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Tom Stoppard parallels the Second Law of Thermodynamics with the human experience in his play Arcadia. The parallelism suggests truths about the evolution of science and human society, love and sexual relationships, and the physical world. The Second Law drives the formation of more complex molecular structures in our universe, the diffusion of energy, such as heat, and is inhibited by the initial energy required to unlock potential energies of compounds. Stoppard takes these concepts and explores human genius and the sexual interactions of people, with an eye towards universal human truth.

Stoppard illustrates the diffusion of energy in comparison to human relationships by incorporating the theme of loss heavily in the play. There is loss of life, loss of knowledge and loss of love, or sexual energy, in Arcadia, as well as the scattering of characters that occurs in the first time period. It could be argued that Stoppard did not intend to imply thermodynamics with all of these elements of loss. However, the depth of this theme, its excellent correlation with thermodynamics, and the way in which it often appears adjacent to direct thermodynamical references, make a strong case for the parallel.

Life is not eternal in Arcadia, as the author shows us loss through diverse references to death. One of many prevalent references to death is the theme of hunting in the play. Thomasina notes, “I have grown up in the sound of guns like a child of a siege.” (Stoppard 13). The game hunting, all of those small animals dying as consequence, has been an enduring part of the Croom household. When the living energies of the grouse and the rabbits are lost, they can never be recovered in the same forms. In a later scene Septimus brings a rabbit for Thomasina, and Jellaby notes with distaste, “It’s dead” (67). Rabbits are symbols of vitality and energy. Septimus has made a rabbit cold by killing it. This repetitive reference to the deaths of game animals implies the loss of heat and the scattering of energy in general.

There are only three human deaths mentioned in the play. Of the three, one, that of the hermit Septimus, relates little to the thermodynamics theme. One of the more significant is the death of Mr. Chater, bit by a monkey in the tropics. His death is not mourned by Lady Croom, who seems to feel the loss of his life energy was the better for her, “We must be thankful the monkey bit Mr. Chater. If it had bit Mrs. Chater the monkey would be dead and we would not be the first in the kingdom to show a dahlia.” (83). Her sarcasm is evident, but it seems that Mr. Chater’s death may have in fact led to better organization, or at least to a bonding of Captain Brice and Mrs. Chater at the expense of Mr. Chater’s life energy. Desire perhaps, being the catalyst for his death.

The other significant death is Thomasina’s. Her death is not only a main plot element, but is also directly connected to thermodynamics as she dies in a fire. The reference to heat is clear. Fire is an excellent example of the energy needed to create a reaction. In this case it was the energy necessary to burn her entire room, and to consume her body, dispersing the energy of her chemical bond into heat and light radiation. The loss of Thomasina’s genius parallels the nature of chemical reactions she understood. Once lost, heat cannot be recovered, it diffuses outward as is its nature. “Newton’s equations go forwards and
backwards, they do not care which way. But the heat equation cares very much, it only goes one way” says Thomasina, and the same is true of her death (87). Her intelligence and potential is unrecoverable.

Stoppard also discusses the loss of knowledge in the play in relation to thermodynamics. The author portrays in this two central ways. He describes the losses to the store of human knowledge in the form of a human genius, and in the form of documentation. Information from the older time period is being sought by the younger, and Stoppard emphasizes the piecemeal task that is. For example, the burned documents of the hermit, or the letter from Byron which Septimus burns without reading. What treasures those would have been for the characters of Hannah and Bernard! The fact that they are both consumed by fire is another allusion to heat, and consequently to thermodynamics.

The other way in which knowledge is lost is as we have seen above, when the genius of a person is lost in death. Thomasina and Septimus are lost, and so is Byron. Bernard and Hannah eagerly follow their geniuses in the modern day, but they cannot bring them back to life. “You can put back the bits of glass but you can’t collect up the heat of the smash. It’s gone.” (93). Valentine says this about thermodynamics, but it applies equally well to researching an extraordinary poet, or a scientist, or even a century’s worth of birds. The life and energy of their research subjects are gone, dissipating into nothingness.

Another poignant theme of loss is the essentially human experience of sexual passion, and the loss of that passion in the form of a lover. Stoppard illustrates this over and over again in the play. The characters collide in a multitude of different combinations. Like atoms, forming complex molecules, which is one of the consequences of the second law of thermodynamics. Chloe makes this parallel directly in the play: “Everything including us is just a lot of atoms bouncing off each other like billiard balls” (73). Indeed the actions of the characters seem to be like that. As they interact and bond, their sexual energy propels their interaction, and sometimes, that energy runs out. The reaction stops, and they break apart; the initial heat of their union is lost into the void of time. Stoppard alludes to this indirectly, as Thomasina observes that the flaw in Newton’s laws is “the actions of bodies in heat.” (84) Her mother sees the double meaning and makes an aside, “the Chater would overflow the Newtonian system in a weekend”. Again Stoppard compares thermodynamics and sexual energy, this time through a direct parallel drawn by one of his characters. The persistence of this sexual union and dissolution theme is a strong argument for its import beyond the creation of plot; the parallels with thermodynamics are that extra significance.

