

SERGEANT  
No. He said the concept of probability itself is insufficient and he is introducing a proto-probabilistic concept of risk--

MAJOR

Proto what?

SERGEANT

Proto-probabilistic concept of risk.

MAJOR

Sergeant, leadership expected of you is the judgment to triage a lot of these to ease the burden on your superiors and the various divisions doing time critical tasks for this war on terror.

SERGEANT

Major what should I do here?

MAJOR

Judgment, Sergeant. Judgment.

SERGEANT

Yes, Sir.

Exit the Major's image. The Sergeant turns off the video conference screen and returns to the room where K. Is waiting.

SERGEANT (CONT'D)

There is not much that I know that is specific to your request. I guess if you go online, you may find links

K.

Well, Sergeant, I have been online. I was hoping would put me in touch directly with the right people, so that I have proper consideration--

SERGEANT

This is primarily an enlistment outpost.

K.

Sergeant. I am of French culture and I read that in 1954, prior to the battle of Dien Bien Phu, a journalist interviewed a young lieutenant, asking him about French prospects in the conflict.

(MORE)



K. (CONT'D)

The Lieutenant scoffed at her question, observing to make his point that the commanding general of the north Vietnamese army, general Giap, had never even been at a Military War School.

SERGEANT

What are you saying, Sir?

K.

I just saw that you were reading this book, and--

SERGEANT

And?

K.

We have been hit by an enemy that looks as insignificant to you as I am now. I am the type of person you would want most.

SERGEANT

That is--

K.

Renegades, outcasts. Those who don't look like it. Those who don't seem like it.

We see K. going out and the image of K.'s father admonition on keeping trying.

In the background, we see, fleetingly: "Y5=El Arian=F(Army);"

INT. K.S NEWARK OFFICE & EL ARI OFFCE - DAY

K. Is on the phone with El Ari. Both are on speakers and are viewed on split screen as the conversation progresses.

K.

Have you read the outline of the paper?

EL ARI

A Theory of Everything!

K.

Well, it's the first presentation of a framework within which all outstanding issues in risk management can be easily solved.

EL ARI

Like a discrete, particle based theory of matter vs. a continuous, wave based theory of matter.

K.

But a unifying one, that privileges discreteness for hedging while allowing for continuous approximations for fast hedging.

EL ARI

So the analogy with chemistry or physics is--

K.

BICs are like identifying the atom as base element and making the inventory of all atoms given by the Mendeleiev table.

EL ARI

In order words, getting alchemy out chemistry.

K.

Or metaphysics out of physics.

EL ARI

Wow, K. --  
(Beat)  
What can I say.

K.

Help.

EL ARI

You see the mathematics you have developed here are like a new language to me.

K.

But--

EL ARI

To adopt it is almost like converting to a new religion!

K.

Religion!

EL ARI

It cannot truly spread until it finds a home in Rome. You are in Rome. You have to sell it there.

K.

I had hoped--

EL ARI

I have a contact you can talk to, near you. He is a scientist and an attorney. He is at Rutgers. His name is KARMA.

INT. KARMA'S OFFICE - DAY

K sitting in Karma's office in the office of technology transfer. K. In front of him. Karma is reading a document that K. brought to him, shaking his head as he reads, and then proceed to read a choice section loudly

KARMA

In financial derivatives risk management, our identification of the basis instruments contracts, or BICs, and the characteristics of each one of them can be likened to the identification of the gene as the unit element in the expression of each living being descriptive feature as well as the inventory of all possible genes. In chemistry or physics, the analogy is the atom and the inventory of all atoms given by the Mendeleiev table.

He then raises his head, staring at K.

KARMA (CONT'D)

Now, let me ask you this, are you nuts?

K. smiles, and then returns the gaze, and then shoots back:

K.

Is that supposed to be a bad thing?

Karma is taken aback, and his expression shows surprise.

KARMA

Ha!

K.

Well nuts are good for your health,  
aren't they?

KARMA

And your head too, I suppose,  
right?

K.

Nothing as tasty as a well roasted  
nut.

Karma starts laughing, pointing his finger at K.

KARMA

Listen, I like nuts, but roasting  
them up is not cheap, you know?

K.

Why not use natural sunlight?

KARMA

If you have leisure to wait that  
long. And after that, still too  
much work to crack up to see what's  
inside.

K.

So, do you have a recipe?

KARMA

You see, everyone who matters in  
your field will most likely ignore  
you.

K.

Why?

KARMA

You are too much work. For  
uncertain outcome.

K.

But we can make noise enough when  
cracking the shell to get noticed,  
no?

KARMA

Then they will fight you, to crack  
you up.

K.

Till when?

KARMA

Well, the fight will go on, you will be tried, until they get to swallow you, at which point you'll have won.

K.

So what do we do, then?

He opens his drawer, and takes out a walnut still in its green husk.

KARMA

You see his nut?

K.

Yeah?--

KARMA

Well that's our task. Our goal is to get to the well roasted kernel

K.

You mean market acceptance.

KARMA

Right. But in order to do that we have remove the husk, crack the shell while ensuring that the nut remains whole, ripens and toasts.

Image of the process described in corner of screen.

K.

A three-pronged approach.

KARMA

Yeah like the atom in chemistry: electron, proton, neutron

Image of atom representation on corner of screen with the three parts being identified.

K.

Right. Just like BICs, they are contracts with three rather than two important times. Number one, the time you agree to the contract, the handshake. Number two the time when one party, the buyer fullfil its obligation, and number three, the time when the other party, the seller fulfills theirs.

Images of hands for each time, moving to do the hand shake on a corner of the screen as K. explains, for each of the times.

KARMA

Well, yeah but here we are talking strategy to get your theory to public acceptance. Removing the husk here is the task to protect your intellectual property.

K.

Well--

KARMA

Go and work on it. I'll guide you. The task is to reduce theory to useful practice.

EXT. PATENT OFFICE -DAY

We see Karma and K. Walking to the Patent Office building in Virginia, with the impressive globe at the center of its campus. They stop to be checked by security. As they do so, we can see both are stressed.

KARMA

Remember, to answer every question, show a specific example where you are solving a practical problem better than everyone else, OK, dial down on theory.

K.

Yes, yes. Three adjectives: New, Useful and Not obvious

KARMA

All right. Teamwork.

K.

OK.

INT. PATENT OFFICE INTERVIEW ROOM - DAY

A relatively young female PATENT OFFICER in her late 20s to early 30s, Karma and K. Are sitting in a conference room style office with writing pad on the wall.

PATENT OFFICER

What I just don't get is this idea of functional notional. It's new all right. But what is it useful for? Is it fancy mathematics for its own sake?

K.

It creates a structural framework that compels more predictable and rational behavior.

KARMA

Like due process in law.

PATENT OFFICER

How's that?

K.

Well by explicitly defining a deterministic formula according to which parties will be obligated to buy or sell hedging instruments, we ensure for moments of market fear or panic when no one wants to trade, essential activity is compelled to proceed--

PATENT OFFICER

Just give me a concrete example

K.

OK. Do you know LTCM?

PATENT OFFICER

Yes! It was in the news a few years ago, right?

K.

Indeed. The firm that was founded by the Nobel prize winning mathematicians who popularized continuous-time trading and the Black Scholes model.

KARMA

They went bankrupt

PATENT OFFICER

Why?

KARMA

Initially everybody trusted them and poured money at them. But then, there was a hint that they were in trouble.

K.

They had the formula to trade to get it right, though.

KARMA

But the market smelled blood and nobody wanted to trade with them no more, so they could not execute steps that would have saved.

K.

They were pushed them into a death spiral. They extended a hand, and there is no one willing to shake it.

KARMA

But, if they had pre-established hedging contracts, they would have been insulated.

PATENT OFFICER

Their Nobel didn't help, huh?

K.

It was predicated on the imaginary world of continuous trading

KARMA

Each time a major company suddenly fails that is what happens. Loss of market confidence precipitates their downfall.

#### INSERT SCENE

As they talk we see a likening of Myron Scholes is seen climbing a rock up to a mountain peak in the background on one corner of the screen. At each step, when he is fresh and strong, many hands are extended, competing to provide support on his way up, until at one point, as he is noticeably tired, sweaty and all scratched, he extends a hand and every one pulls off their hand, causing his weakened body to fall off balance and slip off the cliff into the abyss.

On the other corner, we see a likening of Robert Merton climbing steps to the top of a pyramid.



As he lifts his leg up, obsequious suitors line up to place a ladder to help him up. As he gets noticeably tired, crowds of suitors start thinning, causing his walk to become even shakier, causing him to expense even more energy to keep steady, until finally the ladder is totally pulled at the moment he most depend on it, precipitating his downfall

In each of these scenarios, their is a scenario of a character who has secured the supporting steps composed of anonymous matching blocks, providing the appropriate cushion on the way up to the top.

RETURN TO SCENE

The scene darkens as they talk and we continue only to hear voices off screen.

K. (O.S.)

The market without this type of structure will always display volatile swings.

EXT. CAFE NEAR PATENT OFFICE - DAY

Karma and K. Relaxing at a cafe near the patent office after the interview, discussing prospects

Karma holding the dried walnut of their first meeting, removes the husk.

KARMA

I think the husk on the nut is off.

K.

How do you know?

KARMA

Didn't you hear her say "Their Nobel didn't help"

FLASHBACK TO SCENE of Patent officer uttering those words.

RETURN TO SCENE

KARMA (CONT'D)

I think she's on the side of the little guy. And that means you!

K.

I don't know how long it will take to having the patents. But am running out of cash.

KARMA

Hey I am not even charging you for this. Charge your credit card.

K.

What do you think I am doing? I just don't think I can last this way--

KARMA

Have you applied for grants? Investors?

K.

The army didn't like me much. And I think Wall Street thinks too short term to grasp the value of this at this stage.

KARMA

How about NSF? They like theory there. Or the Advanced Technology Program.

#### SERIES OF SHOTS

A) Footage of Germany surrendering - French flags - Celebrations in the streets of Paris "La Marseillaise"

B) Faculty meeting at the U of Paris

Same room as the deliberation room after thesis defense. Same characters, older. Poincare has been replaced by Lerob. The exchange is tensed and fast paced, with expressive hand gestures.

BOUSSINESQ

I thought we had agreed with Poincare that the position was Bachlelier's before the war.

LEROB

Are we really going to be providing a forum for voodoo science to someone with no credibility?

BOUSSINESQ

The man served this country very honorably against the Boches. It's a miracle he survived. There's not that much faculty left any way.

APPELL

I don't think Mr. Bachelier's  
speculative work is what times call  
for.

BOUSSINESQ

All right. I am retiring anyway.  
It's you guys' call. If he truly  
believes in what he's done, his  
genius will out.

C) Bachelier going Home. We see him in Military fatigues walking towards Paris, searching through Paris as our lyrics adapted version of Andrex's "Je cherche apres Titine," playing on the rhyming of Titine with Augustine (<https://youtu.be/CjYyUzC16zU>) rhythms his pace, with words sung in his voice. See adapted lyrics in [Appendix 4](#)

D) We see him arriving in the front of Augustine's house. Calling. Augustine getting out. Shock. Silence

AUGUSTINE

You have come back.

BACHELIER

I have -- You are alone.

AUGUSTINE

I am.-- You are alive.

There is silence as they look at each other, not knowing what to do.

He notices a picture of her husband with flowers surrounding it and the inscription "Mort pour la France -1917."

And then she rushes in his arm as the refrain of "Je Cherche apres Titine picks up," and emotional scenes of longing affection with kisses and all close the scene.

Je cherche aprèS Titine, Titine, Augustine!  
Je cherche aprèS Titine et je la trouve donc.

D) We see Bachelier and Augustine on the dance floor at their wedding, dancing to the tune of "Je cherche apres Titine" as an animated illustration of 1 + 1 comes together and stretches as a heart falls on the ground to excise a 3 that becomes a straight separate one (this part is perhaps just best shown in animated form than described). Hope and happiness, the expectation of children to come, etc...

As the scene darkens on the animations, we hear Bachelier's thoughts in voice over.

BACHELIER (V.O)

In the triangulations of this life,  
We are two triangle sides, and  
thanks to the eternal Pythagoras  
theorem we are going to hypotenuse  
like crazy..

INT. GRANT PROPOSAL REVIEW COMMITTEE - DAY

A panel of three REVIEWERS is set to vote on K.s proposal for funding for the expansion of development of BICs theory and applications on which his hopes depend to keep his company afloat. Among them is Figloo. REVIEWER 1 is the head of the panel.

REVIEWER 1

So we have this guy who has this concept that he calls BICs, which among other things he describes as a proto- probabilistic concept that allows the incorporation of credit risk, price sensitivity to notional amounts, so as to enable seamless incorporation of subjective factors and insights from behavioral economics.

FIGLOO

I can't believe this is being submitted for funding--

REVIEWER 2

What? You know him?

FIGLOO

Well, I have been in the derivatives business for decades, I don't know what this guy is talking about. Functional notionals, imaginary functions as derivatives payout. I mean...

REVIEWER 2

Who is this guy, anyway?

FIGLOO

A nobody who thinks he is above everybody. Some sort of French. Oh, he is claiming minority status too. As a black person.

REVIEWER 2

OK.

REVIEWER 1

It's certainly very hard to understand what he is saying. All these unfamiliar symbols, and his unusual way of using English. But are we too rigid on form?

REVIEWER 2

I am not going to stick my head out on this. There are thousands of cranks out there who think they are the new Einstein...

REVIEWER 1

Perhaps some are, who knows?

REVIEWER 2

If he is a genius, he will ultimately out, as Schopenhauer would say. He has to figure it out. I don't have enough of a stake here to invest to find out for sure what this is worth.

REVIEWER 1

So, what are you guys saying?

REVIEWER 2

On the fence.

FIGLOO

Against.

REVIEWER 1

All right. Let's move to the next proposal.

INT. RUTGERS UNIVERSITY CAFETERIA - DAY

Karma and K. are seated, having lunch, discussing his prospects. A student passes by, a triangular tattoo on her arm.

KARMA

Well?

K.

They turned me down.

KARMA

Why? Let me read the decision notice.

K hands him the notice.

KARMA (CONT'D)  
Where is your proposal?

K also hand it over to him and he quickly sifts through it.

KARMA (CONT'D)  
Can you explain to me in simple language the proto-probability that you keep bring on with your BICs? When I hear the word proto, I think of some pre human species of some kind.

K.  
That's exactly what I am trying to get at!

KARMA  
How?

K.  
What do we use probabilities for?

KARMA  
To make the wisest decision when there is uncertainty.

K.  
So it is a means of persuading ourselves that we are making the wise choice right?

KARMA  
Oh, I see persuasion! Aristotle right?

K.  
Exactly!

KARMA  
We learn persuasion in law school.

K.  
What does Aristotle say?

KARMA  
There are three modes of persuasion

K. pulls the napkin and draws a triangle in it and writes ethos. Then He writes another one to the right of the first one and writes pathos, and on top of both, he adds another triangle and writes logos.

K.

You see, when someone buys a risky contract, they incorporate into their purchasing decision the probability of the risky event occurring, right?

KARMA

Yes--

K.

But in making their decision to buy, they are influenced by the credibility, that is the credit worthiness of the one who is selling the contract, right?

KARMA

And vice versa.

K.

Yes, indeed. But we are focused on the buyer right now. When you are making your closing argument in front of the jury, what matters is your credibility, not that of the jurors.

KARMA

OK. So--

K.

What also matters is the how much of those risky contracts you are buying, that is how much you are betting. The more you bet, the more we infer that you have information that makes believe that the risk of you loosing your bet is low.

KARMA

Yes, that's how you detect insider trading.

K.

