# Science and Judaism: Relationship in Time and in Schools

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#### **Digest**

Science and Judaism are not isolated fields, standing in opposition to each other, nor is it necessary that they be taught independently. This thesis attempts to demonstrate that while there might be stumbling blocks to finding a seamless integration between science and Judaism, it is crucial and possible.

A pattern emerged when looking at the intersection of these two fields from Biblical times until present day. This trend revealed that the relationship between these topics has been complicated. Never in history has there been a time when Judaism and science did not exist on a spectrum of connectivity. This is certainly true today. In narrowing the focus of this relationship to how they interact in the school setting, further questions arose. In trying to address these questions, we are able to see where more resources would be beneficial.

In terms of science education, a primary concern is the education and confidence level of teachers. Another concern is the contention surrounding evolution and how that ought to be taught—whether it ought to be only Darwinism, only creationism, or some combination therein. This is a fierce debate in public schools, and although it is lessened in Jewish day schools, it does still exist.

In day schools, one overarching goal is the integration of religious and general studies. A survey was created in order to find out more information about how integration is defined and practiced in Reform Jewish day schools. Four schools and fourteen total people responded. While each espoused the desire for full integration, few were able to give details of what that meant.

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With some of these factors in mind, a set of lesson plans which combine a Jewish value with a science experiment were created and are presented here. Ultimately, the goal is to show that science and religion can, and do, coexist in harmony.

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### **Chapter 1: Brief Overview in Time**

In the twenty-first century, we are led to believe that there is a rift between science and religion. That, at best, they occupy different realms, do not overlap, and are essentially mutually exclusive. Or, at worst, they are competing for the same space and only one has the "truth" and the other must therefore be wrong. This dichotomy is felt the strongest in the classroom when teaching about evolution. The fierce debate argues whether or not Darwinism, creationism, or a combination of the two, should be taught in schools. The extremists, on both sides, allow no possibility of connectivity. It is either survival of the fittest or God, but not both. This black and white compartmentalization makes this chemist turned rabbinical student uneasy. I therefore am searching throughout time, to see how others have responded to similar dilemmas in their times.

Before we get into more details on these subjects, it is essential to properly define both science and Judaism in order to engage in a conversation regarding how these subjects are connected. The study of science, and the meaning of the word itself, has changed over time. The modern understanding of science— the study of nature and the study of numbers— may not be sufficient to discuss science throughout history.<sup>1</sup> Another way of characterizing science is by "assuming internal associations between successive phenomena, and moreover, that the sequence of phenomena is significant."<sup>2</sup> It is also a

<sup>&</sup>lt;sup>1</sup> Noah J. Efron, Judaism and Science: A Historical Introduction (Westport: Greenwood Press, 2007) 7.

<sup>&</sup>lt;sup>2</sup> Herman Branover, Science in the Light of Torah: A B'or Ha'Torah Reader (Northvale: J. Aronson, 1994) 11.

way to know the universe by induction.<sup>3</sup> In addition, science can be defined as a dynamic historical phenomenon, rather than an analysis of end products.<sup>4</sup>

Not only has the definition of science changed over time, but so has its goals. Whereas one goal might be describing nature by expressing the most precise and complete explanation possible (for a given field of study);<sup>5</sup> another might be to manipulate nature.<sup>6</sup> Even though these might be expressed goals, what science teaches might be quite different than what people believe about science.<sup>7</sup>

People connect and identify with a wide range of ideas in the sciences, rejecting some concepts while embracing others. This could be, in part, due to the dichotomy that science is mysterious and esoteric, and yet at the same time spiritually difficult with which to connect.<sup>8</sup> Science is in the realm of facts and spirituality in the realm of feelings and beliefs. One would do well, however, to keep in mind that technology is morally neutral; it is what people *do* with technology that is positive or negative.<sup>9</sup>

Similarly, there is a wide range of definitions for religion. In a very broad sense, religion is the human search for meaning.<sup>10</sup> Rabbi David Nelson expands this by saying

<sup>&</sup>lt;sup>3</sup> Gunther W. Plaut, *Judaism and the Scientific Spirit* (New York: Union of American Hebrew Congregations, 1962) 22.

<sup>&</sup>lt;sup>4</sup> Menachem Fisch, *Rational Rabbis Science and Talmudic Culture* (Bloomington: Indiana University Press, 1997), 6.

<sup>&</sup>lt;sup>5</sup> David W. Nelson, *Judaism, Physics, and God: Searching for Sacred Metaphors in a Post-Einstein World* (Woodstock: Jewish Lights Pub., 2005) xxviii.

<sup>&</sup>lt;sup>6</sup> Efron, *Historical Introduction*, 7.

<sup>&</sup>lt;sup>7</sup> Plaut, Judaism and the Scientific Spirit, 23.

<sup>&</sup>lt;sup>8</sup> Branover, *Science in the Light of Torah*, 21.

<sup>&</sup>lt;sup>9</sup> Miryam Z. Wahrman, *Brave New Judaism: When Science and Scripture Collide* (Hanover: University Press of New England [for] Brandeis University Press, 2002) 233.

<sup>&</sup>lt;sup>10</sup> Nelson, Searching for Sacred Metaphors, xviii.

religion is "a concerted attempt to understand God, the world, and our own lives and how these three elements interact."<sup>11</sup> From where does the need of God come? The belief in God is found universally, and therefore the need for spiritual authority must be deemed real.<sup>12</sup> Perhaps that is why man has tried to understand himself and his universe throughout time.<sup>13</sup> A wise person was able to comprehend the ways God organized the natural world, including plants and animals.<sup>14</sup> Note, these discussions all involve God. For "a science which dogmatically asserts that God is not, is no longer science but dogmatism, and a religion sans God is not religion but either philosophy, a system of morality or ethical culture."<sup>15</sup>

The following will offer a brief overview of science as it relates to religion through time. We will peek through the windows of various times, including Torah, Talmudic, Middle Ages, and modernity. This subject is large enough to be a dissertation in itself. This conversation has been occurring for hundreds of years, and we will listen in on snippets of that conversation. After all, "both science and religion are dynamic pursuits of the human mind, and their dynamism precludes a static relation."<sup>16</sup>

#### In the Torah

The Torah contains a great deal of information and wisdom. So much so that it has maintained its relevance for thousands of years. There are many frameworks through

<sup>&</sup>lt;sup>11</sup> Nelson, Searching for Sacred Metaphors, xxvii.

<sup>&</sup>lt;sup>12</sup> Plaut, Judaism and the Scientific Spirit, 11.

<sup>13</sup> Ibid., vii.

<sup>&</sup>lt;sup>14</sup> Efron, *Historical Introduction*, 23.

<sup>&</sup>lt;sup>15</sup> Plaut, Judaism and the Scientific Spirit, 14.

<sup>&</sup>lt;sup>16</sup> Ibid., 66.

which to read the texts; two such ways include with what the Israelites themselves were preoccupied and how later generations understood those preoccupations.

Attempting to look at the text from the Israelite perspective, there are patterns that emerge in the understanding of science. The pattern inherent in plants and animals was a subject in which the Divine was sought. "What happens on earth, which is immediate and knowable, was portentous to ancient Israelites."<sup>17</sup> One way this manifested itself was through the preoccupation of natural kinds and making certain they were not mixed.<sup>18</sup> This was necessary because nature was ordered and created by God. That which is created by God is sacred. For the Israelites, it was the order that was most sacred, and not necessarily the objects themselves. By allowing for nature to not be sacred, by "desanctifying it, the Israelites of the Bible launched a worldview that many years later made science possible."<sup>19</sup> More than paving the way for a different kind of science in the world, it was good theology.<sup>20</sup> Because the Torah depends on observation, this allows for authority to be granted to physicians and other scientists to do their work.<sup>21</sup>

Before it is thought that the Torah is exclusively a science book, or that the Israelites were focused on science, it is helpful to take another perspective. For example, "measuring time with exactitude, like calculating the motions of the heavens, was simply not on the agenda of the Bible."<sup>22</sup> Given that the Book of Genesis starts with the creation of the world, from the splitting of the heavens to the splitting of the waters, it is a wonder

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<sup>&</sup>lt;sup>17</sup> Efron, *Historical Introduction*, 22.

<sup>&</sup>lt;sup>18</sup> Ibid., 31.

<sup>&</sup>lt;sup>19</sup> Ibid., 34.

<sup>&</sup>lt;sup>20</sup> Efron, *Historical Introduction*, 19.

<sup>&</sup>lt;sup>21</sup> Leo Levi, *The Science in Torah: The Scientific Knowledge of the Talmudic Sages* (Jerusalem: Feldheim, 2004), 85.

<sup>&</sup>lt;sup>22</sup> Efron, *Historical Introduction*, 22.

that it speaks inconsistently and remarkably little about nature.<sup>23</sup> While, for the most part the cosmos are regular and predictable, the Israelite cosmos is unfixed.<sup>24</sup> Outside the Book of Genesis, minimal is recorded about the heavens at all, because the subject was only marginally and sporadically of interest.<sup>25</sup>

This is curiously different than the view taken by other Ancient Near East cultures. "The Bible nowhere formalizes (or models or describes mathematically) the movements of the heavenly bodies in the way the literature of some neighboring civilizations did, as in the detailed astronomical table of Babylonian priests recorded on cuneiforms."<sup>26</sup> As this kind of information was not a top priority for the Israelites, it is understandable then to see them as gatherers and importers of knowledge from other cultures.<sup>27</sup> Not everything was brought in by the Israelites. While astrology might have been officially unacceptable, there were still those who were practicing it.<sup>28</sup> Shortly after the estimated codification of the Torah, "Josephus describes Jews misguidedly and pathetically allowing astrologers to lead them into the revolt against the Romans, with tragic results,"<sup>29</sup> which might be another reason for its lack of appeal.

The Torah can also be examined through how people have viewed the text since its writing. One perspective is that "when Jews of a later age looked back at their biblical ancestors, they frequently imagined the ancient Israelites keen to understand the

<sup>&</sup>lt;sup>23</sup> Efron, *Historical Introduction*, 20.

<sup>&</sup>lt;sup>24</sup> Ibid., 21.

<sup>&</sup>lt;sup>25</sup> Ibid., 22.

<sup>&</sup>lt;sup>26</sup> Ibid., 21.

<sup>&</sup>lt;sup>27</sup> Ibid., 30.

<sup>&</sup>lt;sup>28</sup> Ibid., 29.

<sup>29</sup> Ibid.

mysteries of nature and well informed of the workings of the universe.<sup>30</sup> Modern day orthodox Jews look to the Torah in order to understand the commandments. With that in mind, "the Torah delegated to man clarification of the scientific facts required for fulfillment of the Torah's commandments.<sup>31</sup> This is because the Torah is not an antiquated document, to be relegated as a piece of history of some primitive people from long ago.<sup>32</sup> Rather, the Torah nowadays as it has always been, a place for Divine wisdom.<sup>33</sup> Then there are also those who believe that the Torah is divinely inspired and is the product of the human hand. And at a different side of the spectrum are those who believe that the Torah is a text of an ancient people that we can use to inspire us today.

With that in mind, there is the question of how to use this text to understand science in modernity. One idea is that "there is no need to adjust the Torah to fit current theories."<sup>34</sup> Another points out, "fundamentalism is constantly faced with a task of reinterpreting certain portions of the Torah in the light of new scientific insights, to 'reconcile' the two."<sup>35</sup> The problem in the latter case is when there is no reconciliation. The debate then becomes about which is correct, the Bible or the science, leading to a postponement of judgment.<sup>36</sup> There are those who have blamed the Bible for current dismissive attitudes towards nature, because "in desacralizing nature, the Bible gave warrant for people to exploit nature, which was now conceived as inert matter."<sup>37</sup>

<sup>&</sup>lt;sup>30</sup> Efron, *Historical Introduction*, 18.

<sup>&</sup>lt;sup>31</sup> Levi, *The Science in Torah*, 83.

<sup>&</sup>lt;sup>32</sup> Moshe Meiselman, *Torah, Chazal and Science* (Jerusalem: Israel Bookshop Publications, 2013) 2.

<sup>&</sup>lt;sup>33</sup> Meiselman, *Torah, Chazal, and Science*, 2.

<sup>&</sup>lt;sup>34</sup> Ibid., 639.

<sup>&</sup>lt;sup>35</sup> Plaut, *Judaism and the Scientific Spirit*, 19.

<sup>&</sup>lt;sup>36</sup> Ibid.

<sup>&</sup>lt;sup>37</sup> Efron, *Historical Introduction*, 33.

So when it comes to science specifically, what are some of the prevailing attitudes regarding how to read these texts? One idea is to compartmentalize areas of focus, leaving the humanities to the Torah and understanding scientific facts to humans.<sup>38</sup> This is paired with the idea that "the Torah is essentially a guide for life and not, primarily, a science text; when scientific facts are mentioned in Torah literature, this is only incidental."<sup>39</sup> Sitting on nearly the opposite side of this perspective is one that says "the Torah encompasses all the insights and information embodied in science and technology as well, for these too are aspects of Divine wisdom."<sup>40</sup> In actuality, these books can be used however a generation so chooses.<sup>41</sup> Then there is also the thought that little is gained when the Genesis narrative is disposed of in favor of theoretical physics if theological difficulties cannot be easily explained.<sup>42</sup>

Looking at the Torah itself, the debate between science and religion is fairly minimized. The focus of the Torah is religion. "No consensus about nature, or the study of nature, or its control and manipulation emerged in the holy books of the ancient Israelites. And no such consensus ever would."<sup>43</sup> There essentially is no debate because science was not even a concern. As both fields developed in history, this would not remain the case. Religion in the face of pagans and Christians during the years of the Mishnah and then the Talmud looked very different, as did science. It is this era to which we now turn our attention.

<sup>&</sup>lt;sup>38</sup> Levi, *The Science in Torah*, 75.

<sup>&</sup>lt;sup>39</sup> Ibid., 6.

<sup>&</sup>lt;sup>40</sup> Meiselman, *Torah, Chazal, and Science*, 2.

<sup>&</sup>lt;sup>41</sup> Efron, *Historical Introduction*, 16.

<sup>&</sup>lt;sup>42</sup> Nelson, Searching for Sacred Metaphors, 4.

<sup>&</sup>lt;sup>43</sup> Efron, *Historical Introduction*, 16.

#### In the Talmud

The destruction of the Second Temple in 70 CE marks the transition from the time of the Torah to Talmudic times. Early years of Rabbinic Judaism were captured by the writing and codifying of the Mishnah. During this time, Rabbinic Judaism made the renovation from a largely ritualistic religion to a community of learners. This time saw a change from one regulated by rituals in the Temple to one organized and designed by the Talmudic academy.<sup>44</sup> This meant that the meticulous rituals associated with the Temple had to be somehow altered and yet still meaningful; this was done through intensive Torah study.

Additionally, roles and statuses changed as sage replaced priest and monarch.<sup>45</sup> They then had to make their mark in Judaism and they did so by creating a systematic text. "Had the redactors of the *Bavli* wished to compile no more than an up-to-date, ordered, and appropriately synthesized *halakhic* codex, they would probably have produced a very different kind of text."<sup>46</sup> Anyone who has read a page of Talmud knows, however, that this is not exactly what appears to have happened. Rather than codifying the learning, the Sages of the Talmud documented the learning process.<sup>47</sup> This is not to say that the Rabbis were not concerned about every last detail. On the contrary, details were greatly important. Consistency was not a goal; rather categorization of every plant

<sup>&</sup>lt;sup>44</sup> Fisch, *Rational Rabbis*, 49.

<sup>&</sup>lt;sup>45</sup> Ibid.

<sup>&</sup>lt;sup>46</sup> Ibid., 51.

