

Mishnat ha-Middot

משנת המדות

[The Treatise of Measures]

(c. 150–850 CE)

by Unknown (earliest extant Hebrew geometrical treatise).

The 1864 edition attributes it to R. Avraham bar Hiyya ha-Nasi, but the text predates him; authorship and date are uncertain — proposals range from the Tanna R. Nehemiah (c. 150 CE) to a ~9th-c. origin (Gandz).

Translation by Scott Weisman



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Translator Version 2

Upright reason dictates that the recipients of the good, of whatever type and level of beneficence it may be, must show gratitude and blessing to the beneficent person in every way possible, commensurate with the value of the beneficence. And one who has benefited all the people of the world — for example, one who invented a new instrument for the good of the world, or a good book — it is fitting for every discerning person, out of the obligation of love of fellow beings, to at least purchase it, so that the man will profit and his heart will be encouraged thereby to invent yet more good instruments in the world. And similarly, all other wise-hearted people will likewise strive and exert themselves to invent good things and instruments needed for the repair of the world and its perfection.

And therefore, whoever says: "What do I need this new instrument for?" — he does not act well towards the world. For if not for the man who invented it, where would you be? And what would your city do? And more than this, if the man did not exert himself, what would the world do?

— R. Pinchas Eliyahu Hurwitz, Sefer HaBris HaShalem (1797)

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A NOTE ON THE WORK

The earliest known Hebrew treatise on geometry — a concise practical manual of mensuration covering the areas and perimeters of plane figures, the measurement of circles and segments, and an early value for π . It is built from terse measurement rules, each tied to a labeled geometric figure and a worked numeric example. Its date and authorship are debated, with scholars placing the archaic core anywhere from the Mishnaic period to the Geonic era. This volume presents Moritz Steinschneider's critical edition (Berlin, 1864).

A NOTE ON THE TRANSLATION PROCESS

This translation was produced with the translation-pipeline. See the linked repository for details on the process.

A note on the references. A scriptural or bibliographic reference given in brackets or parentheses is, in most cases, an editorial identification of an allusion rather than a citation printed in the source. Books of this kind quote and weave scripture constantly without naming it, and the identification is supplied here as a convenience to the reader. Where the source does print a reference of its own, it is given as printed. An identified allusion is not evidence that the author cited that passage — look at the original before resting an argument on one.

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ACKNOWLEDGEMENTS

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Title page

[At the head of the page, an oval library ownership stamp (Hebrew, partly legible): "ספריית... חברי / יצחק... /... / U.S.A." — a synagogue/society library stamp.]

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משנת המדות [Mishnat ha-Middot — "The Treatise (lit. Mishnah) of Measures"]

MISCHNAT HA-MIDDOT

[German:] the earliest geometrical work in the Hebrew language,
together with

Epilogue of Geometry

by

Abraham bar Chijja [Avraham bar Hiyya].

For the seventieth birthday of Master Zunz

(10 August 1864)

edited from manuscripts in Munich and Rome

by

M. Steinschneider.

[A decorative rule/ornament across the page.]

Berlin. A. ASHER & COMP. 1864.

Dedicatory letter and introduction

[German throughout. The page is set in small type and is in places ink-degraded;
the translation follows the legible text.]

To Dr. L. Zunz.

Most honored friend!

You will not measure the warmth of my congratulations on your day of joy by the size of this little book. Nor is it the task or intention of a student to instruct the master! Rather, I hope, by publishing an old work hitherto thought lost, to give you occasion for fresh insights, and so to earn, indirectly, the thanks of the inquisitive. To the so-called Baraita of Samuel — on which you recently dealt so thoroughly (*Hebräische Bibliographie*, 1862) — there attaches itself, by its mathematical content, the so-called Mishnah of the 49 Middot [measures]; and it requires still more that combination of factual and literary knowledge which very few possess. The history of secular learning among the Jews would indeed deserve, both on account of its general bearings and as an essential component of Jewish cultural history, more independent treatment than it has so far received.

The account I owe, as editor, of the means I have employed — that, unfortunately, I shall be able to discharge only too quickly. The "Mishnah of Measures," in five chapters, containing only 42 propositions in all — perhaps incomplete, perhaps merely divided differently (§§ 4–6 of chapter V were counted 5–7 in the manuscript; perhaps § 3 is to be split?) — I discovered two years ago in the remarkable MS 36 of the Munich Library (cf. H.B. No. 28, p. 107; No.

40, p. 84), which is indeed very incorrect at this point; but here there was certainly no other manuscript to wait for. I have left the text unaltered apart from a few unambiguous scribal errors; for less practiced readers I have added punctuation, and I have placed the conjectured corrections or supplements in brackets.¹ By contrast, I have in no way ventured upon the badly corrupted, scarcely intelligible chapter V. Several specialists whom I consulted about it were unable to decide how far it speaks of solids or of surfaces. I add here further—

Introduction, continued

[German, with embedded Hebrew terms.]

—here two figures which the manuscript contains in the margin of V, 1 and 3,² whereas the preceding figures — belonging to III, 2, 3, 4, 5 and IV, 2, 4, 9, drawn partly inaccurately and in the wrong place — do not aid understanding.

In several respects the terminology is noteworthy; from it an alphabetical selection may here follow:

- גג (gag, "roof") = surface, plane; מרובע (meruba) — [also listed below]
- גוף [recte גוף, guf] (II, 5) = body, solid
- דופן (dofen) (II, 8) = side
- זווית (zavit) = angle
- ישרה (yeshara) (III) — right (angle)
- עקומה (akuma) — curved/bent (line)
- חדה (ḥada) or צורה [צורה?], פתוחה (petuḥa) or רחבה (reḥava) (both V, 10) — right, oblique, acute, obtuse [angle]
- חוט (ḥut, "thread/cord") — diagonal
- חלק s. (cf.) שוה
- חלק על (ḥalek al) (piel, II, 4) — to divide by
- חלק מן (ḥalek min) — to subtract (II, 9)
- חץ (ḥets, "arrow") (I, 5; II, 4) — sinus versus (versed sine)³
- יסוד (yesod) (V, 5) — the square; cf. עיקר [עיקר]
- יתר (yeter) — chord (Sehne)

¹[Footnote 1, German, small type — partly degraded.] The citation from I, 1, 2 in Comtino (Litbl. d. Or. I, 158; Geiger's Wiss. Zeitschr. V, 457) offered, alongside poorer readings, only one probably better and one doubtful. — At I, 8 the MS had במדה האחדים מדה ["a measure of units"(?)] (correctly II, 4[?]); II, 2 העומר (correctly II, 4). II, 11 אתה מי'שרת מרת — I further note: II, 1 הרחב seems superfluous; — מדד [6]; במדה 1.; והמודד / והמודע 1.; מכיל 1.; משוך 1.; החבל 1.; הגדול od. הכל 1. [II, 1 corrections — abraded small-type apparatus, transcribed per legible glyphs] [?]. — chapter III, 5 ממחשבה recte מחשב מחשב אותה vielleicht [perhaps]; II, 7[?] שלישים is naturally $\frac{1}{3}$. — III, 5 ממחשבה [perhaps] מר מחשבה[?], or מחשב; — IV[?] בון [?] perhaps refers to the figure of a quadrilateral divided into 2 triangles. — IV, 2 [?] has 2 dots, perhaps deletion marks. — 7 ∴ a lacuna-mark? — IV, 10 recte והמחשבה [Several individual word-readings in this footnote are flagged in the source itself as conjectural; the Hebrew tokens are abraded in the scan and are transcribed only where legible — [?].]

²[Footnote 2 is the figure-block transcribed in the diagram above.]

³[Footnote 3, German:] Arabic سهم [sahm]; see Sédillot, Mémoires de l'acad. T. I, p. 219.

- ממוצע (memutza) (II, 7) — opposite (Gegensatz) of חד [?]
- משיחה (meshiḥa) — area (Areal), dimension in general⁴
- משוך (mashukh) (II, 7; cf. I, 3) — tapering (of pyramid, cone)
- סיבוב (sivuv) and סביבה (seviva) (V, 3) — periphery, circumference
- סוף (sof) (II, 7) — [terminus]
- ראש (rosh) — apex, point (Spitze) (cf. Abr. b. Chijja, p. 90, n. 14)
- עגולה (agula) — circle (Kreis)
- עולה (ola) — product, result (Facit)
- עמוד (amud) — height (Höhe), but at II, 9: column (Säule)
- עקר [עיקר] (ikar) — root (Wurzel)
- צלע (tzela) — side
- שני צ' [sh'nei tz[ela]] — pair of sides (Seitenpaar) (I, 3; III, 3)
- צרף בתוך (על) (tzaref betokh / al) (po'el) — to multiply by
- מקובה (mekuba) (II, 8, 9) — vaulted/arched? (gewölbt)⁵
- קבע (keva) — base-lines (Grundlinien)
- קטוע (katua) (II, 9) — truncated (abgestumpft)
- קשוחה (kesuḥa) — [Kreisabschnitt — circular segment]
- מחשע בה [?] — [abraded glossary token; a second reading of the leaf, taken without sight of the first, gives מחשע (chet), not the earlier "מתשע" (taf); sense uncertain] [?]
- מרבעה (meruba'a) — quadrilateral, four-sided (Viereck) (I, 8, alongside מחשע [?])
- שבורים (shevurim) — fractions (Brüche)
- טרובע ¼ [רובע ¼] (I, 8, alongside רובע) — quarter
- שוה (shaveh) — of the same kind, alike (gleichartig); opposite of חלוקה / מחלף (hiluf / mahlef) (II, 15; IV, 8)
- משלשת (meshuleshet) — triangle (Dreieck)
- שפלה (shefela) — flat, low (flach) (V, 3)
- תל (tel) (II, 8; V, 2) — mound, hill (Hügel), and hence תלולה (telula) — [raised/conical] (opposite of שפלה?)⁶

To the phraseology I further single out והרבה תבואתה בה (II, 2; cf. יש בה [ve-yesh ba], פנים רבים [panim rabim], II, 4).