Right! BICs allow you to encapsulate not only the logical probability assessment, but also the credibility of the one selling and their interest in doing so. So we have ethos, pathos and logos. And that is why this is a proto-probabilistic concept of risk.

KARMA

And you have put that into mathematical formulas?

K.

Yes. Look for yourself!

KARMA

Now you understand what your problem is, don't you?

K.

What is it?

He draws on the sheet lines separating the upper triangle from the two down triangles. The Upper one he identifies as "probability, logic, rationality." The lower one, he identifies as "prejudice." See Appendix 5. On a corner of the screen, in the background, animated images start expanding on the explanations, bringing them more alive.

KARMA

The rational persuasiveness of your theory rests on the shoulders of prejudice, that is ethos and pathos. Ethos is your scientific credibility and pathos the intensity of investment in this.

K.

Just say it plainly, man.

KARMA

The problem, you see, is that prejudice, which fires creativity, our most intuitive method of risk management, is working against you.

K.

So we will try another track, as my father used to say. Fixed point theorem works by iteration. I'll go to Wall street, see politicians, whatever!

KARMA

In a nutshell, break the shell.

He takes a walnut inside its shell out of his bag and puts it on the table where it rolls and falls onto the floor, not breaking.



As they leave the cafe, we see that a bag of walnuts has been left on the desk. A server comes and quickly cleans and sweeps the bag of nuts inside her apron.

INT. INTERVIEW ROOM ALTGLOBAL X - DAY

K. Is interviewing with the HEAD OF DERIVATIVES at AltGlobal X.

HEAD OF DERIVATIVES

Credit derivatives and mortgage backed securities in particular are booming. We want original quant skills to build an edge here. Do you know about copulas?

K.

It's a way of cobbling together many unrelated distributions, so that we can study combined risks from multiple sources.

HEAD OF DERIVATIVES

There are many of them out there, Gaussian copulas, you name it which ones do you think are best for our business?

K.

You want me to tell the truth?

HEAD OF DERIVATIVES

Yes, of course.

K.

You really don't want go in bed with this copula thing. It's trash.

HEAD OF DERIVATIVES

How?

K.

It's like forcing people who have nothing in common to cohabit in close quarters and expect it will all go smoothly.

HEAD OF DERIVATIVES

No kidding. You got something better?

K.

Yes I do!

HEAD OF DERIVATIVES

What?

K.

It's this BICs theory I have developed--

We see in fast sequence K. gesturing in explanations showing graphs, etc. We see the head of derivatives, listening, nodding. The phone ringing, there is a split screen, the other person on the phone is Mandemba. We see him listening. We see him dialing the phone, the guy on the other line is Figloo. We then see his posture changing to skepticism.

K. (CONT'D)

So, what I have here extends the concept of futures or forward as a basic unit of any derivatives hedging strategy.

HEAD OF DERIVATIVES

Nobody is doing that. And it can wreck a serious hole in our P&L. In this business, it does not pay to be right alone.

K.

Sometimes you have to stand against absurdity even if it means standing alone. This gives you the chance to lead a new market.

HEAD OF DERIVATIVES

Who are you? Ah, Orwell! So you're Smith now, huh! How did it end up for him?

K.

Well--

HEAD OF DERIVATIVES

I think you are very qualified to oversee risk management of our derivatives portfolio. But, what you are saying would kill high speed trading!

K.

Because high speed trading serves no social purpose. It is a scam at the expense of mom and pop traders.

(MORE)

K. (CONT'D)

It feeds systemically dangerous  
crashes

HEAD OF DERIVATIVES

But who are you to talk of taking  
on a whole industry!

K.

What is being done there may be  
criminal, even!

HEAD OF DERIVATIVES

OK. We don't like wrecking the  
ship.

K.

How could it be?

HEAD OF DERIVATIVES

A crime that everyone is committing  
is no longer a crime. Anyway, your  
project won't boost my next bonus.  
Sorry man. I don't think we'll bed  
together.

The scene darkens as we hear the next couple of lines off  
screen, as we transition to the next scene.

K. (O.S.)

It may cost you more in the end.

HEAD OF DERIVATIVES (O.S.)

We're just too big to fail.

EXT. ALTGLOBAL X LOBBY - DAY

K.'s Walking out of the lobby of AltGlobal X when he spots  
Mandemba. It seems Mandemba is uneasy meeting him there.

K.

Hey Mandemba! What a coincidence!  
Are you working here now?

MANDEMBA

Yes man! I am finally making it!

K.

Congratulations!

MANDEMBA

Yeah man. Credit derivatives.

K.  
Oh, is it the headhunter I referred  
you to?

MANDEMBA  
Euh, yes!

K.  
Great guy. So he clued you on how  
to speak the Wall Street language  
and do its dance, huh?

MANDEMBA  
Yeah, man. I am now a great  
pretender. And my bonus speaks for  
it. Bought couple homes back home  
for my family.  
(beat)  
Man, euh--, what's happening to  
you?

K.  
I have developed this new  
derivatives theory--

MANDEMBA  
I heard! They say you have gone a  
bit off!

K.  
Do I sound off to you?

MANDEMBA  
Brother--

K.  
Listen, let's have lunch sometime  
and I'll explain it to you. Here's  
my card. You can make some true  
money off of it.

MANDEMBA  
Uh-- sure. I am coming from a  
break. So busy these days.

EXT. OUTSIDE THE PORT AUTHORITY OF NY & NJ ON 8TH AV - NIGHT

K. Walking by the entrance of the Port Authority of NY & NJ  
when suddenly he notices a man in an argument with a woman in  
front of the new New York Times building in construction.

They both are tanned skinned. It is unclear whether they are black or their skin is darkened by alcohol, substance abuse, and the harshness of homeless life. The man seems mad at the woman for some offense he is hurling at her, and she is sort expressing a blurred apology.

It seems not enough for him and he starts hitting her, saying incoherent things, and she keeps saying sorry, tripping onto the floor.

Stunned, K. rushes towards a police officer to alert them of the development. The officer quickly gets there and pulls him off while radioing others in his unit.

In fast sequence, we see throngs of officers arriving on the scene, kicking the man viciously. Within a few seconds, he is unrecognizably bloodied, and barely moving, trampled in his blood on the floor, as officers harshly handcuff him.

We see K., with his hand on his face, a disconcerted expression on his face, stunned by the disproportionate brutality of the response. The image of the painting of the "Animals sick of the plague" gets superimposed in the background.

Mental representation of formula punishment equaling a logical increasing function of the offense, a decreasing function of the value of the person's ethos and our emotional connection to them. The scene closes with the candidate function:  $\text{Punishment}(I) = \frac{\text{Logos}(\text{offense}(I))}{(\text{Pathos}(I)\text{Ethos}(I))}$ , all this shown in Sierpinski triangle representation. See Appendix 6.

INT. STATE SENATOR'S OFFICE - DAY

K. Is meeting with the local SENATOR to get some support for his company. It appears the senator, based on the description of his work, thinks he is a cash loaded millionaire.

SENATOR

This is a country of immigrants and I would be very pleased to support your entrepreneurial success.

K.

Thank you Senator. I was told you are a champion of small business and entrepreneurship.

SENATOR

Indeed. And I would like to make you a co-chair of our re-election committee.

K.

That would be an incredible honor. The functional notional derivatives trading ideas that I have developed create a language where a lot of legislative reforms could be built into adopted laws.

SENATOR

How?

K.

Let's say retirement age. If rather than saying retirement would be at 55 years old, the original law had said say retirement age is average life expectancy minus fifteen years

SENATOR

But what is our interest in this?

K.

Save us a costly, inexpensive and divisive debate.

SENATOR

Interesting. Interesting. You see, we raise money on issues, and we take time. For instance, as a co-chair you will have to raise money, and here the debate on retirement may help us raise money.

K.

What can you do for supporting our company right now?

SENATOR

Indeed your support for our election can create avenues for beneficial legislations or appropriations--

The phone rings. He lift his hands to be excused.

SENATOR (CONT'D)

Hello!

A voice on the other line.

SENATOR (CONT'D)

Oh, Mr. Chairman! How's the bundling going (beat) super bundling, OK! One second. Hold on.

(MORE)

SENATOR (CONT'D)

(To K.)

Sorry, this is an important one. We need to talk very soon again.

INT. KARMA'S OFFICE - DAY

K. is at the office of Karma. They shake hands as K. takes a seat. Karma seems cheerful and K. beaten down.

KARMA

Hey BIC man, what's up?

K.

All's down!

KARMA

No sweat!

K.

I can't even find a job. I even talked to this politician. And he had a quid pro quo deal there for me I didn't totally get.

KARMA

Yeah. Stay clear of politicians, man. Just do your thing.

K.

I need money! I need money to keep running. I need money to survive. I'll sweep your floor if you'd get me just a little bit more.

Karma looks at K. for a beat, empathetic. A faint mischievous smile flickers through.

KARMA

I feel you, I feel you! We'll get the book with all your ideas out soon. Even if we have to publish it ourselves. I am just waiting for the patent office opinion on what we presented.

K.

How am I going to survive till then?

KARMA

Listen, there's this preacher I sometime play golf with. I want you to drop a bag to him.

K.  
What is it?

He takes a bag of shelled nuts and puts it in front of K.

KARMA  
Nothing. I am just returning his clubs and balls with a couple bags of my nuts to thank him. Do it discretely.

K.  
You and your nuts!

KARMA  
When I crack them, they keep me going. Hey send me the book manuscript asap.

INT. K.S NEWARK OFFICE - DAY

K. is on his desk packing packs of shelled walnuts left by Karma when the phone rings.

K.  
(into phone)  
Hello?

There is little crack in the phone from the long distance international call. K.s mother on the phone.

K. (CONT'D)  
Who's this? Hello?

K.'S MOTHER (O.S)  
(in Ghomala, with English subtitles)  
Now you don't even recognize your mother's voice.

K.  
Oh, mother it is you!

K.'S MOTHER (O.S)  
Are you still peddling that BICs thing or whatever you call it? Is it making any money?

K.  
(Into phone)  
Oh Mother, are you too going to be one of the crabs in the bucket dragging me down?



INSERT - K.'S animated visualization of image of a crab attempting to pull out of a bucket, pulled down by fellow crabs at the bottom, slowly morphing into image of a black man pulling out of a hole, pulled down by white men slowly turning into fellow white men.

RETURN TO SCENE

K.'S MOTHER

Why do you have to always take the road less traveled by? Why?

K.

I am what I am, mother.

K.'S MOTHER

How about caring for your family? Don't you understand, son? You cannot fly with those hifalutin ideas without have settled some basic existential issues we contend with everyday.

INSERT image of Maslow's hierarchy of human needs' triangle in the background.

K.

Mother I am precisely trying to lift us all up, to change all that.

K.'S MOTHER

Change! Change! You and your change! I think you are just playing the lottery. You cannot plan your life on expected lottery winnings!

K.

Perhaps, but mother, the difference here is, if you play the lottery over and over consistently, over time you will lose a lot of money.

K.'S MOTHER

What do you mean?

K.

The choice of change, if repeated and over again, is demonstrably better even if in a specific instance, just like in a lottery it might lead to loss.

INSERT Monty Hall tea cups choice of Bachelier's father in the background as K. speaks, indexed as "Freeze," "Fight," "Flight."

K.'S MOTHER

I am just afraid of the daunting risks.

K.

Every decision we make in life is risky. All we know is that some have a pattern of leading to better outcomes over time.

K.'S MOTHER

But what if you fail, and fail again, and again?

K.

The fact that a decision may lead a bad outcome in a specific instance does not negate the wisdom of the decision rule.

K.'S MOTHER

But don't you know the saying "stick with what you know?"

K.

Mother, when you refuse to hunker down, to freeze, you flee or you fight, and that's twice more chance of making it. Sticking to what you know is actually what gives you winning odds similar to those of buying a lottery ticket. You end up just being a sitting duck.

K.'S MOTHER

So, is it your choice to live like a vagrant?

K.

Well, it is those who left Africa that went on to change the world--

INSERT Image in the back ground of early humans spreading from Eastern Africa through the Sinai Peninsula into Europe and Asia as the image darkens to a close. Europe, Asia, Africa shape into an inverted Sierpinski Triangle, identified as Fight(Europe), Flight(Asia), Freeze(Freeze). See Appendix 7.

EXT. A FEW BLOCKS FROM K'S E-STARTUP OFFICE IN NEWARK - DAY

K. Is walking through blighted black neighborhoods in Newark on his way to the office.

Almost every other block there is a church or other house of worship with various appeal signs extolling salvation through surrender to the will of the Lord.

As he passes in front of a small church front, a black PREACHER, appearance eerily reminiscent of John Lennon, but a bit a la Cornel West, hails him.

PREACHER

Hello young man, the Lord has a karmic message for you today. Want to hear it?

K. nods politely and continue on his way.

K.

I have a package from Karma.

PREACHER

I see you walking here very often, even when the night is cloudy. Karma says there's a light the Lord is shining in front of you, and that you are not noticing it yet?

K. hands him the bag and the preacher takes it discretely.

PREACHER (CONT'D)

Isn't it a shame they are not taking better care of our vets today--

K. halts as the preacher scans the bag.

K.

Sorry, I am not a vet and I think I have figured out the God business.

PREACHER

Good! Have you checked which light the Lord is shining in front of you, and that you are not noticing yet?

K.

I don't need to. I know why we created God.

PREACHER

That's great you are thinking about God, son. But it is God who created us.

K.

We want more to believe that he or she exists in our hour of darkness. Isn't it?

PREACHER

We see better then--

K.

Right. We see her right in front of us, speaking words of wisdom, whispering "let it be." We need him, he who keeps tabs, he who knows who is naughty and who is nice.

PREACHER

And when the day comes--

K.

What matters really is not what will, what is, whatever that means, but what happens here, (pointing to his head and gesturing) in our imaginations, what we imagine--

PREACHER

And that's faith.

K.

But father, if you go to a better off neighborhood, you don't see so many churches, because here people can't engage each other so well. They need someone else to step in, to referee.

PREACHER

You need God's love more.

K.

My mathematics show that that this is just being governed by a mathematical principle.

PREACHER

What?

K.

The holistic theorem.

PREACHER

The what?

K.

The holistic theorem states that the more there are people, the more they need a unifying something to mediate their relationships. That something may be God, government, institutions,

In the background we see a hub and spoke styled network connecting various parties.

PREACHER

Right but--

K.

It may be a common means of communication, language, rules, customs to which we are directly accountable, and which keeps tabs and helps reduce the complexity of one to one relationships.

PREACHER

Son, what gets you to think so hard?

(V.O)

Off?

K.

My searching and seeking. I've been working on this for some time. It helps in finance, in business, a lot of fields. I can show you how the equations fall in place. It is a trade-off between linear and quadratic level of complexity--

We see K.'s mind on screen as he is visualizing the graphs showing the number of relationships in the network managed being linear against the quadratic number of bilateral relationships.

PREACHER

(V.O thinking)

This kid is totally out of his mind and cannot be easily won over! I'd better get going--

(To K.)

(MORE)

PREACHER (CONT'D)

Son, all that is great. You are seeking hard. And when the broken hearted people living in the world agree with your quest, there will be an answer. And I will pray for you that it happens.

(hands a bag to K. as he walks away)

For now, let it be. Let it be.

K.

Wait! It's getting interesting. Explaining the mathematics of God could lead to a revival in Faith--

PREACHER

There is still a chance that they will see. The best mathematical proof known to the human kind since the beginning of times has been a great story well told.

K.

What do you mean?

PREACHER

The Bible is all stories. Your story is still being written. My best to Karma.

He smiles as he walks away.

Suddenly gunshots are heard. A scream. A scuffle. "This is Crips territory! Playing tough huh? Fucking Blood! Look who's dead now!"

