A PROGRAMMATIC NOTE:
ON TWO TYPES OF INTERTEXTUALITY

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ABSTRACT. — The note addresses briefly some reactions to a previous article "*Deuteronomic Texts: Late Antiquity and the History of Mathematics*". In particular it looks at the question: if indeed any text must depend on previous texts, what makes the dependency of commentary and commentary-like text so special to justify my emphasis on this form of writing ? A suggestion is developed, trying to define Deuteronomic texts through their precise semiotics of intertextuality: in general, it is argued, intertextuality may be paradigmatic (= allusion) or syntagmatic (= commentary). The consequences of syntagmatic intertextuality can then be seen to hold for Late Antiquity and the Middle Ages. The note further opens up the question concerning the historical process underlying the transition between modes of intertextuality.

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Résumé (Une note programmatique: sur deux types d'intertextualité)

On répond ici brièvement à quelques réactions suscitées par un précédent article intitulé « Deuteronomic Texts : Late Antiquity and the History of Mathematics ». On y traite en particulier la question suivante : si tout texte doit effectivement dépendre de textes antérieurs, qu'est-ce qui particularise la dépendance de commentaires, et de textes ayant caractère de commentaires, au point de justifier que je mette en avant cette forme d'écriture ? Une suggestion est faite – tentative de caractériser les textes deutéronomiques par la définition sémiotique précise de leur intertextualité : de manière générale, l'intertextualité peut être paradigmatique (= allusion) ou syntagmatique (= commentaire). Il se trouve que les conséquences qui découlent de l'intertextualité syntagmatique sont valables pour les mathématiques de l'Antiquité tardive et du Moyen Âge. La note creuse un peu plus la question du processus historique sous-jacent à la transition entre types d'intertextualité.

I am grateful that several of my colleagues reacted to my article from *Notes & Débats* 1998 "Deuteronomic Texts: Late Antiquity and the History of Mathematics". These include Jens Hoyrup [2000], Karine Chemla [1999] in this forum and Alain Bernard [2003] more recently, in a long article published once again in this forum. (I apologize if I may have missed any further reactions to my article).

I will not discuss here the many particular useful comments made by all of the authors above. Also, I will only mention in passing two very general methodological comments made by many of my readers. One has to do with "lumping together" as against "splitting apart" (readers point out that my article lumps together Late Antiquity and the Middle Ages, crossing traditional language barriers between Latin, Greek and Arabic. Of course, there are important differences between and within all those cultures, but my aim is to find the threads holding all of them together). Another has to do with the historiographical question of the role of value-judgment in the history of mathematics (I think everyone agrees that such value judgments should be used as heuristic terms only. That is: we first make explicit our subjective intuition that a certain piece of mathematics is "good" or "bad" as the case may be. Following that, we analyze the intuition and uncover the concrete, objective features triggering our subjective reaction. We end up transforming subjective intuitions into objective observations. Bernard, in particular, has discussed at length this methodological issue. If I understand him correctly, he ended up recognizing my heuristic approach and approving of it).

My purpose in this reply is to concentrate on the major observation made by all readers, having to do with the opacity of my term "deuteronomic". The issue is not terminological, but substantial: just what is it about those texts I call "deuteronomic" that makes them stand apart from other texts? Here is yet another subjective intuition that cries out to be made objective and explicit. I admit I did not articulate this question at all in my original article. Thanks to the comments made by my readers, I was forced to address this question heads-on, and I now offer an account of the nature of deuteronomic texts. The implications of such a discussion are wide, indeed going beyond the history of mathematics itself. In this programmatic note I bring up issues having to do with textuality as such. But there is no harm if the scholars of the wider culture of writing should now have to turn to journals in the history of mathematics: they should have done so long ago.

The issue raised here is of deep significance, calling for treatment at the level of a monograph – which is precisely what I hope to do in the future. But at this point I wish simply to state my thesis, boldly and programmatically, waiting for what I hope to be a response as vigorous and challenging as that raised by my original paper.

