AHIMSA, ENTROPY, AND THE PROBLEM OF EVIL: A SYSTEMS THEORY ANALYSIS OF JAINA METAPHYSICS IN THE *TATTVARTHASUTRA*

Matthew Zaro Fisher

ABSTRACT

If entropy is a constitutive factor across the various physical and social systems of human culture, then what is entropy's relationship to religious thought and practice? This paper builds upon Arvind Sharma's expansion of the field of philosophy of religion beyond the confines of western theism as well as Wesley Wildman's call to reimagine philosophy of religion as multidisciplinary comparative inquiry, and endeavors to analyze the philosophy of Jaina metaphysics in the context of physical, biological, and social-system interdependency. From a systems theory approach to philosophy of religion, the Jaina doctrine of ahimsa (non-violence) provides an answer to the problem of evil that is emergent from the "problem of entropy" for individuals-in-community in recognizing that minimal energy consumption and truthfulness in information is the least offensive (i.e. disorder-inducing) mode of action in the world for living beings, and is therefore necessary for the soul to achieve liberation. Secular contexts in a globalized economy that wish to minimize consumption can therefore look to ahimsa as an example of systems-oriented thinking that minimizes our "entropic footprint" in the world.

Keywords: Ahimsa (Jainism), Tattvarthasutra, Entropy, Systems Theory, The Problem of Evil, Philosophy of Religion.

INTRODUCTION: ENTROPY AND EXPERIENCE

Walking north on the west bank of the Ganges River in Varanasi one comes across the Burning Ghat. Hindus come here from all over India to pay final respects to family and stranger alike as bodies are cremated on the steps of the Ghat with ash and bone given up forever to one of the holiest rivers in the world. This funeral rite is considered auspicious, ensuring the release of the deceased person's karma, thus freeing them from the cycle of reincarnation and allowing them to attain liberation. The scene at the Burning Ghat is humbling, with smells of burning wood, sights of large funeral pyres, and the visibility of burning flesh. The priests, family members and assistants, all men,

participate in an unending ritual of celebratory mourning that has gone on every day for hundreds of families over thousands of years. It is here in this ritual on the Ganges that the stark reality of human existence is encountered firsthand. The path from birth to death is adorned by both the joys of creation – whether it be in art, amusement, or silent reflection and prayer; and the sorrows of corruption – physical ailment, debilitating disease, psychological anguish, moral failing, or the ultimacy of death. Since the dawn of conscious thought human experience has attempted to come to grips with a life existing in a space between the sacred and profane. As we see with the funeral rituals on banks of the Ganges, religion provides meaning for human communities in a life where the push and pull of creativity and corruption bring people to the heights of joy and the depths of suffering.

Looking at things from a naturalist perspective, we find the answer to the problem of change, corruption, and death to be attributed to localized increases and decreases in the autopoietic functions of living systems (see Maturana 1975,1980; Schatten et. al. 2010). Autopoiesis refers to the self-reproducing capacity of a given system to sustain its organization in a low-entropy, highly organized configuration over time. This is achieved by biological systems by taking in resources from an environment to replenish the energy stores that have increased in entropy since the organisms last intake of food. Entropy is a property of the various thermodynamic, statistical, and information systems in function we experience throughout our daily lives: hunger, a cup of coffee cooling in the morning, a desk becoming messy throughout the day, the very uncertainties raised about one's job due to a cryptic email from one's boss. The funny thing is, without eating; re-heating the coffee; cleaning the desk; emailing one's boss to follow up – that is, without introducing some form of energy into these systems– one will get even hungrier, the coffee will cool to room temperature, the desk will stay messy (or get worse), and the uncertainty will turn into anxiety as you ruminate on the many possibilities the email could be about.

That "entropy will increase in a closed system," while a probability assessment, has been nevertheless observed to hold in all instances of thermodynamic systems in function, and so is known as the second law of thermodynamics, and it is shown to be more than analogously applicable to statistical and informational articulations of the second law (See Bourceanu 2007; Popper 1957; Pierce 1980). The second law is also at play in living systems allowing for the emergence of novel forms according to natural selection (See Brooks 1988, 1989; Katchalsky 1971; Maturana 1975, 1980; Patterson 1983; Wicken 1986), it is a factor in the neurological processing of our brains that makes self-reference possible (Deacon 2006; 2011), and is a factor in the evolution of social systems (Luhmann 1995; Mavrofides 2011). Most relevant to our purposes, the global increase in entropy in the cosmos as a universal thermodynamic system is tied to the "arrow" of time we experience from "before" to "after," but never the other way around (See Carroll 2010; Davies 1974; Hawking 1988). And it is the very entropic character of the universe, its *temporal* character with its apparent built-in, probabilistic finitude that is

existentially problematic for sentient creatures (See Sorabji 1983; Ulanowicz 2013; Uzan 2007).

If entropy is a constitutive factor across the various physical and social system humans find themselves living, then the obvious question is what is entropy's relationship to religion? This paper builds upon Arvind Sharma's expansion of the field of philosophy of religion beyond the confines of western theism (1995, 2001, 2006, 2007, 2008) as well as Wesley Wildman's call to reimagine philosophy of religion as multidisciplinary comparative inquiry (2010) and endeavors to analyze the philosophy of Jaina metaphysics in the context of physical, biological, and social-system interdependency. Expanding on the foundation laid by Niklas Luhmann in his posthumous, *A Systems Theory of Religion* (2013), a systems theory approach to philosophy of religion understands the discipline not as an ontological uncovering of metaphysical principals, but instead as a comparative epistemological tool for analyzing the religious philosophies of different cultures in relation to the dynamics of physical, psychological, and social systems that have universal bearing on human existence. Philosophy of religion as a discipline can use systems thinking (See Bertalanffy 1969; cf. Laszlo 1972) as a tool to identify correlations between the cognitive and social processing of these various forms of entropy and the way that processing is reflected in religious thinking and organization. A systems theory approach is by definition multidisciplinary in nature, and so attention to the way universal system features impact individuals and societies can shed much needed light on why religious belief and practice appear in every human culture, and why "religion" — whatever we really mean by it — will probably never go away but merely change in form.

A SYSTEMS THEORY APPROACH TO PHILOSOPHY OF RELIGION: ENTROPY AND THE PROBLEM OF EVIL.