<sup>&</sup>lt;sup>47</sup> Fisch, *Rational Rabbis*, 52.

and other species, was the goal for ritual purposes.<sup>48</sup> From this categorization, the case can be made that nature and natural knowledge were viewed positively.<sup>49</sup>

Before it even began, "the Midrashic tradition defused conflict between holy texts and the opinions of natural philosophers."<sup>50</sup> The Rabbis could easily merge a natural idea with their religious texts; for them, there just was not a clash.<sup>51</sup> This was an important ability because they lived at a time when other religions and philosophies abounded. For example, in Greek culture, proving one theory to be superior to another was an ultimate goal; of course that aim was attempted through the use of logical means. The debates in the Talmud offer opinions, major and minor ones, and as such, there is little attempt to reach finality.<sup>52</sup> The Rabbis were certainly aware of these debates however and their relationships with other cultures comes out, especially when looking at nature and natural philosophy.<sup>53</sup> In fact, "both the Babylonian and the Jerusalem Talmud agree that non-Jewish scientific sources are acceptable as the basis for a *halakhic* ruling."<sup>54</sup> Interestingly, while non-Jews could lend their knowledge so that *halakhic* rulings could happen, there was also a difference between Jews and non-Jews. In the area of the stars, there is a dualism which exists: "stars do influence earthly matters...but do not influence Jews...a belief that there are regularities of nature that apply to Gentiles but not to Jews."55

<sup>&</sup>lt;sup>48</sup> Efron, *Historical Introduction*, 53.

<sup>&</sup>lt;sup>49</sup> Ibid., 62.

<sup>&</sup>lt;sup>50</sup> Ibid., 42.

<sup>&</sup>lt;sup>51</sup> Ibid.

<sup>&</sup>lt;sup>52</sup> Ibid.

<sup>&</sup>lt;sup>53</sup> Ibid., 41.

<sup>&</sup>lt;sup>54</sup> Levi, *The Science in Torah*, 87.

<sup>&</sup>lt;sup>55</sup> Efron, *Historical Introduction*, 60.

During this age, Jews and non-Jews looked at astronomy through different lenses. While in the Jewish culture, this topic was not held in high esteem, it was in Greek, Roman, and Babylonian cultures. Therefore, unlike a Jewish legal scholar, one who was versed in astronomy was well-regarded by those around him.<sup>56</sup> In particular Rabbi Simeon implied that "astronomy reflects and ratifies the greatness of God's creation; ignore it, and you are denigrating God Himself,"<sup>57</sup> which goes to show that that cosmos were not entirely rejected by the Jews.

Astrology on the other hand, was a different matter. There were disagreements in the Talmud on many areas of astrology. First, did it work at all? Second, if it did work, did it work for Jews? Third, if so, ought it to be used?<sup>58</sup> The debate was a bit different when it came to magic. "The Rabbis described in the Talmud did not reject magic because it does not work, but because they believed that in certain circumstances it does work. It is dangerous because it works, and it should be avoided because it works."<sup>59</sup>

The use of numbers was yet a different story. They were needed in order figure out practical needs, such as *sukkah* dimensions or an *eruv* or *mikveh* size. These items however, did not require intense accuracy, therefore often the numbers generated by the Rabbis were inexact.<sup>60</sup> For the Rabbis, numbers were not used to offer insight into important workings of the world and could even be a source of playfulness.<sup>61,62</sup> Exactitude was more of a concern when it came to animals, especially when ritual

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<sup>&</sup>lt;sup>56</sup> Efron, *Historical Introduction*, 59.

<sup>&</sup>lt;sup>57</sup> Ibid., 48.

<sup>&</sup>lt;sup>58</sup> Ibid., 58.

<sup>&</sup>lt;sup>59</sup> Ibid., 54.

<sup>&</sup>lt;sup>60</sup> Ibid., 45.

<sup>&</sup>lt;sup>61</sup> Ibid., 47.

<sup>&</sup>lt;sup>62</sup> Ibid., 51.

practice was the subject of discussion.<sup>63</sup> In essence, that which had practical value was of interest.<sup>64</sup> There exists the idea that the Sages were so wise, that they must have known matters of nature and science.<sup>65</sup> So while "the Talmudic sages are not likely to have known the complex chemical processes involved in leavening [of bread], they were excellent observers and came to the proper conclusions."<sup>66</sup>

*Halakhah* was taken very seriously and carried more weight than *aggadah*. Facts presented in these two different systems ought to be treated with differing levels of scrutiny, with more intensity in *halakhah* than *aggadah*.<sup>67</sup> If not done this way, when reading the texts, there can be errors and a mistaken understanding in cases where the Sages intended to be metaphorical rather than literal.<sup>68</sup> For them, science "was a servant in the house of God."<sup>69</sup>

Perhaps, this is one of the reasons that the Talmud has the discussion on whether or a not a person is even allowed to practice medicine, or if health is to be left up to God. It was decided that a person may indeed be a physician. This is not to say that medicine was ubiquitously accepted in the Talmud; there was still some unease regarding "the abilities of physicians, surgeons, and bloodletters to alter both the course of nature and the unfettered unfolding of God's will."<sup>70</sup> While medicine was acceptable, that does not mean that the Sages did not have other ideas about from where diseases came. For

<sup>&</sup>lt;sup>63</sup> Efron, *Historical Introduction*, 53.

<sup>&</sup>lt;sup>64</sup> Ibid., 62.

<sup>&</sup>lt;sup>65</sup> Levi, *The Science in Torah*, 2.

<sup>66</sup> Ibid., 13.

<sup>&</sup>lt;sup>67</sup> Ibid., 75.

<sup>68</sup> Ibid., 36.

<sup>&</sup>lt;sup>69</sup> Plaut, *Judaism and the Scientific Spirit*, ix.

<sup>&</sup>lt;sup>70</sup> Efron, *Historical Introduction*, 56.

example, "dropsy is a sign of sin, jaundice is a sign of groundless hatred...and croup is a sign of slander. (BT Shabbat 33a)"<sup>71</sup> Psychological illnesses were likened to being coerced by a demon, described as insane at times.<sup>72</sup> Rav Sherira Gaon commented that the Rabbis were not physicians, rather, they simply observed patients and recorded said observations.<sup>73</sup>

A question still remains: how to use the information, especially the scientific pieces, in the Talmud today. There are apparent contradictions which abound. One possibility is to remember that the Rabbis were not scientists and any knowledge they imparted therein might be granted some leeway. Another opinion is when this discussion comes up, to question "the reliability of the [contemporary] scientific opinion."<sup>74</sup> Somewhere in the middle of this spectrum is historian Norman Cantor who took a broad stroke to the debate. He wrote, "the Talmud is best perceived as not so much imparting information as training the minds of rabbis who will have to make decisions on various matters of civil and religious law in their own courts."<sup>75</sup>

#### In the Middle Ages

Some of the most profound commentators on the Talmud came from the High Middle Ages (11-13<sup>th</sup> centuries CE), notably Maimonides, Gersonides, and Yehudah Ha Levi, just to name a few. These men, and others, linked a philosophical or theological system to the investigation of nature, which was similar to their Muslim and Christian

<sup>&</sup>lt;sup>71</sup> Efron, *Historical Introduction*, 57.

<sup>&</sup>lt;sup>72</sup> Levi, *The Science in Torah*, 129.

<sup>&</sup>lt;sup>73</sup> Ibid., 119.

<sup>&</sup>lt;sup>74</sup> Ibid., 146.

<sup>&</sup>lt;sup>75</sup> Efron, *Historical Introduction*, 41.

counterparts.<sup>76</sup> The ability to do this was in part because of the openness of Islamic cities at the time, both in terms of socialization and intellectual inquiry.<sup>77</sup> These encounters "provided an impetus for perpetuating the rabbinic approaches to nature while deepening their religious and intellectual significance."<sup>78</sup>

Maimonides is an example of someone who had minimal difficulty, at least outwardly, finding a connection between science and religion. To him, there were few areas of conflict. He held the radical belief that "contemporary astronomical knowledge was superior to that found in the Talmud and should be accepted even when it contracted the view of the rabbis."<sup>79</sup> This is not to say that whatever the masses believed to be scientific should then be elevated to such status. On the contrary, astrology and talismans were considered psychological weapons created by an ancient ruling class in order to control the masses.<sup>80</sup> Rambam went as far as proscribing astrology and magic because he felt they were caustic to Judaism.<sup>81</sup> Before the assumption is made that Maimonides was speaking heresy—something not typically part of Jewish tradition<sup>82</sup>—he "declared quite explicitly that every branch of science which reveals God's way in the world is in itself a part of the divine law by which the universe is governed."<sup>83</sup> Halakhah is often seen as

<sup>&</sup>lt;sup>76</sup> David B. Ruderman, *Jewish Thought and Scientific Discovery in Early Modern Europe* (Detroit: Wayne State University Press, 2001) 15.

<sup>&</sup>lt;sup>77</sup> Ruderman, Jewish Thought and Scientific Discovery, 18.

<sup>&</sup>lt;sup>78</sup> Ibid., 17.

<sup>&</sup>lt;sup>79</sup> Ibid., 31.

<sup>&</sup>lt;sup>80</sup> Levi, *The Science in Torah*, 133.

<sup>&</sup>lt;sup>81</sup> Ruderman, Jewish Thought and Scientific Discovery, 29.

<sup>&</sup>lt;sup>82</sup> Plaut, Judaism and the Scientific Spirit, 5.

<sup>&</sup>lt;sup>83</sup> Rabbi Edward E. Klein and Rabbi Roland B. Gittelsohn, *Judaism and the Contemporary Crisis* (New York: Jewish Chautauqua Society, 1965) 28.

this divine law. Isadore Twersky showed that, for Maimonides, there was a recognition of autonomy between scientific knowledge and *halakhah*.<sup>84</sup>

Unlike these ideas from Maimonides, Yehuda Ha Levi "was unwilling to recognize a body of knowledge that had not been derived from the divine revelation on Mount Sinai."<sup>85</sup> A person's humility and reverence toward God, for Ha Levi, was actually elevated by acknowledging a lack of comprehension.<sup>86</sup> Magic was another area in which these two thinkers greatly disagreed. Ha Levi did not view magic as being based in morality, but rather said it was the practitioner who renders it good or bad.<sup>87</sup>

Gersonides was more middle of the road in his understanding of science than either Maimonides or Ha Levi. For him, if a contradiction existed between science and Judaism, "both must be reexamined, because we could have been mistaken in our understanding of either."<sup>88</sup> As an adherent to Aristotelian physics,<sup>89</sup> for whom astrology was the highest science,<sup>90</sup> Gersonides was a staunch defender of the integration of reason and revelation.<sup>91</sup>

Bahya Ibn Pakuda used a combination of scripture, rabbinic tradition, and rational arguments to show the Jewish obligation to study nature.<sup>92</sup> For him, however, this study of nature most definitely left out astrology. He "condemned the intrusion of astrology

<sup>&</sup>lt;sup>84</sup> Ruderman, Jewish Thought and Scientific Discovery, 30.

<sup>&</sup>lt;sup>85</sup> Ibid., 33.

<sup>&</sup>lt;sup>86</sup> Ibid., 34.

<sup>&</sup>lt;sup>87</sup> Ibid.

<sup>&</sup>lt;sup>88</sup> Klein and Gittelsohn, Judaism and the Contemporary Crisis, 28.

<sup>&</sup>lt;sup>89</sup> Ruderman, Jewish Thought and Scientific Discovery, 41.

<sup>&</sup>lt;sup>90</sup> Ibid., 43.

<sup>&</sup>lt;sup>91</sup> Ibid., 41.

<sup>&</sup>lt;sup>92</sup> Ibid., 21.

into Judaism...excluded the activity of predicting events on the basis of the movements of the stars."<sup>93</sup>

This certainly was at odds with one of his contemporaries, Abraham Ibn Ezra. A significant number of biblical events were interpreted in an astrological way by Ibn Ezra. Additionally, he used astrology as a way to "explain certain biblical commandments as defenses against the pernicious influence of the stars."<sup>94</sup>

Other scientists of the time, such as Bar Hiyya, were able to deflect religious objections by "insisting on God's veto power over astral influences."<sup>95</sup> For him, "avoiding a bad constellation is analogous to avoiding harmful food."<sup>96</sup> He asserted in his book, *Hegyon Hanefesh*, that one God created the universe, and this awareness was based on looking at the order and design of the world.<sup>97</sup>

More Jews would have studied in the sciences had there been institutional support, so asserts Gad Freudenthal.<sup>98</sup> This void, however, was partially filled "through support of a high level of medical training among some of its [Jewish community] most privileged members."<sup>99</sup> An unanswerable question is how much difference it would have made were Jews able to attend higher institutions of learning. Copernicus and Galileo, both of whom were incredible scientists and scholars, were declared false in their own time. For three centuries after Galileo had to recant his findings, "Christendom, in its

<sup>&</sup>lt;sup>93</sup> Ruderman, Jewish Thought and Scientific Discovery, 23.

<sup>94</sup> Ibid., 27.

<sup>&</sup>lt;sup>95</sup> Ibid., 25.

<sup>&</sup>lt;sup>96</sup> Ibid.

<sup>&</sup>lt;sup>97</sup> Klein and Gittelsohn, Judaism and the Contemporary Crisis, 28.

<sup>&</sup>lt;sup>98</sup> Ruderman, Jewish Thought and Scientific Discovery, 51.

<sup>99</sup> Ibid.

Catholic, as well as Protestant branches, was saddled with a bitter and destructive controversy."<sup>100</sup> This battle did not subside until there was a shift in control over education. This authority went to the State from the Church, which "had been responsible for all levels of education in Europe since the beginning of the Middle Ages."<sup>101</sup>

#### In Modernity

So how do these ideas, religion and science, connect in modernity? Questions such as this one have spurred a fierce debate, with numerous opinions, in recent times. This debate has not always existed however.<sup>102</sup> For example, Albert Einstein said of the nineteenth century, "The basic unity between cultural, religious, and secular institutions was lost and replaced by a senseless animosity."<sup>103</sup> These two fields cannot be isolated from one another, despite the desire to maintain autonomy.<sup>104</sup> As Menachem Fisch has said, "It is unhelpfully apologetic to claim that there must always be perfect harmony between scientific 'truth' and revealed 'truth', or, conversely, that science and Torah-study examine complementary but mutually exclusive realms, and hence cannot conflict in principle."<sup>105</sup>

There are other authorities who believe quite differently than this. Those who think that reconciliation is neither possible nor desirable.<sup>106</sup> Or that conflict is avoided by completely isolating the two fields; only when the boundaries are overstepped is conflict

<sup>&</sup>lt;sup>100</sup> Plaut, *Judaism and the Scientific Spirit*, 4.

<sup>&</sup>lt;sup>101</sup> Branover, *Science in the Light of Torah*, 17.

<sup>&</sup>lt;sup>102</sup> Plaut, Judaism and the Scientific Spirit, ix.

<sup>&</sup>lt;sup>103</sup> Branover, *Science in the Light of Torah*, 15.

<sup>&</sup>lt;sup>104</sup> Efron, *Historical Introduction*, xi.

<sup>&</sup>lt;sup>105</sup> Fisch, *Rational Rabbis*, xiii.

<sup>&</sup>lt;sup>106</sup> Plaut, Judaism and the Scientific Spirit, ix.

required to arise.<sup>107</sup> What happens, however, when these subjects are thought to be independent of one another, a person feels the need to choose between the two.

Menachem Kasher comes to the conclusion that "for the Orthodox Jew it is either literal Bible or Darwin's theory, but not both."<sup>108</sup> This is certainly true for Rabbi Moshe Meiselman, an orthodox rabbi and author of *Torah, Chazal, and Science*. In his book, he believes that the need to adjust Torah to current scientific theories "derives solely from the tension caused by the confrontation with modern secular academic culture."<sup>109</sup> This strict choice does not resonate with all who are involved in the debate.