The fundamental point – as recognized also by Bernard [2003, p. 158] – was made by Chemla [1999, p. 127], questioning my very notion of "deuteronomic" texts understood merely as "secondary" or "dependent upon previous texts" (my unpacking of the concept in my original article). I translate Chemla's question into English:

"Have there been mathematical writings that were in no sense 'secondary'"?

The answer is clearly negative. Indeed the adjective "mathematical" is irrelevant: all texts, everywhere and always, are, among other things, secondary. Texts depend on previous performances and previous texts. The web of intertextuality is the existential condition of writing itself.

Hoyrup [2000], recognizing the same problem, suggests that we identify levels of dependence (texts that are first-step deuteronomic, and those that are even more derivative), while Bernard himself ends up suggesting that we characterize Late Antiquity as being "more bookish". Such suggestions affirm the validity of the intuition underlying my original article – there does appear to be something remarkable about the writings of

Late Antiquity and the Middle Ages, having to do with their heavy inter-textual dependence – but ultimately there ought to be something deeply unsatisfying about any purely quantitative account of this phenomenon. Hoyrup's and Bernard's suggestions, offering gradations of intertextual dependence, still do not address the problem in its full magnitude. For if indeed we recognize the web of intertextuality for its full significance, it is no longer possible to think of the texts of Late Antiquity as simply "more intertextual" than those of previous epochs. Surely, Eustathius' commentary to Homer is totally dependent upon its source text for commentary; but the same is true for the way in which Homer himself – the founda-tional text of antiquity! – was dependent upon previous performances of the Trojan myth. Imagine a world where all such experience of previous performances is removed, a world where no one knows the myth – and the authorial significance of Homer is completely lost. Eustathius, and Homer, are both dependent upon their intertext in order to survive as texts: such indeed is the condition of texts in the first place.

And yet the intuition remains intact: there is something deeply differ-ent about Eustathius, on the one hand, and Homer, on the other hand. Their manner of dependence upon their intertext is different. And this immediately suggests to us a way forward: the distinction between the types of intertextuality is qualitative, not quantitative. What we should look for is a manner of dependence upon previous texts that is different in the case of Eustathius than in the case of Homer. "Deuteronomic" texts are texts whose dependence upon previous texts has a certain character, distinct from that of the intertextual dependence of texts in general.

Let us first be clear about the alternative to deuteronomy. When we say that all texts are intertextual, what we mean – reverting now to the jar-gon of an older generation of literary critics – is that all texts are allusive. Among other things, all texts bring up in the readers' mind reference to previous works treating of similar material or using similar represen-tations. This is relevant not only for literary but also for scientific texts: while not necessarily "allusive" in the strict literary sense, scientific texts often refer to previous texts and, even when silent about this reference, they may call up in the reader's mind a previous text. A contemporary reader of Euclid would definitely be reminded of previous treatments of the *Elements*; a reader of Archimedes was certainly reminded often (even

explicitly) of Eudoxus. Regardless of the question of intended reception, an author such as Euclid or Archimedes clearly uses a previous source, and uses it in the way in which an allusive text does: the author picks up the contents of the previous work, and offers some kind of variation on it (we shall return to characterize this more precisely below). This return-with-variation is what my readers have in mind especially when pointing out that dependence on previous texts is ubiquitous in science, and my task therefore is to characterize the way in which what I call "deuteronomic texts" differ from this ubiquitous phenomenon.

To make this claim, let us also remind ourselves of the fundamental model of deuteronomy: this is the commentary. Authors in Late Antiquity and the Middle Ages, even if not writing commentaries, operate within an intellectual climate where commentary-writing is the dominant model. My main claim is that the nature of commentary has important consequences for the contents of science produced in such a culture. To make this claim follow from the textual nature of commentaries, then, I need to characterize the nature of intertextuality involved in the writing of commentary.

Our task now becomes much clearer. We seek a qualitative distinction in the manner of intertextuality, between allusion (widely understood), on the one hand, and commentary, on the other hand.

