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Jewish Thought and Scientific Discovery in Early Modern Europe

Noah J. Efron

Almost a quarter-century ago Benjamin Nelson published his famous plea for what he called a “differential” and “*comparative* historical sociology of ‘science’ in civilizational perspective.”¹ Like Max Weber, Robert Merton, and Joseph Needham, Nelson believed that the growth of western science could be better understood when compared to the ways “science” fared in other cultures with other intellectual and institutional and economic sensibilities and structures. A particularly propitious case study for such a differential and comparative historical study of science, as Hillel Levine observed in his 1983 essay about Jewish reactions to heliocentrism, are the Jews of early modern Europe, who constituted “a society geographically and culturally contiguous with those who framed and advanced occidental ‘science.’”²

Since about the time of Nelson’s plea, David B. Ruderman has been writing the history of Jewish attitudes towards, and engagements with, science during the period in which modern western science was constituting itself. It is no exaggeration to say that he established this as a field of study, producing a steady stream of historical studies, initially of Italian Jews who read and wrote about nature and its study, but continually expanding his compass.³ The field

¹ “On the Shoulders of Giants: The Comparative Historical Sociology of ‘Science,’” in *On the Roads to Modernity: Conscience, Science and Civilization—Selected Writings*, ed. Toby E. Huff (Totowa, N.J., 1981), 109-13. See also “Science and Civilization ‘East’ & ‘West’: Joseph Needham & Max Weber,” *ibid.*, 164-98.

² “Paradise Not Surrendered: Jewish Reactions to Copernicus and the Growth of Modern Science,” in *Epistemology, Methodology and the Social Sciences*, eds. R. Cohen and M. Wartofsky (Boston, 1983), 204.

³ Ruderman’s books about Italian Jews engaged by natural philosophy include *The World of a Renaissance Jew: The Life and Thought of Abraham ben Mordecai Farissol* (Cincinnati, 1981), *Kabbalah, Magic, and Science: The Cultural Universe of a Sixteenth-Century Jewish Physician* (Cambridge, Mass., 1988) and *A Valley of Vision: The Heavenly Journey of Abraham Ben Hananiah Yagel* (Philadelphia, 1990). The last book is a translation of Yagel’s *Gei Hizzayon*, to which Ruderman added a significant introduction and commentary. Ruderman has also

Ruderman established and the studies he produced have been “repercussive” (to borrow his own adjective) in many directions—shedding light on Jewish-Christian relations, on early-modern Jewish intellectual history, on the deployments of Kabbalah and magic in early modern times, and so on. One of Ruderman’s achievements—perhaps not the most important in his view (for he considers himself a historian of Jewish thought and culture and not a historian of science) but of great importance nonetheless—has been to begin to lay the groundwork for a comparative history of Jewish and Christian attitudes towards and participation in the “new sciences.”

Ruderman’s newest book is a big step towards Nelson’s desideratum, using Jewish attitudes as the comparative case. It is a collection of twelve linked essays (five of which have appeared elsewhere in one form or another) framed by a synthetic introduction and epilogue. The essays are individual or group portraits of Jews who evinced interest in natural philosophy or medicine, in a variety of settings and for a variety of reasons, between the sixteenth and eighteenth centuries. Ruderman describes his subject as “three distinct but interrelated groups among early modern Jews”: (1) “converso physicians and other university-trained intellectuals who fled Spain and Portugal in the seventeenth century and settled in Holland, Italy, Germany, England, and even eastern Europe, serving as doctors and purveyors of scientific learning throughout the Jewish communities of Europe, while yielding considerable political and economic power,” (2) “certain circles of Jewish scholars in central and eastern Europe [who] pursued scientific learning, especially astronomy, in more informal settings as a desirable supplement to rabbinic study,” and (3) “the hundreds of Jews who attended Italian medical schools, primarily the University of Padua, from the late sixteenth through the eighteenth centuries.”⁴

