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Genesis, Wellhausen and the Computer"

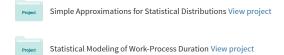
Article in Zeitschrift für die Alttestamentliche Wissenschaft · January 1982

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Genesis, Wellhausen and the Computer

See John Brown

By Yehuda T. Radday, Haim Shore, Moshe A. Pollatschek and Dieter Wickmann

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In the past ten years, a number of homogeneous and cognate enquiries were performed and published by us in the framework of our CASTLOTS (Computer-Assisted Statistical Linguistic Old Testament Studies) laboratory 1. Dealing in the main with cases of interest to Biblical scholars only, they may be seen as preliminary studies, gradually increasing in sophistication, designed to lead, ultimately, to testing the validity of the Documentary Hypothesis in the Pentateuch. That this issue is a matter that concerns not a small coterie like the former, but millions of Jews and Christians and therefore more than another academic exercise surely needs no elaboration. Neither is it necessary to expound here the origin and subsequent history of this hypothesis nor the arguments which it rests upon. As well known, it is dominant to date in Biblical scholarship and only lately have some rumblings in opposition been heard. Dissent has of course been voiced before, but it was rejected, disregarded or even ridiculed as obscurantist. Both camps, though of rather unequal strength, are united, it is only fair to state, in their genuine pursuit of truth, but also, as inevitable when it comes to religious matters, alike in so far as they are heavily influenced by the initial subjective stances of their followers. What separates them is that they are almost not on speaking terms. A fully objective approach is therefore an urgent desideratum.

Such a new approach has become available with the advent of the computer, and has been tried by us. It combines four disciplines: the problem is Biblical, the angle investigated is the linguistic, the method is supplied by statistics, and computer science is instrumental. So we banded together to assess the validity of Wellhausen's theory of Quellenscheidung first in Genesis (Exodus is being processed). When embarking upon this project we felt encouraged by the experience gained in our previous inves-

¹ To name only a few of those available in English: Y.T. Radday, The Unity of Isaiah in the Light of Statistical Linguistics with a contribution by D. Wickmann (Hildesheim: Verlag Gerstenberg, 1973); Y.T. Radday and H. Shore, *And in Isaiah, *Revue de l'organisation internationale pour l'étude des langues anciennes par l'ordinateur 2 (1974), 25–41; Y.T. Radday and D. Wickmann, *The Unity of Zechariah in the Light of Statistical Linguistics, *ZAW 87 (1975), 30–55; Y.T. Radday, D. Wickmann and S. Talmon, *The Book of Judges Examined by Statistical Linguistics, *Biblica 58 (1977), 469–99; Y.T. Radday and M.A. Pollatschek, *Vocabulary Richness and Concentration in Hebrew Biblical Literature, *Bulletin of the Association for Literary and Linguistic Computing 8 (1980), 3, 217–31.

tigation where the method proved itself. To adduce one example only: CASTLOTS was capable to sort out the Samson Cycle as a foreign body in the Book of Judges which should suffice to convince the skeptic how subtle and sensitive the method is. In this case, and incidentally in all others, results confirmed the critical view (of heterogeneity) against the traditional (of homogeneity).

The end product of our endeavours is a voluminous typescript with more than 100 tables and charts. Since it is most doubtful that it will be available in print before 1984, we were asked by colleagues to make at least a small part of it immediately accessible in a concise abstract. The present article was written in response to this request.

The text that served us was the Letteris Bible.² Variants were disregarded as immaterial in a statistical enquiry, nor did we deem it our task to take any stand vis-à-vis the many inconsistencies and repetitions found in Genesis. How to account for them, i.e. whether by hermeneutics or by fragmentation of the book, we decided not to be of our concern. Not so, though, the other main pillar of the Documentary Hypothesis, namely, what its proponents call style. This term is rather loosely used, mostly illdefined and so subject to personal taste that arguing from style is precarious both for or against the homogeneity of a literary text. Moreover, style - whatever it may mean - is closely connected to content. Therefore, instead of style, a preferably large number of formal criteria must be defined to specify what we chose to name a writer's language behaviour his finger prints, so to say. To qualify, these criteria must not be prescribed by rules of grammar, syntax etc. to make their use or not optional. What is even more important, they must be countable and lie beyond the writer's conscious control. Then only can one be sure that they cannot be changed at will nor, a fortiori, be imitated. Our criteria set comprised 56 such variables. The most potent discriminants among them were word length in terms of phonems, the definite article, the conjunctive and consecutive waw, and the frequencies of transitions between word categories (nouns, finite verbs, non-finite verbs, pronouns etc.). Experience in other Biblical books proved that this battery describes language behaviour satisfactorily and is capable of distinguishing between one author and another.

