Technology's Impact on Religious Freedom

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Introduction

Modern technology presents both physical and psychological challenges to mankind. As we develop our technological capabilities, we also change our standard of living. These changes to the standard of living influence academic, professional, and personal endeavors. For example, technological advancements allow corporations to effectively operate around the globe, permit instant communication from any location on the planet, and provide access to a quasi-infinite source of information. However, these substantial changes decrease the utility of the lessons of the past as we face the challenges of the future. The unforeseeable reaction of society to technological progress challenges lawmakers and law enforcers. In particular, the inception of new technology defies government authorities as they attempt to identify, achieve, and maintain the appropriate level of religious freedom.

Even though it is difficult to predict the impact of technology on any aspect of society, it is imperative that we understand technology's impact on religious freedom. Religious freedom foundationally affects the happiness of all individuals. "Freedom of . . . religion is one of the foundations of a 'democratic society'. . . . It is, in its religious dimension, one of the most vital elements that go to make up the identity of believers and their conception of life".[1] As technology changes our experience of life, to preserve mankind's search for happiness, it is vital to know how technological changes affect the religious freedom present in a society.

Scientific principles guide us in understanding technology's impact on religious freedom. Specifically, the second law of thermodynamics illuminates the consequences of technological

[1] Kokkinakis v. Greece, 260-A Eur. Ct. H.R. (ser. A) at 13 (1993).

progress. The second law of thermodynamics helps scientists understand particle interaction in a system. The second law can also explain the interactions of individuals in a society. Throughout history, technological developments have increased people's interaction with one another. As people interact, their societies mix together. As technology increases the interaction of individuals, the second law helps explain the past, present, and future course of religious freedom in a technologically advancing world.

However, many people have never heard of the second law of thermodynamics, and many who have equate the second law with the cryptic word "entropy". In the societal sense, the word "entropy" conjures up images of disorder and anarchy. While disorder and anarchy may be results of the law in certain situations, as a generalization, these descriptors are entirely too subjective and can be inaccurate.[2] To remove the confusion surrounding the term "entropy" it is important to think of the word in terms of probability. Using probability removes the misconceived images of lawless revolutionaries and also helps in applying the physical principles to other situations. A correct understanding of the term "entropy" may allow us to accurately evaluate the future consequences of technological development on religious freedom.

Why Technology Impacts Religious Freedom

As humans, we have many motivations for developing technology. A technologist may use his skill to earn the necessities of life. For example, an engineer may develop military communication systems for his employer.[3] The engineer has no desire to ever use the communication system and he may struggle with the thought that the fruits of his labors kill people in distant lands. But the engineer may dismiss these considerations because of the pressure to earn his living for survival.

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[2] ARIEH BEN-NAIM, ENTROPY DEMYSTIFIED: THE SECOND LAW REDUCED TO PLAIN COMMON SENSE WITH SEVEN SIMULATED GAMES, 196 (2008).

[3] This was the author's experience for developing communication systems that identified military targets.

There are other motivations for developing technology. Probably the most benevolent image of the technologist is the inventor who uses his ingenuity to solve problems that have plagued humanity. These individuals attempt to bless humanity with their talents. Many people rightly think of Thomas Edison in this light. On the subject of his motivations, he said, "I find out what the world needs. Then I go ahead and invent it."[4] However, in stark contrast to the benevolent inventor, the technologist may also develop new technologies solely because it is possible, regardless of any moral considerations. J. Robert Oppenheimer described this motivation when he said:

> "It is my judgment in these things that when you see something that is technically sweet you go ahead and do it and you argue about what to do about it only after you have had your technical success."[5]

In regards to the Atomic Bomb, a physicist explained how the opportunity to develop new technology overrode his own moral qualms when he said:

> "I dreaded the use of this 'better' bomb. I hoped that it would not be used and trembled at the thought of the devastation it would cause. And yet, to be quite frank, I was desperately anxious to find out whether this type of bomb would also do, what was expected of it, in short, whether its intricate mechanism would work. These were dreadful thoughts, I know, and still I could not help having them."[6]

Frequently, a combination of the aforementioned reasons motivates the development of technology.

Another motivation that generally applies to many technologists and may underlie the previous motivations is the fear of death. Death is a universal fear of mankind.[7] Some scholars

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[4] ROBERT A. WILSON & STANLEY MARCUS, AMERICAN GREATS 70 (2000)

[5] JONATHAN GLOVER, HUMANITY: A MORAL HISTORY OF THE TWENTIETH CENTURY 103 (2001)

[6] *Id*.

[7] Calvin Conzelus Moore & John B. Williamson, *The Universal Fear of Death and the Cultural Response, in* 1 HANDBOOK OF DEATH AND DYING 3, 11 (Clifton D. Bryant ed., 2003).

have claimed that the fear of death is multidimensional[8] and includes three components. These are characterized as "intrapersonal components related to the impact of death on the mind and the body, which include fears of loss of fulfillment of personal goals and fear of the body's annihilation; an interpersonal component that is related to the effect of death on interpersonal relationships; and a transpersonal component that concerns fears about the transcendental self, composed of fears about the hereafter and punishment after death."[9] Anciently, to fight the fear of death, men attempted to either appease the perceived forces behind death or control them through their own power.[10] Religious practices helped man appease the forces behind death, while man developed magic to help them control death.[11] Related to the magical attempts to control death, man also developed scientific experimentation.[12] The implementation of scientific experimentation is technology. Therefore, to some extent, technology is an extension of the applied magic of ancient times and may function to help man control death.[13]

Whatever the motivation, mankind has easily found the impetus for developing technology and man's efforts appear to accelerate with the passage of time. From this development, however, mankind, as a whole, has allowed each individual to extend his or her sphere of influence and communicate more profoundly with people throughout the world. Specifically, technology allows people to extend their influence in three dimensions: temporally, profoundly, and spatially.

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[8] Jon W. Hoelter & Janice A. Hoelter, *The Relationship Between Fear of Death and Anxiety*, 99 J. PSYCHOL. 225, 26 (1978). (claiming that the fear of death has eight different dimensions. These dimensions are the fear of the dying process, fear of premature death, fear for significant others, phobic fear of death, fear of being destroyed, fear of the body after death, fear of the unknown, and fear of the dead.)

[9] Victor Florian & Mario Mikulincer, *The Impact of Death-Risk Experiences and Religiosity on the Fear of Personal Death: The Case of Israeli Soldiers in Lebanon*, 26 OMEGA—J. DEATH & DYING 101, 101-11 (1992).

[10] Moore & Williamson, s*upra* note 7 at 5.

[11] *Id*.

[12] *Id*.

[13] *Id*. at 9.

Technology allows people to temporally extend their influence. People now influence others for longer durations of time. Scientists and medical practitioners have ably used the tools provided by science to extend the life span of the average human. For example, technology has extended the life expectancy of people in the United States from 47.3 years in 1900 to 77.8 years in 2005.[14] Also, technology has allowed the memorializing of one's time on earth. People can more easily make records of their lives and pass their records to future generations. Therefore, man lives longer and man can impart a written record to others long after death.

Technology allows people to more profoundly communicate with others by providing more time and more channels for communication. Historically, as a society becomes more technologically advanced, people dedicate a decreasing percentage of their time to basic survival and an increasing percentage of their time to leisurely activities. With the ability to freely leisure, people spend more time communicating with one another. For instance, citizens in a primarily agrarian community dedicate a substantial percentage of their time to food production. Conversely, citizens in a technologically advanced community dedicate very little time to food production and spend more time discussing, philosophizing, and communicating with one another. The people in the technologically advanced society are freer to communicate with one another.

As technology progresses, an increasing number of communication channels become available to the members of a society. As people take advantage of the available channels of communication, they are able to communicate with and influence their neighbors more effectively. Conversely, a person taking advantage of a new communication channel also subjects himself to the influence of his neighbor. For example, the internet has allowed millions

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[14] HEALTH, UNITED STATES, 2008 WITH SPECIAL FEATURE ON THE HEALTH OF YOUNG ADULTS 218 (Center for Disease Control, 2008).

of people to influence others. In particular, web logs or blogs illustrate how people take advantage of the new channels of communication to extend their influence. One study stated five major motivations for creating a web log. These five motivations are: "documenting one's life, providing commentary and opinions, expressing deeply felt emotions, articulating ideas through writing, and forming and maintaining community forums.[15] These declared motivations illustrate how people realize that these new technological channels of communication allow people to enlarge their sphere of influence. People in technologically advanced societies communicate their ideas more ably and influence others more fully.

Technological developments in transportation and communication allow people to spatially increase their influence. Essentially, because of these developments, people communicate with each other over greater distances. The wheel, the buggy, the train, the car, and the airplane help us move quicker from one location to another and writing, the telegraph, the telephone, the television, and the internet help us reach people who are far away. Historically, absent any technological advances, communication with and travel to distant societies was impossible. Now, people communicate with anyone instantaneously and travel anywhere in hours.

As technology increases the communicative range of people, technology also increases the diversity of influences experienced by those people. These influences include a diverse range of ideas that frequently embrace religious belief and expression. Further, as people increasingly share and receive ideas, the chance that communicated ideas conflict with one another also increases. The resolution of these conflicts determines the future of religious freedom and freedom in general.

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[15] Bonnie A. Nardi, Diane J. Schiano, Michelle Gumbrecht & Luke Swartz, *Why We Blog*, COMM. ACM, Dec. 2004, at 41.

Religious freedom is an important cog in the delicate system of society. People use their religious beliefs to form their identity and their conception of an ideal society.[16] The ability to pursue one's dream, irrespective of worldly struggles, is part of the promise of religion. However, the world contains many discordant ideas of perfection and technology causes these perceptions of perfection to increasingly clash. In the ideological collision, people frequently adjust their view of what is ideal and change their behavior and identity to align themselves with their view of perfection. It is important to understand how the aggregated resolutions of these individual ideological conflicts impact religious freedom. The second law of thermodynamics explains the result of these collisions. In physics, the second law helps understand the effects of random individual particle interactions on physical systems. The second law of thermodynamics also explains the effects of individual personal interactions on religious freedom as technology transforms the world into a single global society.

The Second Law and Probability

A Brief History of the Second Law

Sadi Carnot originally laid the foundation for the second law of thermodynamics in the nineteenth century when he described heat engines.[17] Specifically, Carnot explained how one could use the energy difference between cold bodies and hot bodies to accomplish physical work.[18] Given this foundation, Rudolf Clausius and William Thomson formulated what we now know as the second law of thermodynamics.[19] In 1850, Rudolf Clausius observed that the flow of heat from hot bodies to cold bodies was unidirectional[20] and in 1851, William Thomson

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[16] Vincent Brunner, *Religious Belief and personal identity*, 38 NEUE ZEITSCHRIFT FÜR SYSTEMATISCHE THEOLOGIE UND RELIGIONSPHILOSOPHIE 155, 156-57 (1996).

[17] SADI CARNOT, REFLECTIONS ON THE MOTIVE POWER OF HEAT 43 (R. H. Thurston trans.) (1897).

[18] BEN-NAIM, s*upra* note 2 at 2-3.

[19] *Id*. at 4-5.

[20] *Id*.

stated: "It is impossible, by means of inanimate material agency, to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects."[21] From these theories, Rudolf Clausius later formulated the second law of thermodynamics and introduced the term "entropy". He stated that "the entropy of the universe tends toward a maximum."[22]

Many people have never heard of the word "entropy" and many others misunderstand its meaning. Clausius described his reasons for selecting the word "entropy" in the following statement:

> "I prefer going to the ancient languages for the names of important scientific quantities, so that they mean the same thing in all living tongues. I propose, accordingly, to call *S* the entropy of a body, after the Greek word 'transformation.' I have designedly coined the word entropy to be similar to energy, for these two quantities are so analogous in their physical significance, that an analogy of denominations seems to me helpful."[23]

One physicist complained about Clausius' selection of the word when he said, "By [selecting the word entropy] . . . [Clausius] succeeded in coining a word that meant the same thing to everybody: nothing."[24] The word "entropy" is confusing because of two primary flaws. First, the abstract nature of the word detaches the term from common experience. Second, the understanding of the second law of thermodynamics has changed drasticly since its inception.