In fact the distinction is not difficult to make. Allusion is fundamentally a relationship of similarity: what makes a text allusive to another, or (in the case of science) repeating-with-a-variation, is the fact that it treats a similar material, typically using a slightly different approach (indeed the similarities between scientific texts can be much stronger than those between literary texts). As for commentary, there the relationship is somewhat less obvious (a fact to which I shall return). A lemma taken from the work commented upon, and the comment following the lemma, do not stand to each other in the relationship of original and variation. The comment is not a variation upon the original, but is instead some kind of completion of it. Most often, in the texts we are interested in, the original is a statement, while the comment is a brief argument showing the validity of the statement, so that original and commentary stand to each other in a specific relationship of completion, namely: argument

(in commentary) and conclusion (in original). The relationship of "completion" is not as easy to perceive and characterize as that of "similarity", but it is better understood as soon as we perceive in it the wider phenomenon of "contiguity". That is, the essential feature of the relationship of A and B, when B "completes" A, is that in some organic whole consisting of A and B the two are contiguous. The most obvious case of semiotic contiguity in general is the relationship between sequential elements in a sentence, where e.g. the relationship of "I" and "Love You" is that of contiguity (and not, of course, similarity). But this contiguity is in fact no less obvious in the case of commentary, where the lemma from the original and the comment upon it are literally contiguous in the written space, and both form together the organic whole of claim followed by its proof. And indeed, the same is true for commentary as a whole, which is characterized (especially in the codex culture of Late Antiquity and the Middle Ages) by physical contiguity with its source. (In any case, note that even when the commentary is physically separate from the source work, it is intended to be read side-by-side with it).

Now that we notice that allusion is essentially a relationship of similarity, while commentary is essentially a relationship of contiguity, we have hit upon a key that opens a vast treasure. For – of course, not by accident – we have hit upon the most fertile observation made in semiotics: Jakobson's analytic distinction between the paradigmatic and the syntagmatic.[1]

Let us remind ourselves therefore of Jakobson's helpful terminology. His starting point is in the bipolar structure of language: selection and combination, similarity and contiguity, the paradigmatic and the syntagmatic. For the notions of "selection" and "combination" note that, in a text, the speaker (a) selects, for each slot in the text, a unit of speech out of a large pool of available candidates, and also (b) combines the selected units in a certain order. "I" is chosen from among "I", "You" or "He", "Love" is chosen from among "Love", "Hate" or "Dislike". All are then arranged sequentially in e.g. "I love you".

Thus two kinds of structure are at work: *similarity* (of the various candidates for a single slot) and *contiguity* (of units which happen to lie next to each other). The "similarity" kind of structure is known as "*paradigmatic*",

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[1] See especially [Jakobson 1987, chap. 8], originally published in 1956.

the "contiguity" as "*syntagmatic*". Now, in even more general terms, we may say this. One possible textual device is to represent an object through its possible equivalents or near-equivalents, in other words through that to which it stands in the relation of similarity – and this is what Jakobson calls "*metaphor*". Another device would be to represent one object through that to which it stands in the relation of contiguity; this naturally would be Jakobsonian metonym.

One is reminded of Jakobson's deep insight: that literary theory tends to concentrate upon metaphor (as this device is mediated by the referents of symbols, the subject matter that most easily attracts reflection), while metonym is relatively ignored (as this device is mediated by the symbols themselves, independently of their referents). The same is clearly repeated as regards the study of intertextuality. Literary theory is focused upon the referent-relation, where a certain work is similar, in terms of its referents, to another (both Homer and Virgil treat of arms and the man). This is precisely what allusion is: it is the relationship between two works where one is somehow metaphorically related to another. Intent upon the study of allusion, literary theory has nearly ignored the existence of another major form of intertextuality, the one where works are related to each other not through their similar referents but simply by their standing to each other in a relationship of contiguity and completion, that is metonymically: the way in which Eustathius stands to Homer. We may then sum up: the manner of intertextuality in allusion is metaphorical or paradigmatic; the manner of intertextuality in commentary, or in deuteronomic texts in general, is metonymic or syntagmatic. In other words I now define "deuteronomic texts" as texts whose form of intertextuality is syntagmatic. To state this without jargon: deuteronomic texts arise in a culture where the expectation is that texts are read in close, physical proximity to the texts to which they refer (and do not merely "allude" to them). We may also restate the thesis of my original article as follows: the period of Late Antiquity and the Middle Ages in the greater Mediterranean world is characterized by the dominance of *syntagmatic* intertextuality (whereas both antiquity itself as well as modernity are characterized by the dominance of *paradigmatic* intertextuality).

