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Identification of the network structure of the Hebrew Bible texts based upon the notion of the otherworld and the afterlife

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In this paper, we apply the methods of graph theory to reveal hidden relations within the corpus of the Hebrew Bible texts. The structure of relations between different texts was studied based upon their interpretation of the otherworld and the afterlife. We have identified 43 most relevant texts that contained concepts related to the notion of the otherworld and constructed a graph representing the relations between the considered texts. The obtained graph was decomposed into 3 densely connected subgraphs using the Louvain method. An initial interpretation has been given to the results of the decomposition. Furthermore, we used different ranking methods to determine the most important texts forming the network structure of the intertextual connections. It turned out that there is an invariant set of texts that can be interpreted as having the larger influence or importance on the development of the idea of the otherworld. These texts are Proto-Isaiah, Qoheleth, Job, Psalms, and Proverbs as well as 1 Samuel, Ezekiel, and Book of Genesis. Furthermore, a detailed analysis of the notions, associated with these texts, reveals that there are several concepts that are likely to be associated with the most influential texts.

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Introduction

For several decades, the application of graph-theoretic methods to the description and analysis of complex social interactions has become a common place. Probably one of the first examples of such a study is the seminal paper by Read (1954), in which a graph model of interactions between aboriginal tribes of the Central Highlands of New Guinea was presented and analysed. Later, a series of papers had appeared, in which the authors showed that various social structures can be treated in a uniform way using the mathematical apparatus of graph theory. Let us also mention the dissertation by Sampson (1969), which described the relationship between monks in a cloister, the paper by Padgett and Ansell (1993) that gave a network representation of marriage relations between noble families of Florence during the period of Medici's rise. Both these networks have become classical by now. No review can be complete without noting the seminal paper by Milgram (1967), in which the famous conception of six degrees of separation had been introduced.

In philology, there have been several successful attempts to apply network science to the analysis of human language, as was reported in the works by Ferrer i Cancho and Solé (2001), Wachslöper and Rodríguez (2016), and Corrêa et al. (2018), just to mention a few. Another fruitful direction of research consists in the analysis of historical texts. See, for instance, Serif (2023) for the methodological foundations of such studies. Along this line, Choi and Kim (2007) described a network of Greek and Roman mythology that reflects the structure of references between the entries in the corresponding dictionary. Furthermore, an overview of the applications of network analysis to the study of ancient Egyptian and Indian texts can be found in the paper by Elwert (2021).

Of course, the extensive body of biblical texts was not left without attention. Complex networks have been actively used to systematize and understand the complicated structure of relations in the context of Biblical studies. The special issue of the journal *Annali di Storia dell'Esegesi*, devoted to the application of Network Science in Biblical Studies, presents a wide range of results in this field to now. Specifically, the opening paper by Czachesz (2022) gives a detailed overview of the ongoing research in this field.

It should be noted that most applications of network science to biblical studies are mostly centred around the person of Jesus and his environment and refer to the events relating to first-century Christianity, see, e.g., the papers by Duling (2002), Czachesz (2016), and McClure (2018). At the same time, the network structures related to the Old Testament and the Hebrew Bible are studied to a lesser extent. For instance, an attempt to apply the methods of signed networks to the analysis of the interaction structure between different religious and philosophical movements in early Judaism was undertaken by Tantlevskij et al. (2021), where it was shown that the dynamics of relations between different socio-religious sects evolved toward more balanced structures.

While the previous studies mostly aimed at describing and analysing some existing networks, in this paper we set out a more ambitious goal of revealing hidden relations within the corpus of the pre-Christian Jewish texts. To avoid possible ambiguities, we deliberately narrow the scope of this research to the texts of the Hebrew Bible. In doing so, we exclude from consideration a large body of Judaeon pseudepigrapha and apocrypha texts, the Qumran scrolls, as well as the texts that do not belong to the Jewish tradition (e.g., Ancient Egyptian, Ugaritic and Ancient Greek mythology)—although with some exceptions. It should also be noted that in examining the evolution of Israelite/Judahite conceptions of the afterlife, the authors do not specify the possible socio-logical setting of quoted passages.

Since the considered texts contain a multitude of senses, we decided to determine the relations between different texts with respect to their interpretation of the notion of the afterworld. To do so, we identified a number of key concepts related to the idea of the afterlife and possible ramifications thereof. The considered texts were interpreted as the vertices of the network, while the edges reflected the fact that two texts share either one or more concepts. In this way, a weighted graph of relations between different texts of the Hebrew Bible was constructed. We present a number of initial results devoted to the statistical properties and the structure of this network and demonstrate the results of clustering. The latter resulted in splitting the whole set of texts into 3 densely connected groups, which may indicate the existence of a hidden structure, whose nature is yet to be explored. An initial interpretation of the obtained results has been provided.

The rest of this paper is organized as follows. In Section 2 we describe the evolution of the concepts of the afterlife in the Hebrew Bible. Specifically, in Subsection 2.2 we identify and describe the concepts that were used for the construction of the network. Section 3 describes in detail the process of network construction and presents initial results of the analysis of the obtained network. Specifically, we apply the Louvain method to obtain a first decomposition of the constructed graph into closely connected subgraphs. In Sec. 3.3 we give an intuitive explanation of the computed decomposition. The paper is concluded with a discussion section.

Religious-philosophical concepts of the afterlife in the Hebrew Bible

Evolution of the concepts. The materials of the Hebrew Bible (the Old Testament), dating between the 13th/12th and 2nd centuries B.C.E., reflect certain religious-theological and philosophical doctrines of the Israelites and Judahites/Judeans on the otherworld and posthumous transition to it. Naturally, these notions evolved and deviated over time, but may have co-existed for some time in various social circles. In the first part of this article, we will attempt to outline the relevant perceptions and identify the main stages in their evolution.

(1) The Hebrew Bible refers to the netherworld—often specifically designates it as *šə'ôl*, Sheol, as we will refer to it below with a certain degree of conventionality (cf., e.g., Lewis (1992), II, 102–104), and sometimes possibly calls it metaphorically *'ereš/hā-'āreš*, lit. the “earth” (see, e.g., Tsumura (1988), p. 260; Toorn (1996), p. 210; on some other designations for the abode of the dead see, e.g., Lewis (1992) II, 104)—that the ancient Jews believed to be under the earth, the seas and the Ocean, or on the other side of the earth, where the spirits (*rūhôt*) of the dead descend. A certain parallel to the latter concept can be found in the Ancient Egyptian “Praise to the Night Sun”, i.e. the sun that has set behind the sky and shines at night “in the holy land”, i.e. in the world of the dead who awake at this time (text from a tomb in Thebes, dating to the early period of Amenhotep IV's rule [probably, between ca. 1353/1351–1336/1334 B.C.E.]). The Ugaritic text *KTU* 1.6.vi.45–49 (“The Poem of the Struggle of Ba'lu and Mutu”; recorded in the 14th century B.C.E., but probably created in the 20th and 19th cc. B.C.E.) also seems relevant: according to it, the sun goddess Shapshu rules over the community of spirits of the departed (*rp'um, 'ilnym, 'ilm, mtm*) in the otherworld. (Cf. also the image on the altar from Trastevere: the sun deity after sunset is transformed into a god-ruler of the abode of the dead Shifman (1999), p. 242.).

