Chapter 7

by Joseph J. Jean-Claude

To see what is in front of one's nose
needs a constant struggle.
George Orwell

QUANTUM PHENOMENA IN THE MACROCOSM

As we mentioned before, the debate of all debates in modern physics has long been the question concerning the completeness of Quantum Mechanics, a controversy owing to the mathematical treatment of statistical nature at its foundation. Because probability or statistical theory is overwhelmingly a numeric science with no contemplation or inference with regards to causation and determinants of action, physicists have always felt that the Quantum theory is at a miss when it comes to intimately intelligible interpretation of dynamic systems. Even the proponents from the Quantum School of Copenhagen felt that a philosophical justification was necessary in order to at least provide a view as to the analytic implications of the Quantum Theory, notwithstanding the pressure brought to bear onto them by compelling critics. Amidst this hurly-burly, little to no attention was ever paid to the dimension of discrete Quantum expression in the macrocosm thru the application of the same science of Probability Theory. In the following, we re-examine Probability Theory to show that it encloses a discrete ontological dimension that is universally applicable to all objects permeable to probabilistic treatment, thereby directly relating macroscopic dynamics to quantum dynamics on the basis of a unique Unification theory.

7.1. Applicability of the Grand Eigenfunction at Large Scale

The question of unification of Quantum Mechanics to General Relativity is most easily resolved by considering how quantum phenomenology is rendered in the macrocosm under the auspices of the Quanto-Geometric Grand Eigenfunction and its derivates. The Quanto-Geometric canon, as a symmetry stack bundled in the Grand Eigenfunction, describes the ontological foundations of the continuum of coordinate space and the discretisation of the quantum-scalar, along with their correlations. These ontologies are implicated in all objects and phenomena permeable to statistical analysis thru the Gaussian distribution, which is a derivate of the Grand Eigenfunction, per incipient analysis in Chapter 2. In that sense everything in our immediate or remote living environment that is permeable to the standard Gaussian distribution constitutes evidence of quantum phenomenology right in the midst of the macrocosm.

7.2. Timelessness in Statistical Analysis

The most notable yet least appreciated result in statistical analysis is the absence of the time variable in standard distributions, for all manner of phenomena, all of which are initially and ordinarily inconceivable to us if removed from the trace of the arrow of flowing time. Effectively, the distribution of heights in a population, to take just one example, is an artifact that is totally independent from the passage of time as we understand it. There is no formal statistical time constraint imposed on sampling in order to test for the standard distribution of this parameter in a population. Populations of humans throughout the ages have developed consistent with this configuration pattern for the inception of individual heights. The correlation of events and all manner of genetic and behavioral associations between individuals that will occur within the sample group, and which one may want to subject to time flow at least descriptively, has no bearing whatsoever on the distribution.

The timelessness artifact implicated in statistical treatment has been underappreciated throughout the many developments in statistical physics, especially in its application to the physics of the macrocosm. One may even further argue that one of the reasons why probability theory fits so well to the resolution of E. Schrodinger's equation independent of time culminating in the quantum Hamiltonian is because of its complete estrangement with the time variable.

7.3. Intricacies of the Gaussian Probability Function

The reader who has previously been exposed to the Quanto-Geometric Eigenfunction may have at first rebuked it charging that it is simply a repackage of the long-known Gaussian Distribution function. However several characters of that function provide indices for unsuspected features of the Gaussian that are worth analyzing in the context of this re-examination.

From conversion of the Grand Eigenfunction to its implicit form as undertaken in Chapter 2 Section 6, we obtained at one step:

$$\frac{-s^2q^2}{2q}\cdot\frac{2}{q\sigma^2\left[2\ln q+2\ln\sigma+\ln(2\pi)\right]}=1$$

One may quickly notice that if s takes a zero value, then the absurd result of 0 = 1 ensues. The variable q cannot take a zero value, since *ln(0)* is undefined or forbidden leaving the entire left term undefined in that event. Therefore implicit in the function is the condition that neither s nor q can be equal to zero. These constraints are of paramount significance when it comes to interpretative treatment allowed by the Function. In the explicit expression was already set the condition that the Function may never take a zero value $(q = 0)$ because we could already note that as s becomes infinitely large the function approaches zero value without ever taking that value, making the s-axis equivalent to an asymptote. The implicit expression thus reinforces the constraint on q at the same time that it dictates an equiparable constraint on s $(s \neq 0)$.

The constraint of no q-intercept is not known in Statistical Theory. However, it bears significant phenomenological consequences in analysis inspired by the Function. Should we take q for representing probability density and if s models measurement spread for instance, the constraint of no q-value for s becoming extremely small remits to two significant conclusions:

- No matter how many iterations in measurement in the pursuit of precision, there will always be a probability gradient of error, as small as it might be. In other words absolute certainty (100%) is not possible.