Phenomenologically speaking we experience the second law in terms of what we call the "arrow" of time and all the existential angst the arrow brings with it. Many philosophers and theologians have linked what the west has traditionally called "natural evil," or the inherent finitude and dynamism to nature that is the cause of affliction, pain, and ultimately death, to the universal holding of the second law across systems (See Hough 2010; Lambert 1967, 1968; Masani 1985; Murphey 1991; Russell 1984; Stoeger 2007). Although our understanding of entropy as articulated in the second law did not emerge until the middle of the 19th century, it is not as if the history of humanity is unfamiliar with this most fundamental of natural properties: natural evil, the state of sin, bondage in *samsara*, etc., the religions of the world are characterized by various beliefs and practices that respond to the problem of human finitude. To cite an example from my own tradition (Roman Catholic), when viewed through the lens of entropy and systems theory, we see the emergent relationship between the problem of entropy and the problem of evil expressed in the second story of creation in the book of Genesis. God chastises

Adam and Eve for eating of the fruit of the Tree of Knowledge of Good and Evil and pronounces the consequences for their sinful disobedience:

> In the sweat of your face
> You shall eat bread
> Till you return to the ground,
> For out of it you were taken;
> You are dust,
> And to dust you shall return
> (Gen. 3:19; RSV).

Here in this creation narrative we can identify an etiology for entropy's existential impact on the human condition: In order to survive and maintain the statistically low-entropy configuration of our material, living physiology so that we don't return to dust, we need to apply work to our environment by farming or hunting. Thermodynamically speaking, the work of the human body produces heat which translates to sweat, so this is a superficial parallel. But the point of highlighting sweat is relevant to its mythic nature: this etiology represents a fundamental observation concerning how laborious finitude is written into the code of physical existence, with death as the inevitable result. As Indian biochemist Jayant Udgaonkar points out, "[d]eath is the thermodynamically favored state: it represents a large increase in entropy as molecular structure yields to chaos. Although human beings expend a lot of energy to avert death, it is a state of too high of probability to be evaded" (2001). Hence, we see in the Genesis narrative a mythic description of the existential significance of entropy for human experience that could be reframed in systems-nomenclature as the "entropic condition."

By recognizing the universal hold of entropy on human experience as embodied creatures, we can shift the language in philosophy of religion from "the problem of evil" to the "problem of entropy," at least when it comes to distinguishing the "natural" side of the various sufferings that come with existence. Granted, the problem of evil – traditionally construed as a logical conflict between God's omnipotence, benevolence, and experience of evil – is not a problem for those religious systems where there is no God, or their understanding of Ultimate Meaning/Reality is beyond the anthropomorphic conceptions of benevolence and omnipotence present in the Abrahamic system. Arguably, there is no evil to be problematic in complementary dualist systems such as Taoist traditions, where "good" and "bad" are merely perspectival concretizations of the ontological fluidity of the Way of things (*Dao*). This same observation could therefore apply to Jainism where there is nothing "evil" in a world where ontology is conceived as an uncreated cyclical flux characterized by emergence, endurance, and perishing (See Bajželj, 2013). Nevertheless, all religious traditions from localized practices to world traditions exhibit some form of ritualized practice for dealing with the maladies of human experience. As Arvind Sharma notes, for Jainism it is not the problem of evil, but the problem of pain (2001, 38). Nevertheless, and trained in philosophy of religion, Sharma's

observes that "the Jaina solution to the problem of evil is *ahimsa*" (2001, 42). So, we can jettison the terminology of "the problem of evil" because it doesn't apply accurately to all philosophical systems, or we can redefine the problem of evil in such a way that avoids these conceptual and linguistic issues. We are therefore not looking at entropy through the lens of the problem of evil, philosophically or theologically conceived in order to provide a theological or philosophical response to the problem (See Berezin 2002; Bradnick 2008; Byrum 1983; Csikszentmihalyi 1971; Gangel 1980; Kragh 2007; Lambert 1968; Murphey 1991; Russell 2008; Sulaiman 1997; Tannous 1985; Toner 1981). Instead, we are defining "the problem of evil" as a conceptual tool in philosophy of religion in the context of entropy so that we can expand this philosophical category for examining human finitude beyond its linguistic and conceptual limitations when applied to thinking outside of the western philosophical tradition.

What is needed is a specific point of departure in both philosophy of religion and systems thinking from which a systems-based analysis of religious belief and practice can proceed. In their systems analysis of Buddhism, for example, Cho and Squire identify "centroids" as points of comparison concerning the function of religious belief: "A centroid is not an instance of a particular concept, but rather a region in which all of the varieties of a concept are clustered, relative to some scale" (2013, 378). Applying this notion of the "centroid" to our own efforts at developing a systems theory approach to philosophy of religion, we can cluster philosophical articulations on the topic of suffering and finitude around the centroid of "the problem of evil" at the phenomenological level while understanding this phenomenological centroid to be emergent from localized increases and reductions of entropy at the level of thermodynamic, statistical, and informational systems in which we participate. It is indeed the person-in-community, who makes judgments concerning the systems relationships in reality in relation to "good" or "bad," broadly conceived, relative to the frameworks of meaning operative in their social system. By proceeding methodologically from systems thinking and evolutionary epistemology (See Campbell 1974; Harms 2004; Van Fraassen 1980), philosophy of religion can identify the problem of evil as emergent from, but phenomenologically irreducible to, the "problem" inherent in the second law of thermodynamics: there appears to be a built-in finitude to every living system. Hence, the problem of evil could be rephrased as "the problem of entropy" if one wished to avoid the conceptual baggage of "evil." So, we can avoid this concretized conception of evil and pursue a general systems-based definition of the problem of entropy for philosophy of religion. Bechor Zvi Aminoff has provided the foundation for an entropically-aware definition of the problem in his article, "Entropic Definition of Human Happiness and Suffering" (2013). Aminoff identifies a phenomenological correlation between happiness and suffering and the entropy dynamics of existence:

Human suffering is "the complex of *negative* sensations, perceptions, emotions, or thoughts that arise due to a process or condition of an increasing level of entropy of a

person's organism, empathy for others, or his/her environment." Human *satisfaction*, on the other hand, may be defined as the complex of *positive* sensations, perceptions, emotions, or thoughts of that arise due to a process or state of a depressive level of entropy of the individual's organism or that of other individuals or his/her environment…. In order to treat suffering, one should ensure that the entropy level is reduced by complementing it with that which is missing, disturbs, and has been lost (2013, 613, 617).

While Aminoff's definitional efforts are directed toward a system-cognizant form of care for the alleviation of pain, we can nevertheless expand on his understanding in order to excise a theoretical structure for defining the problem of evil in philosophy of religion in relation to entropy: "evil" is broadly understood as the term in English (among other languages) used to describe an undesirable experience of an increase in entropy relative to the state of being the individual (psychic-system) would self-referentially describe as "good." "Good" here would therefore correspond to the low-entropy state that ensures the organism's continued autopoiesis (continued vital function), without pain. Generally speaking, we say this low-entropy state is "good" because there is no pain. Therefore, "evil" represents an increase in entropy relative to the state of "good," with equilibrium representing death, the ultimate evil. Philosophy of religion can therefore leverage entropy as a centroid to cluster analysis concerning the way different cultural traditions address the problem of evil as phenomenologically emergent from, but irreducible to, the entropy-maintenance dynamic responsible for the autopoiesis of physical, psychic, and social systems. So, if Sharma notes that *ahimsa* is Jainism's answer to problem of evil, then the question is *how*? From a systems-theory approach to philosophy of religion, the Jaina doctrine of *ahimsa* answers the problem of evil in recognizing that minimal energy consumption is the least offensive (i.e. disorder-inducing) mode of action in the world for living beings and is therefore necessary for the soul to achieve liberation. We can therefore look to *ahimsa* as an example of systems-oriented thinking that minimizes our "entropic footprint" in the world.

