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PREFACE

Judaism differs considerably from other theistic religions. One of the main features is that Jewish religious laws are not dogmatic but based on specific legal reasoning. This reasoning was developed by the first Judaic commentators of the Bible for inferring Judaic laws from the Pentateuch. The book is about Judaic reasoning from the standpoint of modern logic. Its first goal is to define Judaic logic. This logic was aimed to be a methodology for deducing religious laws. The idea that this methodology can be viewed as original logic that is not less deductive than Aristotle's logic did not emerge until the Late Middle Ages. At that time Medieval Hebrew works about Judaic reasoning were influenced by Arabo-Islamic philosophy as well as by Latin Scholastic logic. In this volume we discuss different forms of influence of the Aristotelian logic on developing the Talmudic methodology. Then we aim to sketch semantics for the Judaic reasoning, explicating Talmudic case study and Rabbinic situation analysis to develop general approaches to formalizing Judaic logic. This consideration of Judaic logic has relevance for modern logic and analytic philosophy and may be compared with the contribution made by the formalization of Ancient Greek logical systems to 20th-century logic and language philosophy.

Andrew Schumann
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In Search Of The Logic Of Judaism: From Talmudic Chaos To Halakhic Linearity

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Abstract

In this paper we examine some common views of scholars concerning the idea of the halakhah *in Judaism. We then explain why their methods failed to account for the main philological and historical evidence regarding the term from the Talmudic texts. Then we suggest as a heuristic explanation that the logic of the Talmud defies linearity and can be discussed productively using chaos theory.*

1. Introduction

The Talmud and Jewish Law guide the lives of many devoted Jews throughout the world even in modern, technologically sophisticated and otherwise secular social contexts. The system of rabbinic law, the *halakhah,* is the primary means by which Jews make contact with and reference to these forces from prior generations. The diverse modern denominations of Orthodox, Conservative and Reform Judaism share a conviction that they have much to gain from studying and following the dictates of the Talmud.

Our two primary teachers inspired our interest into inquiring about the logic of Judaism, both that of the chaotic Talmud and that of the unfolding linearity of the *halakhah.*

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Our revered Orthodox teacher, of blessed memory, Rabbi Joseph Soloveitchik, confronted in his classic work, *Halakhic Man,* the clash that he saw between the person of science and the person of religion. He felt the necessity to explore this conflict for himself as a philosopher and for other secularly educated Orthodox Jews who chose to explore the learning of a secular culture. He solved a major element of the dilemma by proposing the synthesis of the two – science and religion – in the person of *halakhah.* He believed that in that archetype we have a melding of the intellect and the soul that will satisfy even the most demanding modernist and even the most spiritual worshiper.

Soloveitchik was an existentialist philosopher, an Orthodox halakhist and a rabbi. The positive facts of historical Judaism were not of primary concern to him. He did not call his seminal essay, *Talmudic Man,* he called it, *Halakhic Man,* a choice we shall return to consider at the conclusion of this paper.

In the academic context, our teacher Professor Jacob Neusner trained his students to do critical, analytical historical studies. He himself continues to the present day to amalgamate academic modes of inquiry with a variety of theological aims. Neusner persistently shows that Rabbinic Judaism indeed has a well-defined history and culture. Especially later in his work he has come back to show that it has a deep and abiding faith as well and has shown how to be a positivist without reducing the essences of Judaism. He has taught us how to draw on the advances of academic learning without the often accompanying evolutionary triumphalism of the secularist. A major portion of his publications directly explore the primary rabbinic texts of the Talmud. For Neusner, the notion of the *halakhah* is a minor concern of his research.

In this paper we first examine what several modern Judaic scholars have said about the *halakhah* in Judaism. Then we show how their approaches fail to correlate with some of the basic the philological and historical evidence of the Talmudic texts which employ the term *halakhah.* Finally, probing beyond the historical and philological theories of the texts, we advance a new and intuitive hypothesis. We posit that to fathom the logic of the Talmud and of modes of thought of the *halakhah* one needs to go beyond standard notions of linearity and consider concepts from within chaos theory.

2. The linear logic of the *Halakhah* according to Urbach, Roth, Sanders et. al.

As our starting point, we account for what we find in the scholarly literature when we look for discussions of the origins, development and logic of the system of *halakhah*. We consider the results of several representative monographs, including E. E. Urbach's study called *The Halakhah: Its Sources and Development*, Joel Roth's *The Halakhic Process: A Systemic Analysis*, and E. P. Sanders' *Jewish Law from Jesus to the Mishnah*. We chose these scholars because they appear to presume in their work that the *halakhah* has its own ontological essence.