For example, Rabbi Gunther W. Plaut, sees the common goal of searching for truth as being applicable to both the religious thinker and the scientist.<sup>110</sup> Yet, he does find a separation between the two, in terms of the aspects of life on which they focus: "science with the knowledge of the cosmos and religion with values that make life worthwhile."<sup>111</sup> With the intensity and complexity of life ever increasing, Plaut finds unity between the two when he says, "we require the help that the scientist provides, undergirded by the faith and ideals that Judaism teaches."<sup>112</sup>

This unity is held not only by some religious people, but also by some scientists. The lead scientist on the human genome project, Dr. Francis Collins, as he finished the sequencing, is reported to have proclaimed, "We have caught the first glimpses of our

<sup>&</sup>lt;sup>107</sup> Plaut, Judaism and the Scientific Spirit, 10.

<sup>&</sup>lt;sup>108</sup> Ibid., 52.

<sup>&</sup>lt;sup>109</sup> Meiselman, *Torah, Chazal, and Science*, 639.

<sup>&</sup>lt;sup>110</sup> Plaut, Judaism and the Scientific Spirit, viii.

<sup>&</sup>lt;sup>111</sup> Ibid., vii.

<sup>&</sup>lt;sup>112</sup> Ibid.

instruction book previously known only to God."<sup>113</sup> Both science and God have to be relevant, because both are relevant to mankind,<sup>114</sup> but this does not mean that either has to prove the other, or be superior.<sup>115</sup>

Where, and why, then did there get to be such a heated debate? After the Enlightenment period, Cornell University, founded in 1865, was the first to allow autonomy in science education, not requiring religious authority to control these disciplines.<sup>116</sup> It was in this century that technology exploded in areas such as chemistry, anatomy, electricity, and many more.<sup>117</sup> Out of this great excitement and change, came enthusiasm and faith in the power of science, going as far as to think the in the near future hunger and disease would be eliminated.<sup>118</sup>

Simultaneous to the incredible advancements of science, was the growth of socialist movements as well as a growing war against the Church.<sup>119</sup> History, from the socialist's perspective, could not have an intervening God.<sup>120</sup> "For Communist ideology to win, it must not only eradicate the Ten Commandments; it must also destroy, completely, the idea that there is a Creator and that was a Creation..."<sup>121</sup>

The infallibility of science came to a crash in the early twentieth century when Newtonian physics was overthrown.<sup>122</sup> Since that time, hardly a single scientific theory,

<sup>&</sup>lt;sup>113</sup> Wahrman, Brave New Judaism, 237.

<sup>&</sup>lt;sup>114</sup> Plaut, Judaism and the Scientific Spirit, 9.

<sup>&</sup>lt;sup>115</sup> Ibid., viii.

<sup>&</sup>lt;sup>116</sup> Ibid., 4.

<sup>&</sup>lt;sup>117</sup> Branover, Science in the Light of Torah, 17.

<sup>&</sup>lt;sup>118</sup> Ibid., 18.

<sup>&</sup>lt;sup>119</sup> Ibid., 16.

<sup>&</sup>lt;sup>120</sup> Ibid., 19.

<sup>&</sup>lt;sup>121</sup> Ibid. 33.

<sup>&</sup>lt;sup>122</sup> Fisch, Rational Rabbis, 5.

considered basic, "remains accepted in its original form in the twentieth century." Examples include the understanding of subatomic particles, statistical theory, and relative dimensions, just to name a few.<sup>123</sup> While gross errors are often rare and modern science is rather reliable,<sup>124</sup> there is frequently the underlying notion that "today's 'facts' occasionally become tomorrow's obsolete theory."<sup>125</sup> This is because a theory can never be proven but only disproven<sup>126</sup>, with new data, new theories, and new understandings.<sup>127</sup>

One field which is still burgeoning and changing rapidly too, is biotechnology and the ethics which go along with it. According to Miryam Wahrman, bioethics has a cornerstone, which is a quote from *Ecclesiastes*, "*Ayn khadosh takhat hashemesh*, there is nothing new under the sun."<sup>128</sup> Using the parallelism of a genetic code, one can say that scripture also has a code, a moral one.<sup>129</sup> As there are a few different streams of Judaism these days, each often has a differing take on technology as it pertains to ethics, than the others. Though, Dr. Louis Flancbaum, writing in *B'or Ha'torah*, suggests "In the ethical arena, these Responsa show that the differences are more perceived than real. Almost without exception, the Reform and Conservative Responsa on bioethical subjects parallel moderate Orthodox opinions, while within Orthodoxy, there are often exists opinions that occupy opposite ends of the *halakhic* spectrum."<sup>130</sup> Considering the Orthodox use

<sup>&</sup>lt;sup>123</sup> Branover, Science in the Light of Torah, 21.

<sup>&</sup>lt;sup>124</sup> Levi, *The Science in Torah*, 82.

<sup>&</sup>lt;sup>125</sup> Ibid., 148.

<sup>&</sup>lt;sup>126</sup> Branover, Science in the Light of Torah, 38.

<sup>&</sup>lt;sup>127</sup> Nelson, Searching for Sacred Metaphors, xxviii.

<sup>&</sup>lt;sup>128</sup> Wahrman, *Brave New Judaism*, 228.

<sup>&</sup>lt;sup>129</sup> Ibid., 230.

<sup>&</sup>lt;sup>130</sup> Ibid., 10.

uniformly accepted texts, it is a wonder they come up with such radically differing opinions.<sup>131</sup>

There are boundaries to be sure. For example, almost universal is the prohibition of using gender selection for personal preference.<sup>132</sup> One challenge is to find connections, trying to address "how ancient traditions relate to new technologies."<sup>133</sup> An unusual pairing is DNA analysis and the Dead Sea Scrolls. There are around eight hundred original scrolls and DNA analysis is helping "reconstruct the original manuscript by helping them [archeologists and scholars] sort the puzzle pieces to learn which fragments originally came from the same skin."<sup>134</sup>

As has been attempted to be shown, the relationship between science and religion, Judaism specifically, throughout time is quite complex, and not getting any simpler. As science continues to grow at a tremendous pace, religion has to find ways to address new questions. The debate of how humans came to be, as described by Darwin or by the Book of Genesis, is the latest of these questions with which we struggle. Just as in the Torah, there is no consensus in how to connect the two ideas of religion and science. Difficulty in understanding this complex relationship does not allow for it to be ignored. And understanding must begin at the earliest ages. We now turn our attention to education, as it pertains to these two subjects.

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<sup>&</sup>lt;sup>131</sup> Wahrman, *Brave New Judaism*, 10.

<sup>&</sup>lt;sup>132</sup> Ibid., 227.

<sup>&</sup>lt;sup>133</sup> Ibid., 23.

<sup>&</sup>lt;sup>134</sup> Ibid., 232.

## **Chapter 2: Teaching Challenges**

There are a myriad of potential variables that impact the effectiveness of teaching science in schools. This chapter will focus on teachers, teaching methods, and public opinion, as well as challenges specific to teaching in Jewish day schools. However, I will not cover the areas of socio-economic status, student behavioral issues, or cognitive appropriateness, though these variables are also significant. At each step along the way, there are stumbling blocks obstructing the path towards excellent science education.

Teachers are the first piece, on the frontlines, of education. Elementary schools are often structured such that each teacher is in charge of a single classroom for the day. This is unlike the high school model in which each teacher is in charge of an individual subject. Some schools might have music, art, gym, or other 'electives,' which have their own teacher. The core subjects, however, are the responsibility of the primary teacher, including reading, writing, math, social studies, and science. It is in this last area where, as we will see, problems tend to arise. As Elizabeth Lewis et al point out, "Elementary science education has many challenges, centrally, the effective education of teachers to teach K-5 science standards."<sup>135</sup>

What are their qualifications then? Lewis et al find "elementary teacher education programs that only require minimal or inconsistent learning objectives based on national

<sup>&</sup>lt;sup>135</sup> Elizabeth Lewis, Oxana Dema, Dena Harshbarger. "Preparation for Practice: Elementary Preservice Teachers Learning and Using Scientific Classroom Discourse Community Instructional Strategies." School and Science Mathematics 114, no 4 (April 2014). 154 http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1149&context=teachlearnfacpub.

standards.<sup>136</sup> A general survey of the Big Ten<sup>137</sup> and Ivy League Schools<sup>138</sup> sheds an unfavorable light on teacher training. Not every school offers a degree in elementary education: out of 23 schools, 12 offer BAs, 7 offer BAs only in conjunction with an MA (often as a 4+1 program), and 4 do not offer any degrees in this field. A few universities differentiate between Early Childhood Education (generally pre-kindergarten through third grade) and Elementary Education (kindergarten through sixth grade). All the programs require general education courses, with little variation between requirements. Specifically looking at science, the average is 9 credits in *any* science class. Some universities do not require a course with a lab component, allowing classes that are considered less difficult and are specifically geared for people who will not be pursuing a science degree.

Looking at the details of the requirements of the education major, most universities only require one additional science course, and it was not a methods course. Teachers are not only lacking education on *how to teach science*, they are barely educated in science itself. Teachers are being conferred degrees without having the coursework to teach specific subjects. It is conceivable (and not improbable) that a person with an elementary education degree will have never had a course in one of the primary sciences (chemistry, biology, physics) or even stepped foot in a laboratory.

<sup>&</sup>lt;sup>136</sup> Lewis, "Preparation for Practice," 154.

 <sup>&</sup>lt;sup>137</sup> University of Illinois at Urbana-Champaign; Indiana University; University of Iowa; University of Maryland; University of Michigan; Michigan State University; University of Minnesota; University of Nebraska-Lincoln; Northwestern University; Ohio State University; Penn State; Purdue University; Rutgers University; University of Wisconsin-Madison; Johns Hopkins University
 <sup>138</sup> Braum: Columbia: Cornelly Destmoutby University of Despective State; Princeton; University

<sup>&</sup>lt;sup>138</sup> Brown; Columbia; Cornell; Dartmouth; University of Pennsylvania; Yale; Princeton; Harvard

There are, however, a few outliers. The University of Iowa offers a specialty, with an additional 27 credits required in the specialized field. If a person so chooses, said specialty could be in the sciences, with the additional credits directly from the science department. Another positive outlier is the University of Michigan, which requires their students to take an integrated course focused on *how to teach*. Finally, Cornell has a single course covering "interdisciplinary methods" in their science elementary education curriculum.<sup>139</sup>

We can then see how teachers could "lack substantial science subject matter knowledge"<sup>140</sup> and "hold unsophisticated understandings of the nature of science and of scientific inquiry."<sup>141</sup> It comes as no surprise that many teachers have "low confidence and self-efficacy with science content and science teaching."<sup>142</sup> It has been found that there are "negative dispositions of elementary teachers toward teaching science."<sup>143</sup> This could be due in no small part to "their limited science subject matter knowledge"<sup>144</sup> and "limited pedagogical science content knowledge."<sup>145</sup> In these cases, teachers focus mainly on engaging their students, rather than engaging with the material itself. In a worst-case scenario, in the classroom is a teacher who is uncomfortable with science, has

<sup>&</sup>lt;sup>139</sup> The websites of the all the listed universities were reviewed and the details of the degree in elementary education were looked at. For example, the Cornell site had multiple pages for its degree requirements, such as: http://www.cornellcollege.edu/education/degree-requirements/index.shtml Similarly, Michigan State lists its full requirements here:

http://education.msu.edu/academics/undergraduate/elementary/integrative-studies.asp Each of the schools were reviewed in the same fashion.

 <sup>&</sup>lt;sup>140</sup> Davis, Elizabeth A. "Elementary Teachers' Ideas about Effective Science Teaching: A Longitudinal Study." (2008) 1. http://www.umich.edu/~hiceweb/presentations/documents/ICLS08Davis.tosend.pdf.
 <sup>141</sup> Davis, "Elementary Teachers' Ideas," 1.

<sup>&</sup>lt;sup>142</sup> Lewis, "Preparation for Practice," 154.

<sup>&</sup>lt;sup>143</sup> Ibid.

<sup>144</sup> Ibid.

<sup>&</sup>lt;sup>145</sup> Ibid.

had little education in the sciences, no instruction on how to teach these subjects, and minimal resources with which to do so.

Altering the university curriculum to require science courses, as well as courses in *how to teach* science, is one way to alleviate some of this issue. It would also be beneficial for teachers to have a mentor who is comfortable and confident in the sciences.

When discussing the challenges of teaching science, it is prudent to also define what is meant by the term 'science.' "Rather than being viewed as the memorization of facts, science is seen as a way of thinking and trying to understand the world."<sup>146</sup> Additionally, "science is understood to be a process of finding out and a system for organizing and reporting discoveries."<sup>147</sup> The focus is on a methodology and worldview. These definitions do not speak about specifics such as formulating a hypothesis and then devising an experiment with which to test it. Rather, looking at science as a system means that can be applied to all ages of learners. This is important because "all students...need to learn scientific skills such as observation and analysis at a very young age."<sup>148</sup> Therefore, it is the "educators [who] must choose appropriate science content and experiences to match children's cognitive capacities at different stages of their development."<sup>149</sup>

<sup>&</sup>lt;sup>146</sup> Karen K. Lind, "AAAS - Project 2061 - Dialogue on Early Childhood Education: Science in Early Childhood: Developing and Acquiring Fundamental Concepts and Skills". American Association for the Advancement of Science, 1999.

http://www.project2061.org/publications/earlychild/online/experience/lind.htm. <sup>147</sup> Lind, "Dialogue on Early Childhood Education," (1999)

<sup>&</sup>lt;sup>148</sup> Ibid.

<sup>&</sup>lt;sup>149</sup> Lind, "Dialogue on Early Childhood Education," (1999)

Educators have additional power in the way they steer conversations. If the teachers focus on content, it can cue students to do the same.<sup>150</sup> Donald Kennedy, Stanford President Emeritus, believes that the ultimate goal of science education is to "produce a thin layer of outstandingly brilliant innovators"<sup>151</sup> as well as "to produce a level of scientific literacy in the general population that can help our society apply better judgments to policy issues."<sup>152</sup>

One way this can be accomplished is through "problem solving and reflective thinking [which] play an important role in children's science learning in school."<sup>153</sup> Active involvement in their environment is how children build the foundation of learning.<sup>154</sup> While educators agree that the "best way to learn science is to do science,"<sup>155</sup> the how is still difficult. "Elementary teachers often rely on 'activities that work'... rather than engaging in meaningful, coherent, inquiry-oriented science teaching."<sup>156</sup> If we look back at the definition then, students are not really learning science. Without deep understanding of broader concepts or the scientific process,<sup>157</sup> much is lost in the activity.

The goal then should be to focus on inquiry-based lessons. In these lessons, students engage "in the investigative nature of science."<sup>158</sup> This system "can be distilled into asking and answering scientific questions, constructing explanations using evidence

<sup>&</sup>lt;sup>150</sup> Jeffrey S. Kress "Reflection and Connections: The Other Side of Integration." Journal of Jewish Education 76 no. 2 (2010). 168. DOI: 10.1080/15244111003771366

<sup>&</sup>lt;sup>151</sup> Chelsea Anne Young, "Kennedy Lectures on Challenges Facing K-12 Science Education," Stanford News. (2007). http://news.stanford.edu/news/2007/april11/kennedy-041107.html.

<sup>&</sup>lt;sup>152</sup> Young, "Kennedy Lectures on Challenges."

<sup>&</sup>lt;sup>153</sup> Lind, "Dialogue on Early Childhood Education," (1999)

<sup>154</sup> Ibid.