When Clausius identified the term "entropy" and the second law of thermodynamics, physicists misunderstood the composition of matter. At the time, scientists generally thought that matter was continuous throughout and not a conglomeration of individual particles or atoms as we understand today.[25] However, there was a counter current of scientists arguing against the

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[21] William Thomson, *On the dynamical theory of heat; with numerical results deduced from Mr. Joule's equivalent of a thermal unit and M. Regnault's observations on steam*, 1 MATH PHYSICS PAPERS 175, 179 (1851).

[22] K. D. BAILEY, SOCIAL ENTROPY THEORY 52 (State University of New York Press 1990).

[23] LEON N. COOPER, AN INTRODUCTION TO THE MEANING AND STRUCTURE OF PHYSICS 331 (1968).

[24] Id.

[25] BEN-NAIM, s*upra* note 2 at 9.

continuous matter model, by stating that matter was composed of atoms. One of these scientists was Ludwig Boltzmann.[26] Boltzmann used the particle nature of matter to explain the second law of thermodynamics.[27] However, the main scientific community disregarded Boltzmann's theory. For instance, in 1904, at a conference of science and mathematics, the general body of physicists rejected Boltzmann's contention and discussed in detail the properties of the presently antiquated ether.[28] Further, the organizers of the conference decided that Boltzmann did not belong with the physicists but rather with the applied mathematicians, and Boltzmann commenced his lecture by protesting: "My present lecture has been put under the heading of applied mathematics, while my activity as a teacher and investigator belongs to the science of physics."[29] Sadly, Ludwig Boltzmann died in 1906 and was unable to see the scientific community embrace his idea of entropy.[30] However, at the time of his death, scientists were beginning to accept the particle nature of matter and soon Boltzmann's theories would become standardized throughout the scientific community.

As the scientific community embraced Boltzmann's theories, people began to associate the second law of thermodynamics, and more specifically the word "entropy," with disorder.[31] Presently, this is how many people understand the second law of thermodynamics. When asked to define the second law, many say something akin to "things always move from order to disorder." However, this formulation of the law is incorrect, "there is no law of nature that states

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[26] Id. at 10.

[27] Id. at 12. The equation $S = klogW$ is engraved on Ludwig Boltzmann's tombstone. Even though he never wrote the formula, it stems from his work. The formula states that the entropy of a system equals the boltzman constant($k = 1.3806503 \times 10^{-23} m^2 kg\ s^{-2} K^{-1}$) times the logarithm of the number of specific arrangements that may possibly satisfy the observed state of a system. *Boltzmann's Work in Statistical Physics*, STANFORD ENCYCLOPEDIA OF PHILOSOPHY, Nov. 17, 2004, http://plato.stanford.edu/entries/statphys-Boltzmann/ (last visited Apr. 6, 2010).

[28] *See generally* HOWARD JASON ROGERS & HUGO MÜNSTERBERG, CONGRESS OF ARTS AND SCIENCE: UNIVERSAL EXPOSITION, ST. LOUIS, 1904, VOLUME IV (1906).

[29] HUGO MÜNSTERBERG, CONGRESS OF ARTS AND SCIENCE: UNIVERSAL EXPOSITION, ST. LOUIS, 1904, VOLUME I, 591 (1906).

[30] BEN-NAIM, *supra* note 2 at 13.

[31] *See Id*. at.196.

that systems tend to evolve from order to disorder."[32] Entropy, to many, is confusing. For example, John von Neumann reportedly told Claude Shannon "No one knows what entropy really is, so [when you use it] in a debate you will always have the advantage."[33] To overcome these barriers in helping people understand the second law, some physicists have attempted to define the second law through words other than disorder that also fail to fully describe the term. For example, G.N. Lewis wrote in 1930 that a gain in entropy means a loss of information.[34] Leon Cooper suggested the term "lost heat"[35] and others yet have suggested that the term may be unnecessary.[36] Hopefully, the reasons for these suggestions will become clearer through an in depth explanation of how the second law of thermodynamics works. Specifically, the notion encapsulated in the second law that explains why systems move irreversibly in one direction towards a particular state.

Probability and Information Theory

Probability

To fully understand the second law of thermodynamics one needs to also understand some basic premises of probability. One definition of probability states that "Probability is a subjective quantity measuring one's degree or extent of belief that a certain event will occur."[37] This general definition, while accurate, is subjective and a little less than helpful. For example, if I were to go outside and see the sky filled with dark clouds, I may predict that there is a fifty percent chance of rain. Five minutes later, you may go outside and see nothing but clear skies. Based on your observations, you may predict that there is no chance of rain. Both probabilities

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[32] *Id*.
[33] Myron Tribus & Edward C. McIrvine. *Energy and Information*, 225 SCI. AM. 179, 179-84 (1971).
[34] Letter to Irving Langmuir, 5 Aug 1930. Quoted in NATHAN REINGOLD, SCIENCE IN AMERICA: A DOCUMENTARY HISTORY 1900-1939 400 (1981).
[35] COOPER, s*upra* note 23.
[36] BEN-NAIM, s*upra* note 2 at 217.
[37] *Id*. at 20.

may be correct given the difference in observed evidence but when one combines the evidence, both probabilities may be wrong. To counter the different results from different observations, mathematicians developed ways to help people arrive at the same estimate of probability based on identical evidence.[38]

Creating a simple statement that objectively describes probability is difficult and often circular. Because of the difficulty in encapsulating probability within a simple statement, mathematicians axiomatically define probability with three different concepts: a sample space, a collection of events, and a probability associated with an event.[39] The first concept, a sample space, is the "set of all possible outcomes for a specific, well-defined experiment."[40] For example, the sample space for tossing a coin has two outcomes; heads and tails. Alternatively, the sample space for throwing a standard game die has six outcomes; the numbers one through six.[41] The second concept that helps define probability is that the sample space contains identifiable events that can be grouped into different collections of events.[42] For instance, when the sample space contains the outcomes from tossing the six-sided die with faces showing the numbers one, two, three, four, five, and six; a collection of events could include all outcomes where the number on the top face of the die is odd. The odd outcomes include the events {1, 3, 5} from within the sample space {1, 2, 3, 4, 5, 6}. The odd outcomes are a subset from within the sample space.[43] Alternatively, a collection of events can include only the even numbers, a single number, or any collection of experimental outcomes from within the sample space. In

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[38] *Id*. at 20-21.
[39] *Id*. at 26.
[40] *Id*. More rigorously defined, "a sample space *S* associated with an experiment is a set *S* of elements such that any outcome of the experiment corresponds to one and only one element of the set." WILLIAM H. BEYER, CRC STANDARD MATHEMATICAL TABLES 499 (27th ed.) (1984).
[41] BEN-NAIM, s*upra* note 2 at 26.
[42] WILLIAM H. BEYER, CRC STANDARD MATHEMATICAL TABLES 499 (27th ed.) (1984), "An event *E* is a subset of a sample space *S*. An element in a sample space is called a sample point or a simple event (Unit subset of *S*). *Id*.
[43] *See* BEN-NAIM, *supra* note 2 at 26.

review, a sample space is all possible outcomes of an experiment, and a collection of events is a subset of the possible outcomes or a subset of the sample space.

The third concept, a probability of an event, states that each event in the sample space has an associated probability.[44] Specifically, each event in the sample space has a probability of occurring during an experiment associated with a number between zero and one inclusive.[45] Frequently, people think of these numbers in terms of percentages, for example, thirty percent chance of rain, but these percentages are probabilities between zero and one.[46] A few theorems describe the meaning of a probability between zero and one. First, the probability of at least one of the possible events in the sample space occurring is one.[47] In the dice example, this is akin to saying that the probability of getting any of the six numbers on the die to show when the die is tossed is certain to happen. Second, the probability that none of the events in the sample space will occur is zero.[48] Third, the probability of two separate and mutually exclusive events occurring is equal to the addition of the probabilities associated with the separate events.[49] An example of mutual exclusivity is the probability of the separate events heads and tails, when tossing a single coin. Generally, the probability of getting a head is 1/2, the probability of getting a tail is 1/2, and the probability of getting a head or a tail is 1/2 plus 1/2 or one, which means that getting a head or a tail will certainly happen when the coin is tossed.

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[44] *See* BEYER *Supra* note 42; "If an experiment can occur in *n* mutually exclusive and equally likely ways, and if exactly *m* of these ways correspond to an event *E*, then the probability of *E* is given by

$$P(E) = \frac{m}{n}.$$

If *E* is a subset of *S*, and if to each unit subset of *S*, a non-negative number, called its probability, is assigned, and if *E* is the union of two or more different simple events, then the probability of *E*, denoted by *P*(*E*), is the sum of the probabilities of those simple events whose union is *E*. *Id*.

[45] *See* BEN-NAIM, *supra* note 2 at 26.

[46] A percentage is a number between zero and one multiplied by one hundred.

[47] *See* BEN-NAIM, *supra* note 42; "If *S* is the sample space, *P*(S) = 1." *Id.*

[48] *Id*.; "If ϕ is the null set, $P(\phi) = 0$." *Id*.

[49] *Id*.; "If *E* and *F* are mutually exclusive events, $P(E \cup F) = P(E) + P(F)$. *Id*.

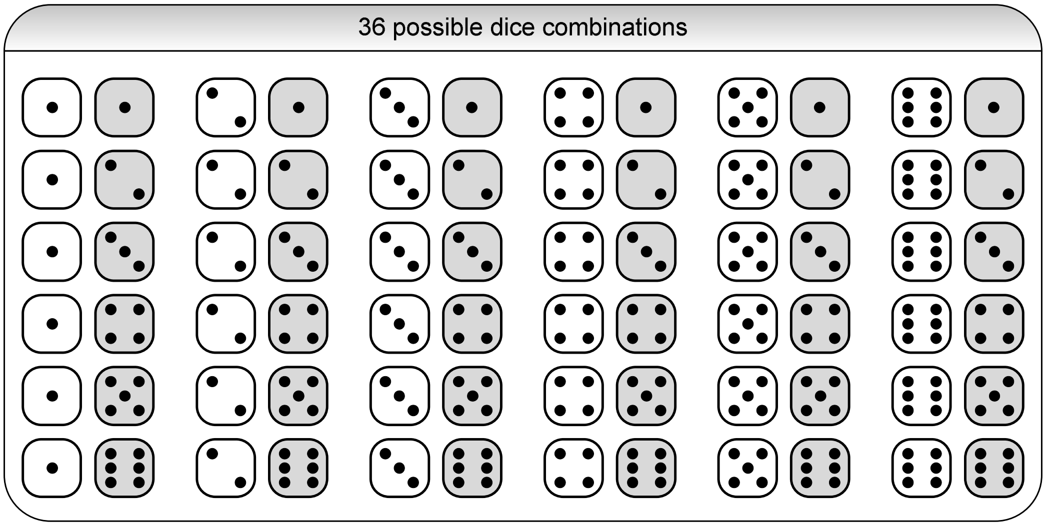

Figure 1 – The 36 possible microstates for a pair of dice

Now for an example of probability using dice. The standard game die has six faces; therefore, the sample space with a single die has six specific events. When we add a second die to the experiment, the sample space increases from six specific events to thirty-six specific events as shown in Figure 1 above. Each specific event has a probability of occurring equal to 1/36. For example, the probability of getting a one on both the white die and the gray die is 1/36. Likewise, the probability of getting a four on the white die and a three on the grey die is 1/36. If we start adding the faces of the dice together we can describe other types of events. For example, the specific configurations {1:4, 2:3, 3:2, 4:1} can be described as rolls where the faces of the dice add up to five. As there are four specific configurations out of the thirty-six possible specific configurations in the sample space where the dice add up to five, the probability of rolling the dice and having the dice add up to five is 4/36 or 1/9. Analyzing each of the possible dice combinations, two through twelve, shows that each dice combination has a different probability associated with it.

