Expanding Jonathan Edwards' Typology Program: The Bell Curve as a Type of Christ

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Abstract

In 1993 an unfinished notebook of Jonathan Edwards called Types *was published for the first time since his death in 1758. It contains a more explicit argument than any of his previous works for extending biblical typology to nature in a biblically grounded manner. This paper is an attempt to extend that research program into mathematics/statistics. The thesis is that the normal distribution (the graph of which is the bell curve) is a type of Christ. All relevant mathematical concepts are defined and a description of thirteen different typological significations of Christ are given. The primary signification is that the celebrated Central Limit Theorem, in which the normal distribution is found to be the center of modern Statistics, typifies that Christ is the center of the plan of God.*

Introduction

> *He made known to us the mystery of His will, according to His kind intention which He purposed in Him with a view to an administration suitable to the fullness of the times, that is, the summing up of all things in Christ, things in the heavens and things on the earth.*
> *~ Ephesians 1:9-10*[1]

In the eighteenth century, Jonathan Edwards, the "most brilliant of all American theologians,"[2] set forth a research program for a novel view of biblical typology. In particular, he was brought up in the contemporary Puritan typology where in the Old Testament an object or event was a type of something to be revealed in the New Testament, most notably Christ. Taking it a step farther, though, Edwards wrote that not only in the Bible, but throughout the entire creation, in nature and history, God expressed Himself in divine communication, a typological language. Furthermore, this language could be learned by man in order to learn more about the God who communicated it. Unfortunately, Edwards' ideas on the subject were not picked up by his successors because they were not published after his untimely passing in 1758. It would not be until 1948 that the first of his notebooks on typology was published,[3] and not until 1993 for the one which succinctly articulated his views.[4] Follow-up work on Edwards' thought has sought to analyze it, rather than advance it, until now.

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[1] All quotations are taken from the New American Standard Bible (NASB), Copyright © 1960, 1962, 1963, 1968, 1971, 1972, 1973, 1975, 1977, 1995 by The Lockman Foundation.

[2] Marsden, George; 2004; *Jonathan Edwards: A Life*; Yale University Press, p. 1.

[3] Miller, Perry; 1948; *Images or Shadows of Divine Things*; New Haven: Yale University Press.

[4] *Typological Writings*; Works of Jonathan Edwards, Vol. 11; New Haven: Yale University Press; p. 146-153. In the same volume, Anderson Wallace in the "Note on the Manuscript of 'Types,'" p. 145 confirms that this was the first time 'Types' was published.

In this paper, I attempt to advance the research program[5] set forth by Edwards from the standpoint of (i) a Christian who largely shares Edwards' theological convictions, and (ii) a mathematician/statistician who is interested in exploring how the abstract objects of mathematics might typify Christ. My thesis is that the normal probability distribution, which is the center of statistical theory, is a type of Christ. Thirteen individual typological features are described. In writing to an educated but non-mathematical audience, this paper is organized in the following sections: Section 1 is a review of the relevant literature, where some of Edwards' most prescriptive statements for the research program are quoted. To my knowledge, no modern adherent of Edwards' thought has carried out his research program on nature types. Section 2 describes all of the theory regarding the normal distribution necessary to understanding the typological claims made in subsequent sections. Section 3 presents four typological features regarding Christ and the univariate normal distribution. Section 4 presents four typological features regarding Christ and the multivariate normal distribution. Section 5 presents three typological features regarding Christ and the limiting nature of the normal distribution. Section 6 is the conclusion, which includes Table 5, a summary of the thirteen typological features presented in Sections 3-5.

1. Literature Review

There is a lot of material written on the typology of Jonathan Edwards. Since the purpose of this of this paper is to present the normal distribution as a type of Christ in the sense Edwards advocated, my literature review will be selective. In particular, it will focus on framing this paper within the broader context of the literature, and then quoting the relevant passages from Edwards as a foundation for the type presented in subsequent sections.

The starting point for Edwardsian typology necessarily begins with the first publication of Edwards' manuscript *Images or Shadows of Divine Things*[6] in 1948 by Perry Miller, with his controversial introduction.[7] In it, he argued that the relevant background for Edwards' system was (i) the Puritan typology of his day was getting out of hand and that, (ii), Edwards took from the Newtonian "New Science" an affirmation of a set of coherent ontological principles, and (iii) Edwards adopted Locke's epistemological idea of distinguishing perception from thing perceived. With this background in Edwards' mind, Miller argues that Edwards recast "the universe in such a manner that nature and history might be viewed as infinite repetitions of a few eternal rules"[8] in order to "attempt… a second reformation."[9] The result, according to Miller, was a system of uniting nature, history, and Scripture, placing nature on equal footing with Scripture.

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[5] At several points in the paper, I refer to Edwards' "research program." By this I mean Edwards' desire to achieve a unified account of his theology, which would include both biblical types, as well as his nature and history types. I do not mean to imply that he sought adherents to extend his research and views in this area. Indeed, he sought to produce such a work himself. In fact, Edwards appears to have intentionally avoided publication on this issue until his ideas had matured and he could offer a robust apologetic with it. See Wallace, "Note", p. 11ff. for a detailed discussion. Nevertheless, Edwards wrote that the whole world was filled with this typological language of God. So, by "research program" I affirm the merit of Edwards' work and believe it points in a fruitful direction for others to extend. I choose to identify myself with his work in *Types* and seek to make an extension within the parameters he originally set forth.

[6] Hereafter referred to as *Images*.

[7] Miller, "Introduction," p. 1-41. For the record, Edwards' original title was *Shadows of Divine Things*. This was later changed to *Images of Divine Things*. Two other titles Edwards considered were *The Book of Nature and Common Providence* and *The Language and Lessons of Nature*. Miller's title reflects a combination of the first two. In 1993, the 11th volume of the Works of Jonathan Edwards was published, in which editor Anderson Wallace used the title *Images of Divine Things*; p. 50-142.

[8] Ibid., p. 30.

[9] Ibid., p. 24.

This was a novel break from tradition and opened the door for the eventual emergence of Emerson's transcendentalism, a legacy which undid the theology Edwards so carefully sought to construct.[10]

Regarding the Newtonian and Lockean influences, some have uncritically accepted them,[11] while others have undermined or even argued against them.[12] Perry Miller framed Edwards' historical and nature uses of typology as intentionally breaking with his Puritan tradition. Later scholars generally agree that Miller overrstated the case.[13] In particular, Edwards did not place nature and history on the level with Scripture, but gave explicit rules subjecting extra-biblical types to Scripture.[14] Miller's thesis has led to antitheses and, although they have improved our knowledge of Edwards, many questions remain. In the best review of the literature to date, Janice Knight wrote, "This difficulty arises at least in part from the focus of the studies; debate over Miller's claims too often sidetracks examination of Edwards' own writings. The alternative here proposed evaluates Edwards' typology within the context of his own first principles."[15]

Knight's modern approach is the one I seek to follow in this paper. In particular, not enough attention has been given to Edwards' brief notebook *Types*, which, as opposed to his more lengthy *Images* and *Types of the Messiah*[16], which expounded numerous scriptural examples, it succinctly contains much of his philosophy of typology with only the most general Scriptural quotations. I would like to bring more attention to it with some generous quotations.

To preface the quotations, a word about Edwards' view is in order. Explicit biblical types consist of two parts, a type and an anti-type. The type is a real thing in the world which in some way points to a greater reality beyond itself. The anti-type is a spiritual reality that is being pointed to by the type. The anti-type is often, but not always, Christ. Edwardsian examples include, "the sun signifies Christ," and "marriage… is a designed type of the union between Christ and the church."[17] Types, or emblems, are to be distinguished from analogies, or tropes, in that analogies are merely a comparison between two things that do not have an essential relationship, often for the purpose of illustration. For example, 'the sun is like Christ in that it is the chief of all heavenly bodies and rules the world' and 'the level of intimacy between a husband and a wife is a good illustration of the level of intimacy Christ desires with the church.' Types are designed by God. Therefore typological language includes words like "signifies," and "represents" to indicate Authorial intention. Analogies are designed by people in order to convey concepts. Analogies often use "like" or "as."

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[10] Ibid., p. 37. See Knight, Janice; 2005; "Typology;" *The Princeton Companion to Jonathan Edwards*; Lee, Sang Hyun, ed.; Princeton, NJ: Princeton University Press; 190-209, on p. 194. See also Feidelson, Charles, Jr; 1953; *Symbolism and American Literature*; Chicago: University of Chicago Press, p. 99-101, who picks up Miller's idea.

[11] For example, see Hunt, Richard; 2003; "Refiguring an Angry God: The Nature of Jonathan Edwards;" *Interdisciplinary Literary Studies*; 4:21-35.