As material for historical criticism I have also appended the well-known references (enriched by a new one).⁷ If references Nos. 5–7 seem to be related to our little book only by misunderstanding, then the latest conjectures of Geiger⁸

⁴[Footnote 4, German:] Arabic مِسْاحَة [misāḥa]; cf. HB No. 28, p. 109; No. 40, p. 12; p. 92, note 20.

⁵[Footnote 5, German:] In the case of this word, late Hebrew competes with the Arabic.

⁶[Footnote 6, German:] Cf. הצורה המשולשת והמרבועה והעגולה והנכבסת [הנכנסת] "the triangular and the quadrilateral and the circular and the inscribed[?] and the simple and the dividing figure" in Saadia (HB 1862, p. 109).

⁷[Footnote 7, German:] The citation in Jacob b. Simson (Bl. 1123–42, Catal. p. 2033) is unfortunately not accessible to me, likewise Jos. Kara on Kings, probably identical with Nos. 3, 4 — the latter perhaps originally belonging to the preceding words of Rashi?

⁸[Footnote 8, German:] Wiss. Zeitschr. VI, 28 (cf. Catal. l.c.; cf. jüd. Zeitschr. II, 68).

stand not much better than the older hypotheses that proceeded from those citations. The Middot evidently aim, first of all, at a brief (and wrestling with the Hebrew idiom) presentation of the most important geometrical theorems; and almost everywhere the occasional reference to a biblical passage⁹ appears to be midrashic, with—

[The introduction continues into the following pages.]

Diagram. Two small woodcut figures reproduced in footnote 2, taken (per Steinschneider) from the margin of the manuscript at V, 1 and V, 3. To the right (read first in this right-to-left work): a tapering, roughly triangular/conical figure (a "mound," *telula*). To the left: a rectangle with an internal label and an external label below.

Right-hand figure (the conical/triangular *tel*):

- תלולה (*telula*, "raised/mound") — label at the apex (top)
- חל יה [חליה? *hulya*] — label inside, at the middle
- כחל (*kaḥal*) — label at the lower-left vertex

Left-hand figure (the rectangle):

- חלי הכבינה — label inside the rectangle
- קרן (*keren*, "corner/horn") — label centered below the rectangle

⁹[Footnote 9, German, with Hebrew:] I, 2: Exod. 27:1; — I, 3 ימין ויבין [*yamin ve-yavin*], if correct perhaps following 1 Kings 7:21; further Isa. 54, verse 3, probably with reference to verse 2; Judges 16:26, the עמודי התורן [*ammudei ha-tavekh*, "central pillars"] as cross-beams? — בזוית למקצעות [*be-zavit le-miktzoot*] Exod. 36:28, cf. 26:23, is unclear; I, 5: Ezek. 1:28, Isa. 21:15, Ps. 11:2; — II, 6: Isa. 6:2, the angels' wings.

Mishnat ha-Middot (The Treatise of Measures)

[Editorial apparatus — conclusion of Steinschneider's Introduction, German]

[The following two pages are the close of Moritz Steinschneider's German-language introduction. The primary Hebrew treatise begins on PDF p. 6; the boundary is marked below.]

Only the passage V, 3 cited by Sabbatai Kohen contains a genuine application — to the so-called "Molten Sea" of Solomon, to which the views on the quadrature of the circle attach. Our little treatise has the formula $22/7$ [the ratio of circumference to diameter], from which the one for area is also derived (II, 3; V, 3; cf. the end of II, 12): $d^2 - [3/14]d^2$; it recalls the conclusion of the geometrical treatise of a certain Abu-Bekr, called Heus or Dens (?), in the Latin translation of Gerard of Cremona:¹⁰ [Latin: Sed si vis multiplicare diametrum in se et minue septimam eius quod aggregatur, et medietatem septime; et quod remanet in duas tertias diametri huius multiplica et erit mensura magnitudinis eius — "But if you wish to multiply the diameter by itself, and subtract a seventh of what is gathered, and the half of the seventh; and what remains, multiply by the two-thirds of this diameter, and it will be the measure of its magnitude."]. If, then, Rashi and Tosafos (Citation 1) really do appeal to our little treatise for the value $1/7$ [recte: the talmudic figure] in the Talmud, one must then presuppose in their case what Maimonides (on Eruvin I, 5; cf. Hebr. Bibl. V, 132) expressly remarks: that in the Talmud it was a matter of a round number, without ascribing to the ancients a more exact knowledge with such precision as Abraham bar Chijja, in whom such things are characteristic.¹¹

For the question of time and place — that is, the connection of our text with Arabic science — the expression חק [heq] is especially to be noted. As for the formula for the area of the triangle with the examples 13, 14, 15 (IV, 9), it appears from Heron onward, in particular in a little treatise of the sons of Musa ben Shakir, who were doubtless well known to the Jews too.¹² Whether the passage I, 8 presupposes the decimal system with positional value, and what follows from it, likewise requires investigation.¹³ Finally, as for the author-name Natan — whose authority rests in the end only on Ibn Ezra — our manuscript does not offer it even in the best-known passage V, 3, into the heading of which this name has perhaps strayed; whereas Sabbatai b. Malkiel, for the words לפי שאמרו בני ארץ בעגולה ["because the people of [the] land said, regarding a circle..."], has the words אמר ד' נחמיה ["Rabbi Nechemiah said..."]. If the latter,

as Geiger (*Ztschr.* V, 457) conjectures, is a false resolution of the abbreviation ר"נ, then בני ארץ could likewise have arisen in a similar way; but I here deliberately refrain from any conjecture.

Enough of riddles, for whose solution other manuscripts would be very desirable; such might perhaps still be sought in Turkey, to which the most recent traces point (Comtino, Sabbatai b. Malkiel, and the manuscript copied at Constantinople around 1480).

¹⁰⁾ In Boncompagni, *Della vita etc. di Gherardo*, p. 54; cf. *D. M. Zeitschr.* XVIII, 168. — This Abu-Bekr I have unfortunately not yet rediscovered with certainty, and conjectures would lead too far afield here. — 22/7 is given by the Indian *Lilavati* and the Arab Muhammed b. Musa el-Chowarezmi; see Chasles (*Sohncke*), *Gesch. d. Geometrie*, p. 509.

¹¹⁾ Cf. ס' העבור [*Sefer ha-Ibbur*], p. 37.

¹²⁾ Chasles (*Sohncke*), *Gesch. d. Geom.*, pp. 465, 481; Sédillot, *Proleg. d'Olough Beg*, p. 246; Boncompagni l. c. p. 64 and *Della vita etc. di Leon. Pisano* p. 61 and 64; cf. also *Hebr. Bibl.* N. 40, p. 90, note 12. The Beni Shakir cite Heron (Iranus); see *Comptes Rendus* XIII, 511 and *H. B. l. c.* note 19.

¹³⁾ With regard to the most recent research on this subject, I refer, for brevity's sake, to Th. H. Martin, *Les signes numéraux etc.*, Rome 1864; cf. also *Jüdische Literatur* (in *Ersch & Gruber*), p. 442, note 88.

Concerning the appended epilogue of Abraham bar Chijja, I refer, for brevity's sake, to the treatise in the *Hebräische Bibliographie* N. 40, and merely remark that I let it begin where the Latin translation of Plato of Tivoli leaves off. I have taken as my basis the much better and more complete Munich manuscript (M.), to which the leaf-number 100 etc. refers, with careful indication — enclosed in parentheses — of the variants of the Vatican manuscript (V.), whose exact tracing I owe to the generosity of Prince Boncompagni in Rome; rarely does the Munich [manuscript] offer corruptions, which I have set, by way of example, in parentheses where I had to follow the text of V. alone.

BERLIN, August 1864.

[Primary Hebrew treatise begins]

תּוֹדֶמֶת הַנִּשְׁמָ (Mishnat ha-Middot)

Chapter I [פרק א']

1. By four methods is measurement comprised, and these are they: the rectangle [מְרוּבַּעַת], the triangle [מְשׁוּלֶשֶׁת], the circle [עֵגוּלָה], and the bow-shape [קְשׁוּתָהּ / circular segment]. The rule is: the second is half the first, and the fourth is half the third; and the rest of the [other figures] [הַצּוּרוֹת] are combinations of these — [marginal note: "...so [צ"ל בכריות] — recte perhaps 'by combination'"].

2. The rectangle has three constituents [lit. "faces"]: side [צִלְעַ], cord [diagonal — חוּט], and roof [area — גֵּג]. Now this — the side [צִלְעַ] is what holds [bounds] the walls/panels [רֹפְנוֹתָיו, recte דּוּפְנוֹתָיו] of the figure [the roof — גֵּג], as it is said, "the altar shall be square"; the cord [חוּט] is the divider [הַמַּפְסִיק]; marginal: המהדק — "the fastener / holder" — running from corner to corner, end to end — it is the longest of the three [recte]. The roof [גֵּג] itself is the area [מְשִׁיחָה].

3. The triangle has three constituents: two sides [shown as "second side" — בַּשְּׁנֵי בַצִּלְעַ (sic)], the base [קְבֹעַ / קִבְעַ — base], and the roof [area]. For this — the two are drawn [slanted], a right and a left, of which there are two; they are [the] two sides set upon it, of which there are two, upon which the structure stands firm. The base [קִבְעַ] is that which the two sides [rest on between them]. The perpendicular [הַעֲמוּד — the altitude], which descends between the two sides to the base, is the [angle?] [זוּיָת] — "the corners of the tabernacle" [לְמַקְצַעוֹת הַמִּשְׁכָּן]. The roof [גֵּג] itself is the area.