The above stated axioms that define probability help us understand the distribution of adding the number on the faces of the dice. The sample space includes all 36 specific events as shown above in Figure 1. These 36 specific events group themselves together into eleven separate dim events, the numbers two through twelve, where the dim event describes the range of values associated with the addition of the faces of the dice. Also, each of the eleven dim events has an associated probability. These probabilities range between zero and one. Specifically, the probabilities range between 1/36 for the events two and twelve and 1/6 for the event seven. The probability of the dice adding up to any of the numbers between two and twelve inclusive is one. In other words, upon rolling the dice, the faces will certainly add up to a number in the range two through twelve. Further the probability of the dice adding up to a number that is not in the range two through twelve or not rolling at all is zero. The numbers will be in the range between two and twelve. Further, the different dim events two through twelve are each mutually exclusive of one another. For instance, if you rolled a three you would not roll an eight and vice versa. Therefore, adding the probabilities of individually rolling a three or an eight is equal to rolling either a three or an eight. Understanding the basic principles of probability will help understand entropy and the second law of thermodynamics.

Information Theory

Back to a little history behind the second law of thermodynamics. After Boltzmann died, the next breakthrough with the understanding of the second law of thermodynamics occurred in 1948 when Claude Shannon developed information theory. Shannon included a description of entropy in his explanation of the transmission of information along communication lines.[50] Shannon related entropy to missing information in a system.[51] Essentially, given a dim configuration, a high entropy system requires more information to identify the specific configuration than a low entropy system.

To fully understand this explanation of information theory and the broader description of the second law of thermodynamics, it is helpful to understand a few helpful terms. These terms are "specific configuration" and "dim configuration", which are also known, respectively, as microstate and macrostate.[52] A specific configuration is the state of an event within a sample space where one knows the exact configuration of the elements in the system.[53] An example from the dice would better illustrate the concept of a specific configuration. In the above dice example, a specific configuration describes the face on the white die and the grey die. With the two dice, there are 36 different specific configurations. For example, a white die showing four and a grey die showing five would be a specific configuration. When one knows the specific configuration of a system, one also knows the specific state of each individual particle in the system.[54]

In contrast to the specific configuration, the dim configuration generally describes a group of specific configurations. In other words, the dim configuration describes a group of specific configurations, such that, when one knows the dim configuration, one does not know the specific configuration. However, knowing the dim configuration decreases the number of possible specific configurations. In the dice example, if we describe the dim configurations as

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[50] Claude Shannon, *A Mathematical Theory of Communication,* BELL SYS. TECHNICAL J., July-Oct. 1948, at 379, 379-423; 623, 623-656.
[51] BEN-NAIM, s*upra* note 2 at 52.
[52] *Id*. at 201.
[53] *Id*. at 90; see also DANIEL V. SCHROEDER, AN INTRODUCTION TO THERMAL PHYSICS 50, (1999).
[54] Schroeder at 50.

the sum of the faces of the dice, there are 36 different specific configurations as compared to the eleven different dim configurations. Each dim configuration describes one or more specific configurations. The following figure 2 shows the different dim configurations and the number of specific configurations described by a particular dim configuration. Alternatively, the number of specific configurations described by a dim configuration can be classified as the multiplicity of the dim configuration.[55]

Dim Configuration	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Number of Specific Configurations	**1**	**2**	**3**	**4**	**5**	**6**	**5**	**4**	**3**	**2**	**1**
Probability of Dim Configuration	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

Figure 2 Dim and Specific Configurations[56]

Knowing the definitions of "dim configuration" and "specific configurations," we can understand how information relates to entropy. Entropy is a measure of how much information is needed to determine the specific configuration when one only knows the dim configuration. For example, if the two dice add up to five or, in other words, the dim configuration for the two dice is five, the dice can be in one of four different specific configurations. Entropy would measure the amount of information needed to determine the particular specific configuration that adds up to five. To make this determination, one knows that the set of possible configurations is {1:4, 2:3, 3:2, 4:1} (the format used to denote a specific configuration is {white die:grey die}). To accurately determine the specific configuration of this dim configuration would maximally take two guesses[57]. Comparatively, the dim configuration of three has the specific

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[55] BEN-NAIM, s*upra* note 2 at 81. The multiplicity is the *W* that is in the equation engraved on Ludwig Boltzman's grave. (See footnote 27). Therefore, entropy is equal to the Boltzmann constant times the logarithm of the multiplicity of a system. *See* Schroeder at 75.

[56] *Id*.

[57] It takes maximally two guesses if each guess eliminates half of the possible specific configurations. For the dim configuration of five, if the first question asks if the white die is greater than 2 the answer whether it is yes or no eliminates half of the possibilities. If the answer is yes, then the specific configuration is either 3:2 or 4:1.

configurations {1:2, 2:1}. To accurately determine the specific configuration of the dim configuration of three would take maximally one guess. Conversely the dim configuration of seven, having specific configurations {1:6, 2:5, 3:4, 4:3, 5:2, 6:1}, would maximally take three guesses.[58] The dim configurations with more associated specific configurations or the dim configurations having the highest multiplicity will require more information to determine the correct specific configuration.

When information theory was applied to the second law, it changed the way that people viewed the measurement of entropy. However, understanding the definition of low and high entropy differs from understanding the reason why systems irreversibly move towards a state of maximized entropy. Hopefully, the following explanation of why things move to the state with the highest entropy will be helpful.

Moving Towards Maximum Entropy

The configuration of particles in an isolated system evolves into the dim configuration with maximum entropy because the dim configuration with maximum entropy has a higher probability of occurring than any of the other dim configurations.[59] Further, when the system includes a large number[60] of particles, the dim configurations with the highest entropy become so overwhelmingly probable, that the configuration of the system will certainly be in one of the

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Assuming the answer was yes, the second question could be whether the white die is three. The answer, whether it is yes or no, reveals the specific configuration of the dice for the dim configuration of five. If the answer is no, then the specific configuration is either 1:4 or 2:3. Assuming the answer was no, the second question could be whether the white die is one. The answer would also reveal the specific configuration of the dice for the dim configuration of five.

[58] *See* BEN-NAIM, *Supra* note 2 at 60.

[59] Id. at 144.

[60] The second law of thermodynamics involves systems with extremely large numbers. These very large numbers can be written using exponential notation. For example, the number 10^{10} can also be written 10000000000. The numbers that are used in the second law of thermodynamics dwarf the number 10^{10} and can be expressed $10^{10^{10}}$ which is a 1 with 10000000000 trailing zeros. The numbers involved in physical systems are extremely large. *Id*. at 60-62.

more likely dim configurations.[61] A simple probabilistic example using coins illustrates how systems move to the dim configuration with the highest probability. Further, this example will show how the system will reach equilibrium at the dim configuration with the highest probability.

For the principles of the second law of thermodynamics to take effect, a system must possess two components. First, the specific configurations must randomly occur and second, the specific configurations must have the chance of occurring.[62] Fortunately, every natural system exhibits these characteristics.[63] For example, a single coin has two different states. A head and a tail. In particular, the single coin has a random chance of being either a head or a tail when the coin is tossed. However, the single coin example fails to increase an understanding of entropy as the dim configuration one head only comprises one specific configuration. Essentially, the system comprising a single coin is always at both its maximum and minimum entropy. However, the single coin system describes the base participant in a system composed of two sided coins. As we will see, increasing the number of coins in the system reveals the essence of entropy.

Another system for consideration consists of four coins.[64] The four coin system has sixteen specific configurations and five dim configurations. Figure 3 illustrates the dim configurations and their associated specific configurations.

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[61] *See* Schroeder at 64-66.
[62] BEN-NAIM, s*upra* note 2 at 142.
[63] *Id*. at 141.
[64] *Id*. at 98.

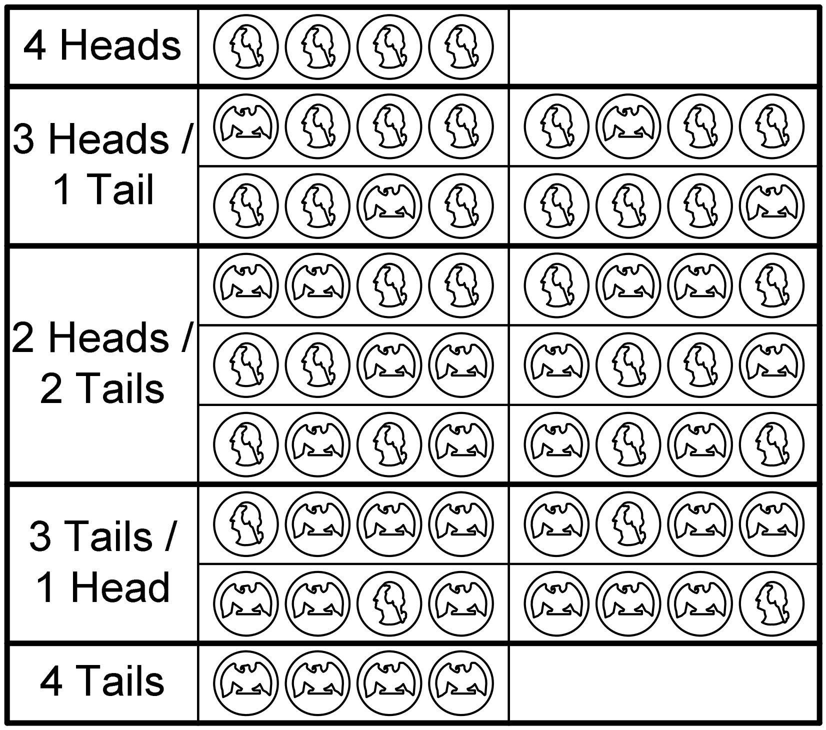

Figure 3 – Configurations of a Four Coin System

As figure 3 shows, the dim configuration for two heads and two tails has more associated specific configurations than any of the other dim configurations. If the coins are entirely fair (meaning that each coin has an equal chance of landing on heads or tails) then the chances of tossing the coins and getting all heads or all tails is 1/8, the probability of getting three heads and one tail or three tails and one head is 1/2, and the probability of getting half heads and half tails is 3/8.[65]

Now an important fact to recognize about the system is the following: as the coins are tossed, they will move from unlikely dim configurations towards the dim configuration with the highest probability. In the system with four coins, the dim configuration with the highest probability is the dim configuration with half heads and half tails. To understand the movement to the most probable state, we can imagine that the four coins are resting on a table. We will only select one coin in the group of coins and flip it. In each dim configuration, we can calculate

[65] *Id*. at 99.

the outcome of performing the calculation in terms of whether or not the number of coins showing heads increases. The following figure shows the probabilities for increasing the number of heads, decreasing the number of heads, or maintaining the same amount of heads in the system where one coin is selected and flipped.[66]

State of the coins before the flip	Probability that number of heads increases	Probability that number of heads remains the same	Probability that number of heads decreases
4 heads	0	1/2	1/2
3 heads / 1 tail	1/8	1/2	3/8
2 heads / 2 tails	1/4	1/2	1/4
1 head / 3 tails	3/8	1/2	1/8
4 tails	1/2	1/2	0

Figure 4 – Probability of Increasing and Decreasing the Number of heads in a Four Dice System[67]

From this data, we can see that the probabilities are symmetrical about the dim configuration with the highest number of associated specific configurations. Because of this symmetry, the system will always have a higher chance of moving towards the dim configuration with the highest number of associated specific configurations. However, with four coins, there is still a reasonably high probability that, at any moment, the system will be found in any of the five specific configurations. The following graph shows a simulation of repeatedly selecting one of the four coins and tossing it. The initial state of the system is all heads or no tails.

66 *Id*. at 102-103

67 To calculate the probability that the number of heads increases or decreases, the following equations apply:

a. To calculate the probability of heads increasing, use the equation $\left(\frac{N-H}{2N}\right)$ where N is the number of coins in the system, and H is the number of heads presently observed in the system.

b. To calculate the probability of heads decreasing, use the equation $\left(\frac{H}{2N}\right)$.

c. The probability of dim configuration remaining the same is 1/2 for all possible dim configurations.