In Urbach's study of the *halakhah*, he presented an understanding of the expression that is representative of many traditionalist scholars [22, pp. 2 – 3]. It might have been more forthright for him to state his agenda outright. Instead he tells us only obliquely where he is coming from:

> There is complete unanimity as to the centrality of the *Halakhah*. Both those who oppose or negate it as well as those who accept its authority agree to this fact. What, however, is the *Halakhah?* This question is not directed to the etymology of the term or its variants but rather to its essential meaning as a religious norm, as law and as a judicial system.
>
> The term *Halakhah* does not occur in the Bible; it is found only in the tannaitic and amoraic literature and not even in other literary sources of the Second Temple period. In its form, *Halakhah* is an Aramaic noun and the verb (*halak* = "to walk" or "to go") from which it is derived, serves in its various forms, to denote a person who observed the Lord's Torah and fulfills its commandments. Thus, one "walks" not only in "the ways of the Lord" (*Ex.* 18:20) but also "in His statutes" (*Lev.* 26:3), "in His judgments" (*Ezek.* 37:24) and "in His Torah" (*Ex.* 16:4). Walking is parallel to observing. Just as one walks along known roads but the act of walking also lays new paths, so too, although one observed the commandments in established ways, the act of observance itself creates new forms.
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> The definition given by Nathan b. Jehiel of Rome, the 11th-century author of the Talmudic dictionary, *Arukh*, which describes *Halakhah* as "something which came from ancient days and [will last] to the end [of time], or [alternatively] something according to which Israel

goes," accurately reflects the double meaning of the term: 1. A tradition followed throughout generations, and 2. A way accepted by the people as a whole. This definition also implies that the *Halakhah* is not explicit in the Bible and that, unlike the Biblical commandments, its source is not in direct revelation. The term, nevertheless, does carry the connotation of authority which is in no way inferior to that of the commandments of the Torah itself. Indeed, the parameters of the Biblical commandments — such as the place and time of their observance and who is obliged to perform them — are fixed by the *Halakhah*. The *tanna*, R. Ishmael, did not hesitate to declare that "in three instances the *Halakhah* overrules Scripture. The Torah says... but the *Halakhah* [is]... In these three cases the *Halakhah* uproots Scripture" [TJ Kiddushin 1:2, 59d].

Urbach attributed to *halakhah* multiple meanings. It denotes religious norms; law; a judicial system; a tradition followed throughout generations; a way accepted by the people as a whole; or fixed parameters of the Biblical commandments — equal in authority to commandments of the Torah. He most clearly believed, as did many German-trained scholars of his generation, that philology recapitulates essence, a claim we find less than satisfying.

Urbach claims that the *halakhah* has a recoverable linear history. The first part of that in summary says: From the first settlement of Canaan by the Israelites and through the Persian and Hellenistic periods, "there existed a judicial system which had legislative and executive authority" [22, p. 4] and an "internal organization" of "elders and judges of every city" [22, p. 5].

The supreme *bet din* in Jerusalem "prevailed during the early days of the Temple and continued — with interruptions — until the last Hasmoneans" [22, p. 5]. The Samaritans rejected "the *halakhah* which emanated from Jerusalem, they proceeded to develop a *halakhah* of their own" [22, p. 6]. So too the Judean Desert Sect formulated their own.

Urbach presumed that this court issued regulations and ordinances. *Takkanot* (i.e. ad hoc edicts) permitted warfare on the Sabbath and permitted some practices for produce of the Sabbatical year [22, pp. 8 – 9]. Takkanot regarding Jewish marriage required at first the deposit of *ketubbah* money in the house of the father-in-law and later mandated the universal use of the *ketubbah* document on the authority of Simeon b. Shetah.

Urbach does not say who issued the Takkanot after the Bar Kokhba war which ordained that lost objects need to be announced only to neighbors and townsmen [22, p. 10]. He does say that the "rabbis" adopted a Takkanah regarding mourners receiving condolences and also asserts that in Ushan times a *tenay bet din* is the same as a Takkanah [22, pp. 11 – 12].

Urbach makes a variety of additional assertions regarding the *halakhah*. Some Ushan or Yavnean laws, "have their source in ancient Takkanot" even though they are "not recorded as such" [22, p. 12]. A teaching of R. Simeon b. Gamaliel had the "force of a Takkanah" [22, p. 13]. R. Aqiba did not have the "official status" to "ordain Takkanot" [22, p. 13].