Probably the oldest concept in the kingdom of Judah (and likely in the Israelite-Judahite community as a whole) was the belief that the spirits of all the departed went to Sheol. In this

concept, it was thought that the identity of the person was preserved in Sheol (cf., e.g., *Gen.* 37:35; *Isa.* 14:10; *Ezek.* 32:21; *1 Sam.* 28:15ff.), in particular, the ability to reflect (*Isa.* 14:16), to feel—one can come down here in “sorrow,” “grief,” a bad state of mind (*Gen.* 37:35, 42:38, 44:29, 31), having been punished (*1 Kgs.* 2:6, 9), but also satisfied with earthly life (cf. *Gen.* 25:8); here one can be comforted (*Ezek.* 31:16). Sheol reproduces the family, national and social differentiation that took place in the earthly world (cf., e.g., *Gen.* 25:8–9, 35:29, 37:35; *Isa.* 14:9–11, 15; *Ezek.* 31:14–18; 32:17–32 [cf. *Job* 3:13–22]), perhaps retaining features of earthly appearance (cf. *1 Sam.* 28:14, cf. further *Matt.* 22:32; *Mk.* 12:26–27; *Lk.* 20:37–38). The spirits of eminent ancestors probably pass into the category of beings-’*elōhīm* (e.g. *Lev.* 24:15; *Judg.* 9:9, 13, 27 *1 Sam.* 28:13; *Isa.* 8:19; cf., e.g., *Deut.* 21:23), gaining extraordinary knowledge (cf. the category of the so-called *yiddā’ōnīm*) and some other supernatural abilities, above all, probably the ability to heal the living (cf. the category of the so-called *rāfā’īm* [the original vocalisation was probably *rōfā’īm*, lit. “healing ones/healers”; cf., e.g.: *2 Chr.* 16:12; also: *Is.* 26:14 and *Ps.* 88:11 in LXX]) and the gift of foresight (*1 Sam.* 28:13; *Isa.* 8:19, 41:23–24) [see further, e.g., Bloch-Smith (1992), p. 146; Toorn (1996), p. 231–235; also: Spronk (1986); Lewis (1989); Schmidt (1994); Moor (2014), p. 373–388]. Euphemistically—and it is attested only for the Hebrews (as well as for Ishmael, Abraham’s son)—man’s earthly demise and transition of his spirit to the netherworld is expressed in the Pentateuch by the formula *wayyē’āsef ’el ’ammāw*, “and joined (“appended”) to his people” (e.g., *Gen.* 25:8 (about Abraham), 17 (about Ishmael), 35:29 (about Isaac), 49:29, 33 (about Jacob); *Num.* 20:24 (about Aaron; cf. also 20:26), 27:13 and *Deut.* 32:50 (about Aaron and Moses), *Num.* 31:2 (about Moses); cf. also *Gen.* 47:30; *Deut.* 31:16). This wording can be understood in two ways: the incorporation of the bones of the deceased into the tomb of his kin; the joining of the spirit of the deceased with the spirits of his fellow tribesmen already residing in the netherworld. For example, the references to Aaron being buried alone on the top of Mount Hor (*Num.* 27:13, 31:2; cf. 20:24, 26) and Moses in an unknown place, “in the valley, in the land of Moab, against Beth Pe’or” (*Deut.* 32:50), do not allow the phrase “joined to his people” to be interpreted in terms of their “joining” their departed kin in the tomb, but imply their spirits passing into the otherworld. The expression “joined to their fathers (sc. ancestors)” (see *Judg.* 2:10; *2 Kgs.* 22:20 (= *2 Chron.* 34:28)) found in the “Deuteronomistic History” [probably 6th century B.C.E.; on hypothetical versions of the origin of the Pentateuch and its relation to the Deuteronomistic History, see, e.g., Campbell and O’Brien (2000); Dozeman et al. (2011)]; on the correlation of the “Deuteronomistic History” and the “Original History”—“Enneateuch” complex, see, e.g., Eckart and Achenbach (2004); Witte et al. (2006); cf. also: Kim (2005)], should probably be interpreted in a similar way (see also *Gen.* 49:29—about Jacob; “Priestly source” [dated between the last third of the 7th century B.C.E. [the Kaufmann School; cf., e.g., Knohl (1995)]] and the post-exilic period [most researchers; cf., e.g., Meyer (2010); Coogan (2014), p. 153; Gordis (1978)]; cf. further, e.g., *Acts* 13:36 (about David)). In particular, the comparison of the texts of *2 Kgs.* 22:20 (= *2 Chron.* 34:28) and *2 Kgs.* 23:29–30 (cf.: *2 Chron.* 35:22–24) is revealing in this respect (see, e.g., Tantlevskij (2020a), p. 217).

The phrase often found in the “Deuteronomistic Historian” (and in some cases in the second part of the “Chronist”; 5th–4th cc. B.C.E.; on the relationship between the “Deuteronomistic History” and the Chronicles see, e.g., Zvi (2009), p. 59–86)—“and rested [so-and-so king] with his ancestors, and was buried with his ancestors”—can be understood in two ways: the transition of the spirit to the netherworld (cf., e.g.: *Ezek.* 31:14–18, 32:18–32 (cf. also *Job* 3:13–22)); on the other hand, according to *Isa.* 14:9,

kings and leaders of nations sit in Sheol on their thrones), or simply as a euphemism for dying, and the subsequent burial of the body (cf.: *Isa.* 14:18 and 20); or as an indication of two stages of burial: the body decays on the burial bed in the family tomb, and then the bones of the deceased are mixed with the bones of the ancestors. Correct burial seems to have been related to the state of the deceased in the afterlife (cf., e.g., *Gen.*, chap. 23; *Isa.* 14:18–20). On burials in Ancient Israel and Judah/Judaea, see in detail, e.g., in Suriano (2018).

There was also the ancient notion that the most wicked could descend into Sheol as punishment for sins before their earthly end (see: *Num.* 16:30–33 [cf. also: 26:9–10]; *Deut.* 11:6; *Ps.* 106:16–18; also 55:16). It is possible that Avaddo(n) (*’bdh/’bdwn*; literally, “destruction,” sc. a place of destruction, as mentioned in *Ps.* 88:12; *Prov.* 15:11, 27:20; *Job* 26:6, 28:22, 31:12; cf. *Rev.* 9:1–11) is precisely the part of Sheol where the most wicked went (cf. the Greek conceptions of Tartarus). In the Roman period, the notion of special, separate parts, or spaces, of Sheol, destined for the spirits of the righteous and the wicked (until the Day of Judgment), became widespread among the Jews (cf. Jesus’ parable of the poor Lazarus; *Lk.* 16:19–31). In contrast, the most righteous persons, having not tasted bodily death, were taken alive to heaven by God (*2 Kgs.* 2:11–12; *Mal.* 3:23 (Elijah); possibly *Gen.* 5:24 (Enoch): “and Enoch walked with God, and he was no more, for God took him”; cf. also *Ps.* 110:4 (Melchizedek), cf. further: the Qumran Midrash of Melchizedek (*11QMelch*); *Heb.* 7:1–3). Thus, even in the early concepts of the otherworld, elements of the notion of an afterlife are evident.

Certain Biblical texts allow for the notion that contact with God is possible in Sheol, e.g.:

I will go up to heaven, Thou are there;

I will go down to Sheol, Thou are there

(*Ps.* 139:7–8; cf. also, e.g., *1 Sam.*, ch. 28; *Am.* 9:2; *Job* 11:8).

On the other hand, it may be assumed that here we are faced with a rhetorical expression.

From the texts of *Ezek.* 31:15–18 and chap. 32 one can conclude that there was also the idea that the souls of Jews and Gentiles would remain in Sheol separately (cf. *Isa.*, chap. 14), or, less likely, that only the souls of the “uncircumcised” (*’ārēlīm*) Gentiles would descend into Sheol.