In fact Ruderman covers even more ground than this. As background, he includes a brief essay on the attitudes of tenth- to fifteenth-century Jews towards nature and its study, surely the best survey of the sort available. Of the thirty or so early modern Jews that he describes in the remainder of the book, about twenty fit in at least one of the three camps upon which he focuses.⁵ Nine

written shorter essays and articles about early modern Jews and natural philosophy, of which the two most important are “Science, Medicine and Jewish Culture in Early Modern Europe,” *Spiegel Lectures in European Jewish History*, 7 (Tel Aviv, 1987), and “The Impact of Science on Jewish Culture and Society in Venice,” in G. Cozzi (ed.), *Gli ebrei e Venezia* (Milan, 1987), 417-48. Less directly related to natural philosophy, Ruderman has edited *Essential Papers on Jewish Culture in Renaissance and Baroque Italy* (New York, 1992), and *Preachers of the Italian Ghetto* (Berkeley, 1992), and has written many articles on various other aspects of Jewish intellectual culture in early modern times.

⁴ *Jewish Thought and Scientific Discovery in Early Modern Europe* (New Haven, 1995), 11.

⁵ The converso doctors whom Ruderman discusses include Juan Huarte de San Juan, Rodrigo de Castro of Hamburg, Benedict de Castro, Amatus Lusitanus, Zacutus Lusitanus,

emerged from different circumstances (though these too were often highly influenced by one or more of the focus populations). This fact does nothing to impugn Ruderman's typology—the groups he described *were*, in fact, of particular importance, and his identification of them as the principle populations contemplating and promulgating natural philosophy among Jews is in itself an advance of some moment. But the fact that a third of the cases Ruderman described do not fit into his own typology is testimony both to the complexity of his subject, and to his agility in addressing it.

By anthologizing a dozen depictions of different thinkers in different milieus, Ruderman affords what might be called a “hawk's-eye view” of his subject, now hovering high enough above to ask “big” questions (about the various relationships between kabbalistic and natural philosophic concerns, for instance, or between skeptical and scientific sensibilities, or halakhic questions and natural philosophic answers), now swooping very low and close to particular individuals, particular texts, and particular approaches to natural philosophy. Constructing the book from individual essays allows Ruderman to explore a variety of general issues, while remaining historically grounded and close to particular texts.⁶

Such an approach is particularly fitting for Ruderman's wide-ranging study, but it also has its costs, and one is that the book is ultimately more suggestive than conclusive, as Ruderman himself is quick to note. Though not timid about asking “big” questions, Ruderman is aptly careful not to draw great, trans-cultural and trans-historical conclusions. In fact the most enduring impression to emerge from the work is of the great variety of responses, conditioned by a great variety of factors, of early modern Jews to developments in natural philosophy and medicine. Ruderman makes it abundantly clear that interest in nature and its study was never an independent variable for Jews of this period; it was always conditioned by a complex of factors: social, political, linguistic, epistemic, and so on.

Ruderman not only refuses to offer simplistic generalizations, he makes it obvious time and again that simple formulations will not do. He describes, for instance, how Leone de Modena (1571-1648) took natural philosophy to be a

and Elijah Montalto. The central and eastern European rabbis include Moshe Isserles (Ramah), Judah Loew b. Bezalel (Maharal), David Gans, Isaac ha-Levi, and Mordechai Jaffe. The graduates of the University of Padua include Joseph Solomon Delmedigo, Joseph Hamiz, Israel and Solomon Conegliano, Isaac ha-Cohen Cantarini, Isaac Lampronti, Samson Morpurgo, Tobias Cohen, and David Nieto. Jacob Zahalon was granted the degree of *artium ac medicinae doctor* at Rome. Others whom Ruderman discusses include Leone Modena, Simone Luzzatto, Azariah Figo, Judah del Bene, Solomon Aviad Sar Shalom Basilea, Judah Briel, Israel ben Moses ha-Levi of Zamosc, Aaron Solomon Gumpertz, and Mordechai Schanber Levison.

⁶ Any of Ruderman's essays could be expanded, and the book, through the extensive citation of the secondary as well as primary literature, invites further study into his subjects and will no doubt spawn numerous dissertations and monographs.

preferable alternative to the “lies and falsehoods” of kabbalah, while his favorite student, Joseph Ḥamiz (d. c. 1676), came to see the disciplines as natural concomitants.⁷ Readers searching for supporting evidence either to confirm or to contradict the Yates thesis (or any other grand theory of the relationship of religious and scientific sensibilities) will be disappointed; Ruderman has a richer, more complex story to tell.