He believes that a *gezerah* is identical to a *seyag* [22, p. 7] but has a "temporary, transient nature" subject to later renewal as in the case of the impurity ordained for lands outside Israel and for glassware. Early Pharisees and the "pairs," but not the court, issued *gezerot*. An early authority decreed some Egyptian wheat unclean. But Urbach states, "The importation of wheat from Alexandria has important economic implications since it served to force down the prices, but the motive for Joshua b. Perahiah's *gezerah*, as well as for its annulment was not economic" [22, p. 15].

In the same vein Urbach continues to credulously suggest that Takkanot attributed by later authorities to Joshua b. Nun or to King Solomon, Ezra, or Nehemiah actually originated with those figures. He hedges a bit only with regard to the authenticity of the Takkanot ascribed to Moses. He distinguishes custom from *halakhah*. He then outlines the system of *halakhah* as it developed historically: the courts, precedents and "testimonies," midrash and *halakhah*, law as practiced, and the votes that establishing famous rulings.

He notes a "deterioration in significance of the term *halakhah*," when it is used in the Talmud to connote views of the law not accepted as binding for practice. He then proceeds to highlights of the Talmud: general rules, terms and principles of legal reasoning, of theology, and of ethics. He adds to these brief pious biographies of rabbis of the Mishnah and Talmud and concludes with a discourse on the authority of the Talmud for Judaism.

In Urbach's narrative the *halakhah* is old and venerable, logical and moral, and ought to be authoritative for Judaism. In short his study is a valued statement of a historicist Orthodox approach. It might be characterized as "the unexpurgated edition of Pirke Avot"

that earliest rabbinic text which purports to account for the origins and transmission of rabbinic literature. Urbach's *halakhah* is riddled with catalogues of seemingly arbitrary edicts and his scholarship ignores many of the procedures of modern historiography and religious studies. That makes the book unconvincing reading or even inaccessible scholarship for many of its potential readers.

Let us consider next the authoritative *Encyclopedia Talmudit's* article on "*halakhah*." This essay gives us a perhaps more compelling and precise Orthodox definition of many of the rules and principles touched upon by Urbach. Its more narrow definition limits the term *halakhah* to *legal decisions in a matter of dispute*. In this approach it notes no "deterioration of the significance" of the term, in contrast to what Urbach apparently found in the literature.

Accordingly, the article's author discusses the role of midrash and aggadah in making decisions of Jewish law; the role of tradition; the role of the rule of the majority; the use of logic; the place of authority; the choice between lenient or strict options and the use of precedents.

The article avers that the rhetoric of the Mishnah or Talmud itself implicitly may guide decisions in matters under dispute even where the text does not specify a preference. As a rule some rabbis have greater authority. The essay spells out when we follow the Tannaitic House of Hillel; Eliezer b. Jacob; Aqiba; Yose; Rabbi; Simeon b. Gamaliel; and Meir in decrees. It provides a summary of the rules for deciding among the views of Rab, Samuel and R. Yohanan; of R. Yohanan and Resh Laqish; according to Nahman; of Rabbah and R. Joseph; Abayye and Raba; Aha and Rabina. There are rules and more authoritative and dominant rabbis.

Now let us compare this with the account presented by Joel Roth, a Conservative Jewish theologian, in his work, *The Halakhic Process: A Systemic Analysis*. Roth studied the scholarship on legal systems and made the major assumption that we may apply its methods of analysis to *halakhah*. Roth makes these key claims.

Philologically, *halakhah* means legal decision. The *halakhah* follows certain <u>processes</u>, as the title suggests. But in the very first pages Roth dashes right by this claim and supposes without a shade of argument that the *halakhah* is a legal system. "As a legal process, *halakhah* is governed by systemic principles that *govern the way in which the process works*, as opposed to those [legal principles] that govern the determination of the law in any given case within the sys-

tem... Certain legal principles are also systemic principles" [17, p. 1]. Then the issues unfold in Roth's discussion: what is its *grundnorm*? The Torah. And how does the relationship between that and its authorities play itself out?

As we said, by making the analogy of the whole process of the *halakhah* to a secular legal system, Roth makes a significant assumption and claim. Nevertheless David Ellenson criticized Roth for his

> …failure to grapple sufficiently with the theological nature of the Jewish legal system. In avoiding this confrontation, Roth overlooks the vital difference which distinguishes a religious system of law, such as the Jewish one, from a secular system, such as the American. In so doing he does not supply adequate epistemological grounds for the authority of the system that he seeks to defend from the attacks of both the Orthodox on the right and the Reform on the left [2].

Gordon Tucker went further in his criticism of Roth [21]. He asked whether it is legitimate to adopt the position of the legal positivists and then *mutatis mutandis* apply their theory of law to the *halakhah*. In Tucker's view, principles of the system are often overridden by maxims, pressures, or even moral imperatives outside of the process.