- There will always be a minimal probability gradient of precision, no matter how removed or inaccurate the measurement. In other words, zero certainty, which is equivalent to absolute uncertainty, is not possible.

Very particularly, because the Function admits no q-intercept by reason of discontinuity at s = 0, the notion of total area under the curve and that of said area equaling unity completely vanish. The notion of the area under the curve equaling unity, however, stands for the most fundamental axiom of traditional Statistical Theory. Since the function is simply not smooth, thus not integrable, over the full domain of [-∞, +∞], the total area under the curve of the Quanto-Geometric function cannot be formulated.

7.4. Discretisation in Probability Theory as a Poster Child of Quanto-Geometric Theory

In quanto-geometric analysis, q or $Q(s)$ represents the universal scalar which ontologically gives rises to mass, and s represents universal space or the void spread. The above characterization poses the first restraint on both the continuum of space in any envisaged dimension and the discretisation of the scalar wherever manifest.

Therefore, if measurements of any kind will always incorporate a gradient of uncertainty or error, if data of all kinds gathered in macroscopic phenomenology will always miss a certain mark, it is not just a fact of nature without cause. They are discretisation restraints imposed by the foremost form of distribution at the root of all ontologies and phenomenologies.

7.5. The Problem of Meaning and Causation in Statistical Analysis

While Statistical Theory have been widely used historically throughout the sciences, it is fair to say that it has always left scientists with the unsatisfactory after-taste of incomplete grasp of the actual physical dynamics effectively correlating the variables at play. Statistical accounts do not explain the "why" it happened and only gives a countable account of events, devoid of underlying dynamical meaning.

A large number of groups in the physics of matter at the macroscopic level and the life sciences follow the distribution pattern depicted by the Probability Density Function. Its use is indeed very wide spread in science in general. Below we report just a few of the well-known areas where prospected data is known to conform to the Gaussian distribution:

- Individuals' heights in populations of the living
- Blood pressure in human populations
- Measurement errors in science
- Test grades in education
- IQ scores in psychometrics
- Workplace salaries

- Societal Polling Data

While statisticians do not ask more of the capabilities of this Function and the empirical analytic techniques developed around that Function, in the physical sciences and in particular in certain quarters of theoretical physics, statistical analysis of dynamic systems had historically been considered incomplete, leaving analysts in search for deeper meaning. The nature of statistical physics had been at the center of the famous debate over Quantum Mechanics ever since the publication of the EPR paper. Effectively causation and determinism are completely absent from this form of knowledge. Most feel that the sole rendition of a probabilistic percentile of events does not constitute thorough explanation.

7.6. Standard Deviation Metric

The ignorance of the inner meanings or ultra-structure of the variables of distribution has led to empirical techniques put in place in statistical theory, thereby obscuring the higher order of certainties inherent to macroscopic physical dynamics.

The standard deviation value represents the most critical parameter set forth in statistical theory for measurement metrics. The empirical practice has it that the abscissa of the putative coordinate system for the graph is measured in integer multiples of σ, setting the basis for the so-called empirical rule of 99-95-68. There is nothing in nature or inherent to the theory, however, that confers any particular weight to these percentiles. According to this rule:

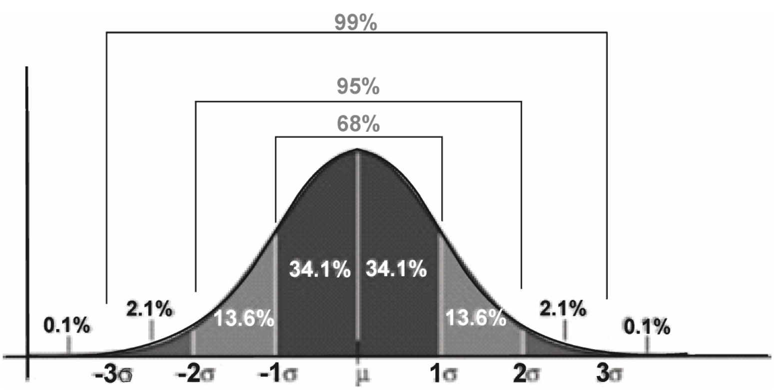


Fig. 7.1 The empirical rule of percentile distribution in Probability Theory

99% of the data corresponds to the area under the curve delimited *by* -3σ and $+3\sigma$.
95% of the data corresponds to the area under the curve delimited by -2σ and $+2\sigma$.
68% of the data corresponds to the area under the curve delimited by -1σ and $+1\sigma$.

An empirical σ metric had been devised for a seemingly rational treatment of sampled data. The one particularity about the standard deviation point that grants it a manner of referential weight is its singular inflexion gradient relating to the curvature of the curvilinear pattern of the function, reflected in its unit value of the abscissa scale.