[12] See Davis, Thomas M; 1968; "The Traditions of Puritan Typology;" Ph.D Dissertation, University of Missouri, p. 385, 387. On p. 527 of Wainwright, William; 1980; "Jonathan Edwards and the Language of God;" Journal of the American Academy of Religion; 48:4, p. 519-530; he explicitly argues against Miller's thesis. In Anderson Wallace's authoritative "Editor's Introduction to 'Images of Divine Things and 'Types;'" p. 3-33; without addressing Miller's theses directly, he provides additional data which undermine the extent of Miller's theses, for example, Newton on p. 16, and Locke on p. 23-24.

[13] See Davis, p. 374, 383, 390-391 and Wainwright, p. 527 and Lowance, Mason I., Jr; "Typology and Millennial Eschatology in Early New England;" in *Literary Uses of Typology: from the Late Middle Ages to the Present*; Ed. Earl Miner; Princeton, NJ: Princeton University Press; p. 273.

[14] See "Proposition #2" below.

[15] Knight, p. 194. This is also the approach of Wallace, "Introduction."

[16] *Typological Writings*; Works of Jonathan Edwards, Vol. 11; New Haven: Yale University Press; p. 191-328.

[17] Edwards, Images no. 5 (p. 52) and no. 9 (p. 53).

Types are right or wrong, to the degree that they reflect God's intention whereas analogies are merely good or bad, to the degree to which they communicate the human's idea. The innovation of Edwards was that he provided a theological and philosophical basis for expanding the set of types from explicitly biblical types to include extra-biblical types, particularly from nature and history, of other spiritual realities.[18] Wainwright gives a particularly lucid discussion of this issue.[19]

Below are three key quotations from *Types*, along with a proposition derived from each, which form the grounds for the type presented in later sections.

> *"Types are a certain sort of language, as it were, in which God is wont to speak to us. And there is, as it were a certain idiom in that language which is to be learnt the same that the idiom of any language is…. Great care should be used, and we should endeavor to be well and thoroughly acquainted, or we shall never understand [or] have a right notion of the idiom of the language. If we go to interpret divine types without this, we shall be just like one that pretends to speak any language that han't thoroughly learnt it…. God han't expressly explained all the types of Scriptures, but has done so much as is sufficient to teach us the language."*[20]

Proposition 1: Types are a certain sort of language which God speaks and can be learned by man.

> *"First, to lay down that persons ought to be exceeding careful in interpreting of types, that they don't give way to a wild fancy; not to fix an interpretation unless warranted by some hint in the New Testament of its being the true interpretation, or a lively figure and representation contained or warranted by an analogy to other types that we interpret on sure grounds."*[21]

Proposition 2: Extra-biblical types are permitted if an analogy can be made to a sure biblical type.

> *"I expect by very ridicule and contempt to be called a man of a very fruitful brain and copious fancy, but they are welcome to it. I am not ashamed to own that I believe the whole universe, heaven and earth, air and seas, and the divine constitution and history of the holy Scriptures, be full of images of divine things, as full as a language is of words; and that the multitude of those things that I have mentioned are but a very small part of what is really intended to be signified and typified by these things: but that there is room for persons to be learning more and more of this language and seeing more of that which is declared in it to the end of the world without discovering all."*[22]

Proposition 3: There are many natural and historical types God intended to signify that await discovery.

While I may not fully understand all of the nuances of Edwards' theology as a foundation for the best appreciation of his typology, my reading of Edwards' Types and Images has been an eye-opening

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[18] Nevertheless, Edwards' catalog was primarily biblical types (on his view), though he did include some extra-biblical, including nos. 76, 95, 142, 146, 156, 196, and 147.

[19] Wainwright, p. 524.

[20] Edwards, *Types*, 151.

[21] Edwards, *Types*, 148.

[22] Edwards, *Types*, 152. Throughout the work, Edwards discusses Ps 78:2; 125:1-2; John 9:7; 6:31-32; Rom 5:14; Gal 4:21-23; 1 Cor 9:9-10; 10:1-4, 6, 11; 13:2; Heb 4:3, 5:6, 11; 7; 8:2, 4-5; 9:1-4, 5, 8-11, 22-24; 10:1; 11:19; 13:11-13; 2 Cor 3:13-14; and Col 2:16-17. This list includes all Bible references in *Types* except those in his argument from the permutation of names, p. 150.

experience. [23] Upon reading, I have converted from seeing the world through analogy, to seeing it through typology—including my field of mathematics/statistics. For the purposes of this paper, I assume the above three propositions on typology. What follows is an attempt to explain one such remarkable phenomenon within this framework.[24]

2. Normal distribution Theory

The normal distribution is by far the most special probability distribution. In order to appreciate its remarkable status, we must first understand the class of objects among which the normal distribution is special: probability distributions. *A probability distribution is a graph, table, or formula that pairs each value of the thing measured, denoted by the variable* X*, with its associated probability*. For example, *Table 1* shows the number of *1's*, *2's*, and so on which were obtained when my kids rolled a fair *6*-sided die *60* times. The probabilities are obtained by dividing the frequency by *60*, e.g. The number *1* was rolled *8* times, so the probability of rolling a *1* was *8/60 = 0.13*. Notice that the probabilities sum to one, or *100%*. Figure 1a shows the same distribution, except in the form of a *graph*. It is not possible to write a *formula* for this exact distribution, since it was obtained empirically and would vary if the experiment were repeated. However, it is possible to write the formula of the theoretical distribution, which is, *probability=1/6* for all *x=1,2,…,6*. The graph of this theoretical distribution is shown in Figure 1b.

X	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
frequency	8	11	7	9	13	12	60
probability	8/60 = 0.13	11/60 = 0.18	7/60 = 0.12	9/60 = 0.15	13/60 = 0.22	12/60 = 0.20	60/60 =1.00

Table 1: Empirical probability distribution table of *60* tosses of a fair 6-sided die.

As another example, Figure 2 shows the empirical distribution of *67* students from one of my statistics classes.[25] This is a *graph*, like Figure 1a, that contains the probability a student in my class was at different heights. This probability distribution could also be expressed in a *table*, like Table 1. While a formula cannot be given for this empirical distribution (like Figure 1a), the *formula* for a theoretical model approximating it can be written.[26] A graph of this formula is the superimposed curve on Figure 2. Note again that the sum of the probabilities, which is the area of all of the bars, sums to one, or *100%*. Thus, we have two examples of common probability distributions, both of which have been considered in the three equivalent forms of *graph*, *table*, and *formula*.

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[23] See Lee, *Contemporary Theology;* Anderson, *Introduction;* and Knight, *Typology,* for three recent, sophisticated, and different attempts at synthesizing Edwards' theology as pertains to typology.

[24] As a Christian, I would like to acknowledge the following quotation from Wainwright, in support of my work, "If classical Christianity is correct, similar clues are available to those who wish to interpret the emblematic discourse constituted by the world of nature. Since God is the speaker, we can assume that what is expressed by types and emblems is truthful, significant, internally consistent, and coherent with reason and Scripture." Wainwright, 526.

[25] Probability and Statistics for Engineering and the Sciences, UC Riverside, Summer 2004.

[26] See Figure 8a for the formula.

Now that we understand what a probability distribution is, we turn to the number of them. On my bookshelf, the Handbook of Statistical Distributions[27] saw fit to include *40* distributions because of their importance for practical statistical work. On my wall is a map of *75* probability distributions and their theoretical relationships to one another.[28] The normal distribution is the most special distribution among all of the more than *75* known probability distributions.

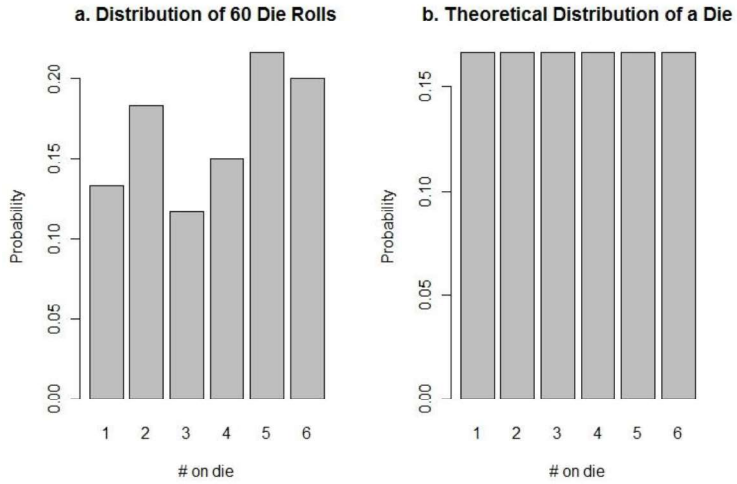

Figure 1: Graphs of the empirical and theoretical distribution of a *6*-sided die. a. Empirical probability distribution graph of *60* tosses of a fair *6*-sided die. b. Theoretical distribution graph of a fair *6*-sided die. Note that the number of tosses does not matter, as the expected probability is always *1/6* for each face.