Tucker wonders if the *halakhah* is indeed a system with its own logic. "Its literature is certainly diverse enough to allow us to treat it as a largely chaotic, and often contradictory, collection of legal norms" [21, p. 366]. Above all Tucker argues, the positivist "account of *halakhah* fails on several counts... The positivist logic leads unavoidably to an account of *halakhah* which is *atheological*" [21, p. 372]. It cuts it off from the believer's faith. It removes it from the existential dimension.

Tucker insists that Roth needs to lay more of the groundwork for presuming that the *halakhah* is a system. And if it is, what is the nature of the organic mind of the corpus?[1] Theoretical discourse in recent academic circles has brought a good deal more sophistica-

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[1]A great deal more attention needs to be paid to influential work [6] by Max Kadushin.

tion to the question of the nature of organization within systems. Roth seems more interested in extrinsic rules than in internal patterns. We shall return to further discuss this concern below.

Some of these issues now raised in our discussion of Roth's monograph were addressed previously in a parallel debate as early as 1980 and even prior to that in the scholarly discourse of the field of משפט עברי, Hebrew Law [5]. Englard described at that time the impetus for the emergence of this field of inquiry that took root in Israel and has had little impact outside of its borders. He explained that the revival of national law accompanied the Zionist revival of the Hebrew Language. The focal aim of the early scholars in the area of משפט עברי (Hebrew Law) was to recover the essentials and national core of Jewish law stripped of its religious layer. Elon simplifies this when he says, "Only the branches of the *halakhah* which correspond to the branches in modern legal systems," pertain to Hebrew Law [3, p. 23]. That is to say the laws governing relations between one person and another are part of Hebrew Law because of their social value. Those with religious significance are not.

The lines of demarcation between Hebrew Law and *halakhah* actually are not so clear. Englard points out for example that all of the *halakhah* of family law is "an integral part of משפט עברי (Hebrew Law)." He critiques Elon's work on several other counts. He says that it combines mutually contradictory methods: a dogmatic approach — directed toward application, normative and synchronic — with a historical inquiry — aimed at understanding formative processes, empirical and diachronic. This cumbersome methodology is not suited to finding basic principles of an immutable character [5, p. 51] and central ideas through positive historical reconstruction. Englard correctly compares Elon's work with that of Boaz Cohen, an earlier Conservative Jewish scholar of the Jewish Theological Seminary. Englard also takes on the task of categorizing the writings in Hebrew Law of Gulak and Albeck. In each instance he correlates the essence of their work with the *tendenz* of the author.

We have assessed some of the issues regarding the notion of *halakhah* in our examination of the work of Urbach, Roth and others. Now let us consider E. P. Sanders' conception of *halakhah* from the perspective of Protestant scholarship. It would be no surprise to find that Christian theologians and historians are interested in Jewish law for their own tendentious theological purposes.

Sanders wants to know what the nature of the law was at the time Jesus overthrew it and what happened to the law after Jesus' advent. So we have his essays: "The Synoptic Jesus and the Law," "Did the Pharisees have Oral Law?" "Did the Pharisees Eat Ordinary Food in Purity?"

The focal choices of these titles show us that definite predetermined perspectives guide these concerns. Other Protestant approaches refine the question a bit more. From the greater distance of a Pauline perspective, Tomson (*Paul and the Jewish Law*) finds many alternative meanings imputed by scholars to *halakhah*. He defines *halakhah* as a tradition of formulated rules of conduct regulating life in Judaism. He says there is an organic interconnection among the parts of the definition of *halakhah* as literary genre, as legal system, and as social rules [20, p. 19].

Tomson recognizes that because *halakhah* is a rabbinic category, it is not useful in the discussion of non-rabbinic data except as a comparison to reflect against that material [20, p. 21 ff]. But a variety of other scholars have posited that patterns of laws suggested there were other forms of Judaic *halakhah*. For example, Revel posited a Karaite *halakhah*. Albeck thought there was a *halakhah* of the Enoch Circle. Ginzberg spoke of a Pharisaic *halakhah*. Baumgarten refers to a wide-spectrum *halakhah*. Zeitlin talks of anachronism and *halakhah*. Alon sees fragments of a *halakhah* in Greek Halakhic midrash and elements of a Christian *halakhah* in the Didache. Tomson discusses Qumran *halakhah* in the Damascus Covenant and Rule of the Community. Additionally, there has been much free discussion about *halakhah* and the Temple Scroll and 4QMMT.