7.7. Overwhelming Numeric Trend in Statistical Theory

The emphasis on number play is such in Statistical Theory that it might almost be considered a form of Number Theory in its own right. It is inarguably a science more heavily based on querying probability figures than on studying *behavior* per se or phenomenology if at all. Accordingly, the queries are as follows.

A dice is rolled. What is the probability for an even number among the six to show when it stops?

If the probability for the sought event is $p(E)$, $n(E)$ the total count of the sought event and $n(S)$ the total number of possible events, the probability of the sought event is given by the formula:

$$p(E) = \frac{n(E)}{n(S)}$$

In this case:

$$n(E) = \{2,4,6\} = 3$$

$$n(S) = \{1,2,3,4,5,6\} = 6$$

Therefore:

$$p(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$$

$$p(E) = 0.5 = 50\%$$

The above allows us to coin the more general formula:

$$Probability\ of\ Specific\ Events = \frac{Number\ of\ Specific\ Events}{Number\ of\ Possible\ Events}$$

A probability is thus a figure that quantifies the specific with respect to the general, at the same time that it principally concerns physical *events*. Furthermore all probability of specific events must be less than or equal to 1. So it is simply because the number of specific events constitutes a subset of the number of possible events, making thereby the fraction always less than or equal to 1. Additionally, because the probability is a ratio figure and that division by zero is forbidden, the probability cannot be equal to 0. Which leads us to the following conditional statement:

$0 < p(E) \leq 1$, where *p(E)* is the probability of specific events.

The pioneers of statistical theory (Poisson, De Moivre, Lebesgue, etc) have found that the Gaussian distribution function perfectly encapsulates all of these principles and have erected this function as the pivotal mathematical scheme for the study of facts or events of chance. Statistical theory views a statistical fact or event as a simple mathematical entity whose only virtue is to contribute to a probability figure. It is not concerned, nor does it consider that it should be concerned, with the underlying physics implicated in the event.

Once the statistical principles have been transposed onto the Gaussian distribution function, statisticians have built an interpretative structure allowing for the computation of probability percentile figures from the data that might be empirically available from a population under scrutiny. Particularly useful to that aim is the z-score formula:

$z = \dfrac{X - \mu}{\sigma}$, where μ is the mean, σ the standard deviation and X the variable's space separation being studied.

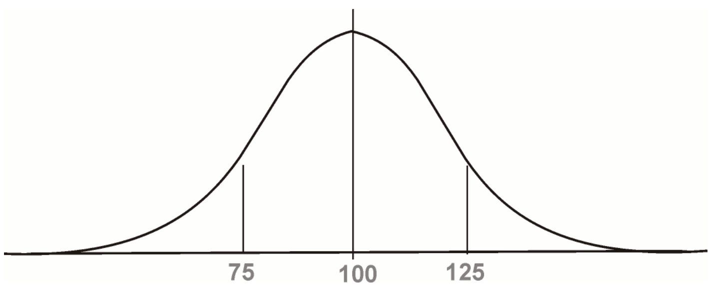


Fig. 7.2 In Probability Theory the graph of the Gaussian distribution is not based on a Cartesian coordinate system

Note that the treatment of the abscissa incarnating the space variable is somewhat unorthodox insofar as the Cartesian coordinate system, since in the Cartesian system the mean is always 0, mid-point between the set of negative real numbers and that of positive real, in accordance with the real number line. In that sense, the abscissa on the probability coordinate system is only a surrogate of the Cartesian abscissa (Fig 7.2).

From the z-tables, to the standard deviation figure, to the μ figure, statisticians have developed empirical techniques aiding in the computation of probable percentiles. While this is all good and well from a utilitarian purpose, the question concerning the meaning of the underlying physics of statistical events has never been addressed, not even in mathematical-physics. The problems posed tend to become merely numeric in nature, such as illustrated below for the use of the empirical formula:

$$s=\sqrt{\frac{\sum\left(x-\bar{x}\right)^2}{n-1}}$$ *(1),* so-called unbiased version or its equivalent:

$$s=\sqrt{\frac{\sum\left(X-\mu\right)^2}{n}}$$ *(2)*, so-called biased version.

A typical reductionist problem follows:

Find the standard deviation for the following distribution of numbers: 13, 16, 18, 21, 31, 44, 45 and 55.

Step 1: Using expression *(1)* and adding up the 9 numbers in the sample or data set:

$x = 13 + 16 + 18 + 21 + 31 + 44 + 45 + 55 = 243.$

Step 2: $$\frac{x^2}{n}=\frac{243^2}{9}=\frac{59049}{9}=6561$$

Step 3: Squaring and adding up the set of original numbers:

$$\bar{x}^2=13^2+16^2+18^2+21^2+31^2+44^2+45^2+55^2$$

$$\bar{x}^2=9137$$

Step 4: Subtracting the amount in Step 2 from the amount in Step 3 yields:

$$\frac{x^2}{n} - \overline{x}^2 = 9260 - 6561 = 2576$$

Step 5: We subtract 1 from the number of items in the data set, because variance estimated on the basis of n-1 is said to be unbiased:

$$9 - 1 = 8$$

Step 6: By dividing the number in Step 4 by 8, the resulting number in Step 5, we obtain the variance:

$$2576 / 8 = 322$$

Step 7: The square root of the variance represents s the standard deviation figure:

$$s = \sqrt{219.778}$$

$$s = 17.94$$

The above example illustrates the pervasiveness of pure numeric treatment commonly undertaken in statistical analysis.