A couple of the Crips gang members snatch the bag from the man K. was talking to. He is lying on the ground, covered in blood, apparently lifeless.

K. has dived to the floor, making himself invisible, heart beating fast.

A few minutes later. It is darker and quieter. He slowly pulls himself away, grabs a stick on the sidewalk and limps away as a trail of blood follows him. A police and ambulance siren are heard on the horizon. People start coming out. A WOMAN's voice sobbing

WOMAN (O.S)

They shot deacon James! Oh my God, they shot deacon James.

INT. NEWARK HOSPITAL - DAY

K. is hospitalized for treatment on his leg at a hospital in Newark. A PHYSICIAN, just finishing an examination. There is a laptop by his bedside and the Bag he got from the preacher.

PHYSICIAN

All we have to do is manage the condition through lifestyles accommodations and

K.

Doc.

PHYSICIAN

Yes?

K.

I was thinking a more permanent treatment for this weakening of my legs could be alleviated by muscle transfer from other parts of my body, together with bones deformity correction.

Dismissive posture.

PHYSICIAN

Transfer muscles? Osteotomy? Are you a physician?

K.

Why?

PHYSICIAN

That's insane!

MOMENTS LATER - AT NIGHT

It is darker in the room. Karma is in by his bedside. The TV is showing images of the scene of the shoot out. It looks like K. Is asleep. The TV comments on the incident as another round of gang violence in the contest for territorial supremacy between Bloods and Crips. Karma switch channels. COMMENTATORS are discussing current events

COMMENTATOR 1

Racial prejudice is not the issue.

COMMENTATOR 2

C'mon! What is?

COMMENTATOR 1

Don't you know that the dwarfing proportion of homicide in black communities is due to black on black violence?

K.

Lies, damn lies and statistics!

KARMA

What?

K.

What an analytical fallacy! Who kills more Americans than Americans themselves? So we should just brush off Muslim extremism, right?

KARMA

All right you are alert.

K.

Who is going to harm you most, but people who are nearest. And clustering desperate folks in ghettos helps, right?

KARMA

Wow, man. Forget that. Thank god you're alive.

K.

What did you get me into?

KARMA

Man, I was just trying to help.

K.

What are taking me for. Am I your walking idiot or what?

KARMA

Relax kid. I just got news that your patent will be approved. Just got to pay all sorts of fees now. Partner is sick, you know?

K.

So?

KARMA

You know, I am publishing your book too.



K.

Well, that's going to get me into more trouble, and I can't fight right now, you know?

KARMA

How about an interesting pen name?

K.

A pen name? Man--

(Beat)

I am getting tired of all this, you know. I am fighting eviction and look at me, my legs. I can't even believe I am alive!

Karma starts, laughing, jocular.

KARMA

You see, you are the kind who would have made a great story if you'd died. More poignant!

K.

Ha! Is this reality or imaginary reality?

KARMA

Life is complex kid. Sometimes you have to be poetic, sometimes you have to be prosaic.

INSERT: K's mental representation  $C = R + iR$  in the background

K.

What does that have to do with anything?

KARMA

I want you to use a pen name as shield, to project something that captures imaginations.

(beat)

Can I use the bathroom by the way?

K.

Sure, help yourself!

karma heads to the bathroom. As he walks in, he asks

KARMA

Hey you got the bag, right?

K.

Yes.

KARMA

You have it?

K.

Here.

As K. Picks the bag from the floor, the zipper opens slightly revealing stacks of \$100 bills. He pulls back for a second.

KARMA

What title would you like for the book?

K.

I don't know. It's really a theory of everything for derivatives.

KARMA

I like that: BICs - Theory of Everything

(beat)

And what name do you want to use for your BICs book?

K.

Louis Bachelier, Jr.

INT. AUGUSTINE BEDROOM - DAY

Bachelier, neatly dressed is standing by Augustine near their bedroom, in a position eerily reminiscent of the one he was in when he went visiting his father at his deathbed. Augustine is sitting just like his mother was. Everything is just about the same, except that there are only two characters present. The scene is constructed to be redolent of the original one. Again, a figure, much like Freud is fleetingly shown in the background as omen to the repetition compulsion principle, faintly scribbling "Wiederholungszwang." (Same happened when Poincare died).

"Je cherche ma tintine" starts playing in the back ground with no voice.

Augustine is in a sour mood. It looks very much like she is not well. Bachelier tries to comfort her. She pushes away and walks out. Bachelier, not sure what to do, follows moments later. He trails her in the garden at a distance. "Je cherche Ma tintine" with adapted lyrics starts playing. We can see it is an upper class bourgeois house. Suddenly she falls.

He rushes to her. Blood sipping off her mouth. She is talking to him he is holding her, kissing, her we can't hear what she is saying. The melody transitions to Jacques Brel/Edith Piaf's rendition of "Ne me quitte pas."

SUPER "Augustine is dead!"

We see a newspaper with the picture of Augustine announcing the passing of Augustine Jeanne Maillot from Liver Cancer.

SERIES OF SHOTS to the tune of "Ne me quitte pas"

A) Silent slow motion scene of Augustine's burial at a cemetery in a scene reminiscent of his parents' burial with flashback replay of his best moments with Augustine, starting with their first encounter more than 30 years before.

B) Bachelier with a long face, angry beard at a crossroad, towards Besancon-Dijon-Rennes the image of Augustine in his in the background

C) Taking the direction of Besancon. Still with the long face and angry beard, disheveled, seen lecturing in a class and then stopping as if choking the image of Augustine still in the background. Scene repeated again as he goes back and takes the direction of Dijon, and then Rennes.

**Short Musical: We can't work it out**

INT. NEWARK HOSPITAL BEDROOM - DAY

We see K. Turning in his bed. An envelope falls on the floor. He leans over his bed to pick it up and opens it up. It reveals a few wads of \$100 banknote and a few shelled walnuts.

We see a flashback of him strolling down the street in front of the hospital with Karma. A shot being heard. Karma falling and in his fall dropping the ball on his wheelchair. We see him rolling the wheelchair at full speed running away into the hospital to save his life. We see Karma lying in a pool of blood. People screaming, running.

He pulls back, scared. He quickly hides it under the bedsheet. We see as body tensed, he mechanically takes out one shelled walnut out and cracks it open, puts it in his mouth without even looking and starts chewing. He makes a funny face on the taste. Soon, his eyes open wide, as if possessed. He is high on drugs, and starts having what appears to be hallucinations

SERIES OF SHOTS

In the form of a short musical to the tune of the Beatles' "We can work it out" with slightly modified lyrics

A) Lyrics sung/shouted in progressively enlarged close-ups on NSF reviewers' vindictive faces and K. as they utter words.

K.

Try to see it my way

NSF REVIEWER 2 & FIGLOO

Do I have to keep on talking till I can't go on?

K.

While you see it your way,

NSF REVIEWER 1

Run the risk of crippling what our deal could have been to

B) With Alt Global X

K.

We can work it out!

HEAD OF DERIVATIVES

We can't work it out

K.

Think of what you're saying

HEAD OF DERIVATIVES

You can get it wrong and still you think that it's all right

K.

Think of what I'm saying!

HEAD OF DERIVATIVES

We can't work it out and get it straight--

K.

Or say good night!

C) With Senator

K. (CONT'D)

We can work it out,

SENATOR

We can't work it out

K.  
Life is very short, and there's no  
time

SENATOR

For fussing and fighting, my friend

K.  
(Displaying the banknotes)  
I have always thought that it's a  
crime

SENATOR & POLICE OFFICER  
So I will ask you once again

K.  
Try to see it my way,  
Only time will tell if I am right  
or I am wrong

SENATOR  
While you see it your way

K.  
There's a chance--

POLICE OFFICER  
that we may fall apart before too  
long.

D) With Karma

K.  
We can't work it out,

KARMA  
We can work it out

K.  
Life is very short,  
and there's no time

KARMA  
For fussing and fighting, my  
friend!

K.  
I have always thought that it's a  
crime,

KARMA  
So I will ask you once again

K.  
Try to see it my way, Only time  
will tell if I am right or I am  
wrong.

KARMA  
While you see it your way!

K.  
There's a chance--

KARMA  
that we may fall apart before too  
long!

K.  
We can't work it out,

KARMA  
(Showing cover of K.'s  
Book)  
We can work it out

K. doing a web search. We see him typing the words  
"osteotomy" "muscle graft" "muscle transfer"

We see a few links popping out to websites in China with  
images of people with different leg impairments.

He clicks on a link. It shows: "We specialize musculoskeletal  
conditions."

He clicks on an image showing various deformities.

He tries to get up. We see that he cannot

We see K. a Chinese book in hand, listening to a DVD:

INSERT - DVD movie

K. in front of the screen, excitedly repeating words as they  
are being read. "Ni, Hao" "Wo jiao K." etc.

RETURN TO SCENE

SERIES OF SHOTS

- A) K. sitting in a plane towards Beijing.
- B) K. at the airport in Beijing.

FLASHBACK

KARMA

You like to tell me that the greatest insight in mathematics is the fixed point theorem--

K.

And you know why? It is because it is at the root of the practical solution of almost all significant equations in mathematics--

KARMA

And it works by constant change, iterating till we get what we want. But if you don't seem to converge to that after a while, you've got to seed again somewhere else, and so on.

END FLASHBACK

INT. BEIJING HOSPITAL - DAY

K. waiting to see a doctor in a patient waiting area. K. rolls into the office of the awaited physician, PROFESSOR QING a tall middle aged man is towering among junior physicians and a female INTERPRETER.

K.

(in a mangled attempt to speak Chinese)  
Wo xiang ni zhi tui

INTERPRETER

Your Chinese is not too bad, but maybe we can communicate a little fast if I translate, you speak English, OK?

K.

OK. I just want to see if he can help my legs as they say on your website.

The interpreter translates and Professor Qing begins his examination. He says something unintelligible to K. in Mandarin.

INTERPRETER

Professor Qing says he just wrote a book about your condition--

K.

Really?

Professor Qing speaks again in Mandarin.

INTERPRETER

His experience is that this  
weakening of your legs could be  
alleviated by muscle graft transfer  
from other parts of my body,  
together with bones deformity  
correction

SPLIT SCREEN WITH PHYSICIAN in the US with K. suggesting  
exactly the same and physician asking if he was insane.

INT. BEIJING HOSPITAL SURGERY ROOM - DAY

K. lying supine on an operating table. Several physicians in  
operating gown and nurses busy around him, preparing for  
injection. He appears edgy, suddenly realizing that is alone  
and vulnerable amongst unknowns. A NURSE behind her gown is  
looking attentively at him. We start hearing K.'s voice over  
describing what his feelings and how he is perceiving the  
actions of those around. The scene slowly starts to blur.

K. (V.O)

The dirty business must be done.  
Is this the end?  
lying supine  
Caps and masks  
Ninja faces hovering  
Over me.  
Truncated irises piercing  
through masking epicantic folds,  
Reddening anxious sclera  
Stoned yet or what?  
Let's get it over with  
Shall we?

The anesthesiologist indicates that he will make an injection  
in the spine.

K. (V.O) (CONT'D)

A needle in the spine  
Another one.  
I am still here. Why?  
Not sure.  
Am I me,  
The bearer of the cross,  
Or my brother,  
Guilty of  
Odious crimes,

(MORE)



K. (V.O) (CONT'D)

Who has to die?  
Dread,  
Unusual, cruel  
Punishment for what, then?  
Are they botching it up?  
Why is it not swift?

The Nurse bends towards his face, her head opposite to his, as if they are to anchor in one another.

THE NURSE

Don't worry, Everything will be  
fine, I promise.

The parts of the Nurse's face come into focus as the poetic recitation continues. Her looks are eerily redolent of the young Augustine.

K. (V.O.)

A face? No, eyes, behind the green  
Mask  
Just eyes  
Beauteous  
Quiver  
Scrumptious  
Beauty, the grace of beauty  
Relieves  
The sparkle of enamel,  
Her incisors shining through  
Betraying that smile  
On her lips  
A shiver in a dream  
I know she is there  
And in the heat of her bosom  
I shelter as into darkness I slip.

K. Has fallen asleep. Images of the surgery as K's legs are being torn apart, muscles pulled from part of the body and re-inserted into others.

INT. K.S PATIENT ROOM POST SURGERY - DAY

Note: The following conversation in is rendered here in pinyin Chinese in parenthetical because its primary interest is to highlight the difficulties a foreigner has in properly rendering Chinese pronunciations and tones, leading to comical misunderstandings.

Three nurses enter into K.s Room, as K is overheard from the outside screaming in pain. The nurses are now with no masks, revealing their full faces. K. stops wailing and immediately excitedly points at the one in the center.

K.  
 (Shi ni!)  
 It's you!

THE NURSE at the center, smiling a bit.

THE NURSE  
 (Shei ah?)  
 Me who?

K.  
 (Shi ta!)  
 It's her! In the operating room.  
 Looking at me.

The three nurses look at each other and smile.

THE NURSE  
 (Teng ma? )  
 Is it painful?

NURSE 2  
 (Nimen xifangren shoubuliao  
 ku ma?)  
 You Westerners can't take the pain,  
 can you?

NURSE 3  
 (You dian Ku hao)  
 A little bit of pain is good.

K.  
 (Teng)  
 Painful

Then, mispronouncing a bit the word for pain, "teng" so that now it comes across as "tang", followed by the word for hot or burning "chao," which make it sound like a reference to the "Tang Dynasty" in China.

K. (CONT'D)  
 (Tang, chao!)  
 Painful, burning.

Smiles and muffled laughter.

THE NURSE  
 (Na women zai tang chao ba  
 quanqiu dao zhongguo!)  
 OK. Yes, we are in the Tang  
 Dynasty. And the world is coming to  
 China!

She spreads a topical Lidocaine spray around the painful areas and then starts to turn his bed around.

THE NURSE (CONT'D)  
 (Tou dongfang.Tui Xifang.  
 Hao fengshui. Shui de  
 hao)  
 I am adjusting your bed head east  
 legs west. You'll sleep better.  
 Good Fengshui.

We see K. Typing on a laptop by his bedside, alone in his room, the only light coming from his computer.

INT. K.S PATIENT ROOM- DAY

Next day. The nurse is removing the bandage on K.s leg.

K. Starts smiling as if preparing a mischievous trick.

K.  
 (Ni hen [p]bang )  
 You [are fat] rock!

The nurse blushes with embarrassment. She thinks K. said she is fat, while he means to compliment her as being a great person.

THE NURSE  
 (Zhende ma? Dui ni laishuo  
 wosuan ma? )  
 Really? Am I too fat for you?

K., rasing the thumb, all amused.

K.  
 (Bang! Jiran women zai tang  
 chao, na pang jui shi  
 bang shi bu shi? )  
 Great! Well, since we are in the  
 Tang dynasty, isn't being fat  
 supposed to be great?

Now realizing what he's been up to...

THE NURSE  
 (Ah ah ni... ni! Ni zenme  
 name dong zhongguo lishi,  
 kai na zhong wanxiao ah?)  
 How do you understand that much  
 Chinese to be able this kind of  
 joke!

She hits him, but in a sweet way that indicates that she enjoyed the repartee. She gets closer to check what he is doing on his laptop.

THE NURSE (CONT'D)

(Ni zai diannao gan shen me  
ya?)

What are you doing on your laptop?

K.

(Xie shige)

Writing a poem

THE NURSE

(Shenmeyang de shi ge)

About what?

K.

(Tongku de shige)

Pain.

THE NURSE

(Tongku? Ni gang xie le  
ma?)

Pain? You just wrote it?

K.

(Shi. Ni nian yingen ma?)

Yes... You can read English?