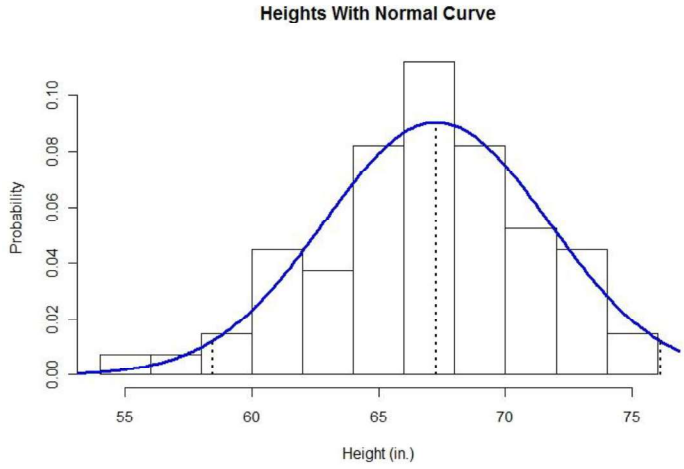

Figure 2: Empirical probability distribution of the heights of *67* students, in inches, with the theoretical normal distribution curve superimposed. The dotted lines mark the *mean* and the points two *standard deviations* above and below it.

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[27] Evans, Merran; Nicholas Hastings; and Brian Peacock; 2000; *Statistical Distributions*, 3rd Ed; New York, NY: John Wiley & Sons.

[28] Special insert in *The American Statistician*; Vol. 62; Feb 2008; of Figure 1 from Leemis, Lawrence M. and Jacquelyn t. McQueston; Univariate Distribution Relationships, p. 45-53.

In order to understand what makes the normal distribution so special, we next consider some of the most common probability distributions, for comparison. Figure 3 shows the graph of six of them, along with their parameters. The parameter(s) of a distribution are the features which are used to uniquely define the distribution. Parameters themselves are variables. The distribution for the *6*-sided die is called the uniform distribution, with one parameter, *k*, the number of categories. For the *6*-sided die in Table 1 and Figure 1, *k=6*. If one were to apply this distribution to the California State lottery with *48* balls, we would use *k=48*. Each of the distributions in Figure 3 has its parameter(s) listed. The meaning of each parameter is not important for our purposes. What is important is that each distribution has one or more parameters and the parameters' nature (as expressed by its name(s)) is different for each distribution.

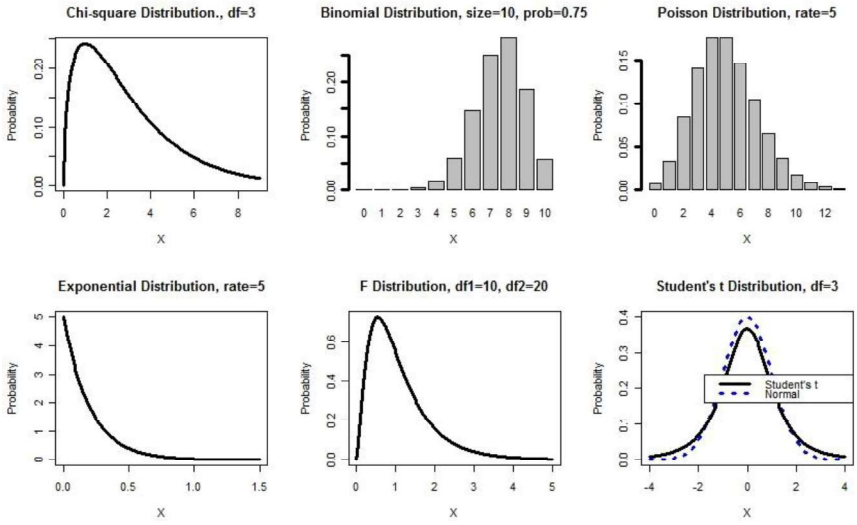

Figure 3: Six common probability distributions. The name is given at the top of each distribution, followed by the parameter(s) used to create the distribution. The *x*-axis label is simply "*x*" denoting the possible values the variable can take on. The Student's *t* distribution appears like the normal distribution, but has slightly fatter tails and a shorter mound, so the normal distribution has been added to show this.

The normal distribution has two parameters, *mean* and *standard deviation*, which we will need later. The *mean* is the average of the distribution. The *standard deviation* is an average distance away from the mean. For example, the mean of the height data is *67.3* inches, which is the exact center of the graph (Figure 2). The standard deviation of the height data is *4.4* inches, meaning that if we made a list of the number of inches away from *67.3* each student's height was, then the 'average' of these deviations would be *4.4* inches per student. If you go two standard deviations above and below the mean of any distribution, then at least *75%* of the data will lie in this range.[29] In Figure 2, *2*4.4=8.8* inches above and below the *mean* of *67.3* inches is *58.5* to *76.1* inches. These lines are marked on the graph, where it is clear that much more than *75%* of the data is contained within this interval.[30]

In order to frame the typology of the normal curve, I will begin with a summary of the features of the normal distribution which will be referenced in subsequent sections. For ease of reference, the relevant features are in a numbered list. I recommend you attempt to understand these concepts on the first read, but

[29] This result is result follows from Chebyshev's Theorem.

[30] In fact, *65* out of *67* points, or *97%* of the data is within the interval.

do not spend too much time on them. Note the main ideas and reference them as needed during the typological portions.

1. **Parameters**. Almost all of the probability distributions in use today are defined in terms of their *natural parameters*, which are the parameters which occur in the simplest possible version of the probability distribution formula. All of the parameters in Figure 3 are natural parameters. The *mean* and *standard deviation* of the normal curve are its natural parameters.[31]

2. **Univariate probability distribution**. A probability distribution involving only one variable. The tables and figures considered thus far are all univariate distributions (Table 1, Figure 1, Figure 2, and Figure 3).

3. **Joint probability distribution**. When k variables are measured simultaneously, then the joint probability of the different combinations of the variables' occurrence can be obtained in the same way as a single variable. This is a *k-variate distribution*. There is no limit to how large k can be. When $k=2$, the graph of the distribution becomes three-dimensional, with the two variables on the x and y axes, and the joint probability on a third axis. For example, consider a triple coin toss wherein three coins are tossed. Let X be the sum of the number of heads, which could be *0,1,2*, or *3*. Let Y be the [absolute] difference between the number of heads, which would be *3* if there were *3* or *0* heads (*3-0=3*) and *1* if there were *1* or *2* heads (*2-1=1*). Table 2 shows the joint probability distribution of the two variables, *X=sum of heads* and *Y=difference of heads and tails*.[32] Figure 4 shows the distribution of Table 2 in the form of a graph. In order to understand joint probability distributions, the reader should study this example until it is understood.

4. **Marginal distribution**. A k-variate joint probability distribution has k marginal distributions, one for each $i=1,2,,...,k$. The marginal distribution is the univariate probability distribution of one variable, independent of the other *k-1* joint variables. For example, in Table 2 the marginal distribution of the sum of the number of heads is given in the bottom row. It can be obtained by summing the rows labeled *1* and *3*. The marginal distribution of the difference of the number of heads is given in the last column. It can be obtained by summing across the columns labeled *0,1,2,* and *3*.[33]

5. **Conditional distribution**. A univariate probability distribution which depends on one or more other variables. When $k=2$, we write, *the conditional distribution of X, given Y*. For example, Table 3

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[31] Technically, all of the above distributions could be defined in different, but equivalent, ways. If they were, then the parameters would change according to the modified definition, while retaining the same probability distribution. The use of natural parameters allows an essentially unique formulation.

[32] To fully understand Table 2, let *H = heads* and *T = tails*. The eight possible outcomes are: *HHH, HHT, HTH, THH, HTT, THT, TTH*, and *TTT*. Each of these events is equally likely and so there is a *1/8* probability of obtaining *HHH*, which is *X=3* and *Y=3-0=3*. There is a *1/8* probability of obtaining *HHT*, which is *X=2* and *Y=2-1=1*. However, *HTH* and *THH* are similar, giving a *1/8+1/8+1/8=3/8* probability for *Y=1*. The other cases are similar.