<sup>155</sup> Ibid.

<sup>&</sup>lt;sup>156</sup> Davis, "Elementary Teachers' Ideas," 1.

<sup>&</sup>lt;sup>157</sup> Ibid.

<sup>&</sup>lt;sup>158</sup> Lind, "Dialogue on Early Childhood Education," (1999)

to support claims, and communicating and justifying findings."<sup>159</sup> It also requires skilled educators who facilitate "drawing lines of comparison and contrast between what you have newly observed and what you already know."<sup>160</sup>

There are a few problems with implementing this approach, beyond what has already been described in regards to teacher training. First, there is no standard curriculum for science in the elementary grades, so "course content was mostly selected according to instructors' personal bias, knowledge, goals, and program needs."<sup>161</sup> Secondly, due to the No Child Left Behind Act (NCLB), students are being asked to recall facts after being told about science — rather than *thinking* scientifically.<sup>162</sup> Teachers are also assessed by the performance of their students and "therefore, come to see their disciplines…as a set of data to absorb."<sup>163</sup> Studies have also shown that, since the implementation of NCLB in 2002, "science instructional time has decreased by one third from 226 to 152 minutes per week."<sup>164</sup> In 1993, around 8% of total class time (or 13% of core curriculum instruction) was spent on the sciences per week.<sup>165</sup> This number is for *all* science instruction. Chemistry, physics, earth sciences, and biology are all included in this small percentage. Often, as stated previously, the individual teacher decides how to use those few minutes.

<sup>&</sup>lt;sup>159</sup> Davis, "Elementary Teachers' Ideas," 1.

<sup>&</sup>lt;sup>160</sup> Kress, "Reflection and Connections," 169.

<sup>&</sup>lt;sup>161</sup> Lewis, "Preparation for Practice," 155.

<sup>&</sup>lt;sup>162</sup> Bruce Alberts, "Prioritizing Science Education." Sceincemag.org (2013) 249.

https://www.sciencemag.org/content/340/6130/249.full.

<sup>&</sup>lt;sup>163</sup> Kress, "Reflection and Connections," 170.

<sup>&</sup>lt;sup>164</sup> Lewis, "Preparation for Practice," 155.

<sup>&</sup>lt;sup>165</sup> Marianne Perie, David P. Baker, Sharon Bobbitt. "Time Spent Teaching Core Academic Subjects in Elementary Schools: Comparisons Across Community, School, Teacher, and Student Characteristics." National Center for Education Statistics (1997). http://nces.ed.gov/pubs/97293.pdf.

One issue facing science teachers revolves around what to teach. Few people question teaching chemistry, or physics, or even a bit of the earth sciences. The hot button issue centers on biology and the question of evolution. For the purpose of this paper, evolution, is defined as: "the scientific theory that life on Earth descended from a common ancestor and that diverse species arose through natural selection and random genetic mutations."<sup>166</sup> This stands in contrast to creationism, which is defined as: "a religious concept that attributes the creation of life and the universe to a supernatural deity."<sup>167</sup>

There are a few key words in each of these definitions that cause conflict. First is the difference between *scientific theory* and *religious concept*. "The highly controversial aspect of the theory [of evolution]...was that it implied a contradiction with the story of man's creation as told in the book of Genesis in the Bible."<sup>168</sup> This automatically pits science against religion, a debate that has been raging for centuries. A second set of problematic words is *natural selection* and *supernatural deity*. Nature is something we can see and study and possibly control (or at least understand). The supernatural, by definition, is outside of nature and therefore we cannot understand, and certainly not control, it. Lastly, who has the authority to decide what is taught as 'truth' in our schools?

In such a large, diverse country as the United States, there are bound to be a variety of opinions. Gallup has been conducting polls for decades that ask Americans

<sup>&</sup>lt;sup>166</sup> Young, "Kennedy Lectures on Challenges."

<sup>&</sup>lt;sup>167</sup> Ibid.

<sup>&</sup>lt;sup>168</sup> Frank Newport, "Third of Americans Say Evidence Has Supported Darwin's Evolution Theory." Gallup (2004). http://www.gallup.com/poll/14107/third-americans-say-evidence-has-supported-darwins-evolution-theory.aspx.

about their beliefs of the Bible, Darwinism, and God (and many other subjects not relevant here). For the last thirty years, the percentage of Americans who believe that God created humans in their current form within the last 10,000 years has remained fairly steady at 50%.<sup>169</sup> The 10,000-year time frame was chosen for its approximation to the age that some Bible literalists have concluded to be the age of the Earth.

This is not the only topic that has seen little change in the polls. "The current views of the American public on the issue of biblical literacy are remarkably similar to what was recorded in August 1976."<sup>170</sup> 82% of those polled believe that God had a role in the creation of the Bible, with 34% believing that it is the literal word of God. 15% say the Bible is strictly a human document, composed of fables and the like.<sup>171</sup> Given this data, it is no wonder that the theory of evolution prompts questioning and heightened emotions.

"American public culture, the science of evolution and the biblical creation story are constructed as opposing narratives of life's origins, and the classroom has become a battleground for this debate."<sup>172</sup> Having no national religion, and a law that requires the separation of church and state, it is no wonder that there are passionate people on all sides of this issue, especially when the curricula at public schools are in question.

http://www.nytimes.com/2008/08/24/education/24evolution.html?pagewanted=all&\_r=1&. <sup>170</sup> Newport, "Third of Americans"

<sup>&</sup>lt;sup>169</sup> Amy Harmon, "A Teacher on the Front Line as Faith and Science Clash." New York Times, August 23, 2008, Education section, online edition.

<sup>171</sup> Ibid.

<sup>&</sup>lt;sup>172</sup> Emma Kippley-Ogman, "Teaching Evolution in Jewish Schools," *My Jewish Learning*, http://www.myjewishlearning.com/beliefs/Issues/Science/Creationism\_and\_Evolution/In\_Jewish\_Education.shtml.

A Gallup poll from 2001 sheds some light on the question of what respondents believe should be taught in public schools. In sum:

Creationism *required* to be taught in standard curriculum: 25%<sup>173</sup> Creationism and evolution both taught as standard curriculum: 68%<sup>174</sup> Creationism as an elective: 56%<sup>175</sup>

In 2005, a similar poll was taken, with slightly amended questions:

If creationism is taught in school, it is upsetting: 22%

If creationism taught in school, it is *not* upsetting [emphasis mine]: 76%<sup>176</sup>

If evolution is taught in school, it is upsetting: 34%

If evolution taught in schools, it is not upsetting [emphasis mine]: 63%<sup>177</sup>

Regardless of what is taught, a teacher risks upsetting more than a fifth of the students and their families. However, these data did not control for location, education level, socio-economic status, age, gender, religion, or other variables. Once these variables are noted, the numbers can shift quite dramatically.

One teacher, in a school where families highly favored creationism, said to his students, "I don't expect you to 'believe' the scientific explanation of evolution that we're going to talk about over the next few weeks. But I do," he added, "expect you to

<sup>&</sup>lt;sup>173</sup> "Public Favorable to Creationism." *Gallup*, (2001).

http://www.gallup.com/poll/2014/Public-Favorable-Creationism.aspx.

<sup>&</sup>lt;sup>174</sup> "Public Favorable to Creationism"

<sup>&</sup>lt;sup>175</sup> Ibid.

 <sup>&</sup>lt;sup>176</sup> Darren K. Carlson, "Americans Weigh In on Evolution vs. Creationism in Schools." *Gallup*, (2005).
 http://www.gallup.com/poll/16462/americans-weigh-evolution-vs-creationism-schools.aspx.
 <sup>177</sup> Carlson, "Evolution vs. Creationism in Schools."
understand it.<sup>"178</sup> This teacher was willing to push his students to learn something that they felt ran in opposition to their faith. One student suggested, "I think a big reason evolutionists believe what they believe is they don't want to have to be ruled by God."<sup>179</sup> Not all teachers are willing to take this risk. However, because there is no standardization, "even states that require teachers to cover the basics of evolution, like natural selection, rarely ask them to explain in any detail how humans, in particular, evolved from earlier life forms."<sup>180</sup> This allows teachers to skirt, or even ignore completely, these issues if it makes them or their students uncomfortable. There are some scientists who "think if teachers just take a class [in evolution] they will accept it, but many simply reject it."<sup>181</sup> Science teachers are left to their own devices to figure out how to make a lesson plan out of a cultural war.<sup>182</sup>

While we can see that there is a heated debate among some, looking at the statistics, it seems as though the majority of Americans would support teaching both creationism and Darwinism in schools. Is this possible? As before, one issue lies with the teachers themselves, who "may be at various stages of their own faith development and may, therefore, be even less inclined to lead a discussion on the topic [of evolution]."<sup>183</sup> Successfully bridging these two schools of thought requires the learner to "reconcile the

<sup>&</sup>lt;sup>178</sup> Harmon, "A Teacher on the Front Line"

<sup>179</sup> Ibid.

<sup>&</sup>lt;sup>180</sup> Harmon, "A Teacher on the Front Line"

 <sup>&</sup>lt;sup>181</sup> Jennifer Welsh. "13 Percent of Biology Teachers Back Creationism." Msnbc.com. January 28, 2011.
http://www.nbcnews.com/id/41313808/ns/technology\_and\_science-science/#.VFJ6YhazbIU.
<sup>182</sup> Harmon, "A Teacher on the Front Line"

<sup>&</sup>lt;sup>183</sup> Kress, "Reflection and Connections," 170.

biblical account of creation with evolutionary theory by rejecting literal understandings of the Bible in favor of metaphorical or allegorical readings."<sup>184</sup>

This option could prove to be very problematic, especially for the one third of Americans who believe the literalness of the Bible. Beyond these personal, philosophical, and theological issues however, there are intellectual concerns with teaching creationism. We turn again to President Emeritus Kennedy, who has said that critical thinking is absent, as is the ability to apply the scientific method when creationism is taught.<sup>185</sup> He went on further, saying that, "what the creationist alternative does to students is to intercept and deaden curiosity. If relationships or correlations can be simply allocated to the cleverness of a [supernatural] designer, there can be no incentive to do an experiment or undertake an analysis."<sup>186</sup> If there are students who do not have the chance to hone their critical thinking skills, to learn the scientific method, nor encourage their curiosity, then we will not meet the goal of producing an informed populous.

Unlike public schools, which are funded by the government and therefore have to abide by the separation of church and state, Jewish day schools are under no such regulation. Day schools have grown significantly since the 1970s. In 1978, there were about 450 schools in the United States with around 100,000 students in total. Just twenty years later, the number of schools had significantly increased to around 700, and the number of students doubled to 200,000.<sup>187</sup> These later figures also represent many more

<sup>&</sup>lt;sup>184</sup> "Creationism & Evolution in Jewish Thought," *My Jewish Learning*.

http://www.myjewishlearning.com/beliefs/Issues/Science/Creationism\_and\_Evolution.shtml?p=0. <sup>185</sup> Young, "Kennedy Lectures on Challenges."

<sup>&</sup>lt;sup>186</sup> Ibid.

<sup>&</sup>lt;sup>187</sup> Rabbi Joshua Elkin, "Day Schools: Yesterday, Today and Tomorrow," *My Jewish Learning*. http://www.myjewishlearning.com/life/Life\_Stages/Jewish\_Education/Trends/ Day\_Schools.shtml?p=0.

options for the non-orthodox. Each of these schools must address the question of how to teach both secular and religious topics.

The high school norm in America does not include religious education, a problem that is "exacerbated within a dual curriculum of Jewish and general studies in which there are few opportunities to connect the two areas."<sup>188</sup> The primary day school model has typically included the term "integration." One reason for this need is that "the single most dominant cultural characteristic of Western Jews has been the desire to participate fully in the life of the larger host society and culture."<sup>189</sup> In the 19<sup>th</sup> century, reformation of the Jewish educational system was undertaken such that "integration and advancement into the larger society"<sup>190</sup> would be possible. This desire to be a part of, and accepted by, the greater community as equals would continue well into the 20<sup>th</sup> century. However, like many ethnic groups, the idea of the melting pot became lukewarm in the 1970s.<sup>191</sup>

Modern Jewish life is categorized by a mental transition "from fate to choice."<sup>192</sup> While an increasing number of Jews have chosen to reject affiliation with Jewish organizations, this stands in stark opposition to "intense pockets of Jewish commitment and knowledge."<sup>193</sup> Jewish day schools are certainly benefitting from those in the latter camp, who crave a deeper connection and understanding of Judaism. However, "in

<sup>&</sup>lt;sup>188</sup> Rebecca Shargel. "Genesis Encounters Darwin: A Case Study of Educators' Understandings of Curricular Integration in a Jewish High School." *Journal of Jewish Education*, 78 no. 1 (2012). 34. DOI: 10.1080/15244113.2011.648898

 <sup>&</sup>lt;sup>189</sup> David Ellenson, "An Ideology for the Liberal Jewish Day School: A Philosophical-Sociological Investigation." *Journal of Jewish Education* 74 no.3 (2008). 246. DOI: 10.1080/15244110802418328
<sup>190</sup> Ellenson, "An Ideology for the Liberal," 247.

<sup>&</sup>lt;sup>191</sup> Ibid., 251.

<sup>&</sup>lt;sup>192</sup> Ibid., 253.

<sup>&</sup>lt;sup>193</sup> Ibid., 254.

pluralistic schools, teachers cannot assume that any element of Jewish participation is common or shared."<sup>194</sup>

Unfortunately, with such enthusiasm for day schools, also comes some problems. First, the shortage of "qualified personnel on the administrative and teacher level is profound."<sup>195</sup> Were that issue able to be addressed, there is still a need for seasoned lay leaders. No longer are these schools composed of a few kids trying to learn a bit Torah along with their usual secular studies; the curricula are increasing complex.<sup>196</sup> As the number of students has doubled, physical space has not necessarily increased. The infrastructure in many day schools is lacking.<sup>197</sup> Finally, as might be expected, most of the non-orthodox day-schools are in major metropolitan areas, which means that there are many Jewish communities not currently being served.<sup>198</sup>

Rabbi Joshua Elkin has proposed three avenues in which to navigate in order to address the rapid growth:

- 1) Embark on an aggressive campaign to recruit and retain talented lay people and professionals for the day school.
- There is an available pool of talented educators who are Jewish but who have not worked previously in Jewish education.
- There is a need to communicate the story of Jewish day school education and the highly positive impact it is having on so many.<sup>199</sup>

<sup>&</sup>lt;sup>194</sup> Kress, "Reflection and Connections," 171.

<sup>&</sup>lt;sup>195</sup> Elkin, "Day Schools: Yesterday, Today and Tomorrow"

<sup>196</sup> Ibid.

<sup>&</sup>lt;sup>197</sup> Ibid.

<sup>&</sup>lt;sup>198</sup> "Jewish Educational Trends," My Jewish Learning. (2013).

http://www.myjewishlearning.com/life/Life\_Stages/Jewish\_Education/Trends.shtml?p=0.