THE NURSE

(Shi a! Rang wo nian ba.)

Of course. Let me read.

INSERT - ROLL OF PAST IMAGES AS THE NURSE READS

Title: Pain mon Pain

Pain from re-innervating innate body parts,  
Deformed, malformed, unformed,  
Dead.

(Images of the cutting of body parts during surgery)  
Pain from strengthening a weakening body,  
Further weakened to be strengthened,  
Further strengthened to be weakened,  
(More surgery.)

Pain for the struggle and through the struggle,  
Pain for the seeming futility of it all,  
Pain and more Pain.

(Images of Figloo downing K.'s paper, shaking his head and putting it away.)

Convincing other reviewers.)  
 Yet again,  
 Never ending cycle,  
 That must someday somehow end.

Companion of untold adventures,  
 Untold places,  
 Unheard of people,

Ku, mon Coucou (Note: Ku here represented in the Chinese  
 character for bitterness)

Upside-downing cuckoo the mind of  
 This seemingly cuckold of fate.

The rich, the poor, the forgotten,  
 Real or imagined or not, hated, loved, loved-hated.

Spleen split, furloughed in bleak bliss.

(Showing images in the US, Africa, Europe)  
 Richer because of you,  
 Poorer because of you,  
 Nothing.

Sometimes in this world,

A man has plan for things,

And then things make plan for the man.

RETURN TO SCENE

INT. K.S PATIENT ROOM- DAY

SUPER: "Next Day"

The nurse comes into the room, as if surreptitiously. She is  
 holding a lunch bag.

K.  
 (Sunshine lai lo)  
 Sunshine is here.

She gestures to him to keep it quiet and hands him food.

THE NURSE  
 (Shen me? )  
 What?

K.

Sunshine.

THE NURSE

(Shenme yisi?)

What do you mean?

K.

(Jiu shi ni shi rizhao. Ni  
bu zhidao zhe shou ge a?)

You are my Sunshine. Don't you know  
that song? "You are my sunshine, my  
only sunshine--"

THE NURSE

(Taoyan! Ni zhe ge, zhe ge  
K. K. K. Daodi shi  
shenmeyang de mingzi. Bu  
hao ting. Cong jintian  
lai wo jiao ni Kong)

Nasty boy! You this, this K.,K.,K.  
What kind of name is that that you  
have to begin with. I don't like  
it. It does not sound good. I'll  
name you KONG.

K.

(Kong? Sun wu Kong de  
Kong?)

"Kong" as the name of the Monkey  
King in Journey to the West?

THE NURSE

(Bu, bu. Qishi, ni yi dian  
xiang Sun wu kong ba. Dan  
wo jiao ni kong fu zi de  
Kong, jiu shi KONG SHU.)

No, No. You look a little like him  
though. But I mean Kong like  
Confucius, the man of the book. So  
all in all you are now "KONG SHU"

K.

(Na, na wo jiao ni "HONG  
YAN!")

Well, then. I'll name you "HONG  
YAN!"

THE NURSE

Hong Yan?

K.

(Shi a, jiu shi meili de  
Hong Yan.)

(MORE)

K. (CONT'D)  
 Yes, "Hong Yan" as in "stupendously  
 beautiful."

From this point on, K. Is interchangeably known as KONG SHU and THE NURSE as HONG YAN.

INT. K.S PATIENT ROOM- DAY

We see Kong Shu in the room playing with drawing software. Soon we see a black & white yin-yang picture. Then we see a drawing of a group of Chinese characters. Then another. Then the picture emerges on the computer.

INSERT DRAWN COMPUTER PICTURE

See appendix.

RETURN TO SCENE

INT. PATIENT'S ROOM HALLWAY - DAY

HONG YAN walks towards Kong Shu Room and enters. Two NURSES coming behind.

ONE NURSE  
 (Ta meitian zai gen laowai  
 huanzhe gan shenme?)  
 Why is she everyday in the  
 foreigner patient's room

THE OTHER NURSE  
 (Ni bu zhidao a?)  
 Don't you know?

Covers an angle of her mouth as she whispers in her colleague's ears. They giggle.

INT. K.S PATIENT ROOM- DAY

We see Hong Yan helping Kong Shu take small steps in his room. He is wearing an A-shirt and jogging pants and seen at a profile angle that sharpen a striking athletic build. They are laughing and teasing other.

INT. K.S PATIENT ROOM- DAY

Hong Yan and the Chief Surgeon, Professor Qing, who is also Hong Yan's father are in K.s Room having an argument.

PROFESSOR QING

(Ni gen Laowai huanzhe you  
shenme guanxi a?)

What are doing with the foreign  
patient?

HONG YAN

(Ba, ni shi shenme yisi?)

Dad, what are you trying to say?

PROFESSOR QING

(Shenne yisi a? Ni bu  
zhidao zhe zhong guanxi  
bu heshi a?)

What Am I trying to say? Don't you  
know that type of relationship is  
not proper?

HONG YAN

(Gen ni you shenme guanxi  
a?)

What does any of this has to do  
with you?

PROFESSOR QING

(wo ji shi ba ye shi nide  
laoban, zenme gen wo shen  
me guanxi a?)

I am your father and your boss. How  
could it not have anything to do  
with me?

HONG YAN

(Wo gen ta xue yingwen a!)

I am just learning English with  
him.

PROFESSOR QING

(Hai bu heshi!)

That's still not proper.

HONG YAN

(Ta hen you tebie a! Wulun  
ruhe, ta kangfu hen kuai.  
Ta yijing xiang chuyuan.)

He's very special. Anyway, his  
recovery has been fast. He already  
wants to leave the hospital.

As they speaks he notice the drawings on the wall and looks  
at them. See [Appendix 8&9](#).



PROFESSOR QING  
 (Shi shei de?)  
 Whose is this?

HONG YAN  
 (Shi ta de. Shi ta zuo de.)  
 It's his. He did it himself.

PROFESSOR QING  
 (Shi ma?)  
 Really

Close up on the drawings as the father inspects them up close.

INT. KARAOKE BAR - NIGHT

K. And a few HOSPITAL STAFF and PATIENTS are celebrating on the eve of his send off at a Karaoke bar. The mood is very celebratory as various guests tryout singing various tunes, in varying states of drunkenness.

All of a sudden Hong Yan asks that "you are my sunshine" be played. She takes the microphone and as the room quiets down her captivating voice fills the room as she sings and scans the audience. Soon her gaze gets fixated on Kong Shu and it becomes clear something else is going on, and the emotional intensity in her voice crescendoes. Kong Shu, a little drunk starts smiling, but is noticeably embarrassed to be so singled out.

When she finishes, the room erupts in applause.

A HOSPITAL STAFF  
 (Na xianzai, women yao ting  
 "Sunshine" xiansheng  
 chang yige, shi bu shi?)  
 Now, we want to hear "Mr. Sunshine"  
 sing a reply to that.

Kong Shu, embarrassed waves off the requests.

KONG SHU  
 (Bu, bu, bu. Rang ta zai  
 chang yi ge ba.)  
 No, no, no. Let her keep singing.

HONG YAN  
 (Hao. Wo chang ba.  
 "yueliang daibiao wo de  
 xin")  
 OK. I'll sing. "The moon represents  
 my heart."

See: [https://www.youtube.com/watch?v=bv\\_cEeDlop0](https://www.youtube.com/watch?v=bv_cEeDlop0)

As she begins singing, this time her gaze is entirely fixated on Kong Shu. And it is as if they are the only ones in the room.

As she finishes. Everyone starts applauding and the chorus rise again for Kong Shu to sing in response.

A YOUNG PATIENT  
 (Ni shi heiren, ni zenme  
 chang buliao a?)  
 You are a Black man, how can't you  
 sing?

KONG SHU  
 (Hao, hao wo chang ba. )  
 OK. "I can't help falling in love  
 with you."

See: <https://youtu.be/K3gsXkf45kM>

K. starts singing, by the end the room has fallen totally quiet, startled.

SERIES OF SHOTS

A) We see Hongyan and Kong Shu having fun, hand in hand climbing the great wall, taking funny pictures.

KONG SHU (CONT'D)  
 (Wo bu dong wei shenme  
 turan ni baba xiang jian  
 wo.)  
 I don't know why your father  
 suddenly wants to meet me.

HONG YAN  
 (Haoxiang, ta kaishi jue de  
 ni zhen shi liaobuqi)  
 He seems to think you are a great  
 guy.

KONG SHU  
 (Shenme liabuqi a?)  
 Me?

B) We see them at the local market. A throng has assembled by game players. Local food peddlers are selling foods that trigger a flashback to the local market and streets of his African youth: roasted sweet potatoes, roasted corn, caramelized peanuts, etc.

KONG SHU (CONT'D)  
 (Wo zhen dao jia le a?)  
 I have really returned home.

HONG YAN  
 (Shenme?)  
 What?

KONG SHU  
 (Zheli yiqie dou xiang wo  
 laojia. Haoxiang shang yi  
 beizi wo shi zhongguoren)  
 Everything here reminds me of my  
 birthplace.

HONG YAN  
 (Na zenme hui a? )  
 How's that possible?

KONG SHU  
 (Ni zhidao ma, lian  
 zhongwen ye tebie xiang  
 wo de muyu a?)  
 You know, even the Chinese language  
 shares some striking similarities  
 with my native tongue.  
 (Nimen shuo "shui," zai wo  
 de muyu, women shuo  
 "shie.")  
 You say "shui" for water and there  
 we say "shie."  
 (Nimen shuo "guo" de  
 "guojia" zai wo de muyu,  
 women shuo "guong," )  
 You say "guo" for country, and we  
 say "guong."  
 (Nimen shuo "le," zai wo de  
 muyu, women shuo "lo,"  
 yiyang de yisi.)  
 You use the uniquely Chinese  
 particle "le" in the same way we  
 use the word "lo"  
 (Shenme de--)  
 And so on--

HONG YAN  
 (Zhende ma? na ni deng  
 zhongguoren ba!)  
 Really?

KONG SHU  
 (Dangran le. Wo zheli tai  
 xingfu.)  
 Indeed! I am just so happy here.

EXT. WATCHING THE GO GAME ON THE SIDEWALK - DAY

Hong Yan and Kong Shu Are watching street PLAYERS of the Chinese GO game on the sidewalk.

KONG SHU  
(Keyi da ma?)  
Can I play?

A PLAYER  
(A, ni zen me jiang  
zhongwen a? )  
Oh, you can speak Chinese?

KONG SHU  
(Wo shi zhongguoren a.)  
I am a Chinese.

A PLAYER  
(Ni ye zhen neng kai  
wanxiao a)  
You also a bit of a sense of humor,  
dont you?

ANOTHER PLAYER  
(Xiang xue zenme da a?)  
Do you want to learn how to play?

KONG SHU  
(Shi. Keyi shi shi ma?)  
Yes. Can I have a try?

A PLAYER  
(Na hao pengyou, wo wen ni  
yi ge xiao wenti huida  
hao, Jui hui qing ni chi  
fan mianfei, ye hui jiao  
ni.)  
Well, dear friend, I'll ask you a  
simple game question. If you answer  
it correctly, I'll not only teach  
you how to play, but you'll also  
get a free lunch from me.

KONGSHU  
(Na wen ba.)  
All right. Ask.

A PLAYER  
(Shenme xingdong chu you  
haochu?)  
What's decision at the beginning an  
advantage?

INSERT FLASHBACK to image of Young K. as a child playing three coin game that was earlier used as a demonstration of the first mover's advantage.

KONG SHU

(Xian da shi you haochu  
de.)

Playing first gives a "first mover  
advantage."

A PLAYER

(Ayo, ni zenme zhidao a?)

Oh! How did you guess that one?

KONG SHU

(Na ni juede wo shuo ni shi  
wo laoxiang wo kai  
wanxiao ma?)

You think when I am calling you my  
fellow countryman I am joking?

A PLAYER

(Na bu hui ba? Shuo shihua  
ni shi nar laizi a?)

Impossible. Where are you coming  
from?

KONG SHU

(Shijuazhuang.)

Shijiazhuang.

Note: Shijiazhuang is the capital of the Northeastern province of Hebei which is adjacent to the capital city of Beijing. Many migrant worker in Beijing come from Hebei. So it is a most reasonable probablistic guess.

A PLAYER

(Bu keneng ba.)

Impossible!

KONG SHU

(Ni zenme bu xin wo a?)

Why can't you believe me?

A PLAYER

(Na, xing shei a?)

So, what's your last name.

KONG SHU

(Wo xing Kong, Kongzi de  
Kong. Ming, Shu. Jiu shi  
Kong Shu.)

(MORE)

KONG SHU (CONT'D)

Kong. Kong as in Confucius. First name Shu. So my name is Kong Shu

A small throng starts surrounding them, every body shrugging in disbelief.

A PLAYER

(Bu hui ba)

Impossible.

ANOTHER PLAYER

(Bui hui ba)

Impossible.

It seems they are trying to say something. But out of politeness, just can't dare. A KID watching intently the scene all of a sudden bursts.

A KID

(Ni shi heiren. Ni bu hui shi zhongguoren.)

You are a black man. You cannot possibly be a Chinese!

Every body bursts in laughter.

INT. BEIJING STREET RESTAURANT - DAY

Hong yan and Kong Shu are dining in a cheap Beijing restaurant opening up to the street. A TV Stand is announcing market news. The listener is switching between channels in Chinese and in English.

HONG YAN

(Ni xingfu ma?)

Are you happy?

KONG SHU

(Dangran le, baobei. Ni gen wo jiu shi zhishu ni jia wo, jiu shi dengyu zhishu ni chengyi zhishu wo. Te qiang! )

Of course, darling. The addition of me to you will have an exponential effect and multiply our strengths. Like:  $e(\text{you}+\text{me}) = e(\text{you}) * e(\text{me});$

HONG YAN

(A yo! Ni shenme yisi a?)

As he talks, he takes a napkin and starts writing on it.

KONG SHU  
 (Ni Kan)  
 Look!

INSERT NAPKIN SCRIPT

"Kong Shu <3 Hong Yan = Exponential (Kong Shu + Hong Yan)=  
 Exponential (Kong Shu)\* Exponential( Hong Yan)"

RETURN TO SCENE

HONG YAN  
 (Shenjing Bing!)  
 Crazy!

RETURN TO SCENE

Suddenly, he gestures to Hong Yan to remain still as he  
 listen to the news...

TV REPORTER(V.O.)  
 Global X on the verge of bankruptcy  
 is being bought for pennies on the  
 dollar by Super Global X.

TV ANNOUNCER (V.O.)  
 But how could this be so suddenly?

TV REPORTER(V.O.)  
 Informed sources have told us that  
 the recent discovery of undetected  
 long mispriced positions in their  
 derivatives portfolio, fatally  
 revealed Global X as a giant  
 standing on feet of clay.

TV ANNOUNCER (V.O.)  
 Hold on-- We are also hearing that  
 a Russian quant trader named Boris  
 Evasov at Global X has been  
 arrested for allegedly disclosing  
 positions or trade secrets to  
 competition.

TV REPORTER(V.O.)  
 Yes. But in fairness to both sides,  
 Evasov, currently in custody at  
 Sing Sing through his attorney  
 denies any wrongdoing and says he  
 is just being used as a convenient  
 scapegoat--

FLASH BACK to image of K. And Savoie parting argument and  
 Boris playing "Tam Tam"

RETURN TO SCENE

KONG SHU  
Oh, my God!

HONG YAN  
(You shi ma?)  
What's the matter?

KONG SHU  
(Mei shi. Women zou ba.)  
Nothing. Let's go.

HONG YAN  
(Eh, baobei. Chunjie wo  
xiang rang ni guo lai  
women de laojia.)  
Oh, darling. During the Spring  
festival, let's go visit my family  
in my native town.

