

## ENGLISH SUMMARY

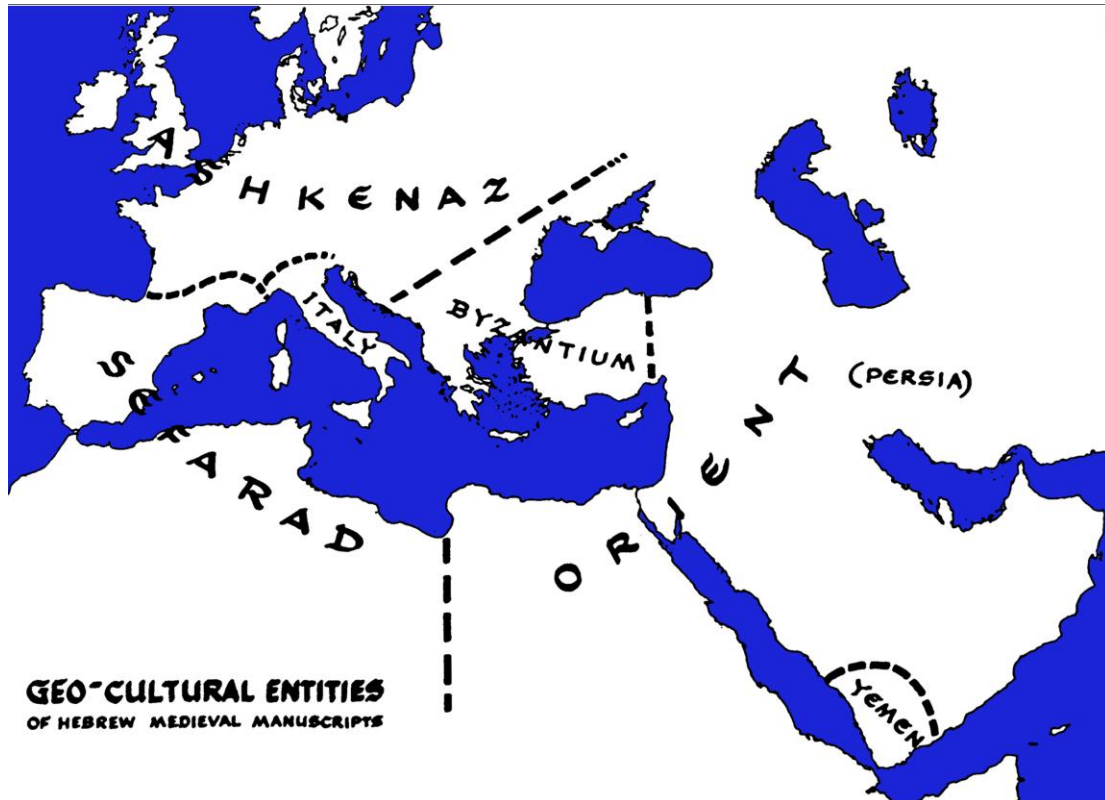
### MAJOR CODICOLOGICAL PRACTICES

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## **I Introduction**

The use of the Palaeo-Hebrew alphabet – a local variant of the Phoenician script, which survived in Palestine in epigraphic finds (inscriptions and ostraca) from the tenth century BC and onwards, was replaced by a Jewish variant of the Aramaic script adopted since the third century BC in Syria, Palestine and Egypt. Its most abundant finds are in the Judean Desert Scrolls and documents. Ever since, this Hebrew script continued to be used, throughout the Middle Ages and until recent times, for writing Hebrew manuscripts and records, as well as other languages inscribed in Hebrew characters, notably Arabic.

Due to historical circumstances, Jewish communities were scattered around the Mediterranean basin and further eastward, westward and northward. The spread of the Hebrew script blurs the demarcation of Orient and Occident since Hebrew manuscripts were produced from Yemen and the Maghrib in the south, to central, northern and eastern Europe in the north, and from central Asia in the east to England in the west, embraced by the book cultures of Islam and Christianity: the Oriental and Western Islamic territories and their Arabic script and booklore, the Byzantine East and its Greek script, the Latin West, and other minor Oriental cultures and scripts. Consequently, dealing with Hebrew manuscripts and Hebrew codicology involves manuscripts produced in both Orient and Occident, and their codicological and palaeographical typology is bound to relate to those of the major host zones, by means of a distinct geo-cultural classification. Bridged by shared script, culture, literature and some scribal traditions, they are separated by the different environments which affected their codicological practices. The essential comparative study of this extensive contained and interwoven booklore has to include, and indeed does - apart from Arabic and other Oriental booklores - Greek, and Latin codicology and palaeography. A considerable number of Hebrew manuscripts were inscribed in Judeo-Arabic, namely in Hebrew characters, mainly in the Orient, but also in North Africa and Spain; some were written in Western vernacular languages, like Yiddish (Judeo-German), in Hebrew characters.



A salient gap of some eight hundred years exists between the abundant finds of Hebrew books dating from the late antiquity (namely the Dead Sea Scrolls and the fragments from the Qumran caves and the Judean Desert dating from the Hellenistic and early Roman period) and the earliest dated and datable surviving Hebrew codices, during which there is hardly any extant evidence of the Hebrew book. Since post-biblical literature was transmitted mainly orally, none of the few dozen existing literary fragments dating from this lacuna, mainly papyri of the Byzantine period excavated in Egypt, derives from a codex. The codex was adopted by the Jews in the Orient much later than it had been by the Christians and not before the eighth century or following the Islamic expansion. The extant Hebrew codices, mostly medieval, number around 100,000 items (including many composite manuscripts) and, in addition, more than 300,000 fragments, all kept in some 800 collections, mainly European.

While some undated codices can be ascribed to the ninth century, dated ones survived only from the beginning of the tenth century and onwards. Thus the codicological typology of the medieval Hebrew manuscripts, based on the *in situ* documentation of almost all the explicitly dated extant manuscripts (numbering more than 3000

codicological units - about half of them with indication of locality – which were documented in 3400 records, as each hand in multi-handed manuscripts was recorded separately) is confined to the central and late Middle Ages.

The following statistics derive from SfarData, the codicological database of the Hebrew Palaeography Project, [www.sfardata.nli.org.il](http://www.sfardata.nli.org.il), sponsored by the Israel Academy of Sciences and Humanities,

<b>Corpus</b>	<b>palaeographical units</b>	<b>codicological units (codices)</b>
Explicitly dated manuscripts until 1540 studied <i>in situ</i>	3142	2777
Unstudied dated manuscripts (partially recorded in microfilms or catalogues)	258	249
Unlocated or lost dated manuscripts (recorded on the basis of catalogues and literature)	179	179
Extant dated manuscripts	3400	3026
Disqualified dated manuscripts	85	85
Studied undated manuscripts, either with colophon or with disclosed names, and other selected manuscripts	1176	1068
Unstudied undated manuscripts partially recorded on the basis of microfilms	430	417
Total of <i>in situ</i> documented Hebrew manuscripts	4318	3845
Selected dated and localised documents	1181	
Dated and localised Arabic manuscripts (paper morphology)	143	143
<b>Total records</b>	<b>6705</b>	<b>5029</b>

### **The circumstances of Hebrew book production and consumption**

Unlike the basically centralised character of medieval Latin, Greek and, to some extent, Arabic book production, unlike the authoritative supervision of the copying of Latin texts and the control over their versions and dissemination, and unlike the preservation and concentration of non-Hebrew books mainly in institutional

collections, the Hebrew medieval book was initiated, produced, consumed and kept individually. Testimonies provided by scribes and copyists, and the absence of contrary evidence in indirect historical sources, such as the responsa, attest to the fact that no Jewish establishment – be they centres of learning, religious academies, synagogues, or community authorities – instigated and financed the production of Hebrew manuscripts, or administered the selection and the versions of texts to be copied. Nor did they assemble and preserve them in communal or in academic collections.

Latin manuscripts were manufactured and usually kept in ecclesiastical, institutional, and authoritative bodies. In the early Middle Ages they were mainly produced in monastic *scriptoria* where canonical books were copied according to ecclesiastical needs and to the functions of the monastery library or commissioned by other monasteries. Books were frequently kept and used in the same location where they had been produced. Later, Latin books were manufactured in religious schools and from the thirteenth century and onwards they were also produced in a well-organized and controlled framework by the newly-established universities. Only towards the late Middle Ages were Latin manuscripts manufactured and disseminated in considerable numbers through private enterprise, to a large extent in secular copying centres and large-scale ateliers. Latin books were preserved at that time in ecclesiastical, royal or aristocratic collections, as was done in Islamic countries. Though many Church dignitaries and members of the aristocracy set up private collections, these can be considered institutional libraries. Indeed, the later Italian libraries established by princely initiatives under humanistic influence are nowadays regarded as the precursors of public or state libraries.

During this period, the making of Hebrew books was the outcome of private enterprise, motivated by personal need and aimed at private use. This can be deduced not only from the rather meagre indirect information in literary and documentary sources on the production practices, copying, purchase, consumption and keeping of books, as well as their social function and economic value, but mainly from the abundant evidence contained in the extant manuscripts themselves.

Scholars, literati, or anybody who could read (in certain areas, as for instance Italy from the late thirteenth century and onwards, these included women as well) and who wished to obtain a copy of a text had three options: The first was to locate an existing

copy and try to purchase it from its owner. Deeds of sale and records of ownership transfers inscribed in many manuscripts, along with the scarcity of evidence to a Hebrew book trade in Europe and North Africa, suggest that used books were usually acquired directly from their owners and not through book dealers. Naturally such acquisitions were limited by the availability of the book in a given region, and the chances of finding a specific text – unless it was a common one – were meagre. One may suppose that many books were acquired at random because they were obtainable. Beside the acquisition by purchase, books were largely inherited. According to many inscriptions and book lists in Italian books, the library of the deceased was usually divided among his heirs.

The two other options facing whoever wished to get hold of a book did not involve handing over but tailor-made production, by means of a hired scribe (professional or casual) or by means of self-production – namely, copying the desired text by one's own hand. Both ways depended of course on the availability of a manuscript that could serve as a model for the copying.

Literary sources on Jewish books comprise mainly the European halakhic literature, while documentary sources comprise mainly lists of books. In Europe – particularly in Italy – such lists are found on blank pages in manuscripts, where an owner registered his private library. He might list the books in his possession just by their titles, or add some codicological or even palaeographical information such as their writing material, their binding or the type of script. In the Middle East book lists were registered separately, some of them apparently prepared by book dealers. The extant examples were recovered from the Cairo Geniza, where dozens of letters relating entirely or partially to the commissioning and copying of manuscripts were found. Latin inventories of large Jewish private libraries, recorded and deposited in Christian archives for legal reasons, survived in Italian archives and more so in Spanish ones.

Almost all the literary and documentary sources relate to books in private possession, produced by private initiative, and to scribes hired by individuals to copy specific texts for their personal use. All the European and some of the Oriental lists are in fact catalogues of private collections or lists of inherited books. Book lists found in the Cairo Geniza are thought to have been book dealers' sales catalogues (in some of them prices are indicated) and inventories intended for private clients. From European literary sources and dedication documents it is clear that books were sometimes kept

in synagogues, but these apparently small collections were amassed over the years through occasional donations by individuals who commissioned books specially or donated books they had owned, rather than through planned communal or institutional enterprise. Apart from private donations, primarily of biblical manuscripts, to synagogue foundations, books were private property, as book lists and inventories from the East and the West show. Their production was the outcome of private initiative, as various Geniza letters attest.

The individual circumstances of Hebrew book production are firmly attested by some 4,000 colophons that have survived in extant medieval manuscripts. According to these colophons, assembled by the Hebrew Palaeography Project in the framework of codicological documentation of all dated manuscripts as well as those bearing indications of their scribe's name, all these manuscripts were privately and personally produced, apart from a few codices written for a community or a synagogue. Less than half were copied by professional, semi-professional or even casual scribes commissioned by private people to produce books for their needs; the rest were prepared by learned users of books or scholars for their personal use. Only about 29% of the colophons state categorically or imply that the manuscript had been made for personal use, while 38% of the colophons testify that it had been inscribed by a hired scribe; 33% do not contain any indication concerning the destination. The great majority of the colophoned manuscripts with no mention of their destination must have been user-produced, since it is inconceivable that a hired scribe should omit from his colophon the mention of whoever had commissioned the book and remunerated him, while it is only natural that an individual copying for himself would not necessarily bother to state this fact. If our assumption is justified, then some 60% of the colophons should attest to self-production.