The search for the hermeneutical principles for the interpretation of the Torah is another aspect of the discussion of the derivation of the *halakhah*. The thirteen middot of Rabbi Ishmael are the best known set of these principles. Through application of the logical rules of the *middot*, the rabbis purport to be able to derive *halakhah* from the Torah. As the Jewish Encyclopedia puts it,

> The science which defines the rules and methods for the investigation and exact determination of the meaning of the Scriptures, both legal and historical. Since the Halakah, however, is regarded simply

as an exposition and explanation of the Torah, Talmud hermeneu-
tics includes also the rules by which the requirements of the oral law
are derived from and established by the written law.[2]

This notion that the rabbinic *halakhah* is derived by application of
logical principles of reasoning to canonical verses of the Torah is
an excellent example of the later rabbis making a certain kind of
assumptions about the linear derivation of their traditions from
prior sacred texts. Their claim underscores our characterization that
halakhah is a linear and deductive system of materials in sharp con-
tradistinction to the Talmud, as we shall discuss below in detail.

To recapitulate, a few general points have emerged from the
studies we have discussed, i.e., scholars claim that the *halakhah* has
a history and development. It is construed as a legal process and
system, a literature, and social rules. And as we certainly have seen,
the *halakhah* has numerous manifestations.

3. The term *Halakhah* in the early literature

Based on a direct review of the earliest primary sources that use the
term *halakhah*, let us raise some doubts about the secondary theo-
ries reviewed above.

In fact, the term *halakhah* is not used as a primary theological
category in the Mishnah, Tosefta, or the Tannaitic Midrashim. The
word *halakhah* or its plural form *halakhot* appears 31 times in Mish-
nah, 105 times in Tosefta and in 59 instances in the early midrashic
compilations: Sifra (20), Sifre Numbers (6), Sifre Deuteronomy

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[2] See "Talmud Hermeneutics" by Wilhelm Bacher and J. Z. Lauterbach
(http://www.jewishencyclopedia.com/view_friendly.jsp?artid=34&letter
=T). We deliberately selected an older source to cite to make the point
that this credulous acceptance of the forward derivative nature of the
hermeneutic principles is a classic statement. Contemporary scholars rec-
ognize that in fact the principles are post facto means to associate rabbinic
view with Biblical verses, not to derive or extract any such content by
application of principles of logic to the Torah.

(18), Mekhilta (10) and Mekhilta of R. Simeon Bar Yohai (5). There is one usage in the Dead Sea Scrolls.[3]

By our preliminary reckoning there are at least 17 usages of the rabbinic term and concept *halakhah* in the early literature. Let us sketch these briefly.

I: A "*halakhah* of Moses" is a tradition handed down from Sinai. This is a statement of the authority and antiquity of a practice.

II: "The *halakhah* agrees with, accords with, follows, laid down by, stated by" a given source or master is a decision of law or practice in accord with a specified text or authority.

III: "X is a *halakhah* or the *halakhah* is X" denotes a statement of the law as it was decided or should be practiced.

IV: "A ruined, defective, wrong *halakhah*" refers to an improper decision of law or practice.

V: "…in the *halakhah*" refers to a matter that is part of the corpus of *halakhah*.

VI: "A word of *halakhah*; a matter of *halakhah*" denotes an identifiable mode of speech, rhetoric, or expression.

VII: "…through the *halakhah*" associates the term with a process of reasoning, law, or culture.

VIII: "The four cubits of *halakhah*" suggests that there is a realm of *halakhah* with its own ontological essence.

IX: "Study *halakhah*, elucidate *halakhah*, repeat *halakhah*" means that one may partake of the corpus, or from the culture or domain of *halakhah*.

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[3]We based this sample on the concordance of the Academy for the Hebrew Language, microfilm version.

X: "The *halakhah* follows the majority or group vs. the individual" is a statement of a more specified principle of decisions of law or practice.

XI: "To fix the *halakhah* (for the future)" suggests another way to express a statement of the law or practice.

XII: "The absolute *halakhah*, no discussion about its correctness (e.g., b. Ber. 31a)" shows that a legal rule about which there is no dispute is also referred to as *halakhah*.

XIII: "Knowledge of *halakhah* (anthropomorphized)" again makes reference to part of the corpus of *halakhah* as a realm with its own ontological essence.

XIV: "The *halakhah* in actual practice (e.g., b. Shab. 54a)" implies the term refers to an ethic or ritual practiced in a social context.

XV: "The *halakhah* decided by reference to practice" is the reverse of the process spelled out in the more common usages as above in categories I, II, III, etc.

XVI: "The *halakhah* accords with strict view or the lenient view" makes reference to external principles for determining the *halakhah* or decision of law.

XVII: "The *halakhah* as a ruling of a disciple against the view of his master" is an unusual bit of data showing how on occasion the text preserves a decision that contravenes the traditional nature of the rabbinic process (esp. cat. I).