EXT. ON THE ROAD - DAY

Car travelling out of Beijing. Scenery changing to rural  
landscape to seaside. Kong Shu asleep by Hong Yan side who is  
driving.

HONG YAN  
(Xing. Women dao jia le.  
Rizhao Shi.)  
Wake up. We're home. Rizhao city.

KONG SHU  
(Rizhao a?)  
Rizhao?

HONG YAN  
(Shi a. Ni xianzai dong le  
ma? "Sunshine--"  
Yuenfen.)  
Yes. Now, do you understand?  
"Sunshine" Fate.

KONG SHU  
Ha!

Arriving at a traditional Chinese compound in Shandong.

Warm greeting of family and extended family members, and meet  
again Professor Qing, Hong Yan's father, this time in  
traditional Chinese Zhongshan/Mao suit.



We see them having a family lunch in a highly festive atmosphere.

A FAMILY MEMBER

(Kong Shu, Kong Shu-- Shei  
gei ni na zhong xingming  
a?)

Kong Shu, Kong Shu-- Who gave you  
this type of name?

Kong Shu points his finger from the back on top of Hong Yan's head.

A FAMILY MEMBER (CONT'D)

(Ta a? Hao! hai shi tebie  
hao de mingzi.)

Her? All right. It's really a good  
name.

HONG YAN

(Ta jiao wo "Sunshine!")  
He called me Sunshine!

ANOTHER FAMILY MEMBER

(Shi ma? Jiu shi Rizhao de  
yisi ba? )

Every body starts laughing.

A FAMILY MEMBER

(Zhen shi yuenfen.)  
That's really fate!

HONG YAN

(Kong Shu ye shi xiang ta  
de xingge. Shi bu shi?)  
The name also fits his personality.  
Doesn't it?

Hong Yan's father smiles.

HONG YAN FATHER

(Ni qu Qufu ma?)  
Did you go to Qufu?

Note: Qufu is the hometown of Confucius

KONG SHU

(Meiyou.)  
No.

HONG YAN FATHER

(Zenme hui a? Mingtian  
nimen qu. Zhi shi san ge  
xiaoshi li.

(MORE)

HONG YAN FATHER (CONT'D)

Qu kan San Kong)

How's that possible? You guys visit it tomorrow. Less than three hours away from here. Go visit the "The Three Confucian [Sites]"

KONG SHU

(Hao.)

OK.

EXT. ON THE ROAD TO QUFU - DAY

We see Hong Yan and Kong Shu. In the car to Qufu. Hong Yan driving. Chatty, laughing and happy. Map showing the path from Rizhao to Qufu in background.

We see them visiting the Confucius temple, the Confucious Cemetery, The Kong Family Mansion. Reading inscriptions. Religious pilgrimage atmosphere.

KONG SHU

(Wo mei xiangdao na wei kongzi chi le name duo ku a?)

I had no idea Confucius struggled that much in his lifetime.

HONG YAN

(Shi. Ba te xiang shou ku qianghua linghun. Ayo! Shijian name kuai guo qu le. Ba xiang wanshang gen ni tan.)

Indeed. Dad likes to say suffering strengthens the soul. Oh, time has gone by so fast. Dad wants to speak to you tonight.

KONG SHU

Bie rang wo jinzhang.  
Oh, don't make me nervous!

HONG YAN

(Meishi. Ta xihuan ni.)  
No worries. He likes you.

She gazes at him. Then gives him a kiss.

INT. HONG YAN FAMILY HOME RIZHAO - EVENING

Hong Yan and Kong Shu Are back at the family home. We see K. Checking American TV business news online.

A panel of COMMENTATORS. Hong Yan is busy unpacking stuff and changing herself.

COMMENTATOR 1

The idea of bonus or compensation clawback provisions in financial traders and executives contracts is gaining steam.

COMMENTATOR 2

Well. Rumors are circulating that Alt Global X is on the verge of bankruptcy. Insider sources say the largest losses were incurred in the credit derivatives and mortgage backed securities portfolio.

COMMENTATOR 3

Yes, according to other sources the most significant losses were due to best practices model error, in particular a mathematical tool named copula to link the behavior of various assets together.

FLASH BACK

K. At the interview with the Head of Derivatives at Alt Global X, their exchange on Copulas and subsequent conversation with Mandemba.

END FLASHBACK

COMMENTATOR 1

Copulas? Excuse my French, but don't these masters of the universe know it's toxic to mix business with pleasure?

COMMENTATOR 2

Well they're the ones loaded with toxic assets right now. Ha!

Roll of video of head derivatives trader hastily packing his office stuff in boxes outside Alt Global X.

COMMENTATOR 3

There are also reports that a bank employee by the name of Mandemba from Congo may have engaged in unauthorized trades that must have compounded losses.

RETURN TO SCENE

KONG SHU

Holy Crap!

HONG YAN

(Shenme yisi a nile! Baba  
hen jiu xiang gen ni tan  
yihuir.)

What's the matter with you! Dad has  
been expecting you for a while.

KONG SHU

(Zhen bu haoyisi. Ta zai  
nar?)

Really sorry. Where is he?

INT. LIVING ROOM - DAY

K. Is in the living room with Hong Yan's father. It depicts  
magnificent calligraphic pieces. They're sitting on two  
dining chairs separated by a small table against the wall,  
facing towards the entrance door they both face.

HONG YAN'S FATHER

(Haizi, wo xihuan ni. )

Child, I like you.

KONG SHU

(Xiexie bofu. Wo tebie  
zunjin nin de nengli)

Thank you father. I have enormous  
respect for your competence.

HONG YAN'S FATHER

(Na ni zhidao wei shenme?)

Now, do you know why?

Polite shrug, to mean please tell me.

HONG YAN'S FATHER (CONT'D)

(ni chi le ku.)

You have struggled.

KONG SHU

(ku?)

Struggle?

HONG YAN'S FATHER

(shi ah)

Yes!

(MORE)

HONG YAN'S FATHER (CONT'D)

(Ku shi women zhongguoren  
zui zhongyao de  
guainian. Women you  
xingku, tongku, kuzhong,  
shenmede. Nimen meiguoren  
dou shi huodong, mangzhe  
de guainian, "business"  
shi ba, duo mangzhe shi  
hao zangzhang, shi bu  
shi?)

Bitter suffering is a core concept  
in Chinese thought. There is such  
an extensive range of words rooted  
in that core word. You Americans  
are all about activities, being  
busy, "business" isn't it? The  
busier the more growth, isn't it?

KONG SHU

(Wo mei xiangdao. ni zheme  
shuo ting youyisi. Zai  
jidujiao shou ku ye ting  
zhongyao. )

Interesting! It had never thought  
about it that way.  
Christianity also elevates  
suffering.

HONG YAN'S FATHER

(Na xianzai xifang,  
zhenzheng de jidutu yue  
lai yue shao ...)

Well, true. But Christianity is on  
the decline in the West..

KONG SHU

(Shi. Zhongguo ye yuelai--)  
Sure. In China too,--

HONG YAN'S FATHER

(Xifang de yingxiang. Wo  
kanjian ni le hao. Wo  
zhidao ni bu shi yiban de  
nanren. Ni Wei shenme  
meiyou Meiguo dang  
gaoguan a?)

Western influence! I have  
observed you carefully.  
You are not an average  
person. Why are you not a  
leading personality in  
the United States?

KONG SHU  
 (Bofu. Nabian qingkuan you  
 dian fuza.)  
 Father. The situation there is  
 rather complex

HONG YAN'S FATHER  
 (Ni bu xiangxin ziji le  
 ma?)  
 You do not trust yourself?

KONG SHU  
 (Bu shi zheyang--Jiu shi--)  
 It is not like that-- It is--

HONG YAN'S FATHER  
 (Wo zhidao. Na rang wo  
 jiang ni ge gushi ba. Jiu  
 shi Mao Zedong jiang de  
 "Yúgong yí shan" gushi)  
 I know. Well, let me tell you a  
 story. The story of "The foolish  
 old man who moved the mountains" as  
 told by Mao Zedong.

KONG SHU  
 (Zhe xiang xila xixifusi de  
 gushi ba)  
 It sounds like the Greek myth of  
 Sisyphus doesn't it.

HONG YAN'S FATHER  
 (Shi, danshi you zhonguo de  
 tebie, ting ting ba)  
 Yes, but natively Chinese. Listen--

See story at:  
[http://en.wikipedia.org/wiki/The\\_Foolish\\_Old\\_Man\\_Removes\\_the\\_Mountains](http://en.wikipedia.org/wiki/The_Foolish_Old_Man_Removes_the_Mountains) and [Appendix 10](#) for English and Chinese versions.

As Hong Yan's father narrates the story of "The foolish old man who removes mountains" is being narrated as told by Mao Zedong, Bob Marley's "Redemption Song" start playing in Kong Shu's mind and the printout of the last lines on trying again of his father's final exhortation poem with his gestures to the child K. fleetingly appear in the background on screen.

HONG YAN'S FATHER (CONT'D)  
 (Ni xianzai de di yi zuo  
 shan shi xiangxin ni de  
 nengli neng rang ni zuo  
 dui tian xia geng liabuqi  
 de shi, ni shi ge shen Di  
 er zuo shan shi rang  
 shijie xiangxin ni shi ge  
 shen )

Your first mountain to move is  
 believing that you can overcome.  
 Your second mountain is letting the  
 world be witness to what you are.

INT. HONG YAN AND KONSHU APARTMENT - DAY

K. is sitting in the living room watching US market news  
 development online on his laptop.

INSERT COMPUTER SCREEN

COMMENTATOR 1

The Fed is holding emergency  
 meetings right now on reports that  
 Super global X's solvability is  
 threatened.

COMMENTATOR 2

Liquidity has dried up. Nobody  
 willing to trade! It's like no one  
 is willing to touch anyone else  
 because they are scared the other  
 guy might have the SARS or Ebola  
 virus.

COMMENTATOR 3

Everybody is prejudiced against  
 everybody.

COMMENTATOR 2

It's like I extend my hand to you  
 right now. You want to shake my  
 hand, right? But you are also  
 thinking, "where has this guy been?  
 Maybe he has Ebola." So nobody  
 wants to shake my hand. The  
 downside for refusing to do that is  
 minimal.

COMMENTATOR 3

Better safe than sorry.

COMMENTATOR 1

But if we had agreed before the Ebola scare set in that today you would shake my hand at this moment or else--, you'd be stuck shaking my hand right now.

COMMENTATOR 2

Or you could manufacture a hand that takes a bit out of all of us to shake my hand. That way everyone's potential exposure to the virus would be minimal

As he speaks an animation shows a matching hand made from small part from all the participants much like K.'s earlier explanations on BICs.

COMMENTATOR 1

That's what the Jules Verne of the world does. Now let's step back from science fiction into conceivable solutions in the near future.

RETURN TO SCENE

KONGSHU

That's not science fiction. That's BICs. BICs check it out! Check it out! BICs. I can't believe this!

He starts typing on the laptop, opening files, e-mailing.

MINUTES LATER

He opens Skype and dials.

SPLIT SCREEN: INT. HONG YAN AND KONGSHU APARTMENT - NIGHT/  
FIGLOO'S OFFICE - DAY

K./Kong Shu is on the Skype phone with Figloo, now president of the mathematical finance society, who is organizing a conference of professionals on "Mathematical models and the crisis" K. Wants his work to be published as an article in the journal he edits and to make a presentation at the conference.

FIGLOO

What you wrote is an exceedingly difficult read. But I tried.

(MORE)



FIGLOO (CONT'D)

What really got me to throw up my hands in the air and give up is when you talk about imaginary derivatives contracts. I mean I've been in the derivatives business for more than thirty years, and I've seen all sorts of cranks and cranky stuff come and go, but imaginary derivatives, that's like...

K.

But Figloo, the complexity of any human experience, situation can only captured in a representation that is the sum total of reality plus imaginary reality. Like we learn in high school math,  $C$  equals  $R$  plus  $iR$

INSERT - K. SCRIBBLING ON A PAPER SHEET

**$C=R+iR$**

BACK TO SCENE

K.

When Einstein performs Gedanken experiments to make a point, the argument still have actual practical use, solving real world problems even if he is describing purely imaginary situations, you see, that's what is involved here.

FIGLOO

Be real! Now you are Einstein?

K.

Figloo.

(beat)

I am myself. And by the way, if you think about it, the actuality of what we think 'real,' like the idea of continuous time, continuous time trading that has served us poorly in this crisis, is often illusory.

FIGLOO

(rolling his eyes)

What?

K.

Prof. Figloo, if you'd give me a chance to come and speak at the conference you are organizing, I'd gladly come and make a fool of myself, how about that?

FIGLOO

So that you can make me look like a fool too? Look, I have to go.

He hangs up. K. continues fiddling on his paper. It soon shows a figure that is eerily reminiscent of the Bachelier drawing when he was turned down on the publication of his book.

HONG YAN

(Ni yizhi zai bijiben  
diannao kan meiguo  
xinwen, you shenme shi  
a?)

You are always on your laptop watching American news. What's happening?

KONG SHU

(Meishi. Hen wo de bendan.)  
Nothing. Just a hater.

HONG YAN

(Hen ni a? Mei ren neng hen  
Kong shu ba. Kong shu shi  
ge shen ren)

Hating you? No one can possibly hate Kong Shu. Kong Shu is a saint.

KONG SHU

(Shi ma? Jiu ta hen K. Ba!)  
Really? In this case he hates K.

HONG YAN

(K. yijing si le. Zhi you  
you Kong Shu.)  
K. Died. There's only Kong Shu.

KONG SHU

(Hong Yan, Hong Ya! Ruguo  
meiyou ni, wo zenme huo  
ne?)  
Hong Yan, Hong Yan! How could I live without you?

He gives her a kiss and goes to the kitchen.

LATER

We see K. Alone in the dark fixated on his laptop, typing.

CLOSE UP ON E-MAIL TEXT

Dear Prof. Figloo

My name is Kong Shu. I am at China National University. I have developed new approach to mathematics that can help with crisis. I wish present work at your conference.

Sincerely,

Kong Shu

MINUTES LATER

E-mail reply arrives from Figloo.

Dear Prof. Kong Shu.

We would indeed be glad for you to be a speaker at our conference. We are eager to hear voices from China on their approach to these timely critical issues. I am copying my assistant Nina on this e-mail who will contact you to help arrange all practical issues relating to the conference.

KONG SHU (CONT'D)  
(thumbing himself up)  
Ha!

EXT. BEIJING PARK - DAY

SUPER "DAYS LATER"

Hang Yan and Kong Shu are walking side by side by a pond in a traditional imperial style garden.

KONG SHU  
(Wo yao hui jia)  
I want to return home.

HONG YAN  
(Zhe shi ni de jia)  
This is your home

KONG SHU  
(Wo yao hui Meiguo)  
I want to return to the United  
States

HONG YAN  
 (Zenmehui a?)  
 How come?

KONG SHU  
 (Buyong guanxin)  
 Don't worry.

HONG YAN  
 (Wo zenme bu guanxin)  
 How could I not?

KONG SHU  
 (Ni Pa ma?)  
 Are you afraid?

HONG YAN  
 (Ni yiqian shuo guo. Ni gen  
 wo shi zhishu de jieguo.  
 Wo hen pa ni li wo hui  
 bian duishu de jieguo)  
 You once said that you with me gave  
 us exponential strength. I am  
 afraid we apart will break into  
 logarithmic strength.

She starts writing on a napkin. Kong Shu takes a look.