[33] For example, to obtain the marginal distribution value *Y=1*, there is a *3/8* probability of obtaining *Y=1* when *X=1* and a *3/8* probability of obtaining *Y=1* when *X=2*. When *X=0* and *X=3*, there is zero probability. Therefore, the cumulative probability for *Y=1*, independent of *X*, is *0+3/8+3/8+0=6/8*.

gives the conditional probability distribution of the sum of heads, given the difference of heads. Thus, there are two conditional distributions shown in the table: '*X*, given *Y=1*' and '*X*, given *Y=3*.' The conditional distribution is obtained by taking the row from Table 2 and dividing it by the marginal probability of that row.[34]

6. **Correlation**. The natural parameter for the bivariate normal distribution which describes the strength of linear association between the two variables is the *correlation coefficient*. *Correlation* is a number between *0* and *1*, where zero is no linear correlation and *1* is perfect linear correlation. As an additional example of a joint distribution, see Figure 5. Here are three bivariate (*k=2*) normal distribution plots with different correlations. *Correlation=0* appears as a classic, three-dimensional bell. Keep in mind that the *x* and *y* axes on the bottom are the normally distributed variables (see the contour plots), while the *z*-axis coming up from them is the probability a particular realization is within a specified range of *x* and *y*. *Correlation=0.50* and *0.90* show the effect on the shape of the distribution. In particular, the closer correlation is to *1*, the more likely *x* and *y* are to both be large or both be small. It is also possible for *correlation* to be negative, at which case it is between *-1* (perfect negative linear correlation) and *0* (no correlation). If *correlation* were negative, then the tendency reverses to *x* being large while *y* is small, and vice versa.

diff \ sum	**0**	**1**	**2**	**3**	**marginal dist$_{diff}$**
1	0	3/8=0.375	3/8=0.375	0	6/8=0.75
3	1/8=0.125	0	0	1/8=0.125	2/8=0.25
marginal dist$_{sum}$	1/8=0.125	3/8=0.375	3/8=0.375	1/8=0.125	8/8=1.00

Table 2: Joint Probability Distribution of Triple Coin Toss Sums and Differences. The entries in rows labeled *1* and *3* paired with the columns labeled *0,1,2*, and *3* are the joint probabilities of the difference and sum, respectively, of the triple coin toss. Notice that they sum to *1.00*, or *100%*, which they must in order to be a distribution. The bottom row is the marginal distribution of the sum. The last column is the marginal distribution of the difference. Notice also that both marginal distributions sum to *1.00*.

[34] For example, the way to obtain the conditional$_1$ row of Table 3, is to take each of the entries of row 1 from Table 2, *{0, 3/8, 3/8, 0}*, and divide each of them by *6/8*, which is the marginal sum. This gives *{0, 1/2, 1/2, 0}*, which is the probabilities of the conditional distribution given in Table 3.

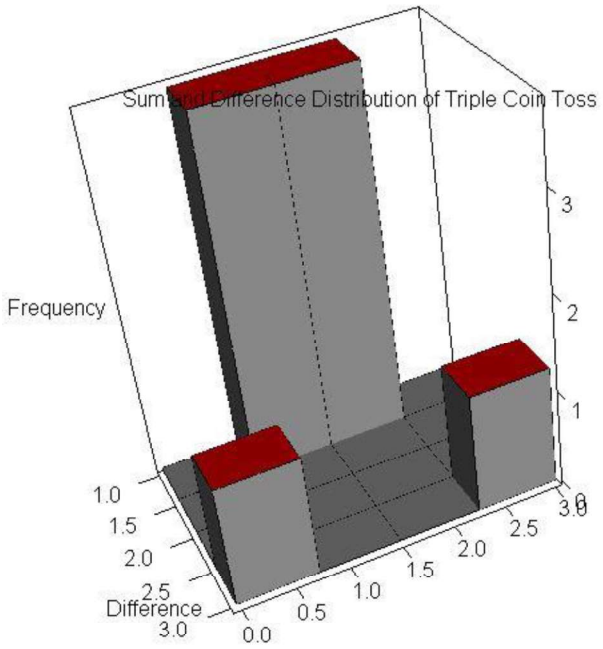

Figure 4: Sums and Differences of Triple Coin Toss. Three dimensional graph of the joint distribution of the triple coin toss from Table 2.

sum	**0**	**1**	**2**	**3**	**Prob$_{diff}$**
conditional$_1$	(0) / (6/8) = 0	(3/8) / (6/8) = 1/2	(3/8) / (6/8) = ½	(0) / (6/8) = 0	(6/8) / (6/8) = 1
conditional$_3$	(1/8) / (2/8) = 1/2	(0) / (2/8) = 0	(0) / (2/8) = 0	(1/8) / (2/8) = 1/2	(2/8) / (2/8) = 1

Table 3: Conditional Probability Distribution of Differences 1 and 3 of the Triple Coin Toss. The conditional$_1$ row is the conditional distribution of the sum of the dice, given that the difference is *1*. It is obtained by taking the *1* row of Table 2 and dividing it by its row sum (marginal probability), which is *6/8*. The conditional$_3$ row is the conditional distribution of the sum of the dice, given that the difference is *3*. It is obtained by taking the *3* row of Table 2 and dividing it by its row sum (marginal probability), which is *2/8*.

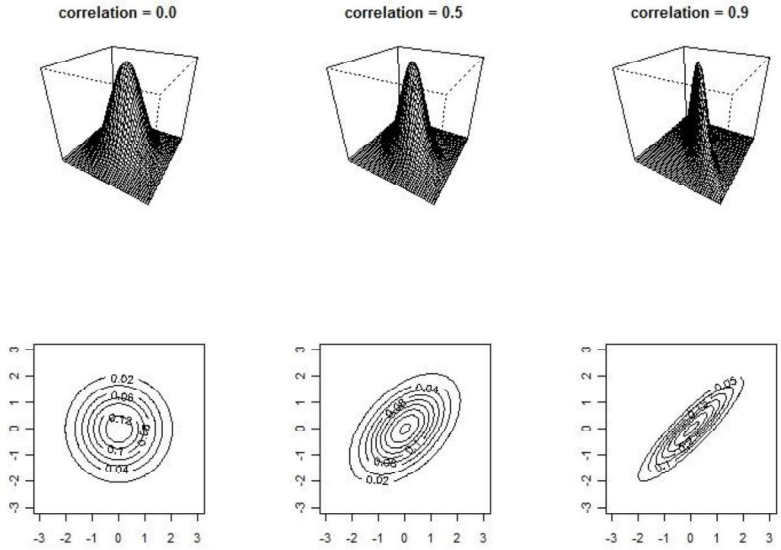

Figure 5: Bivariate Normal Distributions with Contour Plots. The first row contains three bivariate normal distribution plots, with correlations *0, 0.5*, and *0.9*. The second row contains a contour plot (horizontal cross sections of distribution plots) for each of the three distributions. Notice that the contours of the *correlation=0* plot are circles, whereas the contours of the non-zero correlation distributions are ellipses. The ellipses narrow as the correlation increases. The contours shown do not line up vertically with the distributions because the graphs of the three-dimensional distributions have been rotated in order to provide the best view of the effect of the correlation.

The normal curve is widely regarded as the most important probability distribution in all of mathematics. Here are three reasons. First is community recognition. Browsing the Table of Contents of over thirty introductory Probability and Statistics textbooks on my bookshelf revealed the majority of texts have an entire chapter devoted to the normal distribution, with no other chapters devoted to any other probability distribution. A Google search reveals 4.99 million hits for a search of "normal distribution," which is more than five times that of the second most common distribution, chi-square (see Table 4). Second is parameters. The natural parameters of the normal distribution are the mean and standard deviation. The mean is such a commonly used parameter that the fact that it is a natural parameter of the normal distribution, but not a natural parameter of almost all other distributions, is virtually unknown and unappreciated by non-statisticians. It is so fundamental to our thinking that we calculate the mean of other distributions from their natural parameters. The standard deviation, while not as commonly known as mean, is also routinely computed from the parameters of other distributions when working with them. Again, for the bivariate normal distribution, the natural parameter between two jointly distributed variables is the correlation coefficient. This is precisely the relationship of interest between numeric jointly distributed variables, yet it is the parameter of no others. Nevertheless, the correlation coefficient is still routinely calculated between non-normal jointly distributed variables precisely because it is so useful. Third is frequency of occurrence. When it comes to nature, the normal distribution is ubiquitous. Many physical measurements (e.g. heights), non-physical measurements (e.g. IQ scores), random phenomena (e.g. gambling), and errors (e.g. mismeasurements), are normally distributed. Thus, both statisticians and nature give the greatest attention to the normal distribution.

This attention may be summarized in the name, **normal.** All other distribution names are specifically related to either their nature or their discoverer (see the third column of Table 4). The normal distribution has both, but even more. Popularized by the famous mathematician Friedrich Gauss, the normal distribution

is sometimes referred to as the "Gaussian" distribution (1.61 million Google hits). On the other hand, its nature is such that it is a symmetric mound with specific proportions. However, rather than being named as such, its frequency and universality has led to the name "normal" – which goes beyond its nature, or its frequency, but extends to what is expected from any unknown distribution – the default, if you will.[35]

Thus we have attempted to describe the salient features of the normal distribution in preparation for showing its special place among the distributions, which is reflected by its name. It is fitting, therefore, to make the first typological point with its name. Philippians 2:9 says, "God highly exalted [Jesus] and bestowed on Him the name which is above every name." **That the name "normal" is unique and above all other distribution names is an emblem of the uniqueness of the name of Jesus and His name which is above every other name.** The case for of the special place and name will follow from the evidence of the next sections.