A highly professional scribe may have prepared copies of popular and much sought-after books in advance for chance buyers or book dealers without being commissioned *apriori*. Considering the meagre evidence relating to book trade this could have applied to a mere small portion of the colophoned manuscripts. An indisputable example is preserved in the colophon of a Spanish undated fifteenth-century manuscript containing a compilation in Kabbala. The scribe explicitly states he wrote the book for "anyone who would want to purchase it".

Even if part of the undestined colophoned manuscripts were not user-produced copies, the high rate of self-production in Jewish societies – encompassing about half the medieval codices – is unequalled in other civilizations of the book, particularly in Christian societies. The unusual ratio between the professional and individual production found in Hebrew manuscripts reflects the level of Jewish literacy. This do-it-yourself practice encouraged free interference of learned copyists in the transmission of texts, having grave consequences in what concerned the integrity of the texts reproduced in user-produced copies.

Notwithstanding the weighty testimony of colophons regarding the private and personal making of the books considerable number of the dated codices (9% until 1500) were found to have been copied by several scribes (two to seven, usually not more than three) It is not unlikely that the incidence of multi-hand manuscripts among the bulk of undated ones is even higher. This phenomenon is noticeable in France and Germany, yet it occurs only rarely in the Middle East, more particularly in Yemen. Notwithstanding the lack of historical documentation, do these multi-handed copies imply the existence of some kind of institutional or collective production of books? Do they attest to the existence of commercial, multi-scribed, ateliers which dealt with producing and marketing books on a large scale? Both these possibilities must be rejected because of the very fact that multi-hand copying is equally observed in both commissioned and owner-produced copies. If we consider, as we did, most of the undestined colophoned manuscripts to be owner-produced, we would find that shared copying was more common in manuscripts copied for personal use than in those commissioned from hired scribes. The reason for this is probably rooted in the view, held at least in Germany, that non-homogeneous copies were inferior in quality; commissioned copying tended therefore to be executed by a single hand, while learned owners felt indifferent towards shared copying. Additional hands which joined the main scribes remained in most cases unmentioned in the colophons of multi-handed manuscripts. Assumedly, the unmentioned copyists would have been ignored only if they were sons, relatives or pupils of learned individuals copying for their own use, or apprentices of professional scribes.

In conclusion, literary and documentary sources relating to books and the direct evidences provided by colophons, which constitute authentic historical documents far more reliable than vague literary texts, seem to demonstrate unequivocally that the



production of Hebrew codices in the Middle Ages was a personal and private initiative of individuals and apparently never a public enterprise promoted by intellectual or communal establishments. They were never fabricated in academic or commercial organised copying centres on a large scale. Book production and text reproduction were performed by professional scribes hired by private individuals or by learned individuals copying for their own use. Both would sometimes be assisted by secondary scribes – presumably relatives or pupils of the main scribe. Like the *yeshivot* – the Jewish learning centres equivalent to Christian monasteries, cathedral schools and universities – which in Western Europe were private institutions, owned by the rabbis heading them and having no formal affinity to the community, the production, dissemination and keeping of books were a private enterprise. Like the autonomy exercised by each Jewish community, especially in Europe, and the lack of a centralized civic or halakhic, let alone political, authority in the dispersed Jewish society of the Middle Ages, so were texts reproduced and propagated by private channels without supervision or monitoring, and, naturally, no standardisation of their versions could have been imposed. The individual nature of book production and consumption did not encourage the creation of public libraries even at the end of the Middle Ages, apart from humble collections of donated or bequeathed biblical and liturgical books in synagogues. As – unlike Latin codices - they were not produced and kept in a centralised and collective manner, Hebrew books were not assembled and preserved in institutional libraries but in many small collections. Making, using and collecting books in Jewish societies was indeed an extraordinarily private activity. And whereas the institutional and centralized character of Christian book production and text dissemination – whether carried out in monasteries, cathedral schools, universities, or commercial outlets or initiated by them – enabled supervision and control over the propagation of texts and the standardization of versions, no authoritative guidance or monitoring could have been involved in the private transmission of texts in Hebrew characters. In this respect, the social framework of Hebrew book production seems closer to that of the Islamic world than to the Christian one, despite evidence on the institutional initiative of book copying and the large-scale commercialization of book production in the Arab world.

## Distribution of copying destination in dated manuscripts until 1540

(1) commissioned mss

(2) user-produced mss (including mss copied by family members)

(3) undestined mss

<b>Zones</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>Total</b>
	<b>MSS</b>	<b>%</b>	<b>MSS</b>	<b>%</b>	<b>MSS</b>	<b>%</b>	<b>MSS</b>
Sefarad	194	32	203	34	201	34	599
Ashkenaz	156	43	77	21	126	35	360
Italy	441	45	290	29	260	26	990
Byzantium	90	32	102	37	86	31	277
Orient	87	22	108	27	199	50	397
Yemen	93	72	13	10	23	18	129
Uncertain	9	36	6	24	10	40	25
<b>Total</b>	1070	<b>39</b>	799	<b>29</b>	905	<b>33</b>	2777

The high rate of self-production had no doubt an immense effect on the nature of the transmission and versions of the texts. Within the individualistic mode of reproduction of Hebrew texts, a distinction ought to be made, between texts reproduced by professional or hired scribes and those copied by scholars and by the learned for their own use and needs. To be sure, neither hired scribes nor copyist-owners could escape the many inevitable snares set by the unconscious mechanics of copying. The complicated psychological and physiological process of copying frustrated the best intentions of both professional scribes and copyists in their efforts to adhere to their model, as the collation of manuscripts successively copied by different scribes demonstrate. Even more telling are those rare cases in which the same hired scribe or learned copyist copied the same text twice from the same model within a short time. Comparisons between such copies betray the astonishing reality that deviation from the exemplar is not, as is usually assumed, rigidly conditioned by certain psychological, linguistic, or mental configurations, nor by the copyist's spelling habits and pronunciation; it is a volatile and inconsistent process. However, one is probably justified in assuming that the average hired scribe would have been more consciously loyal to his model, repeating its mistakes and refraining from critical or deliberate intervention in the transmission, yet at the same time more

vulnerable to the involuntary changes and mistakes conditioned by the mechanics of copying. The scholar-copyist on the other hand, might intentionally interfere in the transmission, revise his exemplar, emend and reconstruct corrupted texts, and indeed regard copying as critical editing and not merely as duplicating.

If these assumptions are correct, the high rate of user-produced Hebrew manuscripts must have improved the versions of a considerable number of surviving manuscripts by an accumulated process of critical emendation by learned people and scholars who restored texts that had been corrupted by ignorant hired scribes. These assumptions can be substantiated and verified by scribes' and copyists' own statements in their colophons. Reflexive colophons of learned copyists who produced books for their own use confirm the assumption with regard to their critical manner of copying. Yet by the same token those reflexive colophons by scholar-copyists attest to the increasing freedom with which they were interfering in the transmission of the text. They seem to have been confident that they were entitled, even obliged, to improve the copied text by their personal critical judgment.

Copyists of user-produced books testify that their copying involved not only amending and restoring the corrupted model but also critically revising and editing it. The inclination to editorial intervention in transmission emerged only in the late Middle Ages, from the early fourteenth century, but is attested primarily in fifteenth-century colophons. One of the main manifestations of the editorial tendency and the critical urge is to be found in colophons of copyists in Italy, Spain, Provence, France, and Germany, and later also in Turkey, in which they state that they had been using two models, sometimes more, blending different sources according to their critical judgment, thus producing totally eclectic versions. These and similar statements by copyists reflect an evolutionary escalation of deliberate interference in the transmission of texts. The individualistic mode of Jewish book production and the lack of institutional supervision and authoritative control over the dissemination of texts naturally contributed to this process.

## II Colophons

As against the scarce documentary and literary sources on book production and consumption, abundant data can be found within the manuscripts, primarily in colophons. These authentic documents convey information provided by the copyist on the circumstances of production. About 4,000 colophons of codices written in Hebrew script have survived, some 3400 are dated. They constitute about 7% of the estimated 60,000 complete or partial extant medieval codices (out of a total of 100,000 Hebrew manuscripts and excluding the many fragments). Half the colophons include an indication of locality.

A colophon might contain the following details: The scribe's name; the name of the person who commissioned the copying or an indication that the copyist copied for himself; the title of the copied text; the date in which the copying was completed; the locality of the copying; and finally, eulogies and blessings. Sometimes scribes and copyists would include valuable information on the circumstances and background of the copying, on the *forlage*, on their critical approach and practice, the duration of copying, remuneration, and other personal and historical data. Not all colophons contain all these components and part of them are very brief, as was the earliest undated one, a fourth-century magical papyrus from Oxyrhynchus written in Western Aramaic, which contained the scribe's name, definition of the text and ending formula.

**Producer's name.** The name of the scribe is specified in 85% of the colophons. In addition to scribal colophons, a colophon by the vocalizer might be added in biblical manuscripts; in rare cases an illuminator would also add his colophon. moreover, a custom which was common among Hebrew scribes reveals the names of anonymous copyists: Scribes would often adorn and highlight their own names where these happened to occur in the transcribed text, particularly at the beginning or, less often, at the ending of a line; or they would indicate the letters of their names in acrostics in the first letters of a series of lines. This unique practice was common in all areas (yet hardly in the Orient) and was implemented in half the manuscripts until 1500 in all literary genres, including biblical manuscripts. It is frequently found in manuscripts with colophons which include the scribe's name and appears not only in anonymous colophoned copies but also in many hundreds of uncolophoned manuscripts and in multi-handed copies in which only the name of the major scribe is indicated. This

scribal "trick" or stratagem provides us with a highly useful tool for analysing multiple-handed copies, and assists us in cases of uncertainty as to whether a particular manuscript is homogeneous or a product of several hands, especially when a number of them used this device to disclose their name. The highlighting of the scribes' names also helps in ascertaining the division of the text among different scribes and the distinction of one hand from another [Beit-Arié, "How Scribes Disclosed their Names in Hebrew Manuscripts" (2006)].

**Dating.** Dates are presented according to five eras: In a considerable number of Oriental colophons two or more parallel eras are used. The commonest is the Jewish era according to the Creation. The Seleucid era, which began in 312 B.C., was used only in the Orient where it was the standard dating practice. There it appears in 61% of the dated colophons (in Yemen – 82%). The calculation according to the destruction of the second Temple in Jerusalem is the least used era. It appears in 5% of the Oriental colophons and in a few dozen Italian ones. The Islamic Hijra era is used only in the Eastern Islamic zone (excluding Yemen) and appears in a quarter of the colophons there, almost always in manuscripts written in Judeo-Arabic. The employment of the Christian Gregorian calendar is confined to manuscripts copied by Christian converts. However, since the mid-fourteenth century, a combination of the Jewish calendar and the Christian one appears in a considerable number of Italian colophons, where years are rendered according to the Jewish Creation era, while days and months are indicated according to the Christian era.

**Locality.** Localities are rendered by Hebrew transliteration, reflecting the old medieval name, frequently retaining it while disregarding transformation of a political or linguistic nature. Some toponyms are indicated by Hebrew calque translations and some by ascribed biblical names.

### **Pace of copying and speed of scribes**

More than 250 colophons provide information on the duration of copying and enable the calculation of the speed and output of scribes. There are two ways to retrieve such data - a direct, explicit one and an indirect one. The direct kind, which is less frequent than the indirect one, includes scribes' specification of the duration of their copying in their colophon. The indirect one includes either a statement on the date of beginning and end of the copying, or a number of fully dated colophons at the end of the textual units of the manuscript, from which the duration of the copying can be inferred. In

both kinds of information we usually lack a specification concerning the daily input, how many hours per day were spent on copying and whether the scribe or copyist copied continuously, day by day (except for Saturdays and festive days). A few multi-colophoned manuscripts containing direct data show that the scribe was engaged in copying during only a part of the time which had elapsed between the completion of one textual unit and the consecutive one. Thus the calculation of the duration of copying based on the indirect evidences might be misleading.