INSERT NAPKIN SCRIPT

KONG SHU <3 HONG YAN = EXP(KONG SHU + HONG YAN)

KONG SHU </3 HONG YAN = LOG(KONG SHU/HONG YAN)

RETURN TO SCENE

KONG SHU  
 (Ni zhe ge tiancai! Na suan  
 le. Wo bu qu)  
 You are a genius! That is the  
 universal equation of love  
 All right. I won't go.

HONG YAN  
 (Zhi you zai Putonghua women shuo  
 ni aishang le bieren. Nimen zai  
 yingyu shuo "you fall in love.")  
 Except that in Chinese we say "you  
 rise up to love." In English you  
 say "you fall in love."

INT. HONG YAN AND KONSHU APARTMENT - NIGHT

K. Again alone in the living room fixated on his laptop, watching market commentators.

INSERT LAPTOP VIEW

COMMENTATOR 1

The problem is nobody knows what anybody else has, if they will be there tomorrow.

COMMENTATOR 2

No omniscient God. Well if we had a central counterparty on all trade, like they do at exchanges, that would help. But who would be that?

COMMENTATOR 3

Government--

COMMENTATOR 2

Even at this time, the idea of that kind of bureaucratic Big brother--

COMMENTATOR 1

The house is burning. I mean the Fed is stepping in that role right now in very expensive ways, loading its balance sheet to unprecedented levels.

RETURN TO SCENE

KONG SHU

(Waving both hands)

Holistic theorem. Holistic theorem!

He stands up and starts pacing the room. He opens the door to the bedroom. Hong Yan is sleeping. He starts gazing at her. He goes next to the bed and watch her beautifully asleep. The "Only fools rush in" tune plays in the background as the scene closes out.

And then he turns and looks at the two yin-yang (Taijitu) drawings hanging in their room. "The beauty and the beast" and "Crisis Danger Opportunity." The scenes concludes with his eyes fixated in close up on the Crisis drawing.

SPLIT SCREEN/ INT. HONG YAN AND KONGSHU APARTMENT- DAY / INT.  
PLANE TO NEW YORK - DAY

Split screen shaped into the yinyang drawing as Kong Shu is seen into the plane looking at the window eyes filled with tears and wiping away/

Hong Yan arrives in the apartment. She starts taking off her work clothes.

HONG YAN  
(Kong Shu, ni zhidao ma--  
Kong Shu? Kong Shu?--)  
Kong Shu, Kong Shu, you know-- Kong  
Shu, Kong Shu?--

She notices the note on the table. It reads:

INSERT - The Tang Dynasty poet WANG WEI's "Double Ninth, Remembering my Shandong Brothers," as it is read as she looks at the note, by Kong Shu in voice over.

KONG SHU  
**As a lonely stranger in a foreign  
land,  
At every holiday my homesickness  
increases.  
Far away, I know my brothers have  
reached the peak;  
They are covered with laurels, but  
one is not present.**

See: [https://en.wikipedia.org/wiki/Double\\_Ninth\\_Festival](https://en.wikipedia.org/wiki/Double_Ninth_Festival)

RETURN TO SCENE

As she reads, she wipes away tears, as the image of President Obama's swearing in ceremony hovers in the background.

K. Is looking at the window as the plane lifts off, tears flowing off his cheeks. He chokes.

Dark clouds hover over the Beijing landscape, as a coal power plant in the horizon exhales smoke in the atmosphere.

The scene closes as the black and white parts of the taijitu split screen containing Hong Yan and K. split and scramble into the next scene.

EXT. NEW YORK HIGHWAY TO THE CITY -DAY

K. driving in the fast lane towards the conference center. In the background, we can notice a graphic depiction of the fixed point theorem. A copy of a text is by his side. He peaks at it once in a while.

H is suddenly slowed down by a car ahead of him slowly driving below the minimum speed on the fastlane, while on the phone. He flashes lights to call the driver's attention and is ignored by the driver. There is a driver to K.'s right side lane, so he cannot quickly change lanes. He honks and is ignored. It goes on for a little while. Finally the driver to his side clears the side and he is able to change lanes and go past the slow driver. As he passes him, he makes a sign to indicate to the driver that he is on the fast lane. Suddenly the man puts a police hat on, attaches emergency flashlights on the hood of his car and signals to K. to pull to the side. K., incredulous complies as the two cars park on the roadside. As he comes out of his vehicle advancing towards K., It is clear that he is a POLICE SERGEANT.

K.

Is there a problem, officer?

POLICE SERGEANT

Sir, registration, driver's license and insurance?

K.

May I know why I am being stopped?

POLICE SERGEANT

Reckless driving on the Highway.

K. Shakes his head in disbelief.

K.

Excuse me?

POLICE SERGEANT

Sir, watch the tone of your voice.

K. bends to look for the vehicle's papers on the side.

POLICE SERGEANT (CONT'D)

Hands up, Sir.

K.

What?

POLICE SERGEANT

Hold your hands up there for a second. Whose jacket is that?

K.

Mine.

POLICE SERGEANT

Can you lift it up?

He notices the badge on it. The name says "Kong Shu"

POLICE SERGEANT (CONT'D)

Now whose jacket is it again?

K.

Mine.

POLICE SERGEANT

Why does the name say "Kong Shu" on it?

K.

That's my name.

POLICE SERGEANT

(Pointing to the driver's  
license)

Well, that's not what I am reading here.

K.

Officer, what I am being accused of?

POLICE SERGEANT

Cool down, OK?

The Officer takes off his handgun.

K.

Just so that you know, my phone is recording all of this.

POLICE SERGEANT

(A panicked expression on  
his face)

Where?

K.

Look right between my legs.

The officer promptly puts his handgun back in as he notices the cell phone on. He also notices the sheet by K.'s side that he was earlier peaking at. It reads "The man in the arena," for lines excerpted from Theodore Roosevelt's (1910) "Citizenship in a Republic" speech.



POLICE SERGEANT

Oh, you are a new age Malcolm X mission in the arena for lawsuit money, huh?

(starts scribbling)

Here's your ticket, Sir!

K.

For what?

POLICE SERGEANT

Well, you'll make your case in municipal court, won't you?

INT. NAVY MINISTRY CABINET - DAY

Lerob is now minister of the Navy. Bachelier is sitting at the reception room antichambre to the minister's office facing the secretary by the door. The Minister walks past his secretary and Bachelier jumps past and forces himself on Lerob.

BACHELIER

Monsieur le Ministre!

LEROB

Bachelier!?

BACHELIER

I have been waiting all morning.

LEROB

Did we have a scheduled appointment?

BACHELIER

Oh, it's been such a long time. I just did not think the Ministre--

LEROB

Well, what can I do for you?

BACHELIER

It will be less than five minutes.

LEROB

All right. Five minutes.

They walk into the office.

BACHELIER

Mr. le Ministre, I am about to be appointed for a chair in Dijon and I wanted a chance to consult on the Navy war preparedness.

LEROB

Well, well, well.

BACHELIER

You know my research has applications in Finance and Physics.

LEROB

But typically these are missions we assign to tenured faculty of weightier standing.

BACHELIER

I just wanted to say Mr. le ministre that if I offended you at some point in the past, I am now your most ardent fan.

LEROB

All right. I'll tell you what. When you get appointed, let's talk about it some more. OK?

EXT - COUNTRY ROAD - DAY

Middle aged Bachelier and his older sister Clotilde are walking along the road. Bachelier is holding a travelling bag as if he has just come to visit Clotilde. It is very clear they have not seen each other in a while.

CLOTILDE

I can't believe you shaved your beard. Look at you, all well groomed.

BACHELIER

Oh, stop giving a hard time to this old man.

CLOTILDE

Old man! We can find you a new wife in no time. Which young one is taking care of you these days--

BACHELIER

Stop it will you.

CLOTILDE  
I am just happy to see like  
yourself again.

BACHELIER  
Hope.

CLOTILDE  
Hope what?

BACHELIER  
I may be getting a professorship  
chair soon.

CLOTILDE  
No kidding! About time. Where?

BACHELIER  
Dijon. There are only two  
candidates left. When I was a  
substitute there everybody liked  
me. They say I am a favorite  
against a much younger candidate--

INT.- LEROB OFFICE-GREVEY OFFICE - DAY

Split Screen on Lerob on the phone with Professor Maurice  
GREVEY chairperson of the math chair recruitment committee.

LEROB  
I hear that you are selecting  
cranks for Math chairs now--

GREVEY  
Who's that?

LEROB  
Even people who write theories of  
speculation.

GREVEY  
Ah!-- Well, rest assured that that  
is not happening.

INT. DIJON UNIVERSITY- AUDITION ROOM (1926)-DAY

The committee for the appointment of a new professor for the  
chair of mathematics, chaired by Professor Maurice Grevey.  
There are three panel members facing Bachelier, but Grevey  
seems to mobilize is framing like an inquisition.

GREVEY

We all know you're the man, Bachelier. But, Cerf, too is the man. His thesis was just seven years ago. You on the other hand, have a long and established record that we can look at.

BACHELIER

I am sure reading through it will convince anyone that I've long been due a professorship.

GREVEY

Let's review the record then shall we?

BACHELIER

Certainly. I have established very remarkable results in pure and applied mathematics.

GREVEY

Some of them speculative, perhaps.

BACHELIER

Well, theory without practice builds impressive shells on the outside, that will crack apart on the first clash with reality. And finance is a foremost field that brings reality back to us

GREVEY

I am particularly interested by your 1913 paper

BACHELIER

Oh, OK.

GREVEY

I was very interested because it introduces some of the results that the American mathematician Wiener exposes in his 1923 paper on what we will call the Wiener process.

BACHELIER

Indeed, while my work is discounted here, internationally some are paying attention to it, and perhaps my name should be associated with it.

GREVEY

I was nonetheless struck that you note  $v$  as a constant for the standard deviation of this process over small time increments

BACHELIER

Indeed

GREVEY

So,  $v$  is a constant in your view?

BACHELIER

I am not sure what you are getting at--

GREVEY

Well, I have checked that part and it seems trivially incorrect.

BACHELIER

You read the whole paper and that is all you think is worth saying about it?

GREVEY

For someone seeking a professorship in mathematics, that should be of some concern no?

BACHELIER

I wonder what the other panel members think here.

Grevey turns to them, as asking if they care to speak. They both gesture that he keeps on.

GREVEY

Well Mr. Bachelier, I have checked this with Paul Levy in Paris, and he concurs that this is a pretty fatal flaw.

BACHELIER

Do you remember "The Animals Sick of the Plague?"

GREVEY

Well, if this has to be a contest on Lafontaine's fables, may I ask you if you remember "The Crow and the Fox"

BACHELIER

What does that have to do with anything here?

GREVEY

Well someone has been outfoxed.

BACHELIER

Mr. Levy has written a work of 300 pages on probability without even opening my book on the same subject, the book which is, in some respects, above the book by Laplace and which contains significant new results

GREVEY

So are we being served the argument that I cannot read a mathematical proof? And not only that, must we concede that Paul Levy too is an ignoramus?

Bachelier looks at the panel members for a few seconds, speechless.

GREVEY (CONT'D)

Mr. Bachelier, anything to say?

Bachelier takes a deep breath. And then finally:

BACHELIER

I am being Dreyfused.

GREVEY

What?

BACHELIER

I am being Dreyfused.

Grevey starts acting outraged. Bachelier looks directly at him, intensely.

BACHELIER (CONT'D)

And I will not dignify this charade any longer.

He takes his bag and walks out of the stunned selection panel.

Moments later, we see him walking along a long foggy sinuous road, alone.

In voice over, the following poem is being read, as it appears simultaneously on screen

See [Appendix 11](#) "Krank" Poem.

INT. CONFERENCE ROOM. DAY

We see Kong Shu(K.) in a conference room into his lecture "On the Mathematics of Uncertainty & Decision Making in View of the Present Crisis" shown at the entrance door and on the projector screen. The room is almost full of LISTENERS. There is a black man SECURITY GUARD near the door standing together with a Latino woman, both seemingly in their mid thirties.

KONG SHU

The present crisis emerges out of our use of a deficient method of imagining how we make decisions under uncertainty, a mathematical representation that fails to account at its core the ancient Aristotelian truisms of persuasion, the false belief that trading, all the time, is not only possible, but is the most effective way of reducing risks.

LISTENER 1

Is there any news here.

KONG SHU

No. Indeed, those who created those mathematics would be turning in their caskets if they knew what use their works has been put to. Others have sensed that these problems where there.

LISTENER 2

Is there a new principle you want to outline?

KONG SHU

Yes, commitment. A most ancient method of reducing risk is through commitment and pulling resources together.

LISTENER 2

How do you do that?

KONG SHU

Well, it all starts with a contract, what people are willing to pay for something that is not a sure thing.

WHISPERING IN THE CORNER..

MALE SECURITY GUARD

Yeah. Show me the money baby.

LATINA SECURITY GUARD

Money talks and everything else walks.

MALE SECURITY GUARD

(Smiling)

So baby, no money, no honey huh?

RETURN TO MAIN SCENE

KONG SHU

In the way we financially commits in contracts, we imbed our beliefs about how much credibility we are according the other side, our feelings about things, how rationally we estimate likely. By identifying the elemental contracts that you embed the canonical elements of persuasion.

LISTENER 1

What contracts are those.

KONG SHU

Well, Basis Instruments Contracts or BICs.

Show the letters of BIC (B I C) inside an elemental Sierpinski triangle being projected on the screen. See [Appendix 13](#).

LISTENER 2

What's special about them?

KONG SHU

They are elemental contracts that can be combined to yield any contract you can conceive. They allows us to share the risks in any contract.



As he speaks he extends his hand and we see virtual green lighted hand, assembled on the fly from small blocks coming to match his.

WHISPERING IN THE CORNER..

MALE SECURITY GUARD

Yeah, we're all in together or all out together, right!

RETURN TO MAIN SCENE

LISTENER 3

What about behavioral economics, behavioral finance?

KONG SHU

I know. They're the trendy thing these days. But the insights of behavioral sciences at best only help refine data that can be seamlessly input into the enabling mathematical structure that we create, in to help us automate how we decide to price BICs.

LISTENER 1

Don't you think this feels like deja vu all over again? Shouldn't we be asking why we seem trapped in this pattern?

KONG SHU

The boom/bust cycle is unavoidable, it is convenient to say. A fish must swing in water to move forward. But the frog leaps forward in discrete increments, just as we go over steps up floors.

We get in the background a flashback of K. watching a fish swim and a frog in the rain after his father passed, going over steps and ramp up to his office.

LISTENER 1

What?

KONG SHU

What I am saying is that the right structure can reduce volatility within tolerable levels and constrain the magnitude of swings.

LISTENER 3

So?

KONG SHU

Just as New Deal's institutional structures constrained the scope of recessions for many decades after, here, with these mathematics we are offering a language to encode a more effective thought process. For, as someone said, if thought corrupts language, the mathematical language we have spoken for too long has corrupted our thoughts on decision making under uncertainty.

A LISTENER

(Shrugging)

This seems too good to be true.  
Have you published this somewhere?

He takes out a copy of the book that Karma had edited before he died: "BICs 4 Derivatives Volume I: Theory" by Louis Bachelier, Jr.

INT. CONFERENCE HALLWAY - DAY

We see Figloo arriving down the conference hallway. As he passes by the door where K. Is giving his lecture, he reads the name and topic on the window and smiles. Then he comes back and peaks through the square glass door eye viewer and recognizes K. And pulls back shocked. And then he barges in.

FIGLOO

But that is not Kong Shu! How did he get there?

Pause. Eyes turn towards Kong Shu.

KONG SHU

My name is Kong Shu.

FIGLOO

I know him. He is no Kong Shu This is an impostor! Where is Nina my assistant again? How did this happen?

A LISTENER

Who is he?

FIGLOO

He's a crank who peddles imaginary theories. Who is it again?  
His name is what's that again?  
Yes, K., K. That's right K.