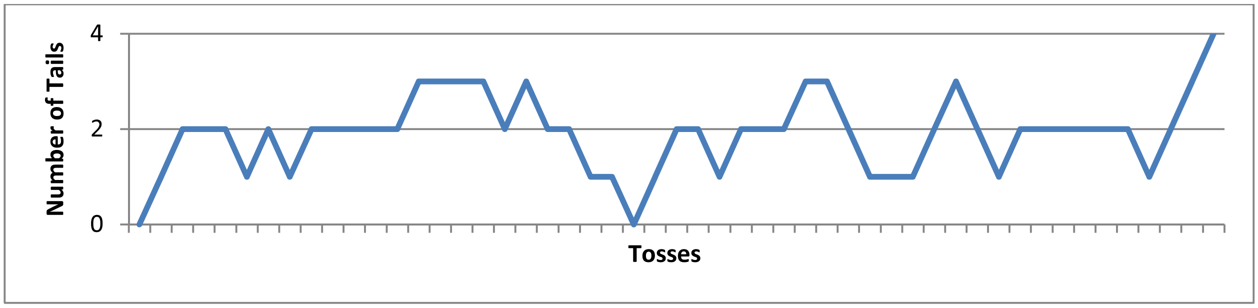

Figure 5 – The Number of Tails After Selecting a Coin and Tossing It

After starting at zero tails (otherwise stated "all heads"), the system moves toward the dim configuration with the highest multiplicity, the state of half heads and half tails. After the four coin system achieves the half heads/half tails state, the system later achieves all possible dim configurations in the four coin system, but when the system departs from the half heads/half tails state, the probability that the system will move back into the half heads/half tails state is always higher than the probability that the system will move away from the half heads/half tails state.

As we continue increasing the number of coins in the system, the effects of the second law of thermodynamics become more pronounced. The following graph shows the distribution of probabilities for the dim configurations of a ten coin system, where the measured probability is the chance of seeing a specified number of heads.

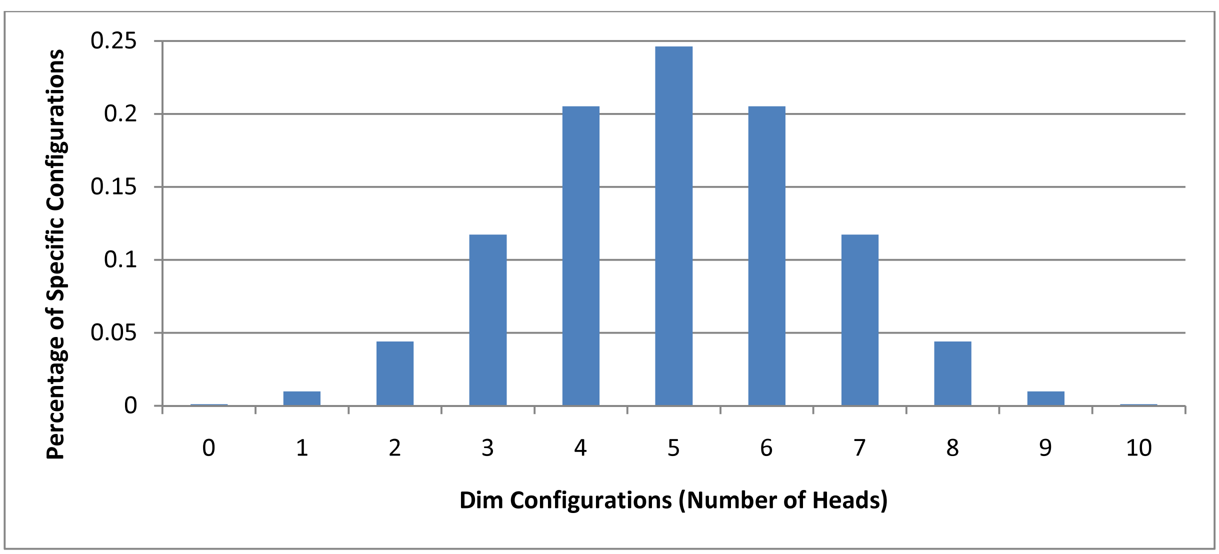

Figure 6 – Probability Distribution for a Ten Coin System

In figure 6, if all ten coins are tossed, the most likely dim configuration will have almost a twenty five percent chance of happening. Also, the most unlikely dim configurations are increasingly unlikely to occur. For example, the most likely dim configuration is 252 times more likely to occur than either the all heads configuration or the all tails configuration. If we repeat the test, where we have all the coins lying heads up on a table and we select one coin for flipping at a time, the graph of the coins looks like the following:

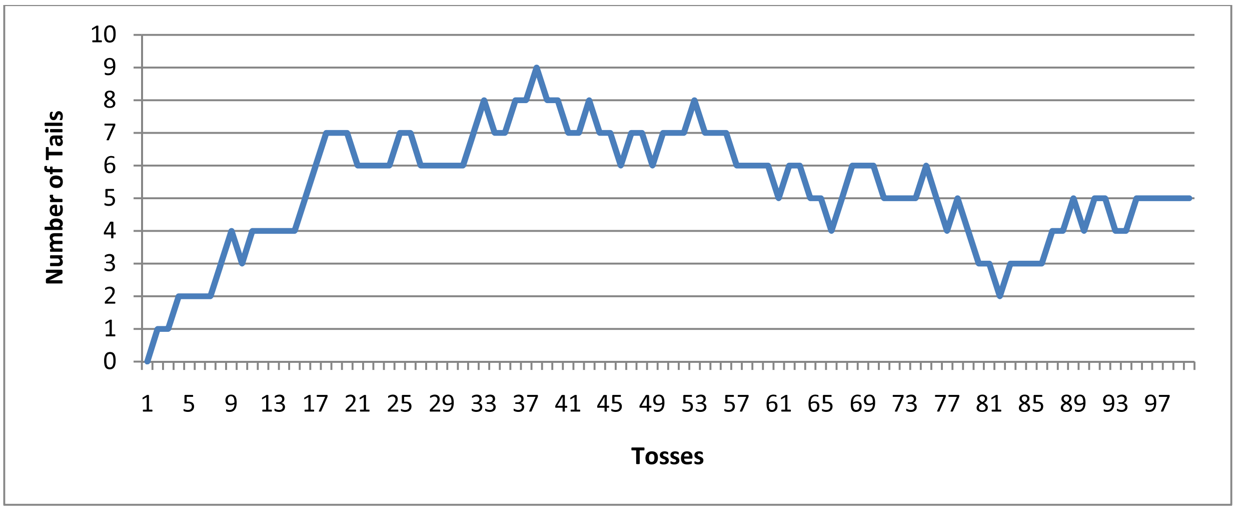

Figure 7 - The Number of Tails After Selecting a Coin and Tossing It

After starting at zero tails, the system also moves toward the dim configuration with the highest multiplicity, the state of half heads and half tails. After the ten coin system achieves the half heads/half tails state, the system fails to achieve all of the possible dim configurations for the ten coin system. However, through one hundred tosses, the system achieves seventy percent of the possible dim configurations. As will be shown, as the number of coins increases the system will achieve a decreasingly smaller percentage of the possible dim configurations because a higher percentage of dim configurations become profoundly unlikely. To further illustrate this point the following series of graphs is for a hundred coin system.

The following graph illustrates the probability distribution of the specific configurations for a hundred coin system, where the probability is the chance of seeing a specified number of heads.

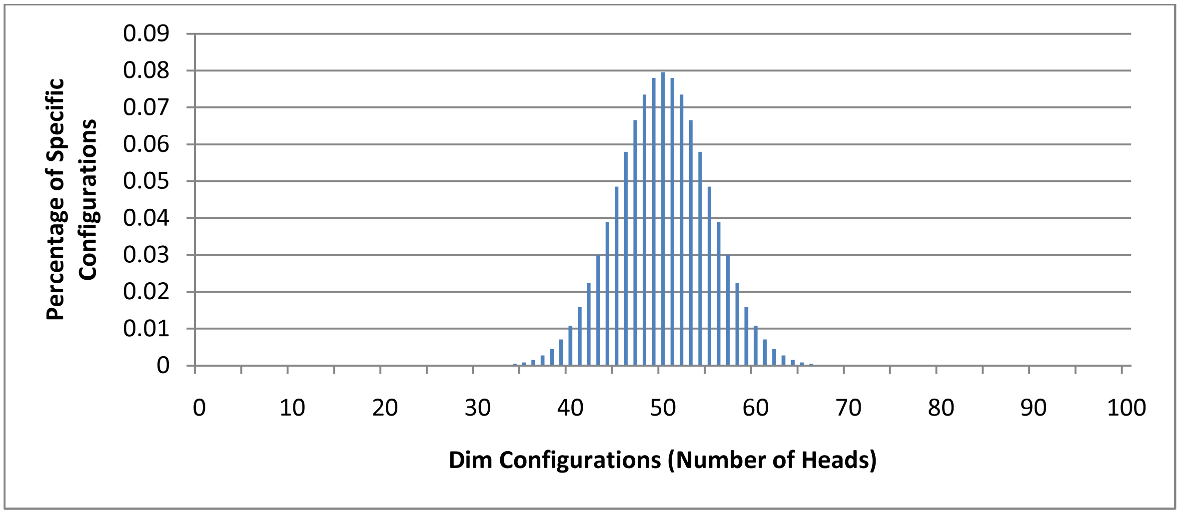

Figure 8 – Probability Distribution for a Hundred Coin System

The above graph shows that a large percentage of the possible specific configurations exist close to the fifty heads and fifty tails configuration. In fact the fifty heads dim configuration is 1.0089×10^{29} times more likely than achieving either all heads or achieving all tails. Further, there is only a one in 1.2677×10^{30} chance that either the all heads or all tails configuration will be seen in a single experiment. The chances of seeing the most extreme configurations is so small that their occurrence is virtually impossible. For example, if you flipped one randomly selected coin every second, you may have to live not just through one duration of the universe but 3 trillion times the amount of time through which the universe has existed.[68] This is in stark contrast to a situation with ten coins where if a randomly selected coin is flipped every second, the all heads configuration may reasonably be expected to be seen over 3 times an hour.

[68] Once every 4.019×10^{22} years, also assuming that the universe is 15 billion years old.

Repeating the test where all the coins begin in a heads up configuration on a table and we select one coin for flipping at a time, the graph of the coins looks like the following:

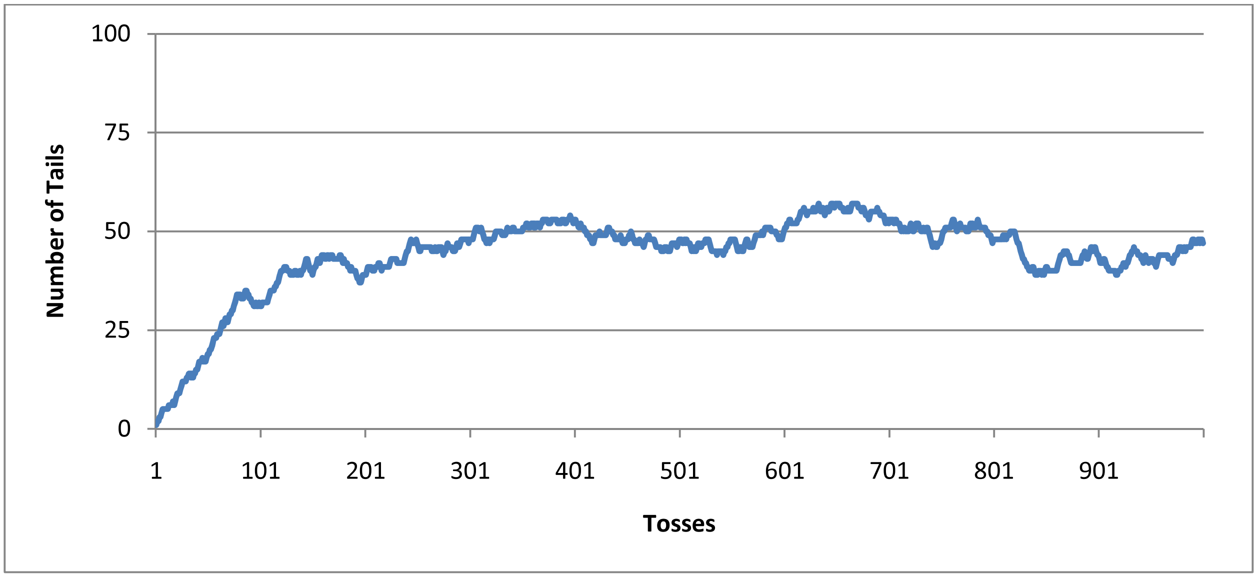

Figure 9 - The Number of Tails After Selecting a Coin and Tossing It

After starting at zero tails, the system moves toward the dim configuration with the highest multiplicity, the state of half heads and half tails. After the hundred coin system achieves the half heads/half tails state, the system will stay near the half heads/half tails dim configuration.