(2) Starting from the Persian period in Judaeon history, approximately from the end of the 6th and the beginning of the 5th century B.C.E., the books of the Hebrew Bible—besides the concept of all the spirits of the dead going to Sheol—as one might assume, also bear witness to the idea of the spirits of the righteous and wise men ascending to God in heaven, which is their reward in the other world (cf., e.g., *Ps.* 119:112; see below); the souls of others go down to Sheol. This view finds its at least implicit expression, e.g., in some Psalms (e.g., 16:5–11, 17:15, 21:5, 23:6, 27:13, 36:10, 37:34–38, 41:13, 49:16, 56:14, 61:8, 73:24–28, 103:4–5, 116:8–9, 119:112, 139:24, 142:5–7, 143:10; see further in detail, e.g., Dahood I–III, 2011) and a number of passages from other Biblical books, e.g.: *Prov.* 12:28, 14:37, 15:24, *Job* 19:25–27 (cf. *Job* 32:8, 33:4, 6, 34:14–15); *Qoh.* 12:7 (cf. *Hos.* 6:2, 13:14; cf. also *Isa.* 25:8; *Ps.* 16:10–11; cf. also especially *1 Sam.* 2:6: “The Lord kills and makes alive; He brings down to Sheol and raises up”).

Within the framework of this concept, which probably assumes the possibility of ascension to heaven, Sheol begins to be portrayed in very negative tones and is seen predominantly as the abode of the dull existence of the likeness (shadow) of man or as the equivalent of the actual loss of individuality, the destruction of personality (e.g., *Qoh.* 9:5, 10; also, e.g., *Job* 3:11–19; cf. further the Ancient Greek idea of Hades). It is a land of gloom, disorder (*Job* 10:21–22) and speechlessness (see, e.g., *Ps.* 94:17); according to some views, there is no contact with God here (cf., e.g., *Ps.*

6:5–6, 30:9; *Isa.* 38:18; *Qoh.* 9:10b–c; see also: 9:3b–6 [cf., however, *Ps.* 139:7–8; *Isa.* 7:11; *1 Sam.* 28:16–19]).

One of the euphemisms for Sheol is probably the Biblical term *bəliyya'al* (cf. especially *2 Sam.* 22:5–6 = *Ps.* 18:5–6), which can be interpreted as “(a place from which) no one will rise” (cf. *Job* 7:9: “he who has descended into Sheol shall not rise (*lō' ya'āleh*)”), however, interpretations of the term *bəliyya'al* as “useless”, “worthless”; “destruction”, etc. are also suggested; the Biblical expression “man (people) of *bəliyya'al*” apparently serves to refer to those who are destined to enter the underworld kingdom of the dead and remain there forever.

(3) It is probable that from about the 5th century B.C.E. there was also the notion that initially, immediately after the death of the flesh, all spirits descend into Sheol (cf., e.g., *Ps.* 16:10; 49:16; see further also, e.g., the Qumran Thanksgiving Hymn *1QH^a* 11:19ff. (probably mid-2nd cent. B.C.E.)), where judgment—according to Proverbs (this collection was compiled no later than the Persian period in Judaeon history), the “weighing” of “spirits” (*rūhōt*; 16:2) or “hearts” (*libbōt*; 21:2, 24:12), i.e. the Divine judgment on a person in the otherworld, takes place (cf. further, e.g., *Qoh.* 3:16–17, 8:5–6, 11:9c, 12:14). (Cf. the corresponding Ancient Egyptian notions of the weighing of the heart at the judgment in the afterlife, especially chap. 125 of the “Book of the Dead”; to what extent the Ancient Egyptian doctrine of “psychostasy” may have influenced these passages in the Book of Proverbs remains a matter of debate.) In this context, the etymology of the term “Sheol” (*š'ōl*), probably deriving from the verb *šā'al* (“to inquire”, “to request”, “to demand”), is of particular relevance (for other possible proposals see, e.g., Lewis (1992), II, 101–102). The souls of the wicked and the fools, laden with sins, remain here forever as punishment. The souls of the just, the industrious and the clever ascend upwards, to heaven to their Creator, which is their reward in the otherworld. (Cf., e.g., *Ps.* 119:112, which probably expresses the idea of “eternal reward” (*lā'ōlām 'ēqeb*); cf. further *Isa.* 5:23, where the term '*ēqeb*' is used to mean “reward” to one who obeys the laws of the Lord; cf. also, e.g., *Ps.* 16:5–11, 21:5, 116:5, as well as the passages in Psalms mentioned in Item 2); *Prov.* 12:28 (in this passage the term “immortality” (*'al-māwet*) is used (in this connection let us note that the concept of “immortality” (*blmt*) is also attested in the Ugaritic epos “About Aqhit”, see KTU, 1976 1.17:vi.27; *Qoh.* 12:7)).

(4) At the beginning of the Persian period in the history of Judaea, the idea of the spirit as a bearer of human self and the possibility of its immortality through the accession to the Divine world, to God begins to appear more often (in all probability, not without contacts with Zoroastrianism). For example, the Book of Job (probably late 6th to first half of the 5th century B.C.E.; see below) seems to testify to this. Already the meaning of the name of the protagonist of this book—the Masoretic vocalization *Yyyōb*—is significant: it should probably be interpreted as “Where is the spirit of the ancestor (forefather)?” (*'ēy (')ōb*; cf., e.g., also: [Pope (1973), p. 5–6; Fokkelman (2012), p. 35–42]). So already the very name of the protagonist reveals the purpose of the book's writing and the very essence of its content: what happens to man, righteous or wicked, after his earthly demise and is there an afterlife retribution? Job, on the brink of death, declares the injustice of the earthly world to the righteous and the wicked. Even beyond the grave there seems to be no hope: after all, according to the popular belief known to Job, the passage of the human spirit into Sheol is tantamount to practically total non-existence.

But at the highest point of tension—for God “opens people's ears in the affliction” (*Job* 36:15b), i.e. “sensitivity” to intuitive knowledge in existential situations,—Job, being in a liminal situation, comes to his main conclusion, which he wishes not

merely to record in a scroll, but proposes to carve with an iron cutter in the rock forever so that it may be accessible to all generations; namely, he states:

“...beyond my flesh (i.e., having gone beyond the decaying flesh) I (i.e., the spirit of Job; cf. 32:8, 33:4, 6, 34:14–15) will see God (*ū-mi-bbāšāri 'ehēzeh 'ēlō^ah*),
I myself will see (Him),
my eyes will see (sc. “eyes of the spirit” of Job)—(myself and not another”

(*Job* 19:26b–27).

Regardless of what idea the author originally intended to express, the reader could (and still does) interpret the passage as containing an indication of the possibility of human immortality.

Be this as it may, the Book of Job clearly records the notion that the spirit is the centre and bearer of man's personality, self; it is, in fact, identical with his ego. It is the intelligent spirit of man (*Job* 32:8)—being not so much a creation, but in essence a particle of the Spirit of God—that returns at the death of the flesh to its Creator (cf. *Job* 33:4, 6, 34:14–15; cf. also *Gen.* 6:3; *Qoh.* 12:7b).