Google Search Entry	Number of hits	Note on Name
"normal distribution"	4,990,000	Frequency
"chi square distribution"	1,040,000	Nature: square of the normal ($X \sim$Normal, $\chi^2 \sim$chi-square)
"binomial distribution"	1,010,000	Nature: two categories—success and fail (binary)
"Poisson distribution"	987,000	Discoverer: Poisson
"exponential distribution"	728,000	Nature: shape follows exponential curve
"F distribution"	529,000	Discoverer: R.A. Fisher
"Student's t distribution"	406,000	Discoverer: Pseudonymous author named "Student"

Table 4: Number of hits for the most commonly used probability distributions. Numbers were obtained by typing the entry in the first column into Google on 6/20/2012. The second column records the reported number of hits. The third column notes the origin of the name. In particular, there are two origins for the names of probability distributions, namely the discoverer or the nature of the distribution.

3. Graphs of the Univariate Normal Distribution

In this section, I propose four ways in which the graphs of the univariate normal distribution typify Christ, one per subsection. The format of each subsection is the same: a Scripture quotation followed by a brief explanation of the type, which will be given somewhere in **bold**. The Scripture(s) are intended to indicate the manner in which Proposition #2 in Section 1 is, or could be, satisfied, which would justify the type. It is assumed the reader is familiar with the biblical context and meaning of the passages quoted, as only brief explanations for less obvious cases are given. Explanations are not intended to be exhaustive, but

[35] When considering a distribution, this allows us to say things like, "Is it normal, or not?" or "It's close to normal."

only to incline the reader to the proposed type in order that they might "hear" it with their own spiritual ears and discern for themselves whether or not it resonates with the divine tone.

Beauty

> *One thing I have asked from the LORD, that I shall seek:*
> *That I may dwell in the house of the LORD all the days of my life,*
> *To behold the beauty of the LORD*
> *And to meditate in His temple.*
> *~Psalm 27:4*

> *And He is the radiance of His glory and the exact representation of His nature…*
> *~Hebrews 1:3*

The beauty of the graph of the normal curve signifies the beauty of Christ (Figure 6). In fact, the shape of the graph is so noteworthy that it has been given a special name, "the bell curve." Imagine steadily pouring out a bucket of sand on a flat surface. A mound emerges. Next, imagine a knife slicing through the mound perpendicular to the bottom, from any position on the mound. The cross section of the cut would be a bell curve. If you were to compress this mound on two sides by two large parallel pieces of glass very close to one another, like an ant farm, then the resultant shape would also be a bell curve. [36] This amazing three dimensional mound turns out to be the shape upon which bells used to be cast, as they give the greatest resonance.

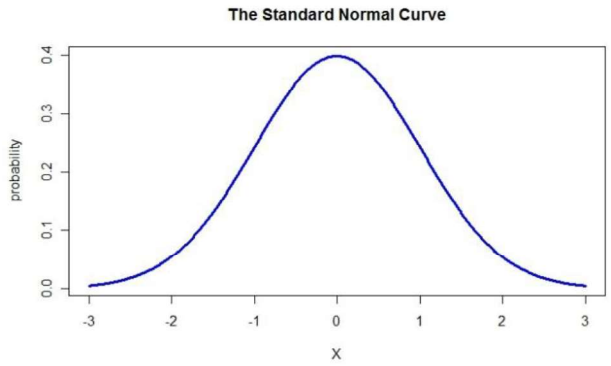

Figure 6: Graph of the standard normal curve, also known as the bell curve.

Finite and infinite

> *In the beginning was the Word, and the Word was with God, and the Word was God…. And the Word became flesh, and dwelt among us, and we saw His glory, glory as of the only begotten from the Father, full of grace and truth.*
> *~John 1:1,14*

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[36] The shape formed is a bivariate normal distribution and the cross sections are conditional distributions while the compressed version is the marginal distribution. See the top row of Figure 5. Many of the univariate distributions have a multivariate extension, with corresponding conditional and marginal distributions, so this phenomenon is not part of the typological argument. The type is the beauty. Typological features of the multivariate normal will be proposed in subsequent sections.

Therefore, following the holy fathers, we all with one accord teach men to acknowledge one and the same Son, our Lord Jesus Christ, at once complete in Godhead and complete in manhood, truly God and truly man, consisting also of a reasonable soul and body; of one substance with the Father as regards his Godhead, and at the same time of one substance with us as regards his manhood….

~Definition of the Council of Chalcedon (A.D. 451)[37]

According to orthodox Christian doctrine, Christ is one person, yet with two natures, fully God and fully man simultaneously. The graph of the normal curve has no beginning, and no end, as it never touches the *x*-axis on either side, continuing infinitely on both sides of the mean (Figure 6). This represents the divine nature of Christ. Nevertheless, the area under the normal curve is one, which is finite.[38] This represents the human nature of Christ.

Multi-faceted

Then the kingdom of heaven will be comparable to ten virgins, who took their lamps and went out to meet the bridegroom.

~Matthew 25:1

Then the King will say to those on His right, 'Come, you who are blessed of My Father, inherit the kingdom prepared for you from the foundation of the world.'

~Matthew 25:34

For we must all appear before the judgment seat of Christ, so that each one may be recompensed for his deeds in the body, according to what he has done, whether good or bad.

~ 2 Corinthians 5:10

Christ, the second person of the Trinity, is given different names in the Bible to emphasize different aspects of His nature, His functioning in that instance. In passages regarding the end times, a favorite topic of Edwards, Christ is referred to as Bridegroom, King, and Judge. For a particular use of the normal curve, it is defined by a particular configuration of parameters, of which three are shown in Figure 7. A model with large variance would look more like the 'Judge' curve whereas a model with more certainty would look like the 'King' curve.[39] **The way in which there are many functions of the normal distribution, yet they are all referred to as the one normal distribution, represents how Christ has many names and yet is one. The way that different parameter configurations show the various facets of the normal distribution signifies how different names show the various facets of Christ.**

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[37] http://www.reformed.org/documents/index.html

[38] Q: How can this be? A: The tails of the curve grow increasingly closer and closer to the line, without ever touching it. As such, they have no end, yet the area underneath the tails decreases at such a rapid rate that there is so little underneath that it sums to a finite number. This phenomenon is not unique to the normal curve. Many probability distributions, as well as other mathematical objects have this property. In Edwardsian language, if I am correct in this typology, then they are also images of divine things (in this case, the two natures of Christ), but they are images further removed from the type. Similar remarks could be made for some of the other typological connections in this section. Note, however, that while other mathematical phenomena may exhibit the features collected here for the normal curve, they are disparate phenomena, whereas here they are united in the one remarkable normal distribution. In particular, the features described in Section 5 are not exhibited by other mathematical phenomena.

[39] In fact, when working with the normal distribution without a computer, it is common practice to convert all normal distributions to 'the standard normal distribution,' and use the one table for the standard normal distribution for calculations. All normal distributions can be put into one-to-one correspondence with the standard normal.

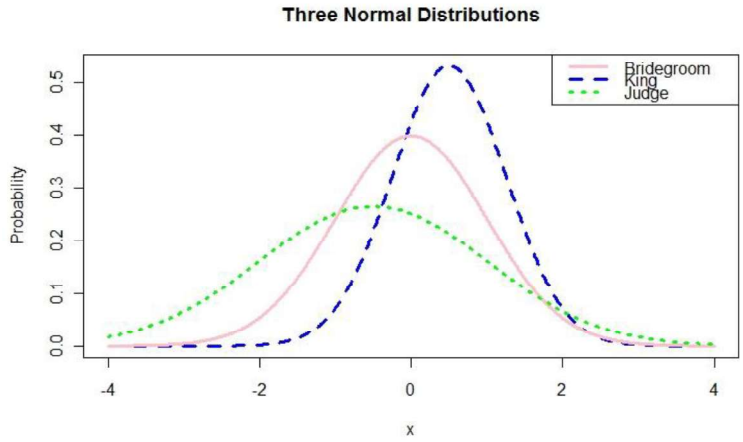


Figure 7: Three different normal distributions, Bridegroom~Normal(*mean = 0.5, SD = 0.75*), King~Normal(*mean = 0, SD = 1*), and Judge~Normal(*mean = -0.5, SD = 1.5*).