Having stated this bold thesis, I shall now very briefly elaborate upon it.

There is one striking way in which we may see the syntagmatic dependence of a commentary upon its source. This is as follows. Typically, the syntagmatic properties of a work are largely autonomous. That is: the order in which the various parts of the work are presented is defined by some kind of inner logic, and there is a tight connection between such parts that are contiguous. Joyce may well choose to have his Ulysses refer, through various relations of similarity, to the Odyssey: but the order of the chapters follows the inner logic of the work, proceeding thematically through day into night and stylistically through parody into farce. In a nutshell: a work whose dominant mode of intertextuality is paradigmatic should have its syntagmatic properties autonomous. We predict, however, that a work whose dominant mode of intertextuality is syntagmatic will have its syntagmatic connections directed outside itself, to the previous work. No longer autonomous, we also predict its internal syntagmatic properties to be weak. Now the theoretical jargon of the last few sentences was thick (as I wish to stress the logical necessity of the derivation), but the point is clear and obvious: open up Eutocius' commentary to Archimedes, and there is no importance to the sequence of the passages. That two paragraphs are contiguous makes no difference; you may in fact read the commentary in whichever order you wish. On the other hand, each of Eutocius' paragraphs essentially depends upon its contiguity to its source passage in Archimedes. Indeed this property – of weak internal syntagmatic arrangement – can be seen not only in commentaries but in other works I identify as deuteronomic, such as the epitome for instance (where the selection of excerpts necessarily weakens the extent to which the contiguity mattered in the original work).

What we perceive is a fundamental distinction: in a culture of paradigmatic intertextuality, order and contiguity matter at the level of a single work (the order and internal contiguity of, say, scenes in a platonic dialogue). In a culture of syntagmatic intertextuality, on the other hand, order and contiguity become significant at the level joining several works together (such as, for instance, the corpus of the Platonic dialogues as a whole). And indeed, we can observe a fascinating development through Late Antiquity and the Middle Ages: the very understanding of the role of order is changed. It is perceived as a property constitutive not so much to individual works, but rather to entire corpora. Readers of Plato do

come to care deeply about questions such as "the right order" in which he should be read (as pointed out by J. Mansfeld [1994; 1998]), this question of "the right order" is central to the genre of isagogic works – works introducing a reader to a canonic author). The entire phenomenon of canon formation is closely tied to this growing interest in "the right order". The cultures of scriptural authority define the correct order of certain texts which, in turn, come to possess a certain primacy among other texts – a phenomenon which may be seen not only in scriptural religion but also, for instance, in late Platonism or in the Medieval canonization of Aristotle and Galen. The rise of Euclid as the central mathematical authority is related to the same interest in arranging books together. The readers of the Middle Ages could find here a natural canon: 13 books (or 15, as they sometimes saw it, with the addition of Hypsicles and Isidore), quite clearly arranged in "the right order". Archimedes' works, on the other hand, do not form any large-scale progression. And for the reasons seen above: the tight, clever arrangement internal to each of Archimedes' treatises was less important to the culture of syntagmatic intertextuality of Late Antiquity.

At this point we may revisit the observations made in my original paper, on deuteronomic texts. There, having surveyed the various properties that make deuteronomic texts appear "pedantic" or "scholastic", I subsumed them under three main vectors. The first was an interest in (i) "completeness" (aiming at giving complete arguments that survey all possible cases), the second was an interest in (ii) "standardization" (making all arguments fit a given format), and the third - an interest in (iii) meta-mathematical considerations. All those vectors can now be predicted from the syntagmatic nature of the intertextuality of deuteronomic texts. (i) The interest in completeness is a direct consequence, as we have just seen, of the emphasis on the syntagmatic: this culture is concerned with arranging works in a single given order, hence with making sure everything is indeed surveyed and is surveyed at its right place. (ii) The interest in standardization is best understood when a culture of paradigmatic intertextuality is compared with a culture of syntagmatic intertextuality. In a culture of paradigmatic intertextuality, the governing relationship between texts is that of similarity- with-a-difference. A certain taste emerges for the clever allusion, one that keeps something of