If we were to arrange and comment on each of the instances where the text uses the term *halakhah* or *halakhot*, we would have no more than a further refinement of this categorization of usages. We would undoubtedly conclude that the conceptualization of *halakhah* as a system is not intrinsic to the earliest data. That notion derives from the analysis that later scholars associate with the data and the ideas that they impose a posteriori on the evidence. Indeed it is apparent that we have here an example of a living creative theological process within rabbinic Judaism that takes and expands upon

the malleable matter of the earlier ages and, in reworking it, keeps some of its contours and reshapes others.

4. Two metaphors of logic: linearity or chaos

Our present critiques have shown that what scholars claim to have found in the earliest texts concerning the term and idea of the *halakhah* does not properly characterize the evidence. The theories of historians and philologians fail to adequately describe the characteristics of the Talmud and of the *halakhah*.

We propose to reach far afield of our ancient religious texts and their standard modes of interpretation to find a metaphor for describing the way the texts took shape in their historical contexts. We suggest that the corpus of the Talmud be described as a chaotic system and that the related and derivative body of *halakhah* be seen as a more linear offshoot system of its own.

Those who construct models in mathematics and the sciences have come to recognize that more real-world situations than previously thought demand non-linear representations. Some commonly invoked examples of such in our real world include the dripping of a faucet or the movement or lack thereof of automobiles in a traffic jam.[4] Such examples are so rich in information they are difficult to characterize. That does not mean they are poor in order. It means that they are complex and may not easily be framed or reduced to linearity.

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[4] Professor Kevin Dooley of the Institute of Technology of the University of Minnesota graciously provided some keen insights on this paper. We reproduce them in our footnotes in this section, thereby providing the reader with a Talmudic dialectic.

Dooley points out to begin with, "Chaotic systems are complex, but not all complex systems are chaotic. The 'chaos' filter that you are using here is of much less value, and interest, than the 'complex adaptive systems' filter, or 'self-organizing' filter that could be used. It would be much more useful to look at the Talmud's progression as a self-ordered, evolutionary system, rather than to see whether its 'dynamics' – whatever they are – are chaotic or not."

Having just barely invoked this large theoretical construct, to now go on and use it as an interpretive tool, we advance this modest hypothesis regarding our issues at hand (cf. [4]):

> The realm of Talmudic thought behaves chaotically in some instances. It is generally non-linear, open, complex, "noisy" and process oriented. The domain of *halakhic* reasoning imposes upon this data from the Talmud an order bound to linearity, directed toward closure and decision, focused on simplicity of view, muting what is noisy, and oriented to essences rather than processes.

Some classical rabbinic images in fact project and clarify this distinction. The rabbis speak in their own well-accepted metaphors of the chaotic "sea of the Talmud" and the distinct and different linear "set table of the *halakhah*."[5]

We hereby have proposed to substitute for these classical images – to upgrade and modernize them to the metaphors of the complex system and the linear system. The heuristic value of doing this shows up as we spell out these newer metaphors drawn from mathematics.

Once we start to speak in terms of the theory of chaotics, we introduce into our discourse several additional components. In the mathematics of chaos, couplings between levels of the data are understood to be complex and unpredictable. The paradox of scaling in this universe of discourse is that different levels in the system may show self-similar attributes. At the same time, the chaos theory

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[5] Dooley responds: Herein lies the difficulty with using 'chaos' as a construct, even at a metaphorical level. Systems are not chaotic. Some attribute of the system may behave chaotically. Chaos is not an attribute of the system itself, but rather an attribute of the behavior of one of the system's attributes (observable phenomenon). If one wants to invoke the chaos metaphors of non-linear, complex, unpredictable, etc. one might be better off with some paradigmatic label, such as (nonlinear) systems, or complex systems, or self-organizing systems, or maybe even "pre-modern" (as opposed to modern and postmodern). I am being sticky in my definition, but even metaphors must be rigorous.

tells us that respective behaviors at those different levels may be highly coupled or not coupled at all.[6]

As in the currents of a sea, we may encounter unexpected evolutions and turbulent flows. Talmudic thought fosters this in the accepted paradigms of its textual expressions. By contrast, *halakhic* reasoning stifles the complex in favor of a deterministic sequence of authorities or columns of laws. It discourages unpredictable swirls in favor of what can be replicated and extended to more numerous situations.[7]

A further useful element for our metaphor from the theory of chaotics is the so-called "butterfly effect." This means that minute fluctuations in a situation within a system may be amplified into dramatic and large scale consequences. An example of this from common experience: A single car on the highway may swerve in the chaos of rush hour, engendering a multiple car accident and hours of delays in the traffic jam that may then ensue.[8]

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[6] Dooley notes: Coupling between elements of the system at the same level obviously exists – that is what makes it a system.