A similar doctrine is reflected in the Book of Qoheleth (Gr. Ecclesiastes), probably created in the 5th century B.C.E. (but later dates—up to the 3rd century B.C.E.—have also been suggested; see, e.g., Tantlevskij (2021), p. 47–97). It would seem that the Book of Qoheleth is imbued with “scepticism” and “pessimism”. Thus, in the eyes of Qoheleth, all activity and virtuous living lose their meaning and value provided “all things go to the same place: all things sprang from dust, and all things return to dust” (*Qoh.* 3:20; see also: *Qoh.* 2:14–15; 9:2–6)—that is, both body and spirit; so that “the same spirit (dwells) in all” (*Qoh.* 3:19)—i.e., the spirit of man, like that of the animal, “descends down into the earth” (*Qoh.* 3:21b; cf., e.g.: *Gen.* 2:7, 3:19, 6:3, *Job* 34:15; *Ps.* 146:4). Within this concept, the subterranean abode of the departed, Sheol, is thought of in the darkest terms (*Qoh.* 9:10; cf. *Qoh.* 9:3b–6; see also above). But even in the context of these truly deeply pessimistic opinions, attested to in one form or another in the Book of Qoheleth—opinions that at times contain an underlying horror of such an arrangement of the universe—there is nevertheless a glimmer of hope:

“Who knows whether the spirit of the sons of man ascends upwards,
And whether the spirit of the animal descends down, into the earth?”

(*Qoh.* 3:21; see also *Qoh.* 7:14; 11:4, 5a).

The Divine spirit in man is opposed to the carnal beginning already in *Gen.* 6:3 (“My Spirit shall not (remain) in man forever, since he is (also) flesh...”; cf. also, e.g., *Num.* 16:22, 27:16). The allegories, metaphors and tropes of the final chapter of the Book of Qoheleth are difficult to interpret, but in the light of the conviction expressed by its author about the return of the spirit to God (*Qoh.* 12:7b) it may be assumed that *Qoh.* 12:5–6 contains an allegory of the immortality of the human spirit (see in detail: Tantlevskij (2019), p. 48–57).

The original differentiation of human spirit and flesh and their implicit opposition is also expressed by Qoheleth in verse 11:5a–b (with spirit being primary):

“...You do not know where the spirit came from,
Nor (do you know) the bones (whence) in the pregnant woman's womb...”

So, from *Qoh.* 12:7, we can conclude that there was a distinct notion of the ascension of the spirits of the dead to God in heaven, which the author of the Book of Qoheleth eventually began to adhere to:

“And the dust shall return to the earth, which it was,
and the spirit shall return to God who gave it.”

But the notion of the descent of all the spirits of the dead into Sheol also continued to exist. On the other hand, Qoheleth was well aware of the three-part structure of the universe: heaven (sun)—earth (life “under the sun/sky”)—Sheol (the underworld).

(5) From the Hellenistic era onwards, in Judaea there was a proliferation of the doctrine of an individual bodily resurrection of the dead at a time determined by God—when the “End of Days” will come. Thus, the true immortality of the individual begins to be thought of not as the eternal existence of the spirit, but only in the complete union of spirit and flesh. In the Hebrew Bible, the idea of bodily resurrection is reflected in the Book of Daniel, created in its present form by late 165 or 164 B.C.E. (See, e.g., Hartman and Di Lella (1978), p. 14; some scholars have suggested that the verses in *Dan.* 12:11 and 12:12, as well as the prayer in *Dan.* 9:4–20 may have been added later; cf. on the other hand, Seow (2003), p. 9: “A postscript (12:5–13) was added to the whole book at the end (probably sometime in the spring of 163 B.C.E.) to update the final revelation in 10:1–12:4”; see also: Seow (2003), p. 191–196; for the details see Van der Kam and Flint (2002).) The verses *Dan.* 12:2, 13 express the idea of a bodily resurrection of the dead. The text *Dan.* 12:1–2 states that “many” (i.e., not all) “of those who sleep in the dust of the earth shall awaken, some to everlasting life, and others to everlasting shame and contempt.” It is probably assumed that the worst sinners will not rise at all, and that this will be the ultimate punishment for them. Let us note in this connection that, according to the pseudepigraphic 1 Enoch 108:3, the souls of the wicked, whose names have been blotted out from the Book of Life, are destroyed after preliminary torments by fire in some invisible (or abiding in state of chaos) desert (cf. also, e.g., 1 *En.* 22:10–13). A similar idea is recorded in the text of the Qumran Rule of the Community (1QS) 4:9–14, which states that after severe torment in the “dark regions” (of Sheol) the spirits of the wicked will be subjected to “destruction without rest and (possibility of) salvation.” This idea correlates with the notion of Avaddon-“annihilation”—the place of Sheol, where, as the ancient Jews probably believed, the spirits of especial sinners (and perhaps the spirits of those who were not properly buried) are destroyed. *Dan.* 12:13 contains the foretelling that the righteous Daniel, having “rested”, “will rise to receive his lot at the End of Days.” (On the other hand, judging from *Dan.* 12:3 (cf. also some Qumran texts, especially the so-called “Self-Glorification Hymn” (4Q491c 1, 4–12) and its modifications, in particular 4Q471b, frags. 1–3, 5 [= 4Q427, frags. 7 col. 1 + 9, 8]: “...who is like me among the gods (*bā-’ēlīm*)?” (cf. *Ex.* 15:11); cf., e.g., Wise (2000), p. 173–219), the spirits of the righteous “sages”—before the bodily resurrection—abide in heaven and may even be “deified” in a sense, while the spirits of the wicked abide in Sheol (cf. *Dan.* 12:2).) The doctrine of the bodily resurrection of the dead is also attested in the Dead Sea manuscripts (see, e.g., 1QH^a 12:21f., 14:29f., 34 [cf., e.g.: 11:11–14, 13:11f., also: 19:11–14; 21:11f.], 1QpHab 9:12–10:5 [cf. also 5:3–6, 10:6–13], 4Q521; cf., e.g., CD-A 6:10f.; 4QD^b, 6, 1; 4QD^d, 4, 2; cf. further 4Q385, frag. 2, probably not of Qumran origin), as well as in a number of Jewish pseudepigrapha from the Hellenistic era (cf. especially 2 *Macc.* 7:14, 29; 14:46) and later.

It is possible that the doctrine of an individual bodily resurrection of the dead at the End of Days, which had been widespread in Judaea since the Hellenistic period, may ultimately have been crystallised under the influence of the prophets of the Babylonian captivity period (6th century B.C.E.; see below). It may also be assumed that the writer of the final version of the Book of Job correlates the misfortunes of the pious and righteous Job, man of old, with the plight of the Jewish people who, around

622/621 B.C.E., carried out a religious reform initiated by King Josiah—which resulted in a single centralised service to God in the Temple of Jerusalem, purged of any pagan elements—but who lost their homeland and found themselves in captivity in Babylon on the verge of national ruin (see Tantlevskij (2020b), p. 26–37). However, like the servant of the Lord in Isaiah 52:13–53:12 (the so-called Deutero-Isaiah [*Isa.*, chap. 40–55] usually dates from the very end of the Babylonian captivity of the Jews, see, e.g., Blenkinsopp (2002); Whybray (2004), p. 1–12)—personifying the Jewish people, cruelly afflicted by the Babylonians, “torn from the land of the living” (*Isa.* 53:8b; see also 53:9, 12), but close to the beginning of their rebirth, the servant of the Lord Job (*Job* 42:7–8) was also sort of reborn by God and gained new children and possessions. In this connection, we may also mention the image of the people of Israel “bodily” rising from the dead as depicted in the Book of Ezekiel 37:1–14 (his prophecies date from the first third of the 6th century B.C.E.). In this connection, it is indicative that the phrase describing Job’s restoration and rebirth to new life in 42:10 is *šāb ’eṭ šābīt (šābūt)*, lit. “to bring back the captivity (captives)”: this expression was used by the Judaeans prophets, at whose time the beginning of the Babylonian captivity occurred, regarding the return of Judaeans exiles from captivity (see *Jer.* 29:14, 30:3; *Ezek.* 16:53, 39:25; see also *Deut.* 30:3; cf., on the other hand, e.g., the prophecy in *Am.* 9:14). The Book of Job could be dated from the Babylonian captivity or from the very beginning of the Persian period (late 6th to first half of the 5th century B.C.E., Judaea; see, e.g., Seow (2013), p. 45).