KONG SHU

Does whom you think I am makes what I am saying less true?

FIGLOO

How can we condone such violations of basic principles of professional integrity.

(Towards the security guard)

Security, call police, please.

The Security guard seems surprised, unsure what to do. Then he raises hands and shoulders in a shrug as he exits the room.

KONG SHU

Everything that could have prevented this crisis is here, and I think it deserve to be heard.

Confusion People starts taking over the room. Some start leaving

A LISTENER

But the author of the book is Louis Bachelier Jr.

FIGLOO

You are Kong Shu, Louis Bachelier and K, right?

KONG SHU

Yes, they are all me. They have narratives that differ a bit here and there, but at their core speak to the same issue. So they are me.

A LISTENER

What's that?

KONG SHU

The issue of prejudice that harm us all, reduce us to less than what we could be.

FIGLOO

What a fraud!

He steps outside. An officer has arrived on the scene and Figloo rushes to him. It is the police sergeant with whom K. Had an argument on the highway.

FIGLOO (CONT'D)

Good morning, Sergeant. Thanks for getting here so quick.

POLICE SERGEANT

Good morning Sir. What's happening?

FIGLOO

We have a very dangerous individual who is hijacking our conference proceedings.

POLICE SERGEANT

Where's that?

Figloo leads him to the conference room door. He peaks to through the glass and immediately recognizes.

POLICE SERGEANT (CONT'D)

Holy-- I know what we are dealing with. Hold on.

(He radios in.)

Get the SWAT team here asap. Possible hold up and imposture in progress.

He heads into the room and starts crossing his hands that it is over.

KONG SHU

You are denying me the right to speak because I do not look the part, because I do not feel the part. That is all this talk is about--

FIGLOO

The man is a crank. You see? He's clearly dangerously delusional.

POLICE SERGEANT

I know. We are going to deal with it.

KONG SHU

The issues that lead to this crisis are issues I spoke of beforehand. I have a structural prescription against them.

The remaining listeners vacate the room.

POLICE SERGEANT

Sir you have to exit the room right now or force will be used against you.

KONG SHU

What I speak of will help us all--

POLICE SERGEANT

Sir, this is our last warning.

The lights are turned off the room turns dark with only the projection laptop's light on.

KONG SHU

I am just asking for the right to speak.

POLICE SERGEANT

But you can speak all you want out of these premises.

KONG SHU

The right to speak, to finish what I started before they who can understand what I speak of.

POLICE SERGEANT

All right Sir, we are done talking.

FIGLOO

This man is clearly out of his mind!

We start seeing aiming lights of sniper guns cutting through the darkness, pointing towards K.s head. He raises his hands in the sign of the cross.

KONG SHU

I am not crazy. Or anything.

Jean Jacques Goldman's "La-Bas" starts picking up the lights from the projector start pushing series of triangles related to BICs in very edgy animation ([Appendix 12](#) shows illustrative static version). The scenes ends on the music the sniper aiming on K. hands in raise in the sign of the cross, alone in the dark room.

As it closes we get scenes that quickly replay some of the various puzzles, card and mathematical tricks, quizzes that populated the narrative, with solution cues.

FADE OUT.

**APPENDIX TO THE SCRIPT I, BACHELIER**

<b>Appendix Number</b>	<b>Item Title</b>	<b>Reference page in Script</b>
1	Text of “Le laboureur et ses enfants” in French	3
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**APPENDIX 1: Le laboureur et ses enfants (The rich farmer and his children) – In French**

CHILD (V.O.)

(singing, in French, as illustrative images slide, with English subtitles -(1))

Le laboureur et ses enfants  
(The rich farmer and his children)

INSERT ANIMATED DRAWING

Sample animated drawings in Black & White of a Rich Farmer and Sons on his deathbed, sons gathering  
by his side.

FARMER

Travaillez, prenez de la peine:  
C'est le fonds qui manque le moins.

CHILD (V.O.)

Un riche laboureur, sentant sa mort prochaine, fit venir ses enfants, leur parla sans t

FARMER

Gardez-vous (Coughs)

CHILD (V.O.)

leur dit-il,

FARMER

de vendre l'héritage

Que nous ont laissés nos parents:

Un trésor est caché dedans.

Je ne sais pas l'endroit ; mais un peu de courage vous le fera trouver, vous en viendrez à bout

Remuez votre champ dès qu'on aura fait l'Oratoire.

Creusez, fouillez, bêchez; ne laissez nulle place

Où la main ne passe et repasse."

INSERT IMAGE

Sample animated Black & White drawing of Sons at work in the fields

CHILD (V.O.)

Le père mort, les fils vous retournent le champ,

Deçà, delà, partout ; si bien, qu'au bout de l'an

Il en rapporta davantage.

D'argent, point de caché. Mais le père fut sage

De leur montrer, avant sa mort,



Que le travail est un trésor.

**APPENDIX 2 : La politique de la France ne se fait pas à la corbeille.(In French)**

PRESIDENT DE GAULLE

La Bourse, en 1962, était exagérément bonne, en 1966, elle est exagérément mauvaise, mais vous savez, la politique de la France ne se fait pas à la corbeille"

See : <https://youtu.be/HsG5RomoWYQ>

# APPENDIX 3

Handwritten text, possibly bleed-through from the reverse side of the page. The text is mirrored and includes the words "POETRY" and "CROSS".

C= R+iR

#### APPENDIX 4 : Je Cherche « Tintine » Adapted Lyrics (Augustine)

Mon parrain des jours pristines  
Qui avait t te et positions,  
M'a dit : Je pars pour la c lestine  
Et tu connais mes conditions :  
Mon h ritage je te le destine  
Mais tu ne toucherais pas un rond  
Si tu ne prenais pas soin de Titine  
Pour qui j'ai une adoration... "  
Y a quatre ans que je ne l'ai point vue  
Et je suis bien entitin ...

{au Refrain}

Je cherche apr s Titine, Titine, Augustine !  
Je cherche apr s Titine et ne la trouve pas  
Je cherche apr s Titine, Titine, Augustine !  
Je cherche apr s Titine et ne la trouve pas

Elle avait les yeux en losange  
Un regard tr s compromettant  
Elle tait fris e comme un ange  
Et s'tortillait tout en marchant  
Titine, avec son cœoeur frivole  
Changeait de flirt dix fois par jour  
J'en avais honte, mais ce qui me d sole  
C'est qu'elle est partie pour des ans  
C' st ... vous la reconnaîtrez bien  
Une chienne qui a vraiment du chien.

{au Refrain}

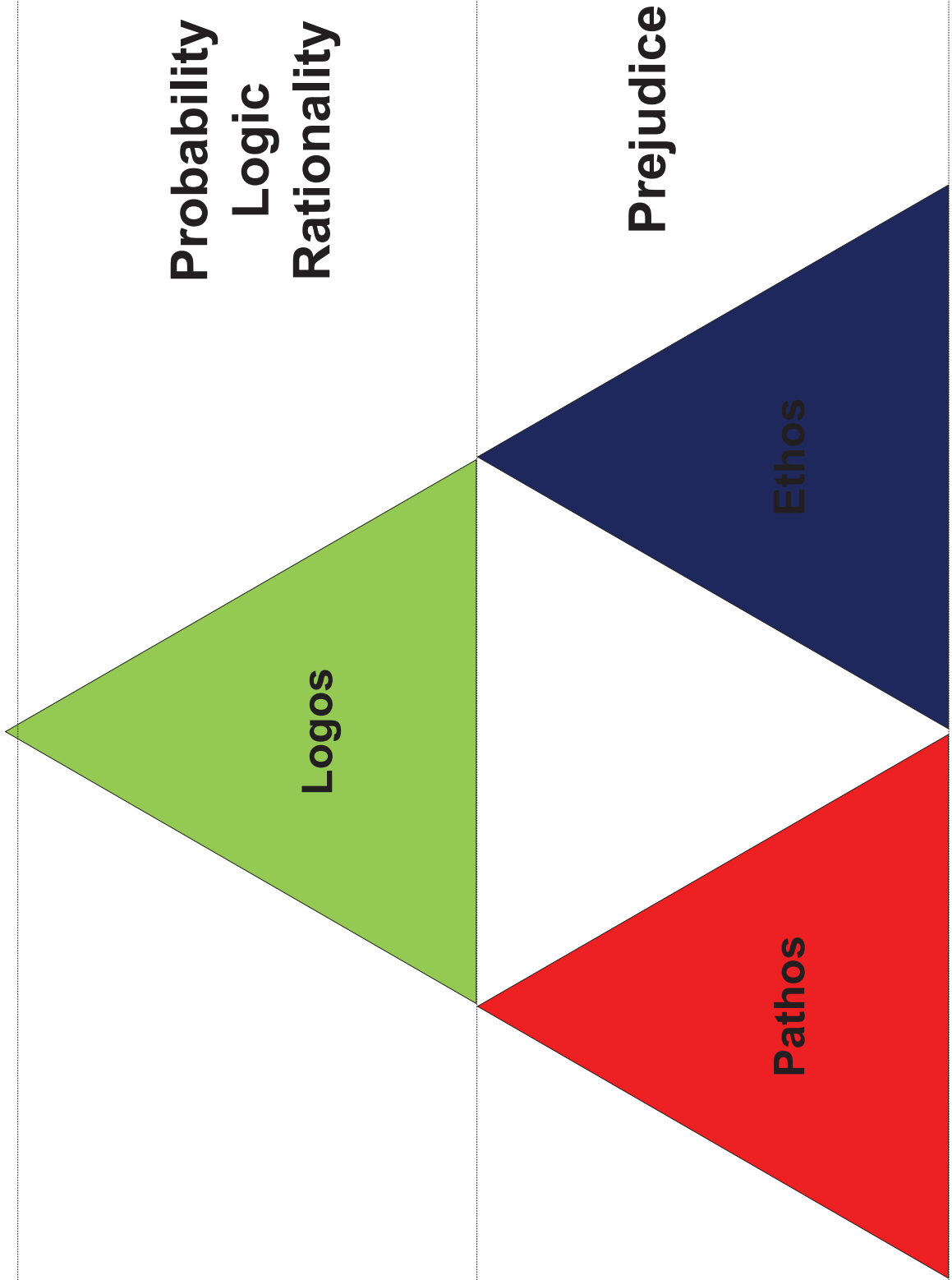
{au Refrain}

Je cherche apr s Titine, Titine, Augustine !  
Je cherche apr s Titine et je la trouve donc.

Audrex recording at: <https://youtu.be/CjYyUzC16zU>

Charlie Chaplin version in Modern Times at: [https://youtu.be/-Jhxbo5I8q4?list=PLpCzFS\\_x1mQdw1j2IczHSlqtFn-NvHjX8](https://youtu.be/-Jhxbo5I8q4?list=PLpCzFS_x1mQdw1j2IczHSlqtFn-NvHjX8)