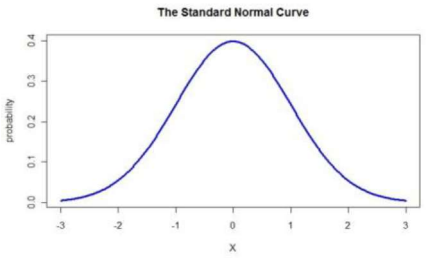
Diversely expressed

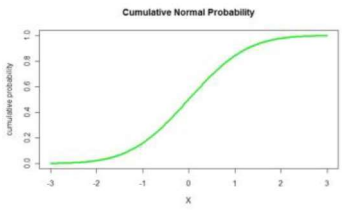
> *Now it came about when Joshua was by Jericho, that he lifted up his eyes and looked, and behold, a man was standing opposite him with his sword drawn in his hand, and Joshua went to him and said to him, "Are you for us or for our adversaries?" He said, "No; rather I indeed come now as captain of the host of the LORD." And Joshua fell on his face to the earth, and bowed down, and said to him, "What has my lord to say to his servant?" The captain of the LORD'S host said to Joshua, "Remove your sandals from your feet, for the place where you are standing is holy." And Joshua did so.*
> *~Joshua 5:13-15*
>
> *Does not wisdom call,*
> *And understanding lift up her voice? ...*
> *"To you, O men, I call,*
> *And my voice is to the sons of men....*
> *"The LORD possessed me at the beginning of His way,*
> *Before His works of old....*
> *"When He established the heavens, I was there,*
> *When He inscribed a circle on the face of the deep,...*
> *"Then I was beside Him, as a master workman;*
> *And I was daily His delight,*
> *Rejoicing always before Him...."*
> *~Proverbs 8:1,4,22,27,30*
>
> *And the Word became flesh, and dwelt among us, and we saw His glory, glory as of the only begotten from the Father, full of grace and truth.*
> *~John 1:14*
>
> *"I kept looking in the night visions,*
> *And behold, with the clouds of heaven*
> *One like a Son of Man was coming,*

And He came up to the Ancient of Days
And was presented before Him.

"And to Him was given dominion,
Glory and a kingdom,
That all the peoples, nations and men of every language
Might serve Him.
His dominion is an everlasting dominion
Which will not pass away;
And His kingdom is one
Which will not be destroyed.
~Daniel 7:13-14

Christ's manifesting Himself in different ways is signified by the manner in which the normal curve may be expressed in different ways. It is the same thing, but in a different form. Four examples of manifestations of the second person of the Trinity, Christ, are quoted above. They are the Captain of the LORD's host who received worship, the Wisdom of God which created the world, the God-man Jesus of Nazareth , and the Son of Man who will be given dominion over God's everlasting kingdom. Four examples of substantively different expressions of the one normal distribution are shown in Figure 8.

a. Normal density function	b. Graph of normal density function
$f(x) = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{(x-\mu)^2}{2\sigma}}$	
c. Graph of cumulative normal dist. function	d. Key regions of normal distribution function



Interval	Probability
mean-3SD to mean-2SD	0.02
mean-2SD to mean-SD	0.14
mean-SD to mean	0.34
mean to mean+SD	0.34
mean+SD to mean+2SD	0.14
mean+2SD to mean+3SD	0.02

Figure 8: Different expressions of the standard normal distribution. a. The functional form of the normal distribution, in terms of mean μ and standard deviation σ. Note that *e* is the base of the natural logarithm, approximately *2.718*. b. The graph of the normal density function given in (a) with $\mu=0$ and $\sigma=1$. c. The graph of the cumulative normal density, where the *y*-axis which is obtained by taking the area of the normal probability distribution in (c), of all values less than *x*. d. Tablular form of some of the common areas under the normal curve.

4. Multivariate Normal Distribution

In this section, I propose four ways in which the multivariate normal distribution typifies Christ. The format is similar to Section 3. The features of the normal distribution described in Section 2 will be drawn upon heavily.

Multi-dimensional

> *Great is our Lord and abundant in strength;*
> *His understanding is infinite.*
> *~Psalm 147:5*

> *[Christ] is the image of the invisible God, the firstborn of all creation. For by Him all things were created, both in the heavens and on earth, visible and invisible, whether thrones or dominions or rulers or authorities--all things have been created through Him and for Him. He is before all things, and in Him all things hold together.*
> *~Colossians 1:15-17*

The infinite dimensions of the multivariate normal distribution reflect the infinite dimensions of Christ. The classic attributes of deity are omnipotence, omniscience, and omnipresence; all these and more are in view. Furthermore, the way in which the multivariate normal density expresses exactly the distribution which cannot be graphed in dimensions higher than four[40] signifies how Christ expressed in finite form the exact representation of the Father who cannot be seen.[41] If X is a vector of k random variables, μ is a vector of their k means, and Σ is a variance-covariance matrix,[42] then $f(x)$ is the exact functional form of the multivariate normal distribution in Figure 9. The graph of some bivariate normal

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[40] Color can be added to a three dimensional graph in order to represent a fourth dimension, although this is difficult to interpret.

[41] John 1:18, "No one has seen God at any time; the only begotten God who is in the bosom of the Father, He has explained *Him*."

[42] A *variance-covariance matrix* is a natural parameter of the multivariate normal distribution. It is the multivariate analog of the SD of the univariate normal distribution. It is a matrix of the *correlation coefficient* between each pair of the k variables of X, scaled by the *standard deviations* of each of the k variables.

distributions (*k=2*) are given in Figure 5. No matter how large k becomes, the functional form *f(x)* in Figure 9 remains the same.

$$f(x) = \frac{1}{(2\pi)^{p/2} |\Sigma|^{1/2}} \exp[-\frac{1}{2}(x-\mu)^T \Sigma^{-1/2}(x-\mu)]$$

Figure 9: Multivariate normal distribution function. If *x* is a vector of *k* variables, μ is a vector of their *means*, and Σ is a *variance-covariance matrix*, then *f(x)* is the functional form of the multivariate normal distribution.

Fullness (conditional)

> *That Christ may dwell in your hearts through faith; and that you, being rooted and grounded in love, may be able to comprehend with all the saints what is the breadth and length and height and depth, and to know the love of Christ which surpasses knowledge, that you may be filled up to all the fullness of God.*
> *~Ephesians 3:17-19*

Any conditional distribution of the multivariate normal distribution is itself normal. Furthermore, its parameters are completely defined in terms of the original parameters. This elegant and beautiful property of the normal distribution is not true of multivariate distributions in general.[43] **That the conditional is a cross-section for an individual variable of *x*, itself fully normal but dependent upon *x*, typifies how Christ reveals the fullness of God**.

For example, let ***x*** follow a multivariate normal distribution with *k=3* variables, perhaps x_1 = "breadth" and x_2 = "length" and x_3 = "height." Now, each of the three variables of ***x***,has a conditional distribution, e.g. height (x_3), given fixed values of breadth (x_1) and length (x_2). This variable, 'height given fixed breadth and length,' is normally distributed. Graphically, this could be seen in Figure 5 where a cross section andy of the 3D curves would itself be a bell curve. Thus, not only is the whole normal, but each dimension (variable) within it is normal as well. A 'fullness' of the normal distribution is revealed

Complete (marginal)

> *God, after He spoke long ago to the fathers in the prophets in many portions and in many ways, in these last days has spoken to us in His Son, whom He appointed heir of all things, through whom also He made the world. And He is the radiance of His glory and the exact representation of His nature, and upholds all things by the word of His power.*
> *~Hebrews 1:1-2*

The *k* marginal distributions of a *k*-variate normal distribution are all normal. Furthermore, their parameters are completely defined in terms of the original parameters. Like the conditionals, this elegant and beautiful property is shared by few multivariate distributions. **The fact that the marginal is fully normal (the full curve) is emblematic of the person of Jesus being fully God**.

5. Limits

In this section, I propose three final ways in which the normal distribution typifies Christ. It differs importantly from the previous sections. Whereas Sections 3 and 4 proposed specific features of the normal distribution as typifying Christ, the phenomena in this section are more fundamental and comprehensive. They refer to mathematical theorems regarding the nature of the normal distribution and its relation to many

[43] It is true of a few. The multinomial and the multivariate Student's t come to mind.

other distributions. While some of the previous items proposed are interesting and provocative, in the absence of the phenomena of this section, the case is incomplete. Given the enormity of the Central Limit Theorem in Statistics and the world, I find the case becomes compelling.

The Central Limit Theorem

> *He is before all things, and in Him all things hold together. He is also head of the body, the church; and He is the beginning, the firstborn from the dead, so that He Himself will come to have first place in everything. For it was the Father's good pleasure for all the fullness to dwell in Him, and through Him to reconcile all things to Himself, having made peace through the blood of His cross; through Him, I say, whether things on earth or things in heaven.*
>
> *~Colossians 1:17-20*

> *The center of anything always exerts a very powerful drawing force. The fact is even more true in the spiritual realm. On the one hand, there is a drawing force in the center of your being; it is powerful and irresistible. And on the other hand, there is also a very strong tendency in every man to be reunited to his center. The center is not only drawing the object away from the surface, but the object itself tends toward its center! As you become more perfected in Christ, this tendency to be drawn within to the Lord becomes stronger and more active.*
>
> *~ Jean Guyon (c. 1685)*[44]

The most important theorem in all of statistics is called the Central Limit Theorem (CLT). It says that, for any single variable, if you take a bunch of random samples, and then take their means, that the distribution of those means (not the individual data points in all of the samples) tends to the normal distribution.[45] This is for a single variable. If you collect k variables simultaneously, and take the k means of each of a bunch of such samples, then the distribution of those sets of k means tends to the k-variate normal distribution. This theorem is surprising and remarkable. It is very easy to envision a world where the distribution of means for one distribution is one thing, and for another distribution is another. But this is not our world. In our world, every empirical distribution's means converge, inexorably, to the normal distribution.