The propensity for a system of coins to achieve and stay at the dim configuration with the highest amount of associated specific configurations becomes increasingly pronounced when the number of coins in the system is increased. Also, further increasing the number of coins in the system likewise decreases the range of likely dim configurations in comparison to the total range of possible dim configurations. The following table shows the number of coins in a system, the average dim configuration for each coin, the range of achieved dim configurations as a percentage of total possible dim configurations, and a width of probable achieved configurations.

Number of Coins in the System	**Achieved configurations compared to total possible configurations**	**Average dim configuration expressed as a ratio of heads to tails (heads:tails)**	**Width of probable achieved configurations expressed as a percentage of total possible configurations.**[69]
1	100%	1:1	100%
10	100%	2:3	100%
100	58%	49:51	36%
1000	17.9%	1:1	11.6%
10000	5.14%	1:1	3.7%
100000	1.414%	49997:50003 ≈ 1:1	1.17%
1000000	0.4229%	500012:499988 ≈ 1:1	0.37%
10000000	.041%	5000698:4999302 ≈ 1:1	0.11%
100000000[70]	-	-	0.037%
1000000000	-	-	0.011%
10000000000	-	-	0.0037%
100000000000	-	-	0.0011%
1000000000000	-	-	0.00037%

Figure 10 – Table Illustrating the Narrowing of Achieved Ranges

As the number of elements in the system increases, the probability that a change in the system will be noticeable will also decrease. In natural systems, the numbers of elements in the system are so large (one gram of hydrogen has 6.02×10^{23} atoms) that any departures from the most likely dim configuration are unnoticeable. Essentially, entropy comes down to the following, "events that are expected to occur more frequently, will occur more frequently. For [a very large

[69] The possible achieved configurations is the set of dim configurations where the number of associated specific configurations is at least one thousendth of the number of specific configurations associated with the dim configuration with maximum associated specific configurations. The percentage is found by the solving the following equation for x, where x is the edge of curve(n is the number of coins in the set:

$$\frac{\binom{n}{n/2}}{\binom{n}{x}} = 100$$

The equation can be expanded to the following:

$$\frac{\frac{n!}{(\frac{n}{2}!)^2}}{\frac{n!}{x!\,(n-x)!}} = 100$$

Then the following property can be applied. *See* Schroeder at 62.

$$\ln(N!) \approx N\ln(N) - N$$

This yields the following equation that can be solved for variable x, where x indicates the boundary for the value to be compared to the dim configuration with the maximum number of associated specific configurations.

$$x\left(\ln\left(\frac{x}{n-x}\right)\right) + n\left(\ln\left(\frac{n-r}{\frac{n}{2}}\right)\right) = \ln(100)$$

[70] This and higher numbers were beyond the capabilities of computer simulation.

number of particles], more frequently equates with always."[71] While the system will depart slightly, the departures will be unnoticeable. For example, if one had a system of 10^{20} coins, a graph of the probabilities could stretch more than two times around the equator, yet the portion of the graph that includes nearly all of the achievable states would fit within a single centimeter. When this narrow range of achievable states is compared to all the possible states, the changes will be unnoticeable.

While entropy is frequently misunderstood, hopefully, the above description has reduced it to a simple matter of probability. From the above discussion, there are a few important points that should be reiterated. They are as follows:

- The elements in a system can be found in mutual exclusively occurring specific configurations, where the characteristics of every particle in the system are known.
- A dim configuration is a configuration that describes a group of specific configurations.
- The system is most likely to be found in the dim configuration that describes the most specific configurations.
- As the number of particles in the system increases, the probability that the system will be found near the dim configuration with the most specific configurations increases.
- When the number of particles becomes extremely large, the probability that the system will be found near the dim configuration with the most specific configurations approaches one.

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[71] BEN-NAIM, *supra* note 2 at 144.

- After a system with an extremely large number of particles reaches the dim configuration with the most specific configurations, any departures from that dim configuration will be unnoticeable.
- Entropy is a measurement of the amount of information needed to determine the specific configuration when one knows the dim configuration.

Rate of Changing Entropy

The rate at which particles in a system move toward the most likely dim configuration depends on the particles' ability to interact with one another. Back to the coin example, if all the coins were tossed at the same time, the system will achieve the state of maximum entropy much faster than if only one coin is selected and tossed at a time. In the physical world, systems that mix with one another provide a good example of the rate of changing entropy.

The first example is a system consisting of a shoebox with a partition dividing the shoebox into two compartments. The first compartment has several white marbles, the second compartment has several grey marbles as shown in the following figure:

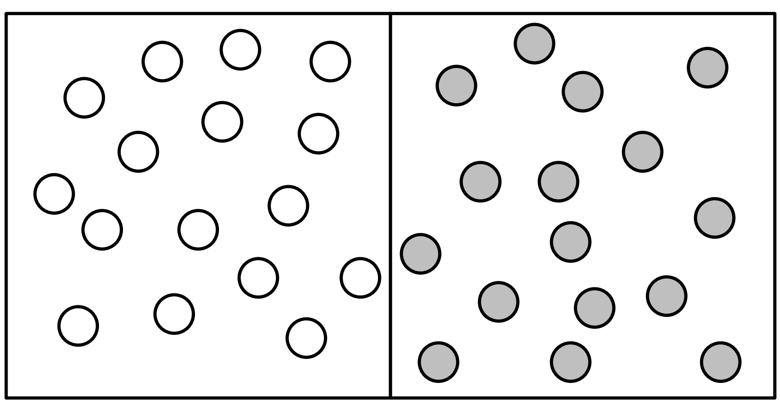

Figure 11 – Shoebox with Partition and Separated Marbles.

If the partition is entirely removed and the shoebox is shaken, the marbles rapidly mix as displayed by the following figure:[72]

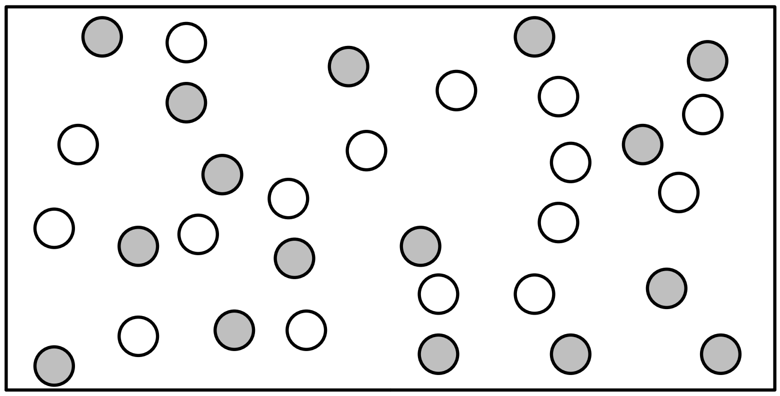

Figure 12 – Shoebox with Partition Removed

However, if the partition is only partially removed, such that only one marble can pass through the partition at a time, then the marbles will still mix but at a slower rate, as shown by the following figure:[73]

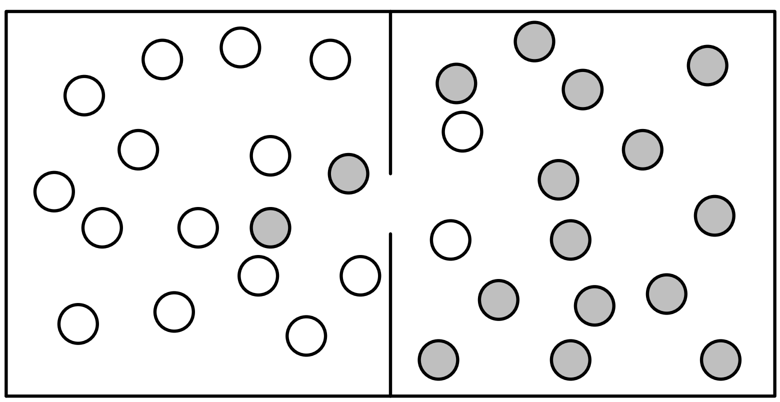

Figure 13 – Shoebox with Portion of Partition Removed

In the last example, the marbles are limited in their ability to interact with one another.[74] The degree of particle interaction determines the rate at which systems move towards their dim configuration with maximum entropy.

[72] *Id*. at 148.
[73] *Id*. at 149.

Many physical systems display the effects of particle interaction on the rate of change. For example, air in a balloon slowly diffuses through the rubber surface and mixes with external air. If one pops the balloon, the air will appear to instantly mix with the external air. Ice cubes placed in a cup of water present another example of this principle. The water in the ice cubes slowly mixes with the water in the cup as the ice cubes melt. Conversely, if one melts the ice cubes and then adds the melted cubes to the cup of water, the water that was previously the ice cube will appear to mix instantly with the water in the cup.

Likely, the most famous interaction between particles is that between hot and cold bodies. When a hot body comes into contact with a cold body, the hot body will give energy to the cold body until the bodies have the same temperature. Each body contains a set of particles that are moving with a particular velocity. The particles in the hot body move faster than the particles in the cold body. As the bodies come into contact with one another, the particles start to collide until the particles in the two bodies move with the same average velocity. The rate of interaction determines how fast the temperatures equilibrate.

Therefore, when systems combine, the systems will move towards their dim configuration with maximum entropy at a rate that is determined by the ability of the individual particles in the system to interact with one another. Understanding these principles of math and physics, we can now understand the impact of technology on religious freedom.