It is likely that the descriptions in *Isa.* 26:19 and 41:14 of the “dead bodies” of the departed Israelites and Judahites rising from the dust of the earth are also allegories of the nation’s rebirth after the Babylonian captivity. Although the texts of chapters 24–27 of the Book of Isaiah (this part is tentatively titled “A Prophecy of the Salvation of Zion/Israel”, see Sweeney (1996), p. 311f.) were included in the prophecies of “Proto-Isaiah” (*Isa.*, chap. 1–39; second half of the 8th century B.C.E.), many scholars date them to the period of the Babylonian exile of the Jews or even the very beginning of Persian dominion in Judaea (see Sweeney (1996), p. 311–353).

On the other hand—as possible sources for the origin of the idea of an individual bodily resurrection from the dead—it should not be overlooked that the texts 1 *Kgs.* 17:22 and 2 *Kgs.* 4:35, 8:1, 13:21 mention bodily “revitalisations” connected with miraculous deeds of Elijah and Elisha (cf. also *Sir.* 48:5 in Hebrew, referring to 1 *Kgs.* 17:22, that directly speaks of restoration “from death and from Sheol”).

At the end of this explication, we will also mention that the conception of Ehrman (2020), who rejects the presence of the idea of the afterlife and posthumous retribution in the Hebrew Bible and even—in a sense—in the New Testament and sees its origin in Homer, Plato, and Virgil, stands apart from the others.

Biblical concepts of the otherworld in ex hypothesi chronological order. The concepts of afterlife in Biblical texts can be systematised along several lines, as shown below. Some concepts are partially overlapping to allow for a better differentiation between different aspects of the considered ideas.

The passage of spirits.

1. The spirits of all the departed pass into the netherworld—often specifically labelled Sheol—and remain there forever [C_0].
2. The previous concept is specified by assuming that family, national and social differentiation are reproduced in Sheol and even feelings and features of earthly appearance are retained [C_1].

- Another feature of the previous concept is expressed by the fact that the transition of the spirit of the Hebrews/Judahites into Sheol is specifically referred to as “joining [‘appending’] to his people (or ‘fathers’, sc. ancestors)” [C_2].

There is a further differentiation of afterlife in the otherworld / Sheol with respect to the qualities of people:

- The most wicked people may descend into Sheol as punishment for their sins even before their earthly demise (probably right in the body) [C_3].
- The idea of the spirits of the righteous and wise men ascending to God in heaven, which is their reward in the other world; the souls of others go down to Sheol [C_4].
- The most righteous individuals (in the Hebrew Bible these are Enoch, Elijah and possibly Melchizedek), without tasting bodily death, were raptured alive into heaven by God [C_5].
- A variant of the previous implies that the spirits of eminent ancestors probably pass into the category of beings-*‘elohim*, gaining extraordinary knowledge and abilities, above all, probably the ability to heal the living and to foresee the future [C_6].
- Two possible alternative interpretations of the texts of Ezek. 31:15–18 and ch. 32 allow for the existence of the following two variants that we do not distinguish in the context of this study [C_7]:
 - The spirits of Jews and Gentiles abide in Sheol separately;
 - or, less likely, only the spirits of the “uncircumcised” go down to Sheol.

Different condition of stay in Sheol. At a certain stage, probably beginning with the Babylonian captivity of the Judaeans, but more likely in the Persian period (probably in its first half—late 6th to 5th centuries B.C.E.), two types of beliefs become widespread. On the one hand, Sheol is essentially almost total nothingness; the personalities of the righteous and the wicked, the wise man and the fool are either nearly virtually annihilated there (this is found sporadically in the Books of Proverbs, Qoheleth and Job), or still retain some features of individuality. Here, we distinguish the following variants:

- Some aspects of the identity of the person are preserved in Sheol [C_8];
- The ability to feel is preserved in Sheol [C_9];
- Perhaps retaining features of earthly appearance takes place in Sheol. [C_10];
- Sheol is seen predominantly as the abode of the dull existence of the likeness (shadow) of man; it is a land of gloom, of disorder [C_11];
- There is no contact with God in Sheol (common perception) [C_12].
- Nevertheless, according to some views, there is a way one can contact with God while being in Sheol [C_13].
- Sheol is the equivalent of actual loss of individuality, destruction of personality, complete ruin; “(a place from which) no one will rise” [C_14].
- Avaddo(n) (sc. a place of “destruction”) is the part of Sheol where (the spirits of) the most wicked went; after much torment they are destroyed in this deepest area of Sheol [C_15].

On the other hand, due to the development of the conception of spirit as the bearer of man’s selfhood and the possibility of his

immortality through the accession to the Divine world, to God, and also of the Divine nature of the spirit in man, opposing his carnal nature, the concepts considering possibility of gaining immortality by the spirit of man in full measure are spreading giving rise to the following concepts:

- The Divine spirit in man in a way constituting his selfness is opposed to the carnal beginning [C_16];
- All spirits at the death of the flesh pass into Sheol, where judgment takes place on them; but after that, the spirits of the righteous and the intelligent ascend into the heavenly, Divine world, while the wicked and the foolish, weighed down by sins and foolish ideas, remain forever in Sheol [C_17].

Concepts of complete spiritual immortality and resurrection. In the Hellenistic era (especially since the 2nd century B.C.E.) the emphasis on the attainment of true immortality of the spirit as the midpoint of man’s personality intensifies, the idea of ascending the spirits of the righteous to the heaven and transforming them into angelic beings (Daniel; also Books of Enoch; Qumran writings, etc.) develops. We distinguish the following aspects:

- The possibility of true human immortality [C_18]; and, specifically,
- The idea of the spirit as a bearer of human self and the possibility of its complete immortality through the accession to the Divine world, to God [C_19].
- No later than 164 B.C.E. the Book of Daniel witnessed the idea of a bodily resurrection of the dead at the End of Days and a universal Last Judgment with consequent benefits in eternal life for the righteous and corporal punishment for the ungodly. (In the New Testament times, or perhaps even earlier, a debate will arise as to what these bodies will be: purely carnal (physical) or “spiritual”/“in spiritual flesh”) [C_20].
- Before the bodily resurrection, the spirits abide in Sheol (probably this idea is found in Dan. 12:2, 13) [C_21].
- Before the bodily resurrection, the spirits of the righteous abide in heaven, may even be “deified”, while the spirits of the wicked abide in Sheol (already undergoing preliminary punishments) [C_22].
- The bodies of particular sinners are not resurrected at all, and their spirits are annihilated—the worst punishment [C_23].

All listed above concepts are systematized in Table 1 below.

Network construction and analysis

Vertices and their relations. In total, we identified 43 texts that contained concepts related to the notion of the otherworld. These are Book of Genesis, Book of Numbers, Book of Deuteronomy, 1st and 2nd Books of Samuel, Book of Judges, 2nd Book of Kings, Proto- and Deutero-Isaiah, Book of Jeremiah, Book of Ezekiel, Book of Hosea, Book of Malachi, a number of Psalms: 6, 16, 17, 21, 23, 27, 30, 36, 37, 41, 49, 55, 56, 61, 73, 88, 94, 103, 106, 110, 116, 119, 139, 142, 143, Book of Job, Book of Proverbs, Book of Qoheleth, Book of Daniel, as well as 2nd Book of Chronicles.