JAINA METAPHYSICS IN THE *TATTVARTHASUTRA*

We are able to obtain an accurate representation of Jaina metaphysics by turning to the *Tattvarthasutra*[1], written by the second-century Jain philosopher, Acharya Umasvami. According to Jeffery Long:

The *Tattvarthasutra* has been commented upon by Svetambara and Digambar alike over the centuries and is the closest thing available to a universally accepted Jain text.... When scholars, Jain and Non-Jain, describe the 'Jain worldview' in philosophical, metaphysical terms, the system described is essentially that set forth in the Tattvarthasutra (2009, 65).

Jainism's metaphysics is derived from a strict dualism that distinguishes between two types of substance *jiva* (soul) (*Tattvarthasutra* Chapter II), and *ajiva* (non-soul, or matter) (*Tatt.* V). Everyone's soul is independent, and is in a never-ending transmigratory journey of birth, death, and rebirth into different types of being depending on one's *karma* accrued in one's previous life. Jains believe that we continue to be reincarnated as physical beings due to our ignorance of the true nature of reality: that every living being (*jiva*) is an omniscient soul whose nature is free from attachment and suffering. The *jiva*'s liberation (*Moksha*) from the cycle of rebirth (*samsara*) is only hindered by the soul's bondage to *karma* that keeps one ignorant of this knowledge. Jains follow the *jinna*, or "spiritual conqueror," who has right faith, right knowledge, and right conduct in all matters of life. Jainism recognizes twenty-four unique *jinnas* called *tirthankaras* (ford/bridge-makers) who have revealed the path to liberation throughout human history. Because the *jinna* is considered to be omniscient, the ford established by the *tirthankara* is recognized to be an authoritative pronouncement on the nature of reality and the means to achieving liberation. Jains places fundamental emphasis on the teachings of the *tirthankaras*, especially the most recent, Mahavira, as the authoritative and infallible source of knowledge for Jaina teaching and philosophy.

The *Tattvarthasutra* identifies the *loka*[2] as what we would call "the universe" in common parlance. The *loka* is not just the physical universe, however, but also contains heavenly, hellish, and liberated realms (*siddhalok*). As such, the *loka* is the spatiotemporal field in which souls (*jiva*) are born into material non-soul substance (*ajiva*) again and again (*samsara*), until they achieve liberation (*moksha*) by shedding *karma*, a form of matter that is bonded to the soul relative to one's observance of *ahimsa* (non-violence). *Moksha* is the soul's total detachment from not only the body, but also all desire and relationships. Where Vedanta identifies liberation with the soul's (*atman*) union with the "all" that is *Brahman*, and Buddhist schools identify liberation as *Nirvana*, the extinguishing of the sense of the ego-driven self, Jain's preserve the substantial nature of the soul but reject *Brahman* or any other referent from which the soul is ontologically emergent. Moksha is said to be the state of the soul's omniscient, eternal existence, and takes place in the upper-most realm of the *loka*, the *siddhalok*, the abode of liberated souls (See *Tatt.* X).

Every soul, in its liberated state, is a "final end" in the system of being in the *loka.* In addition to the living substance of *jiva*, there are five non-living substances (*dravya*) in the *loka*: space, time, medium of motion, medium of rest, and matter (See *Tatt.* V). The *loka* has anthropomorphic spatial extension, it is without creator, it is eternal and infinitely repeating through six different cycles. Beyond the *loka* lies only *aloka*: the void. Jaina cosmology puts human existence in the middle-world (*Madya loka*; See *Tatt.* III.7), and it is here that the moral law of *karmavad* applies to all living beings (S.C. Jain 2012, 178-220). Actions in the world bear out proportionate causal effects on the psychological and physical states of those *jives* as they transmigrate through the cycle of

samsara (Bhandari 2011, 38). From the metaphysical point of view, one cannot distinguish between karma and matter, for it is the "karmic information" that expresses itself in *pudgily*, or a material substrate. To draw an analogy from Biology, where the phenotype (physical characteristics) expresses the genotype (genetic information), here the *jiva's* body in the next lifetime is an expression of the information contained in the karmic accounting of their actions in their previous lifetimes (and even in the present life). *Karma* can therefore be considered a form of "ethical information" that is expressed through various physical, psychological, and social conditions in one's life (cf. S.C. Jain 2012, 194-7)**.**

What is fascinating about the *Tattvarthasutra* is the degree to which it categorizes the various psychological, physiological, and environmental effects of *karma* (S.C. Jain 2012, 197-206; TVS VIII.4). Psychological Karmas express themselves through various ways: delusion of faith, emotional states, ignorance as to right knowledge that leads to immoral action. Physical Karmas influence what type of body the soul will find attachment to as an animal, plant, or human (man, woman, gender neutral). Furthermore, the environmental category of karmas expands on the physical karmas to impact the location, class, status, etc. the *jiva* is born into. In *Structures and Function of the Soul in Jainism*, S.C. Jain summarizes the conditioning role of karma in Jaina philosophy: "individuals differ among themselves in respect of their capacities, behaviour, material adjunct and the consequent feelings of pain and happiness. The principle of *karma*, as the believers of the doctrine think, just reveals the secret of such variations and differences" (S.C. Jain 2012, 178). Therefore, the Jaina understanding the doctrine of *karma is* physics in the *loka*, from an ontological point of view, for it is *karma* that is responsible for what the embodied soul experiences in the world in terms psychological, physiological, and environmental determination, in its relationship with gross matter. Therefore, if you have knowledge of the physics of karma, you know how to stop it. And if you know how to stop the influx of karma, you have discerned the path to liberation. The relationship between the soul, the non-soul, the influx of Karma, its bondage to the soul, how to stop it and dissociate karma from the soul in order to achieve liberation, "constitute[s] reality" (*Tatt.* I.4). While it is non-theistic, the Jaina doctrine of *karmavad* is nevertheless a form of theodicy because it justifies the significance and importance of living existence in the face of the problem of evil/finitude in terms of the soul's journey from ignorance to omniscience, from samsara to liberation, using only the "karmic physics" of the universe. It is through non-violence and minimal action that we can resist the karmic forces that keep us bound in *samsara*.