No doubt the speed of copying was conditioned or affected by several factors: The mode of script (the square one - requiring more strokes while inscribing the letters, the semi-cursive and the cursive), the genre of the text and its social function, its esthetic quality, and its destination (whether the manuscript had been commissioned and copied uncritically or was user-produced by a learned person reproducing the text critically). Moreover, any calculation of the speed must take into consideration the dimensions of the surface area, the width of lines and their number per page, and above all, the average number of written signs within a line. Multiplying the average number of written signs per line by the number of lines and by the number of copied pages, then dividing it by the number of copying days enables us to calculate the average input per day in terms of written signs and compare it to the writing speed in other manuscripts of the same script mode, even if written in different layouts. SfarData makes this calculation possible since it contains data on the number of average written signs per line. For example, the average daily pace of a copyist who indicated the exact number of copying days in two colophons in manuscript Cambridge, University Library Add. 173, dated 1289, probably in Rome, and in two colophons in manuscript London, BL Or. 6712, dated 1287, both written in a semi-cursive script, was 49,550 written signs (about 20 folios per day). Manuscripts Parma, Biblioteca Palatina Parm. 3118, 3126, and 3099 were copied in 1323 by a professional scribe, active in Rome and its vicinity, for his own use. The speed of this scribe, who wrote in a minute current semi-cursive script, was only 17,685 daily written signs. Calculating scribes' speed should be based on the count of written signs rather than on that of written folios.

### **III Writing Materials**

#### **Parchment and its replacement by paper**

The use of parchment as standard writing material had probably started at the time of the canonisation of the Hebrew Old Testament and continued until the end of the first millennium in the Orient, and until mid-fifteenth century in most parts of Europe. According to the dated Hebrew codices, the replacement of parchment by paper as the main writing material was a rapid process only in the Orient, already in the early eleventh century, and to a lesser degree in Byzantium. Elsewhere – in the Iberian Peninsula and Provence, France, the German lands and Italy - the transition had been gradual and occurred at a much later stage, as was papermaking. In the Sefardic zone paper became the main writing material in the second half of the fourteenth century; in Italy and Ashkenaz (central and northern France, the German lands and their adjacent territories) parchment remained the main writing material until mid-fifteenth century while in the second half of the century paper was used as much as parchment. The number of surviving Hebrew dated manuscripts produced in the Orient on parchment is meagre – 28 codices, mostly fragmented, which constitute eight percents of the corpus of the Oriental dated manuscripts. They were all produced not later than 1327, all of them but two eleventh-century Geniza fragments containing biblical texts. All extant codices from the tenth century are biblical parchment copies. However, the Cairo Geniza collection and the Firkovitch collections in the National Library of Russia in St. Petersburg contain many undated parchment biblical codices and their remains, which can be ascribed to the tenth and the eleventh centuries. The drastic decrease in the use of parchment in Oriental Hebrew book production correlates to the same phenomenon in the production of Arabic codices in the Orient.

The ratio of the parchment manuscripts within the entire corpus of dated manuscripts until 1500 is 43% (71% in the thirteenth century, 54% in the fourteenth century and 34% in the fifteenth century). In the Sefardic zone 36% (84% in the thirteenth century 46% in the fourteenth century and 22% in the fifteenth century); in Franco-German territories 82% (100% in the thirteenth century, 98% in the fourteenth century, 51% in the fifteenth century); in Italy 59% (98% in the thirteenth century, 82% in the fourteenth century, 51% in the fifteenth century); in Byzantium 14%; in the Orient only 8% (in Yemen 13%).

The selection of the expensive writing material while paper was available as well was dictated by the economic capability and social status of those who commissioned the copies or those who copied books for their own use; at the same time it was also genre-bound. Bibles, prayer books and to some extent halakhic (legal) corpora were copied on the more durable and prestigious writing material even after the use of paper had spread, because of their contents and their frequent use. Classification of the writing materials by the destination of the copying does not show that self-produced copies were made mainly on paper; however, in all regions (outside the Orient where parchment was almost abandoned) cheaper paper for self production was used twice as much as parchment in user-produced dated manuscripts.

Cattle skin in which only one side was processed for writing is called in Hebrew *gevil*. Talmudic instructions require writing the liturgical Tora Scroll on *gevil* and this dictate persists to this very day. Literary halakhic sources and chemical analyses attest to regional differences in the materials used for the processing of the skins used for scrolls, particularly the utilisation of tannin in the Orient. No doubt, this kind of analysis can be applied to codices in a very limited way. Yet it is feasible to grade the kinds of parchment by means of their visual appearance, especially that of the hair side, which vary from zone to zone (in one specific zone they vary even from period to period). Consequently, these visual differences may serve as a codicological criterion for identifying the provenance of a manuscript (while in Ashkenazic manuscripts they serve for indicating the period as well).

**Oriental parchment.** In the Orient, parchment bifolia are clearly characterized. The Oriental parchment is known to us from the extant early dated biblical codices and the later Yemenite manuscripts. The method of preparing the parchment makes the distinction between hair and flesh sides difficult since both sides are glossy and smooth. No marks of scrapping can be seen on the hair side and only occasionally remains of hair roots or follicles discernible. Nevertheless, it is always possible to identify the sides by their hue, the flesh sides being slightly lighter and brighter than the hair sides. It is obvious that despite the similarity between the sides the manuscripts producers distinguished between the sides, as the arrangement of the quire bifolia and the ruling method demonstrate.

**Sefardic parchment.** The visual features of the parchment used in Christian Spain in the late twelfth century are known to us from a few dated manuscripts. This parchment is



similar to the Italian type (see below). An earlier manuscript produced in Kairouan (Tunisia) shows a similarity to the Oriental type. The absence of dated parchment manuscripts from Muslim Spain and the Maghrib before the thirteenth century prevents us from establishing whether the Oriental-Arabic type had indeed been used there in early times. Later, the appearance changed and the distinction between the sides became possible. In most cases the hair side is not scratched and follicles and hair roots are visible. In some manuscripts the hair side is scraped and the remains are not visible. The flesh side is very bright and glossy.

**Italian parchment.** The type of parchment employed in Italian dated Hebrew manuscripts from the earliest dated manuscript of 1072/3 until the late Middle Ages retained the natural difference between the sides. Their disparity is sharp and easily discernible: Hair sides are rough and scraped yet the follicles and residues of hair roots are visible. Flesh sides are smooth and much lighter. The difference in the appearance of the codex alternate openings is very conspicuous. Only high-quality manuscripts which were produced during the fifteenth century, more particularly illuminated ones, were written on refined, thin, very light parchment (known from humanistic copies), in which hair roots are not seen yet one can distinguish between its sides.

**Byzantine parchment.** The visual characterisation of parchment in Hebrew Byzantine manuscripts is impeded by the small number of dated manuscripts. It seems that it bears a similarity to the Italian type. Its processing retained the natural side differences and allows clear differentiation.

**Ashkenazic parchment.** The visual appearance of the parchment employed in the German lands and their adjacent territories and in some variant way in northern France, especially from the last third of the thirteenth century and on does not resemble parchment types in all other geo-cultural zones; it reflects a shift in the processing technique and in an aesthetical concept of book design. Until this shift, the processing of hides in all areas of Hebrew book production retained substantially or moderately the difference between the sides, and the quire openings were arranged in alternating matching sides. Indeed, appearance like that of the Italian codices is witnessed in the earliest dated Ashkenazic codices of the last quarter of the twelfth century and more distinctly in earlier undated codices. It seems that in Germany, northern France and England, a change in the processing of the parchment started to

evolve already in the late twelfth century, as witnessed in Hebrew manuscripts. The differences had gradually been reduced with the aim of presenting a similar appearance of the hair and flesh sides, until these became entirely equalised in the last decades of the thirteenth century, prominently in Germany.

Due to the scarcity of Ashkenazic manuscripts with indications of place, classification by the provenance of these manuscripts (either German lands or northern France) can be established by their contents, mainly the liturgical rite of prayer books. The examination of the parchment in all dated Ashkenazic manuscripts which indicate the place of production, or which are soundly localisable, exposes a difference between the appearance of the parchment of manuscripts produced in the German lands and that of manuscripts produced in northern France. This difference, sometimes rather slight, can serve as a basic codicological yardstick for differentiation between “German” and “French” manuscripts, which share both types of script and codicological features. In most of the French localised and localisable manuscripts it is possible to distinguish between the sides either easily or at least with some effort. In many of them remains of hair roots are visible since the earliest localised manuscript written in La Rochelle in 1215 until 1499 (in the north-eastern of France, where Jews were allowed to reside after the last expulsion of 1395). There is not one single French manuscript written on entirely equalised sides. It is evident that the parchment processing was aimed towards reducing the difference between its sides by the scrapping of both. This said, it seems that scribes were nevertheless aware of the differences as they arranged the quire bifolia according to matching sides, following the so-called Gregory Rule.

Dated manuscripts that were surely manufactured in German lands since 1226/7, and without exception since 1264 and on, were inscribed on equalised parchment. One can discern only with great effort the parchment sides in a few manuscripts from the late fourteenth and early fifteenth century. No doubt, sporadic remains of follicles and hair roots can be also observed in equalised-parchment manuscripts and here too it seems that scribes were capable of distinguishing between the sides and arrange the quires in accordance to Gregory's Rule. However, after the change which Ashkenazic parchment had gone in the course of the thirteenth century, its visual characterisation - as perceived by the codicologist - is completely different from that of the parchment of other codicological zones. To sum up, from the last third of the thirteenth century

and on there was in the German lands no parchment which sides can be clearly discerned. While Germany started to adopt the processing technique of equalising parchment sides in the second half the thirteenth century, northern France continued to use parchment with distinguishable sides or parchment in which side distinction was considerably reduced yet discernible.

The shift in parchment processing was associated with a shift in the pricking and ruling techniques and methods.

The replacement of parchment by paper as the main writing material, as witnessed in dated Hebrew codices, had been a rapid process only in the Orient, already in the early eleventh century, and to a lesser degree in Byzantium. Elsewhere – in the Iberian Peninsula and Provence, France, the German lands and Italy -- the transition had been gradual. The extant early manuscripts were written on parchment, and only one large fragment found in the famous Cairo Geniza (depository of worn out books and documents) is written on papyrus. The earliest dated codex written on paper was produced in the Orient in 1005.

Manuscripts produced in the Orient were written on Arabic paper, displaying several regional and temporal patterns of laid and grouped chain lines.

In the Sefardic zone paper became the main writing material in the second half of the fourteenth century, while in Italy, France and the German lands parchment remained the main writing material until mid-fifteenth century; in the second half of that century paper came to be used as much as parchment.

## **Paper**

### **Chronology and diffusion of Oriental paper**

‘Oriental’ paper was used in Hebrew codices in the Orient since 1005 -- the date of the earliest extant dated paper manuscript (*Codices hebraicis*, 15) -- at the latest (and in documents no later than 933). Since then, Oriental-Arabic paper became the standard writing material in Oriental Hebrew manuscripts. Only some dozen fifteenth-century manuscripts and a similar number in the first four decades of the sixteenth century were written on European watermarked paper, most of them by Sefardic immigrant copyists.

The earliest dated paper manuscript in the Byzantine zone was written in Gagra (Caucasus) in 1207 on Oriental paper. However, very few dated manuscripts are written on such paper, and most of the rest are written on European paper. concluded In the Sefardic zone (Spain and the Maghrib) the earliest paper manuscript was written in Muslim Valencia in 1119, probably on Arabic paper produced in Islamic Spain (mid-eleventh century commercial letters in Judeo-Arabic found in the Cairo Geniza concluded the dispute over the period in which the employment of an improved Oriental technique for papermaking had begun). A fragmented manuscript dated 1125/6, probably in Mahdia (Tunisia), was inscribed on Oriental paper (or rather on Maghribi paper produced in the Oriental technique). All other dated manuscripts until 1315 were written on pre-watermarked Spanish paper, some of them showing zigzag marks. Since then all Sefardic paper manuscripts were produced on European watermarked paper.

There was, naturally, no utilization of Oriental paper in Italy (the earliest dated paper manuscript was produced on watermarked paper in 1276/7-1284) or in Ashkenaz (earliest paper manuscript – 1343/4). Initially the use of paper in both areas had been scarce, spreading only gradually. In fourteenth-century Italy it was limited to 15% of the dated manuscripts, while in the first half of the fifteenth century it grew to one third of the production and in the second half of the century it reached some 50% (likewise in Ashkenaz).