Still, the whole that Ruderman presents is greater than the sum of the parts, and “certain continuities” (as he calls them)—general trends and dynamics that expressed themselves in many different places and times—do emerge from his account. The most striking of these continuities, Ruderman writes, was “a conscious attempt to disentangle physics from metaphysics, the secular from the sacred, science from theology” (369).

Ruderman has made a case that there was an intellectual tradition adopted by many of those Jews who contemplated the natural world in the sixteenth to eighteenth centuries,⁸ in which talk about nature and talk about God were largely separated from each other except in limited circumstances in which the former was made to testify for the latter. These Jews, then, were reading, considering, and reporting about *natural philosophy*, but without the philosophy. In some instances they borrowed arguments from Christian natural theologians, but without the theology. It is no surprise, then, that they conceived their subject somewhat differently than the natural philosophers and theologians whose work they studied appreciatively.

Before describing some important implications of these differences, it is worthwhile to consider just how and why Jews tried to “disentangle ... the secular from the sacred, science from theology.” One of the first, most influential, and most explicit attempts to do so, Ruderman explains, was that of Judah Loew b. Bezalel, who was also known as Maharal (d. 1609). According to Ruderman,

Maharal’s discussions of the theory of knowledge, the criteria of establishing truth, and the relation between religious belief and scientific investigation have had a critical impact on Jewish thinkers throughout the modern period.... [His] most important clarification was to disentangle natural philosophy from the assumptions and restraints of Jewish theology and Aristotelian metaphysics, and in so doing to provide an autonomous realm in which scientific pursuit could legitimately flourish. (77)

⁷ *Jewish Thought and Scientific Discovery*, 118-52. The fragment quoted is cited on page 123.

⁸ This tradition was adopted by many, though certainly not all, as his discussions of two eighteenth-century English rabbis, the Newtonian David Nieto (1654-1728) and the Linnaean Mordechai Schnaber Levison (1741-97), for instance, illustrate.

Later, Ruderman described the accomplishment of the Maharal as having “formulated a theological structure whereby Jewish faith was safeguarded from science and science was protected from the unwarranted intrusions of Jewish faith” (82).

This structure, one learns from Ruderman’s analysis, had both epistemic and ontologic components (which bore an odd relationship one to the other). The epistemic component was a persuasion that all statements about the natural world are uncertain and unverifiable. In fact Maharal went so far as to call all statements of the natural philosophers “lies,” of more or less flagrant varieties. Ruderman quotes from Maharal’s *Be’er ha-Golah*:

It is not even appropriate to call the science of astronomy a science because science is only attainable by one who actually knows something as it is, and that condition you will never find in their [so-called] science, for no one can verify its truth, and what is the difference if one lies a great deal or lies a little? In the final analysis, he can never know the truth of a thing.... (82)

Ruderman might also have added the passage in which Maharal apparently describes Copernicus:

... and what was said about [astronomic knowledge and intercalation] being “your wisdom in the eyes of the nations,” because it is the nations who most want to become erudite in this wisdom, and were becoming learned in this very, very great wisdom ... and always others came after them and negated their efforts that they laboriously achieved. And just as one came who was called the Master of the New Astronomy, who provided a different picture [of the universe] and all that the first scholars before them understood and gave as a picture of the path of the stars and constellations and heavenly bodies, he contradicted them all and presented a picture of a new wisdom. Only even he himself wrote that he has still not resolved everything.⁹

The statements of the “scholars of nature,” then, are always at best uncertain. They can never be treated as truth, *ergo*—“what is the difference if one lies a great deal or lies a little?”—they must be treated as something less than truth.