7.8. Numeric Focus in Probability Theory

Two central theorems in Probability Theory significantly contribute to the numeric focus of the science, notwithstanding their unquestionable accuracy. One is the Law of Large Numbers, and the other the Central Limit Theorem, both intimately related to one another.

7.8.1 Law of Large Numbers

The Law of Large Numbers expresses the fact that the numeric characteristics of a random sample become closer to the characteristics of the whole population as the cardinal size of the sample increases.

For example, a single roll of a fair six-sided dice produces one of the numbers 1, 2, 3, 4, 5, or 6, each with equal probability. Therefore, the expected or **mean** value of a single dice roll is

$$\mu = \frac{1+2+3+4+5+6}{6} = 3.5$$

Consonant with the Law of Large Numbers, if the number of rolls of the six-sided dice becomes large, the average value of the total sum of the top faces shown or the mean value is likely to be close to 3.5, while the precision increases as the number of throws or trials increases. By the same token, this law establishes a correlation between the variable space and the abscissa of the coordinate system underlying the Gaussian Distribution Function. Because each side of the dice has a probability of 1 or 100% to appear when the dice stops, there is correspondence between the probability value of 1 or 100% with the μ mean value for total number of trials: the mean value must coincide with the probability *density* axis.

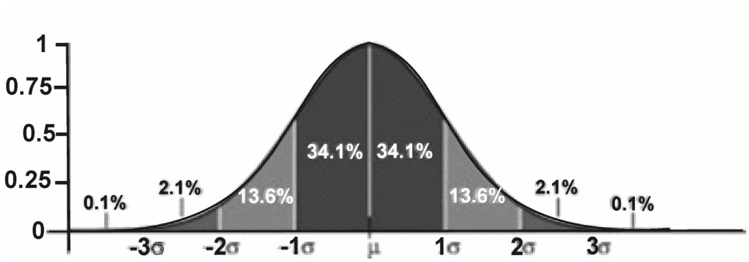


Fig. 7.3 Despite acknowledgment of a vertical coordinate axis by the Law of Large Numbers, the axis is not officially acknowledged in Probability Theory

In the empirical system of Probability Theory however, the vertical axis of the coordinate system is uncharacteristically not acknowledged, because the system technically privileges the area under the curve in the determination of probability values.

7.8.2 Central Limit Theorem

The Central Limit Theorem establishes that, for the most commonly studied scenarios, when independent random variables are added, their sum tends toward a *normal* distribution even if the original variables themselves are not *normally* distributed. The foremost normal distribution is the commonly known Gaussian distribution. This theorem generalizes the law of distribution on account of trial counts as it stipulates that all distributions, no matter their original forms, tend to conform to the normal distribution as the trial counts reach a larger and larger number. On that account, probabilistic and statistical methods become universally applicable since they can be applied to many problems involving other types of distributions.

Just as the Law of Large Numbers principally correlates to the horizontal axis of the probability coordinate system, the Central Limit Theorem directly correlates to the putative vertical axis of the probability coordinate system in that it establishes the same to be the materialization of the scalar state of a normal distribution. The larger the scalar state of the sample, one should conclude, the more resolved the normal distribution. In that sense, what we normally call the probability density as it relates to the vertical axis of the Gaussian distribution function, must in fact be equated to a scalar density.

7.9. Toward the Physical Meaning Underlying Statistical Accounts

We are next going to undertake an inquest of the Gaussian distribution with the aims of uncovering analytic meaning beyond pure numeric accounts.

7.9.1 Re-Dimensioning the Standard Deviation Metric

Following the vein of predominance of the role played by σ the standard deviation figure, one should pay attention to curvature evolution throughout the rundown of the function. This undertaking reveals a different metric to be superimposed on the abscissa of the coordinate system. That is the metric arising from the curvature sectionals making up the curvilinear pattern of the function. A study of these sectionals in terms of Tensors and Operators has been undertaken in Chapter 4. Most importantly, the symmetry implications of this approach contribute to the most fundamental order of certainties ever revealed to be associated with the Gaussian distribution as Quanto-Geometrically re-dimensioned. Effectively every sectional corresponds to an ontological and phenomenological Norm characterizing both the structural and evolution modalities of every object in the universe.