[7] Dooley comments: Here, one can draw upon great bodies of philosophy (rather than necessarily chaotic dynamics) to under gird the notions of determinism and randomness. The ancient writers were probably influenced by a certain indeterminate outlook, whereas the halakhics' writers were probably influenced by determinism. Chaos provided an oddity, because before chaos was discovered, deterministic systems were equated with predictability, and indeterministic systems were equated with unpredictability. Chaos showed one can have deterministic systems which were unpredictable, hence decoupling one epistemological stance from one's view of predictability.

[8] Dooley Comments: This metaphor has a lot of appeal, but a lot of problems. People – including myself – have been using the butterfly effect to explain historical dynamics of all sorts. Let me refer to a discussion in one of our research papers:

One could passively observe systems and see if they exhibit sensitive dependency. For examples, historians have observed certain "small" events leading to large effects (e.g. the start of World War One) and have claimed the butterfly effect. This is problematic in two ways.

First, sensitive dependency is global – the system must exhibit significant differences evolving from any two closely related initial states S_1 and S_2. In historical analysis though, only two states are observed – S_1 is the

In the Talmud, this notion of small movements causing large effects is a frequent part of the discourse. For instance, in one narrative, a simple query was asked by a single student, "Is the Evening Service optional or compulsory?" The result was the large effect of the deposition of the patriarch and the revision of the structure of the rabbinic system. In another case the Talmud insists that on account of a minute dispute between two individuals over a small matter of law led to the larger tragedy of the destruction of the Temple and the city of Jerusalem by the Romans. Such relations between small local causes and unpredictable major global effects are evocative of a prominent feature of nonlinear chaotics.

Yet another element of the theory informs us that movement in chaotic systems is determined by the effects on the elements by

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state of the system immediately before the event (the event has not occurred yet), and S_2 is the occurring event. Symbolically we could say $S_1 = 0$ and $S_2 =$ event. This only proves sensitive dependency with respect to these two initial conditions.

Because the system must exhibit sensitive dependency for all values of S_1 and S_2, this means one must compare system behavior as a result of event A and similar event B, for many different events A and B. This is conceivable in a simulation context, but impossible otherwise.

Sensitive dependency must also be shown to be exponential in nature — the resulting error due to differences between S_1 and S_2 should grow exponentially over time. What is often claimed to be sensitive dependency may in fact be a linear difference which has simply grown large with the passage of time.

Some other 'problems' with your analogy is that who is to say the question asked is 'small?' Compared to what?

The problem with using the butterfly effect is not so much in explaining the phenomena itself, but rather in what it implies. Certainly if we see butterfly, we can infer chaos. But if we incorrectly identify a 'snowball' effect with a butterfly, then we incorrectly conclude chaotic behavior. If I am supposed to give you a dollar, and instead I give you $1.01, after a million transactions, that small difference of a penny makes a big difference in the end result. However, the system is linear (1.01+1.01+1.01+...), not chaotic. The big difference exists because of a lot of 'events.' So, if I were to look at the penny grow into $10k and proclaim the system behavior chaotic, I would be misleading myself.

It is very difficult in social systems to distinguish true butterflies from lots of pennies added up.

certain recurrent patterns of "strange attractors" acting on the directions of the components. In the chaos of Talmudic thought these notions help us visualize the ways in which the corpus treats the Mishnah, and Scripture and the recurring characteristics comprising the charisma of the many individual rabbis.[9]

Further, actions within a chaotic system are described by reference to recursive symmetries. Across multiple levels these attain continuity through the repeated reference to the attractors. Our teacher, Jacob Neusner's studies of the tractates of the Talmud comes close to accurately characterizing these recursive harmonies in the chaotic Talmud. [10] He goes many steps further by showing that chaos in the system does not lead to entropy. He argues that Talmudic thought derives new energies from contacts in crucial cultural moments. He posits that tangential connections recharge, and even electrify Talmudic thought.[11]

Accordingly, we find it helpful to say that the rich information of Talmudic thought is guided by local recursive symmetries and references to the personal and limited attractors of the corpus.