### **Geo-chronological typology of Oriental-Arabic paper**

Here follows a presentation of the morphological types of Oriental-Arabic paper according to the dated medieval manuscripts written in Hebrew characters, with a characterisation of their patterns chronologically and regionally. In addition, the corpus includes 140 Oriental dated manuscripts kept in the Bodleian Library, Oxford, written on Arabic paper -- mostly in Arabic script, some of them in Persian, and a few in Syriac script -- all of them from the Near East. The excellent physical condition found, as a rule, in the Bodleian Arabic and Persian codices contributes immensely to the study of Arabic paper morphology. Altogether, the typology is based on 620 dated manuscripts with some additional 110 undated named ones, many of them datable.

One should bear in mind the common difficulty in identifying the visible structure of the Oriental-Arabic paper even in well-preserved manuscripts, as well as the many cases of ambiguous documentation and the inconsistent or contradicting impressions

which impede clear and distinctive description. Only a systematic reproduction of the wire pattern of a large part of the folios (or, when feasible, of unfolded bifolia), such as the beta-radiography technique, might provide us with a clearer typology. Regular small-size beta-radiography reproductions have usually been found to supply insufficient information, due to the irregularity of Arabic paper. Above all, a systematic study of dated and localised Arabic manuscripts is essential for establishing a more solid typology of the patterns of Oriental-Arabic paper, their emergence, distribution and scope.

The earliest paper manuscript examined can be considered the earliest dated Arabic paper manuscript, inscribed in 848 and kept in the Regional Library of Alexandria. The only other pre-1000 manuscript examined is dated 983. The earliest surviving dated Hebrew paper manuscripts are dated 1005 (a fragment, MS Cambridge, UL TS 8 Ca.1) and 1006 (a codex, manuscript St. Petersburg, NL EBP.-AP. I 4520).

The following seven types, mostly in accordance with those pointed out by J. Irigoin and his colleagues, can be discerned, outlined and characterised time-wise and, to certain degree, region-wise.

#### **A. Wireless paper**

Its occurrence in the earliest dated manuscript (the above mentioned Ms Alexandria dated 848) may very well indicate that early Arabic paper was wireless or pattern-less. This kind of paper, in which no laid or chain lines are visible, was constantly used from the beginning of the eleventh century until the end of Middle Ages. It was found in a considerable number of manuscripts, produced everywhere in the Near East, but relatively much more frequently in manuscripts localised in Iraq and in Iran; there it can be found in some 18% of the recorded manuscripts.

A particular wireless paper showing some “chaotic” patterns and conspicuous fibres was extensively and exclusively used in Yemen from the beginning of the fourteenth century until the introduction of Italian watermarked paper, around the middle of the sixteenth century. This peculiar type, found in almost 80% of the 110 dated manuscripts produced in Yemen, was most probably manufactured in that region, as it is not to be found in any other Oriental manuscripts. The only recorded Arabic codex written in Yemen shows indeed a similar type of paper.

#### **B. Laid lines only**

An early type, whose first appearance in our corpus is dated 983, was -- like the previous type -- produced continuously and used extensively until 1500. It was the dominating type until 1250, declining thereafter, because of the competition of the growing and emerging types of clustered chain lines. Yet, it still constituted 35% of the dated paper manuscripts in the second half of the thirteenth century and about 23% in the following century.

This type was used everywhere, but -- like the first type -- many of its manuscripts were produced in the eastern part of the Near East, namely, Iraq, Iran and central Asia, where this kind of paper was the main type from the eleventh century onward, constituting an average of about 70% of the dated manuscripts. Thus, the lack of chain lines characterises paper produced in those northern-eastern areas. The production of both wireless and particularly laid-lines-only paper is still attested there in the sixteenth century. The limited use of various types of chain-lined paper in those areas may hint that this kind of Arabic paper was not produced there, but imported from neighboring (western) areas.

### **C. Laid and chain lines**

In many cases the visible pattern of the chain lines is not clear enough, being irregular or presenting combinations of more than one type.

#### **1. Single chain lines**

Visible chain lines in Oriental Arabic paper are usually clustered in several uneven groupings. Paper manuscripts showing single chain lines are extremely rare, comprising about 3% of our corpus. This type was found in dated manuscripts from the beginning of the twelfth (and perhaps already in a 1048 manuscript, where single chain lines are apparently seen, spaced 30-35 mm) until late fifteenth century. Usually, single chain lines are curved and not evenly distanced. In most clear cases their distribution is very dense: 12-25 mm. Two cases showing wider spaced single chain lines (36-40 mm), might represent paper produced in North Africa, as might perhaps all the rare occurrences of the single chain lines.

#### **2. Clustered chain lines**

This multi-pattern kind emerged clearly at the beginning of the twelfth century or perhaps a little earlier. Its use increased gradually, equaling the laid-lines-only paper in the second half of the thirteenth century and becoming the dominant kind from the first half of the following century onward. This kind of paper was rarely found in the areas of Iraq/Iran/central Asia and never in Yemen after the beginning of the

fourteenth century. Everything indicates that it was produced and/or used in the western parts of the Near East - Syria, Palestine and Egypt.

**2a. Chain lines grouped in pairs**

This was the earliest recorded type of the clustered kind of Oriental-Arabic paper. Its first unmistakable appearance in our corpus is dated 1119/20. Its peak, according to our corpus, seems to have been in the second half of the fourteenth century.

**2b. Chain Lines Grouped in Threes**

This type apparently emerged in the early thirteenth century, though its earliest clear pattern was not attested before 1249. However, its extensive diffusion occurred much later: In the fifteenth and the first half of the sixteenth century it overruled other types used in the western Orient, remaining the only kind of chained paper.

**2c. Chain lines grouped in pairs and threes alternately**

This youngest pattern is attested for the first time by our corpus in an Arabic manuscript dated 1338. The late Don Baker, however, noticed it in an earlier Arabic manuscript dating from 1304 (*The Paper Conservator*, 15, 1991, p. 31). Only in the second half of the fourteenth century its spread prevailed over all other types of paper used in the western regions.

**2d. Chain lines grouped in fours**

This unusual pattern has so far been noticed without certitude in two Hebrew manuscripts dating from 1331/2 and 1452, but clearly only in one Arabic codex, dated 1210. Its scarce occurrence may indicate that such a type was produced on a very limited, probably local, scale, or that it was not properly identified.

Finally, a note concerning the peculiar feature of the splitting edges of Oriental-Arabic paper sheets. This phenomenon, for which a conclusive explanation is still much lacking, was frequently observed in recently recorded dated manuscripts, both the Arabic ones of the Bodleian Library, and the Hebrew codices of St. Petersburg. Among the latter, which were studied more thoroughly, 40% were found to show splitting edges, or rather *splittable* edges. In some cases the edges, mainly external corners, were split into 3 layers.

The same phenomenon can be witnessed in manuscripts as early as the eleventh century and until the end of the Middle Ages. It seems that it does not at all characterise wireless paper, including the peculiar Yemenite type, which may challenge scholarly suggestions (backed by medieval literary sources) that such paper

was manufactured by pasting two sheets together. In solving the puzzle of the splitting, or splittable, Oriental-Arabic paper, however, one should give heed to the fact that a similar phenomenon is also observed in several Hebrew manuscripts written in early twelfth-century Spain, as well as in thirteenth-century Italy and Byzantium. Accordingly, this feature should be studied in comparison to the Occidental Arabic (Spanish) paper and the pre-watermarked Italian paper.



#### IV Book Form: Rolls, rotuli and codices

The scroll was the only book form used by the Jews for their scriptures in antiquity and for literary compositions -- like in the Judean Desert finds -- in post-biblical times. It became the only form for the liturgical Pentateuch (*Sefer Tora*) in its reading in synagogues to this day. A Munich palimpsest in which a sheet of a scroll containing a Hebrew prayer book was reused for a Latin text in the Bobbio scriptorium at around 800 attests to the late use of the scroll. [M. Beit-Arié, "The Munich Palimpsest: A Hebrew Scroll Written Before the Eighth Century", *Kirjath Sepher* 43 (1967-68), 411-428 (in Hebrew)]. All references to books in the rich Talmudic literature, both of Palestine and Babylonia, relate to scrolls; only a few isolated passages use metaphorically the Greek term of *pinax*, apparently meant to designate a concertina-like multi-plate writing device, more like a scroll than a codex. The revolutionary codex form of the book, which was adopted and diffused by Christians already in the first centuries of our era, replacing the old scroll form in the areas around the Mediterranean from about 300, was employed by the Jews much later. As was emphasized in the Introduction, between the abundant finds of Hebrew books from Late Antiquity – the Dead Sea Scrolls and the fragments from the Qumran caves and the Judean desert dating from the Hellenistic and early Roman period – and the earliest dated and datable surviving Hebrew codices, there is a salient gap of some eight hundred years in which almost no evidence of the Hebrew book, in either roll or codex form, is found. The earliest categorically dated extant Hebrew codices were inscribed at the beginning of the tenth century, all of them in the Orient. However, in the structural, figural, and artistic design of the copied texts, in their harmonious scripts and shared styles, and in the mature employment of codicological practices, these earliest manuscripts demonstrate elaborate craftsmanship and regularity, surely attesting to a long-established tradition of codex design and production. In fact, the earliest reference to the codex form in Jewish literature does not date before the end of the eighth or the beginning of the ninth century. Moreover, the earliest term designating a codex (*mishaf*) was borrowed from Arabic and persisted in the Orient for quite a long time. Therefore it seems that the Jews in the East adopted the codex after the Arabic conquest, very likely not before the ninth century or a little earlier. The long gap with no testimonies of a Hebrew codex until the ninth century can be

explained by the basically oral transmission of Jewish literature in the Hebrew script and by the belated adoption of the codex. The long rejection of the codex – the more capacious, durable, usable, easy to carry about, store and refer to book form - can be explained by assuming that the Jews adhered to the scroll book in order to differentiate themselves from the Christians, who first used the codex for disseminating the New Testament and the translated Old Testament. Indeed, the *Sefer Tora* -- the Pentateuch used for liturgical readings in synagogues -- and some other biblical books, are written to this day on scrolls. But the late employment of the codex may very well also reflect the basically oral nature of the transmission of Hebrew post-Biblical, Talmudic and Midrashic literature, which is explicitly testified by some sources and implied by the literary structures and patterns, mnemonic devices and diversified versions of this literature.

Old rotuli were noticed in the Cairo Geniza decades ago, but only recently their extent, chronology and variety of genres have been clarified by Gideon Bohak and especially Judith Olszowy-Schlanger, who was the oral source for the information which follows. The production and use of these Hebrew rotuli was rather extensive. So far hundreds of vertical fragmented scrolls were recorded, half of them written on parchment and half – on paper. They spread mainly in Egypt in the eleventh century, yet part of them undoubtedly dates from the birth of the Hebrew codex. They contain a large variety of texts: About half are liturgical while the rest include Talmudic treatises, halakhic literature, anthologies of biblical verses, dictionaries, glossaries, medicine and magic. About half of the rotuli were copied on the blank side of written documents, some of them in Arabic in Arabic script. The sizes of pieces that were stitched together to form a rotulus are not uniform, their width is narrow and their length varies. It seems that the rotuli, whose production was cheap and rapid and their form conveniently portable, were produced by their users -- rabbis, scholars, physicians and magicians -- for personal and professional use.

## V Quiring

### **The making of the quires by cutting or folding**

So far we have not noticed clear evidences for constructing parchment quires by folding – evidences which can be inferred by the visual appearance of the parchment, contours of holes, cuts, stains, position of flanks etc. that are contiguous along certain of the folio edges, as well as measured thickness or traces of uncut folds – i.e. bridge marks. Yet it should be admitted that no systematic observation of this facet has ever been carried out in Hebrew codicology. However, the sheer odd quire structure of most of the dated Hebrew codicological units, i.e. the standard quinion quiring which characterises Oriental manuscripts (both parchment and paper codices, regardless their size, apart from those produced in Persia and Uzbekistan) - a standard composition shared also by Arabic and Syriac scribes, and apparent in very early Greek and Latin manuscripts produced in the Orient – as well as the many extant Hebrew Italian parchment manuscripts dating from the eleventh century and until the fifteenth century - thwarts this possibility. In his *Manuel* Francois Déroche, dealing with early Arabic Qur'ans, particularly of the ninth century, definitely defies the possibility that the parchment sides in the quinions had been arranged by folding. While the consequence of forming a quire by folding is matching sides on each opening (hair side or flesh side alternately), in those Arabic codices the hair side is displayed in each recto of the quire, leading Déroche to the inevitable conclusion that quires were formed by stacking cut bifolia and folding them down. Though a few undated early Hebrew Oriental codices, produced probably in Iraq prior to the tenth century, show the same asymmetrical arrangement of the parchment sides (HHHHH), all the dated manuscripts follow the so-called Gregory Rule. It seems that the structure of most of the Hebrew codices imply that quires were composed by stacking bifolia from a pile of already-cut bifolia, picked up at random.