It follows from the above that the distribution is best normalized transversally by catering to the curvature sectionals as strata across the q-axis, given that the discontinuity at $s = 0$ further squarely forbids application of the 99-95-68 % empirical rule.

This set of Nine Norms represents the highest order of certainties encapsulated in the Gaussian distribution. It incontestably projects to every group or topology of objects fit for statistical analysis. The sigma super-metric established over the s variable (Fig. 4.4) represents the symmetry metric grading the fabric of space in its continuum, while the values of the q variable establish the true first-order quantization basis applicable to fitting topologies. Note that we are expressly avoiding the characterization of quantization of space because the space variable shall always be visualized as a continuum and not a bundle, given that what essentially distinguishes one space spread from another is not a quantity but a quality, to be precise a geometric or symmetry quality.

We hope that the reader is fully taking stock of this development which is increasingly deflating the problem of applying analytic schemes to the macrocosm that are at the same time valid for the quantum realm. I cannot overstress that to the extent that statistical theory indeed contains the complete quantization basis and the geometric and symmetry elements characterizing the continuum of space, it brings to every observable object or subject of analysis in the macroscopic realm this quantum background long coveted for a unified view of physical dynamics.

7.9.2 Event Transformations in Probability Theory

In this interpretation of Statistical Theory, what we have arrived at thus far is a three-fold conclusion:

- The Theory implies a description based on a coordinate system with a horizontal axis for true coordinate space.
- The Theory implies a coordinate system with a vertical axis for the representation of scalar density.
- Statistical events may have physical meaning beyond the probability percentiles.

We have arrived at the above three-fold conclusion despite the fact that the Theory heavily leans toward a flat numeric treatment of distributions. Taking into account the physicality of the elements participating in a distribution, we may define statistical events as follows:

An event stack (or a phenomenon) is the larger frame of spatial transformations under which a variables set is preserved as an invariant agent to the action.

Under that vision, an event stack ultimately constitutes a new object based on two distinct variables. The randomness of the numerous iterations by the agent of action creates a new scalar state that is distributive in nature. That much becomes quite clear when we consider the throw of a dice not from the point of view of the thrower but from the point of view of the dice. Independently of how long it takes to repetitively throw the dice, or how long the intervals between the trials last, the dice as the point object of action transforms into a new scalar spread, if we allow ourselves to become blind to the throwing hand and if we run the clock on the event stack. The mass of the dice acquires a new state, of a distributive nature, that pertains to a **different scalar order** than the original and still invariant-compact state.

Likewise if we give proper consideration to the position spread of the dice at every throw, it becomes manifest as an entity in its own right. Wherever the dice is being thrown, the immediate physical boundaries of the support medium constitute the *amplitude* of the position spread experienced by the dice. It must be understood as the *stationary limit* of the action which may be or must be visualized as the wavelength of a stationary wave developed by the very *position space* or position spread. This position space spread is real coordinate space in nature, not a fictitious mathematical space, the one to which the Quantum Theory has unfortunately accustomed us. The many different iterations of the throw within this position space spread creates the *harmonic character* of the action within the spread, independent of the direction of the momentum in development.

From the point of view of the dice, as a point object it is subject to or develops on its own a (repetitive) harmonic motion constrained by a position space spread. We have just described nothing else than the physicality of the material *wavefunction*, as mysterious and controversial as it has always been. It is a harmonic motional artifact that springs from the very void of physical space.

The two new variables that we have uncovered thus far are ***distributive scalar state*** and ***position space spread***. They will be directly and straightforwardly modeled by a Cartesian coordinate system whereby the vertical axis incarnates the first as the dependent variable and the horizontal axis incarnates the second as the independent variable.

7.9.3 From Variance to Ontological Covariance

In the traditional probability graph, abscissa and ordinate axes are not correlated, simply due to the inexistence of the ordinate in the graph. Therefore the variance expressed in terms of factors of σ on abscissa does not have any particular meaning in reference to a putative ordinate variable:

$$\sum (X - \mu)^2 = N\sigma^2$$

Hence the variance admittedly has very little meaning and only roughly gives an idea of spread. It is knowingly not used for much at all, except to compute the standard deviation figure, which is the main protagonist of the show. However, the concept behind the variance is a remote prelude to the very important concept of ontology or physical meaning ascribed to the abscissa variable of the Gaussian Distribution Function. As a descriptor of spread, the concept of variance relates to the notion of ***position space spread*** that we spoke of previously for the abscissa of the Quanto-Geometric coordinate system. It indeed refers to the inner variability of physical space spreads which *covariantly* relates to scalar density as the second tenet of the ontology subtending all statistical physical objects, not to say universal objects.