Of the many versions of the Documentary Hypothesis we chose the one cited in the *Encyclopaedia Judaica*.³ It is detailed enough and at the same time not extremist. Since a stastistical enquiry into 20000 items (words) is most unlikely to be influenced by minutiae, opting for another

² Published by the British and Foreign Bible Society, under the supervision of M. L. Letteris, in 1852 and reprinted ever since.

³ Encyclopaedia Judaica (Macmillan and Keter Publishing House), vol. 7, col. 391, s.v. Genesis see p. 479.

recension of the hypothesis (which is feasible at any time) would not distort findings significantly if they are clearcut – and clearcut they are.

The first step was analyzing Genesis linguistically word for word. What this means is demonstrated in our Key-Word-in-Context Concordance to the book.4 Not demonstrated there, though, is that we added to each word one of the sigla I, E, or P, respectively (the Redaktor R does not appear in the aforementioned recension). On afterthoughts, we also marked words by N when the narrator speaks, by H when they are uttered by his dramatis personae, or by D when they occur in Divine direct speech. All this information, including chapter, verse and no. of word within the verse, was registered on magnetic tape. In this manner, we were able to test consistency in language behaviour in three dimensions: per Documents (DOC), per Sorts-of-Discourse (SDS) and per Divisions (DIV). By the latter we mean the Urgeschichte (chs. 1-11, DIV I), the Patriarchal Cycle (chs. 12-36, DIV II) and the Joseph Story (chs. 37-50, DIV III). Excluded from all calculations were two portions which we considered as poetry and hence not comparable with prose, even if rhythmic: ch. 11-23 and ch. 491-27. Re-inserting either into calculations if its poetic character is doubted is always possible.

Essentially, we proceeded in two stages: (A) ex hypothesi and (B) without any a priori assumptions. Of each, no more than an example or two of procedures and results have place in a resumé.

In stage (A), all portions ascribed to J, E, and P, respectively, were extracted and pooled together. The three corpuses were then compared with each other and the probability computed of each pair stemming from the same statistical population, taking 54 variables into consideration. This resulted in

- (a) the probability of *J* and *E* being homogeneous: 82.0%
- (b) the probability of J and P being homogeneous: 0.000000%
- (c) the probability of E and P being homogeneous: 0.000000%

How enormously high the percentage (a) is can best be illustrated by comparison with what Newton called a fool's test: when the probability was calculated, on the basis on transition frequencies as above, of Kant having written Kant, and of Goethe having written Goethe, it transpired that it was in the first case 8% and in the second 22%. In the light of these data, one of the foremost claims of the Documentary Hypothesis, and in

⁴ Y.T. Radday, An Analytical Linguistic Key-Word-in-Context Concordance to the Book of Genesis, The Computer Bible Project vol. 18, ed. J.A. Baird and D.N. Freedman (Wooster OH: Biblical Research Associates, 1979).

⁵ For particulars on this research in German literature see D. Wickmann, Eine mathematischstatistische Methode zur Untersuchung der Verfasserfrage literarischer Texte, durchgeführt am Beispiel der Nachtwachen von Bonaventure mit Hilfe der Wortartübergänge (Opladen: Forschungsberichte des Landes Nordrhein-Westfalen, 1969).

fact its starting point, that is, that there was a Jahwist and an Elohist, is extremely improbable. P, though, looks definitely like a source apart. If so, should then Wellhausen's tripartition of Genesis be substituted by a bipartition (J + E vs. P)? Let us suspend judgment, for the time being.