Consider a world where there was no CLT -- no regular pattern followed by sample means or other measures of center. The business world would lose the forecasting power of time series techniques, industrial quality control would be hamstrung without control charts, scientific research would grope in the dark without regression and t-tests, economists would be back to the drawing board without their normal models, agriculture research would not have gotten off the ground without ANOVA, and I could go on – each of these foundational techniques resting on the assumption of normality. This is not to imply that there are no alternative approaches, because there are. However, the foundation of the statistical theory behind these and similar applications is the normal distribution. The statistical world has been built upon a mountain whose shape is the bell.

The idea of the CLT can be shown graphically. Figure 10 shows it for two distributions we have already seen: the rectangular distribution of the fair 6-sided die (Figure 1) and the exponential distribution

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[44] Madame Guyon was a seventeenth century mystic, writing before Edwards was born. Guyon, Jean; 1981; *Experiencing the Depths of Jesus Christ*, 3rd Ed.; Christian Books Publishing House; p. 55-56.

[45] This assumes the standard deviation of the distribution is finite. It does not apply to distributions whose theoretical standard deviation does not exist, such as the Cauchy distribution. Such distributions are theoretical only. Any distribution in the real world (empirical distribution) has a finite standard deviation, and so the CLT applies to it.

(Figure 3). Neither distribution begins anywhere near to the bell shape (Figure 10a,d), but at samples of size 30, the means of these samples are already close to normal (Figure 10b,e) and at size 100, it is clear that the bell shape has been achieved (Figure 10c,f).[46] A graphical interpretation of the CLT is that you could take *any* empirical probability distribution, no matter what its original shape, and put it on the left (e.g. Figure 10a,d). Then, take numerous samples from it. The larger the sample size, the closer the graph of the *means* will be to the bell curve (Figure 10b,e is closer and Figure 10c,f is closer still). This is not some esoteric trick that is only works when the sample sizes are virtually infinite. As shown in Figure 10, the shape is approximated by the bell curve for very modest sample sizes.

The CLT is remarkable because it does not matter what distribution the original variable has! It always works. This theorem is in many ways the foundation modern statistics.[47] **That the normal distribution is the center of the discipline of Statistics signifies that Christ is the center of the plan of God**.

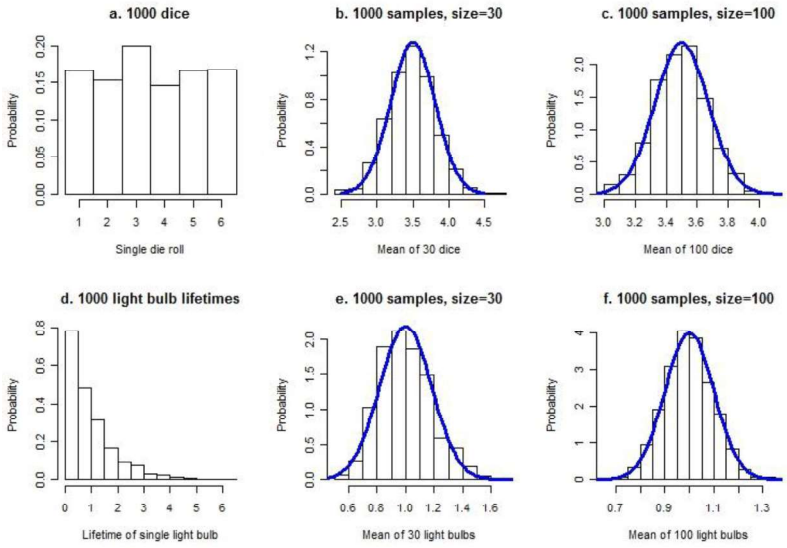

Figure 10: Graphs demonstrating the central limit theorem. a. Distribution of *1000* observations of a die roll, which fall into the expected rectangular shape. b. Distribution of the mean of *1000* samples of *30* dice each, which become approximately normally distributed. c. Distribution of the mean of *1000* samples of *100* dice each, which become approximately normally distributed. d. Distribution of *1000* observations of the lifetime of a certain brand of light bulb (in *1000's* of hours). e. Distribution of the mean of *1000* samples of the lifetime of *30* light bulbs per sample, which begins to look pretty normal, although notice the slight gaps below the normal curve on the left side and the corresponding bars above the blue curve on the right, which are the remnants of the original skew right light bulb distribution. f. Distribution of the mean of *1000* samples of the lifetime of *100* light bulbs per sample. Compared to (e), the distribution is even closer to the expected normal curve.

---

[46] Means of the rectangular distribution become normal very rapidly, as do all symmetric distributions. The 'worst case scenario' is extremely skewed distributions, like the exponential, which still shows some skewness at samples of size 30, but has come into close agreement at sample size 100. Technical hypothesis tests can be run on the level of fit of the means to the bell curve to confirm this claim.

[47] With the advent of modern computers, resampling techniques can be used to avoid the use of the Central Limit Theorem. Nevertheless, even with modern computing, statistical methods developed for normally distributed data are the most powerful (technical term meaning able to successfully make statistical discoveries) and are therefore still the primary focus in most Introduction to Probability and Statistics courses in the United States today.

Limiting distribution

> *For Christ is the end of the law for righteousness to everyone who believes.*
> *~Romans 10:4*
>
> *There is neither Jew nor Greek, there is neither slave nor free man, there is neither male nor female; for you are all one in Christ Jesus.*
> *~Galatians 3:28*
>
> *The glory which You have given Me I have given to them, that they may be one, just as We are one.*
> *~John 17:22*
>
> *For from Him and through Him and to Him are all things. To Him be the glory forever. Amen.*
> *~Romans 11:36*

Many probability distributions have the normal distribution as their limiting distribution.[48] A limiting distribution of distribution *X* is the distribution *Y* that *X* approaches when the sample is large enough. It turns out that *Y* is normal for many different *X*. Consider the binomial distribution, for example (Figure 3). It can be used to model the number of correct responses on a multiple choice exam with *n* questions where the probability of getting each question correct is fixed at *100p%*. For example, let us start with *n=20* questions with *p=0.10* probability of getting each right, as shown in Figure 11a. This distribution is clearly skewed to the right, [49] and this is the typical sort of binomial graph when *p* is not *0.50*, at which case the graph is symmetric. When the number of questions increases, however, while the probability of success stays the same, then the graph becomes bell-shaped (*n=100, 250* in Figure 11b,c). This example has shown that the normal distribution is the limiting distribution of the binomial.

As another example, consider the gamma distribution which can be used for modeling the number of minutes it takes until *n* cars pass a certain marker, if the traffic rate is *5* cars/minute. The distribution of minutes until *n=5,20,* and *50* cars is shown in Figure 11d,e,f. The number of minutes until *n=5* cars pass is clearly not normal, whereas the time for *n=50* cars has become rather normal. This illustrates a second limiting distribution. The normal distribution is, by far, the most common limiting distribution as so many other variables have it as their limiting distribution.

The regularity and the ubiquity with which probability distributions have as their limit, or end, to become one with the normal typifies the way in which things find their end or become one with Christ. Just as there are a great number of distributions which have the normal as their limiting distribution, so there are a great number of senses in which things find their end or become one in Christ. "The law" (Rom 10:4) and "all things" (Rom 11:36)[50] are quoted as examples which end in Christ. Ethnicity, socio-economic status, gender, (Gal 3:28) and mystical union (Jn 17:22) are cited as examples of oneness in Christ.

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[48] An exact percentage statement would be difficult, but of the six non-normal distributions in Table 4, five of them have the normal distribution as their limiting distribution. The exponential does not, because it maintains its same skew shape for all parameters.

[49] There are several ways to see this: (i) The bars on the left side of the curve are well above the superimposed bell curve. (ii) The left side of the curve begins at *0* questions correct, which has over a *0.10* probability of occurring, whereas the right side skews off with decreasing probability all the way to *20* questions correct, which is virtually impossible.