To establish the relations between different texts, we first identified all pairs text—concept. In total, this resulted in 112 pairs. The full list of all the pairs is presented in the Supplementary Materials. An edge connects two vertices (texts) if they share the same concept. In the case when two texts share more than one concept, the corresponding edge is ascribed a weight equal to the number of shared concepts.

Table 1 A table of the main concepts of the afterlife and their short descriptions.

#	Tag	Description
0	Sh_all	The spirits of all the departed went to Sheol.
1	Sh_differentiation	Sheol reproduces the family, national and social differentiation that took place in the earthly world.
2	Sh_join_people	Euphemistically, the Hebrews/Judahites' earthly demise and their spirits' transition to Sheol is expressed by the formula way-yē'āsef 'el 'ammāw, "and joined ('appended') to his people (or 'to his fathers')".
3	Sh_punish_wicked	The most wicked could descend into Sheol as punishment for sins even before their earthly end.
4	Sh_others	The idea of the spirits of the righteous and wise men ascending to God in heaven, which is their reward in the other world; the souls of others go down to Sheol.
5	Ascension_to_heaven	The most righteous individuals were raptured alive into heaven by God in the flesh.
6	Afterlife_deification	The spirits of eminent ancestors probably pass into the category of beings-'ēlohīm, lit. "gods", gaining extraordinary knowledge and, in particular, the abilities of healing and foreseeing the future.
7	Sh_Jews_and_Gentiles	The spirits of Jews and Gentiles abide in Sheol, probably each nation separately (there may also have been a perception that only the spirits of the "uncircumcised" go down to Sheol).
8	Sh_identity	The identity of the person was preserved in Sheol.
9	Sh_feel	The ability to feel was preserved in Sheol.
10	Sh_appearance	Perhaps, retaining features of earthly appearance takes place in Sheol.
11	Sh_dull_existence	Sheol is portrayed in very negative tones and is seen predominantly as the abode of the dull existence of the likeness (shadow) of man.
12	Sh_no_contact_with_God	A common perception: there is no contact with God in Sheol.
13	Sh_contacts_with_God	But, according to some opinions, there is a way one can contact with God while being in Sheol.
14	Sh_loss_of_individuality	The equivalent of the actual loss of individuality, the destruction of personality, "(a place from which) no one will rise".
15	Sh_Avaddon	Avaddo(n) is precisely the part of Sheol where (the spirits of) the most wicked went (and probably are destroyed after much torment).
16	Spirit_vs_flesh	The Divine spirit in man, in a way constituting his identity, is opposed to the carnal beginning.
17	Lord_justice	Initially, immediately after the death of the flesh, all spirits are descended into Sheol, where judgment takes place.
18	True_immortality	The possibility of human true and complete immortality: spiritual and in the flesh.
19	Human_spirit_bears_selfness	The idea of the spirit as a bearer of the human self and the possibility of its complete immortality through the accession to the Divine world, to God.
20	Resurrection	The idea of a bodily resurrection of the dead and the subsequent Last Judgment over them.
21	Sh_before_resurrection	Before the bodily resurrection, all the spirits abide in Sheol.
22	Heaven_before_resurrection	The spirits of the righteous abide in heaven before the bodily resurrection.
23	Selected_resurrection	The bodies of particular sinners are not resurrected, and their spirits are eventually annihilated.

The described procedure resulted in the weighted network shown in Fig. 1. The vertices are shown as bold dots with the names of the associated texts written above, while the edges are represented by lines that join different vertices. In Fig. 1, the weights of the edges are indicated by the thickness of the corresponding lines. The obtained graph is unambiguously determined by its adjacency matrix, which can be found in the Supplementary Materials.

Statistical analysis. The obtained graph consists of 43 vertices and 383 edges. The total weight of the graph, i.e., the sum of all weights of the edges, is 462, which indicates that there are edges with weights larger than 1. The average degree of the graph is approximately equal to 17.8. Recall that the degree of a vertex is the number of edges incident to this vertex, and the average degree of a graph is the arithmetic average of all vertex degrees. The distribution of the vertex degrees is shown in Fig. 2, where one can observe that the degrees are distributed non-uniformly, with a large peak at $d = 23$ and two smaller peaks at $d = 6$ and 27 . Furthermore, the graph density is equal to 0.424, which indicates that the graph is rather densely connected. The density of a graph is computed as the ration of the number of edges to the total possible number of edges, which is equal to $V \cdot (V-1)$, where V is the number of vertices.

Clustering of the graph. A standard approach in network science consists in decomposing the whole network into several clusters, whose vertices are densely connected internally, while having less connections to the vertices from different clusters. This problem is well known as community detection, see, e.g., Girvan and

Newman (2002); Newman (2004); Porter et al. (2009). Decomposition of a network may help to identify the elements of the network, i.e., the vertices that are closer to each other than the others. In this study, we used the Louvain community detection algorithm described by Blondel et al. (2008). The Louvain method belongs to the class of methods that aim at maximizing the modularity of the decomposition. Here, modularity is a measure of the structure of the network that characterises the extent to which the network is divided into modules. We refer the interested reader to Newman (2006) for more detail.

Using the described algorithm, all vertices, i.e., texts were divided into three groups (clusters) as follows:

Group 1: Book of Genesis, Book of Numbers, Book of Deuteronomy, 1st Book of Samuel, Book of Judges, 2nd Book of Kings, Proto- and Deutero-Isaiah, Book of Jeremiah, Book of Ezekiel, Psalms 55 and 106, Book of Daniel, as well as 2nd Book of Chronicles.

Group 2: 2nd Book of Samuel, Psalms 6, 30, 88, 94, as well as Book of Job and Book of Qoheleth.

Group 3: Book of Hosea, Book of Malachi, as well as Psalms 16, 17, 21, 23, 27, 36, 37, 41, 49, 56, 61, 73, 103, 110, 116, 119, 139, 142, 143, and Book of Proverbs.

Although such division might seem arbitrary, we can observe that texts within the same group are more closely connected rather than the texts from different groups. Furthermore, we can identify concepts that belong exclusively to the texts from one of the clusters and are either not or minimally represented in the texts from other clusters. For instance, Group 3 is characterized by the concepts "Ascension_to_heaven" and "Sh_others". We recall that the former concept says that the most righteous individuals were raptured alive into heaven by God in the flesh,