4. The circle has three constituents: circumference [סְבִיבָה], cord [diameter — חוּט], and roof [area]. The circumference [סְבִיבָה] is the line that encompasses the circle, of which there are [these] — a line of thirty cubits "encircled it round about" [a line of thirty cubits to go around it]. The cord [חוּט / diameter] is that which is drawn [across], from edge to edge [from its one lip to its other lip]. The roof [גֵּג] itself is the area.

5. The bow-shape [הַקְשׁוּתָהּ — circular segment] has four constituents: arc [קֶשֶׁת], chord [יֵתֶר], arrow [sagitta — חֶץ], and roof [area]. The arc [קֶשֶׁת] is a portion of the circle, of which there are [these]: "like the appearance of the bow that is in the cloud." The chord [יֵתֶר] is that which holds the two ends [mouths] of the arc [its two drawn ends — שְׁנֵי קֶשֶׁת דְּרוּכָה]. The arrow [הַחֶץ — sagitta] is that which is drawn from the middle of the arc to the middle of the chord, of which there are [these]: and they [the two halves] are set, signed [aligned], upon the chord. The roof [גֵּג] itself is the area.

6. How do you measure [know] the area [הַמְשִׁיחָה] by the count [calculation]? It is one upon one [unit by unit]; that is the area [הַמְשִׁיחָה], and it is one cubit

by one cubit. You find a roof [גג] equal in its sides and its corners, and you indeed count them — units on every side, and corners [of] two [each side]; and its measure [is found] computed: four units in the measure [scale] of one [cubit] — that is, "[a square] one cubit within one cubit" [a cubit-square, one within one]. And when it [each side] is three [ג' here, see note], each side is then nine [ט'] units in the scale of one; and likewise three by four [ד' על ד' — see note], and four by five [ה' על ד' — see note]; and so [ה' על ה']. From here onward, go out and reckon by this scale and upward [for larger figures].

— **

7. As for the divisions [the parts — הפחותין]: thus you divide [it]. One cubit by [its] two cords [diagonals/lines — חוטיין], and the divider [recte: המפסיק — "the partition"] [divides] them [the figure]. This: in the middle, [from] the side of the right to the left side [marginal: שמאל], and likewise top to bottom; [thus] you find the roof [area] divided into four sections [פסקאות], and you take out [extract] half a cubit by half a cubit — its area [משיחה] being its own [self-]division [צמה חלק]. [Half a cubit?] [מ' ?] — what is a quarter of every [unit] [רבע מכל ד' / רבע מכל צד] "a quarter of each side"; and likewise a third by a third [שליש על שליש], and a fifth within a fifth [חומש בתוך חומש], equal[ly] [בשויים] and in alternations [ובחלופים]. From here onward, go out and reckon the broken [fractional] parts [שבורים] by this scale and downward [for smaller figures].

8. They have already said: "half by half" is a quarter [רובע]; and likewise "a third by a third" is "a ninth" [תשע — i.e. 1/9], in them being equal[?] [בהן] [marginal: בדומין להן אלא] — in equality [בשוין] and in alternations the divisions belong to them — [marginal: אב אהוא]. Thus you count [ten] [עשרה] by ten — they indeed amount to a hundred [ק' = 100]; and half of [ten] [the ten — חצי העשר] is five [ה' = 5], [and] five times five are twenty-five [כ"ה = 25], and that is a quarter of a hundred [רבע ק' = 25, i.e. one-quarter of 100]. And the position [scale-rank] of ten [מעמד י'] comes [yields] [a hundred? — מעמד ה' בא]; and the position [scale-rank] of the hundred [מעמד הק'] [is two — ב' — and a thousand: ואלף בק] "and a thousand by hundred". From here onward, go out and reckon the broken [fractional] parts by another scale; but [for] others, it [the count] adds, and in the divisions it [the count] diminishes [הוא גורע].

9. The rule is: "half by half" is "half the half" [חצי המחצה], and "a third by a third" is half [recte: a third — צ"ל שליש] of the third [השליש]; and likewise "half by a third" is half the third [חצי השליש], and likewise "a quarter by a third" is a quarter of the third [רביע השליש] — in them and their like, equally and in alternations.

Chapter 2 [פרק ב']

1. He who wishes to learn the measures [areas] of rectangles, equally and in alternations: let him join the length to the breadth, and what arises from the

two of them is the breadth [recte? — רחב?] [marginal: ?] — that is the area [המשיחה].

§2 (continued). ...And [for] a triangle, whether equal-sided or in alternations [scalene]: join the perpendicular to half the base, and what arises from the two of them is the area — multiply it well by this.

§3. A circle — how? Join the cord [diameter] within itself, and cast out from it a seventh and half a seventh, and what remains [Steinschneider: read והנותר] is the area. For example: a cord that is 36 [ל"ו] — its product is [?]; and when you join [add] 49 [מ"ט] and half a seventh [וחצי שביעי], you find the area to be $38\frac{1}{2}$ [ל"ח ומחצה].

§4. The curved figure [arc/segment] — how? Give the arrow [sagitta] to the chord, join it within itself, take half [the chord] at once, and join it within half [?] [the chord]; multiply [?] and set them aside. Then take again half the chord, join it within itself, and divide by 14 [י"ד], and what arises, add it to the standing one [the prior result]; what arises is the area. And there are other ways for it.

§5. He who wishes to learn [the area of] the surface of a rectangle, even though it is equal-sided [a square] — that is, it being length and breadth and depth [?] : the surface, by the count of its six faces — six panels in all — join the length within the breadth within the depth, and what arises from the three of them is the area of the surface, and that is the solid [body].

§6. And if it was a circle or a triangle or any of the various kinds — provided that it be a straight, fitting line [?], from which [from where] does one measure the surface that is measured [?] [Steinschneider queries this clause] — join it within the depth, and that is the area of the solid.

§7. And [for] one whose head and base [top and bottom] are drawn through the middle [tapering], even though it be a rectangle or a circle or a triangle: you measure the area of the solid, cast away two thirds of it; one third remains [Steinschneider: read השליש], and that [Steinschneider: read והוא] is one [?] — then join it within the height, and what arises is the area of the solid from head [Steinschneider: read מראש] to base.

§8. One must learn that [a body] hollowed [?] only [partly] — whether it be a sphere or the like of it — join one of the cords [diameters] from edge to edge within half another [diameter], and what arises from the two of them is the area.

§9. A standing body [column]: if its head and base are drawn or its head drawn to half the hollow [Steinschneider: read הקובה / queries המקובה?], or however it may be [?] [Steinschneider queries]: at its end, and as for its being cut off [truncated] — that it is cut off at the head — divide that according to the measure of the end and its measure [?] by the calculation of the latter [?], and cast away the small from the cord [?] [Steinschneider queries מן החבל]; and what remains is the area of the column.

§10. How? For example, a standing body, a quadrilateral, its base 4 cubits [ד' אמות] within 4 cubits [ד' אמות], deficient [tapering], rising [to] a deficient

[smaller] square of 2 cubits [שתי אמות]; and you must know how much is its area and how much is its [other measure]. Now, the etrog-shape [taper] was already spoken of [in the latter, Steinschneider: read באחרון] — only [here] it is cut off level [שו קטוע]; and as yet you do not know how much the standing body is until it terminates at one head [?] [Steinschneider queries וחד] above.

§II. From where do you measure it? You said: the two are 4 [?], and from the length of the standing body, which is half a cubit [?] [חצי מעלה reads "half a step/degree"], it is found that the whole [length] from the head — twenty cubits up to where it terminates [tapers] — twenty cubits up to the truncation: 10 cubits [אי אמות]. This you have learned: the measure of two out of four-fold [?] [פרת] is 10 out of twenty [מי מן העשרים].

§I2. One must take a third [of] its head [top] and join [it to] the end with [Steinschneider: בט"ז] — they are five [יה] and a third — and join it within [?]; that is [Steinschneider: כט"ז] and they rise to 106 [ק"ו] cubits and two-thirds of a cubit [עולים ק"ו אמות ושני שלישי אמה]; and the second [?] thirds, 9 [ט] — how much [?]. You set them aside. Then take again a third [of] the truncation, 3 [ג] of [?] 3 [ג] — that is the line [צד], a third — join it within the ten [עשר] upper cubits, they rise to 53 [נ"ג] cubits [?], a third. Cast away from it [the result] thirds; there remain there [שם] 79 [ע"ט] and a third —; cast away from them thirds, there remain there 309 [ש"ט] and a third — and that [Steinschneider queries בבאתן]. The column being truncated: if it is a circle, cast from it a seventh and half a seventh; what is foreign [the remainder, Steinschneider: read והנשאר] within it [Steinschneider queries בו] is [the area, Steinschneider queries המשיחה].

Chapter 3 [פרק ג]

§1. There are five kinds [of figures] among the quadrilaterals, and these they are: There is one that is straight [equal] in its sides and in its angles. §2 [ב']. And there is one that is unequal [varied] in its sides and straight in its angles. §3 [ג']. And there is one that is straight in its sides and unequal in its angles. §4 [ד']. And there is one that is straight in its sides and in its angles but its two lengths are equal apart and its two breadths apart [a rectangle: opposite sides equal]. §5 [ה']. And there is one that is unequal in its sides and in its angles altogether [an irregular quadrilateral].

§2. The one equal in sides and in angles [the square] — which is it? For example, [a side of] ten [עשרה] out of [?] [Steinschneider: read מן [כל]]: join length to the breadth, and what arises is the area; they are 100 [ק']. And one side is the root [base] of the other; and its two sides are the two roots [bases]. So too 3 [ג'], and so too 4 [ד' — i.e. ד', 4].