Another step within stage (A) was applying Discriminant Analysis to each of the three dimensions. Here, not three, as before, but nine corpuses were extracted: *J*, *E*, *P*; *N*, *H*, *D*; and *I*, *II*, *III*. After each was subdivided into consecutive samples of 200 words, the following configurations per dimension in the Discriminant Function Space ensued: Fig. 1 for DOC, Fig. 2 for SDS and Fig. 3 for DIV.

Consider Fig. 1. The area encompassing P-samples hardly touches the other two, while the J-area and the E-area are almost congruent and their centroids, i.e. centres of gravitation, almost coincide.

Fig. 2 is no less interesting. The N, H, D dimension falls within the confines of Discourse Analysis, a rather recent branch of linguistics and hence obviously overlooked by the fathers of the Documentary Hypothesis. The chart reveals the startling fact that at least as much variation in language behaviour is discernable here as in Fig. 1 – actually a much wider and more distinct one: the narrator's tale is neatly demarcated from direct speech.

Fig. 3 evinces again another constellation. There is indeed much overlapping of the three areas, yet a certain pattern is recognizable: the impression gained is as if the fields moved gradatim from left to right. Now, a slow transition in language behaviour can be sensed by the reader who is not prejudiced by scholarly theories but guided by his own attentive ear. He cannot fail to notice that Genesis starts with typology, individuizes imperceptibly when it reaches the archetypal figure of Abraham, uses that of Isaac as a link between his father who is still monumental and his son who is already reduced to human measurements, and finally focuses for a full quarter of the book on a detailed biography of Joseph.⁶ It makes perfect sense that this gradual change in literary technique and treatment of personages is reflected in the chart.

It should be pointed out, in this context, that the three Figures do not carry the same specific weight, to borrow a term from another discipline. The data which produced Figs. 2 and 3 are given in the text as it stands, whereas Fig. 1 evolved from theoretical premises, whether correct or not. It is the more noteworthy that difference in language behaviour is most pronounced in Fig. 2, less so in Fig. 3 and, if it were not for the peculiar comport of P, almost nonexistent in Fig. 1, the chart pertaining to Docu-

⁶ This slow transition in Genesis from typology to individuization is discussed by Y.T. Radday, "Chiasm in Hebrew Biblical Narratives" in J. Welch (ed.), Chiasm in Antiquity (Hildesheim: Verlag Gerstenberg, 1981). Incidentally, an attempt was made there also to account for the many repetitions found in Genesis.