<sup>&</sup>lt;sup>199</sup> Elkin, "Day Schools: Yesterday, Today and Tomorrow"

There is much work to be done, even though much progress has already been made. Leaders are reviewing their own curricula and asking how they can better educate the populations they serve. Experiential education, including service-learning, is a new trend. Many of these innovative schools are implementing the creative arts into their teaching and taking learning out of the classroom during overnight Shabbatot.<sup>200</sup> "Parents who send their children to supplementary (afternoon and Sunday) schools for their primary Jewish education are often quite surprised to discover that these institutions are very much changed since their own childhood days."<sup>201</sup> These parents might even be included in their child's education through family programming.<sup>202</sup>

Most day schools consider integration a primary goal. What does integration mean? In 1978, Solomon broke the term into three components: integration of the secular with the religious, of Judaism with Americanism, and of particular topics with one another.<sup>203</sup> A decade later, Jacobs took a universal approach when he said that integration was an "approach that consciously applies methodology and language from more than one discipline to examine a central theme [or] issue..."<sup>204</sup> After another decade, Zeldin further broadened this definition: "bringing Judaism and the culture of modernity into relationship with one another in the curriculum of the Jewish day school"<sup>205</sup>

These are rather conceptual, broad characterizations which do not quite explain the who or the how of integration. One study found that administrators cited

<sup>&</sup>lt;sup>200</sup> "Jewish Educational Trends"

<sup>&</sup>lt;sup>201</sup> Ibid.

<sup>&</sup>lt;sup>202</sup> Ibid.

 <sup>&</sup>lt;sup>203</sup> Mitchel Malkus. "The Curricular Symphony: How One Jewish Day School Integrate Its Curriculum." *Journal of Jewish Education*, 68 no. 1 (2002). 48. DOI: 10.1080/0021624020680107
<sup>204</sup> Malkus. "The Curricular Symphony," 47.

<sup>&</sup>lt;sup>205</sup> Kress, "Reflection and Connections," 165.

strengthening Jewish identity as the primary purpose for an integrative model. Teachers, on the other hand, were concerned with the practical aspects of linking subjects, see next chapter for examples.<sup>206</sup>

Zeldin described four different approaches to a dual curriculum:

- 1) Parallel: students study related topics in different subject areas
- 2) Contextual: students study in one area placed in the context of another subject area
- Integrated: teachers make explicit connections between Judaism and other subjects
- Integrating: teachers aim to help students discover for themselves the relationship between Judaism and the curriculum of modernity<sup>207</sup>

Whichever model is chosen, the primary goal is to find a connection between Judaism and modernity. "When a school takes a holistic view of its core ideas ... the unity of the various disciplines becomes hard-wired within its culture."<sup>208</sup> Knowing that "a curriculum that splits its Judaic and general aspects is unlikely to promote in students the type of synthesis of Judaism and secular culture, or of tradition and modernity, needed to function as a contemporary Jew"<sup>209</sup> is only the first step.

These ideas do not address the implementation of or potential challenges associated with an integrated curriculum. Lorch found that spontaneity produced a

<sup>&</sup>lt;sup>206</sup> Shargel. "Genesis Encounters Darwin,"34.

<sup>&</sup>lt;sup>207</sup> Michael Zeldin. "Integration and Interaction in the Jewish Day School." *Wikispaces.com* http://jewishdayschoolintegration.wikispaces.com/file/view/ Integration and Interaction in JDS-Zeldin.pdf.

 <sup>&</sup>lt;sup>208</sup> Dr. Steven C. Lorch, "A New Paradigm of Integration." Solomon Schechter School of Manhattan. March
1, 2008. http://www.sssm.org/uploaded/lorch\_articles/A\_New\_Paradigm\_of\_Integration.pdf.
<sup>209</sup> Kress, "Reflection and Connections," 165.

deeper integration over lessons with explicit Judaic connections.<sup>210</sup> An example of an explicit connection is studying *Tu B'Shevat* while learning about trees as part of the science lesson.<sup>211</sup> "When schools provide the opportunity to draw general and Judaic studies together, this can help students develop a worldview that values Jewish and secular learning equally."<sup>212</sup> However, in many day schools, these are two separate academic departments, and teachers are divided between secular and religious subjects.<sup>213</sup> Many of these teachers will create their courses without collaborating with colleagues in different disciplines.<sup>214</sup> As discussed earlier, the rapid growth of day schools has already caused a shortage of human resources. And these resources lack another finite resource: time. There is so much demand on teachers' time that "virtually no discretionary time is left over for thinking about integration, much less doing anything about it."<sup>215</sup>

As much as this term and ideology is espoused in these schools, "interdisciplinary learning is implemented in very limited ways."<sup>216</sup> Because schools are not necessarily achieving the goal of integration, it is often left up to the student to make these connections for himself. According to Dr. Steven Lorch, "Integration is nobody's job (with the possible exception of the students'!)"<sup>217</sup>

In orthodox schools, science is often one of the subjects intentionally *not* integrated with Torah. There are some orthodox, and many ultra-orthodox, who reject

<sup>&</sup>lt;sup>210</sup> Lorch, "A New Paradigm of Integration."

<sup>&</sup>lt;sup>211</sup> Ibid.

<sup>&</sup>lt;sup>212</sup> Shargel. "Genesis Encounters Darwin," 35.

<sup>&</sup>lt;sup>213</sup> Ibid.

<sup>&</sup>lt;sup>214</sup> Ibid., 36.

<sup>&</sup>lt;sup>215</sup> Lorch, "A New Paradigm of Integration."

<sup>&</sup>lt;sup>216</sup> Shargel. "Genesis Encounters Darwin," 35.

<sup>&</sup>lt;sup>217</sup> Lorch, "A New Paradigm of Integration."

evolutionary theory and who are "unwilling to reinterpret [Torah] in order to reconcile it with a scientific theory that, in their view, may be disproved in another hundred years."<sup>218</sup> In some Haredi schools, discrepancies between a biology textbook and the Torah are clarified by a rabbi, who then uses the Talmud to settle the disputes.<sup>219</sup>

These are not, however, the prevailing thoughts among pluralistic or other more liberal day schools. In these schools, there is a general sense that the narrative of modernity, including the theory of evolution and the narrative of creation, are able to coexist.<sup>220</sup> There is a desire to fit the biblical account into modern science<sup>221</sup>, as opposed to making science fit the Torah. There are those who go as far as rejecting the biblical account of creation altogether because it conflicts with the current evolutionary theory.<sup>222</sup>

It seems as though, this debate might be more heated between adults than students. As Katerina Sherman, who is the chair of the science department at the Maimonides School, said, there are "very few students [who] have issues combining their religious views and their scientific knowledge."<sup>223</sup> One potential reason for this is the way the Torah is viewed, as Nick Miller suggests: "The intent of the Torah is not to be a science book but to reveal the mind of God to us,"<sup>224</sup> leaving space for the teaching of science without infringing too much on the sacred text. This statement was supported by other teachers, such as one who teaches at a yeshiva for girls: "Perelis's students bring

<sup>&</sup>lt;sup>218</sup> "Creationism & Evolution in Jewish Thought,"

<sup>&</sup>lt;sup>219</sup> Kippley-Ogman, "Teaching Evolution in Jewish Schools"

<sup>&</sup>lt;sup>220</sup> Ibid.

<sup>&</sup>lt;sup>221</sup> "Creationism & Evolution in Jewish Thought,"

<sup>&</sup>lt;sup>222</sup> "Creationism & Evolution in Jewish Thought,"

<sup>&</sup>lt;sup>223</sup> Kippley-Ogman, "Teaching Evolution in Jewish Schools"

<sup>224</sup> Ibid.

religious questions to their conversation about human evolutionary biology; he is able to address their concerns with a blending of religious and scientific language."<sup>225</sup>

Students in Jewish day schools are not necessarily different from those in public schools in terms of trying to understand their religion in relationship to modernity. However, because they take classes about both science and Torah, they are more equipped to ask these questions in school. They also (ideally) have role models who can demonstrate the unity between the two subjects. Unlike in public schools, religious questions are welcomed, and teachers are not legally required to address multiple religious perspectives.

As has been shown, there exists a multitude of challenges when looking at science education. While some of them might be mitigated in the day school setting, such as the ability to speak about religion, others arise, such as less time for instruction. Whether or not the school is secular or religious, one core challenge is present: resources for the teacher. From a lack of confidence to a lack of university courses to a lack of mentoring and time in the classroom, teachers encounter trials at every step along the way.

One challenge which I want to explore from actual, as opposed to theoretical, classrooms, is that of integration, specifically as it pertains to science and Judaism. In the next chapter, I will present a survey of specific schools and teachers who are dealing with these questions.

<sup>&</sup>lt;sup>225</sup> Ibid.

### **Chapter 3: Survey for Reform Jewish Day Schools**

The previous chapters have been focused on the theoretical. First was a historical overview of the relationship between Judaism and science. Then we moved on to more contemporary issues of how these two topics are addressed in schools, with teachers and the problems therein. This chapter will take these ideas from the theoretical realm into the real world. This was accomplished by a survey sent to four Reform day schools. The intent is not to prove the validity of the difficulties explored in the previous chapter, but rather to give an impression of what is occurring in actual schools.

The initial goal of the survey was to have a few Heads of School provide feedback to selected questions. A related and additional goal was to reach people from various streams of Judaism and this piece was not successful. The people with whom I spoke initially said that they would also send this survey out to their teachers with my request. I was appreciative, though not anticipating many returns. In that vein, the questions I posed intended to get an overall sense of both Judaism and science in these day schools. I wanted to know how each of these terms is defined, how many hours are spent on instruction, what challenges might stand in the way, and the amount of integration of these two topics into other subjects.

In the end, four different liberal day-schools are represented in this survey: Jacobson Sinai Academy in North Miami Beach, FL<sup>226</sup>; The Leo Baeck Day School in

<sup>&</sup>lt;sup>226</sup> Jacobson Sinai Academy. General information. http://www.tsnd.org/education/academy/

Toronto, Canada<sup>227</sup>; The Rashi School in Boston, MA<sup>228</sup>; and Temple Beth Am Day School in Miami, FL<sup>229</sup>. For brevity in the following pages, these will be referred to as: Jacobson, Leo Baeck, Rashi, and Beth Am respectively.

Jacobson and Beth Am each had three people respond; Leo Baeck and Rashi each had four, with fourteen answers possible in each question; respondents were given the opportunity to skip a question if they did not feel they could give knowledgeable answer. The roles they hold at their respective schools vary anywhere from classroom teacher to head of school and many positions in between. With this diverse pool, a good range of answers were generated. Clearly, this data should not be used to extrapolate what happens in every Jewish Reform day-school, but it is a start in trying to understand how to move forward. Presented here are the questions in the survey and an analysis of the responses.

#### What grades are included in your school? Or that you specifically teach?

[many people teach multiple grades, or they are answering for the whole school]

As can be seen by the chart below (3.1), there is a near uniform distribution of the grades represented in this survey. Nine of the fourteen respondents are teachers; the other five having varying roles. Unfortunately, I did not ask this as a two-part question and therefore the answers are a little confusing. I had hoped that teachers would answer

<sup>&</sup>lt;sup>227</sup> The Leo Beck Day School. General information. https://leobaeck.ca/

<sup>&</sup>lt;sup>228</sup> The Rashi School. General information. http://www.rashi.org/

<sup>&</sup>lt;sup>229</sup> Temple Beth Am Day School. General information.

http://www.tbam.org/schools/temple-beth- am-day-school/

which grades they specifically taught, and anyone in an administrator role would answer for the whole school (or their portion of the school). Removing the administrators from the results, a new chart is constructed; see below, chart 3.2.



Chart 3.1 Grade distribution for all respondents.

Chart 3.2 Grade distribution for teachers only.



These chart show the wide range of grades which are represented in this survey. All of the teachers after fifth grade teach all grades in the middle (or upper) school. Given the number of students in the classes (see chart 3.3), this likely indicates a separation by subject, rather than by grade, at these levels.

#### How many students in the school total? Or in your classroom?

Similar to the above question, this one should have been worded differently or made into a two-part question. Unfortunately, I realized that only after analyzing the responses. A few of the teachers answered specifically about their individual classrooms, and a few did not. For those that did answer precisely, the numbers were fairly low, with the average at 19 students per class. See chart 3.3 below for actual values. Three of the four schools also gave totals for the schools, see chart 3.4 below.

For Leo Baeck, a couple different answers were given, which vary significantly. One respondent said 480 total students, while another said 890 total students. There are a few possible reasons for this discrepancy; there might be two campuses, two schools, or perhaps the larger number represents the classes (with students in multiple classes). The latter is used because the position held by that respondent has a higher administrative role than the others. Also notable is that three of the schools offer classes beyond fifth grade, while Beth Am is the only one which does not.

Beth Am is in Florida, where the average number of students per elementary school is nearly 700.<sup>230</sup> A school only 60% of that size can be appealing to parents

<sup>&</sup>lt;sup>230</sup> "Overview of Public Elementary and Secondary Schools and Districts: School Year 1999-2000". *National Center for Education Statistics*. nces.ed.gov/pubs2001/overview/table05.asp

looking for alternatives to public schools. When combining middle and elementary schools in Massachusetts, Rashi has about one third of students enrolled than in the public sector.<sup>231</sup>

	Students per class
K	18
1	17
2	18
3	20
4	17
5	26
6	17
7	20
8	20

Chart 3.3 Number of students per class

Chart 3.4 Number of students in the school

Jacobson	Not answered
Leo Baeck	890
Rashi	318
Beth Am	410

<sup>&</sup>lt;sup>231</sup> Ibid.

#### Is it [your school] accredited or certified by the state (and/or local) government?

Of the four schools represented, three indicated that they are accredited.

Jacobson Sinai is accredited by FCIS (Florida Council of Independent Schools). More than 150 schools are part of this system. Additionally, FCIS is part of a larger council, NAIS (National Association of Independent Schools), which includes hundreds of schools nationwide. According to their website, an independent school is one which is governed by a board of trustees, has excellent academics, and has autonomy in many areas, such as curriculum, religious affiliation, and educational philosophy.<sup>232</sup> Also part of NAIS is AISNE (Association of Independent Schools in New England), from which Rashi receives its accreditation. Beth Am responded that they are accredited but did not provide further information. Leo Baeck is not accredited, though it is in Canada, and thus has different regulations regarding accreditation than the United States.

Interestingly, each of the teachers at Rashi knew they were accredited and with which system. None of the teachers at Leo Baeck were sure (one said "no clue", when asked this question). At Jacobson it was mixed, with all respondents knowing there was accreditation, and one knowing which one. It appears that, in some schools, some of the teachers have at least partial knowledge of administrative operations. Having accreditation is major selling point for schools. A teacher is always at least partially involved in the accreditation process. Being included in this level could go a long way

<sup>&</sup>lt;sup>232</sup> "Why Choose an Independent School." Florida Council of Independent Schools. http://www.fcis.org/uploaded/Accreditation/New\_Docs\_2/Why\_Choose\_an\_Independent\_ School.pdf

towards fostering open dialogue and even help lead to more true integration (see previous and following chapters for discussion of this topic).

# In a few sentences, can you state how Jewish education is defined in your school/classroom?

For this question, I broke down the answers by school, because it is interesting to see how staff within the same institution have varied ideas when it comes to a core subject. This can be a starting point if schools are interested in how to define, refine, and engage in integration.

At Jacobson, the respondents were vague about the definition of "Jewish education." For example, one teacher said, "We are true to our mission: providing academic excellence while nurturing souls." This order puts the emphasis on academics in the secular sense, and it relegates the religious material to non-academic work, putting Judaism a distant second; it does not even refer to Judaism specifically. Other teachers at this school referenced including Israel in the curriculum, as well as "Jewish heritage tradition and identity." It is unclear if these are discrete lessons or if they are integrated with other subjects.

Similarly, at Leo Baeck, respondents were imprecise regarding the meaning of Jewish education. The Head of School even admitted, "I don't think we have a definition," which suggests how fluid the subject is. For those that did go into more detail, a strong focus was the holidays and Shabbat. Hebrew was identified as a

[52]

component of the curriculum for all grades. One thing separating this school from the others is the employment of Israeli emissaries each year. The teachers showed some difference in perspective. One said, "Jewish education is an integral part in almost every activity," while another said, "Judaic ties are incorporated into other [other than Hebrew] classes as relevant." Finally, one respondent referred to "Reform Judaism" specifically

The teachers at Rashi gave more specific examples, though they tended to be shorter answers. One pointed to the integration of *shomrei adamah* in science class as well as the composing of students' own *midrashim* in writing class. Specific observances were enumerated, such as frequency of *t'filah*. None of the respondents mentioned a comprehensive integration. In addition to the twice-weekly Jewish studies class, one teacher said, "We also incorporate Jewish studies into other subjects where applicable." This to me sounds like the contextual model Zeldin suggested as described in chapter two.