§3. The one unequal in its sides and straight in its angles [a rectangle] — for example, [one side of] 8 [ח'] in its two sides [breadths] and six [ששה] in its two [other] sides [lengths]: join length to breadth, and they are 48 [מ"ח], that is the area. It is straight in side, straight in line [Steinschneider queries 'בווי? "in angle"]].

§4. The one straight in its sides and unequal in its angles — which is it? For example, [one in] which every side is 5 [ה'] [?]; and its two pairs of opposing angles, and two acute angles [?]; and two cords [diagonals] divide it, this one and that one, the one in the middle being 8 [ח'? — reads "the first 8"] and the second [from] six [מששה]. He who wishes to learn [its area]: join one of the cords [diagonals] within half its fellow, and what arises from the two of them is the area — 24 cubits [כ"ד אמה], like this.

§5. The one unequal in sides and in angles — its two lengths apart and its two breadths apart, and the angles being non-standard [?] — how? By calculation [Steinschneider: sic on the spelling]: cut it [the quadrilateral] into two angle by angle [along a diagonal]; set up two [triangles] and reckon each one by itself, [for] you have said: it is a triangle — so that is the area. So too you measure the calculation of an [irregular] quadrilateral in every kind by cutting it into two. The unequal quadrilaterals whatever is done [?] [Steinschneider queries עשה?]: their thirds [?], the various ones, in every kind, [are reckoned] like this, by cutting into two.

Chapter 4 [פרק ד]

§1. There are three kinds among the triangles, and these they are: the upright [right-angled], the acute [sharp-angled], the open [obtuse-angled]. Which is the upright? It is the one whose two cut sides [the two legs about the right angle] are joined, each by itself — that is, the first, for example: six [from] this side and eight [from] that side [Steinschneider: read **שש מצד זה ושמונה מצד זה**]; and what arises [from] these — each by itself in its own right, this one a hundred [מאה] and that one a hundred [מאה]. And one must learn [Steinschneider: read **וצריך** "and join"?]: join [?] of the cut sides within half its fellow, or 8 within 3 [י"ח בתוך ג] or 6 within 4 [י' בתוך ד], and what arises is the area.

§2. And the angle that stands between the cut sides [legs] is the upright [right] angle, and it is the half [quarter, **חצייה**] of a square that is unequal in sides and straight in angles [i.e. a rectangle]. He who seeks to reckon it: reckon the standing-body [the figure] in the manner of its way [as it lies]; and it is its two cut sides being its legs [Steinschneider queries], and they are like upright pillars [props].

§3. And the column [perpendicular] is drawn from them to the long side [Steinschneider queries **ונפל** "and falls"], and it is fixed. He who wishes to learn [its area]: join the column [perpendicular] within half the base, and what arises from the calculation is the area.

§4. The acute-angled [triangle] — how? Its two sides are cut, or [Steinschneider: **השווים** "equal"], each joined by itself [squared]; the second side that is fixed [the base] is joined by itself, the first joining [Steinschneider: **הצירוף**] being larger than the last. And there is, of the acute-angled, that whose sides are straight [equal]. He who wishes to learn — set it [the perpendicular] against the base, find the upright [right] angles — [reckon] the measure of the first by the measure of the last, the sharp [acute] ones being [Steinschneider: sic] its legs.

§5. He who wishes to know the measure of the column [perpendicular] of a triangle of equal sides [equilateral]: join one of the sides within itself [square it], cast away the smaller [part] from the larger, and what remains is the foundation [base] that is found in [Steinschneider's text breaks] the column [perpendicular].

§6. How? For example, ten upon ten [$10 \times 10 = 100$, **ק עשרה על עשרה**], and half the second side, which is 5 [ה'], joined by itself: cast away the smaller from the larger — there remains there 75 [ע"ה], and that is the foundation [base], and its root [square root] is 5 [ה'] [Steinschneider: read **ח**, i.e. 8] and [some] thirds. And one must learn: join the foundation [base] within half the lower [base] side, and what arises [Steinschneider: read **היא** "it is"] from [it] is the area, which is 43 [מ"ג] and thirds.

§7. Seven other kinds among the triangles [Steinschneider: read במשולשות]: equal in its sides — every side and side * being seen [reckoned] by itself, you say of this one as you say of that one [Steinschneider: read [וה] של...[וה] של]; and one who understands an apple [Steinschneider queries תפוח? "apple-shape"]: join one of them by itself [square one side], they are 100 [ק']; cast away the quarter [רבע], which is 25 [Steinschneider: read כ"ה], and there remains 75 [ע"ה]. And one must learn: join 75 within [?]; cast away [?] the quarter [רבע], which is 25 [Steinschneider: read כ"ה], and there remains 75 [ע"ה]; and they [the three sides squared?] are 1058 [?] and grasp the root [square root], which is the area, which is 43 [מ"ג] and thirds. From here you find the column [perpendicular] to be half the base, [the area being] 61 [ס"א] falling forever [never resolving].

§8. Behold, [for] the equilateral the [perpendicular's] extraction is alike, and so its like; but [for] alternations [scalene triangles] you have no straightforward path from them by the calculation of the area; and one who is exacting with them sets [computes] the two legs between the column [perpendicular] and the base.

§9. How? For example, a triangle of alternations [scalene] that is acute-angled, [one of] 15 [ט"ו] from the first side, 14 [י"ד] from the second side, 13 [י"ג] from the third side. One must hold all three at once — they rise to 42 [מ"ב]. Take the half, and see how much it exceeds the first side; join the half to the excess over the first, which is 6 [ו'] within [?] — they are made 126 [קכ"ו]; set it aside. Then take again

the half and see how much it exceeds the second side; join the excess, which is 7 [ז'] [21 - 14 = 7], within [?] — they are 882 [?]; set it aside. Then again take the half and see how much it exceeds the third side; join the excess, which is 8 [ח'] [21 - 13 = 8], within [?] [882] — they rise to 7,056 [ז' אלפים ונ"ו]; and its root [$\sqrt{7056}$] is 84 [פ"ד], and that is the area.

§10. The open [obtuse-angled triangle] — how? Its short sides, each joined by itself [squared], add this to that; and the third side, which is the base, is joined by itself [Steinschneider: read מצורף], the latter joining being greater than the first. For example: 5 from this side [Steinschneider: read ה' מצד זה] and 6 from this side [ו' מצד זה], 9 [ט'] from that side; and it is found that the breadth [of the obtuse opening at] the first [angle] is 61 [ס"א] and the last is 81 [פ"א]. And one must learn the clear reckoning of the standing-body [the figure] with the base. And if one desires, it is in the calculation of the sides, the half being the calculation; and consider this.

Chapter 5 [פרק ה']

§1. There are three kinds among the circle [round figures], and these they are: the suspended [hemispherical dome], the heaped-up [conical/raised], the lowered [flat/depressed]. Which is the suspended? It is the one that stands [Steinschneider: read **ומדת** [ע]ה] at the foundation [base] — a fourth [רביעי] of a circle, like a ball or the like — and the area is [reckoned] like a watermelon that is rounded on its circumference only, its body being equal in length, breadth, and depth. Its measure — how? You measure: join one of the cords [diameters] within half itself, and what arises is the area; and double it, for they are its walls [surfaces].

§2. The heaped-up — which is it? It is the one that stands [on] half the suspended [a half-dome], a mound or like a hollow [Steinschneider: read **קובה**], provided that it be equal [regular]. One must learn: join one of the cords [diameters] from edge to edge within half the other, and within half itself, and what arises is the area.

§3. The lowered — which is it? It is the one set upon the ground as a fit circular field, or the form of a circle [a flat disk]. One must learn: join the cord [diameter] within itself, and cast out from it a seventh and half a seventh, and what remains is the area. And if you wish to know the circumference [Steinschneider: read **הסיבוב**], its compass, behold it is [Steinschneider: read **והוי**]: join the cord [diameter] within 3 [ג'] and a seventh, and it comes to 22 [כ"ב]. And if you wish to measure [the area]: take half its circumference, which is 11 [יא], and join it within half the cord [diameter], which is 3 [ג'] and a half — and it rises to $38\frac{1}{2}$ [ל"ח ומחצה], so the first like the latter [both methods agree]. Behold, He says: "And he made the sea of cast metal, ten cubits from its brim to its brim, round all about, and its height was five cubits, and a line of thirty cubits encircled it round about" (Melachim I 7:23). What does it teach? "A line of thirty cubits" — for from this they said: the children [scholars] of [Israel measure?] a circular field, its circumference being held [reckoned] at three times its cord [diameter]: cast [multiply] them [the 7 cubits of diameter] — 22 [?] comes out, and a quarter besides in its thickness, for the two brims [walls]; what is left over is [its content], to round it about with the [smaller?] measure. The rest [these matters] — days [seasons], pools [Steinschneider: read **והמקואות**], and pits [reservoirs] — [are measured] by length, breadth, and depth: one measure [governs] the measure of the circle.

§4. Three things [the Sages] said about the curved figure [arc/segment], and these they are: the straight [semicircle], the deficient [minor segment], and the excessive [major segment]. Which is the straight? Every one that stands upon half a circle [a diameter], neither deficient nor excessive. The deficient — every

one that is less than half a circle. The excessive — every one that exceeds half a circle. This is the rule: every segment standing on less than half [a diameter], it is known [Steinschneider: **בידוע**] to be deficient; and every segment [standing on] more than half, it is known to be excessive.

§5. He who wishes to learn [the area of] the straight curved figure [semicircle]: join the chord [Steinschneider: read **היתר**] within itself entirely, and cast out from it a seventh and half a seventh, and what is found is half [Steinschneider: read **חציו**] — and that is the area.