As for the possible preparation of bifolia by folding Oriental paper production-sheets: In most of the early dated manuscripts the direction of the laid lines in relation to the width of the folio is horizontal, but it is evident that this was not conditioned by the format of the book or by the number of times the paper production-sheet was folded. This is demonstrated by a comparison of the manuscripts whose bifolia are similar in size. While two such manuscripts (*Codices hebraicis* nos. 60 and 65) show horizontal

laid lines, another (*Codices hebraicis* no. 57) shows vertical laid lines. Furthermore, an additional manuscript showing single chain lines and horizontal laid lines (*Codices hebraicis* no. 61), in fact contradicts the horizontal evidence of nos. 60 and 65 since its bifolia size – 386 x 294 mm – is twice the size of the more-or-less common bifolia in the other manuscripts with single chain lines. Thus, although the dimensions of most of the paper manuscripts attest to considerably standardised production-sheet sizes before their folding and trimming, it seems that the direction of the wire lines was not uniform. This is demonstrated incontestably by *Codices hebraicis* no. 51, written on two different papers of the same size, one showing vertical and the other horizontal laid lines.

### **The structure of the quires**

Naturally, while presenting practices of quire structure we relate to the structure of most of the quires in a codicological unit, disregarding partial deviations from the dominant structure, which were dictated in many cases by textual demarcation or by working stages. In general, parchment quires comprised 4-6 bifolia (only very rarely ternions) while paper or mixed quires contained 4-14 bifolia (usually not exceeding 10 bifolia). The only extant papyrus codex (preserved in the Cairo Geniza) contained at least 24 bifolia. Only in the Orient did parchment and paper manuscripts share the same standard structure; part of the Franco-German and Italian paper quires were constructed, to some degree, like the parchment ones.

Before presenting the typology of the quire structure one has to relate to the disposition of the hair and flesh sides within the quire. As already mentioned, all the dated parchment manuscripts which sides are distinguishable (Franco-German manuscripts as from of the last third of the thirteenth century and on were inscribed on equalised or hardly distinguishable parchment) are arranged according to matching openings. Since the earliest dated manuscripts are from the early tenth century, this practice correlates to the Syriac and Arabic shift to a symmetrical arrangement. However, there are two ways to abide by the Gregory Rule: the outer bifolium can start either with the hair side or with the flesh side. In most of the Hebrew geo-cultural zones, quires start with the hair side, but in Italy, as from 1280 and on, the practice of starting with the flesh side spread gradually until it was employed in about 60% of the dated fifteenth-century manuscripts. At that period almost all the humanistic Latin manuscripts were arranged likewise, judging by the extensive corpus

studied by Albert Derolez. The wide diffusion of this practice since the 1420's in Hebrew manuscripts ruled in pale ink, unguided by pricking, and the fact that it was common also in manuscripts copied by immigrant scribes (from France, Germany, Spain and Provence) prompt the question whether ruled quires had indeed been manufactured and sold by stationers (see below, Ruling). Strangely enough, starting with the flesh side is found only in a small part of the Byzantine zone, where this was common practice in Greek manuscripts.

Most of the mixed quires start with the hair side, including those produced in Italy; naturally, the side of the last verso of each quire corresponds to the first recto of the successive quire.

In about two thirds of the combined parchment and paper manuscripts in which the central bifolium is also made of parchment, the central openings display hair side.

**Ternions** -- are very rare among the dated manuscripts and are found mainly in Spain and north Africa; they were, apparently, more common in Toledo – a centre of production of accurate copies of the Bible - between the end of the twelfth century and 1300. This practice was possibly inspired by Arabic scribes, particularly in North Africa.

**Quaternions** – The standard composition of Franco-German (Ashkenazic) parchment manuscripts, found in almost all the dated codices, ever since the earliest one produced in the last quarter of the twelfth century and until 1540; about half of the dated paper manuscripts share this composition. Quaternions were the commonest structure of parchment manuscripts in the Sefardic zone (Iberian Peninsula, Provence and Bas Languedoc and the Maghrib). It was very rare in the Orient, except for paper manuscripts from Iran and Uzbekistan according to localised or localisable manuscripts (which numbers are rather limited), where it seems to have been the standard composition. This conclusion is corroborated by the data on the quiring of Arabic and Persian paper manuscripts as from the second half of the thirteenth century. The earliest Persian Hebrew manuscript is dated 1190, but most manuscripts date to the fourteenth and fifteenth centuries. In Italy this composition was rather rare, but from the last decade of the fourteenth century it was used in 15% of the parchment manuscripts, most of them produced by Ashkenazic and Sefardic immigrant scribes who settled in Italy in the wake of the expulsion from France and the persecutions in Spain in 1391.

**Quinions** - The standard composition in the Orient since the earliest dated codices, regardless of the writing material. The same is found in Arabic manuscripts as well as in Syriac and Coptic paper manuscripts. This is also the quiring practice of Italian manuscripts since the earliest dated manuscripts of the eleventh century and on, and in 30% of the fifteenth-century dated paper manuscripts.

**Senions** -- Quires of six bifolia are not common in parchment codices, but were notably employed in paper ones. In the Iberian Peninsula and Provence senions were a secondary composition in parchment codices since 1275, yet they were used until 1500 in only 15% of them. Senions were used in about 45% of the dated paper manuscripts in the Sefardic zone, and in half of the dated Byzantine manuscripts. They were found in a quarter of the Italian paper manuscripts, but only in a very few Oriental manuscripts. Naturally, these data do not relate to fragments but to manuscripts whose quire structure is uniform.

The compositions of seven to fourteen bifolia were used only in paper and in mixed quires of parchment and paper in the Sefardic zone, Italy and the Byzantine zone. All were used occasionally, except for the eight-bifolia quiring which was relatively common in those areas during the fourteenth and fifteenth century.

### **Mixed quires**

The technique of constructing paper quires by adding protective outer and central parchment bifolia as a compromise between the durable but expensive parchment and the more vulnerable and cheaper paper is not witnessed at all in the Oriental Hebrew dated manuscripts, whether commissioned and self-produced (as has been mentioned, according to colophoned manuscripts at least half of the Hebrew manuscripts were owner-produced books). Notwithstanding the fact that the earliest mixed manuscript, dated 1212, was copied in Alexandria, it demonstrates a Byzantine codicological book craft. Perhaps the speedy replacement of parchment by paper as the main writing material can explain it. The practice of mixed quires was widely used in Byzantine Hebrew codices: one third of the dated paper manuscripts in the fourteenth century and nearly the same percentage in the fifteenth century show mixed quires. In the Sefardic zone, where the earliest extant sample from Spain is dated 1225, mixed quires constitute one third of the dated paper manuscripts in the fourteenth century, and only 10% in the fifteenth century. In Italy, half of the small number of surviving

fourteenth-century dated paper manuscripts show mixed quires, and one fifth only in the fifteenth century.

Unlike the situation in Latin manuscripts, this technique had not been adopted by Ashkenazic scribes and copyists, who replaced parchment by paper very late.

In most of the mixed quires everywhere, both the outer and central bifolia were made of parchment, while in about 20% of the mixed manuscripts only the outer bifolium was a parchment one. In Byzantium the first figure reaches 36% while it is only in a few manuscripts that just the central bifolium is parchment.

In almost all the mixed quires everywhere the first recto and last verso folia display the hair side, and consequently parchment openings between the quires respect the Gregory Rule (needless to say that the openings of the central bifolia display matching sides. Indeed, more than two thirds of the mixed manuscripts with central parchment bifolium show a hair-side opening.

Finally a remark about a practice witnessed in paper manuscripts, which can be viewed as a reduced and minimal variant of the mixed quires, known from papyrus codices, namely -- the placing of a narrow strip of parchment in the centre fold of a quire and on its outside back fold; usually this strip was pasted onto the paper, and sewn in order to reinforce the folds and protect the quire from the sewing thread. This practice is found in Hebrew manuscripts produced in the same areas where mixed quires were used, namely the Byzantine zone, the Sefardic zone and Italy (the earliest manuscript of this kind is a Sefardic codex dated 1282).

## **VI Marking the sequence of quires, bifolia or folios in the codex**

Hebrew scribes and copyists employed various systems for ensuring the correct order of the codex based on the numbering of quires in Hebrew letters, or on the repetition of the last copied words in two variations, and by marking the central opening of the quire.

Tenth-century dated manuscripts do not contain any ordering system, probably due to the fact that all are copies of the Bible. Scribes of the early period of the Hebrew codex were no doubt deterred from adding anything to the Masoretic text. Similarly, the absence of signatures in the earliest copies of the Qur'an may have originated for the same considerations. Indeed, a few undated non-biblical codices that probably antedated the tenth century do contain quire catchwords, and traces of sheet signatures were found in a fragmentary scroll in Qumran. However, since the beginning of the eleventh century both signatures and catchwords appear in Oriental manuscripts and in codices produced in all other geo-cultural areas. Moreover, both systems would be used in the same copy. In Ashkenazic manuscripts signatures are extremely rare.

### **Quire signatures**

Quire signatures appear for the first time in extant dated manuscripts in the earliest paper codex written in Fustat (Egypt) in 1006. It is a Karaite codex written in Judeo-Arabic, which, for the first time, contains also catchwords (*Codices hebraicis*, I, 16).

The appearance of signatures in a manuscript containing the Prophets in MS Cairo, the Karaite Synagogue, written, according to a long colophon, in Tiberias (Palestine) in 894/5, stands at variance with all the tenth-century Biblical codices, thus adding a codicological doubt to the philological doubts raised by scholars concerning the authenticity of the colophon. Indeed, a Carbon-14 test conducted by the Oxford University laboratory set the date range between 990 and 1160 (with 95.4% certitude). Since the codex was repaired in 1129/30, it had obviously been written before that date, most probably at the end of the tenth or in the early eleventh century, when biblical manuscripts started to employ means for ensuring the right order of the quires. The same codicological argument relates to another biblical manuscript that has apparently a record of sale dated to the year 847 (MS St Petersburg, Oriental



Institute of the Academy of Sciences D62). Its quire signatures are one of a few reasons for disqualifying the record.

The numbering of quires was the commonest ordering practice in the early periods since the beginning of the eleventh century, but it is absent from the early manuscripts in the Maghrib and Italy. Usually signatures coexist along with quire catchwords.

Just a small part of manuscripts, produced in the Orient, the Sefardic zone and Italy particularly in the early periods, employ signatures only.

The digits in all numbering systems are rendered almost exclusively in Hebrew letters, which is the regular indication of numerals in Hebrew. In the Orient in almost half (45%) of the manuscripts which contain quire signatures, parallel signatures are added in Arabic, mostly in words and always in Arabic script (this is witnessed also in a few manuscripts in Yemen and in two manuscripts in Spain). Usually the Arabic equivalent signatures (in digits) at the head of the quires are written on the outer corner of the upper margin, while the Hebrew signatures (in letters) are usually placed in the inner corner (in some manuscripts which have double signatures – both at the head and the end of the quire or at its end only; the Arabic numbering would also be added at the end Of the quire. In a considerable number of these manuscripts the signatures were written in Arabic numerals.

This practice of bilingual signatures can be found already in the eleventh century, and it was employed in the earliest extant complete Bible written in Cairo in 1008 (like in many other manuscripts, the Arabic is written in a different ink; it also contains Hebrew signatures added by a different hand). No doubt, these Arabic additions were intended for Arabic binders or probably inscribed by them.

Quire signatures were widespread especially in the Orient, where they were employed in more than half of the dated (not fragmentary) manuscripts until 1500, particularly in Yemen (which constitutes an independent codicological and palaeographical sub-entity within the Oriental geo-cultural entity), where they appear in nearly all the manuscripts (82%), and in Italy, where the device appears in 41% of the manuscripts. The use of partial numbering is found in one of the earliest manuscripts which had most probably been produced in Italy in 1105/6, while regular numbering appears in a manuscript dated 1246/7. Quire signatures appear in one quarter of the dated manuscripts of the Sefardic zone; however, the use of signatures was very rare until

the last quarter of the thirteenth century. Quire signatures in Byzantine manuscripts are rare, and in Franco-German manuscripts they are exceptions.