At Beth Am, the answers given to this question were far more vague than in other schools, perhaps due to the roles of those who responded. The only concrete examples were a monthly mitzvah project as well as a monthly *middah* on which to focus. Statements such as "we integrate general and Judaic studies to create opportunities for greater breadth and depth of perspective" give an overview of the intent, though not the actuality. This school also purports to "include Jewish ideas and values into all subject matters."

Below is a chart highlighting the various terms used by the respondents for this question. Shabbat and holidays is the most employed Judaics topic. Jewish values came

[53]

in a close second, with the remainder of the topics significantly less frequently mentioned.



Chart 3.5 Areas which are considered Jewish Education

### How many hours per week are spent exclusively on Jewish education?



Chart 3.6 Hours per week spent exclusively on Jewish Education

The above chart 3.6, shows that the number of hours spent teaching Judaics exclusively varies tremendously. There were vast disparities reported at Leo Baeck, where the Head of School listed ten hours a week and the K-5 principal reported about five hours per week. The teachers at this school could not agree either: one said about four hours while the other said eight. The respondents from Jacobson were most in alignment, all of whom reported six or seven hours. This similarity is true for the Jewish life coordinator and Judaic studies director at Beth Am as well, both of who said about six hours. The divergent opinion comes from the specialist who listed only three hours a week.

There are a few potential reasons for the differences in the reporting. One is the role of the respondent. The respondents in administrative roles may be taking an average, may be reporting the ideal, or may have a broader definition of "Jewish education." From the previous question, we learned that Shabbat and holidays was the most common subject taught when speaking about Jewish education. It is unclear whether or not time spent in *t'filah* is counted towards these hours. Based on this data, the average time spent exclusively on Jewish education is 75 minutes per day. This will be compared to science education later in this chapter.

## Is there an intentional separation or an integration of Judaism into other subjects? Please explain.

This question arose from looking back at the challenges of integration in the previous chapter. A wide variety of answers were given. At Jacobson, answers spanned

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the spectrum, from, "We integrate Judaism into every subject, as much as possible," to "there is no set plan for integration." It seems as though the first answer is the ideal, and the second is the lack of implementation of the goal. It also sounds as though teachers are left to their own devices to figure out how to make the connections. One teacher does just that, as per this example: "in our study of Earth Science about water, we make connections to irrigation/hydroponics/water conservation in Israel, and how this reflects our Jewish values."

Leo Baeck seems a little more realistic, in that most everyone agreed, "classes weave in their own Jewish knowledge and connections based on level of knowledge and comfort." This statement is similar to one from Rashi, where a respondent described, "intentional integration during certain units," which indicates that it is not in every class at all times. At Beth Am, there was an explicit mention of teaching the teachers: "our teachers are trained to infuse the day with Jewish content and value. Therefore, when someone is gossiping, the teacher discusses *lashon hara*." Each of these schools handles the theory and implementation of integration differently, including how this integration is communicated and practiced in the classrooms.

# In addition to the core curriculum, are there other religious requirements (such as daily *t'filah*, *tzitzit/kippot*, dress code, *birkat hamazon*, etc)? Please explain.

When asked about different kinds of non-academic religious activities, there were a few common events. Weekday *t'filah*, as well as Shabbat service, as might be expected, are the most common. Blessings before and after a meal followed closely behind. Only a

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few respondents mentioned the use of *kippot*, either optional or required. Two of the schools use uniforms, and both have a different uniform for weekday than for Shabbat (which means Fridays at school). Finally, one school observes *havdallah* on Mondays. See chart 3.7 below for overall observances during school.





This question seemed as though it would be answered in the same way regardless of the person responding, and yet that was not the case. See chart 3.8 below for a breakdown based on school. The legend shows the four schools, and in parentheses is the total number of respondents in each school. For example, of the four people who responded for Leo Baeck, only one reported having a service for Shabbat. Uniforms are used by Jacobson and Beth Am, and yet there was not 100% reporting of this fact.



Chart 3.8 Religious observances based on the school

### What are some challenges teachers might have when teaching Judaism to children?



Chart 3.9 Challenges teaching Judaism to children

\*some respondents gave more than one answer, so the total # of answers adds to more than 14

As the chart 3.9 above shows, the biggest challenge of teaching Judaism is the teachers themselves. The number one challenge indicated is lack of knowledge on the part of the teacher. Not being comfortable with the subject, having different practices at home than at school (which includes not being Jewish themselves) are also about the teacher. Having other staff available, in this case clergy, also allows for the teacher to be somewhat removed from the subject. Only 15% of respondents said there are no challenges that they could see.

What is interesting in these responses is that not a single one focused on the second part of the question, "to children." I had anticipated a different set of answers. Such as: children are often concrete and literal thinkers, and religion can be more abstract. Or Judaism, especially the Reform movement, has very few requirements (and some would argue, none at all), and explaining that fluidity can be challenging. See chart 3.13 for a similar question related to science education.

# In a few sentences, can you state how science education is defined in your school/classroom?

Unlike when a very similar question was asked about religious education, there was no school consensus on how to define science education. The clearest responses came from those who taught older grades, where science is often intentionally separated from other academic subjects. For example, at Jacobson, 6<sup>th</sup> grade has a focus of Life science, 7<sup>th</sup> is Earth science, and 8<sup>th</sup> is Physical science. Another teacher at Jacobson said that science is integrated into other subject areas, such as reading and art. A teacher at Beth Am also made the connection between science and painting. I am intrigued by

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joining the arts and science. One the one hand, it makes sense to study the properties of ink for example, and then paint with the ink. However, I wonder how the scientific method is employed in this combination. At Rashi, one teacher pointed out significant components of science learning: "questioning is an important part of the class" and students are also "taught skills related to experimentation and data collection." This particular respondent is a science teacher. One teacher uses a yearly theme to teach various topics; for example, *shomrei adamah* focuses on water, earth worms, soil, habitats, etc. A third grade teacher listed the types of topics discussed in that classroom, such as the solar system, light and sound, and the animal kingdom.

Looking back to the parallel question, the answers there were vague, and yet the examples demonstrated the foci. Here, the responses are even more vague with examples that were still broad.

### How many hours per week are spent exclusively on science education?

See below (chart 3.10) for number of hours spent per week in each classroom exclusively on science education. According to one teacher, science is taught daily at the Leo Baeck school; another reported twice weekly at the Rashi school. The average is 3.6 hours; though excluding the outlier who reported 10 hours a week, the average is 3 hours, or about 35 minutes per day. This is less than half the time than was reported for exclusive religious education. Though, unlike the religious content, which was as little as three hours per week, science instruction was reported as less than an hour a week in some classrooms.

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Chart 3.10 Weekly hours exclusive to science education

## Is there an intentional separation or an integration of science into other subjects? Please explain.

Chart 3.11 Is science integrated into other subjects.



This question (see chart 3.11 above) was met with equal ambiguity as its religious counterpart. Unlike that question, however, there did not seem to be an apologetic attitude about the lack of integration. 43% of respondents said there was no integration of science into other areas. One reason given is that the teachers are not comfortable in the sciences. One teacher gave a detailed example: "During science fair, the Language Arts [teachers] are asked to look over the grammar and help with the writing component. Most of the teachers complain and only a few actually help with it."

Of those that said yes, most also gave a caveat, as in "when there is a genuine link" or "an obvious overlap." Some examples where this might occur are when doing "climate mapping and our mapping unit in social studies." Or "when we are learning about the *middah* of *baal tashkhit*, the children are given science worksheets to measure their carbon footprints." One teacher pointed out that integration is "very easily done in the moon/solar system unit (integration with the Jewish calendar)." It seems as though science integration most often occurs with math, the above examples notwithstanding. This could be in part, as one respondent suggests, because the math teacher sometimes also teaches science.

The data suggests that the connections between science and other subjects are difficult because the teachers are not comfortable with the subject, there are not obvious overlapping points, and there is someone else to teach it. Fnally, there does not appear to be a desire to see integration of the sciences into other subjects, unlike the general need to do so with Judaism.

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#### How does your school's science curriculum compare to that of a secular school?



Chart 3.12 Science curriculum as compared to secular school.

See above (chart 3.12) for how each respondent feels the science curriculum at their schools compares to that in a secular school. Those that think it is better — 35% — say as much because, "I think it is similar in that it covers state standards, but superior in that we have more hands on experiences and that we do mitzvoth with our science as well!" This was the typical sentiment: the science education in a day school is better because there is Judaism in it. However, 15% believe that there are more challenges because of the religious component, and a consequence of this is less time available to teach the sciences. One respondent said that the science curriculum is the same as in a secular school, but "with Hebrew and Judaics added in, approximately 1/3 of the time [to teach science is available]." This is a significant decrease in the amount of time as compared to a secular school.

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What are some challenges teachers might have when teaching science to children in a Jewish religious environment?



Chart 3.13 Challenges in teaching science

The majority of respondents said they encounter no issues in teaching science to children in a Jewish school. Some pointed to the fact that they teach at a liberal school, implying that orthodox schools would have problems in this area. One respondent offered an explanation: "science and religion answer different questions. Science tells us about how the world came to be, how it work - the "how" question. Religion tells us why we are here, what God wants from us - the "why" questions." Another respondents who reported no issues, gave a more pointed comment: "I have made it clear that if we have difficulty teaching religion and science because they come into conflict, we are teaching one of them wrong--and my bet is religion."

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Time also seems to be a factor here. There is so much to teach that something ultimately is sacrificed. There is minimal time for much science at all, let alone integration with other subjects: "It takes planning and developing and currently I don't have time to put labs together never mind figuring out how to integrate."

As might be expected, creationism versus evolution was also a potential issue. Someone called it a "very touchy subject," but did not go into further detail. Another respondent gave an example of how this debate is handled: "There is usually a question of how the Torah can be true when creation took longer than 6 days. This is something we discuss and explain to the appropriately aged students the difference between something happening, and something being true."

Here too, issues related to development of the children were not given as answers or listed as challenges. Unlike in the parallel question, the respondents did not list the teacher as an issue—though that was encountered in previous questions.

# Any additional information on Jewish education at your school you would like to share?

Of the three people who responded to this question, all said they could use more time for Judaic studies. One person at Jacobson said the school is "piloting a program through the iCenter in Israel called iNfuse, where we are taking a yearlong survey of the current state of our Israel/Judaic integration, creating a vision of where we want to be, and creating a plan to go from vision to implementation." A new position was created at

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Beth Am to specifically look at the Hebrew and Judaic Studies curricula and revamp it as necessary.

# Any additional information on science education at your school/classroom you would like to share?

There was one person who responded to this question; here is the answer in full:

I like that administration gives me freedom to teach science without religion affecting it. Let me explain. At a school I thinking about working, I would have to have the Judaics director ok my labs. In life science, we dissect bait squid. I was told we could not do that lab because they did not want the students touching a squid. When I questioned this, they said it would look bad that squid is brought into a Jewish day school with a conservative temple attached. I protested. The students were not eating it. They were learning how the body is organized. It was banned. I never took the job at the school.

This answer highlights a few issues faced by religious day schools. First, that there might be competing forces between religion and science. There is a question of how far Judaism's prohibitions extend. The teacher is focused on science education, and the director of Jewish studies is concerned with religious matters. This leads to another problem— autonomy in the classroom. Where is the balance between the different (and sometimes competing) subjects, and who has final say over the curriculum? In a school that aligns itself with a particular movement, this might be less of an issue than in a

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community day school where there will likely be students from diverse religious backgrounds.

Now that the information has been gathered, the question remains of practical application. This survey can provide schools a lens through which to evaluate their curricula and to define both science and religious education for their students, which could prompt unexpected discoveries. By asking questions which require a person to define what religious education looks like, makes that person look at the overall day of a student and find what that means. The same goes for science education. For example, while Beth Am said they use STEM (science, technology, engineering, math) as a basis for science education, they also reported a lower-than-average amount of time per week in the sciences.

All of these schools highlight an integrated curriculum in their mission statements, but when pushed to identity if, and where, such integration takes place, few were able to do so. While creating an integrated lesson takes some serious time, it also allows for less time spent on each subject separately. I believe that the first step is to give knowledge, confidence, and resources to teachers such that they are more able to integrate material across multiple subjects. In the next chapter, I have created sample lesson plans as an example of how this integration could take place.

### **Chapter 4: Integration and Lesson Plans**

The various questions associated with the connectivity between Judaism and science have been the subject throughout this paper. In chapter one, a brief overview, a narrative really, of the relationship between these two topics throughout time was explored. Using various definitions, for both science and religion, we came to see that a conflict is still present. This battle is more than just the debate of Darwinism versus creationism. It is also a debate of what and how we teach our children.

As we saw in chapter two, so much authority to the answer of this question truly resides with the teachers. Their knowledge bases, their personal biases, their time constraints, and many other factors are present when they are constructing lesson plans. An added layer is found in Jewish day schools: a place where science and Judaism can inhabit the same space. As was discussed, the majority of day schools espouse an integrated curriculum. We'll address the topic of integration more in this chapter.

A survey was conducted with four Reform Jewish day schools, which attempted to understand their foci in the school. While all the schools made mention of the idealized term "integration," few were able to define it and show examples of how it was practiced.

The topic of integration between Jewish and general studies cannot be emphasized enough. It is a serious and complex matter which faces the overwhelming majority of Jewish day schools. Most schools do not want compartmentalization of these

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two fields, as that then can possible create negative competition, often with the Jewish side losing out.<sup>233</sup>

A publication by RAVSAK schools, those which are defined as community day schools (not Jewish stream-affiliated ones), highlights a few of the issues of integration. As with so many fields of study, defining the goal is challenging and a source of debate. As one article points out, "Some [day schools] emphasize cultural knowledge: Hebrew fluency, *tefillah* mastery, literacy of core texts in the Jewish library. Others view *middot* as central: ethics, commitment, curiosity, caring; while yet others choose social action as the goal."<sup>234</sup> Once a school has decided what the goal is to be for their students, the school still needs to figure out *how* that goal is to be met.

Rather than isolated islands of knowledge which has been the traditional model of education, sometimes the *how* is "cross-curricular" design. As was discussed previously, the time it takes to create lessons which span multiple disciplines can be extensive, which is one reason it is not done so frequently. Another obstacle in an integrated school, is the school itself trying to do too much. "It is important to keep in mind that curriculum integration is not a goal unto itself, but a means toward the creation of integrated thinkers."<sup>235</sup>

Instead of trying to bring these disciplines together all the time, one school, Shoshana S. Cardin School in Baltimore, has successfully implemented another option:

<sup>&</sup>lt;sup>233</sup> Stan Peerless, "Digest of Literature on Curriculum Integration," *Lookstein Center* http://www.lookstein.org/integration/curriculum\_intro.htm

 <sup>&</sup>lt;sup>234</sup> Rebecca Shargel, "Bridging Dualism: Cross-Curricular Learning in the Jewish High School," *Hayidion The RAVSAK Journal*. http://ravsak.org/bridging-dualism-cross-curricular-learning-jewish-high-school
<sup>235</sup> Peerless, "Digest of Literature"

Theme week. During this week, "students focus on *one topic* that that raises important questions whose answers occur in more than one subject area."<sup>236</sup> This learning and teaching environment allows for cross-curricular study to a heightened degree. Teachers use the lens of their subject to answer questions pertaining to the particular theme. Students in these cases are given the opportunity to learn from a variety of teachers, more than those with whom they are typically in class. Unlike traditionally classes which are separated by grade level, theme week blurs those boundaries and has all students able to study together. Additionally, this type of learning allows students and faculty to connect in ways in which they are not usually able. Teachers are able to learn from each other as well. This nature of holistic learning, models the value of seeing issues from multiple perspectives. I believe that learning through various means can create people who are more tolerant and understanding of others and who are willing to look at controversies with a more open mind.