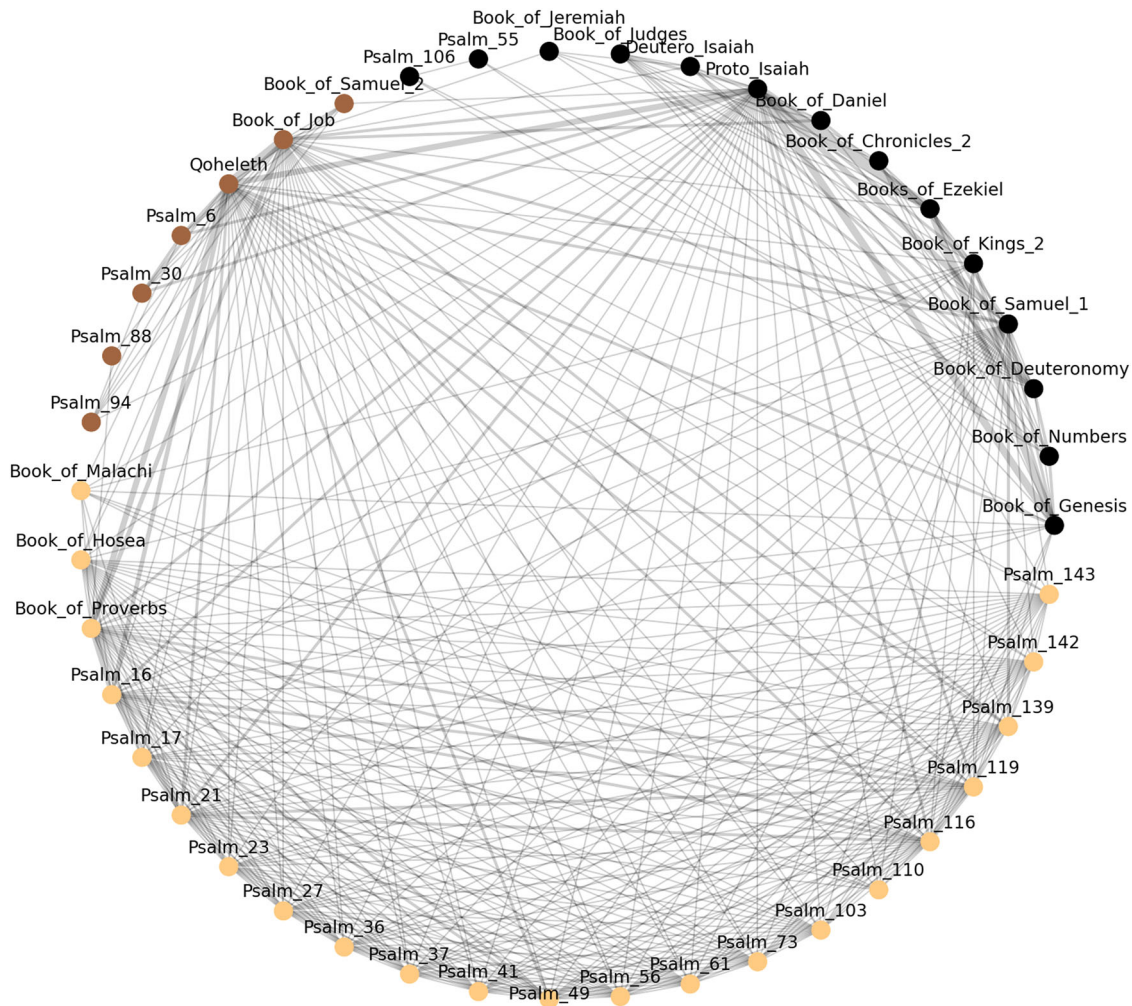


Fig. 1 Graph of relations between the texts of the Hebrew Bible. The vertices correspond to the individual texts, and the names are written above the vertices. An edge (a connecting line) between two vertices indicates that the respective texts share one or more concepts. The weight of the edge corresponds to the number of concepts shared by the texts. In the figure, the weights of the edges are indicated by the thickness of the respective lines. Vertices that belong to the same group are drawn in the same colour.

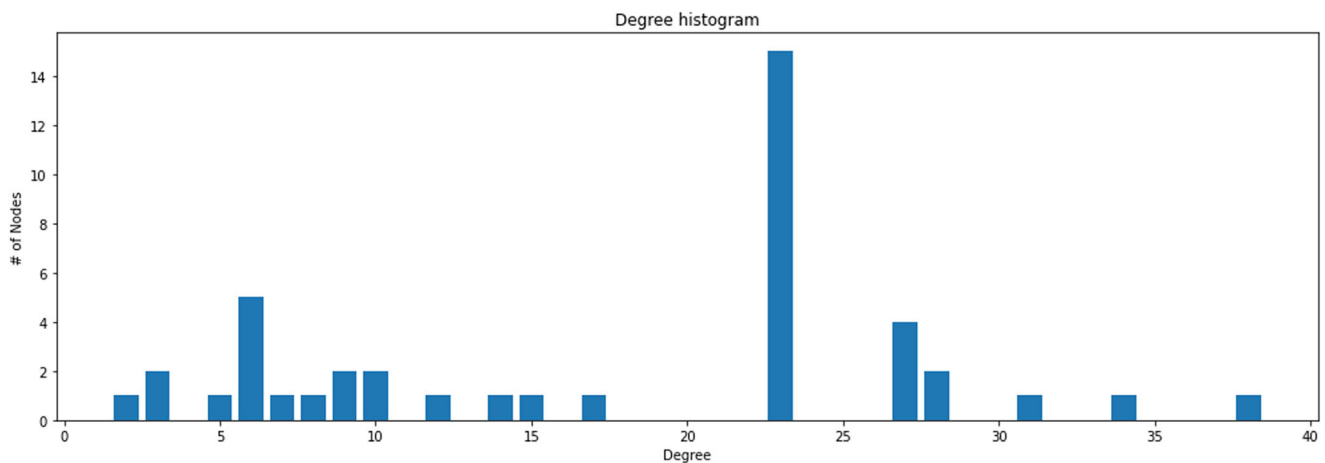


Fig. 2 Distribution of the vertex degrees in the graph. A higher vertex degree implies that the respective text has a larger conceptual overlap with other texts.

while the latter one contains the related idea that the spirits of the righteous and wise men ascend to God in heaven, while the souls of others go down to Sheol. Furthermore, Group 2 is characterized by two similar concepts, “Sh_dull_existence” and

“Sh_no_contact_with_God”. The first concept portrays Sheol in very negative tones and sees it predominantly as the abode of the dull existence of the likeness (shadow) of man; respectively, the second concept says that there is no contact with God in Sheol.