By contrast, *halakhic* reasoning seeks global expressions and the freedom of anonymity, even transcendent authority. Above all, this legal process thrives on linearity. First principles lead to sources and those lead to authorities. These in turn bring us to later

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[9] Dooley Comments: An attractor is not an object nor a culture/value/ etc. The attractor, strange or otherwise, is the recurrent pattern of behavior. So, for example, someone cannot say leadership is an attractor. One could say though that a person's leadership behavior follows a certain pattern of recurrent behavior, described by a strange (or otherwise) attractor. If some characteristic of the Talmud exhibits behavior over time which tends to an attractor, then the attractor (pattern) has come about because of the shared values and cultures of the system's players, and their subsequent interactions. [It is] more pertinent to analyze the role of these players in the self-organization of the book.

[10] A selection of Jacob Neusner's relevant volumes of analysis are listed in the references section of this paper. He has published over 1000 books on the Talmud and related subjects.

[11] Dooley comments: What you are trying to explain via 'chaos' would be much better explained with emergent order via self-organization.

decisions so we may formulate a present statement that is simple and unequivocal.[12]

Rigorous mathematicians no doubt could object to our excursion into metaphor. The case could be made that in order to effectively use the chaos template one needs to isolate some trajectory of the system, some element/characteristic/behavior which changes over time. The argument could be made that we ought better to use the concept of "self-organizing systems" rather than chaos. We are uneasy with this alternative metaphor mainly because human rabbinic redactors do impose their notions of chaotic order on the system. We are not sure after all how a multi-generational literary system would organize itself.

We may be better served to retreat from the chaos metaphor and suggest that in theory Talmud is a complex adaptive system, a living system, an evolutionary dynamic, an organism of punctuated equilibrium or an emergent system. Selection of the best templates

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[12] Dooley disagrees: In order to effectively use the chaos template, one needs to isolate some 'trajectory' of the system, some element/characteristic/behavior which changes over time. I do not see that identified here. I do not know what behavior of the Talmud is claimed to be chaotic, and where the proof is ([it] does not have to be mathematical).

Instead, what I see you trying to describe is how a system was put together, how it grew and evolved, and why it looks like the way it does. Mimicking my earlier comments, the chaos language will not help you much here. Much better to go to the self organization/complex adaptive systems/living systems/evolutionary dynamics/punctuated equilibrium/emergent systems theory.

From a somewhat rigorous but nonmathematical standpoint, the best book would be *Order Out of Chaos* by Ilya Prigogine. For exposure to a huge variety of emergent systems, see *Out of Control* by Kevin Kelly. For a living systems perspective, see *The Tree of Knowledge* by Humberto R. Maturana and Francisco Varela. For a psychological perspective, see *Mechanisms of the Mind* by Edward deBono; also Gregory Bateson's, *Steps to an Ecology of the Mind* is pertinent.

One of the things that seems obvious when comparing these two works, that I do not see brought out explicitly, is the fact that the Talmud is highly contextual and the 'laws' are highly context-independent. This is a key difference between linear and nonlinear (complex) systems, and… a key difference between the feminist and masculine communication styles.

for comparison remains a task ahead for all who would pursue this line of inquiry.

5. Fractal conclusions

We have examined above first some common views of scholars concerning the idea of the *halakhah* in Judaism. We then explained why their methods failed to account for the main philological and historical evidence regarding the term from the Talmudic texts. Then we suggested a heuristic explanation that the logic of the Talmud defies linearity can be productively discussed using chaos theory.

Perhaps even more intuitively, we shall conclude that the Talmud may be compared metaphorically to fractals. A fractal image emerges when a single equation is applied to some initial condition and the outcome is a colored point of complex patterns.

We have the basic components for making an imaginary fractal out of the texts of rabbinic Judaism: *miẓwot*, *middot*, truths, and values, applied in different contexts by various authorities leading to differing colored and complex results.[13]

We close with some certainty that the chaotic Talmud needs to be better imagined before one can understand the details of the logic of its more linear offshoots, the tomes of *halakhic* reasoning.

Last, we believe that this more rigorous theoretical exploration and more detailed philological textual analysis of our cultural constructs of both Talmudic thought and *halakhic* reasoning advances

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[13] Dooley suggests an expanded metaphor: If you look at one of the fractal images, the way it emerges is that a single 'equation' is applied to some 'initial condition,' and the outcome is recorded as some colored dot. Metaphorically, we have some simple set of rules, truths, commandments, values, being applied in different contexts, leading to different results. So yes, there are some small set of 'rules' which hold throughout, which from your discussion appears to be what the 'LAWS' were trying to capture. But as these laws are applied in different contexts, different interpretations emerge which are context dependent, which appears to be what the Talmud is about. So it would seem that in a strong metaphorical sense, the Talmud is fractal. (Systems which self-organize often have these fractal characteristics).

our admiration for the great contributions of the past and helps us find the greatest ultimate theoretical meaning of all – to know more intimately the intentions of the one who first brought order out of primeval chaos and utter void.

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