One of the suggestions for beginning the conversation of a theme week involves choosing a controversy and unpacking it from each discipline. While the aforementioned article, and school, focuses on high school students, the general principle of theme week can be applied to any age range. The big questions which people struggle with can be addressed using this model. Such inquiries might include the creationism versus Darwinism debate which has been the subject of discussion in this paper. Whereas during the traditional week, the connection between Judaism and humanities might be clearer than it is with the sciences, a topic such as evolution puts that connection to the forefront of conversation. The importance of organically illustrating the relationship of science

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<sup>&</sup>lt;sup>236</sup> Shargel, "Bridging Dualism"

and Judaism cannot be overstated. "Allowing a forum for science to connect to everyday Jewish practice can make Judaism more meaningful to students who might otherwise see it as archaic or irrelevant to contemporary life."<sup>237</sup> This type of experiential learning can have a long lasting impact on those involved.

Using this idea of experiential learning, which is also a foundation of science understanding, with a goal of interdisciplinary lessons, the following lessons are presented. Each lesson is intended for use for pre-kindergarten to second grade (ages 4-7 years). At these ages, children are very hands-on and are exploring the world around them constantly. Often, they are concrete and literal thinkers, and this has been taken into account. Similarly, considering the age, each lesson is approximately thirty minutes in total length. As has been discussed previously, the teacher is a crucial component to learning. Here, the assumption is that the instructor has minimal knowledge in the sciences and has a working knowledge of Judaism. One of the issues which was pointed out in the previous chapters is a discomfort in the sciences by the teachers, which is one reason there is such emphasis on that instruction in these lessons.

Each lesson is arranged the same way, for ease of use: it opens with a Jewish value or a science topic, then moves onto either reading a book or having a discussion, making a transition to the science experiment, hands-on learning activity, and then a reiteration of the connection between science and Judaism. The goals of these lessons, to varying degrees, is threefold. First, doing a science experiment is the primary objective. A secondary aim is to relate the science to a Jewish value or concept or event. This

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<sup>&</sup>lt;sup>237</sup> Shargel, "Bridging Dualism"

connection at times is stronger than at others. Correlations are not necessarily one to one in the larger world. By demonstrating that a Jewish lens can be used, students will hopefully be more equipped when the associations are less clear. Finally, a third and mostly subtle goal is encouraging growth as good people.
## Alphabetical by Experiment

#### Bridges\_\_\_\_\_ 74 Buoyancy\_\_\_\_ 75 Celery/Daisy Tinting\_\_\_\_\_76 Cleaning Pennies\_\_\_\_\_ 77 Density Drawings\_\_\_\_\_78 Density Layers\_\_\_\_\_79 Density Tests\_\_\_\_\_\_80 Grape Juice Colors 81 Invisible Ink Drawings 82 Magnetism\_\_\_\_\_\_83 Milk Art\_\_\_\_\_\_84 Salt and Sound\_\_\_\_\_85 Self-inflatable Balloon\_\_\_\_\_86 Straw-hoop Plane 87

## Jewish Value

#### קהילה [Kehilah] Community\_\_\_\_\_ 74 אהבת ישראל [Ahavat Yisrael] Love of Israel <u>75</u> שומרי אדמה [Shomrei Adamah] Caretakers of the Earth \_\_\_\_\_\_ 76 דדקה [Tzedakah] Charity 77 בל-תשחית [Bal taschit] Not being careless or wasteful\_\_\_\_\_ 78 על שלושה דברים [Al sh'losha devarim] On three things\_\_\_\_\_ 79 אומץ לב [Ometz Lev] Bravery\_\_\_\_\_ 80 שבת [Shabbat] Sabbath\_\_\_\_\_\_ התפלאות [Hitpaliut] Wonder\_\_\_\_\_ 81 82 שמירת הגוף [Shmirat haguf] Caring for our bodies\_\_\_\_\_\_85 למוד [Limud] Learning <u>86</u> לשון הרע [Lashon Hara] Gossip\_\_\_\_\_ 87

**\*\*SAFETY\*\*** PLEASE NOTE: This is science! Even though we use everyday ingredients and in other cases we might be able to eat them, when we are doing experiments, we do not put anything in our mouths.

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## Page

Title: Building Bridges



**Scientific topic:** Examine force and weight distribution which is demonstrated by building variously shaped paper bridges.

### Jewish Value: קהילה [Kehilah] Community.

1) A community is made of many different people. If we make the analogy that a person is a ridge, then the more people, the stronger the community (just like the more ridges the stronger the bridge).

2) If we each carry a small bit of weight, we can get a lot more done than if one person is asked to do it all.

3) Communities allow us to see the bridge between Judaism and science.

Introductory activity: Read: Crossing the New Bridge, by Emily Arnold McCully

### Materials:

- 1) Sheet(s) of plain paper
- 2) Bridge supports (plastic buckets, books, etc.)
- 3) Paper plate or small plastic cup
- 4) Pennies

### **Directions:**

- 1) Create two bridge supports of the same height. Use books, blocks, etc. They should be 6inches apart.
- Bridge #1 will just be a piece of paper across the bridge supports. Test how many pennies (one at a time) can be placed on the paper without it collapsing. [very first bridge used by humans]
- 3) Bridge #2 can be shaped into an arch. Test how many pennies (one at a time) can be placed on the paper without it collapsing. [bridges used by the Greeks in Bronze Age]
- 4) Bridge #3 is made by folding the paper like a fan/accordion. Test how many pennies (one at a time) can be placed on the paper without it collapsing.

### Science Explanation:

In these physical science activities you can see that bridges which spread out the force or weight are stronger than bridges that do not. The first bridge's weight was directed at the edge of the two bridge supports. The arch bridge weight is supported by the abutments at either side of the arch. The "fan" bridge's weight is shared with many support structures making it very strong. The larger and fewer numbers of folds of the fan the more weight it will support. Title: Buoyancy and Israel's Dead Sea



#### Sample Picture:

Scientific topic: Buoyancy and how salination affects it.

Jewish Value: אהבת ישראל [Ahavat Yisrael] Love of Israel.

Connection to Israel and the Dead Sea. Can talk about the love of Israel, which includes the Dead Sea, the saltiest place on earth. Everything floats in the Dead Sea. One way to remember the word and its connection to the Dead Sea is: "Boy and Sea" = buoyancy. If desired, a further discussion can be had about water conservation, since we cannot drink salty water.

**Introductory activity:** Read Israel chapter in: *Hanukkah: Eight Lights Around the World* by Susan Sussman, illustrations by Judith Friedman.

### **Materials:**

- 1) 2 Hard-boiled eggs
- 2) 2 cups half-filled with tap water
- 3) Salt
- 4) Dry-erase marker

### **Directions:**

- 1) Get a clear cup (preferably see-through glass)
- 2) Add water about 1/2 full
- 3) Draw line to mark level
- 4) Put egg in it
- 5) Draw new line to mark level
- 6) In second cup, stir in up to 10t of salt (one teaspoon at a time)
- 7) Mark water line
- 8) Add new egg
- 9) Mark new water line
- 10) Note difference between salty water and tap water regarding buoyancy

**Science Explanation:** Gravity pushes an object down; buoyancy pushes an object up. When putting objects in liquids, both the density of the object and the density of the liquid matter. Regular water has no salt and has a density of 1.00; ocean water is about 1.03; but the Dead Sea is 10 times saltier than ocean water (!) and has a density of 1.24. This is why some things can float in the ocean, and not in lakes, and why everything floats in the Dead Sea.



### Sample Picture:

**Scientific topic:** Capillary action in plants and learning how plants get nutrients. This experiment takes standing knowledge and applies it differently.

Jewish Value: שומרי אדמה [Shomrei Adamah] Caretakers of the Earth.

We must care for the environment. We can see that what is in the ground, the soil and the water, affects what happens to plants. This means we must protect our environment; speak about water and ground pollution.

**Introductory activity:** Ask the children how we eat (including absurd questions) and how we think plants eat.

### Materials:

- 1) Clear glass or vase
- 2) Water
- 3) Food coloring, various colors
- 4) Celery [makes a tasty snack] or Daisy/Carnation [optional, makes a nice gift]

### **Directions:**

- 1) Have each kid make/choose their preferred color
- 2) Have them cut with scissors at an angle the bottom of the stem
- 3) Put it in the colored water
- 4) Now we wait: 24-72hrs for the colors to appear. Check back a couple times a day.

### **Science Explanation:**

This is a good activity to show children how plants drink water through their stalks and where the water goes. Everything in the water (in this case, including the dye), makes its way through the celery/flower. Expansion idea: Temperature variation (put some at room temp, some in the sun, and some in the fridge).

### Title: Cleaning Pennies



### Sample Picture:

Scientific topic: Acid as a cleaner of pennies

### Jewish Value: צדקה [Tzedakah] Charity.

What concepts of צדקה can this experiment demonstrate: When giving צדקה or donating items (toys, clothes, etc.), is it preferable to give a dirty, used-up thing we no longer want or rather to give a clean, shiny and beautiful item we'd like to use ourselves? צדקה is not just about giving, but giving generously with a kind heart.

[Anecdotally] In past experiments, each child chose to give 3 or more of their pennies to צדקה.

**Introductory activity:** Read: *Benny's Pennies* by Pat Brisson. Ask what will they do with their pennies now that they are cleaned?

### Materials:

- 1) 5 moderately dirty pennies
- 2) Table salt
- 3) Vinegar
- 4) Dixie cup
- 5) Tzedakah box

### **Directions:**

- 1) Have a small cup, pre-measured vinegar (2T), and pre-measured salt (½ t).
- 2) Add the salt to the cup
- 3) Add the vinegar to the cup
- 4) Add the penny to the cup
- 5) Stir; see what happens
- 6) Add 4 additional pennies one at a time
- 7) Each child will then have 5 clean pennies

**Science Explanation:** Vinegar is an acid, and the acid in the vinegar reacts with the salt to remove what chemists call copper oxide which was making your pennies dull. Expansion idea: Try other acids (ketchup, cola, lemons, etc.) and see how well they work to varying degrees too.

### Title: Density Drawings



### Sample Picture:

Scientific topic: Density: how oil floats on water

<u>Jewish Value:</u> בל-תשחית [Bal taschit] Not being careless or wasteful.

All resources are precious and we have to be careful not to waste any of them. This includes water and oil. It is our job to treat the earth, and everything in it, well.

**Introductory activity:** Read: *Roscoe and the Pelican Rescue* by Lynn Rowe Reed. Demonstrate how difficult it is to just "pick up" oil.

### Materials:

- 1) Shallow Pan (like a brownie pan)
- 2) Water
- 3) Food Coloring
- 4) Cooking Oil
- 5) White Paper
- 6) Fork
- 7) Cups

### **Directions:**

- 1) Put tablespoon of cooking oil in each cup
- 2) Add separate food coloring to each cup. Stir to mix (best with a fork)
- 3) Fill shallow pan halfway with water
- 4) Pour a little of the colored oil into the water (it should float)
- 5) Swirl the colors as desired (fork works here too)
- 6) Lay a clean/white sheet of paper on top of the pan for about 15sec
- 7) Carefully lift off paper, trying to remove excess oil; allow to dry (best if dried on newspaper)

**Science Explanation:** Water is denser than oil which means the oil floats and therefore contacts the paper. However, since water and oil do not mix, the oil sticks to paper without changing design.

### Title: Density Layers

### Sample Pictures:



Material	Density	Material	Density
Alcohol	0.79	Water	1.00
Lamp oil	0.80	Milk	1.03
Baby oil	0.83	Dish soap	1.06
Veg oil	0.92	Corn syrup	1.33
Ice cube	0.92	Honey	1.42

**Scientific topic:** Density: how different liquids can make a column when put in density order. Creates a beautiful palate when completed

Jewish Value: על שלושה דברים [Al sh'losha devarim] On three things.

Distill down our textual quote to: be a good person (תורה), love God (עבודה), and do good things (גמילות הסידים) We can look at each layer and suggest what that one might represent for us.

**Introductory activity:** Read: *The Important Book* by Margaret Wise Brown. Ask: what are the important facets in each of our lives.

### Materials:

- 1) Water
- 2) Alcohol (rubbing works well)
- 3) Vegetable oil
- 4) Clear glass cup/beaker/test tube

### **Directions:**

- 1) Bring out and label the liquids: The water (blue) as the most important one, then the alcohol (red) as the next, then the oil (original yellow) as the least.
- 2) Pour the liquids [always down the sides, not center]: The most dense goes first. In this case, water goes first, then alcohol, then the oil.
- 3) Note how they do not mix. Each just sits on top of the other. The 'most important one' is on the bottom, holding everything else up.
- 4) This is called density
- 5) See second picture if additional layers are desired (lamp oil/rubbing alcohol/veg oil/water/dish soap/karo syrup/honey)

### Science Explanation:

The denser a substance, the lower it will be in a container. See table at top for values.

### Title: Density Tests



### Sample Picture:

**Scientific topic:** Density of solids—will they float or sink in tap water? Just because something is solid, does not automatically mean it will sink. Conversely, just because something has holes, does not mean it will float.

### Jewish Value: אומץ לב [Ometz Lev] Bravery!

Try new things – be open and be curious about the world. This activity is engaging and active. Because the experiment defies expectations about how different object behave in water, this experiment can be a helpful tool for helping children overcome initial fears or assessments to try new things, meet new people, etc.

**Introductory activity:** Kids love throwing things in water! Gather many objects, guess if they will sink or float—write it down.

### **Materials:**

Potential objects to te	est:	
Paperclips—metal	Pen	Buttons
and plastic	Pipe-cleaner	Magnets
Bunch of staples	Paper—flat and	Noodles
Plastic and regular	balled up	Seeds
Fork/spoon	Foil—flat and balled	
Pencil	up	

### **Directions:**

- 1. Get plastic container and put a few inches of water inside.
- 2. Make guesses/hypotheses about objects
- 3. Drop objects in one at a time and record results
- 4. See if results give pattern

### **Science Explanation:**

Density of solids is hard to predict and really has to be experimental. We have to investigate and experiment before understanding the density of an object.

Title: Grape Juice Colors

Sample Picture:



**Scientific topic:** Exploring acid-base chemistry with color changes. Grape juice can be used as a litmus and we can use it to explain acid-base chemistry.

<u>Jewish Value:</u> שבת [Shabbat] Sabbath.

On Shabbat we celebrate candles, challah, and grape juice. Grape juice is the bridge between science and Shabbat. We can see that grape juice can be used for both science in an experiment and in Judaism as an element for celebrating Shabbat.

**Introductory activity:** Discuss Shabbat and the various ways we celebrate it. One of the blessings we say is over grape juice. Now let's look at the properties of grapes.