Varying degrees of *Karma* therefore prevent living beings (*Jiva*) from recognizing their omniscient nature as a conscious soul, i.e. "five-sensed beings" (TVS II.24). This emphasis on the rational nature of the *Jiva* highlights the epistemological character of Jaina eschatology: "Right faith, right knowledge and right conduct all together constitute the path to liberation" (*Tattvarthasutra* I.1). Liberation is not only

freedom from the cycle of embodiment, but also freedom from ignorance. S.C. Jain notes that "*karma* may, thus, be said to be the principle of limitation and obscuration of the powers of the soul. As nothing in the constitution of an entity can be detrimental to its own identity, the Jaina thinks that this obstructing factor, called the *karma*, must be alien to the soul's constitution" (178, 2012). Interestingly enough, we see here a parallel to the Augustinian interpretation of evil as a deficiency or lack of good, rather than having positive existence. In Jaina philosophy the soul is omniscient, hence ignorance of this fact in this life must be attributed to something other than the soul itself: karmic bondage (*pudgala*). Perhaps, therefore, retaining the nomenclature of "the problem of evil" remains appropriate when applied to the Jaina tradition, even if there is no God, because it is our karmic bondage to matter (*pudgala*) that is responsible for the various forms of ignorance that leads to suffering in the world, not our *jiva* "nature."

Cosmologically speaking, Jaina doctrine does not concern itself with the origins of the soul's existence in *samsara*, but rather as a form of theodicy, takes it as a primordial axiom. According to S.C. Jain,

The mundane existence of the self and the variations of its powers suggest that there may be a state of the self's existence where it is free from the mundane limitations and distortions. It means that then the liberated soul will have no obstruction to the manifestations of its powers. In Jaina philosophy the doctrine of *karma* provides the principles of the soul's fall from its pure state. The disappearance of the *karmic* influence from the soul will lead to its pure and self-determined functions. Thus the theory of liberation presupposes the existence of the soul and its bondage by the *karmas*; liberation, then, is the freedom of the soul from the bondage of the *karmas* (2012, 221).

The language of "fall" is difficult here because it presupposes an ideal state that is for whatever reason no longer the case. Granted, there are six different, infinitely repeating, time cycles in Jain metaphysics that reflect different heights of happiness and depths of despair. However, the soul was never without karmic bondage, for once the soul attains liberation, one cannot fall back into embodied existence. The "givenness" of the existence of the soul in the karmically-bonded regions of the *loka* is a fundamental axiom of Jain theodicy*:* "(The) soul, (the) non-soul, influx, bondage, stoppage, gradual dissociation and liberation constitute reality" (*Tatt.* I. 4).

The three-fold path of right faith, conduct, and knowledge as the path to liberation is signified in Jaina iconography as three dots above the swastika representing *samsara* but below a crescent signifying the *siddhalok* – the realm of liberated souls. Although right faith may be considered proper belief in the teachings of the *tirthankaras*, it is also intrinsically linked to right-knowledge, from which right conduct (*ahimsa*) necessarily follows as an ethical correlate. In order to establish right knowledge, one must first recognize the non-absolute nature of reality. In Jain philosophy this is called *anekantavada*. The most accurate translation is its etymological deconstruction: *an–*

akanta–vada, literally "non-one-sided" (Long 2009, 117). The doctrine of *anekantavada* recognizes the dynamism of reality for the knowing subject. The philosophical position of non-absolutism is derived from the contradictory characteristics of reality: emergence, endurance, and perishing (Long 2009, 141-2). Kamal Chand Sogani emphasizes that because of the recognition of the permanent, emergent, and perishable nature of reality in the doctrine of *anekantavada*, "the Jaina philosopher differs from all absolutists in their approach to the enfoldment of the inner nature of reality. The Jaina advocates change to be as much ontologically real as permanence. Being implies becoming and vice versa" (Sogani 2011a, 302). Hence the correct knowledge and belief in substances and their modes, which according to the *Tattvarthasutra* is definitive of right faith (*Tatt.* I.2), is a knowledge and belief characterized by permanence, emergence, and change. The problem of realty is the problem of knowing about the proper nature of the substances of the world – the soul in particular (Sogani 2011a, 302).

Although reality is indeed multifaceted in the theory of *anekantavada* and hence non-absolute, it does not imply it is indescribable.[3] On the contrary, reality is entirely understandable through the employment of a two-pronged method of epistemological engagement: *pramana* and *naya*:

> Pramana refers to the grasping of reality in its wholeness, while Naya points to an aspect of infinitely-phased reality illumined by Pramana, thus the letter [*sic*] takes into consideration only a fragment of the totality.... Pramana assimilates all the characteristics at once without any contradiction and animosity between one characteristics and the other, for instance, between one and many, existent and non-existent, etc. of the unfathomable characteristics, Naya chooses one at one moment, but keeps in view the other characteristics also" (Sogani 2011a, 304).

Hence, the employment of both *pramana* and *naya* are necessary for a correct understanding of reality expressed linguistically in the Jaina epistemological method of seven-fold predication (*syadvada*) (See A.K. Jain 2011, 288-292).

The recognition of the nature of reality as *anekantavada* lays the foundation for the Jaina ethic of *ahimsa* (non-violence) along with *aparigraha* (non-possessiveness) as a following correlate. In other words, the very capacity for the Jaina to adopt a position of non-violence and non-possession within the world comes from the Jaina's recognition that her understanding of self and place in nature is merely one understanding among an infinity of others. Because Jaina philosophy holds that there are an infinite number of souls existing in the never-ending cycle of *samsara*, there are therefore an infinity of positions one can take, and each should be recognized as partially correct from its particular perspective. Because the infinity of souls in the *loka* are unique and individual, and because *anekantavada* and *syadvada* support a multi-faceted nature of reality in both ontology and epistemology, Jainism concludes that all of reality is interconnected, and is distinguished only relative to point of view. All living beings, human and sub-human

alike, share an intimate bond that is codified in the non-one-sided (*anekantavada*) nature of material existence.

The recognition of the interconnectedness of nature via *anekantavada* leads to the ethical doctrine of *ahimsa*, and its necessary correlate, vegetarianism. This understanding is best summarized in the *Tattvarthasutra*: "(the function) of souls is to help one another" (*Tatt.* V. 21). If one takes one's point of view as superior and imposes it on others, then one is doing violence. This can be done in thought, word, or deed. *Ahimsa* is not only a doctrine of non-violence but as the *Tattvarthasutra* notes, it is also an ethic of mutual dependence. Contrary to much misunderstanding in the west, the doctrine of *ahimsa* does not necessarily prohibit the use and consumption of animal products, so long as the life of the animal is not at risk nor is the animal held in bondage, threatened, or tormented, etc. For instance, one would refrain from eating meat or wearing leather, because the death of the animal is involved, but one could drink milk. The cow may wander freely on the property with humans feeding it grass and giving it a happy cow-life in which it shares its milk with people in reciprocity for the care. Although *ahimsa* would not preclude one from drinking milk in this scenario, *ahimsa* is clearly incongruent with many of the methods and technologies of industrial food production. So, the conditions of reciprocity matter here. Although the Jaina practitioner would not be barred from drinking milk, she would be implored through *ahimsa* to find an ethical source for her dairy products. Humans are those living beings capable of recognizing the need for *ahimsa* because the only way to achieve liberation is to refrain from imposing ourselves on another living being's path to liberation, otherwise we'll incur negative life-determining *karma* (*Tattvarthasutra*, VIII. 10). Ultimately, *ahimsa* is an ethics of reciprocal relationship between all embodied *jivas* (souls).