§6. And [for] the others [deficient and excessive segments] you must know how much is the measure of [the segment's] elevation [the arrow/sagitta]. How? Join half the chord within itself, and what arises, divide by the arrow [sagitta], and what is found from the division, add it to the arrow, and what arises is the cord [diameter] of the [full] circle. Take half this cord [diameter] and join it within half the arrow, and set it aside [Steinschneider: read **מעמידו**]; and see: if the curved figure [segment] was deficient, cast out half the cord of the circle, join [it] to what remains within half the chord [Steinschneider: read **היתר**], deduct it from the [other] side, and what remains is the area; cast away 18 [?]. And if the curved figure [segment] was excessive, cast out the circle, halve itself [Steinschneider: read **מחצה עצמה**], join what remains within half the chord, add it to the side, and what arises is the area — like the measure of the first [method], so the manner of the last.

The chapter is completed, and with its completion the treatise of measures is finished [Steinschneider: read **מסכת**? "tractate"]. May He who awakens [enlightens?] know freedoms [Steinschneider's text: **בעור יודע חירות** — corrupt colophon; uncertain].

References [יִסְנִיץ]

[The following is Steinschneider's editorial apparatus — seven lettered notes (א–ז) collecting the Talmudic and Midrashic loci behind the "forty-nine measures." Abbreviated scholar-names and manuscript sigla appear throughout; Steinschneider's own conjectural emendations are marked [צ"ל ...] = "read."]

א'. "By however much a square exceeds a circle — a quarter" (Gemara Sukkah, fol. 8a [דף ח' ע"א]). A Mishnah teaches: "forty-nine measures [מתני' מדהות בארבעים ותשע מדהות], and these are the things that are visible to the eyes [?], for in them a thread of round measure four cubits in its surroundings [?] one cubit to every direction encompasses [?] [the matter] (Rashi). — And in the marginal notes to the Talmud [בהגהות הש"ס] it is written: "read [צ"ל]: in Massekhet [מס'] Middot, chapter 2 [פי"ב], halakha 16 [מ"י] — but in the Tosafos to Sukkah [ש"ס], fol. 25, [the printed text reads] something else; and as for what is written there: 'Behold, it is found in the Baraita of Massekhet Middot' — read [וצ"ל]: forty-nine [דמ"ט] measures."

ב'. "...That there remained four cubits hanging behind the boards" (in the printed text: of the Mishkan [Tabernacle]) "on the west, two lower cubits curtained off [?] — and there go forth the forty-nine measures expounded in the Baraita" (Rashi, Shemos 26[?], according to a manuscript [כ"י] at München, no. 5, fol. 65; and in the printed text: "the Baraita of Massekhet Middot," so there is no place here for what the investigators [החוקרים] have [argued]).

And as for the words of the one who says: "[these] things, as they are written, the cubits of its height were not the length of the [?] but rather ten cubits" — so there go forth the [forty-nine measures] in Massekhet [Steinschneider: read: Mishnat?] [49 measures] [במשנת מ"ט] of measures (Rashi, Shemos 26[?], 5; and they are counted on fol. 91, note c — one must emend [the citation] in its place, [in] Shemos and Vayikra).

ג'. "Five cubits the height of the one capital" (Melakhim [Kings] I, 7[?]). At the end of the book [Steinschneider] says: there are not [those] cubits in Massekhet [צ"ל: in the Mishnah?] [of] forty-nine measures; the lower cubits of the capitals were not even [level], because in them there were three upper [courses] curving outward, encircled round about, as it is said "engraved work, knops [round bosses] all about" [?] (Rashi).

ד'. "Closures they were" (there, verse 28 [פסוק כ"ח]) — I found [it] in the Mishnah (and in a manuscript [bearing] the [reading] "Mishnat M" T": Midrash) [the] forty-nine measures: closures [are] a kind of bulges [?], closures they are — closures immediately at the side and so forth (Rashi).

[Horizontal rule-divider]

ה'. "He who sends the springs into streams" (Tehillim 104[?], [verse]) — for they were all from the well, and the princes draw it after them [?] and travel with it in their travels; the waters flow [?] after them in every direction, tribe by tribe, on the matter [of] which it is said "with their staves" [Bamidbar 21:18]; "with their staves" — [this is] the explanation [of the] forty-nine measures (Rashi; and in the Yalkut, §764 [תשס"ד]: "the heads of the people dig it" [Bamidbar 21:18] — the princes [נשיאים] were measuring [?] over [it]; [?] each and every one [drew it off] to his tribe, to his family." Behold, before me [is] §[?] of [the Yalkut], fol. 274, and there he did not find a citation [?]; I do not know which printing the author [רב א"ג] saw — [perhaps a] citation he expounded).

י'. "Concerning every watch" (Ta'anit 27[?]) — the twenty-four [priestly] watches of the priests... they divided into 24 stations corresponding to the twenty-four watches, as is taught in the Baraita [of the] 49 measures (so the commentary ascribed to Rashi, in the München manuscript no. 216 ascribed to Ragmah [Rabbenu Gershon], which I have not myself seen — this manuscript [?]; consult that place in the [reference] above).

י'. "And the sons of Noah were" (Bereishis 10[?], [verse] 18) [?]. "...Yefet, and his sons 32 [?], Ham [?] and his sons 26 [?], and from these [מאלה]...by these was the earth divided" [Bereishis 10:32] — "and He did not apportion the world but [reserved it] for [?] Israel"; [for] Jacob's offspring [were destined for] [?] greatness [?], and Jacob and his sons, in their descent to Egypt, were 70 [?]; [from] Arpakhshad, Shelah, Ever — [these] were righteous [men], yet they were not reckoned among the [70] nations (Yalkut §[?] [סי' ס"א], and there alone is cited Midrash [of] 49 measures).

[Horizontal rule-divider]

The Conclusion [סיום] of the Book "Ḥibbur ha-Meshiḥah ve-ha-Tishboret" [Treatise on Area and Mensuration], by R. Avraham bar Ḥiyya

[The primary epilogue of bar Ḥiyya's treatise begins here, with the author's byline.]

And now, my son [?], I command you: from now on conduct yourself in the mensuration of land along this approximate way [?] that I have shown you [?]; be careful and take pains [exert yourself; Steinschneider: read מִשְׁתַּדֵּל], and in your doings beware lest some stumbling come about by your hand — and you will be the more firmly grounded in all the rules that have been handed down on this matter. Remember the letters that I have set down for you [over] every shape and form, so that it may go well [Steinschneider: read שְׂתַבָּא] by your hand. And I take an oath that, if this practice becomes habitual for you, your ways will be trustworthy and faithful, and this craft will be firm in your hand; you will bring forth from it [the answer] and produce the right outcome. And if you cast off the rules, after a single detail [?] you will stumble badly [?] [Steinschneider: read תִּפְרֹחַ].

the craft [?] [Steinschneider: read מִיָּדָךְ] will depart [?] from your heart, and you will fall [Steinschneider: read בְּזוּתָךְ] into error — into it [?] fall the men of the other lands [?] who have not seen it [?] and known it [?]. [The men of those lands] sometimes lead the line [cord] of measurement over the whole face of the land — [over] the surface of the land as it is [?] [Steinschneider: 99b]; and sometimes they lead the line of measurement over [only] the middle of the land; and sometimes they square the land [reckon its area] by [taking] a quarter [?] of half its two parallel sides (that is, [these] against [?] half of [its] sides [?]); and sometimes they square it [reckon] by [taking] a quarter [?] of half [?] [the area], the two standing [adjacent] sides; sometimes [taking] the third side itself, and sometimes adding the fourth side [?]. And there is no consistency [?] in it, and there is no consistency in [?] the measurement and the calculation. The reason [?] [is that] their methods [?] differed [in] the ways of measurement and of reckoning — they have no consistency [Steinschneider: read סְדֵרִי, "orders"] of measurement upon which to rely [?]. And they go on leading the line of measurement forever [?] over the whole face of the land — [over] the surface

of the land, [taking] a quarter of half [the area] [Steinschneider: this clause absent in the manuscript] of the two parallel sides — that is, half of [its] two other parallel sides — and they pay no heed to [the difference between] the surface itself and [what merely] is reckoned thus. All these are the great errors befitting their hands.

And I have heard concerning one of those who busy themselves with the measurement [Steinschneider: read במשיחת] of land in the way of [these] reckoners [the erring ones, Steinschneider: read הטועים] — this one said: "Know that this method by which I sit and reckon the hire [valuation] of land is not the genuine reckoning; but I have no way to depart from it, for so I was taught. Yet our Rabbis, of blessed memory, do know with certainty [?] that 'the diagonal [אלכסון] adds two-fifths over the square' — that is, 'a circumference of three handbreadths has a breadth of one handbreadth.' Even so, I am not accustomed to use [?] [these rules] — [I do] not [hold them] in my hand. For [our Rabbis] said: 'A square [is reckoned] a quarter [more than] the square' [?]; 'two-fifths is its diagonal' [?]; 'whatever there is in [a circle's] circumference (in its quartering!) [is] three handbreadths — has [a breadth of] one handbreadth.' So I do not know how to reckon this without [these rules] — even so, I do not hold to them [?]." When you hear these words, how greatly will you marvel [?]: how could it [enter] his heart to say so?! And [yet] it is so. — And our Rabbis, of blessed memory, our masters [Steinschneider: read רבותינו], "do not rely [Steinschneider: read אין סומכין] [on] this reckoning [Steinschneider: read על החשבון] (Steinschneider: V. 58b.) [?]" — this concerning [the diagonal] (in the squaring!) of the square in a place where one [merely] brings [it] in through the leniency [?] [of] a mitzvah; [Steinschneider: these are leniencies! מודידים] in a place that requires reckoning the diagonal precisely, as the Rabbis said: "the knop and the flower [הגנה והקרפף]..." [?]; [for] handbreadths are carried about within it [?]. And in the halakha [Steinschneider: read והלכה] those who say [Steinschneider: read אומרת] [reckon] (100) "that a square [is reckoned] for them [Steinschneider: read ליה] as [?]" [Steinschneider queries דלפינן] — from the wall of the Mishkan. You see here that they [our Rabbis] gave the diagonal of the Mishkan, whose [side] was 70 [ע'] [cubits, reckoning it] as 70 [?] plus two-fifths of a cubit — but they did not so add [?] here; [rather], without [Steinschneider: read בלא] more, [there] is carried about [?] a place where the dimension of the Mishkan is — and that is a leniency of [reckoning a] mitzvah.