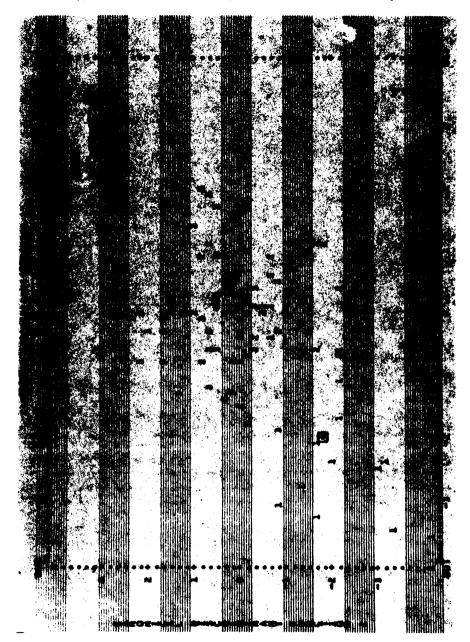


Fig. 1

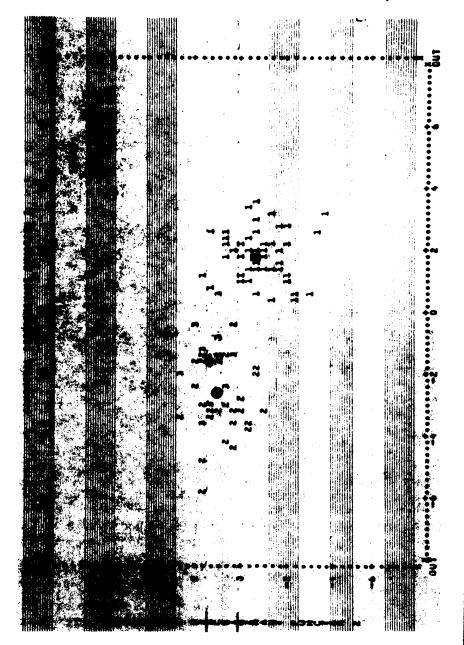


Fig. 2

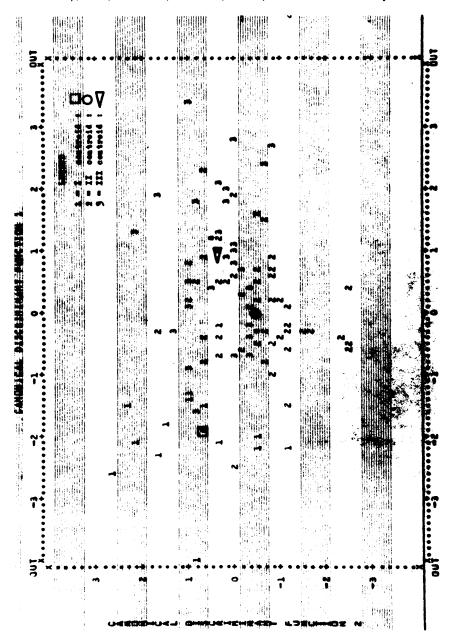


Fig. 3

ments. The situation is therefore by far more complex than what Documentarians imagined it to be, particularly since there may well be some sort of interaction between SDS and DIV and possibly also between these two and the hypothetical DOC. We actually calculated the interaction effects, but cannot afford to enter into such detail for lack of space. Instead, we had better proceed to stage (B).

In stage (B), we did not acknowledge any hypothesis, but let the 96 text samples group by themselves, so to say. A few words about this strategy must preceed the results. While so far each of the three dimensions (DOC, SDS, DIV) was treated separately, a sample is now being defined at once by the Document, the Sort-of-Discourse and the Division it belongs to. It goes without saying that, in addition, samples are numbered consecutively from 1 through 96, that they are of equal lenght (200 words with fluctuations of +1 or 2%) and that a list is available of the limits of each sample in the text, for purposes of identification. These limits may in some cases be quite narrow and fall within one single chapter, and in others be spread over half the book. For example: sample no. 17 (NE) means that it belongs to the subcategory. The Elohist as a Narrator and comprises ch. 3014-41; sample no. 57 (HP) means that it belongs to the subcategory Human direct speech as reported by the Priestly Writer and since such Priestly direct speech is extremely scarce, this sample extends from ch. 2746 right until the very end of Genesis; both samples are thus constituents of Division II. As tridimensional presentation, though feasible, is confusing on paper, we are going to neglect, for the time being,

		D	OOC I		I	DOC E		I	DOC P		T	otal	
		words	sam	ples	words	sam	ples	words	sam	ples	words	sam	ples
	words	5539			3294			2408			11241		
SDS N		l .	NJ		l	NE		ĺ	NP			N	- 1
	samples			27			16			12			55
	words	2849			3161			360			6370		
SDS H			ΗJ		}	HE		١	HP			Н	
	samples			14			16			2			32
	words	1021			161			611			1793		
SDS D			DJ		1	DE		ŀ	DP			D	
	samples		•	5			1			3			9
	words	9409			6616			3379			19404		
Total			1			Ε		1	P				
	samples			46			33			17			96

Fig. 4

DIV, and display the distribution of samples with regard to DOC and SDS alone. The following matrix obtained.

The columns represent categories of Documents, the rows, categories of Sorts-of-Discourse. Capital letters within the cells mark the nine subcategories. The number of words per cell is also indicated as well as that of pertinent samples (number of words divided by 200).

The first task of the statistician was to find out whether samples of the same subcategory behave linguistically in a consistent manner. The majority, it was soon established, indeed do, with one notable exception, though: NP. This case is far from surprising when we recall that of the 3379 words apportioned by Documentarians to the source P, a full 73% are of the N-category (see of Fig. 4) and that P comprises genres as disparate as ch. 5, a roster of names and numbers, and ch. 23, the account of Abraham's purchase of the burial cave.