A conspicuous difference exists in the Sefardic zone and in Italy in the use of signatures in parchment manuscripts as against paper manuscripts or in mixed quires manuscripts. The ratio of parchment manuscripts in the corpus of manuscripts with quire signatures in the Sefardic zone is twice that of paper manuscripts bearing the same signatures (67% and 33%). In Italy the proportion is 78% and 22%. This characterisation cannot be applied to the Orient, where most of the manuscripts were written on paper.

### **The placement of the quire signatures**

The placement practice relates to two positions – the position of signatures in the quire and their place on the page in which they are inscribed. The numbering in Hebrew manuscripts might have been written at the head of each quire, usually in the inner corner of the upper margin; or at the end of the quire, in the inner corner of the lower margin; or both at the beginning and at the end.

In the entire corpus of studied dated manuscripts until 1500, 56% have double signatures at the head and at the end, 30% at the head only and 19% at the end only (the reason for the total sum of 105% is due to manuscripts in which two systems were employed, and this explains other ratios which exceed 100%).

None of the codicological entities adhere to one single positioning, but preferences are noticeable. In the Orient, excluding Yemen, 80% of the manuscripts with quire signatures place them at the head; until mid-twelfth century the practice is witnessed in all the extant manuscripts. Yet 32% have a double signature and 7% contain end signatures (one notices that mixed systems are most frequent: in Yemen 63% have double signatures; in the Sefardic zone 60% have the double system while 23% have end signatures and 19% have head signatures; in Italy 69% have double numbering, 24% end signatures, and 10% head signatures). In Byzantine manuscripts signatures are found to be scarce.

The earliest partial appearance of the double system was in an Oriental manuscript dated 1112; in regular use it was found in a manuscript written in Damascus in 1161. In Spain the earliest extant parchment manuscript, produced in Gerona in 1184, contained double numbering, while in Italy the earliest use is attested to 1246/7.

### **Counter-signatures**

An exceptional numbering of the end of the quire with a repeated signature at the head of the successive quire should be termed as counter-signatures. The system appears only in a handful of manuscripts and seems to have emerged in Germany and France (where signatures were not practiced) already in the thirteenth century. Outside the Franco-German zone it appears in a few manuscripts in Byzantium, Spain, Provence and Italy.

### **Bifolium signatures**

Bifolium signatures appear only in a small number of manuscripts, and it seems that bifolium catchwords or counter catchwords replaced their role. In most of these manuscripts the signatures were not accompanied by quire signatures, except for a few manuscripts written in Judeo-Arabic (mostly Karaite) from 1146 until the late fourteenth century: bifolia are numerated mostly in Arabic but also in Hebrew letters, such as "2 of 3", following the practice of several Arab Middle Eastern manuscripts produced between 1149-1292.

### **Foliation**

Foliation by the scribe is very rare and appears in only 1% of the dated palaeographical units within the codicological units. It was employed sometimes in the Sefardic zone, for first time in 1272, mainly in parchment manuscripts, and in Italy (the earliest occurrence was in 1286, and then in the fifteenth century), but never in the Orient or Byzantium. In Ashkenaz it appeared in the second half of the fifteenth century.

### **Mid-quire marking**

In part of the Oriental manuscripts and particularly the Yemenite ones the openings of the central bifolium in the quires are marked by various shapes, but mostly by marks similar to the Ghūbār numeral 5, placed in various corners of the opening, sometimes at the top outer corner of the right-hand page, as well as at the bottom outer corner of the left page; sometimes only one corner would be marked, while occasionally all four corner are marked by short diagonal strokes. These marks are usually inscribed in an ink different than that of the text. The mid-quire marking follows a practice found in certain Arabic manuscripts in the Orient and the Maghrib as was described by Guesdon. The earliest Hebrew codex with mid-quire marks was written in Jerusalem

in 988/9 by a Maghribi scribe (*Codices hebraicis*, 12), and the next one, in chronological order, was also written by a Maghribi scribe in Palestine in 1020/1 (*Codices hebraicis*, 19). Marks in the central openings are found in a biblical codex written in Kairouan in which the date is damaged; however, it must have been written between 941 and 1039 (*Codices hebraicis*, 29); the marks are usually in both upper corners. Not taking into account a few manuscripts from North Africa, most of the marked manuscripts are Oriental. The marking was most probably meant for the non-Jewish binder, and very likely would be added by the binder himself, as implied by the different ink.

### **Catchwords**

The catchword system is used in two ways. In the most widespread one, the first word(s) of a quire, or a bifolium, or a folio, is inscribed at the bottom of the preceding quire/bifolium/folio, usually in the inner margin below the end of the written text, and mainly horizontally. In European manuscripts catchwords would sometimes be inscribed in the middle of the lower margin. Such positioning would sometimes occur in Byzantium too but not in the Orient. Catchwords would sometimes be placed vertically (mostly quire catchwords, but also some leaf [or folio] catchwords), as was favoured by Ashkenazic scribes (in 13% of the dated manuscripts). Since the late eleventh century the practice of writing catchwords diagonally had been spreading amongst Oriental manuscripts; it appears in about one third of the manuscripts that contain catchwords of any kind. The tendency to write diagonal catchwords is part of the line management practice of many Oriental Hebrew scribes and copyists: when exceeding the left border line, last words were written diagonally, a practice borrowed probably from Arabic manuscripts).

Catchwords were usually marked or decorated simply. In Europe they were often adorned with complex designs, and in the Ashkenazic regions they were sometimes embellished by pretty pen drawings, mostly of animals.

The second type of catchwords also uses repetition of words from the copied text, but here the repeated word, instead of being placed conspicuously below the written page, is written within the text at the end of its last line. The last word of a quire, or a bifolium or a leaf is thus doubled at the beginning of the succeeding quire. Following Denis Muzerelle's *Vocabulaire* this stratagem can be defined as counter-catchwords.

### **Quire catchwords**

This had been the common device in parchment manuscripts in Europe and the Maghrib, whereas paper (or mixed-quire) manuscripts utilized bifolium or leaf catchwords as well. Quire catchwords were less used in the Orient until the late twelfth century; at that period scribes preferred quire signatures. In Franco-German areas quire catchwords were the only system used for ensuring quires order, apart from a few exceptions.

### **Bifolium catchwords**

Strangely enough, the practice of writing catchwords on the verso of the first leaf of each bifolium in order to ensure the right order of the written bifolia within a quire emerged later than the practice of leaf catchwords, which was more widespread. Despite its earliest use in a mixed quire manuscript dated 1225 in Spain, it appeared in all other areas only in the fourteenth century. All in all, it has been found in about 5% of the dated manuscripts. Although the writing of a catchword on the last verso of the first half of the quire – in the central bifolium - was not required, most of the scribes did use it.

### **Leaf catchwords**

This system was the most widespread in the late paper manuscripts in all the zones of Hebrew book production, and is found in two thirds of all the Hebrew dated paper manuscripts of the fourteenth and fifteenth centuries; yet it appears in only 10% of the parchment manuscripts. Though the earliest extant dated manuscript that contains leaf catchwords was written on paper in Damietta (Egypt) as early as 1168 (the scribe did not inscribe catchwords in the central openings), the practice started to spread in the Oriental paper manuscripts only from the second half of the fourteenth century. In the Sefardic zone this practice started in correlation with the replacement of parchment by paper in the second half of that same century, yet its first appearance was in a Provençal parchment manuscript, produced in Tarascon in 1284. It became common practice in paper manuscripts of the Iberian Peninsula, Provence and the Maghrib during the fifteenth century, and appears in 86% of the paper dated manuscripts (calculated also in consideration of the number of hands in multi-scribe copies). Its first appearance in Byzantine manuscripts was in a parchment codex dated 1298, yet at the same time it was widely used in paper manuscripts which constitute most of the

surviving dated manuscripts. This practice was employed there in two thirds of the fourteenth-century paper manuscripts, and in the course of the fifteenth century it became almost as widespread as in the Sefardic zone.

The fact that leaf catchwords were mainly used in paper manuscripts implies that the aim of this practice was not meant only to ensure the right order of bifolia, which could have been achieved by means of bifolium catchwords. Being aware of the vulnerability of paper and the possibility of detachment of single leaves, it may have been that scribes preferred to secure the position of every single folio in the quire.

Another possibility is related to the catchwords as instrumental to the copying process on loose bifolia. The recent discoveries in Latin and Greek manuscripts of temporary stitching (tacketing) of quires performed while copying, at least as early as 800 and until the twelfth century, and the introduction in thirteenth-century Latin manuscripts of bifolium signatures within each quire, implying that tacketing was not practiced any more, prompt us to conclude that leaf catchwords facilitated the copying sequence on loose bifolia.

#### **Page catchwords**

Consistent employment of this redundant device is extremely rare. Its earliest specimen is found in a manuscript written in Bursa (Turkey) in 1377 by two scribes, both of whom used page catchwords. All other manuscripts are from fifteenth-century Italy, Byzantium, Orient and Germany (in some of them counter-catchwords occasionally substitute the page catchwords).

#### **Counter-catchwords**

This variant of catchwords (repeated words) is frequently mixed with regular catchwords. The earliest manuscript containing them is an Oriental one of 1112, where the last word of the quire is repeated at the beginning of the successive quire. In another Oriental manuscript, dated 1282, there are leaf counter-catchwords. Counter-catchwords can be observed in many manuscripts in all geo-cultural areas; however, in a considerable part of them they are not employed regularly, but rather as random substitutes for catchwords. Outside the Orient counter-catchwords appear in a Spanish parchment manuscript dated 1214, at the beginning of bifolia (including the recto of the central bifolium opening) and at the beginning of quires; leaf counter-catchwords appear in a mixed-quires codex written in Tripoli in 1293. Since then many Sefardic scribes applied the repeated words at the beginning of each leaf. The

earliest Byzantine manuscript with regular use of leaf counter-catchwords is dated 1319 (mixed quires).

In the fourteenth and the fifteen century counter-catchwords in all their forms were employed, either systematically or mixed with regular catchwords: 21% in Sefarad, 14% in Ashkenaz and Byzantium, 12% in Italy and 8% in the Orient. One third of these manuscripts are parchment manuscripts.

## **VII The scaffolding of copying: The graphic architectural disposition of the copied text and its techniques**

### **Pricking**

Guiding pricking for the drawing of horizontal lines and of vertical bounding lines was employed in almost all the Hebrew parchment manuscripts that were ruled by hard point or plummet in all regions and periods. Only in early Oriental paper manuscripts, which were ruled by hard point - like the early parchment manuscripts - pricking was also employed. This shared technique of ruling of both parchment and paper codices was practiced mainly in the first century of the Hebrew paper codex, i.e. the eleventh century, and sometimes also in the late twelfth century. The ruling technique of Oriental paper codices was transformed radically and rapidly in the first third of the twelfth century at the latest, by use of the ruling board which no more required guiding pricking. Outside the Orient, complete sets of prickings were rarely used in paper manuscripts.

The practice of guiding the ruling of the lines preceded the appearance of the codex. It had been employed already in the Judean Desert Scrolls and was noticed in dozens of scrolls. The lines were guided not by pricks, but by dots, sometimes by strokes inscribed in ink. Indeed, Eric Turner noticed such guiding rows of dots in a few early Greek papyri.

In most dated manuscripts pricking was applied to all the folded leaves of each quire concurrently, not only to reduce labour time but no doubt also to ensure ruling uniformity. When the ruling unit comprised an unfolded bifolium, i.e. the smallest codicological component – only the outer margins of a folded quire were pricked and the horizontal lines were drawn across the unfolded bifolia. When the ruling unit constituted a leaf or several leaves (or a page), both inner and outer margins had to be pricked, and horizontal lines were traced across each leaf or page separately.

In the Orient, Byzantium and Italy pricking was confined to the outer margins. Manuscripts written by Maghribi or Spanish scribes in the early period in the Orient and part of the manuscripts written in Italy by Ashkenazic and Sefardic immigrant scribes were pricked in both margins. Since the twelfth century pricking applied to both margins was the standard practice in the Sefardic zone, dictated by the system of ruling two leaves at once. The earliest manuscript to have been pricked in both



margins was produced in the Maghrib by a scribe from Libya in 1123 and since then all extant Sefardic dated manuscripts until 1270 were also pricked according to this practice. Since 1271, single-margin pricking (and the ruling method associated with it) was employed in about one third of the Sefardic manuscripts, while the old two-margin pricking (and the old ruling method) continued to characterise the Sefardic unique book making.