[Steinschneider: read ומשהו "and a fraction," absent in the manuscript], and because [these] things were [?] said in a more rigorous manner [?] [than] is fitting [?] for you in [?] the precise [?] reckoning — they brought [it about] through the rigor of a mitzvah, [as] they said: "they squared the city [Steinschneider: read המרובע, the squared figure] in [reckoning] the diagonal [as] only two-fifths," exactly as the Rabbis said: "a square [is reckoned a] thousand by [a thousand]" [?] — that it is two thousand by two thousand [?], deficient [in] the diagonal. And the whole reckoning is by halakha — [reckoning] the diagonal as only two-fifths; and the halakha reckons it thus

— “[reckon] the diagonal: a cubit [is] two-fifths,” only as is the halakha. So those who say: “[the side of] the Mishkan stands [?] at fifty [?], that there should be before it [?] [a side of] a cubit and [?] two cubits” [?] — in every direction you will find here the diagonal of the Mishkan reckoned [as] a cubit, [in] view of the [scriptural] detraction [?] [Steinschneider: read **שהגרעון**, “the diminution”], which is [more] of a stringency [Steinschneider: read **מחומרא** than [?] of a mitzvah [?], and a warning [Steinschneider: read **ואזהרה** against this leniency [Steinschneider: read **הקלקול הזה**, “this corruption”]. And it appears to us by clarification that the rule which gave [the value of] the diagonal — there is no relying upon it except in a place where a mitzvah brings [it about] [through a] stringency. So too the rule which gave that “[a circle] surrounded by three handbreadths has a breadth of one handbreadth”: were they to say that “its breadth is a handbreadth less by [a fraction] divided into 1/22 of [?] a handbreadth [Steinschneider: read **חלק א' מכ"ב חלקים**, “one part of 22 parts”], they would not pay heed to this fraction [?] of a handbreadth, since it was not their wish to safeguard [?] [Steinschneider: read **לשומרו** every fraction” — [there is] no relying upon it except in a place where a stringency of the commandments is given [Steinschneider: this clause absent in the manuscript]. And were one to say: “what did Solomon make of it?” [?] — well, [Scripture] says of the circumference [a circle] that is “three [handbreadths around] and one [handbreadth] of breadth”: he made [the Sea] round, “and thirty cubits did compass it round about” [Melakhim I 7:23], that is [its] circumference [?] [Steinschneider: read **עיגול**]; “[a line] of thirty cubits compassed it round about” [Melakhim I 7:23]. And were one to say: “what did he make of it [reckoning it] by measure?” — well, [these] are round cubits [?], and the circumference [Steinschneider: read **והקו המקיף**] is three [times the breadth]; “[a line] of thirty cubits [did] compass [?]” its breadth [is] ten [cubits], as it says of it: “ten cubits [from] brim to brim” [Melakhim I 7:23]; and his [Solomon's] making of it [Steinschneider: read **ושפתו, ומעשהו**] was “the making of a cup's brim” [Melakhim I 7:26]. And as for the [account in] Divrei ha-Yamim [Chronicles] (Steinschneider: read **הוא**), it says of it: “ten cubits [from] brim to brim, the making of a cup's brim” [Divrei ha-Yamim II 4:2]. — You see that this circle, set far back [?] from the straight side [Steinschneider: read **הישרה**] of a square [whose side is] one handbreadth [?] — there will be [a portion of] the line that remains [unaccounted], the breadth of the circle, ten cubits less by two handbreadths, [?] five handbreadths [?] [to] the cubit, as our Rabbis, of blessed memory, reckoned it: “[a circumference of] less than two handbreadths,” in view of this [scriptural] detraction [?] [Steinschneider: read **ההעיבור**]; for [reckoning] the whole circumference — if you count nine

cubits and three-fifths of a cubit, [reckoning each cubit as] sometimes [?] the seventh [?] — together it would be thirty cubits and [yet] there go [?] off [?] [Steinschneider: read **ליה**] six fractions of a cubit [Steinschneider: read **לים**]; for the breadth of the circle would be [?] [Steinschneider: read **סיבובו**, “its circumference”] in [reckoning?] 5 cubits, one [?] no more. You find here that

the breadth of the circle, which was the breadth of the Sea, is [a portion of] a line, one part of 26 [parts] of a cubit [Steinschneider: read **א' מן כ"ו חלקים**, "one part of twenty-six parts"]. If you take half its breadth, half of [?] its line, [the line] will be felt [perceptible] in the reckoning, in the matter [of] which [?] there would be [a remainder of] the circle, one cubit [and] $1/53$ of a cubit [?] [Steinschneider: read **א' מן נ"ג**, "one of fifty-three"], two-fifths of a cubit. The Sea that Solomon made — its height [Steinschneider: read **קומתו**] was five cubits, those being three round cubits, as they said: "thirty by [?]..." [Steinschneider: read **ב"צ**]. You are able to see this matter [as] it is written (Steinschneider: read **אורו מן הכותבים**): for so it says (Melakhim I 7:24) — "the gourds [פקעים]" (Steinschneider: in München manuscript: **קחים**) "beneath the brim round about did compass it, ten cubits compassing [Steinschneider: read **קומים**] the Sea" [Melakhim I 7:24] (Steinschneider: V. 59) "round about; you see that the bottom of the Sea, a square, [is reckoned] a square [?] [whose side is] two cubits in every direction." I say that "gourds" — "knops, gourds — cast metal [?] [Steinschneider: read **יציקות**], cast when [the Sea] itself was cast" — they are round cubits, which were squared [?]. So if you take the hire [valuation] of one round cubit, [namely the] valuation [?] of two round cubits, of which a cubit [is] four-fifths

of a cubit, you add to them one [?] cubit, and they are the hire of [Steinschneider: read **המרובע**, "the squared figure"] — for the hire [?] [of the] Sea [is] [Steinschneider: read **כלים**, "vessels"]...[Steinschneider: read four-fifths]. If you take this [Steinschneider: read **הזה**] [and reckon it] sometimes [as] half [of a thousand?], you find from here [?] fifty cubits, [a fifty cubits] hold[ing?] four cubits and a half. Our Rabbis, of blessed memory, reckoned the miqveh [ritual bath] at one [part] less per cubit [Steinschneider: read **מק"ל**] [?] — [a number of] fractions [?] of [?] the [Sea, Steinschneider: read **הזה**] — the whole of [the] two thousand [?] of the measure of the ephah [התנא האיפה], by [reckoning] one [ephah] (Steinschneider: read **הם**) [as] the ephah, that is two [?]; and it is not found except [a quantity of] water, two thousand [cubits], for the miqveh, that is forty thousand [cubits, Steinschneider: read **מ' אלפים**]. There would [then] be here a miqveh of one part less per cubit, and there would be here a remainder [?]. And the volume of [Steinschneider: read **וגוף**] the miqveh by our reckoning [is] how much? [?] — and how many waters? Three hundred cubits (Steinschneider: from here, "three hundred measures [cubits]," absent in the manuscript) less one part [in?] 27 [Steinschneider: read **כ"ז**, "twenty-seven"] of a cubit. Our Rabbis, of blessed memory, reckoned the miqveh (101) [at] how many waters? Three hundred cubits [Steinschneider: read **של"ית**]; and they paid no heed to [a small] shortfall [in] the result. This reckoning of theirs is [?] [valid] only because it brings [the matter] in through the leniency [?] [Steinschneider: read **במצוה**] of the [mitzvah]; their way in all of this is like this. If you say: "this reckoning, [if reckoned] by the genuine [way], will rise upon your heart [?]" — well, they reckoned the volume of the Sea [at] 53 cubits [ל"ג אמה], and there come from it [?] three hundred square [cubits],

[as] there remain[s] in your hand [?] [Steinschneider: read שתי, "two"] round cubits, [namely] 53 cubits [ל"ג אמה], and these are 4 cubits [Steinschneider: read ד' אמות אלו] [reckoned as] a square [?]; they were 4 (Steinschneider: read ד', V.) cubits, and these are the cubit which, [when] squared, you add to the circle a quarter, [so that] there remains in your hand 53 cubits [ל"ג אמה], as our Rabbis [reckoned]. They said: "are they not 53 [our Rabbis']?... — and the matter [being] rounded [Steinschneider: read מעוגל], "the Sea [is] 104 cubits [ק"ד אמה] [?], the diagonal [Steinschneider: read האלכסון], which has in it [?] [the round cubits?]; "and it is not fitting [?] [Steinschneider: read שתכן] to say of them, of blessed memory, that they did not [reckon, Steinschneider: read מחמירים על פיהו] sixty handbreadths" — for that is the brim of a round vessel [Steinschneider: read עגולה / בעגולה], of which (Steinschneider: read היא) Scripture says explicitly: "(that?) a matter [?] of a handbreadth, hollowed within" — it [should] not [be?] reckoned for them [as] a cubit. Behold, know that this [reckoning] of a handbreadth, "all that compasses it round about," our Rabbis [gave?]; if this handbreadth would be the matter of a brim, drawn round [?] the circle — as long as there remains a breadth over this measure [?], which is [?] ten cubits less two handbreadths [?] — the second supposition [Steinschneider: read והסברה השנית] would be [Steinschneider: this clause is absent in the manuscript: that this is the matter of the circle] [?]: it would be the breadth [רוחב] —