Technology, Entropy, and Religious Freedom

Probability and particle configuration play a large role in determining the religious freedom in a society. To understand exactly how, it is helpful to identify analogous parts

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[74] *Id*. Physically, in the system where the marbles are limited in their ability to pass through the partition, the marbles would achieve what are called intermediate equilibrium states. "This kind of process is referred to as a quasi-static process. . . . The system is not in an equilibrium state, but the measurable quantities . . . change very slowly, as if [the system] is passing through a sequence of equilibrium states." *Id*. This is compared to the rapid change that occurs when the particles are free to interact with one another.

between the social world and the realm of physics. In physics, the universe includes everything, the universe is the sample space of sample spaces. The universe is divided into a series of semi-isolated systems and each of these systems comprises particles. The social world has equivalent parts. Assuming that the earth is absolutely isolated from any extra-terrestrial societies, the physical universe is analogous to a global society. Whereas the universe comprises uncountable semi-isolated systems that have limited interaction with one another, the social structure of the world comprises billions of individuals with similarly limited interactions with one another. Further, the individual particles contained in the semi-isolated systems are equivalent to an individual's beliefs that form one's concept of reality. The following Venn diagrams illustrate this analogy:

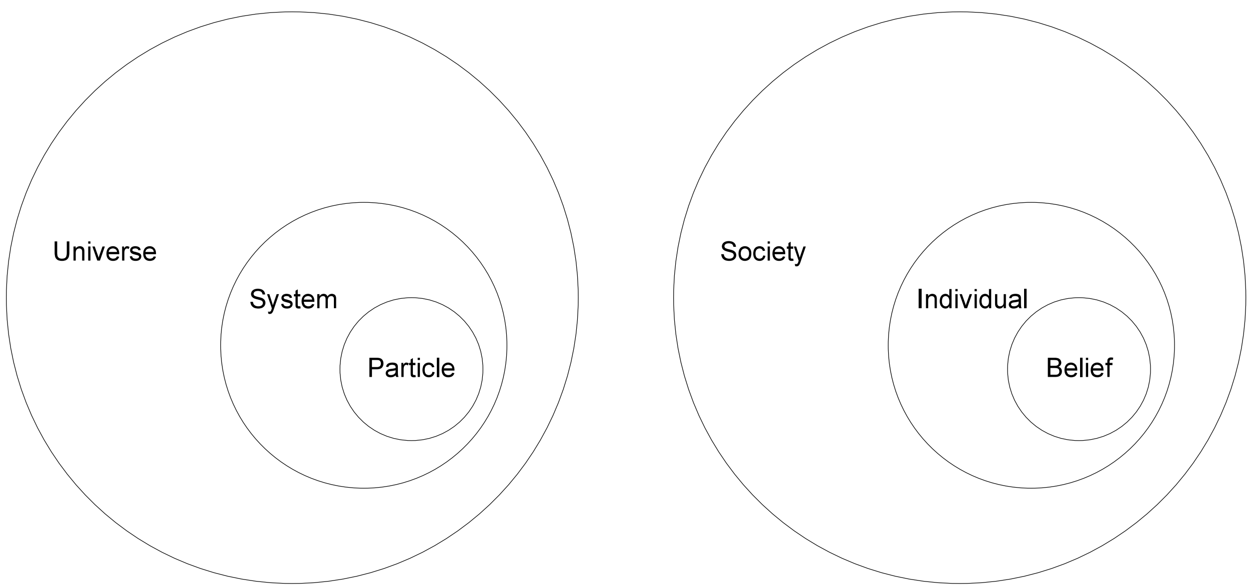

Figure 14 – Venn Diagrams Analogizing Physical Systems to Social Systems

With this analogy in place, it is easier to see how the interaction of individual beliefs conform to the second law of thermodynamics in the same way that interacting particles follow the second law of thermodynamics.

As was previously elaborated, the second law of thermodynamics essentially states that systems move into the state that is most probable. To understand how probability works in the context of beliefs, it is helpful to understand the theory of cognitive dissonance. As the second law of thermodynamics helps us understand the interaction of particles and semi-isolated systems, the theory of cognitive dissonance helps explain how beliefs interact within an individual.

The Theory of Cognitive Dissonance

As people interact with others, they may learn about new beliefs and practices. When these new beliefs and practices conflict with one's own beliefs and practices, a person may experience mental discomfort called cognitive dissonance. Psychologists have developed a theory of cognitive dissonance that deals with the way people react to mental discomfort arising from the aforementioned conflicts.[75] Humans deal with cognitive dissonance in similar ways to particle interaction in a physical system. Particularly, beliefs that cause dissonance are comparable to the interactions of particles with different energy levels in cold and hot bodies.

Defining Dissonance

We desire to avoid mental conflict that arises when we experience cognitive dissonance. In general, we want our actions and beliefs to agree with the environment that constitutes our reality.[76] To explain how people achieve consonance, the theory of cognitive dissonance uses two main hypotheses. The first hypothesis states that "the existence of dissonance, being psychologically uncomfortable, will motivate the person to try to reduce the dissonance and achieve consonance."[77] The second hypothesis states that "when dissonance is present, in addition to trying to reduce it, the person will actively avoid situations and information which

[75] Elizabeth Harmer-Dionne, *Once a Peculiar People: Cognitive Dissonance and the Suppression of Mormon Polygamy As a Case Study Negating the Belief-Action Distinction*, 50 Stan. L. Rev. 1295, 1312 (1997-98).
[76] LEON FESTINGER, A THEORY OF COGNITIVE DISSONANCE 1, (1957).
[77] *Id*. at 3.

would likely increase the dissonance."[78] In the scope of human and societal interaction, these hypotheses greatly influence religious belief and expression.

People may experience particularly strong dissonance when the conflicts involve religious beliefs and practices. Stronger dissonance encourages speedy reconciliation of the cognitive differences. "The strength of the pressures to reduce the dissonance is a function of the magnitude of the dissonance."[79] As religious beliefs help form an individual's identity, dissonance involving religious belief threatens to undercut that identity's foundation.[80] As the pressure to reconcile religious beliefs with a discordant reality may be strong, people zealously protect their religious beliefs and practices.

In *Cantwell v. Connecticut*, a proselytizer confronted two men in a street. The proselytizer asked the men if he could play a phonograph for them. The two men obliged but soon realized that the phonograph challenged their religious convictions and asked the proselytizer to stop as the recording caused unbearable uneasiness. The man with the phonograph complied and left.[81] Eventually, the police arrested the proselytizer and charged him with inciting the other two men to breaching the peace.[82] Even though courts invalidated the conviction, the circumstances illustrate that some people believe that challenging the religious beliefs of others may deserve any incited violent response. In another example, one may have lived her entire life thinking, believing, and acting accordingly with the thought that her actions earned her an eternity of endless bliss. Then another person comes along and teaches her that her actions did not earn the sought after heaven but rather put her in hell. Understandably, an individual would show a strong negative reaction to the discordant belief. Ideally, the individual

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[78] *Id*.
[79] *Id*. at 18
[80] BRUNNER, s*upra* note 16.
[81] 310 U.S. 296, 302-303 (1940).
[82] *Id*. at 303.

would avoid all such teachings, but increasing interactions increase the frequency of such challenges to religious belief.

Leo Festinger defined cognitive dissonance as a general conflict between two elements.[83] He coined these elements the behavioral element and the environmental element. The behavioral element comprises ones beliefs and actions, which encapsulates religious belief and religious expression. The environmental element is a set of factors that externally influence a person.[84] Changing either the behavioral element or the environmental element such that they agree with one another eliminates dissonance.[85] A person can use several different mechanisms to change an element.[86] The choice of which mechanism to use to change an element depends on the type of element and the context surrounding the element.[87] Frequently, when dissonance is experienced, one can change the conflicting behavioral element more easily than a conflicting environmental element.[88] Changing the behavioral element "in such a way that it is consonant with the environmental element" is one mechanism to remove cognitive dissonance.[89]

In place of changing the behavioral element, one can also try to change the environmental element.[90] However, changing an environmental element is not always possible. Sometimes, we are powerless to change the circumstances that conflict with our beliefs and corresponding behavior.[91] However, when we do find it easier to change the environment rather than our behavior, elements derived from the social environment may be more changeable than elements

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[83] *See* FESTINGER *supra* note 76 at 18.
[84] *Id*. at 19-24.
[85] *Id*.
[86] *Id*. at 18-19.
[87] *Id*. at 19.
[88] *Id*. at 19.
[89] *Id*.
[90] *Id*. at 19-20.
[91] *Id*. at 20.

derived from the physical environment.[92] For an example of the challenges posed by a physical environment, a person who has lived his life above the Arctic Circle may have religious beliefs and expressions revolving around the darkness during the winter months and sunshine during the summer months. If he were to move to the equator, where the cycles of the sun are different from the sun cycles above the Arctic Circle, his beliefs would now disagree with the environment. As he cannot control the sun, he cannot change the environment to agree with his beliefs. As such, to resolve the cognitive dissonance, he must change his beliefs regarding the cycles of the sun to agree with his physical environment. Some environmental elements are unchangeable and if we are to find cognitive consonance we must change our beliefs to agree with these environmental elements.

Social environments are more malleable than physical environments. For example, a person may change her social environment by preaching her beliefs and increasing a group of people who hold the same beliefs. For example, Galileo believed that the universe was not concentrated on the earth and these beliefs contrasted to the teachings of his social environment. He was thoroughly convinced that he was correct and he never capitulated to the social pressures imposed on him by others. Galileo did attempt to teach others and his efforts were fruitful to the point where people now almost universally agree with his teachings. Galileo tried to change his environment instead of his behavior by introducing his behavioral element into the social environment. "Establishing a social reality by gaining the agreement and support of other people is one of the major ways in which a cognition can be changed when the pressures to change it are present."[93]

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[92] *Id*.
[93] *Id*. at 21.

Another way to reduce the dissonance between two cognitive elements is to add new cognitive elements that bridge the gap between the environmental and behavioral elements.[94] Additional elements, both behavioral and environmental, can mediate between the conflicting behavioral and environmental elements to reduce the importance of the dissonance.[95] A person can find facts that support the rationality of her belief. For example, a person may have a religious belief that smoking marijuana is good, despite societal pressure to stop the practice and relinquish the belief because of its illegality and societal harms. He may find information touting positive health benefits, or other information that minimizes the social harms caused by the use of marijuana. By acquiring the new information, the believer may reduce the cognitive dissonance caused by the conflicting religious belief and environmental pressures.

Alternatively, the addition of new elements may reduce the cognitive dissonance between religious beliefs by connecting the environment and belief together in such a way that they agree with one another.[96] Festinger provides a good example from Spiro based on the belief system of the Ifaluk. The Ifaluk believe that people are good.[97] However, young children all go through a "period of particularly strong overt aggression, hostility, and destructiveness."[98] The environment element, concerning the children's behavior, conflicts with the religious belief about the inherent goodness of man. The Ifaluk connect these two dissonant elements by also believing that "malevolent ghosts . . . enter into persons and cause them to do bad things."[99] The third element explains the behavior of the children in such a way that it agrees with their religious beliefs and removes the cognitive dissonance.

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[94] *See Id*.
[95] *See Id*. at 22.
[96] *See Id*. at 23.
[97] *See Id*. at 22.
[98] *See Id*. at 23.
[99] *Id*.

There are several ways to overcome cognitive dissonance that results from conflicting environment and behavioral elements. One can change beliefs and actions, change the environment, find new elements that reduce the importance of the dissonance, or find new elements that remove the dissonance all together.

Resistance to Change

Changing a behavioral or environmental element is not as easy as flipping a switch. To change either element, one must overcome the resistance that each element has to changing. "Whether or not [an element changes], and if so, which ones, will . . .[is] determined in part by the magnitude of resistance to change which [an element possesses]."[100] There are several reasons why a belief would resist change, and many of these reasons prevent people from changing their religious beliefs. A person may resist change because the change causes pain and/or the loss of something important.[101] As religious beliefs compose a major part of our identities, forsaking or changing a belief may cause isolation from society, persecution, and even death. Certain societies may impose harsh consequences on anyone who changes their religious beliefs. The fear of increased discomfort causes people to resist the changing of a behavioral element.

A person may also resist changing a behavioral element because the behavioral element provides satisfaction.[102] In the context of religious beliefs, a person may derive joy and satisfaction from following the teachings of a religion and participating in any accompanying social structure. Further, the teachings of a religion may mask the pain caused by difficult life events. The prospective loss of enjoyment resulting from conversion may cause one to resist conversion. The benefits of belief in conjunction with the cost of conversion prevent many from

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[100] *Id*. at 24
[101] *See Id*. at 25.
[102] *See Id*. at 25.

changing certain aspects of their behavioral element. Further, at times it may be impossible to change a behavioral element.[103] In all respects, determining whether to change the behavioral element or the environmental element depends on the "responsiveness of such elements to reality."[104]

Environmental elements also resist change. The magnitude of an environmental element's resistance depends on how closely the environmental element represents the reality experienced by the believer. For example, "when there is a clear and unequivocal reality corresponding to some cognitive element, the possibilities of [changing that cognitive element] are almost nil."[105] However, social realities are more malleable than physical realities, "the resistance to change [of a social reality] would be determined by the difficulty of finding persons to support the new cognition."[106] For a missionary, the resistance to change depends on the convincing nature of the message and its ability to change the proselyte's view of reality.