Ahimsa, however, cannot be fully understood without a proper explanation of the understanding of *himsa* within Jaina philosophy. Although one can translate *himsa* as "violence," it can also mean the very activity of the embodied *jiva* in the world (see *Tatt.* VI.1-2). But how can one live a life of *ahimsa*, and so achieve liberation, if one must be active in the world and incur *karma* in order to survive and live a life of *ahimsa* in order to shed *karma*? Keep in mind, the final achievement of liberation takes place in a meditative state in complete stillness, so *ahimsa* as correlated with minimal action is supported by a commentary on the *Tattvarthasutra*, where it is noted that "pure meditation is the direct cause of liberation" (Umasvami 2011, 351, A.IX.29.2). It is therefore difficult to see how action in the world can have a positive karmic effect, and so the logical conclusion is to withdraw from the world and move as little as possible. Vilas Sangave notes that the common critique is that the Jain understanding of *ahimsa* is negative in character, a prohibition against certain actions, a mere "abstention from *himsa*" (1991, 43). Any action, benevolent or malevolent, would appear to only add to one's karmic baggage.

Interestingly enough, the Jaina solution to this dilemma is found in a pragmatic response to the metaphysical relationship between the soul, karmic matter, and liberation. While all actions bear karmic fruits, metaphysically speaking, the *Tattvarthasutra* distinguishes between the influx of inauspicious and auspicious *karmas* in relation to one's activity in the world: "Virtuous activity is the cause of merit (*punya*) and wicked activity is the cause of demerit (*papa*)" (*Tatt.*VI. 3). The influx is proportional to the attitudes and passions of the individual, relative to one's attachment to worldly things. However, if the action proceeds from motivations outside of self-interest, then the karmic influx is positive, and therefore transmigration-reducing (*Tatt.* VI.4). The karmic fruits of virtuous action are still forms of matter that attach to the soul, but these fruits help pay down the karmic debt faster than without them. One therefore needs to develop a method for paying down this karmic debt if one intends to achieve liberation. According to Shugan Jain,

> The empirical soul or jiva has to develop a force of austerities etc. to counteract the force of attraction and aversion (main causes of bondage). The force of austerities must be greater than the force of attraction and aversion if ultimate spiritual progress is desired. The debonding process i.e. enhancing the forces of austerities and gradual elimination of the forces of attraction and aversion when followed continuously results in elimination of all the karmika bondage with the empirical soul till the pure soul state is achieved (2011b, 248).

The metaphysics of the *Tattvarthasutra* recognizes that actions done out of concern for other living beings (i.e. mercy, tolerance, compassion) are therefore considered auspicious and meritorious, causing the influx of "good" karma that reduces one's time in *samsara*.

Pragmatically speaking, Mahavira differentiated his followers between householders and ascetics, the distinction between the two being the degree to which *ahimsa* is observed and practiced. Of the nine ways to follow *ahimsa*, monks and nuns are expected to implement and follow all methods to ensure the avoidance of both intentional and non-intentional *himsa* in thought, word, and deed. The vows the ascetics take are called are called *ahimsa-mahavrata* (Sangave 1991, 18-19). Monks and nuns renounce attachment to the world and focus a life on minimal movement and action. The ascetic's life is entirely focused on detachment, because it is only through detachment that the soul will attain liberation. In fact, Digambar monks (translated as "sky-clad") take this renunciation so seriously they have given up attachment to clothing. In the words of a Digambar Acharya whom I heard speak to our group in Delhi during the 2012 International Summer School for Jain Studies: "the happenings of the outside world are of no concern to me." The correlation between *ahimsa*, total detachment, and liberation implies that a householder must first renounce the world and become an ascetic before he or she is capable of attaining liberation. To this end, the ascetic is totally committed to the

purification of his own soul and so he does not concern himself with the passions and demands of his body, nor the passions and demands of others. The ascetic lives a life of total detachment, inwardly focused only on knowledge of the soul.

The householder, on the other hand, is required to observe *ahimsa-anuvrata*: the avoidance of intentional *himsa* in thought, word, and deed. Sangave notes that "[the] layman does not intentionally injure any form of life above the class of one-sensed beings (vegetable and the like), by an act of the mind, speech or body...by himself...by inciting others to commit such an act...nor by...approving of it subsequent to its commission by others" (1991, 19-20). Thus, the distinction between monk and householder revolves around intent. The householder is only morally accountable for those forms of violence done out of intention. Nevertheless, the physics of karmic accountability remains for injuring another *jiva*, and therefore the harmful actions still bear negative karmic fruit. From a sociological point of view, we can see that allowing householders some leeway in the observing *ahimsa* so that they can work to provide the foundation for Jaina society from which ascetics emerge to pursue the path to liberation. These ascetics in turn teach their knowledge of the teachings of the *Tirthankaras* to the householders in their community. Once again, the refrain from the *Tattvarthasutra* is heard: "(the function) of souls is to help one another" (*Tatt.* V. 21).

Jaina philosophy understands that we help each other attain liberation by helping each other lead a life of non-violence. But what is liberation? As stated in the *Tattvarthasutra*, "Owing to the absence of the causes of bondage and with the functioning of dissociation of karmas, the annihilation of all karmas is liberation" (*Tatt.* X.2). Because Karma is material in substance (*pudgala*) and attaches to the soul, it weighs down the soul from its natural state (*Tatt.* X.6). Like a weight released from a helium balloon, a soon as the soul has shed all of its karma through the methods for stoppage and dissociation (See *Tatt.* IX) and attained liberation, "the soul darts up to the end of the universe " (*Tatt* X.5). It is here, in the *Siddha-loka*, the abode of liberated souls, that the *jiva* as *jinna* – one whose soul has conquered the demands of earthly life – remains, without attachment or desire, and totally omniscient, in a state of eternal bliss.

AHIMSA AND ENTROPY

In the previous section we discussed how *Ahimsa* is an ethical doctrine that endeavors to minimize one's impact on other living beings in the world by being mindful and aware of their presence so as not to harm them. This ethic is motivated by a metaphysics that posits all living beings to be souls (*jiva*) participating in an infinitely repeating transmigratory journey through physical existence where one is reborn again and again into various forms of karmic embodiment, proportional to their pursuit of *ahimsa* in their previous lifetimes. This is the cycle of *samsara*. If you harm another living being, you stay in *samsara* longer; if you help living beings, or at least not get in their way, you shorten your time in *samsara*.