[50] "All things" should not be read to mean literally *100%* of all conceivable things. The obvious exemption is God. In fact, Paul is explicit about this in a similar passage, 1 Cor 15:27, "For He has put all things in subjection under his feet. But when He says, 'All things are put in subjection,' it is evident that He is excepted who put all things in subjection to Him." Possible other exempted things could include non-existent things (pink unicorns), logically contradictory things (rocks so big God cannot lift them), and other

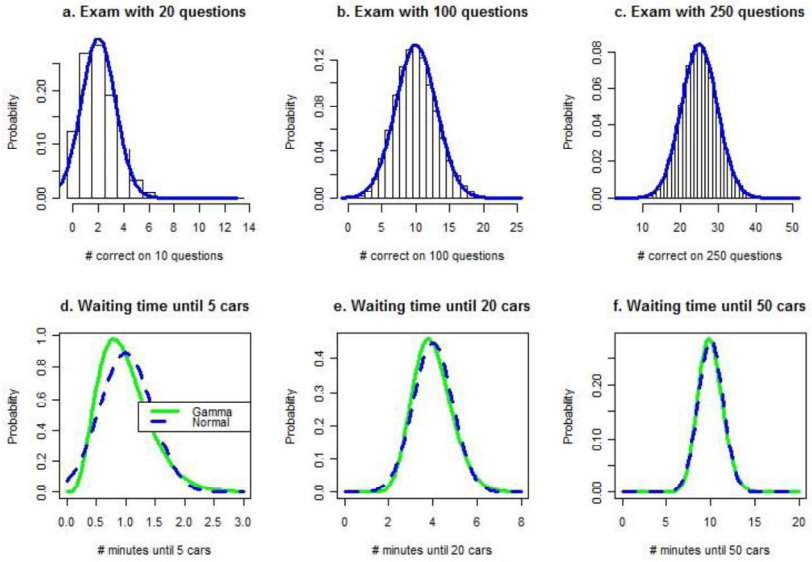

Figure 11: Limiting distribution plots. a-c. Distribution of the number of exam questions correct out of 10, 100, and 250 questions, respectively, with a normal curve superimposed. These distributions are based on the assumption of a 10% chance of getting each question correct. As the number of questions increases, the distribution becomes increasingly normal. d-f. Distribution of the waiting time until n (= 5, 20, and 50, respectively) cars cross a certain measuring strip. These distributions are based on the assumption that the average rate of traffic on this road is 5 cars per minute. As the number of cars waited for increases, the waiting time correspondingly increases, and it becomes increasingly normal.

6. Conclusion

And He is the radiance of His glory and the exact representation of His nature….
~Hebrews 1:3

In Section 2, we asserted that the normal distribution is the most special of all distributions. Sections 3-4 displayed eight features of the normal distribution. Different distributions share different features of the first eight, but none of them all.[51] Most importantly, none of the other distributions have anything even close to the remarkable features presented in Section 5. These have earned it the preeminent place in the theory of Statistics. **The normal curve is the glory of statistics. This fact may be taken as signifying that Christ is the glory of the kingdom of God**. That has been the theme of this paper, namely Jesus Christ, and his centrality in Christian theology and practice—both in Edwards and his Christian descendants today. This is clearly expressed in the theme verse quoted at the beginning, "He made known to us the mystery of His will, according to His kind intention which He purposed in Him with a view to an administration suitable to the

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theologically inappropriate things (those cast into the lake of fire, Rev 20:14-15). The point is that the fact that all distributions do not have the normal as their limiting distribution does not nullify the argument for this type.

[51] In fact, Edwards argues that God not only made superior things in nature as images of spiritual realities, but He also made inferior things as images of the superior realities. "So it is God's way in the natural world to make inferior things in conformity and analogy to the superior, so as to be images of them. Thus the beasts are made like men: in all kinds of them there is an evident respect had to the body of man, in the formation and contrivance of their bodies, though the superior are more in conformity and the inferior less. Thus they have the same senses, the same sensitive organs, the same members—head, teeth, tongues, nostrils, heart, lungs, bowels, feet, etc. And from the lowest animal to the highest you will find an analogy, though the nearer you come to the highest, the more you may observe of analogy…." Images no. 19, p. 55-56. See also no. 86, p. 85. In this manner, the normal distribution should be construed as the superior image and the other distributions as inferior.

fullness of the times, that is, the summing up of all things in Christ, things in the heavens and things on the earth (Eph 1:9-10)."

In the eighteenth century, Jonathan Edwards articulated a vision of typology which embraced nature itself as a language in which God revealed divine things. This was not a liberal, break-from-tradition kind of view, but rather it was a grand expression of a brilliant mind attempting to capture the effulgence of the infinite Creator-God.[52] While his ideas were taken in various directions, to my knowledge there have been no followers who conscientiously attempted to carry out the program of deciphering 'the language of God' which Edwards began in *Images* and sketched out the ground rules for in *Types* (Proposition #1).[53] In so doing, Edwards stressed that extra-biblical types were permitted only if an analogy could be made to a sure biblical type (Proposition #2). This paper has been an attempt to do extend Edwards' program into the discipline of mathematics, particularly statistics (Proposition #3). As a summary of the work, and an aid in comprehension, Table 5 contains every normal curve type and anti-type of Christ presented in the paper, with support.

In the preceding, I have attempted to provide generous biblical quotations in order to indicate to the reader the direction of theological justification of every signification claimed. In the process I never intended to provide elaborate or exhaustive justification, but only an indication. This is in keeping with Edwards' own *Images of Divine Things*. This approach reflects the belief that the type is real, and its evidence is primarily 'seen' by the reader who looks at it, rather than intellectually convinced by reasoning on the analogies, though that is not out of place. Although the original ideas came during a time of prayer (not study), I do not claim divine inspiration for the specifics. While I have become increasingly persuaded by the totality of the type, namely the normal curve signifying Christ, I am open to revision of the specifics set forth here. The intent has been to explore an idea, meditate on the person of Christ, and open a dialogue—as opposed to develop new theology. It is my hope and prayer that this will spark for you some of the inspiration which Edwards expressed when he wrote, "The enjoyment of [God] is the only happiness with which our souls can be satisfied…. Fathers and mothers, husbands, wives, or children, or the company of earthly friends, are but shadows; but God is the substance. These are but scattered beams, but God is the sun. These are but streams. But God is the ocean." Only time will tell the success of this enterprise.

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[52] Knight, p. 194 captures the richness of Edwards when she emphasizes that Edwards's core theology is about God as an infinitely complete and *effulgent* being who delights in communicating Himself to His creation. She adds that this flows out through Scripture, history, nature, and any other category one might come up with, although Edwards didn't care to categorize it all out, as for him it was all connected.

[53] This is not to say, or diminish, the work of Christians since Edwards who have recognized that nature teaches us about God. There are academic contemporary examples, like Gonzalez, Guillermo and Jay W. Richards; *The Privileged Planet*; Washington, D.C.: Regnery Publishing, Inc. In it, Gonzalez and Richards describe features of our planet and galaxy which they argue exhibit the precision of a Grand Engineer. There are also contemporary examples like Gothard, Bill; 1976; *Character Sketches*, Vol. 1; Institute in Basic Life Principles Publishing. In it, Gothard sees character traits of God expressed through animals, like the orderliness of the beaver. This is similar to Edwards' Images no. 102, p. 90 describing the industriousness of ants and bees. What is fundamentally different about works such as these is that they are only exploring a particular aspect of nature to learn a particular thing about God. Edwards program, by contrast, is to learn the *entire* language, which must necessarily encompass both the specifics of things like the aforementioned work (should it pass the biblical tests) as well as the higher order principles inherent to the language itself. It is this latter task which I find no evidence of in the literature, not the former.

	Type ***Feature of Normal Curve***	**Anti-type** ***Feature of Christ***	**Support**
Over-view	Name unique and above all other distribution names	"Name which is above every name"	Phil 2:9
	Glory of statistics	Glory of the kingdom of God	Heb 1:3
Graph of the Univariate Normal Distribution	Bell curve graph	Beauty	Ps 27:4; Heb 1:3
	Simultaneous finitude and infinity of the bell curve	Simultaneous human and divine natures	Definition of the Council of Chalcedon
	Different parameter configurations	Different facets	Mt 25:1; 25:34; 2 Cor 5:10
	Different manifestations	Different manifestations	Jos 5:13-15; Prov 8:1,4,22,27,30; Jn 1:14; Dan 7:13-14
Multivariate Normal Distribution	Infinite dimensional	Omniscience, omnipresence, omnipotence, etc.	Ps 147:5
	Finite and elegant formula	Human form	Col 1:15-17
	Conditional distribution	Fullness of God	Eph 3:17-19
	Marginal distribution	Fully God	Heb 1:1-2
Limits	Center of statistics	Center of the plan of God	Col 1:17-20
	Limiting distributions are+ normal	End of all things	Rom 10:4; 11:36
	Limiting distributions become one with normal	Mystical union with God	Gal 3:28; Jn 17:22

Table 5: Summary of all types and anti-types of the normal curve and Christ in the paper.

Postscript

It has been about one year since I wrote this paper, and about one month after presenting it at the 2013 ACMS conference. After reflection, and invaluable feedback with those whom I have discussed it with, particularly Rick Langer, Jim Bradley and Russ Howell, I personally retain belief in the thesis. However, it is not as clear or convincing to other people and I have been seeking ways to improve the argument. In particular, each of the phenomena claimed to have typological significance need a great deal of both clarification and further support. Beyond that, it seems desirable to develop the hermeneutic which Edwards sketched, in order to lay biblical hermeneutical criteria by which these and other alleged cases of nature types may be judged. This is the direction I am currently inclined. If successful, for future research, I have a collection of other remarkable mathematical phenomena which might also be mined for further typological connections.