There are some resistances to change that affect both behavioral and environmental elements. When "an element is in a relationship with a number of other elements. To the extent that the element is consonant with a large number of other elements and to the extent that changing it would replace these consonances by dissonances, the element will be resistant to change."[107] In essence, a cognitive element will resist change if changing the cognitive element will cause collateral dissonance, with other cognitive elements, that outweighs the original cognitive dissonance. The chance that a change will cause unbearable collateral dissonance depends on the number of collateral religious beliefs related to originally conflicting religious belief. Sometimes, the religious beliefs may support many other religious beliefs and practices.

[103] *Id*. at 26.
[104] *Id*. at 24.
[105] *Id*. at 27.
[106] *Id*. at 27.
[107] *Id*. at 27.

For example, Christians may associate many of their religious beliefs and practices with the divine nature of Jesus Christ. As a belief in Christ is foundational to many Christians, a person is unlikely to change this belief because it may cause more collateral dissonance than one can bear. Conversely, changing a peripheral religious practice may meet much less resistance.

Despite how much an element resists change, the resistance cannot hold in the face of infinitely surmounting dissonance. Either the behavior element or the environmental element will change.

> "The maximum dissonance that can possibly exist between any two elements is equal to the total resistance to change of the less resistant element. The magnitude of dissonance cannot exceed this amount because, at this point of maximum possible dissonance, the less resistant element would change, thus eliminating the dissonance."[108]

When a person confronts infinite dissonance, he will change the element that resists change the least.

Avoiding Dissonance

Festinger's second hypothesis stated that "when dissonance is present, in addition to trying to reduce it, the person will actively avoid situations and information which would likely increase the dissonance."[109] To avoid future dissonance, one must first experience the emotional conflict caused by conflicting elements.[110] Once the dissonance is being resolved, reduced, or removed, a person will actively avoid anything that could cause the dissonance to increase or return.[111] When an alcoholic whole-heartedly converts to teetotalism, the reformed alcoholic, having passed through the dissonance of conversion, will avoid situations that may cause the alcoholism and the associated

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[108] *Id*. at 28.
[109] *Id*. at 3
[110] *Id*. at 30
[111] *Id*.

cognitive dissonance to return. Because of the desire to avoid dissonance, conversion becomes a one way street for many. A person has passed through the fire, found it unremittingly uncomfortable, and will avoid anything that can cause the dissonance to return.

Conflicts between behavioral and environmental elements produce a limited set of outcomes. A person experiencing dissonance will change the behavioral element to fall more in line with the environmental element, change the environmental element to agree more fully with the behavioral element, find new elements that reduce or remove the dissonance between the environmental element and the behavioral element, or resist changing the conflicting elements. Further, after resolving the cognitive dissonance, the person will avoid anything that can cause the dissonance to return.

Probability and Societal Resolution

As was previously stated, we can think of people as individual systems unto themselves, and the different beliefs held by people interact with one another. The interaction of beliefs within individuals, as they deal with cognitive dissonance, is similar to the interaction of particles as they transfer energy back and forth. When two particles collide with one another, the system averages out.[112] Similarly, colliding beliefs average out as they come to rest at a point that is a combination of the two original beliefs.[113] Also, where physical systems are aggregates of many interacting particles, societies are also aggregations of individuals resolving their individual cognitive dissonance. People

[112] In a collision of two particles, the resultant system takes into account the speed of the particles, the mass of the particles, and the angle at which the particles collide.

[113] In a collision of two beliefs, the resultant system may also take into account the amount to which a person relies on a belief (mass), the amount of time which a person thinks on and exercises a belief (speed), and how directly the two beliefs collide with one another (angle). The author believes that this analogy could be explored in greater depth.

interact with one another causing beliefs from different individuals to also interact. The collision of these beliefs will move a society towards a state of equilibrium, which exists at the state of greatest probability. When all the possible configurations of religious belief are considered, the state of greatest probability minimizes cognitive dissonance for all individuals in a society.

To see the interaction between the theory of cognitive dissonance and entropy requires more than just the example of an individual, we must look to the interaction of multiple individuals. When individuals possess different, conflicting religious beliefs and they express those religious beliefs to one another, cognitive dissonance, as experienced by the separate individuals, arises in a society. The individuals will attempt to resolve their cognitive dissonance. As the individuals resolve their inward dissonance, the society as a whole will move toward a state of minimized cognitive dissonance.

Analyzing the possible outcomes of a conflictive interaction between different individuals illustrates how the system will move toward minimized cognitive dissonance and not move toward more cognitive dissonance. In one outcome of the resolution of conflicting beliefs, the different individuals will maintain their separate beliefs and practices associated with those beliefs. In this case, the cognitive dissonance will remain static and the individuals will inwardly decide to experience their own dissonance arising from their interactions. In another outcome, the individuals will decide to maintain their beliefs but eliminate the outward expression of those beliefs. Essentially, the individuals attempt to act as if the interaction never occurred. However, in the society there will be either a tacit or express agreement between the individuals that the expression of one of those beliefs is unacceptable. Eventually, when a society rejects the expression of a religious belief, individuals who hold that belief will eventually lose that belief.[114] When a society rejects the expression of a religious belief, the cognitive dissonance decreases in a system.

Other outcomes that will all decrease the cognitive dissonance in the system include: an individual who changes his belief to agree with the belief of the other individual, the individuals jointly form a new belief, or one individual creates a hybrid belief from the conflicting beliefs that removes the conflicting portions of the expression from the system. Conversely, for cognitive dissonance to increase in a society, an individual would have to form a conflicting belief from an interaction with someone having an originally non-conflicting belief. Where the two individuals experience the same external environment, this is highly unlikely if not impossible.[115] For this to happen, for example, two people would have to meet without any external influences or pressures. They could both espouse their belief in the bible to one another and solely as a result of this interaction, one would have to change their belief in the bible because of the interaction. This would be absurd.

Each outcome for the resolution of cognitive dissonance has a probability of occurring. These probabilities show that the chance of conflicting religious beliefs converging is much greater than the probability of non-conflicting religious beliefs diverging. The aggregated effect of individuals resolving their cognitive dissonances will

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[114] Harmer-Dionne, s*upra* note 75.

[115] Computer code was written where a predetermined number of people were each assigned a separate belief. Each person's belief initially conflicted with every other belief held by the other individuals in the simulation. Then two members of the societies were randomly selected to have a religious conflict. Probabilities were randomly determined that were used to select an outcome related to the possible outcomes of an individual based on a resolution of cognitive dissonance. Then an outcome of the beliefs for each of the randomly selected participants was determined and stored for the next conflict. The above stated process was iterated multiple times in accordance with the number of members in the society. No matter what probabilities were assigned to the outcomes, the religious beliefs converged.

cause the religious beliefs in a society to also converge. The societal convergence of religious beliefs minimizes societal cognitive dissonance.

Technological development hastens the rate of cohesion for religious beliefs in a global society. As technology develops, it will link the isolated societies of the world together into a single communicative society. Analyzing the history of civilizations elucidates technology's impacts on religious freedom. To analyze the history of the world in terms of interpersonal interaction, it is helpful to divide history into four different stages. The first stage looks to the interactions of people as their societies expand to fill the globe. The second stage is after the globe is filled with people, but the people are not in direct contact with each other because of a lack of technology. The third stage occurs when technology facilitates the cohesion of the many isolated societies. We are currently living in the third stage. Finally, the fourth stage begins after the societies of the world are technologically mature and combined into a global society.

Religious Freedom in the expanding Human World

At some point man realized that they were different from animals. Whether, it was a slow realization as man evolved from other animals, or a clear cut initialization from the divine imposition of man on the earth, man had a beginning. At some point man's conscience encompassed the world beyond the bare instincts of the animal world. As part of this self-realization, man began to note both supernatural and physical characteristics of his environment. In the effort to understand the characteristics of his surrounding world, he developed religion.

Assuming that the beginning of man's ability to comprehend belief and spirituality was a sharp moment, the lone man and woman possessed incomparable religious freedom. One man and one woman alone would only be limited in their religious practice by what was physically possible. If they wanted to practice human sacrifice (if there were other humans to sacrifice), they would have been free to pursue their belief. If they wanted to sacrifice animals,[116] smoke peyote,[117] or any other activity in the name of religion, they were absolutely free to do so. They essentially had no limits on their religious expression. However, as history bears out, these humans procreated and the fruits of their procreation also possessed the same ability to develop explanations for their physical observations.

In this first stage of humanity, people developed religious beliefs that differed from the religious beliefs of their ancestors. The expanding human world was largely vacant and untouched by man's influence. As the world was vacant, if one attempted to live independently of the support of her family, she frequently disconnected herself from the religious beliefs of her descendents. As technology was undeveloped, the different social units in the world were isolated from one another. These isolated social structures independently developed distinct religious beliefs unaffected by the religious beliefs of most other social structures.

As humans left the societies of their families, and at times were required to leave, a diverse array of religious beliefs developed as people covered the earth. In the world, people created and taught many different ways to explain their world and life in general. The diverse array of religious beliefs included polytheism, pantheism, animisim, henotheism, monotheism, agnosticism, and atheism.[118] The people of this time were similar to the energetic particles spewed into the universe at the time of the big bang when the universe possibly began. Just as those wild particles settled down to provide the rich beauty that we behold as we gaze through the cosmos, our wild ancestors developed the rich diversity of religious belief that we view in the world today. It is also similar to the evolution of species into the diverse flora and fauna that

[116] Church of the Lukumi Babalu Aye v. City of Hialeah, 508 U.S. 520 (1993).
[117] Employment Division, Dept. of Human Resources v. Smith, 494 U.S. 872 (1990)
[118] T. M. K. Hicks (2006) http://www.ewabaptist.org/theismhandout.pdf.

exists in the world. The creation of isolated social systems led to the widespread religious diversity that exists in the world today.

The Sectionalized Earth

Eventually, after hunting and gathering for centuries, the social systems evolved into the more efficient civilization. In Mesopotamia, where civilization was born, people accumulated along the Fertile Crescent between the Tigris and Euphrates Rivers. Likewise, other civilizations began to sprout up in other optimal locations throughout the world. Many times these civilizations established themselves along rivers like the Indus, Yellow, and Nile, or other watercourses like the Mediterranean Sea. These locations possessed the natural resources that allowed civilizations to support themselves with agriculture.

The many civilizations that began around the world were generally isolated from one another. As such, each civilization developed different religious beliefs and practices. Many societies believed in a pantheon of gods and god-kings. The Egyptians, Greeks, Sumerians, Babylonians, and others believed in a plurality of Gods which were dedicated to the governance of different earthly and supernatural domains. However, the citizens of different ancient civilizations generally had identifiably different religious beliefs.

Periodically, a civilization would come into contact with neighboring civilizations through trade, conquest, or other means of interaction, but these interactions did not contain the profundity and duration necessary for the civilizations to meld into a single society. Further, social structures frequently isolated people from one another within a society. For example, kings and pharaohs infrequently interacted with the beggar. Many societies had castes and classes that isolated people from one another within the same society. As there were different gradations of social station, the intersociety contact of citizens depended on an individual's social class. For example, kings dealt with other rulers, while the dealings of a peasant were primarily, if not exclusively, with other locally living peasants.

Throughout this time, technology was developing and allowing people to achieve more in their lifetimes. People could develop more crops and interact more with their neighbors. However, despite the technological advances of the times, communication and transportation technology lagged behind and people could not travel far from their homes while simultaneously preserving contact with their homeland. For instance, a person moving one hundred miles away from her family could experience an entirely different social system and would possibly never see or speak again with her family.

Civilizations were not completely isolated from one another as they indirectly interacted with one another. For instance, the Greeks influenced the British via the Romans. The indirect interaction of religious beliefs between isolated societies was similar to the indirect transfer of energy between isolated systems. For example, a house with different isolated rooms has separate thermostats set to different temperatures in each room. While each room will try to stay at the temperature set by the room's thermostat, the rooms will transmit their heat through the walls that divide the different rooms. The transfer of energy through the walls will affect the temperature in each isolated room. The different religious beliefs in each of the isolated civilizations similarly influenced each other.