the original while introducing a variation. In other words, subtle differences are noticed and valued. This disappears in a culture of syntagmatic intertextuality: the governing relationship between works is much more obvious, and instead of subtle variation one is interested in seamless sequence, with the consequence of an interest in standardization. (iii) Finally, the interest in meta-mathematical considerations (or more general – in meta-textual considerations) is an immediate consequence of Jakobson's observation, already quoted above, concerning the difference between the paradigmatic and the syntagmatic: the paradigmatic involves the referents of symbols, the syntagmatic involves the symbols themselves as symbols. In a culture of syntagmatic intertextuality, the governing relationship between texts involves not their contents, but their formal relationship of being put side by side. The deuteronomic author goes back to the original works and arranges them as works, looking from the outside at the global properties of the works (e.g. is the work introductory in character? Is it logically complete?). He is thereby interested in meta-textual considerations.

In my original paper, I argued that the properties that strike us as "pedantic" or "scholastic" in Late Ancient and Medieval texts can be derived from the second-order, or deuteronomic nature of writings in those cultures. I now refine the meaning of the term "deuteronomic", pointing out that it involves being second-order, or intertextual in a specific manner – namely, a syntagmatic and not a paradigmatic manner – and argue further that the properties discussed in my original paper can be derived from this manner of intertextuality. Thus my original argument is restated on the basis of a more precise definition of "Deuteronomy".

Before concluding, I mention briefly a striking property of deuteronomic writings, visible in mathematics and in mathematics alone – as this will help us discuss the historical setting for the transition into the culture of deuteronomic writings.

That commentary depends syntagmatically – in terms of straightforward contiguity – upon its source work is perhaps seen best in the case of mathematics. For so often do commentaries offer comments that presuppose the original diagram! In other words, the assumption is that the reader has the source text open alongside the comment made in the commentary: contiguity in the most literal sense. This would be obvious

in the (common) case where commentary is presented in the form of marginalia to the source text, but even when the commentary is written separately we can be sure, in the case of mathematics, that the reader was physically leafing back and forth between text and commentary. In mathematics, the contiguity of text and commentary is a cognitive necessity.

The last observation reminds us finally of the physical nature of writing. We move from semiotics itself, to its material setting. And at this point it is natural to try and offer some explanations for why intertextuality in Late Antiquity and the Middle Ages turns – as I claim it does – from the paradigmatic to the syntagmatic.

An important consideration was mentioned already. I made use several times of Jakobson's observation (made in the context of metonym and metaphor) for why the paradigmatic is more obvious than the syntagmatic: the paradigmatic is a relationship between referents (namely similarity), while the syntagmatic is a relationship between symbols themselves (namely contiguity). In other words, to the extent that the sign itself is foregrounded (and not just its referent), to that extent we should expect cultures to pay attention to the relationships of contiguity. Once again, I make a point in its full abstraction, to reveal its logical power; but the point, stripped of jargon, is quite obvious. The cultures of the codex pay much more attention to the physical arrangement of texts – since these cultures pay much attention, to begin with, to the text as physical object. The codex is much more valuable and labor-intensive than the roll, hence one takes more time thinking about the order of works within it and about their mutual arrangement. One comes to think hard of texts as signs (and not just as referents) and as a correlate to this, one comes to think hard about contiguity. Marginalia become important (hence a new role for the commentary), and the order of works becomes established (hence the rise of the canon). A new physical support for writing gives rise to a new emphasis in intertextuality: physical intertextuality, namely contiguity, comes to the fore. And correlated with this: in the world of the papyrus roll, with its very minimal articulation of the physical text (very few or no illustrations, little punctuation, scriptura continua), the physical properties of the written texts – such as their order and arrangement – hardly matter. Even if not necessarily read aloud, works are understood

primarily independently of their physical setting, that is in terms of their contents, and so the primary way in which one work relates to another is via the similarity of their contents, i.e. through allusion. Antiquity itself is therefore a period of paradigmatic intertextuality. Only later, with the invention of the codex, is the period of syntagmatic intertextuality ushered in.