7.9.4 Parallel Between the Quanto-Geometric Covariant Spectrum and Statistical Percentiles

Suffice it to translate standard statistical accounts to the Quanto-Geometric canon for all the blanks of statistical analysis, not just to be filled in by causation, but to be replaced by an order of normed certainties representing the highest level of knowledge universally attainable. So it is despite the fact that the metric on the abscissa variable distinctly and more stringently goes up to *4σ* in Quanto-Geometry, beyond the ordinary *3σ* used in empirical analysis. Table 4.1 reflects the Primitives of the Quanto-Geometric Order of Certainties.

The referred symmetry primitives constitute the analytical categories that belie the empirical z-value calculations of gradients of probability involving σ and variance ordinarily undertaken in statistical theory. As previously highlighted, there is normally no meaning other than flat numeric cardinality to a percentile value of probability. What this science had ignored, having no means to otherwise inquire, is that there exists a transverse normative order to the probability distribution which is given by a different metric of σ over the variable. This analytic framework considers not the area or fractions of area under the curve but the curvilinear sectionals of the curve. It is there that statistical results acquire ontological and phenomenological qualities making up the deepest and most fundamental descriptive order of certainties in nature. In the strictest sense, the visualization of an area under the curve that spans across the probability density axis is illegitimate because the implicit expression of the function mandates discontinuity at $s = 0$. It is no wonder that there exists no natural or intrinsic meaning to the parcelization of the area under the curve and that the founders of this science had resorted to empirical methods of computation garnered in the z-tables in order to draw meaning and usefulness to the Function.

In a translation of the old methodology and its results to the new quanto-geometric dimension of the distribution, we would have to discard all z-values implicating transverse areas under the curve crossing the probability density axis. Only the individual tail z-values (involving external arms of the distribution) would remain valid.

For example, in educational settings, the bell curve is known to perfectly categorize test results of any class. Results are always such that the bulk of students will score the average or a C grade, while a smaller number of students will score a B or a D. Yet an even smaller percentage of students will score either an F or an A. The question is what is the cause of this distribution or what does it mean?

The Quanto-Geometric Eigenfunction, grandfather of the Gaussian distribution function, teaches the following:

A.- The position space spread axis mandates a division of students in two groups (Fig. 7.4). One group that positively interacts with the study material (positive s-axis spread), making an honest and consistent effort to apprehend the material. One other group that negatively interacts with the material (negative s-axis spread), engaging inconsistently with it. Per the axis, both groups are mirror images to one another.

B.- On the positive side, the 1% of students obtaining an A grade, experience the largest *dispersion* or *detachment* in their learning experience with the material. By exerting the ability to take *cognitive distance* from the material they are able to better prospect and visualize the material. This ability is a characteristic of the Quanto-Geometric asymptotic or transcendental layer where the s value set of the wavefunction is at its maximum.

C.- At the other end of the spectrum, we have the about 30% of students, the largest group, with the average C grade. These are the students in this group who could realize the least amount of cognitive detachment from the material. Their interaction with the material was too constraining or intrusive, or perhaps obsessive; they were unable to *elevate* over it for better visualization and thus better grasp. This ability or better say inability is typical of monocentric ontology experienced primarily at the monolithic layer of the Quanto-Geometric spectrum.

D.- The intermediate group of students in this rubrique, quantified in the distribution at about 13%, are those obtaining a B grade. Their B grade is due to a cognitive *distal* ability that is below the A group but above the C group. They are essentially marked by the Quadratic ontology experienced in the spectrum at level 4, where position space spread equals scalar density in covariant influence.

One can see that, by catering to the ontological variables, the distribution acquires meaning much beyond the percentile figures. If we were to be more granular about the percentiles and taking into account the full set of expected grades (A+, A-, B+, B-, etc.), and further delimit them according to the σ super-metric, the quanto-geometric set of 9 transverse primitives would become pointedly manifest in the distribution for us to observe.

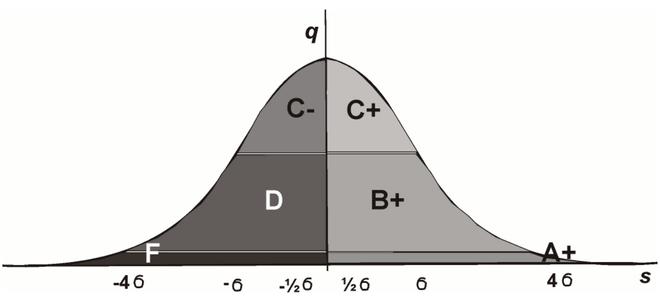


Fig. 7.4 Standard grade distribution in educational settings as a distribution function over a Quanto-Geometric coordinate system. The s variable grades student's cognitive distal ability and the q variable student count percentile.

Let us now examine the left side of the distribution, namely the distribution of grades F, D, and C$^-$. These students experienced the negative or least performing side of the ranking, which corresponds to the negative side of the position space spread axis. While on the positive side of the axis the position space spread showed the quality of cognitive *absorption*, on the negative side the distal variable equates cognitive *distraction* rather, two qualities that are concordantly antithetic to one another.