### Materials:

1. Grape Juice	2. Baking soda	3. Lemon juice
4. Spoons/cups	5. Vinegar	6. Dish soap

### **Directions**

Glass of Grape Juice	Add	Color	Reason for change
A	Nothing—leave pure	Purple	Control
В	Couple teaspoons of baking soda	Green	Base
С	Couple teaspoons of lemon juice	Red	acid

1. Set up three glasses as per the chart.

- 2. Leave the first cup alone (A).
- 3. To cup (B) add a couple teaspoons of baking soda –it should turn green because it becoming basic.
- 4. To cup (C) add a teaspoon or two of lemon juice—it should turn red because it is becoming acidic.
- 5. Possible to use paint brushes to now color on paper with the various colors.
- 6. Additional activities:
  - a. To cup (C), add some baking soda: color (goes back to purple).
  - b. Or, same set up, but use vinegar/dish soap in place of lemon juice/baking soda.

### Science Explanation:

A base will change the color of an indicator from blue to green. All acids will turn a blue liquid or indicator, red. Acid-base reactions, yield color chemistry

Title: Invisible Ink Drawings



### Sample Picture:

Scientific topic: Oxidation; lemon juice (or citrus) turns brown when exposed to heat

**Jewish Value:** התפלאות [Hitpaliut] Wonder.

We may not see everything on the surface. Just like we cannot see everything on the surface when we read the Torah, we may not see everything when we do science. Both of these are filled with wonder. And with good tools, we can uncover some of that wonder. Be ready to be amazed by life.

**Introductory activity:** Talk about what amazes each of us. Younger children might be more open to awe; older children can use the reminder/renewed amazement (especially in supplementary school).

### **Materials:**

- 1) Lemon Juice
- 2) Q-tips
- 3) Paper
- 4) Hair dryer

### **Directions:**

- 1) Pour some lemon juice into small cup
- 2) Use q-tips to draw picture on paper
- 3) Use hair dryer to heat up lemon juice
- 4) Watch lemon juice turn brown and have picture show up

### Science Explanation:

Lemon juice is an organic substance, meaning it contains carbon compounds. These compounds are pretty much colorless at room temperature. But heat can break down these compounds, releasing the carbon. If the carbon comes in contact with the air, a process called oxidation occurs, and the substance turns light or dark brown. (Other substances that work in a similar way include: orange juice, honey, milk, onion juice, vinegar and wine.)

### Title: Magnetism



### Sample Picture:

### Scientific topic: Magnetism

#### Jewish Value: נס [Nes] Miracle.

Magnets can hold things up and look like magic, but really it is science. The way the world works is both miraculous and scientific. Even if we understand the science behind something, it is still miraculous.

Introductory activity: Read Shivers in the Fridge by Fran Manushkin and Paul Zelinsky.

#### **Materials:**

- 1) 2L bottle, empty
- 2) Cut-up pipe cleaners (about 1" long each piece)
- 3) Strong magnet

### **Directions:**

**\*\*** The above picture uses rare-earth magnets. These can be VERY DANGEROUS, especially for little fingers. Use extra caution when using these magnets.

- 1) Add pipe cleaners to plastic bottle; seal lid.
- 2) Use strong magnet to pull up pipe cleaners
- 3) See how many can be picked up at once

### **Science Explanation:**

Pipe cleaners have metal in them and the magnet is attracted to that metal. The amount of pipe cleaners pulled up depends on the strength of the magnet. Note, not all metal is magnetic.

Expansion idea: turn the bottle on its side, try to go around corners. Competing magnets on different sides of the bottle.

### Title: Milk Art



### Sample Picture:

**Scientific topic:** Fat and protein break-down. Milk has both fat and proteins which can be broken down by dish soap.

### Jewish Value: אומנות [Omanut] Art.

Art can be created from a variety of forms. Art does not have to be only paint and a canvas. There are lots of things in nature which can create art. By understanding properties of things found in nature, we are able to see and create beauty all around us. What is important with art is that what is beautiful is in the eye of the beholder.

#### Introductory activity: Read: Vincent's Colors by Vincent van Gogh

#### Materials:

- 1) Milk (2% and whole milk work best; half/half does not work great)
- 2) Food coloring
- 3) Dish soap
- 4) Q-tips
- 5) Shallow dish

### **Directions:**

- 1) Add milk to dish
- 2) Add a few drops of color wherever is desired
- 3) Put dish soap on end of q-tip
- 4) Dip q-tip in milk
- Watch the food coloring scatter
  Optional: Take picture of plate and send to parents or put on wall in classroom.

### Science Explanation:

Milk contains protein and tiny amounts of fat in it. Both fat and proteins are very sensitive to chemical changes. The chemicals in the dish soap weaken the chemical bonds that hold the protein together in the milk. The food coloring allows us to visibly see the changes in the protein molecules. Also, the soap molecules cause the fat in the milk to mix and swirl until the fat has been distributed across the entire amount of milk.

### Title: Salt and Sound



Sample Picture:

[with salt]

Scientific topic: Decibels levels and our ears. How increasing noise can increase the damage done to our ears.

#### Jewish Value: שמירת הגוף [Shmirat haguf] Caring for our bodies.

We only have one set of ears and we have to take care of them. We can see the effects of sound on ears by watching the salt on the speakers. One way we can show respect for our bodies is by not listening to very loud sounds for extended amounts of time.

Introductory activity: Read: Too much Noise by Ann McGovern. What were all the sounds he heard? What are some sounds you hear? What happens when there is too much noise?

### Materials:

- 1) Wax paper, with corners bent to retain salt
- 2) Table salt
- 3) Stereo speakers which have reverberation (faced up)

### **Directions:**

- 1) Turn speakers facing the ceiling (so that wax paper can sit on it)
- 2) Place folded wax paper on top of the speaker and add a tablespoon of salt
- 3) Try various radio stations to see differences in frequency and the effect on salt
- 4) Variables: talk radio, country, classical, rock station, volume changes

### Science Explanation:

The vibrations caused by the sound waves causes the salt to jump. This is likened to the effects of sound jumping on our ear drums.

Expansion idea: Great for introducing dramatic play area set to "doctor room".



### Sample Picture:

**Scientific topic:** Acid-base reactions and the capturing of the released carbon dioxide.

### Jewish Value: לימוד [Limud] Learn.

Learning "for the sake of heaven" is a value espoused by Judaism. By learning about properties of materials, we can be creative and find new ways of doing activities. In this experiment, we learn a new way of inflating a balloon.

**Introductory activity:** Balloon ball pit! Then transition to science by asking when we use balloons and how difficult it can be to inflate them. How else can we fill them?

### Materials:

- 1) Soft Drink Bottle (20oz ok)
- 2) Vinegar
- 3) Baking Soda
- 4) Balloon

### **Directions:**

- 1) Fill bottle about 1/4 with vinegar [a few tablespoons will even do]
- 2) Add a few teaspoons of baking soda to deflated balloon
- 3) Attach balloon to bottle (careful not to spill it)
- 4) When ready, invert balloon to mix baking soda and vinegar
- 5) Balloon will inflate (and stay that way for a while)

### **Science Explanation:**

Carbon dioxide is one result of the reaction between baking soda and vinegar. Once the carbon dioxide fills up the bottle, it has nowhere else to go but into the balloon, filling it up as more carbon dioxide is created.

Title: Straw-hoop Plane



### Sample Picture:

Scientific topic: Aerodynamics and resistance

Jewish Value: לשון הרע [Lashon Hara] Evil tongue (aka gossip).

When we gossip, we do not know where our words will land. Just like the airplane, once it leaves our hands, we do not know where it will land. We have to be careful with what we say.

**Introductory activity:** Tell short vignette of *lashon hara* (see here for example: <u>http://www.jewfaq.org/speech.htm</u>), make connection between gossip and arrows. Try to predict where your plane will land once you throw it. Can also play game of "telephone" with older children.

### **Materials:**

- 1) Drinking straw
- 2) Index card
- 3) Scotch tape (or double-sided tape)
- 4) Scissors

### **Directions:**

- 1) Cut the index card into three strips (1x5" each).
- 2) Tape two of the pieces together to create long piece  $(1x10^{"})$  and short  $(1x5^{"})$  piece.
- 3) Make each piece into a hoop and tape to retain shape.
- 4) On one end tape the straw to the inside of the small hoop
- 5) Tape the large hoop to the other end of the straw. Fly new airplane!

### **Science Explanation:**

The two sizes of hoops help to keep the straw balanced as it flies. The big hoop creates "drag" (or air resistance) which helps keep the straw level while the smaller hoop in at the front keeps it from turning off course. It does not turn over be objects of different weight generally fall at the same speed, the hoop will keep its "upright" position.

Expansion idea: Adding more hoops to same or different parts of straw. Alter the shape of the 'hoops', try a triangle or a square. Throw it backwards/upside down/sideways.

### **Conclusion**

The preceding pages intended to show that science and Judaism are not isolated fields, standing in opposition to each other, needing to be taught independently. In a day and age when these two subjects are often pitted as mutually exclusive, forcing a person to choose sides, I wanted to find a way to break this stereotype.

By looking at the relationship of science and Judaism, I was able to answer a few questions which had made me curious. Questions such as, did the Rabbis of the Talmud reject, celebrate, or ignore the sciences? Especially considering that the sciences were often expressed by the majority cultures they found themselves within. Or, was Maimonides a fluke among the medieval sages in his synthesis of these areas? Did Einstein have anything to say regarding religion and its role in science?

In searching for answers to these questions, and many more like them, I found an assortment of books on this topic. Some of these books cover a specific time period, others cover a particular field of study, and still others focus on the texts with a lenses of that community. For example, Rabbi Gunther W. Plaut in his book, *Judaism and the Scientific Spirit*, focuses on the essence of the subjects and comes to the conclusion that indeed, they are of similar mind. *Science in Light of Torah* takes examples of applied science and breaks them down to show how the Torah can inform the whole world around us. These, and many others, help shape my current understanding of the relationship between science and Judaism; which, in a word, can be described as complicated. Similar to the present time, in history, no single voice is heard. For

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example, while talismans were taboo, magic was not for the Rabbis. Maimonides, Gersonides, and Ibn Ezra all had different opinions when it came to astrology. Throughout time, the multitude of opinions of Judaism are heard and create a cacophony of voices.

While I am able to answer some of these more basic questions, still remaining is a more in-depth analysis of what to do with this information. How can learning about the various attitudes held by the medieval sages, or others throughout time, instruct how we view the world nowadays? Is there a way to bridge the views of the orthodox and the liberal movements when it comes to understanding the Torah? Other areas of interest which, at present, have gone unanswered include looking at the evolution of science and how that compares to the evolution of religion. Or, finding connections between sages of various times and how they inform each other. So, while I was able to find and answer a few questions, by reading and learning more, I have uncovered numerous additional questions which will remain unanswered for the time being.

What matters to me, however, is not just the various intersections and divergences in time between science and Judaism, but also how they are taught to children. What challenges arise when teaching both of these subjects? Are there specific issues for Jewish day schools that a secular school does not have to face, or vice versa? How is evolution, in particular, dealt with, if at all?

The biggest concern about science education for children is the ability of the teachers themselves. More than in other subject areas, when elementary school teachers

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need to teach science, there is often an issue of confidence and knowledge. Frequently the fallback is to use experiments which works to demonstrate an idea, rather than using experiments which demonstrate the scientific method. The default is to learn the content, rather than a way of thinking.

Teaching science in public schools is only made more complicated because of the debate on how to teach evolution—with only Darwinism, only creationism, or a combination of both. Each teacher, school district, and state has their own answer to this dilemma, which only adds to the existent complex nature of the subject.

I find that this debate did not disappear in the Jewish day school, but rather has a different set of complications. Jewish day schools are a growing business, more than doubling in number and in enrollment, in less than forty years. This alone creates infrastructure challenges, fiscal constraints, and human resource problems. These schools often employ teachers to teach either Judaic or general studies, though rarely both. While there might be a teacher in the school who can help the student wrestle with the big ideas of creation, it is likely not the person teaching them about science.

Another question I tried to answer involved the definition and application of integration. Jewish day schools overwhelmingly espouse the value of having an integrated curriculum, and I sought to find what that meant. This question spans the interest of three of the chapters in this paper—a satisfactory answer is hard to come by. I find there are many ways of defining this term and applying goals to it. Each school which states this as part of their mission, also has a goal in mind of what they hope to

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achieve through an integrated school. Goals such as combining religious and secular, or Jewish and American, or topical, are all found to be options.

More than the theoretical however, I am interested in the application of integration—what does it look like when science and Judaism meet in the classroom. To try to answer this question, I created and sent a survey to several people. In the end, four schools, with fourteen total people, replied. There was quite the diversity in the jobs of those who answered: teacher, head of school, Judaic studies director, science teacher, and others. Across this spectrum, the results were also quite diverse. Compared to secular schools, how is the day structured, with how long for instruction on particular subjects? In general, the number of minutes in science instruction is about one third that in a secular school; the need to also teach Judaic studies was often cited as the reason for this difference. At the same time, on average, the respondents reported that their science curriculum was as good as, if not superior to, that which is found in secular schools.

After analyzing the results of this survey, several more questions occur to me that I had wished I had asked. I realized after the fact that not only am I searching for the concept of integration, but also the practical application of it. How is it that a school which spends significantly less time on a subject report that they are better than another? Noting that the challenges found in general with teaching science stemmed from the teacher, how, if at all, is that addressed in the Jewish day school? Going back to the question of integration, I would like to see examples of that in place. Which model, or models, seem to work best, especially as it relates to science.

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In that vein, I would like to follow up on the use of the lesson plans included in this paper. While the Jewish value and the science topic might not have always been immediately obvious, conceptually there was a connection. Was that connection made by the students? For those teachers who are weary of science, were the lessons comfortable for them?

It is here, with the teachers, that I believe that the most resources should to be spent. Examples of additional resources might include: educating teachers on how to teach science, on doing science; aiding them with creating lesson plans which meet the goals of the school; giving them time to collaborate with other teachers to find the best ways of integration. Teachers are really the ultimate resource and it should be our goal give them all the support they need. This is the direction on which we should focus.

# Appendix A

## Booklist for Lesson Plans:

- 1. Crossing the New Bridge, by Emily Arnold McCully [isbn: 978-0399226182]
- Hanukkah: Eight Lights Around the World by Susan Sussman, illustrations by Judith Friedman. [isbn 978-0807531457]
- 3. *Benny's Pennies* by Pat Brisson [isbn: 978-0440410164]
- 4. *Roscoe and the Pelican Rescue* by Lynn Rowe Reed [isbn: 978-0823423521]
- 5. The Important Book by Margaret Wise Brown [isbn: 978-0064432276]
- 6. Shivers in the Fridge by Fran Manushkin and Paul Zelinsky [isbn: 978-0525469438]
- 7. Vincent's Colors by Vincent van Gogh [isnb: 978-0811850995]
- 8. Too much Noise by Ann McGovern [isbn: 978-0395629857]

## Appendix **B**

List of charts used in chapter 3

- 3.1 Grade distribution for all respondents.
- 3.2 Grade distribution for teachers only.
- 3.3 Number of students per class
- 3.4 Number of students in the school
- 3.5 Areas which are considered Jewish Education
- 3.6 Hours per week spent exclusively on Jewish Education
- 3.7 Religious observances during school
- 3.8 Religious observances based on the school
- 3.9 Challenges teaching Judaism to children
- 3.10 Weekly hours exclusive to science education
- 3.11 Is science integrated into other subjects.
- 3.12 Science curriculum as compared to secular school.
- 3.13 Challenges in teaching science

# Appendix C

Thank you to those who responded to the survey which was the basis for chapter 3.

The Leo Baeck Day School [Toronto, CN]: **Eric Petersiel** David Martosh Lauren Sigel Ilana The Rashi School [Boston, MA]: Dave Rosenberg Melissa A. Fine Temple Beth Am Day School [Miami, FL]: Rabbi Rachel Greengrass Debbie Roman Rabbi Marc F. Kasten Jacobson Sinai Academy [North Miami Beach, FL]: Lauren Cindy Newman Maxine Erving

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