Another component of the “theological structure” set out by the Maharal was a radical ontology. Maharal described a great divide between the realm described by Torah and the realm described by the “scholars of the natural

⁹ Judah Loew b. Bezalel, *Be’er ha-Golah* (1598; Jerusalem, 1972), 60-61.

world.” Maharal’s division was far more severe than that implied by the commonplace distinction between the “book of God’s words” and the “book of God’s works.” For Maharal, as Ruderman interprets him, the realm described by the Torah and the realm of the natural world are entirely distinct ontological entities—so distinct, in fact, that he seems to have argued that apparently conflicting states of affair can simultaneously pertain in the two realms. Ruderman quotes Maharal’s commentary on the verses in Joshua describing the Sun standing still in Gibeon:

it is possible that the sun follows its accustomed course while [at the same time] it stands still as a miracle. For it is possible for one subject to possess two opposite conditions because of two perspectives—the course of nature being one unique subject and the unnatural, the other.... Thus for Joshua and his people who needed an unnatural miracle, [the sun] stood still, but for the rest of the world who did not require the miracle, they experienced the natural course [of the sun]. (79)

It is difficult to understand the ontologic assumptions behind this passage. Elsewhere, in *Netivot ‘Olam* for instance, Maharal described a two-tiered ontology that is more familiarly Platonic:

The Torah is the order of the universe.... That they said in the midrash that God “looked in the Torah as he created the world” [Bereishit Raba, Ch. 1], that meant that the Torah itself is the order of everything, and thus when the Blessed Name wanted to create His universe and order it, he would look in the Torah which is the order of everything [in order to] create His universe.¹⁰

As a result the very existence of the physical universe is entirely dependent upon the existence of the Torah:

The statements of the Torah support and confirm all of the universe.... And that the statements of the Torah support the universe, this is from the sages who said [in tractate *Shabbat*, 88a] that because of that God said on the sixth day that all of Creation depended upon the sixth of Sivan. If the Jews would receive the Torah [on that day] then all was well, and if not, the universe would return to chaos.¹¹

¹⁰ Judah Loew b. Bezalel, *Netivot Olam* (1595; Jerusalem, 1971), I, *Netiv ha-Torah*, 3.

¹¹ *Ibid.*

Maharal did not try to describe a rigorously coherent philosophy, and he need not be held to strict standards of internal consistency. Just as there are inconsistencies between various ontological statements in his work, there may also be a tension between his epistemology and the apparent certainty with which he seems to think each ontological realm could be described. But rigor and absolute consistency were not necessary for Maharal's scheme to warrant the study of the natural world, just as Ruderman has described.

Taken together, Maharal's epistemic and ontologic positions did, as Ruderman writes, sequester "Torah knowledge" from "nature knowledge," such as the latter is. Because study of the natural world produces no "true" statements and because the object of this study is also a realm far removed from Torah, it is logically impossible for the statements of the "scholars of nature" to contradict any truth derived from Torah. "While the Torah offers a deeper insight into creation," Ruderman concludes, "it undermines neither the autonomy of the natural order nor the naturalist's understanding of that order."

Ruderman has also shown that epistemic and ontologic outlooks like that of Maharal—sequestering study of nature from study of Torah, occasionally calling upon the former to bear character witness for the latter—were adopted by a variety of Jewish intellectuals in a variety of milieus up through the eighteenth century. Jews in Italy and then to north and west erected "theological structures" that differed from that of the Maharal in emphasis, nuance, and sophistication but not in essence. For those who adopted them, these structures helped give license to consider contemporary scientific theory freely and independently, without seeking the imprimatur of contemporary theologic theory.

This is a bold conclusion, and Ruderman makes it stick. He cites Judah del Bene (c. 1615-78) "excoriating" Aristotle in *Kissot le-Veit David* because "the mind cannot fathom with any certainty ... the unattainable questions of the universe" (190). He describes Azariah Figo (1579-1647), who was persuaded "that science was a hypothetical system based on and verified through experience alone [that] never claimed to possess absolute truth, but merely to describe the appearances of things" (page 190). He recounted how Tobias Cohen (1652-1729) "fully identified himself with an emerging field of study, a chemistry to be studied, methodized and employed for purely utilitarian purposes rather than one to be experienced or religiously celebrated" (255). He cites Judah Briel (1643-1722), who wrote that Gentile scholars "knew and understood nature only in its superficialities regarding observable things and not in its internal nature as known to the receivers of *ma'aseh bereshit* who were enlightened" (262); the view of Solomon Aviad Sar Shalom Basilea (c. 1680-1749) that "human knowledge will never grasp even a part of the received knowledge of the rabbis until hundreds and thousands of years have passed" (263-64); and the bizarre two-pronged "exegetical strategy" of Isaac Lampronti (1679-1756), whereby he interpreted statements about nature either "according

to a view of the ancient philosophers” or “by the truth ... of traditional [Torah] knowledge even if it is hidden to the naturalists, even if it doesn’t appear possible to reconcile the matter according to [the naturalists’] way” (270). In each of these cases—and there are many others as well—Jewish intellectuals joined real interest in contemporary natural philosophic theories and discoveries with a fundamental conviction that these cannot be known to be true, and that they at best describe a realm separate and inferior to the realm of Torah. In each instance, Ruderman has observed, one witnesses an attempt to create an autonomous realm for the discoveries of the new science.