Did I offer right now an explanation for the transition from paradigmatic to syntagmatic intertextuality? Perhaps, but I am not quite sure. It is tempting to look for explanations at the material level, but are we justified in drawing the causal nexus in this direction and not the other? There is certainly a logical interdependence: a culture where the physicality of texts is put to the fore is also a culture where syntagmatic intertextuality becomes more emphasized. But the causal nexus may be drawn the other way – or not drawn at all. Once again, stripped of theory, the issue is quite simple: did Late Antiquity introduce the codex for some accidental, material reason, and only then found new uses for the new support for writing? Or did it introduce the codex precisely because it wanted to arrange works in a fixed way?

Now, a central hypothesis concerning the rise of the codex links its use to the need of the early church to fix the identity and order of the authentic gospels[2] – very much the textbook case for the syntagmatic arrangement of a canon. This may suggest then that the rise of the codex, and the overall rise in the interest in the physicality of writing, is not the cause of the new textual practices of Late Antiquity, but is rather their outcome. A sea change has occurred at a deep cultural level; the relationship between texts came to be seen as based more on contiguity than on similarity; the physicality of texts came to the fore; the codex, a format more fitting for displaying the physical connections between and within works, was now favored. This is a possible causal story, as persuasive as any. And indeed, if cultures are – as I would suggest – primarily ways of putting texts together, then the manners of intertextuality may well serve as the causal foundation for all else. Best of all, instead of causality let us think of correlations: a culture where the physicality of texts is more marked

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[2] See [Skeat 1994] and references there to earlier work by the same author and his colleagues. The thesis is controversial: see e.g. in [Blanchard 1989].

would tend more towards syntagmatic intertextuality, a culture where the physicality of texts is less marked would tend more towards paradigmatic intertextuality:

Physicality of Texts Marked $\longleftrightarrow$ Syntagmatic Intertextuality

Physicality of Texts Unmarked $\longleftrightarrow$ Paradigmatic Intertextuality

I offer my thesis, then, as a fundamental principle explaining the nature of the transition from Antiquity into Late Antiquity and the Middle Ages: the heart of this transition, I suggest, was a change in the predominant mode of intertextuality, from the paradigmatic to the syntagmatic. I now offer this bold thesis, programmatically stated, for debate.

BIBLIOGRAPHY

BERNARD (Alain)
  [2003]   Comment définir la nature des textes mathématiques de l'Antiquité grecque tardive. Propositions de réforme de la notion de 'textes deutéronomiques', *Revue d'histoire des mathématiques*, 9 (2003), pp. 131–173.
BLANCHARD (Alain), ed.
  [1989]   *Les débuts du codex*, Turnhout: Brepols, 1989.
CHEMLA (Karine)
  [1999]   Commentaires, éditions et autres textes seconds: quel enjeu pour l'histoire des mathématiques? Réflexions inspirées par la note de Reviel Netz, *Revue d'histoire des mathématiques*, 5 (1999), pp. 127–148.
HOYRUP (Jens)
  [2000]   Review of [Netz 1998], *Mathematical Reviews*, (2000); 2000g:01012.
JAKOBSON (Roman)
  [1987]   *Language in Literature*, Cambridge MA: Harvard University Press, 1987.
MANSFELD (Jaap)
  [1994]   *Prolegomena: Questions to be Settled Before the Study of an Author, or a Text*, Leiden: Brill, 1994.
  [1998]   *Prolegomena Mathematica: from Apollonius of Perga to the Late Neoplatonists, With an Appendix on Pappus and the History of Platonism*, Leiden: Brill, 1998.
NETZ (Reviel)
  [1998]   Deuteronomic Texts: Late Antiquity and the History of Mathematics, *Revue d'histoire des mathématiques*, 4 (1998), pp. 261–288.
SKEAT (Theodore Cressy)
  [1994]   The Origin of the Christian Codex, *Zeitschrift für Papyrologie und Epigraphik*, 102 (1994), pp. 263–268.