(Steinschneider: read וכ"ו, absent here, [the clause] "of the circle, and the breadth would be...") of the circle [Steinschneider: read והעיגול]; and the line [Steinschneider: read הקו, "the circumference"], divided, is the cause [the reason]; this would be the matter [in] question. He said: "[reckon] the breadth as a part of the line, [and] this would be the matter [in] question." He said: "[reckon] the breadth as a part of the line of the circle (Steinschneider: read והוא, [and] there would be a handbreadth [as] a part of the line) [which] surrounds [it]"; [reckoning] by two [parts?] of breadth, there remains the supposition that the cubits [are] strong [?] [Steinschneider: read כ"ח]. Our Rabbis, of blessed memory: "take the middle between these two suppositions" — from this [comes] a cubit of six handbreadths. He added [it as] a stringency [Steinschneider: read בחומרא]. If you make the breadth of the circle, which has in it [a side?] of one [Steinschneider: read פס חד], six handbreadths to a cubit, there would be one hire [a single valuation, Steinschneider: read חת: אמ] for them; according to [the measure of] [?] [Steinschneider: read כמו שיעור] 14 [י"ד] and a fraction [Steinschneider: read תית משהו, queries]. If you make [the breadth] two cubits [each] having within it two handbreadths, the cubit would be, by their account, 13 cubits [י"ג אמה], like half a cubit [Steinschneider: read האמה]. Our Rabbis, of blessed memory: "take the middle between these two reckonings" — from this [comes] a cubit of 75 [ע"ה] cubits [?]. They were sensitive [attentive] to the matter of [the] brim, paying heed [to the difference between] the two suppositions: from this [comes] a cubit of 6 handbreadths. He added [it] as a stringency [Steinschneider: read לחומרא], [going] in the way of [the measure of] [?], not relying on the calculation that rises upon your heart [Steinschneider:

read בדעתך]; for in this whole matter [Steinschneider: read לבני אדם, "to people"] [?] there is no one [?] who turns aside [?] from the reckoning [?]: they imposed a stringency [for the sake of] the mitzvah (101b) in all [Steinschneider: read לכל] this practice [act], as is fitting for them [of blessed memory, Steinschneider: read ז"ל].

And out of this there came to be unfolded yet another matter [?], and concern [?] [for?] the Sea that Solomon made [?] — to investigate [?] [Steinschneider: read לחקור] and search out [?] our [matter] [?] [Steinschneider: read ראינו / ולחקור, queries] (Steinschneider: V. 59b) [?] (Steinschneider: read לתרץ, "to resolve," absent in the manuscript) the contradiction [discrepancy, Steinschneider: read המחלוקת הנמצאת, "found"] between what is mentioned in [Melakhim] Kings (which is "two thousand bat [Steinschneider: read ב' אלפים, "two thousand"] and what is mentioned in Divrei ha-Yamim [Chronicles], which is "three thousand" [ג' אלפים]. For all admit [Steinschneider: read מודים] that what is mentioned in Melakhim, namely the capacity of the Sea, is from [?]...[Steinschneider: read מן הלח, "of the liquid (measure)"], and that what is mentioned in Divrei ha-Yamim — its capacity is from [?]...of the [?] — but they differed in their view in the explanation of this matter. Some say: by the [measure that] you measure [Steinschneider: read תשער, "you reckon"] the Sea [in] its two places [?] — the one and the same is the capacity, [reckoning?] of the dry [measure] [?]: the third [?] is liquid [?] — that is, [it differs] from one [?]...

[The discussion of the Kings-vs-Chronicles 2,000-vs-3,000 bat contradiction continues past this page.]

and they said that the bat by which the molten Sea is measured holds two thousand, while the [book of] Chronicles [makes it] three thousand. And as for the bat whose measure he set down [in describing] it, by the two measurements the body [of the vessel] [?]... one body holding a bat more than the hin — and not [?]... the two measures [?] of the molten Sea, [one] a single coin's worth [?] in measure. And as for [you, that you should] know! — that this book is not [?]... upon [?]... the volume more than the hin, since [?] its volume more than [?] holds, from [?] (הן מכילין) [recte: הן מכילין, "they hold"] (M.!) — from a hin more than [?] it holds, [from?]... in any case, since the matter does not stand upon a single measure. And as for [?] it shall be the largest bat whose measures are [those] by which the hin is measured. And we find [?]... what reason was there [that] the great bat should teach concerning the hin of the bat... the hin was [?] in the matter by exchange (בחלוקה) [recte/var.]. And we cannot give a reason [?]... to teach the hin by the small bat and the hin by the large bat — but [?] for every person... and we shall not find [?]... they need not [?] with them any water. And further, since the verse does not [?]... the verse of the [Chronicles] passage on the one hand, by the small bat, and the [number] two by the large bat, [?] explaining the Sea's holding from the [number] of waters which [?] was made — the Sea — to hold a thousand [?]... the hin and the two log of a hin. And (102) explaining that, for if it [be]... [?]

[?]. ... and holding from the hin four thousand and one hundred [אֶרְבַּעַת אֲלָפִים וְק' מֵאוֹת] — the hundreds-figure reads ק' = 100]... the [?] one body holds his words on every side, for [?]... [from] the hin, and not [from] it more than a hin if there be — (אֵין לִיתָא) [recte: אֵין לִיתָא / var.]... holds. And as for the difference between them, [the] particular matter [?] (בִּינִיהֶם M. נב"י) [Steinschneider note]... (על) a single form [?]... that the measures, [if they be?] water — then [?] there shall be [?] a measure from the hin. And as for [?] there (הֵם שֶׁמֶן) [recte: "if there be oil"] [?] and its [?] teben [straw?] [?] holds [?]... holds from the hin. And as for (וְגִלוּת) a difference [?]... as the verse [?] to give [?]... and as for the body of the bat whose measures are [those] by which the hin [?] is measured. And our matter — this is more fitting to say than the first. [?]... the hin of the bat and the small bat to teach concerning the hin, and we shall not [?] give a reason in the matter (לְדַבֵּר) [recte] [?]... and not to forbid Israel [?]... for every person concedes its like, and you cannot deny [?]... the verse did not bring [the?] two passages except to explain the holding [?]... and the [number] two — by the large bat — and it is known that they are not [the same?], but rather they came [?]... the Sea, to hold them; and how can it be said to us that they are alike, but [?] the one [?]... a thousand more or less. And were the verse to write [?] the one — a thousand [?]... (אם) — the hin a thousand bat, in accordance with that the bat holds [?]... [there be?]

[?]... the [Chronicles?] passage on the one hand, by the small bat, and the [number] two by the large bat [?] explaining the Sea's holding from the [number] of waters which the Sea was made to hold (102). Explaining that, for if it be... [?] the bat it holds, and were he to say "the two thousand"... [?]... as it is, so too a thousand bat the bat, for [?]... three thousand bat (אֲלָפִים בַּת) — were that the case [?] between this and that (לֹא הִיא בֵּין זֶה לַזֶּה) [?]... and we find the verse needing to teach concerning the molten Sea the two measures of the hin [?]... a reason. And far be it from us to write words of the living God [?]... the verses: a single body it was — bat by its bat [recte: bat be-vatto] (לִיתָא בְּיָדֵי) [absent in the MSS] [?]... [the Sea] holds from the hin, and two thousand bat (אֲלָפִים בַּת) in the joining is, by the malkis [reckoning?], its holding [?]... (בַּת) — for it holds the Sea by it, [as] cast upon [?]... upon a single point, and three thousand bat (שְׁלֹשָׁת אֲלָפִים בַּת) which (הוּא) [is] in the words [?]... it fills its body, and you have nothing to set down [?] the first. And [?]... in its sides and its ribs, and let its [third] height be — its third height (קוֹמָתָהּ שְׁלִישִׁית) [?]... it was, holding within its body compartments [recte: batim], its volume [?]... and this vessel — this you [?] those who explain the hin. And if its form [?] upon another form [?]... and this vessel was [?] (לֹא) [recte] — its volume would stand upon the measures (מִחוּץ) [?]... or diminished. And we find the verse [setting] for words [?] a bat, a bat (לֹא בַת אֶלֶף לַתַּת) [?]... which our measures, in it the bat of the Sea, [are] not by another thing. And as for [?]

[?]... [as for that] the measures (הַנִּזְכָּרִים) [the aforementioned] are nullified — and all this is not the way [of] the words of Torah (תּוֹרָה)... [?] to teach us the holding of the Sea by the [round] form, [namely] how much the Sea was [?]...

to grasp from the hin, then you set down its first. By the malkis [reckoning?...] a difference between (שוך) [?] a difference [grasps?] from the hin — it holds three thousand bat (שלשת אלפים בת) [?] the lip of the cup [is] a difference [?] those written (102b) this (החלוקה) [the exchange]... a bat it holds, and there is no (זוכר) [recte: "and we do not recall"] (יכיל) [recte] [?]... [holds?] (חזוק) and the two (יכיל) [recte] one says, holding (מחזיק) [?] holds from the lips, [if] compartments [batim], then you add upon them, holding [?]... the verses, the [ones] saying three thousand bat (אלפים בת), [it] holds from [?]