In a way analogous to the second law of thermodynamics, Jainism recognizes that it is impossible to live without the constraints imposed by the "karmic condition." In order to achieve liberation, the conscious self must take control of one's existence in that condition, because one is fundamentally other-than that condition (*jiva*). As Sogani notes, the human person "is subject to *himsa* by the very condition of his existence" (2011c, 89). From a systems-theory perspective, *ahimsa* can be interpreted as recognizing the interdependent relationship between living beings as disparate systems in an interrelated network of existence and exchange, both physically (metabolic) and metaphysically (*karma* and *samsara*). Whether it is the individual requiring food, or the planetary eco-system requiring energy of the sun to maintain its biological diversification, everything relies on an exchange of energy to survive. What the Jaina tradition recognizes is that there is a phenomenological correlation to these natural system dynamics called pain, and it is pain that we should avoid inflicting on others.

We can now see how ahimsa, at the phenomenological level, responds to the problem of entropy for conscious creatures according to its thermodynamic, statistical, and informational articulations: *Ahimsa* addresses the problem of entropy in human experience by minimizing one's impact on the bio-mechanics of other living systems, as well as the systems from which those living systems draw on for their resources, so as not to cause pain to other living beings. If the human body is a biological system living in an environment from which it draws food to survive, then like all animals the human needs to replenish its metabolic resources from a food supply, otherwise it will die. *Ahimsa*'s most immediate and obvious expression is the dietary restrictions it places on householders and ascetics. The Jain vegetarian diet is limited to one-sensed beings (plants), because they experience far less pain than other two-sensed beings. If it is necessary to consume living beings to survive, the Jaina approach is to inflict as little pain as possible on living beings in doing so. But this system-aware nature of *ahimsa* goes further than just plants and recognizes in a statistical sense that the consumption of root vegetables disturbs the relations in their respective ecosystems concerning the living beings in the ground, and so they are avoided too. From a thermodynamic perspective, the fuel one needs to continue one's physical function should therefore be minimal, because increases in entropy correlate with perceptions of pain (Aminoff 2013). Jain aesthetics serve as a paradigm of restraint concerning food consumption, eating one small and simple meal a day from what is left over from the householders. Notice, this requires a conscious effort to understand one's action in the world in a way that recognizes the interrelated systems in which one participates, and that one's movement and action in the world while benefiting the individual, may have a detrimental impact on living beings outside one's immediate perspective and concern.

The statistical interpretation of the second law in terms of organization extends from the thermodynamic understanding. If all living beings are biological systems, they organize together in societies according to kind over the space of geography and require

each other for survival and reproduction. Boltzmann's understanding of the dissipation of gasses in a statistical-mechanical sense can be applied to populations both human and otherwise. From algae to the lone wolf, species of animals within an ecosystem come together in one way shape or form to keep the species going. If we are not careful and disturb environments, we destabilized the low-entropy, highly organized autopoietic (self-regenerating) structure of the population, leading to possible extinction unless the exogenous activity is checked. Granted, the history of biology is the history of predator-prey relationships, and there have been changes to the global climate over the eons. But do we want humans to make it worse by getting in the way of natural processes? Jain philosophy recognizes that it is humans who are the five-sensed *jiva* capable of recognizing this inter-related dynamic to the *loka* as a system. Therefore, it is humans who can recognize the pain and suffering inflicted by being an animal in the world (humans included). Due to our five-sensed nature, Jaina philosophy holds that it is humanity's responsibility to recognize this dynamic and pursue avenues to living that are the least painful to the living beings we encounter as we live together – hence the minor and major vows of householders.

Extending from the thermodynamic need for food, and the statistical tendency for people to organize together in societies, Jains then recognize that one must be truthful (*satya*) so as to never lead anyone into intended or unintended harm. Here information is understood to be actionable in character and could therefore have an impact on the entropy of groups, individuals, or resources. Shannon's informational interpretation of entropy (1948) becomes immediately apparent when applied to a social context: the presence of uncertainty in the communication channel can lead to actions based on partial or mis-information. Misinformed action can lead to violent results if people aren't careful. Jaina philosophy therefore recognizes that non-violence is not just physical, but must be followed in thought and speech, as those too are activities that produce karma (*Tatt.* VI.1). *Ahimsa* is making a conscious effort to be truthful about information, and to never misrepresent information in our communication. If we as a species need to organize in a low-entropy state (society) in order to survive the thermodynamic demands of embodied existence (work and food), then we need to make sure we avoid saying things to each other that could disturb the social organization required to achieve those goals. Nevertheless, we can only achieve this organization when we are truthful with each other. From an *ahimsa*-oriented view, we need to be a little more careful with how we communicate in the world to ensure we don't contribute toward the influence of actions (or inaction) that have harmful results on living beings. When we speak information into the world through various means (e.g. spoken, written, etc.), we need to consider how that information may or may not increase or reduce uncertainty about our relationships with each other, and the way that increase or decrease in information entropy may impact the society in which the communication is taking place. Will what be said have a stabilizing or destabilizing result? What impact will this stabilization or destabilization have on various living systems? Is this destabilization good or bad? Who gets to decide?

Such are the questions of an *ahimsa*-oriented approach to humanity's role in system-dynamics.

CONCLUSION

The Jaina doctrine of *ahimsa* (non-violence) provides an answer to the problem of evil that is emergent from the "problem of entropy" for individuals-in-community in recognizing that minimal energy consumption and truthfulness in information is the least offensive (i.e. disorder-inducing) mode of action in the world for living beings. Without such an *ahimsa*-aware orientation to one's actions in life, liberation is impossible. Jainism's ancient ethical insight provides a way forward in a world economy driven by consumption: the less energy we consume as humans in our local environment, the more energy there will be to be used by other living beings on a global scale. From a secular perspective cognizant of the economics of energy concerning the livelihood and well-being of people and the planet, we can therefore look to *ahimsa* as an example of systems-oriented thinking that minimizes our "entropic footprint" in the world.

The argument presented here, however, should not be interpreted in a catechetical or evangelizing in nature. In a more general sense, this article endeavors to develop a systems-theory approach to expanding the field of philosophy of religion beyond its traditional limitation as an exercise in the reasoned defense of tenets of western theism. Given the assumption from which the analysis proceeds – that the thermodynamic, statistical, and informational articulations of the second law apply universally across all systems in which human communities find themselves existing – then the field of philosophy of religion has a point of departure for the comparative analysis of religious thinking that is arguably independent of the geographic, historic, and linguistic constraints that have traditionally limited its analysis. Granted, the science on entropy itself emerged from Europe and the United States in the nineteenth and twentieth centuries, nevertheless the ubiquitous presence of industrial and communicative technologies in the private and government sectors throughout our global economy (for better or for worse) are a testament to the leveraging of the three forms of entropy to provide goods and services. Clearly, entropy impacts our daily lives *in praxis*. The real question is: where else has entropy been relevant for social systems in the past and today? So, if we already recognize entropy's impact on our lives, particularly as property of systems in function that enforces finitude, then why wouldn't entropy have a bearing on the thinking and concepts we develop to understand our place in the world as individuals-in-community? Does religion only respond to, or is religion in fact driven by, the problem of entropy in human experience? Pursuing these types of questions is the task of a systems theory approach to philosophy of religion.