But just what sort of autonomous realm is it? Michael Heyd, in an important essay called “The Emergence of Modern Science as an Autonomous World of Knowledge in the Protestant Tradition of the Seventeenth Century,”¹² observed (following Isaiah Berlin, perhaps) that there is an important distinction to be made between the “negative” and “positive” autonomy of scientific inquiry.¹³ The epistemic and ontologic outlooks that Ruderman finds common to many of the subjects of his book were enough to ensure for them “negative” autonomy for the study of nature. While negative autonomy was enough to *sanction* contemplation of science, it was not, as Heyd explained, enough to ensure, at least for its Protestant practitioners, “its relevance to central cultural and religious concerns.”¹⁴ To achieve this, Heyd writes, Protestant “natural philosophers sought to reinvest their study of nature with soteriological meaning, and thus renew the links between theology and human knowledge.”¹⁵ One expression of this reinvestment was the Baconian conviction that both God’s book of words and his book of works—the book of nature—(as Heyd put it) “led ultimately to the same truth [though] the nature of each of them was different as was the manner of ‘reading’ them.”¹⁶

As Ruderman’s studies make clear, however, this strategy was less readily available to Jewish intellectuals who adopted the Maharal’s “theological structure” or another like it. By insisting on the uncertainty and unverifiability—the

¹² *In Knowledge and Society—Cultural Traditions and Worlds of Knowledge: Exploration in the Sociology of Knowledge*, ed. Andrew Pickering (Greenwich, Conn., 1988), VII, 165-79.

¹³ Heyd is not alone, of course, in noting the importance of the motive forces—or “positive autonomy”—religious traditions could confer to natural philosophic endeavor. There is a rich and well-established literature describing this, e.g., Richard S. Westfall, *Science and Religion in Seventeenth-Century England* (New Haven, 1958), and John Dillenberger, *Protestant Thought and Natural Science: A Historical Introduction* (1960; Notre Dame, 1988). For a rather different conception of the sources of positive autonomy of natural philosophy, see Amos Funkenstein, *Theology and the Scientific Imagination from the Middle Ages to the Seventeenth Century* (Princeton, 1986). For a very useful introduction to the subject, see John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge, 1991); and for a bibliography, see Steven Shapin, *The Scientific Revolution* (Chicago, 1996), 195-200.

¹⁴ *In Knowledge and Society*, 171.

¹⁵ *Ibid.*, 172.

¹⁶ *Ibid.*

principled *untruth*—of all statements about the realm of nature and by insisting upon its ontological distinctness, the Maharal’s “structure” militated strongly against positive autonomy of nature study, even as it ensured the negative autonomy. It comes as no surprise that Maharal himself devalued the study of the material universe, even as he permitted it. Thus he wrote that:

The importance of an [intellectual] attainment varies according to the importance of the subject. And certainly everything depends upon this. If a person labors and becomes wiser than all the ancients in ... [worldly] wisdom ... there is no doubt that this is considered nothing compared to a small [intellectual] attainment concerning the hosts of the heavens.¹⁷

In *Tiferet Yisrael* Maharal was even more explicit:

It is not appropriate to call someone who knows about material things “wise,” just as a shoemaker is not called “wise,” even though this is [a sort of] wisdom too. Therefore, only the person who studies holy matters [is called wise], and this is called wisdom.¹⁸

This characterization of the study of the material world as a mere craft was repeated by del Bene who insisted explicitly, as Ruderman noted, that “the science of nature is a craft, not a science” (191). Such an assessment does not confer importance to the endeavor of natural sciences, and provides weak motivation to pursue them.