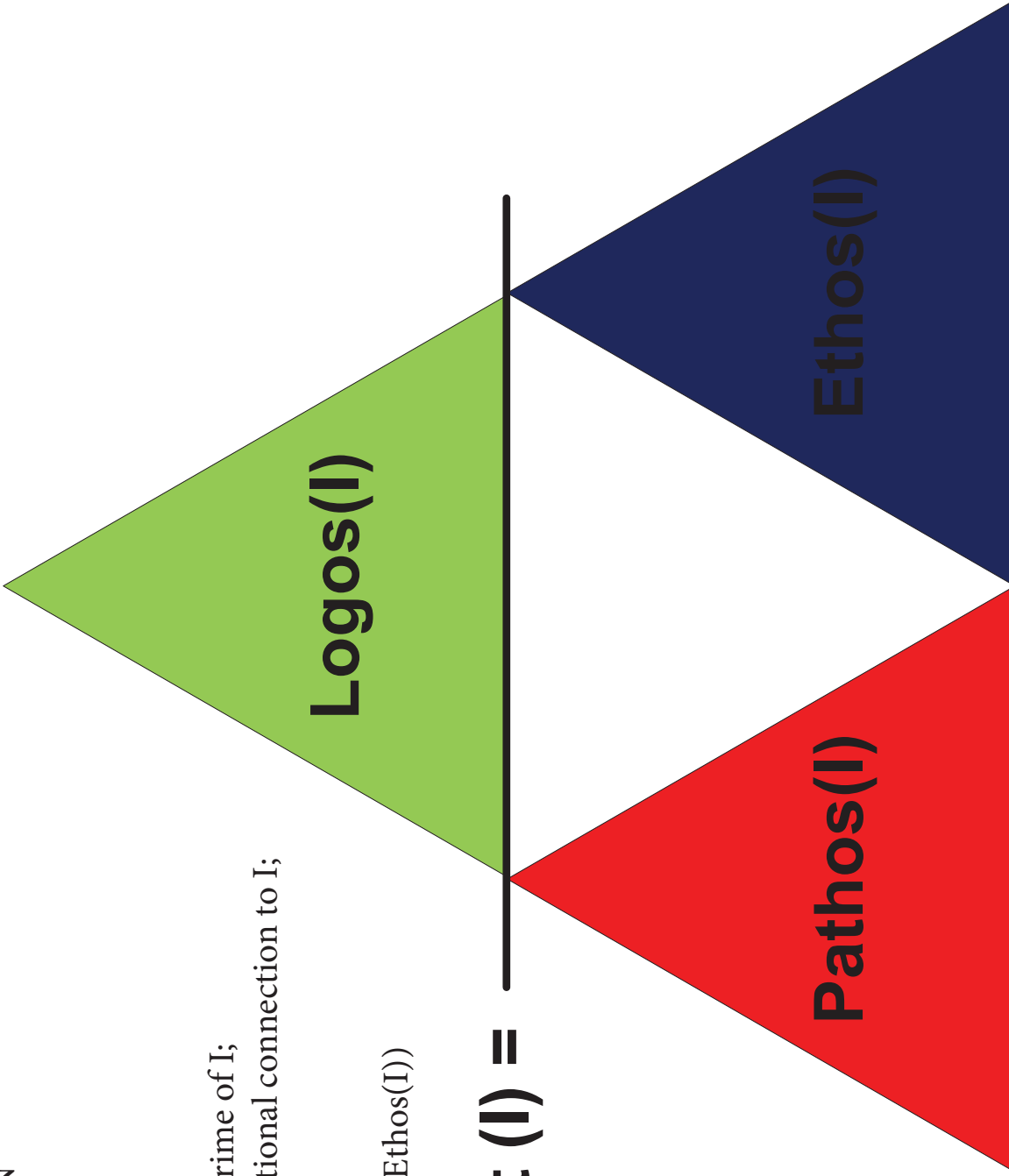
**APPENDIX 5: ELEMENTS OF PERSUASION**



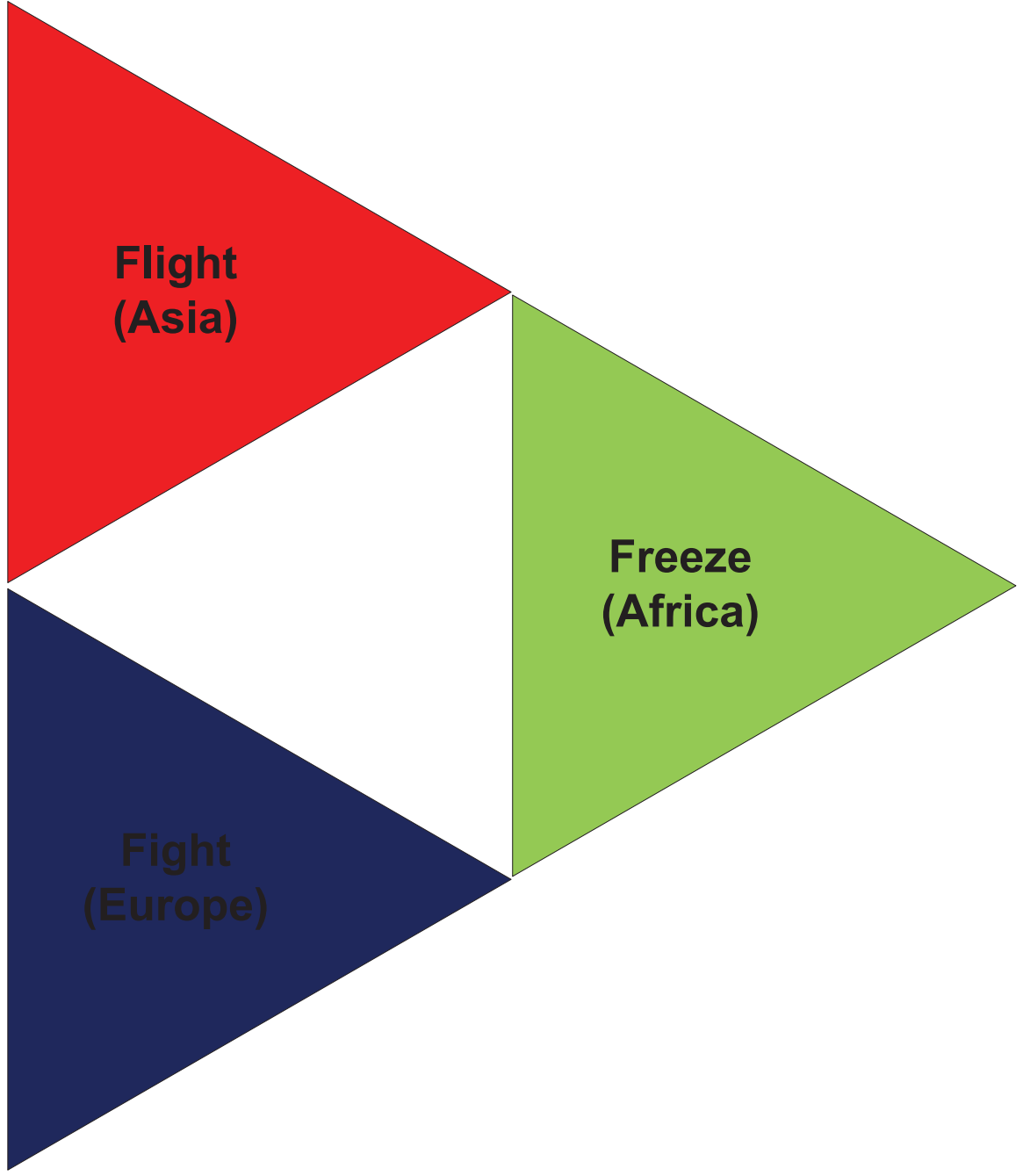
APPENDIX 6: PUNISHMENT FUNCTION

- I = Individual;
- Logos(I) = Logical appraisal of the Crime of I;
- Pathos(I) = The strength of our emotional connection to I;
- Ethos(I) = The respectability of I;
- Punishment(I) = Punishment of I;
- Punishment(I) =  $\text{Logos(I)} / (\text{Pathos(I)}\text{Ethos(I)})$

**Punishment (I) =**



**APPENDIX 7: FIGHT- FLIGHT-FREEZE**









## APPENDIX 10: "The Foolish Old Man Removes the Mountains" - "愚公移山"

(Excerpted from Mao Zedong's Speech June 11, 1945)

There is an ancient Chinese fable called "The Foolish Old Man Who Removed the Mountains". It tells of an old man who lived in northern China long, long ago and was known as the Foolish Old Man of North Mountain. His house faced south and beyond his doorway stood the two great peaks, Taihang and Wangwu, obstructing the way. He called his sons, and hoe in hand they began to dig up these mountains with great determination. Another graybeard, known as the Wise Old Man, saw them and said derisively, "How silly of you to do this! It is quite impossible for you few to dig up those two huge mountains." The Foolish Old Man replied, "When I die, my sons will carry on; when they die, there will be my grandsons, and then their sons and grandsons, and so on to infinity. High as they are, the mountains cannot grow any higher and with every bit we dig, they will be that much lower. Why can't we clear them away?" Having refuted the Wise Old Man's wrong view, he went on digging every day, unshaken in his conviction. God was moved by this, and he sent down two angels, who carried the mountains away on their backs.

Ref: [https://www.marxists.org/reference/archive/mao/selected-works/volume-3/mswv3\\_26.htm](https://www.marxists.org/reference/archive/mao/selected-works/volume-3/mswv3_26.htm)

中国古代有个寓言，叫做愚公移山。说的是古代有一位老人，住在华北，名叫北山愚公。他的家门南面有两座大山挡住他家的出路，一座叫做太行山，一座叫做王屋山。愚公下决心率领他的儿子们要用锄头挖去这两座大山。有个老头子名叫智叟的看了发笑，说是你们这样干未免太愚蠢了，你们父子数人要挖掉这样两座大山是完全不可能的。愚公回答说：我死了以后有我的儿子，儿子死了，又有孙子，子子孙孙是没有穷尽的。这两座山虽然很高，却是不会再增高了，挖一点就会少一点，为什么挖不平呢？愚公批驳了智叟的错误思想，毫不动摇，每天挖山不止。这件事感动了上帝，他就派了两个神仙下凡，把两座山背走了。

Ref: <http://cpc.people.com.cn/GB/64162/64168/64559/4442117.html>

## **APPENDIX 11: "Krank" poem**

**Krank!**

**They** say we are cranks!

**They** say we say cranky things - down a crank.

**They** say, bewildered, that we are wild.

**They** say we should be avoided, voided, violently opposed.

**Do** they know what we mean?

**Do** they know that they are mean when they are mean?

**Do** they know that their fierceness reveals but their fears?

**Do** they know their midst is the mean of the mediocre minds?

**Not** for today but for tomorrow we've strived.

**Not** for today but for tomorrow we've sought.

**Not** today but tomorrow we'll be rewarded for finding.

**Not** for them - not even for us perhaps - but for THE DAY of the greater minds, we must not yield!

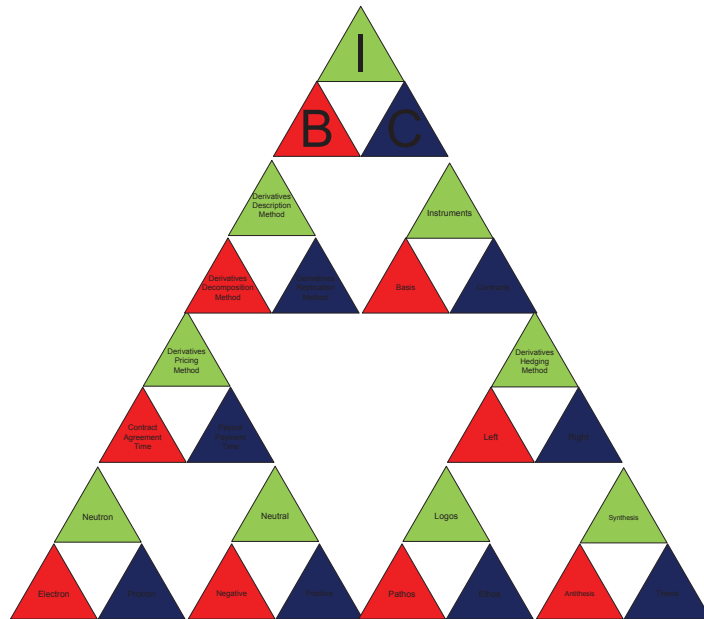
**Know** that we know.

**Know** that their no to us is no to life

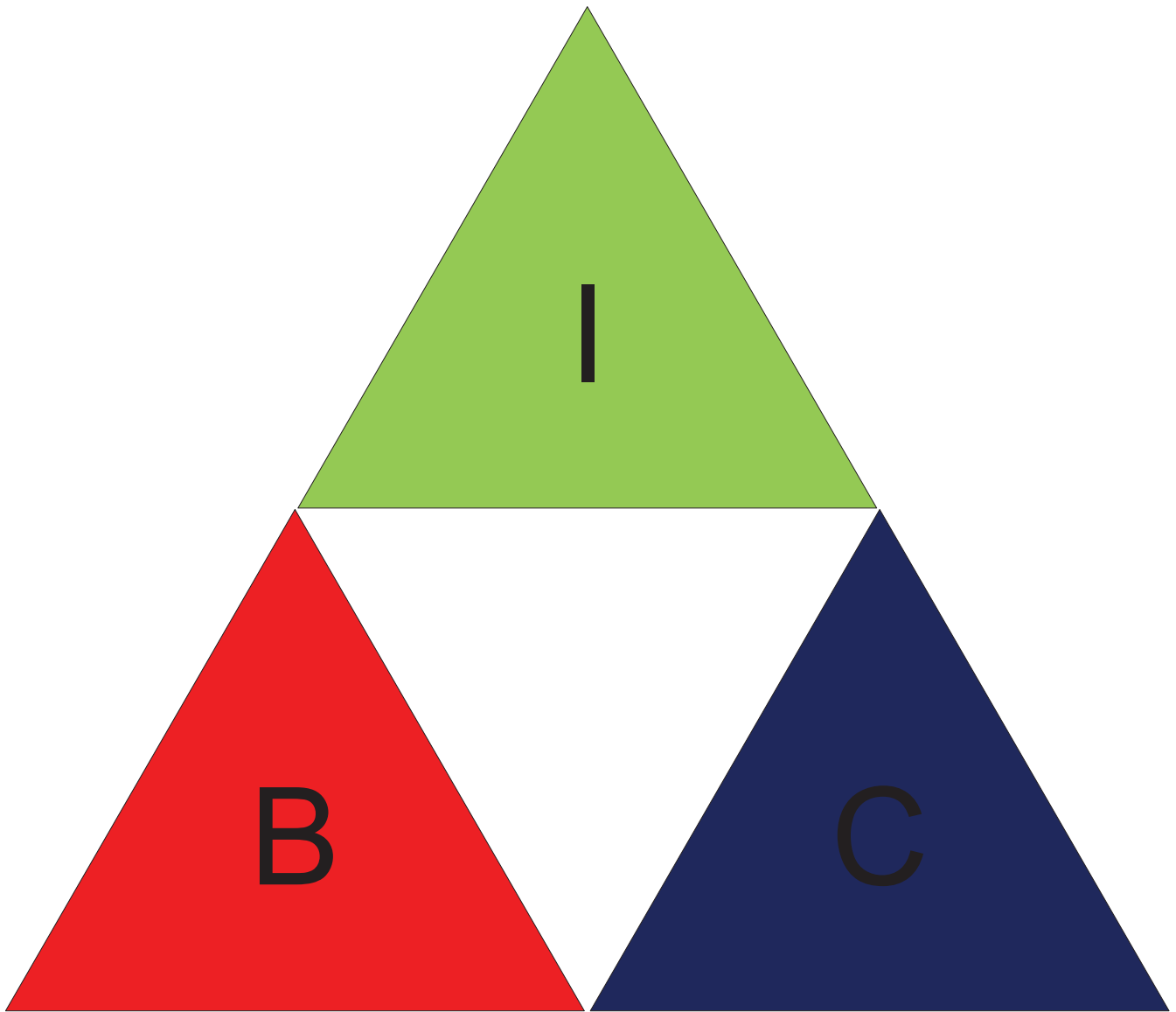
**Know** that they are fated for nose-diving

**Know** that their kindred is the kind to whom history is most unkind.

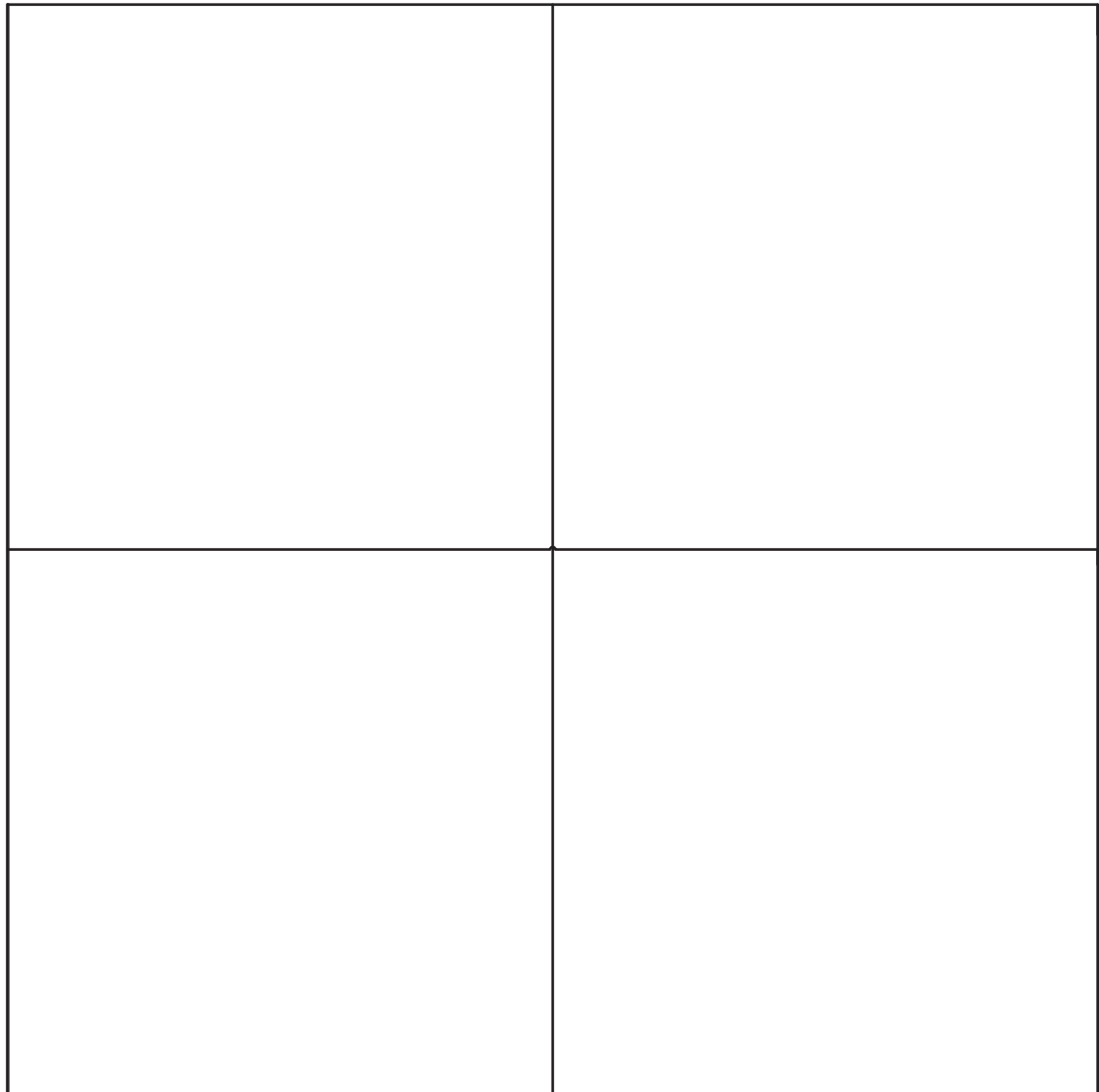
# APPENDIX 12: SIERPINSKI - FRACTAL - BICS REPRESENTATION



APPENDIX 13: SIERPINSKI - B I C



APPENDIX 14:



**The 3-Game as Illustration of the First Mover Advantage**

- Each player has the red or blue stars.
- The winner is the one who aligns them on the square on a straight line first.