NOTES

[1]I am relying two sources for English translations of the aphorisms of the *Tattvarthasutra*: Umasvami (2011) ed. Vijay Jain; and Uma Swami (2011) ed. Shugan C. Jain. References to the *Tattvarthasutra* will supply a shortened title of the text with the chapter number in roman numerals, and the specific aphorism referenced will be indicated with Arabic numerals, e.g.: (*Tatt*. V.2). Any quotations supplied from the *Tattvarthasutra* will follow the Vijay Jain edition (Umasvami 2011), whereas the Shugan C. Jain edition (2011) will be referenced when it is relevant to include the question-answer commentaries on the *Tattvarthasutra*.

[2] For a comprehensive discussion of the Jain Cosmological system as disclosed in the *Tattvarthasutra* see: Bhandari 2011.

[3] For an extended analysis of the logic of *anakentevada* see Schwartz 2018.

REFERENCES

Aminoff, Bechor Zvi. (2013). "Entropic Definition of Human Happiness and Suffering." Philosophy Study 3, no. 7: 609-18. DOI:10.17265/2159-5313/2013.07.004

Arnold, Darrell P. (2013). "Systems Theory: A Secret History of the Twentieth Century." In *Traditions of Systems Theory: Major figures and contemporary developments*. Edited by Darrell Arnold. Florence, KY: Routledge.

Bajželj, A. (2013). "The Jain Ontological Model according to Kundakunda and Umāsvāti." *Asian Studies*, (1), 3-16.

Berezin, Alexander A. (2002) "Energy, Information, and Emergence in the Context of Ultimate Reality and Meaning." *Ultimate Reality and Meaning* 25, no. 4: 256-273.

Bertalanffy, Ludwig von. (1969). *General System Theory: Foundations, Development, Applications*, vol. 5. New York: George Braziller.

Bhandari, Narendra. (2011). *Jainism: The Eternal and Universal path for Enlightenment.* Ahmedabad: Research Institute of Scientific Secrets from Indian Oriental Scriptures.

Bourceanu, Gelu. (2007). "Entropy, a Measure of Order Degradation in the Universe." *Journal for Interdisciplinary Research on Religion and Science*, no. 1: 117-132.

Bradnick, David. (2008). "A Pentecostal Perspective on Entropy, Emergent Systems, and Eschatology." *Zygon* 43, no. 4 (2008): 925-942.

Brooks, Daniel R., E.O. Wiley. (1988). *Evolution as Entropy: Toward a Unified field of Biology*. Chicago: University of Chicago press.

Brooks, Daniel R., John Collier, Brian A. Maurer, Jonathan D.H. Smith and E. O. Wiley. (1989). "Entropy and Evolution in Emerging Biological Systems." *Biology and Philosophy*, 4: 407-432.

Byrum, C. Stephen. (1983). "Entropy and the Religious Experience." In *The Christian Century* 14, no 21: 808-9.

Campbell, Donald T. (1974) "Evolutionary Epistemology." In *The Philosophy of Karl Popper Book I*." Edited by Paul Arthur Schilpp, 413-463. La Salle: Open Court.

Carroll, Sean. (2010) *From Eternity to Hear: The Quest for the Ultimate Theory of Time*. New York: Dutton, 2010.

Clayton, Philip. (2004). *Mind and Emergence: From Quantum to Consciousness*. Oxford: Oxford University Press.

_____. (2009). *In Quest of Freedom: The Emergence of Spirit in the Natural World.* Göttingen: Vandenhoeck and Ruprecht.

Cho, Francisca and Richard King Squier. (2013). "Religion as a Complex and Dynamic System," *Journal of the American Academy of Religion.* Volume 81, Issue 2, June 2013, 357-398. doi:10.1093/jaarel/lft016.

Csikszentmihalyi, Mihaly. (1971). "From Thermodynamics to Values: A Transition Yet to Be Accomplished." *Zygon* 6, no. 2: 163-167.

Davies, Paul C. W. (1974). *The Physics of Time Asymmetry*. Berkeley: University of California Press.

Deacon, Terrence. (2006). "Emergence: the Hole at the Wheel's Hub." In *The Re-Emergence of Emergence: The Emergentist Hypothesis from Science to Religion*, edited by Philip Clayton and Paul Davies, 111-50. Oxford: University Press.

_____. (2011). *Incomplete Nature: How Mind Emerged from Matter*. New York: Norton & Co.

Fry, Iris. (1995). "Evolution in Thermodynamic Perspective: A Historical and Philosophical Angle." In *Zygon* 30, no 2: 227-48.

Gangel, Kenneth O. (1980). "Moral Entropy, Creation, and the Battle for the Mind." In *Biblioteca Sacra*: 156-169.

Goodenough, Ursula and Terrence Deacon (2003). "From Biology to Consciousness to Morality." *Zygon* 38: 801-819.

Hamilton, H. J. (1977). "A thermodynamic theory of the origin and hierarchical evolution of living systems." *Zygon* 12, no. 4: 289-335.

Harms, William F. (2004). *Information and Meaning in Evolutionary Processes*. Cambridge: University Press.

Hawking, Stephen. (1988). *A Brief History of Time*. Toronto: Bantam Books.

Hayflick, Leonard. (2007). "Biological Aging is No Longer an Unsolved Problem." Annals of the New York Academy of Sciences. 1100: 1-13.

Helrich, Carl S. (1999). "Thermodynamics: What One Needs to Know." *Zygon* 34, no. 3: 501-514.

Hough, Adrian. (2010). *The Flaw in the Universe: Natural Disaster and Human Sin*. John Hunt Publishing.

Jain, A.K. (2011). "The Concept of Naya in Jainism." In *7th International Summer School for Jain Studies: Study Notes,* vol. 4: International School for Jain Studies, 288-92.

Jain, S.C. (2006). *Structure and Functions of the Soul in Jainism*. Delhi: Bharatiya Jnanpith.

Jain, Shugan. (2011a). "Ahimsa/Non-violence." In *7th International Summer School for Jain Studies 2011: Study Notes*, vol. 4: International School for Jain Studies, 390-6.

_____. (2011b). "Karma Doctrine of Jainism." In *7th International Summer School for Jain Studies: Study Notes*, vol. 4: International School for Jain Studies, 242-53

Katchalsky, Aharon. (1971). "Thermodynamics of flow and biological organization." *Zygon*® 6, no. 2: 99-125.

Kragh, Helge S. "Cosmology and the entropic creation argument." *Historical Studies in the Physical and Biological Sciences* 37, no. 2 (2007): 369-382.

Lambert, Frank L. (1967). "Chaos, Entropy, and Original Sin." *Religion in Life*, 36, no. 2: 259-69.