A.- The F students have equal amount of separation with the subject as the A students, but in this case separation has the negative quality of *distraction* or attention "away" from the subject, as opposed to attention "toward" the subject experienced by the A students.

B.- At the other end of the spectrum, the C- students could have spent equally long hours of study as the C+ student counterparts demonstrating to be equally studious, but their attention was directed away from the subject for the most part, running in a mode of distraction instead of absorption. Therefore, they score the lesser part of the average grade, a C^- grade.

C.- The intermediate group of students in this rubrique are those obtaining the D grade, counterparts of the B grade students. Their D grade is due to a cognitive *distal distractive* quality that sits in between the C^- group and the F group. They are essentially marked by the Quadratic ontology experienced in the spectrum at level 4, where position space spread equals scalar density in covariant influence.

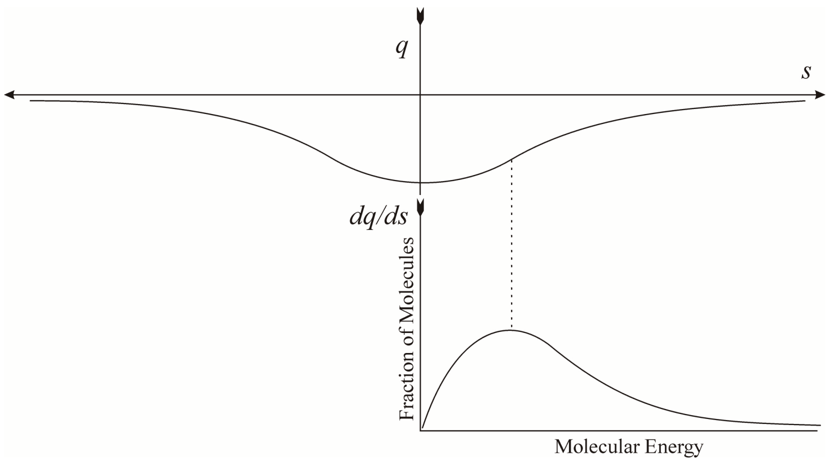
The same remarks that we have advanced regarding the granularity of grade distribution on the positive side of the distal variable with respect to ontological qualities are valid here as well. In all, one ought to consider each individual student with his/her learning materials and the educational events occurring as interactions between the two as an event stack forming a *quanto-geometric* object, to be even more exact a *distributive* object. Consequently the population of students shows the full spectrum of possible quanto-geometric correlations or covariance accessible to all material ontologies as described by the Grand Eigenfunction.

This example virtuously demonstrates **how to use the Grand Eigenfunction in the analysis of macroscopic statistical phenomena, in particular how to model the variant variable, whatever its nature, with the Quanto-Geometric space spread independent variable.** One must endeavor to identify in the sample the element that embodies the spatial spread inherent to the Quanto-Geometric visualization, which is not always quite obvious. Once that physicality is uncovered, we are a long way into unraveling the subjacent quanto-geometric qualities to the distribution that make it materially meaningful or causational beyond the mere probability percentiles.

We shall conclude that the above analysis has made it clear that cleverness and/or success in learning is not in direct proportion with compulsive learning behavior, but instead directly proportional to the learner's cognitive *distal* ability. It is thru the mental ability of detachment and elevation that one is able to scope a subject and establish its possible connections with other familiar physical elements, which then confers grasp and significant absorption of the subject matter. The web of symmetries that one is able to establish from scoping a subject constitutes the most important element of successful learning while setting the basis for deep memorization of the subject elements. At best realization, the learner becomes *transcendentally* one with the subject.

7.10. Classical Statistical Physics v. Statistical Quantum Mechanics

Classical Kinetic Theory, first formulated for gases or fluids and subsequently for solids, studies the behavior of large populations as single whole as well as how the properties of the whole relate to those of the constituent units of the whole. It is interesting to note that the formulation of the theory no longer privileges the probability distribution function directly but its functional derivative.



7.5 Distribution of molecular energies in an ideal gas

An important fact to keep in mind is that in practice, I argue theoretically as well, it is almost impossible to study the evolution of the unit particles constituting the whole in a deterministic fashion, essentially along a timeline, that is. The proponents of the theory have argued that the behavior of the unary constituents do not bring pertinent information about the whole population or system, despite the fact that it is the sum total of their properties and behavior that give birth to the macroscopic behavior of the population as a whole. Given the eminent role played by the time variable in classical physics, the proponents of the Kinetic Theory (Maxwell, Boltzmann, etc.) have brushed aside the fact that the behavior of the unit constituents could not be studied deterministically.