Pricking both inner and outer margins became the standard practice of most Franco-German manuscripts (unlike the Latin) since the late thirteenth century. The shift from outer pricking, the old standard practice, to outer and inner pricking was gradual. Pricking in both margins emerged at the latest at the end of the first third of the thirteenth century. The earliest manuscript displaying a complete pricking of both margins as well as the new method of ruling and a new appearance of the parchment (undistinguishable sides) is dated 1264. According to the only surviving dated manuscript produced in England in 1189, before the expulsion of the Jews which occurred at the end of the thirteenth century, together with a few other undated manuscripts, Hebrew manuscripts produced there adopted the English two-margin pricking which became standard practice after the Norman conquest. The shift into two-margin pricking was required by the shift from blind ruling of unfolded bifolia into the coloured ruling of pages. However, the one-margin pricking did not disappear, and almost half of the dated Ashkenazic manuscripts in the fourteenth and fifteenth centuries were pricked in the outer margins alone, though they were ruled by plummet.

In some manuscripts, mainly in the Ashkenazic zone, the guiding vertical pricking has itself a guiding ruled line to guarantee a straight row of pricks. An Oriental example of this stratagem can be found in a manuscript copied in Yemen in 1299.

#### **Double pricks for marking through-lines (major lines)**

A custom that pertaining to pricking which characterises Ashkenazic manuscripts is the use of double pricks for special lines – one, two or three lines out of the three upper, three central and three bottom lines. The lines that were pricked by double prickings are ruled as through-lines. These double prickings were no doubt intended to mark, for the scribe's sake, where through-lines should be drawn. This practice occurs in manuscripts which were ruled either by hard point or by coloured ruling, more particularly in Gothic (Latin and Hebrew) manuscripts, which placed an

emphasis on the grid structure. Almost half the Ashkenazic parchment manuscripts display this practice (46%).

### **Single pricks**

Recently a singular phenomenon had been discovered, that of marginal single pricks, the function of which is yet unclear. They do not relate to the marking of horizontal lines, but apparently to a different manner of ruling, executed in pale ink and guided not by pricking but by some kind of instrument (possibly a rake?), by which groups of lines are drawn in one operation. This instrument must have required a minimal number of prickings (up to 3 only) to guide its positioning. I shall not elaborate on this, since it belongs to the ruling.

### **Ruling**

Ruling guided the regularity of writing in even and straight lines from Antiquity in the Ancient Near East and Crete, as it noticeable already in plates of Sumerian, Acadian and Babylonian clay tablets written in cuneiforms, in which the lines are engraved, and similarly in clay tablets inscribed in Middle Script B, in which the lines are in relief. The Judean Desert Scrolls were ruled by hard point and the Talmudic law requires, according of earlier Tanaitic (post biblical) sources, that Tora Scrolls should be ruled in blind ruling.

In a considerable number of manuscripts, part of which display a vulgar appearance, no ruling is visible; or, more frequently, they only have frame ruling that demarcates the written area, or just vertical bounding lines. Most of these manuscripts were written on paper in the Orient in early times; yet part of them was later produced in Europe by copyists transcribing texts for their own use. When the written lines do not correspond one to another on the two sides of the leaf and their number is not identical, one can infer that indeed no horizontal lines were ruled. Among these “sloppy” manuscripts in which only the vertical boundary lines, or frame, or portal were traced -- 3% without ruled horizontal lines were parchment manuscripts and 11% were paper manuscripts, not taking into account Oriental Geniza fragments. No wonder so many paper manuscripts, chiefly those produced for self-consumption, were ruled in a reduced manner. Apparently, ruling required proficiency and time input, and its cost in the calculation of commissioned books constituted a considerable part of production expenses (as attested in a unique list of the detailed costs of the writing material, the ruling and the copying, written in Venice in 1393 by the scribe of a commissioned paper manuscript at the end of his copy). According to this evidence, the cost of ruling – which may have been executed not by the scribe himself – was twice as high as that of the paper. Observing parchment manuscripts in which the ruling is well noticeable,

it is clear from the many pattern variations and modifications that the scribes themselves executed the ruling; thus it seems that specifying of the cost of ruling – which was surely simpler on paper than on parchment – implies that it was handed over to be executed elsewhere. However, in some manuscripts there is evidence they had been ruled beforehand in a pattern not suited to the copied text and consequently the scribe had had to adjust the ruling, convert one column into two columns, or vice versa, extend the lines, etc.

The wide dispersion of the Jewish communities engendered the employment of a large variety of ruling techniques and systems over the six centuries of extant dated Hebrew codices. In general, they can be classified into two main kinds of techniques: one is the technique of relief (or blind) ruling and the other is the coloured techniques. Relief ruling was made either by a sharp metallic instrument such as a hard point, a knife or a stylus, or by ruling boards; in the Orient the boards contained cords, and were used for ruling paper manuscripts, while in Europe they were allegedly made with strings and were sometimes used for ruling parchment manuscripts. The shared feature of the two kinds is the reduced presence of the scaffolding of the grid area and the time saving process by which more than a page or one side of an unfolded bifolium is ruled in one go: namely, either the back side of the prime ruling unit, or, in case of hard point ruling, even several leaves or unfolded bifolia at once.

The other techniques used by Hebrew scribes include ruling by metallic plummet, engraving plummet and, only later, by ink.

The various ruling techniques can otherwise be classified from the viewpoint of the ruling guidance method. We can distinguish between rulings which are guided by prickings and those which are guided by ruling boards. The Oriental board is mentioned in medieval sources, with some surviving specimen. The European boards are verbally attested only in sixteenth century sources, but can their use can be detected in many paper and some parchment manuscripts which do not show any traces of guiding pricks (particularly in the inner margins as those in the outer margins were prone to trimming) and yet are ruled by blind ruling leaf by leaf.

In general, Jewish scribes first employed relief ruling, while the coloured ruling was employed later in the Ashkenazic zone and later in Italy.

## **Relief/Blind rulings**

### **Ruling by hard point (dry point)**

Relief ruling by hard point was the standard technique in the early Hebrew parchment codices in the Orient, and in early paper codices as well. It was the current technique in parchment codices also in the West, including Byzantium, Italy, Ashkenaz and the

Sefardic zone, and in most of these areas it remained so until the late Middle Ages. This technique was always guided by pricking.

**Ruling by hard point, each unfolded parchment bifolium on the hair side**

Such ruling had to be executed before nesting the quire and arranging the order of bifolia by the corresponding parchment sides. However, the ruling was guided by outer pricking, which was made - as far as we can judge by the shapes of the pricking slots and the track patterns of their rows - on all the leaves of each folded quire in one go while it was arranged in corresponding sides. Thus one has to conclude that the pricking process contradicts the ruling process and we must infer that first the quire was constructed by corresponding sides for the pricking, then deconstructed for the sake of the ruling and reassembled again, following the Gregory Rule. Each opening displays not only the same parchment side, but also the same ruled sides, furrows or ridges alternately. The complex process seems ergonomically strange and uneconomical, but it demonstrates the preference of the aesthetic and harmonious considerations over ergonomical comfort and the saving of time.

This system was the standard ruling practice in Italy since the earliest manuscripts of the eleventh century; moreover, until the 1380's it had been the only practice. Only in the fifteenth century, following the spread of ink ruling from the 1430's and on, the use of hard point ruling decreased, particularly in the second half of the century.

In the Ashkenazic territories the technique was the only practice that fitted parchment with distinguishable sides until the last third of the thirteenth century; then the coloured ruling by plummet and prickings in both margins and the use of equalised parchment started to spread.

In the Sefardic zone this system of hard point ruling together with pricking was employed in a many manuscripts only from 1271 and on, while ruling leaf by leaf in some manuscripts can be observed since 1198. However, as we shall see later, until 1270 (and quite considerably also in later times) the standard system was ruling two consecutive leaves at once.

**Ruling by hard point, each unfolded bifolium on the flesh side**

In the Orient too the practice of hard point ruling on each unfolded parchment bifolium guided by outer prickings was employed, but unlike in Europe and the Maghrib, not on the hair side, which is more discernible, but always on the flesh side. This is a unique codicological practice that enables us to identify the provenance of manuscripts and fragments written in unidentified script.

Ruling on the flesh side characterises almost all the early Latin manuscripts before the eighth century which were produced probably in the Orient.

**Ruling by hard point, each unfolded paper bifolium**

Early Oriental paper manuscripts of the eleventh century are pricked and ruled by hard point, apparently like parchment manuscripts. Yet the bifolia within the quire were not arranged by corresponding ruled sides after being ruled; instead, the scribes of the eleventh century arranged the bifolia in such a way that all recto sides of the first half of the quire and all verso sides of the second half display the indented furrows, and furrows face ridges. Only at the end of the twelfth century one scribe who produced several dated pricked and ruled paper manuscripts in Cairo arranged two manuscripts in corresponding ruled sides.

**Ruling by hard point successive parchment leaves or bifolia in one go on the hair side**

An economical method of implementing hard point ruling is manifested in many manuscripts produced in the Sefardic areas. Successive leaves (or sometimes bifolia), while they are arranged in corresponding sides within the quire, are ruled in one go, the primary page always showing the hair side. The ruled sides in the opening pages do not correspond. The usual number of leaves ruled together is two; the hair-side recto of the first leaf of the pair displays the furrows executed by the direct blind ruling while the flesh-side recto of the second shows the indirect furrows. In a few manuscripts produced in Spain it is possible to discern more than pairs of leaves, even up to an entire quire, as is the case with Latin manuscripts until the Carolingian period. The ruling of pair of leaves required pricking both margins, while the ruling of pairs of bifolia required only outer pricking. The economical Sefardic system characterises the book production of parchment manuscripts in Spain, Provence and North Africa since the last three decades of the thirteenth century. However, the system was practiced about three hundred years earlier as it is attested by a manuscript produced in Jerusalem in 988/9 and two others produced in Palestine in the first decade of the eleventh century by Maghribi scribes. The system was practiced in Visigothic Latin manuscripts.

The advantage of ruling four pages at once had its disadvantage. In many manuscripts we can observe that the secondary ruling, particularly on the fourth page of the pair, is hardly visible, so much so that the scribe had to re-rule it, partially or entirely.

**Ruling each leaf by hard point**

This system is found in a small part of parchment manuscripts produced in Byzantium and in the Sefardic areas (including manuscripts written by Sefardic immigrants in Italy and Byzantium) since the mid-fourteenth century and on. Many Spanish manuscripts ruled leaf by leaf were pricked on both margins. Some of them were not pricked at all, and must have been ruled by a ruling board of some kind.

Seemingly, this was the standard system in all the Hebrew paper manuscripts ruled by a relief technique in all geo-cultural areas, apart from the Orient. However, the fact that

all these manuscripts were not pricked at all implies that they were ruled by a ruling board or template.

### **Relief/blind ruling by ruling boards or templates**

The other kind of relief (or blind) ruling was not guided by pricking but executed by ruling boards that ruled leaves mechanically or, supposedly, by templates that guided the tracing of hard point of some sort. The nature of the ruling board, which was in standard use in almost all the Hebrew paper manuscripts in the Orient, is known to us through Jewish and Arabic literary sources as well as by finds of such medieval boards and the existence of modern ones. The use of ruling boards in Europe is deduced by means of observation and – as mentioned above - the only textual evidence concerning them is found in sixteenth-century printed manuals on calligraphy.

To the category of mechanical ruling one can add the technique of coloured ruling executed by an instrument whose nature is not clear, ruling in pale ink a group of several lines in one go.

The Oriental ruling board – *mastara* (or *mistara*) in Arabic, *kanna* in medieval Hebrew sources - was made of cardboard or wood; such a board had been brought from Yemen at the end of the late nineteenth century by German geographers, and is now in the Israel Museum. Indeed, in recent generations Jewish scribes in Yemen were witnessed ruling paper manuscripts with a *mastara* made of wood. Cords were threaded into grooves and stretched, forming ridges corresponding to the horizontal and the vertical bounding lines, in accordance with the desired mis-en-page. The scribe would place each leaf of the manuscript on the board and rub it with the thumb along the cords, which consequently left their impressions on the leaf. Strangely enough, the same kind of ruling-board is still used in the Western Siberian scriptoria of the Old Believers. Samaritan scribes in Nablus, as well as a Syriac scribe in a monastery in Jerusalem use to this very day a similar device, made of cardboard.