To that matrix were now administered a whole range of statistical techniques such as Cluster, Factor, Reliability and other analyses. To explain here their theoretical background would again exceed the limits of an abstract, and without such explanations the results are incomprehensible. We shall consequently concentrate on one only, namely Cluster Analysis, and that because it is the easiest to understand and to display visually.

The basic idea of Cluster Analysis is the following. Recall first that each sample is characterized by the realizations of 54 variables. The analysis is capable to work out which pair of samples is of the highest mutual affinity, which of a slightly lesser and so on, an assignment which, considering the large number of characteristics, is plainly beyond the capacity of human diligence and the human brain. The program produces a triangular chart as shown in Fig. 5.

In Col. 1 on the left-hand margin, the nos. of samples are given, their sequence being repeated on the bottom line so that the result of the comparison between any two samples can be read at the point where the two coordinates meet. The darker this point, the greater is the similarity in language behaviour between the two comparands. Col. 2 indicates the subcategory and Col. 3 the Division which a sample originated in.

The mass of information contained in this chart is so immense that one could write a new kind of commentary on Genesis founded on it. Attention can be drawn to a few features only.

We observe, first of all, a small very dark triangle in the uppermost corner which, when the proximity signs below it are inspected, turns out to have almost nothing in common with the rest of the book. Its constituents are three NP-samples. When their origin in the book is identified, they are found to be no other than the three long genealogies in chs. 5, 6 and 11. That the program was able to reveal their uniqueness is highly gratifying and proves how well the set of formal criteria describes not only the linguistic comport, but also the literary genre of a given text.

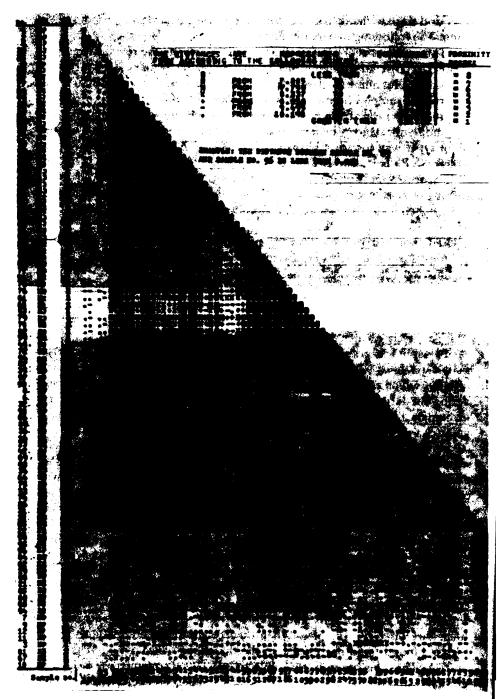
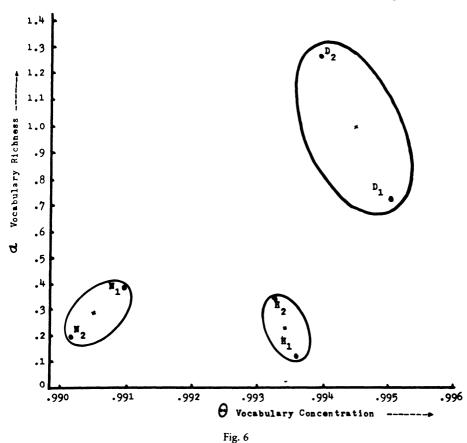


Fig. 5



Then follows a large dark triangle of very high proximity and uniform and uninterrupted density. By tracing its composition as to subcategories in Col. 2 we immediately recognize that it derives exclusively from category N and that, as far as Documents are concerned, J and E alternate at random as if they never existed. Only one lonely NP-sample intrudes the conglomerate of NJ and NE: no. 5. When looked up in the list of Sample Limits, no. 5 is seen to be roughly identical with ch. 14, the one chapter which commentators were at a loss to attribute to any Document and which they designated in consequence to be a foreign body – either very ancient or a very late accretion to Genesis. The analysis demonstrates that it is actually fully consonant with J = E. Incidentally, Col. 3 is also quite enlightening: not one of the 26 samples in the present triangle comes from Division I, the dissimilarity of which from Divisions II and III was already brought to light by Discriminant Analysis.