Stated more generally, the science that Ruderman found in the writings of many of his subjects—the science warranted by the sequestering of nature study from God study—was unable to serve as a “soteriological bridge,” to continue to use Heyd’s terminology. Indeed, a science that is in principle untrue and whose object of study is a realm perfectly distinct from the spiritual, social, and moral realms could easily become so unstable and ad hoc as to be useless as a bridge to anything. Descartes insisted that through his science he was discovering the “laws that God put into nature.” But such conviction (and its attendant motive force) was denied to one who insists on the “untruth” of all statements of natural philosophers. Such a person might also find it more difficult to see sciences as progressive affairs, as when Maharal’s student, David Gans (1541-1613), was unwilling or unable to adjudicate between the Ptolemaic, Copernican, and Tychonic systems because he viewed each as unverifiable. Most important, the notion that studying nature can render true knowl-

¹⁷ Quoted in M. Zuriel, “Ha-Hagbalot ‘al ha-’Isuk ha-Sikhli shel ha-Adam le-fi MaHaRaL,” *Ha-Ma’ayan*, XXVII, n. 1 (1986), 55.

¹⁸ Judah Loew b. Bezalel, *Tiferet Yisrael* (1599; Jerusalem, 1978), 35.

edge about God is difficult to accept for one convinced that the material world—if it is law-governed at all—is a realm distinct from God that operates according to unknowable laws. Likewise, for one for whom the material world bears no relation to the spiritual, it is hard to accept a view like Sprat's, that studying God's works will confer the virtues of humility, piety, perseverance, and love of truth. In short, many of precisely those motives that were constitutive of the "positive autonomy" or sanction that science enjoyed among Protestants, were attenuated or entirely unavailable to those early modern Jews—and Ruderman shows that there were many—who adopted attitudes towards nature study like those of the Maharal. Ruderman also shows that Europe's Jews *did* study, throughout the early modern period, those subjects that came to be called "science" and that they had a variety of motives for doing so, aside from their simple fascination with such matters.

Another of the "continuities" that emerge from Ruderman's work is that much Jewish interest in natural philosophy and medicine was a by-product of cooperative and competitive interactions between early modern Jewish and Christian communities. The interactions took place on several levels. On the most basic level some Jews simply appropriated Christian arguments about the religious utility of natural philosophy. "Jewish responses to science not only paralleled those in the Christian community," Ruderman writes, "on occasion Jewish thinkers consciously drew upon Christian arguments in shaping their own: del Bene and Nieto, for example, were influenced by Jesuit and Anglican science, respectively" (370). But such appropriations never provided strong motivation to pursue natural philosophy, because most Jews were still careful to insist that the realms of natural philosophy and theology remain distinct. Relatedly, certain Jewish intellectuals looked to the findings of the natural philosophers to vindicate rabbinic sapience, which was blithely dismissed by Christian intellectuals, and kabbalah. What Ruderman finds common to most of his subjects is "an attempt to see the new discoveries in science as vindicating and confirming previously discredited rabbinic and especially kabbalistic views, thus preserving the seemingly peaceful coexistence between kabbalah, magic, and science among such thinkers as [Joseph] Delmedigo and Basilea well into the eighteenth century" (369). But as several of his studies make clear, this vindication was also an important bulwark against the claim that Christian knowledge had greatly outstripped Jewish knowledge by early modern times. Tycho Brahe's greatest achievement, according to David Gans, was that he *proved* that the rabbis and not the savants of the nations had been correct in their cosmological theorizing. Gans emphasized that the greatest scholar of the age was deeply impressed by rabbinic knowledge. One reason to pursue natural philosophy, for Gans and others like him, was because it could demonstrate the excellence of past Jewish intellectual achievements.