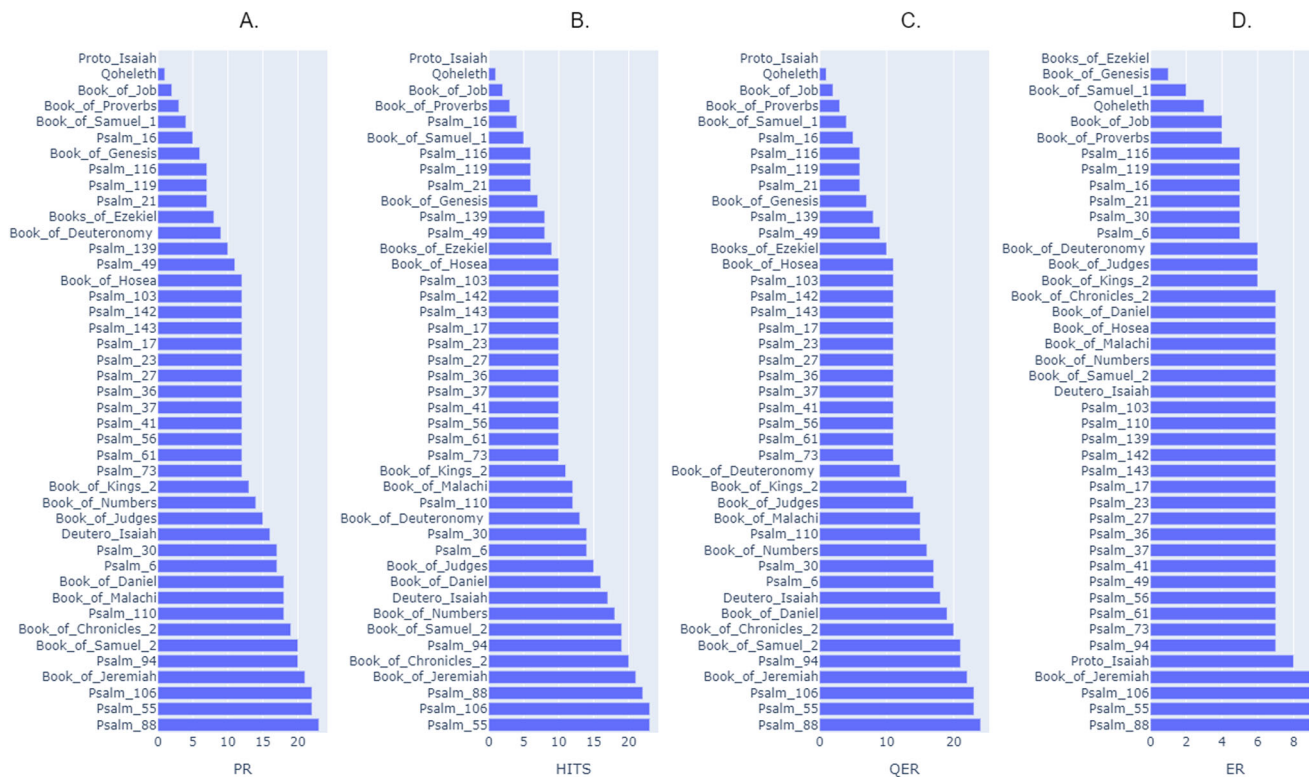


Fig. 3 Results of the ranking of graph vertices using 4 different schemes (PageRank, HITS, quasi-exponential ranking, and exponential ranking). The vertices are arranged from the most influential ones (top) to the least influential (bottom). The abbreviations are: PR is PageRank, QER is quasi-exponential ranking, ER is exponential ranking. A higher position in the rank implies that the respective text plays a more important role in the total body of texts: it contains the concepts that appear more often in other texts and has a greater overlap with other texts.

Again, we observe that these two concepts are closely related, which might indicate the existence of some relations between the respective texts.

While not the most numerous, Group 1 is the most diversified in terms of the concepts it contains. It is therefore more difficult to identify a few concepts that characterize this group. We mention concepts “Sh_join_people”, “Resurrection”, and “After-life_defication”. These concepts are not as closely related as the concepts mentioned above. This might indicate the need for a further decomposition of the first cluster.

Ranking of the vertices. Important information about a graph can be obtained by ranking its vertices. There exist numerous algorithms aimed at identifying the most important or influential vertices. Intuitively, we may expect that a vertex is more important if it is connected to a larger number of (preferably important) vertices. Although the central idea of vertex ranking remains the same, its realizations differ to a larger extent. In this work, we rank the vertices of the graph shown in Fig. 1 by 4 different methods: PageRank by Brin and Page (1998), HITS by Kleinberg (1999), quasi-exponential ranking by Gromov and Evmenova (2021), and exponential ranking by Traag et al. (2010). It is worth noting that the former three algorithms are (quasi-)linear, while the latter one is non-linear. We do not go into the specific mathematical intricacies of the described methods, and refer the interested reader to the references mentioned above.

The results of the different ranking algorithms are presented in Fig. 3. Quite remarkably, if we look at the 5 most influential vertices, we observe that the first three algorithms resulted in the same rankings up to a little variation in the fifth position. Thus, the most influential texts according to the first ranking are (in the

order of decreasing importance): Proto-Isaiah, Book of Qoheleth, Book of Job, Book of Proverbs, and the 1st Book of Samuel. On the other hand, the exponential ranking scheme resulted in a somewhat similar, but not completely identical ranking: Book of Ezekiel, Book of Genesis, the 1st Book of Samuel, Book of Qoheleth, and Book of Job. One can readily observe that these are the texts that contain the maximal number of concepts: from 12 concepts in Proto-Isaiah, 9 concepts in Qoheleth, Book of Job, and Book of Ezekiel, 8 concepts in Book of Genesis, to 5 concepts in both Book of Proverbs and the 1st Book of Samuel. On the other hand, the rankings of these books do not always coincide with the number of concepts they contain. Thus, this number can only serve as an indirect indicator of the importance of the particular text.

It is interesting to note that the most important vertices are distributed between the previously computed clusters quite uniformly. This may imply that the suggested decomposition does not correlate with the importance of the vertices.

The presented analysis can be deepened further by considering the concepts that are typical for the most influential texts. An analysis of the concepts for the first 5 texts in the first ranking clearly shows that all these texts share the concept Sh_other and Ascension_to_Heaven. Recall that the first concept reflects the idea that the spirits of the righteous and wise men ascend to God in heaven, which is their reward in the other world, while the souls of others go down to Sheol. The second, closely related concept says that the most righteous individuals are raptured alive into heaven by God in the flesh. Looking further, we observe that there are several concepts that appear in the considered texts more often. These important concepts are Lord_justice, Sh_dull_existence, True_immortality, Human_spirit_bears_selfness, and

Sh_identity (see Table 1 for these descriptions). Note that the important concepts are not necessarily those that appear in many texts (for instance, the concepts Sh_join_people and Resurrection appear very often, but yet are not important). This is a significant observation, which implies that the importance does not always result from frequent use. In this sense, the methods of graph theory may contribute to better understanding of the underlying phenomena.

Discussion

In this paper, we presented a network that describes the relation between different texts of the Hebrew Bible with respect to their treatment of the notions of the otherworld and the afterlife. Quite remarkable, the obtained results exhibit a very high degree of interconnection between different texts, which indicates the high extent of mutual influence between the texts of the Hebrew Bible. We carried out a basic statistical analysis of the obtained graph and applied the Louvain clustering method to split the whole graph into a number of densely connected subgraphs. The performed analysis reveals certain similarities between different texts of the Hebrew Bible and can indicate some hidden connections. However, more interesting results were obtained using different ranking methods. It turned out that there is an invariant set of texts that can be interpreted as having the larger influence or importance on the development of the idea of the otherworld. These texts are Proto-Isaiah, Qoheleth, Job, and Proverbs as well as 1 Samuel, Book of Ezekiel, and Book of Genesis (relevant passages from these books, their correlations and interpretations can be found in section 2.1). Furthermore, a detailed analysis of the concepts associated with these texts revealed that there are a number of concepts that are likely to be associated with the most influential texts. These concepts are in the first line: Sh_other and Ascension_to_Heaven as well as Lord_justice, Sh_dull_existence, True_immortality, Human_spirit_bears_selfness, and Sh_identity.

In general, our analysis indicates that the development of the notions of the otherworld and afterlife followed the path of increasing intensification of the idea of the preservation of the earthly features of the individual personality—initially spiritual identity/self, and in the later concept of resurrection—the corporeal identity as well. The ethical component—the afterlife’s reward for the righteous and the sinners—came increasingly to the fore. The ethical aspect correlated to a certain extent with the intellectual: righteousness with reasonableness and wickedness with foolishness.

One possible direction of the further work is to expand the described study to a larger body of texts that are more recent in relation to the Hebrew Bible, namely apocrypha and pseudepigrapha, the Dead Sea scrolls, the New Testament, early Christian and Rabbinic literature. Thus, with the help of the proposed methodology, it would be possible to study not only the entire corpus of Biblical texts, but also Jewish, Judeo-Christian and early Christian concepts of the otherworld and the afterlife (both orthodox and heterodox) up to the end of the Roman period in Judaea and thus try to reconstruct not only the whole picture of the corresponding concepts in Judaism and early Christianity, their evolution, deviation, etc., but also to reveal the probable ways of their interpenetration and mutual influence. Further, the obtained graph presents some interesting mathematical properties—e.g., an invariance of the ranking results over a large span of methods—that can be the subject of a separate study.

Data availability

All data supporting reported results can be found in Supplementary Materials. The supporting information includes the following: list of texts, list of concepts, list of pairs

text-concept, adjacency matrix of the constructed graph. The dataset can be accessed at <https://doi.org/10.7910/DVN/TGFQY7>.

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