That such a device was employed by Jewish Oriental scribes in the Middle Ages is clearly proved by a student's model of such a board, fortunately preserved in the Cairo *Geniza* and presently kept in the Cambridge University Library among the *Geniza* fragments. This model board was made by gluing together used leaves of paper inscribed with Coptic writing. The threads, pulled into two rows of grooves, were glued to the surface of the board. On its other side the board was labelled in Judeo-Arabic “a practise *mastara*”, a term mentioned already by Maimonides, which appears in book lists in the Geniza. In the same Geniza another *mastara* has been found. B. Layton, in his *Catalogue of Coptic Literary Manuscripts in the British Library Acquired since the Year 1906*, London 1987, where he indicates that most paper manuscripts were

ruled by *masṭara*, refers (p. lxi) to one of the Beinecke Library Arabic manuscripts in which a *masṭara* was incorporated as one of the boards of the binding.

Most Oriental Hebrew paper manuscripts were ruled by *masṭara* on the verso pages.

Identification of this technique of ruling is easy. First, there is no guiding pricking. The relief ruled lines are not deep and narrow as the relief lines ruled by hard point, but wide and rather flat, and they are not straight, but slightly curved. In some manuscripts it is possible to see the impression of the twisted cords. In addition, a uniform layout is noticeable, and the horizontal lines never exceed the boundary lines.

The earliest dated manuscript ruled by this ruling board dates from 1131. The Oriental scribes and copyists invented an efficient ruling technique which reduced considerably the time and cost of paper book-production. Thus they had introduced a mechanical device earlier than the appearance of a similar in Europe.

In fact, it seems that a relief ruling board of some kind that enabled quick, uniform and economical ruling was employed in Europe as well, but unlike in the Orient, it is not mentioned in contemporaneous sources earlier than the sixteenth century. Moreover, none of the actual devices has survived or been identified to this day.

Proofs for the use of a ruling device in European Hebrew manuscripts are based on logic and on the observation of the ruling and its system in the manuscripts. The conclusion by which part of the parchment manuscripts were ruled by a ruling device does not stem from the appearance of the traced lines, as it does in Oriental paper manuscripts, but from the very fact that while these manuscripts are ruled leaf by leaf, there is no trace of any guiding pricking in them. Ruling of leaf units requires pricking of both outer and inner margins. While outer margins may have been trimmed over the years, inner margins stayed intact. The absence of prickings in the inner margins of these manuscripts attests that the only way they could have been ruled is by "mechanical" ruling boards or some templates. The phenomenon is prominent in the Iberian Peninsula and appears in 87% of the paper manuscripts of the fourteenth and fifteenth centuries. It is found in about two thirds of the Byzantine paper manuscripts and in almost one third of the parchment ones, and in about half of the Italian paper manuscripts and some parchment ones.

The lines traced by this system in the European manuscripts are thin and straight, and seem to have been executed with metallic wires or strings. Indeed, according to a Spanish calligrapher who cites in his 1550 printed book another book printed in 1531, the ruling board is made of wood on which strings of musical instruments are stretched, then a leaf or bifolium is placed on them and rubbed by a cloth.

## **Coloured ruling**

The adoptions of coloured ruling – executed by plummet or, later, with ink - was a revolutionary turnabout in the book craft in all the codex civilization that adopted it despite its being an ergonomically regressive step. The main change is the shift from the economical technique of the blind ruling system, which enabled the ruling of two sides of a leaf or a bifolium or even several leaves or bifolia in one operation, into ruling separately each page, or each side of a bifolium. Yet, the coloured technique enabled flexibility of the ruling and the text disposition, while the hard point ruling imposed a uniform layout, at least for the pages that were ruled together.

## **Plummet ruling**

The use of plummet for tracing lines had emerged in Latin manuscripts already in the late eleventh century. Ever since the twelfth century it became a widespread practice everywhere (excepting Humanistic manuscripts in fifteenth-century Italy). In Oriental Christian Syriac manuscripts the employment of plummet preceded that in the Western Christian manuscripts. The vague information on this topic was recently corroborated by Sebastian Brook in his catalogue of the Syriac fragments in St Catherine's Monastery in Sinai. Brook indicates that plummet was used in many fragments, initially - since the sixth century -- just for vertical lines, then for full ruling (first found in an eighth to ninth-century fragment).

Hebrew scribes in Europe started to employ the plummet, gradually and hesitatingly, about a hundred years after the Christian Latin scribes had adopted it, at first in the Ashkenazic zone, and later only partially in Italy and Spain, but never in the Orient and Byzantium. The delay in using the new instrument seems to have stemmed from the Halakhic context. The spread of the plummet in Latin Europe during the twelfth century raised the question among the rabbinical authorities as to whether it could be used in ruling the ritual Tora Scroll, which had to be ruled - and for about one thousand years had indeed been ruled - by blind ruling and not by coloured ruling. The plummet substitute was rejected by all the Jewish authorities in France, Germany and Provence. It is likely that the rejection of the use of lead plummet in the liturgical scrolls deterred scribes from using it in codices. The avoidance of plummet ruling had consecutively evaporated gradually: initially it was in partial use in the earliest extant dated codices from France and Germany since the last quarter of the twelfth century, until it became widespread there in the last third of thirteenth century.

It is possible that the gradual acceptance of the metallic plummet in spite of all was promoted by literary development and scholarly needs. The adoption of the plummet matched the emergence of many glossed works, multi-layer texts and commentated bibles in the thirteenth century, culminating at the end of the century. These popular copies required a dynamic, changing ruling which the hard point technique could not



provide yet plummet ruling did. Perhaps it is not a coincidence that the emergence of the twelfth-century Latin glossed Bible corresponded to the spread of the plummet in Latin manuscripts.

At the beginning, the use of plummet in the Hebrew codices was partial, mainly for reinforcing invisible lines traced by hard point. Sefardic scribes too employed the plummet in the same manner, using it to reinforce vertical bounding lines in manuscripts ruled by hard point ruling of two consecutive leaves, where the original tracing was unclear on the fourth or the third page.

In France and the German lands the complete plummet ruling spread while being associated with the shift in pricking and the visual appearance of parchment sides. In the fourteenth and fifteenth centuries 94% of parchment manuscripts were ruled by plummet, either page by page or each bifolium on both sides. Apart from the secondary use of plummet for reinforcing the more economical blind ruling practiced in Sefardic parchment manuscripts and in other areas (apart from Ashkenaz), plummet ruling was used in some manuscripts in Italy, mostly by immigrant Ashkenazic scribes. Yet, a different application of the metallic plummet ruling spread in a limited diffusion, combining the old economical relief ruling with the new coloured ruling, perhaps using a different sort of plummet,.

#### **Ruling by engraving plummet**

In certain Ashkenazic and Sefardic parchment manuscripts and particularly in Italian manuscripts one notices that the direct ruling is executed by a sharp plummet on one side of each unfolded bifolium or leaf, like the Ashkenazic plummet ruling; yet the ruling on the other side of the bifolium or the leaf is not coloured at all, but displays the ridges of the direct ruling. In other words, the metallic plummet technique was employed like the system of hard point. Leroy indicated that a few dozen Greek manuscripts from Byzantine Calabria were ruled by plummet used as hard point (or by hard point reinforced by plummet or ink) Such a mixed technique was perhaps created as a compromise between the old technique and the new one, mainly in Italy, where the mixed technique was quite extensively used. The codicological practices employed in Italy were quite conservative, undergoing no transformations until the 1430's, unlike the case with Latin manuscripts. The use of the plummet enabled some of the Italian scribes to adhere to the traditional relief technique and at the same time use the new instrument. Indeed, in some Italian manuscripts part of the quires were ruled by the engraving plummet and some entirely by hard point, which implies that the plummet was regarded in Italy as a relief instrument. It seems that there were two kinds of plummets; and indeed each of several recent scientific analyses detected different chemical elements that were mixed with lead, which is the main component of the plummet.

The earliest manuscript ruled entirely by the engraving plummet was produced in Lisbon in 1278. A German manuscript survived from 1286, pricked in both margins according to the new practice, which fitted the use of plummet, and ruled by the sharp plummet page by page. In Italy the sharp plummet was first put into use in a 1304 manuscript; however, like the 1286 manuscript, this one too was traced on both sides of the bifolia. Soon, in 1311 in Tarquinia, we would find the earliest Italian manuscript ruled entirely by the engraving plummet on the hair side of the unfolded bifolia, as if the ruling had been done by hard point.

### **Ruling with ink**

The employment of coloured ink for tracing lines guided by pricking spread in Latin manuscripts during the thirteenth century, about two hundred years after the beginning of the use of plummet. This technique was never used by medieval European Hebrew scribes (yet some of the Judea Desert scrolls are ruled with diluted ink). When Hebrew manuscripts started to show ruling executed with ink, it was not the coloured ink characteristic to Latin manuscripts, particularly Gothic ones, but a very light, diluted ink. In these manuscripts the horizontals were not guided by pricking. This kind of ruling appeared only in Italy, not before the twenties of the fifteenth century, and was implemented in parchment and paper manuscripts, page by page. Naturally, this ruling serves as a useful and reliable codicological criterion for localising and dating manuscripts.

In the first decades of its emergence in Italy ink ruling was employed to a limited extent only in comparison to the other techniques, especially the hard point ruling that was the standard method till the middle of the fifteenth century. In the twenties and the thirties only a few manuscripts were ink-ruled; in the forties the rate was some 22%, in the fifties 16%, in the seventies 50% and about the same rate until 1500.

In 84% of the manuscripts ink-ruled, only the horizontals were traced with ink, while the verticals were added by plummet, clearly at a later stage, while copying, as blank ruled pages attest.

As mentioned above, ink ruling was not guided by pricking, yet the vertical bounding lines, ruled by plummet, were guided by a single prick in the upper and the lower margins, reinforcing the suggestion that the ruling was executed in two stages.

In the beginning of the 1980's, Albert Derolez, while documenting 1200 Humanistic parchment manuscripts, noticed a single prick that does not correspond to any of the horizontal lines that usually in the outer margins of ink-ruled manuscripts which do not have pricking. Attempting to solve the mystery of the absence of pricking and the lone prick he suggested the existence of an unknown ruling device which guided in a mechanical way the tracing of the horizontals. The single prick that was detected had supposedly marked the positioning of that device on the page. Derolez further

suggested that ink-ruled quires were mass produced and commercially marketed. His assumption was supported by the inventories of Italian Renaissance cartolai which listed ruled quires. Meanwhile more documents have been found substantiating this evidence. Ten years earlier Malachi Beit-Arié proposed a similar suggestion concerning the marketing and consumption of ruled quires due to the mobility of members of Jewish society. The puzzling fact that more than half of the ink-ruled manuscripts produced in Italy were written by Sefardic and Ashkenazic immigrant scribes from Spain, Provence, France, and German lands – where ink ruling was not practiced at all -- led to assume that scribes purchased ruled quires or were supplied with them by their patrons, a supposition which might explain the sweeping adoption in Italy of the local practices of both ruling technique and quinion structure of the quires.

If these arguments consolidate the assumption of mass production, marketing and consumption of ruled quires, we are facing here the precursor of mechanical mass production of an important part of book-making before the mechanical printing. Yet, such an assumption as well as the obscure and enigmatic ruling instrument arouses doubts. First, if ruled quires were marketed we should expect to be able to detect among the many hundreds of documented Hebrew manuscripts some clusters of codices that shared an identical disposition of the ruling, patterns and size. In fact we find a large variety of patterns, spacing between lines and number of lines which do not group even in the same locality, time and genre. Furthermore, ink ruling appears also in multi-layer texts, like commentated works, which involve a dynamic and changeable ruling.

No doubt ruled quires were sold by cartolai, both wholesale and tailor-made. It is very likely that scribes themselves used the “enigmatic” instrument for ruling their copies. Whether ruling by ink was a scribal initiative or a commercial enterprise, it is still unknown whether it was performed by a mechanical device by means of a template of some kind which only guided it line by line, as implied by the lack of uniformity of line lengths. If the latter possibility is correct, we should acknowledge the superiority of the Oriental scribal inventiveness, which initiated the mechanical ruling long before the European scribes.

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