Finally, one last glimpse into one more aspect of Genesis investigated. The reader may have wondered why the number of variables was given as 56 in one place and 54 in another. The answer is that two criteria were treated separately and did not participate in all the above. They deal with the lexical side of the controversy.

Much has been made of vocabulary by unitarians and Documentarians alike. The recurrence of qedos yisra'el in both halves of Isaiah is said to be a sign of that book's unity while critics saw in Genesis the alternate use of 'amah and šipkah reason enough to ascribe the respective text blocks to different writers. Yet either argument is most tenuous. The first may be a case of quotation and the second depend on circumstances, just as in English the same husband may call a certain woman his wife, his spouse, his better part or else. Any text property lying under the conscious control of a writer must be disqualified in an authorship study. What, on the other hand, is indicative of a writer are two quantitative values of his vocabulary: its richness (VR) and its concentration (VC). The former refers to the percentage of hapax legomena (or perhaps also dislegomena) in his opus, the latter to the percentage of the text size taken up by, say, the first 10 (or perhaps 20 etc.) most frequent words. The obstacles on the way to using either as an author-specifying criterion are many. Why should measuring VR stop at dislegomena and not include trislegomena too? Why schould measuring VC not extend to the first 30 most frequent words? Are not both functions of the text size? And why should the main part of the frequency list, that is the one lying between the most frequent and the most rare words be neglected? Various ways out of this quandary have been suggested, none, though, is satisfactory.

On these grounds, we employed an altogether new theoretical statistical distribution proposed by Sichel which takes into account the frequency list as a whole and makes it independent of text lenght.⁸ Accordingly, frequency lists were drawn up by the computer of lemmata for each of the six corpuses J, E, P, N, H, and D separately, however, after each was arbitrarily divided into two equal halves. In this manner, twelve points obtained on a grid where VC may be read on one and VR on the other axis. What emerged for the SDS-dimension may be viewed in Fig. 6.

The Figure is selfexplanatory: the three areas are very remote from each other. If space permitted it, the grid for the DOC-dimension should also be displayed for comparison. Since this is impossible, we must be believed: there, the areas of J and E are close whereas that of P stands out by its high VR. This feature is rather astonishing for of all the three presumed writers it is exactly the Priestly one who is said to be repetitive!

⁷ This argument for the unity of Isaih is used by A. Kaminka, Meḥqarim ba-Miqra uva-Talmud uva-Sifrut ha-Rabbanit (Tel-Aviv: Devir, 1935).

⁸ For this distribution, see H. S. Sichel, »On a Distribution Law of Word Frequencies«, Journal of the American Statistical Association 70 (1975), 542–7.

GENESIS, BOOK OF

		7 .									
P	1	J E P	2	1-4a	4b-25		; د	3 4	J E P	5	1-28
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E		6			7						
P	30-32	U			,						10.21
							•		13-108	1/8	18-21
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E			8							9	
Р		24		1-2a	38	b5	13a	14-	19	9 11	1-17
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E P J E P J E P	15-23 24-43 18b-20 36 39	28-21 24 31 J E P	3 3 40 43	30 -29 18e 4 7)18-64 5 7 8 P 2b- 1-2a 41	35-20 21	32 32 35 1-8 25=-24 3 45	20–21a 3–5 1–2 4–3 1–3 1–3 1. 9–13 27 28a 46b–57	22 3 3 4 16 286 286 42	3 17-20a 120a 21-20	20b 21-23 -17 18a 22a 22b-29 J 38 27-28
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The ever recurring anomaly of P then calls for some discussion. At first sight, it looks as if this phenomenon would corroborate at least part of the Documentary Hypothesis, but only seemingly so because the argument is circular. If certain parts of Genesis, because of their totally different literary type, are marked as a source per se, then one must not infer from their different language behaviour that they belong to a different source. Comparing then the two literary types is pointless and using the computer to manifest the difference is a waste of time and funds.