First, just as the temperature in an individual room attempted to achieve the temperature set on a thermostat, the expressed religious beliefs in an isolated society moved toward a uniform religious system. The citizens in a completely isolated and fully integrated society, which has been in existence for a substantial period of time, will exercise their religion in such a way that an individual's religious practice is indistinguishable from the religious practice of his neighbor.

Intra-societal pressure from individuals causes members of a society to conform their religious practices to a normative religious practice.

After a society established a religious identity, the society would intermittently interact with other civilizations. Returning to the room analogy from the above paragraph, if a room's door opens, the rapid transfer of air will upset the temperature equilibrium within the separated rooms. Just as the rooms adjusted to the upset equilibrium, when two societies collide with each other, the societies also adjust to the upset uniformity of religious belief. In societies, conquest, trade, exploration, and colonization all serve to upset the equilibrium that is the uniformity of religious belief. In the ancient world, these connections were usually brief and intermittent. Similar to the example of the shoebox and marbles mentioned in the discussion on entropy, where the marbles in each partition mix slowly when there is only a small hole in the partition, the isolated societies of the world were slowly mixing and stagnantly moving towards a globally uniform religious practice.

The intermittent connections created the large diversity of religious beliefs that exists in the world today. However, isolated societies, subject to intermittent external influence, attempted to minimize the societal cognitive dissonance by converging on a uniform expression of religious belief. Technology, during this time period, was unable to connect the many different societies together. Eventually, technology began to manifest its famous exponential growth, and the different civilizations of the world began coalescing into a single global society.

The combining world

Technology had been slowly developing since the beginning of man. The wheel, boat, horse and cart, bow and arrow, and spear were all technological developments that greatly changed the human experience. However, communication technology lagged behind the other technologic developments. Until the 1400's communication technology failed to progress beyond writing and paper, and even these were inaccessible to a majority of people. However, the geographic barriers to communication soon began to fall.

Gutenberg's invention of the movable type printing press in 1468 signaled the start of the communication era. The press imprinted ideas on paper, assembled books, and distributed the memorialized knowledge to the masses. In combination with Gutenberg's invention, other technologic advancements were beginning to bring societies together. For example, in the mid 1400's Prince Henry the Navigator of Portugal began sending ships to Africa. These efforts of exploration eventually led the Portuguese to explore the coasts of Africa and Asia, and brought European culture to the rest of the world and the rest of the world to Europe. These were just a few of the physical technologies that caused the world to begin mixing together.

Other developments, while not providing immediate physical benefits, laid the future for far more advanced technologies to continue the trajectory of technological innovation. The increased world view incited dissonance and the resolution of the dissonance changed man's understanding of existence. For example, Galileo Galilei, Isaac Newton, Rene Descartes, and many others developed new ways to view their environment. The developments of these scientists and mathematicians have led to the birth of a diverse array of technologies that further mixed the world.

Going back to the analogy where a room is filled with balloons containing different air compositions. As stated before, the air in the balloons will eventually diffuse through the balloons until the air inside all the balloons escapes and the air is uniformly distributed throughout the room. While this process may take several weeks or months to fully achieve, if a needle pops all the balloons in the room, the air will uniformally distribute throughout the room instantly. When it comes to the distribution of religious beliefs throughout the societies of the world, technology is the needle that pops the societal balloons of borders, distance, and culture allowing the people of the world to freely mix. As technology began popping the societal balloons centuries old established religions entered states of upheaval. Religious revolutions, the inquisition, missionary work, and conquistadores each occurred during this time period as people struggled to deal with the new forces impacting the societal psyche.

The exploration of the world and new scientific developments were only the beginning of the disturbance. In the midst of social turmoil, technology continued to flourish. By the 1900s, it was conceivable that a human could visit any location in the world that was habitable, if given the appropriate equipment which was in existence at the time. However, if a person was to visit another land, he would cut himself off from his land of origin. It was nearly impossible to experience the complete influence of two cultures simultaneously. Communication technology was lacking but the foundation had been laid for the information revolution that occurred by the end of the century.

The Scot James Clerk Maxwell discovered some of the four most important equations of all time. Maxwell composed four relatively simple equations that combined the electric force and the magnetic force into a single electromagnetic force.[119] These simple equations allowed other scientists to develop technologic applications that used electromagnetic waves. In 1896,

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[119] James Clerk Maxwell, On Physical Lines of Force, 4 The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science 161, (March 1861). The equations that govern the electromagnetic force are:

$$\nabla \bullet \mathbf{E} = \frac{\rho}{\varepsilon_\circ}$$
$$\nabla \bullet \mathbf{B} = 0$$
$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$
$$\nabla \times \mathbf{B} = \mu_\circ \mathbf{j} + \mu_\circ \varepsilon_\circ \frac{\partial \mathbf{E}}{\partial t}.$$

Nikolas Tesla invented Wireless communication.[120] Man built computers, put satellites in orbit, and constructed radar and other communication stations. People took advantage of these new technologies to communicate across the globe at rates approaching the speed of light. While still too close to the present to provide any substantive hindsight, the development of the internet in 1958 may prove to be the greatest communication technology yet developed. As has been seen recently, the internet has given man the ability to overcome any national barriers that would prevent them from communicating across the globe. Essentially, because of technological developments, anyone can be anywhere on the earth and experience the influence of every other culture in real time.

The recently developed communication technology has affected the world substantially. It has contributed to the overthrow of governments, the disestablishment of religions, and a sense of freedom that is spreading around the world. The societies of the world have followed the predictions of the second law of thermodynamics. As has been stated, technology has popped the society balloons, and people experience a wide array of diverse ideas, causing many, if not all, to experience almost unending cognitive dissonance. Yet, as individuals digest many more conflicting ideas than their predecessors, the actual diversity of accepted religious practice in the connected world is declining. In the highly connected mainstream western society, the civilization sanctions religious practices such as polygamy, human sacrifice, religious drug usage, and religiously motivated genocide. While this list may sound horrible in our view of the world, all of these practices were part of the valid exercise of religious belief in certain historical societies. As society coalesces into a global society, the range of accepted religious beliefs decreases.

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[120] Dr. Ljubo Vujovic, *Tesla Biography – Tesla Memorial Society of New York*, http://www.teslasociety.com/biography.htm (last updated July 10, 1998).

There is a tradeoff between the advancing of technology and religious practice. When individual, isolated societies covered the globe, people had more freedom to practice the religion that dominated their individual society. After the development of technology began forming a global society, people have more freedom to choose a variety of religious practices but less freedom to practice a religious belief with the outright zealousness of their forebears. This may be a common sense assertion, but probability in the scope of the entropy model predicts this outcome and the process by which society arrived at this outcome. Therefore, using the entropy model we can explain the future of religious freedom in the global society as technology continues to link the world together into a single global society.

Imagining the Future

To identify what will happen in the future under the entropy model requires that we identify the state of society or dim configuration that has the greatest probability. This dim configuration will be the future of the world because as the world becomes a global society, the number of people and ideas in the society increases and the probability of movement towards the most probable state becomes overwhelmingly likely to the point that this dim configuration becomes a quasi-certainty. However, identifying this state from our current viewpoint presents a challenge. Returning to the discussion on cognitive dissonance may provide the needed guidance.

The theory of cognitive dissonance states that people will try to reconcile any dissonance arising from conflicts between their environmental and behavioral elements. The exercise of religious belief stems from a person's behavioral element. The environmental element exerts an external influence on a person's religious belief. Therefore, a person will only change one's religious belief if the belief conflicts with her environment. Further, it will also only happen when changing the religious belief is easier than changing the environmental element or there are no other elements that can mediate the differences between the religious practice and the environmental element. Therefore, where the environment element is more rigid than the behavioral element, people will try to align their beliefs in accordance with the general environmental element presented by society or they will withdraw the expression of their religious beliefs from society.

The aligning of beliefs with the general environmental element or the withdrawal of expressed beliefs will bring society to the state with the greatest entropy. In terms of information theory, the state of greatest entropy is the state that provides the least amount of information about the particles in the system. In terms of religious beliefs and freedom, the state of greatest entropy is the state that provides the least amount of information about the individual beliefs of the individuals in the system. As people align their beliefs with the external environment or withdraw the expression of their beliefs from the public sphere, less information is available that identifies a particular individual's beliefs. For example, one can heat four separate cups of water to different temperatures. One can be reasonable certain that the particles in the four separate cups have energy levels near the temperature of the water. Therefore, there is information that identifies the energy level of the water in the cups. If all the water is combined, the temperature will change, and there will be less information about the individual particles of water. Similarly, a society with a large diversity of religious beliefs provides more information about the beliefs held by individuals. As technology combines the societies, people will begin to align their religious beliefs to a common environmental element, or stop expressing religious beliefs that conflict with the common environmental element. Just as there was less information about the water after the temperature equilibrated, there will be less information about a particular individual's beliefs after the expressed beliefs align with the common environmental element.

Throughout history, social groups have aligned their religious beliefs to a common environmental element. In the past the common environmental element helped spur religious expression, as the supernatural was primarily used to explain life's experiences. Many times, people explained the physical nature of the world in terms of gods who governed designated terrestrial spheres. The supernatural, theistic explanations for the world acted as a precursor for the scientific developments of the day. Today, with the new abilities of technology and science to explain many of the physical experiences of our life, and many other scientific oddities that are beyond our experience, the common environmental element has changed. Today, instead of coercing people into a belief in the supernatural, the common environmental element pushes people to believing in only the purely natural. Therefore, as technology creates a single global civilization, the allowed religious expression in society will coalesce around expressions rooted in the purely physical experiences of life. The religious expression will then agree with the common environmental element and cognitive dissonance will be minimized.

Overcoming Overwhelming Probability

As technology creates a global society, the probability will become overwhelmingly high that religious expression will be restricted to what all commonly experience. As humans, can we buck the deterministic ways of natural law and preserve religious diversity in a global society? Is it even desirable to maintain religious diversity?

The answer to the first question is "it depends". If technology maximizes the ways in which people can communicate with one another and there are no societies or external influences left that can join the global society, then the world will coalesce around the common environmental element. If technology continues to find new ways that allow humans to communicate their ideas with one another, then those new fields of interaction may still allow a diversity of religious expression. Further, if there is an unknown society that may begin interacting with our civilization in the future, then the new influence may also help preserve religious freedom. Also, the global society can fracture into isolated societies that may commence diversification from the common environmental element.

The answer to the second question is "yes". It is imperative that we as a society maintain religious diversity. First, there is more to life than the global common experience. Even the strong and sturdy science is full of unknowns and mystery. By coalescing about a common environmental element, we as a society take a great risk that we are excluding truth. Second, by losing religious diversity, we likewise lose religious freedom. After society minimizes cognitive dissonance, society will suppress any action that conflicts with the common environmental element. James Madison stated that "religious freedom 'arises from that multiplicity of sects, which pervades America, and which is the best and only security for religious liberty in any society'."[121]

As a wholly interconnected society will move towards a convergence of religious expression based on a common environmental element, religious diversity will diminish. From an individual viewpoint for one who wants to preserve their religious views for future generations, it is important that we maximize our usage of the channels of technology and share our religious views and expressions with as many people as possible. To preserve our religious views, we must make our religious practices part of the common environmental element.

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[121] J.L. Hill, *The Five Faces of Freedom in American Political and Constitutional Thought*, 45 B.C. L. Rev. 499, 583-584 (2004).

Otherwise, our religious views and practices will disappear with the advancing tide of technology.

Conclusion

Technology affects religious freedom by combining diverse societies together. While the breadth of the effects of technology are subdued, the second law of thermodynamics provides a model for understanding how the societies in the world have interacted, are interacting, and will interact as the civilizations of the world coalesce into a single global society. As the diversity of religious beliefs in the world decreases and melts into a common religious belief, for an individual to preserve their religious practices for future generations, he must publicly make his religious expressions part of the common experience of everyone. If one avoids the expression of her religious beliefs to avoid causing herself and others mental discomfort, she will discover her beliefs sliding outside the realm of public acceptance. Therefore, to preserve our freedom to practice our religions, we must actively make our beliefs part of the public sphere.