And the sages of measure, by what way they investigated this and upon [?]...

its mouth square, with its ribs and its sides, [if] you fill it [?]... toward its diagonal or its inner measure, fine; and its sides which are fitting, it [?]... upon its first form a likeness of a hollow which is [?]... [be]... its line [be] a square upon its first form, by [?], and until here [?]... its height. Below the rib of the diagonal [is] a corner-angle (זווית) [?]... by the breadth of the diagonal of the height, up to the elevation of the height upon the half of the rib of the diagonal [?]...

every thing that you add to its place adds upon the corner of the [base] over against [?] (ברור ובהיר) [clear and lucid] for every discerning one (מביין), [this is] the way of the measure. And [?]... square upon a corner-angle [is] as its length and its breadth (מכאן ואילך) [from here onward]... its body's grasp. And were the square vessel, its base [?]... its base [a] half by the rib of its base [recte: belatavto], its volume [a] third — its grasp [?]... holding within its depth by half [recte: be-mechtzeit], its grasp [a] third (מחזיק בכ"י M.!) [recte: var.] [?]... he can find the worth of the depth of all the square vessel [?]... in the rib of its base. And the Sea which Solomon made — its height was [?]... fitting to be the grasp of its whole body, but because of the round [form] there was [?]... in our hands, and we shall not find in the precise reckoning, by the view of the sages [?]... [the] grasp of four batim [compartments] and a half a bat, and the Sea was (V. 60b)... [?] and its height (103) was a hundred cubits, as it is written: ten cubits [?]... by its height, and were it made into a square structure [?]... and were you to double them four times and a half-time, as [?]... the sages of measure: the Sea's grasp would be found [to be] (היתה) [?] holding [?]... two hundred and fifty (ומאתים וחמשים) [?] bat, and were it (היתה בכ"י M.)... its volume [holds] 750 bat (שבע מאות וחמשים בת), which are a third [of the volume of] three thousand bat (שלשת אלפים בת... אשר הם שלש) [?]

[?]... over against [?] (נכבת עד) its length; and this matter [is] clear and lucid by (מאמה) [?] the measure. And from this principle we say that we speak [of] every vessel (מכאן ואילך חסר בכ"י) [from here onward, missing in the MSS]: [?] holds [?]... square, its base holding by half the rib of its base (ונגברו שאין) [?] its [grasp]. And were its height [?] holding by half the rib of its base [?] (M.!)... its grasp (חזוק) [recte] its body. And the matter of [?]... the base, not by half its body's grasp [knows?] as it [?]... its height was its base [a] half by the rib of its base, and its grasp was [?]... the round which was [?] two cubits (אמות)

from it; this principle did not [?] stand for us [?]... the view of the sages of measure, for one cubit square is a quarter [?] of the Sea from the Sea (V. 60b)... [?] its base ten cubits over against ten cubits (אמות)... [?] surrounding the Sea on its sides, and it is written: ten cubits [?]... square up to its mouth, its volume was its grasp five hundred cubits [recte: chamesh me'ot ammah] (מאות מאה) [recte] [?]... [?] as the number of the compartments which the cubit holds, to know [?]... were it square, its base up to its mouth would hold two thousand bat (אלפים בת) (M.) holding its base's depth up to its point [recte: nekudah] (תהיה) [?]... [a] full third of its body, and it was holding within its body with its volume [?]...

the sages of measure [say] the Sea's grasp would be found (היתה)... [?] holding [it] [?] two hundred and fifty (ומאתים וחמשים) [?] bat (תהיה בכ"י M.)... [?] its grasp [a] full third of its body, and were it (היתה בכ"י M.) [?]... [the] Chronicles passage [?] holds, to [?]... we have explained (שנתגלגלו) [recte] (M.)... [?] from them the two cubits, and we have informed [you] (נגבדו)... [?] with its volume [a] full third of its body [?]... and we see from this that the two cubits (אמות)... [?] [were] not less and not more. And we find [that this] is well-explained, going upon the principle [?]... that the grasp is a third of the body. And so will the reckoning be found — this (מיסב) [?]... and it comes whole, [as] one (ואחד) — and the verses [are come] to inform us of the matter [?]... informing of it. And it is clarified for us, fine and clear, that the two [?]... by the way of [the sages of] measure (M.), and there is no establishing [recte: takanah] and no [?]... many [recte: rabbot] (ז"ל) — and the sages of measure dispute by the way of the number [?]... and [those] preserving in the place of fitting [recte: be-makom she-ra'ui] (מה שראוי M.)... [?] to be more stringent, in order [?]... to find the measure of the mikveh [ritual bath], by the view of our Rabbis (רבותינו) of blessed memory the measure is [?] a cubit by a cubit (בכ"י)... [?] of perfection, and by the view of the sages of measure how much the measure is a cubit by [?]... twenty by a cubit. And this? (וזה) (?)... [?] [the] log by the words [of those who say] "many" [recte: rabbot] (ז"ל) — two fingerbreadths (אצבעים) by [?]... and the hot-place [?] a fingerbreadth (אצבע); (ולדברי... the sages of measure [say] [it is] fingerbreadths (אצבעות) by fingerbreadths (אצבעות)... [?] the log by the words of "many" [recte: rabbot] (ז"ל) — four fingerbreadths (ארבע אצבעות) by four [?]... a fingerbreadth (אצבע). And a se'ah (וסאה) — (והרודא M.) — by the words of "many" [recte: rabbot] (ז"ל) — three [?]...

two thirds of a cubit and one part of a hundred and twenty (ממאה ועשרים) [= 1/120] of a cubit, and [?]... [a] third of a cubit by two thirds of a cubit and no more. And the bat [?]... two thirds of a cubit by two thirds of a cubit and one part of a hundred and twenty (ממאה)... [?] [a] third of a cubit upon two thirds of a cubit by two thirds of a cubit and no more (ולא יותר)... [?] [the] dispute in the form of the reckoning except [in the words of] "many" [recte: rabbot] (ז"ל) — they saw fit (ראו) (רחוי... this, in order to be more stringent in the commandment and to guard it. And I have intended [?]... so that there

should be a sealing [recte: chotem] by the words of Torah (תורה). May it be the will before [recte: milfanai?] (אלי... those who hold fast (מחזיקים M.) in [the] Torah (תורה), that He help us [recte: ve-ya'zrenu] and aid us (ויסיענו) to meditate on it and to learn and teach it [recte: להגות בה וללמדה] and to occupy ourselves with His commandments all the days of our lives, by [the] abundance of (כרוב) His compassion and His loving-kindnesses (ליתא בכ"י) [absent in the MSS] — Amen, Amen, Selah (אמן אמן סלה).

תהלה לאדון העוז והתפארת, והתשבורת (המשיחת) נשלם ספר חבור המשיחה. The Book of the Treatise of Measuring (recte: ha-meshichat) and Calculation is completed — a praise to the Lord, [to whom belong] majesty and splendor (העוז והתפארת).

חם ונשלם חל"ע. [Closing rubric] חם ונשלם חל"ע — Amen.

[German:]

Through the bookshop A. Asher & Co. in Berlin may be obtained:

- Hai et Ezobi. [Hebrew title: מוסר השכל ושיר הקערה — "Musar ha-Sekhel and Shir ha-Ke'arah"]. Text emended ... [by] Steinschneider. Berlin 1860.
- Nachmanides [Ramban]. [Hebrew title: ויכוח הרמב"ן] Disputatio pro fide judaica [The Disputation in Defense of the Jewish Faith], from manuscript codices ... by M. Steinschneider. Berlin 1860. ... Sgr.
- Siracides [Ben Sira]. [Hebrew title: אלף בית דבן סירא — "Alef-Bet of Ben Sira"] restored to its full integrity and emended from a manuscript codex ... by M. Steinschneider. 12[mo]. Berlin 1858. 10 Sgr.
- — on large white paper. 20 Sgr.
- Steinschneider, M. [Hebrew title: משל ומליצה — "Mashal u-Melitzah"], a collection of fables for the use of Jewish youth in the eastern countries. Berlin 1860. With engravings. ½ Th. (without illustrations, 8 Sgr.)
- — [Hebrew title: ראשית הלמוד — "Reshit ha-Limmud"]. A systematic Hebrew primer for the D. Sassoon Institute at Bombay. With engravings, maps, and the music of the anthem. Berlin 1860. 1⅔ Th.
- — Jewish Literature from the eighth to the eighteenth century. 8[vo]. London 1857. 4½ Th.
- — Catalogus Codd. h[ebr.] Biblioth. Lugduno-Batav. [Catalogue of Hebrew Codices of the Leiden Library]. 8[vo]. Leiden (Lugdun.) 1858. 3⅓ Th.
- — Catalogus libror. hebr. in Biblioth. Bodl. [Catalogue of Hebrew Books in the Bodleian Library]. 4[to]. Berlin 1852–60. 33⅓ Th.

Of the "Specimen Catalogi" (containing the articles Maimonides, Saadia, Salomo Isaki [Rashi], Salomo Ibn Gabirol, Samuel Nagid, see H. B. I p. 15) a few copies are still to be had from the Antiquariat of the bookshop at 2 Th. bound.

- Wissenschaftliche Blätter [Scholarly Papers] from the Veitel Heine Ephraim foundation school. First Collection. 1. F. Lebrecht: Handschriften u. erste Gesamtausgaben des Babylon. Talmud. 2. Th[eil].

Haarbrücker: Rabbi Tanchum Jeruschalmi, Arab. Commentar zum B. Josua. 3. M. Steinschneider: Zur pseudepigraphischen Literatur des Mittelalters. Berlin 1862. 1²/₃ Th.

- Hebräische Bibliographie. Blätter für neuere und ältere Literatur des Judenthums. Edited by M. Steinschneider. Vol. (Jahrg.) 1860 and following. each 1¹/₃ Th.

[Imprint, foot of page:] Friedländer'sche Buchdruckerei in Berlin. [Friedländer Print-house in Berlin.]

[End of the volume. The treatise concludes with the colophon and benediction]