We however find a quasi similar scenario at the level of individual particles evolving in a stationary manner conducive to an atomic orbital. In this case the large number count of the population is surrogated by the large number of probabilistic iterations within the position space spread. Furthermore, in quantum mechanics we must assume that the particle is forced to behave as though restrained in a cubic box for the wavefunction to be extolled, which turns out to be a stationary wavefunction independent of time. Likewise, to study the dynamics of a population of gas molecules, we must admittedly assume a cubic container of any desirable volume. The container or its size determines the amplitude of the position space spread but not the space spread itself. Here the role of the position space spread is played by the velocities accessible to the molecules. **It is important to understand that it is the space spread that instantiates the motion which becomes apparent as molecular velocities. It is not the discrete molecule that creates the motion, but its space spread of inhabitation.** The discrete molecules only become submissive to innate spatial motion to be visualized as defoliation or the *un-folding* or *defoliation* of physical coordinate space. The group of molecules accessible to the many different velocities (or wavelengths of the position-space-spread wavefunction) creates the co-relational discrete scalar states of the distribution. Those discrete groups of molecules are directly comparable to the scalar density states of an electron in orbitalization. To be exact, it is not the number of molecules but the percentile fractional number of molecules that compare to the scalar density states. Effectively the vertical axis of the distribution graph represents a derivative function, by nature a rate. Therefore every velocity is a wavelength value of the material wavefunction of the ideal gas as a whole. The principal figure that characterizes an ideal gas in the Kinetic Theory is the product of the pressure P and volume V occupied by the gas, such that: $PV = \left(\frac{2}{3}N\right) \cdot \frac{mv^2}{2}$

where v^2 is the square of the average of all molecular velocities, N the total number of molecules and m their individual mass. Note how close v^2 is notionally to probabilistic variance. If we set the moment Q of one molecule to be:

$$Q = mv \text{ , then } PV = \left(\frac{2}{3}N\right) \cdot \left[\frac{Q^2}{2m}\right].$$

PV is thus an expression of the kinetic energy of the gas. In the Hamiltonian operator for the orbitalized or bound electron the core term is:

$$\left[-\frac{\hbar^2}{2m}\right] \cdot \left[\frac{d^2}{dx^2}\right].$$

The first part of the term expresses the kinetic energy displayed by the bound particle. Note its analogy with the same term in the ontological formula for the ideal gas. The difference between $\hbar$ and Q is simply the difference between quasi relativistic motion and non-relativistic classical motion. There is a factor of physical scale as well to account for the difference between the both phenomena visible in the mathematical basis for their formal treatment. One is in development in the atomic Shell of matter and the other in the Astral Shell, medium of inhabitation of the living where we setup our laboratories. Analysis conducted in Chapter 5 has shown the determinants to the formation of those Shells. However our principal interest here is to make explicit the large similarities between the two phenomena in their statistical interpretation.

Once we understand that mass behaves as a density scalar state, that the fraction of gas molecules constitutes a discrete derivative scalar state, coupled with an understanding of the innate dynamical behavior of real position space spread, we will begin to understand a common ontological ultra-structure to all probabilistic behavior in all realms of matter, whether quantum or large-scale. What lies beyond is an equal understanding of the covariant relationship between those two ubiquitous variables in the serial development of Shells of matter, well developed throughout previous Chapters of this study.

7.11. Randomness is Relative

Randomness is incomplete in scope. Beyond randomness is the certainty or teleology of types otherwise expressed as normative typologies involving co-variance between the fundamental variables underpinning the ontology of physical objects or evolution of events. Beyond randomness lies the new physics or the physics of:

- Spatial wavefunction of a single object
- Symmetry roots belying all transformation groups
- Ontological covariant spectrum

The incompleteness of Quantum Mechanics does not altogether reside in Quantum Mechanics itself but essentially in the mathematical statistical theory that sustains its development. The required analytic categories for a physical interpretation of the ontological configuration of a bound electron simply falter in the probabilistic science of chances as known thus far.

A. Einstein famously conceded that *he cannot imagine the electron hoping like a bug* as implied in the quantum treatment. Could he have conceived that free will is not random either? There is nothing in existence, I repeat NOTHING, that can escape the Quanto-Geometric ontological covariant spectrum. Cognition of the living, bug or human, develops in covariant quantum-space phases according to the normal *quanto-geometric* distribution harbored by the Grand Eigenfunction, just the same way or in the same *modalities* that an electron evolves within an atomic orbital.

7.12. Conclusion

In the quest for a Unification Theory that single-handedly furnishes a formal and assertive description of the entire sweep of the successive Shells of matter, banking on Probability Theory is good intellectual investment. The universal applicability of the Theory, from quantum density states to rolling dice to the distribution of parameters characterizing the living, is an inestimable asset in that endeavor. The timelessness view implicated in the Theory applies across the full spectrum of Shells of matter, calling for a dramatic ban of the familiar but unphysical time variable in macroscopic ontologies and phenomenology as well. When re-dimensioned under the umbrella of the Quanto-Geometric Grand Eigenfunction, the Gaussian distribution function at the core of Probability Theory