Such reasoning explains without much difficulty the aforementioned often met anomaly of P. The subcategory NP being the only heterogeneous one among nine could have been expected: it is spread here and there all over the book, comprises toledot in Divisions I and II and other portions as unlike toledot as genuine narratives, mainly in Division I. (e.g. in the Flood Story). This is why NP resembles NJ especially in Division I. With regard to P's high values of VR, it could have been foreseen too: if a text abounds in proper names, each occurring only one or twice as it happens in the genealogies, and if proper names are considered to be lemmata, then VR must grow inordinately.

To sum up:

- (1) No statistically significant difference was found in any analysis between the Jahwist and the Elohist.
- (2) A wide gap divides P from J+E, but it is accounted for by differences in genre and content and hence not reason enough to regard P as a separate source.
- (3) A pronounced variety of language behaviour occurs in the SDS-dimension: the narrator's if clearly distinguished from that of his personages. If a partition of Genesis is indeed a sine qua non, then one would have to assume that the storyteller wrote his part and passed the pen to a colleague whenever direct speech began only to have it returned to him when the latter terminated which is clearly unthinkable.
- (4) Significant variation in language behaviour also came to light between the Primeval and the Patriarchal Stories, and to a lesser degree between the latter and the Joseph Cycle. We wish to suggest that it is necessitated by two (or three) different literary techniques employed in Divisions, respectively.
- (5) There exist strong interaction between SDS and DIV and between these two and DOC (if there were any Documents).

The objectivity of the method and the accuracy of the data are inassailable. The critical school cannot approve of the method if it reinforces that school's view and repudiate it when it does not.

The above notwithstanding, a few qualifying remarks are appropriate. It is so far in Genesis only that the Documentary Hypothesis is so shaken – what will emerge in Exodus remains to be seen. The contradic-

tions and repetitions in Genesis still stand, for we considered it beyond our terms of reference to interpret them or to propose a hypothesis other than the Documentary on how the book was composed. Statistics, it has been said, is the science of making wise decisions in face of uncertainties: even complete similarity in language behaviour makes the assumption of single authorship only highly probable, but not certain. Nothing in our calculations has any bearing on the question of Mosaic authorship. However, heterogeneity of Genesis excludes it, homogeneity does not.

Despite these reservations, we are firm in our belief that the Documentary Hypothesis in Genesis should either be rejected or at least thoroughly revised. Several of the book's problems may have been solved, many remain, and a new one has been posed by the findings submitted here in short: how hitherto convinced Documentarians will come to terms with them.

Die mittels der statistischen Linguistik und mit Hilfe der elektronischen Datenverarbeitung durchgeführte Untersuchung der Gültigkeit der Quellenscheidungstheorie in Genesis erwies, daß es außerordentlich unwahrscheinlich ist, den Jahwisten vom Elohisten zu trennen, und daß die Quelle P zwar von diesen beiden absticht, was aber wohl auf den Inhalt der dieser Quelle zugeschriebenen Textteile zurückgeführt werden muß. Obendrein stellte es sich heraus, daß der zweifellos bestehende Wechsel im Sprachverhalten viel eher und weit eindeutiger auf dem Unterschied zwischen den Worten des Erzählers und der direkten Rede beruht, wobei dann auch noch die in den einzelnen Teilen des Buches sich allmählich ändernde Erzählungstechnik mitspielt.

Converging Lines of Evidence Bearing on the Date of P

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General acceptance of the ordering of the Pentateuchal documents, J-E-D-P, among liberal biblical scholars is due primarily to the brilliant advocacy of J. Wellhausen in Geschichte Israels, 1878, and Prolegomena zur Geschichte Israels, 1882 (E.T. Prolegomena to the History of Ancient Israel, 1885). From the outset of his work, Wellhausen presupposed the conclusions of his predecessors that the basic composition was a Hexateuch comprised of four major sources, the Jahwist, the Elohist, the Priestly source, and Deuteronomy. Furthermore, he accepted the dating of Deuteronomy to the age of its discovery in the time of Josiah,² and of J

¹ Cf. the Introductions of S. R. Driver, O. Eissfeldt, G. Fohrer, O. Kaiser, A. Weiser.

² Prolegomena to the History of Ancient Israel, 1885; reprinted New York, 1957, 6-10.