Such reasoning was clearly apologetic. A further motivation for Jews pursuing natural philosophy was still more apologetic. Many of the Jews that Ruderman describes saw natural philosophic knowledge as necessary if Jews were to avoid seeming hopelessly ignorant in the eyes of contemporary Christians. Ruderman cites Gans's observation that "the exalted sciences were depleted among us to the point that their memory was almost completely lost" (84-85). Gans was driven, Ruderman noted, by "deeply felt inferiority and the need to counter the charges of non-Jews regarding Jewish boorishness" (85), and this accounts for passages like the following, in the introduction to his magnum opus, *Magen David*:

What should we do at a time when the wise Gentiles speak to us, asking us the reason for the order of intercalation, and our tradition is insufficient [to respond] to them? Is it appropriate for us to put our hands to our mouths, appearing as a mute incapable of opening his mouth? Is this not [a matter] of our honor or that of our Maker? (85)

Almost a century later, the doctor and author Tobias Cohen expressed remarkably similar sentiments. He wrote of the Christians he encountered while a student at the University of Frankfurt that they:

vex us, raising their voices without restraint, speaking haughtily with arrogance and scorn, telling us that we have no mouth to respond, nor a forehead to raise our heads in matters of faith, and that our knowledge and ancient intelligence have been lost.... The truth of the matter is that because of our many sins men of learning are lost and we have no one who knows how to answer with an appropriate winning response. (236)

Cohen described the purpose of his medical textbook, *Ma'aseh Tuvyah*, as providing the knowledge "to respond to those abusers and to demonstrate to them that they were not the only beneficiaries of these sciences; and even though we are presently living in the darkness of this bitter exile, God is still a light unto us and we still have among us wise and righteous men, mathematicians [scientists]" (236). Cohen was particularly sour in his opinion of Jewish-Christian relations. But many of the other figures Ruderman describes—Delmedigo, Luzzatto, del Bene, and Levison to name just a few—were persuaded that what can be called, anachronistically, "scientific literacy" might enhance the social stature of Jews among the Christians. It is easy to see why such people might believe that natural philosophy and medicine would be good conduits to increased social esteem. The sort of separation between theological concerns and

scientific concerns that Ruderman ascribes to most of them, would (from the point of view of Jews, at least) render the “scientific” concerns an excellent bridge between Jewish and Christian intellectuals. Jews insisted upon viewing statements about nature as theologically “neutral” (Maharal had wondered in *Netivot 'Olam*, “why did they call it ‘Greek wisdom’?, because if it is intended to explain the realities of the world, is it not so that this wisdom is the wisdom of *every man*?” and many of Ruderman’s subjects endorsed this sentiment in various ways), and the result was a potentially neutral basis of dialogue and comparison between Jews and Christians. Natural philosophy and medicine, at least in principle, were disciplines about which Jews and Christians could converse as equals, in which individuals of either confession could excel and in which excellence could be recognized and appreciated, without regard to religion.

It emerges from Ruderman’s descriptions, then, that there were some social motivations to become literate about developments in natural philosophy and medicine. But these remained far less potent than the sorts of motivation that makes *doing* “science” a positive imperative, parallel in stature and import to studying God’s word and fulfilling his commandments. For the very strategy that allowed Jews to view these disciplines as theologically neutral ultimately undercuts their value. God’s book of words, to Jews, could be accurately read while God’s book of works, ultimately, could not. If Kepler could “think God’s thoughts after him” by describing the motions of the heavenly bodies, Gans could not.

Another of Ruderman’s achievements, I should add, is to show that this balancing of theological disinterest and sociological interest in science was always tenuous, and to begin to describe its collapse toward the end of the early modern period. Not all those whom Ruderman portrayed shared epistemic or ontologic assumptions at all similar to those of the Maharal. The views of Nieto, Levison, and others were entirely different, at times approaching those of Newton and Clarke. (Ruderman’s reconstruction of the sources of Nieto’s views, grounding them in Clarke’s Boyle lectures of 1704 and 1705, is another of the jewels of the book.) It is perhaps telling that these exceptions were all relatively later, suggesting a deterioration of the Maharal’s “theological structure,” which might be explained in light of the impressive successes of science and scientists in the centuries since the Maharal.