Another indirect parallel in the play between diffusion of energy and loss is the tendency of the characters in the 19th century to disperse. After the cataclysmic reaction of Lady Croom to the discovery of Mrs. Chater in Byron’s bed, the Chaters, Captain Brice, and Lord Byron all leave at once. The scattering is a parallel to the thermodynamic concept of energy’s tendency to disperse, because it occurs right after a series of sexually charged confrontations. At their loss much of the turbulent sexual energy of the household spreads out into the wider world.

The energy needed to begin a reaction is another important chemical concept relating to the second law of thermodynamics. While energy has a universal tendency to disperse, “It’ll take
a while but we’re all going to end up at room temperature” as Valentine mentions, it is obstructed in this dispersal by chemical bonds. We can apply this to people by observing that sexual energy in particular often brings people together for a reaction. Heat can be the energy propelling the “chemical ‘Ladies’” as Chloe says, and men together as we have already discussed (“the action of bodies in heat”) (16, 84).

Stoppard extends all these references to thermodynamics with another aspect of the Second Law, that being that the tendency for energy dispersal has in fact resulted in the formation of more complex molecules. At the beginning of time, after the big bang, there was lots of energy in the form of the simple components of atoms. These combined, and continued to do so, releasing energy in the process and adding to the general scattering of energy to create the complex molecules of life. Stoppard insinuates that in human interactions, despite the loss of life and love, culture continues to build in complexity. “We die on the march. But there is nothing outside the march so nothing can be lost.” (38). So says Septimus, as he explains why despite the loss of a human being, or a body of knowledge, people will continue to interact forming great works of science and literature. This is much like the physical world. Though heat is released to empty space, the tendency of the matter of the universe is to form more complex structures at the same time. Moreover, “there is nothing outside the march” in the universe either. Heat does not disappear, even though we cannot recover all of it. It just tends to leave places of concentrated energy such as stars and planets. The Second Law of Thermodynamics directly implies this.

Indeed, as Byron says, “I had a dream which was not all a dream, the bright sun was extinguished…and the icy earth swung blind and blackening in the moonless air.” (79). The release of heat in the universe is creating cold in our warm world. Stoppard is aware of this and applies the concept to the human experience, especially the search for knowledge. As all the matter collides and reacts and gives off energy, so does he imply human science is mixing and moving forward with time irreversibly. “The heat goes into the mix…and everything is mixing the same way, all the time irreversibly,” says Valentine. As he talks, Septimus does as well, their dialogue mixing in the same direction of thought, doubly emphasizing his words. “…till there is no time left, that is what time means” he finishes, and Septumis’s continues for him, “When we have found all the mysteries and lost all the meaning, we will be alone, on an empty shore.” (94). With this structure and with the words of the script, Stoppard links the human search for knowledge and the cooling of our planet with powerful imagery.

The end of the play also connects the thermodynamic concept of chemical bonding and cooling with human knowledge through symbolism. The characters in both plays end up dancing. Their movement is resonant of the reactions of atoms, spinning forward in time. It is especially significant that an apple, a symbol appearing throughout the play, is given to Hannah by Gus, and then later, he gives her the piece she needed to complete her knowledge of the hermit. The apple is a Biblical symbol for the temptation of knowledge. As Hannah dances away with the person who offered her knowledge, a poignant picture of the movement toward greater knowledge is formed. The teacher and the student, whose interactions produced the heat of love, and the heat of intellectual discovery, are dancing at the same time. Stoppard is drawing threads of thermodynamics and human behavior, especially passion and the pursuit of knowledge, together.
Arcadia elegantly explains mathematical and scientific concepts. But “it is not science. [It] is story telling” as Septimus elegantly puts for the audience. Tom Stoppard is using the complex ideas of thermodynamics to explain the mechanics of the human experience, using heat as a metaphor for scientific and sexual passions. The author’s theme of loss compares to the Second Law of Thermodynamics which states energy’s tendency to disperse. He also uses people’s sexual interactions to parallel chemical reactions, and scientific progress to parallel the Second Laws tendency to lead to more complex molecular structures. This is the comparison that Stoppard chooses to dwell on in the closing scenes of the play. For this reason, it can be extrapolated that the author wishes to draw attention to this parallel in particular as a broader truth. In other words, Stoppard has been leading us through this play of heat and cooling to say something profound about human knowledge. He wishes his audience to see that the progress of human understanding is a result of our passions, our reactions with each other. Arcadia asks us to see how human desire fuels our growth as a species, despite the deaths of individuals.

Bibliography


Note: The idea of complex molecules and orderly organisms forming despite entropy, which is the tendency of energy to seek disorder, is a difficult concept to explain. This order is only possible, because in the process of forming, or existing, the reactions give out more energy than is conserved or ordered, or at least equal. In other words, this complexity is possible only because the entropy is either equal or greater after a more complex form is created. Much of this is due to the heat that is released by such reactions leading to a higher level of complexity. This is the best I can do for an explanation without attempting to write a second paper entirely on this concept. The sources I referenced should fill in any holes as to my understanding and interpretation of the Second Law of Thermodynamics in relation to Arcadia.