____. (1968). "The Ontology of Evil." *Zygon* 3, no. 2 (1968): 116-128.

Laszlo, Ervin. (1972). *Introduction to Systems Philosophy: Toward a New Paradigm of*

Contemporary Thought. New York: Gordon and Breach.

Long, Jeffery. (2009). *Jainism: An Introduction*. London: I.B. Tauris.

Luhmann, Niklas. (1995). *Social Systems*. Translated by John Bednatz. Stanford: University Press.

_____. (2013). *A Systems Theory of Religion*. Translated by David A. Brenner. Stanford: University Press.

Maccone, Lorenzo. (2009). "Quantum Solution to the Arrow-of-Time Dilemma." *Physical Review Letters*, 103, 8: 080401.1-4, The American Physical Society.

Masani, P. R. (1985). "The Thermodynamic and Phylogenetic Foundations of Human Wickedness." *Zygon* 20, no. 3: 283-320.

Maturana, Humberto R. (1975). "The organization of the living: A theory of the living organization." *International journal of man-machine studies* 7, no. 3: 313-332.

_____. (1980). *Autopoiesis and cognition: The realization of the living*. No. 42. Springer Science & Business Media.

Mavrofides, Thomas, Achilleas Kameas, Dimitris Papageorgiou, and Antonios Los. (2011). "On the entropy of social systems: A revision of the concepts of entropy and energy in the social context." *Systems Research and Behavioral Science* 28, no. 4: 353-368.

Murphy, George L. (1991). "Time, Thermodynamics, and Theology." *Zygon* 26, no. 3: 359-372.

Newburgh, R. (2009). "Carnot to Clausius: Caloric to Entropy." *European journal of physics*, *30*(4), 713.

Pace, E. (2011). Religion as communication. *International Review of Sociology*, *21*(1), 205-229.

Patterson, John. (1983). "Thermodynamics and Evolution." In *Scientists Confront Creationism*, edited by Laurie R. Godfrey, 99-116. New York: Norton & Co.

Popper, Karl R. (1957). "Irreversibility; or, Entropy since 1905." *British Journal for the Philosophy of Science*: 151-155.

Pierce, John R. (1980). *An Introduction to Information Theory: Symbols, Signals, and Noise*. New York: Dover.

Roberts, Christopher. (2011). "Entropy, Sacrifice and Lévi-Strauss's Dismissal of Ritual." *Method & Theory in the Study of Religion* 23, no. 3-4: 326-350.

Russell, Robert John. (1984). "Entropy and evil." *Zygon* 19, no. 4: 449-468.

_____ (2008). *Cosmology: from Alpha to Omega: the creative mutual interaction of theology and science*. Minneapolis: Fortress Press.

Sangave, Vilas. (1991). *The Jain Path of Ahimsa*. Solapur: Bhagawan Mahavir Research Center

Schatten, Markus, and Miroslav Bača. (2010). "A critical review of autopoietic theory and its applications to living, social, organizational and information systems." *Društvena istraživanja* 108, no. 109, 4-5.

Schwartz, W. A. (2018). *The Metaphysics of Paradox: Jainism, Absolute Relativity, and Religious Pluralism*. Rowman & Littlefield.

Shannon, C.E. (1948). "A mathematical theory of communication," in *The Bell System Technica lJournal*, vol. 27, no. 3, pp. 379-423. doi: 10.1002/j.1538-7305.1948.tb01338.x.

Sharma, A. (1990). *A Hindu Perspective on the Philosophy of Religion.* London: Macmillan [New York: St. Martin's Press, 1991].

_____. (1995). The Philosophy of Religion: A Buddhist Perspective. Delhi: Oxford University Press.

_____. (2001). *A Jaina Perspective on the Philosophy of Religion.* Delhi: Motilal Banarsidass.

_____. (2006). *A Primal Perspective on the Philosophy of Religion*. Dordrecht, The Netherlands: Springer.

_____. (2007). *The Philosophy of Religion: A Sikh Perspective*. New Delhi: Rupa & Co.

_____. (2008). *The Philosophy of Religion and Advaita Vedanta: a Comparative Study in Religion and Reason*. Penn State Press.

Sogani, K.C. (2011a). "Anekanta, metaphysical considerations." In *7th International Summer School for Jain Studies: Study Notes*, vol. 4: 302-7.

_____. (2011b). "Gunasthana–Stages of Spiritual Development." In *7th International Summer School for Jain Studies: Study Notes*, vol. 4: 254-61.

_____. (2011)c. "Methods of Mahavira for Social Changes." In *7th International Summer School for Jain Studies: Study Notes*, vol. 4: International School for Jain Studies, 84-92.

Sorabji, Richard. (1983). *Time, Creation and the Continuum: Theories in Antiquity and the Early Middle Ages*. Ithaca: Cornell University Press.

Stoeger, William. (2007). "Entropy, Emergence, and the Physical Roots of Natural Evil," In *Physics and Cosmology: Scientific Perspectives on the Problem of Natural Evil*, ed.

Nancey Murphy, Robert Russell and William Stoeger. Volume 1. Vatican Observatory: Vatican City, 93-108.

Sulaiman, F. Al-. (1997). "The Thermodynamic Property Entropy and the Holy Qur'an." *Hamdard Islamicus* 20 no. 4: 51-56.

Tannous, Afif I. (1985). "Order and disorder: Thermodynamics, creation, and values." *Zygon* 20, no. 4 : 445-450.

Troster, L. (1985) "Asymmetry, Negative Entropy and the Problem of Evil." *Judaism* 34, no. 4: 453-461.

Toner, Richard K. (1981) "Thermodynamics and Theology: a study of the pathways and hindrances encountered in the search for truth." *Anglican Theological Review*, 63 no 4 (1981): 446-464.

Umasvami, (2011). *Acharya Umasvami's Tattvarthasutra*. Edited by Vijay K. Jain. Dehradun: Vikalp Publishers, DOI: http://crossasia-repository.ub.uni-heidelberg.de/1790.

Uma Swami, (2011). "Tattvarthasutra," in *Jainism: Key to Reality*. Edited by Shugan C.vJain. Hastinapur: Digamar Jain Trilok Shodh Sansthan.

Ulanowicz, Robert E. (2013). "A world of contingencies." *Zygon* 48, no. 1: 77-92.

Undgaokar, Jayant B. (2001). "Entropy in Biology." *Resonance*. September: 61-6.

Uzan, Pierre. (2007). "The Arrow of Time and Meaning." *Foundations of Science* 12, no. 2: 109-137.

Van Fraassen, B. C. (1980). *The scientific image*. Oxford University Press.

Wicken, Jeffrey S. (1986). "Entropy and Evolution: Ground Rules for Discourse." *Systematic Zoology*, 35, 1: 22-36.

Wildman, Wesley, (2010). *Religious Philosophy as Multidisciplinary Comparative Inquiry: Envisioning a Future for the Philosophy of Religion*. Albany: SUNY Press.