Ruderman also makes clear, though, that despite the great esteem for Maharal shared by most of those whom he describes, few adopted Maharal’s extreme views in their entirety. Some, even in the sixteenth and seventeenth centuries, did find in natural philosophy and medicine some support for their faith. Joseph Delmedigo is an example, as is Abraham Yagel (about whom Ruderman has produced two prior books).¹⁹ Ruderman also explains that some of his

¹⁹ *Kabbalah, Magic, and Science: The Cultural Universe of a Sixteenth-Century Jewish Physician and A Valley of Vision*. See note 3 above for references.

subjects who were practicing physicians believed that in healing the sick they were fulfilling a divine duty, a duty that some took to be no less important than their *halakhic* and rabbinic duties. Cohen, Cantarini, and Lampronti are all examples. For such Jews, the walls dividing theology from natural philosophy were more porous than those posited by Maharal. These of facts of the first importance and further illustrate the subtlety of Ruderman's work. Still, for those few who fully embraced Maharal's views and for the many who partially (and sometimes inconsistently) embraced these views, science achieved far stronger "negative" autonomy than "positive autonomy."

In the book's epilogue Ruderman considers why it was that "actual scientific performance among Jews in early modern Europe"—in contrast to their vigorous "reflections on scientific activity" in the same period—"was inconsequential." It could not have been, as he proved throughout his volume, that "Judaism [was] less tolerant or enthusiastic than Christianity in validating the autonomous pursuit of sciences." The reason, Ruderman concludes, is sociological. For any number of reasons, Jews remained "out of the loop" institutionally—largely excluded from universities and scientific academies and societies. Jews "remained outside the scientific laboratory," Ruderman summarizes, "because of social, not religious constraints."²⁰

This is undoubtedly the most important single factor that explains why Jews did not become practicing scientists. But as Ruderman's own analysis shows, there was also another reason. In the main, early modern Jewish enthusiasts of science adopted a set of ontologic and epistemic assumptions that, while ensuring the "negative autonomy" of science, did little to confer to science, particularly to *doing* science, sufficient enough "positive autonomy." Faced with a choice of devoting lives of study to a God's book of words, which rendered truth, or his book of works, which did not, most Jews—even those keenly engaged by the advances in the study of nature that they saw around them—understandably chose the first. While they suffered no "religious constraints," they enjoyed little religious motivation to engage actively in science.

All of this is simply one example of the sorts of analysis and the sorts of explanations that *Jewish Thought and Scientific Discovery* inspires and begins to make possible. Other examples—ones that are no less suggestive and important—are easy to find. One example is Ruderman's emphasis on "disciplinarity" when considering the responses of Jews to "scientific discovery." His analysis of the differential receptivity to medicine, biology, astronomy, and other natural philosophic disciplines is trenchant and of the first importance; and indeed one might have wished for Ruderman to integrate this analysis even further within his own work. While he makes it clear that Jews of different times and places were far more interested in medicine and biology than they were in physical disciplines, for instance, he himself on occasion groups all these under the somewhat anachronistic rubric "science."

²⁰ *Jewish Thought and Scientific Discovery*, 370-71.

Ruderman also stresses the importance of institutional affiliation to the receptivity of Jews. He notes the difficulties for Jews of “practicing” natural philosophy when they were effectively excluded from scientific societies. Further, he notes that the fact that the only avenue for Jews to attain formal education in natural philosophy (at least in the sixteenth and seventeenth centuries) was in Italian universities meant that Jews were predisposed towards the attitudes reflected in these institutions. Since these universities (and especially the medical schools, for obvious reasons) were stronger on biological than physical disciplines, this bias was absorbed and reflected by Jewish intellectuals of the day. Ruderman also describes the influence of the shifts in Jewish demographics during the period he describes on Jewish receptivity and knowledge of natural philosophic disciplines; and he offers valuable insights into the relation of a variety of intellectual concerns and the receptivity and knowledge of the Jews. He describes, for example, an odd relationship that pertained between skepticism and religious and natural philosophic theorizing and belief. He considers the various impacts that kabbalistic commitments had upon natural philosophic concerns.

No single book could provide definitive analyses of *any* of these issues, much less of all of them. Ruderman’s book is as valuable for the rich way in which it presents these issues—embedded in very particular historical circumstances, and exemplified by particular people and texts—as it is for the necessarily tentative analyses that it provides. But it is in both regards ground-breaking. It introduces Jews, for the first time in a serious way, into the discussions of the relationships between religious and scientific sensibilities that have been a subject of debate among historians and sociologists of science for over two generations. In so doing, it (and the subsequent studies that it will certainly inspire) will ultimately not only help us understand better the complex reactions of the Jews of early modern Europe to the “scientific revolution” but also to understand the complexities of the development of western science itself.

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