

Communication within the Scientific process by Croatian journals

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Foreword

We shall look into the scientific communication mechanism in 19th century Croatia. The “weaving” of the scientific cognitive net(work) began thanks to a partial, but later a usual custom of introducing into publications the references to the forerunners’ texts¹. Scientific journals are of importance in providing for the worldwide inter-connectivity within the scientific process. The rapid development of the latter is in fact ascribed to the emergence of scientific journals, in the 17th century, as a new communication medium, retained to the present times in spite of the changes in the transport technique, from paper and press, to the digital ones.

When has this communication mechanism through scientific journals come into being in our local settings? For an answer we must /1./ determine the historical period in which the appearance of scientific infrastructures can most likely be expected to have emerged in Croatia, and /2./ find out a proper indicator for it.

Ad /1./

There is a paradox if one traces through Croatian journals the turbulent years of the mid-nineteenth’s century. The revolutionary 1848 did not produce any significant echo in Croatian journals, but during the “Bach’s absolutism” there emerged several journals important for the Croatian culture^{2,3}. I. Kukuljević-Sakcinski published our first humanistic scientific journal *Arkiv za pověstnicu jugoslavensku* (1851-75 in 12 books); *Pravdonoša* (1851-52) appeared in Zadar, as the first law journal by South Slaves, to be continued by *Pravnik* (1853-54) in Zagreb, a journal for law and government science.

Although its title does not suggest *Književnik* (=Literary Writer 1864-68) turns out to be interesting for the development of scientific communication in Croatia.

Year 1867 sees publication of *Rad JAZU*, the works of the thence Yugoslav Academy of Sciences and Arts (since 1991 Croatian...), one edition till 1881, to be split afterwards into two series followed later by more splitting into ever narrower subjects. In its first ten years it was the only scientific journal apart from the *Arkiv*.

It thus appears that one could expect the appearance of scientific communication flow to-and-from the Croatian journals with respect to other countries in the second half (and especially during the last quarter) of the nineteenth century. Initially, though, mainly within the humanities.

Ad 2.

In pursuing a proper indicator about ties with the world at large within the scientific process we rely especially on a recent book⁴. It provides for both a detailed description and explanation how in Europe the scientific article hatched out in an evolutionary way into its present-day form. On p. 15 it says: “... we look at the rapid change in communicative practices that characterize the first decade after the founding of the *Vienna Academy of Science* in the mid-19th century. In this case, we are able to identify, tentatively, though we think plausibly, an actual selection pressure at work in a specific situation.... we offer an evolutionary explanation for the changes we have described. To give substance to our theoretical formulations, we use as our example the communicative practices of the *Vienna Academy of Science* during the first decade after its founding in the mid-19 century. In this case, we see the rapid evolution of communicative practices in the direction of conformity with European, especially with German norms, themselves the product of a more lengthy cultural evolution, a process that maintains communicative efficiency and argumentative efficacy in the face of the increasing volume of information and increasing cognitive complexity.” Hence, the authors of this book concern themselves also with the development of scientific communication in the 19th century and in the Croatian part of the world, too, so that the book is particularly useful here.

According to its “INDEX” “citation” is a very frequent word in the book, whereas reference(s)” is absent. Both terms have been interchangeably used in the pertinent literature as if there is no distinction between their meanings. Paul Wouters⁵ has thoroughly defined the different meanings of the two terms. As we are focused here upon a single historical fact, that of the emergence of the habit *to refer* to the work of the predecessors, we shall be using only the term “*reference*”.

Our understanding of the reference is when in a given publication the previous relevant publications (articles) are indicated {*one-to-several*}. The “citation” is reserved for cases when several papers refer to the same predecessor {*several-to-one*}. There are no citations without references, while it is frequent for references to have no citations. Each reference is a one-person (the paper’s authorship) standpoint towards the world scientific literature. On the other hand citations are a reflection of an unsolicited opinion poll from the scientific community worldwide.

*Gross et al.*⁴ say (on p. 43) about the very beginning of referring to earlier work in scientific publications: “...Seventeenth-century citations are apparently mere reminders to a small audience of initiates of familiar and mutually possessed books and articles. They are few in number and relatively few articles have them: there are 36% English articles with citations, 34% French. Placement is not uniform. Some citations appear beside, some within running text. Information included is not uniform. Page number, author, or article title can be omitted and often are. Format also is not uniform...”

It will be shown here that also in Croatian journals, but about two centuries later, the references are not standardized, while at the same time in Austria making use of references to earlier literature quickly becomes uniformed following the German example (⁴ p. 91).

The references ("citations") are one among a dozen regular indicators through several numerical tables in the study⁴ of the articles rhetoric in natural sciences journals.

Independently of the present-day (21st century) "status" of the references, they are indeed a satisfactory sign that the journals are scientific. Besides, the sign can easily be noted without resort to a thorough rhetorical analysis.

Nineteenth Century Croatian Journals

Croatian journals are meant here to be those which were published in Croatian (language), irrespective of their political and geographical location: *Gospodarski list*, *Pravnik*, *Pravdoneša*, *Napredak*, *Književnik*, *Kolo*, *Arkiv za pověstnicu jugoslavensku*, *Rad Jugoslavenske akademije znanosti i umjetnosti*, *Zora Dalmatinska*, *Šumarski list*, *Liečnički viestnik*, *Glasnik hrvatskoga naravoslovnoga društva*.

At the outset of their publications (middle of 19th century) Croatian journals had sporadic footnotes clarifying points in the texts. Mostly books are referred to like for instance in: *Gospodarski list* (thence *List mēsečni horvatsko-slavonskoga Gospodarskoga Društva*) –1(1842), p. 168. : *Anl.^b zur Kenntn. der engl. Landwirtschaft 1 sv. st.85*. This is almost a complete reference: the author (Thär) is given within the (anonymous) article ("Zemlja" = earth, soil), but not the title/author of the reference itself although the foreign source could be traced^b. This appears to be the first link (in 1842) to foreign sources within the scientific communication from Croatia albeit half a century after the source publication. (However, that is outside the natural sciences proper, which are the sole concern of the book by Gross et al.⁴).

Pravnik – This title bears an additional explanation: "a journal for law and government sciences" so that one would expect the practice of referring to former scientific sources, which is in fact, partially, and very rarely found, like for instance in # 16 on page 134: - *No.64. Mittermayer 107, Protobevera*,

^b We are grateful to Prof. Dr. Marina Čizmić Horvat for tracing the source (and its correct spelling): Albrecht Daniel Thaer: *Einleitung zur Kenntniss der englischen Landwirthschaft und ihrer neueren practischen und theoretischen Fortschritte in Rücksicht auf Vervollkommnung deutscher Landwirthschaft für denkende Landwirthe und Cameralisten* (Bd. 1-3, Hannover, 1798-1804). [the first word/abbrev. in the original reference is wrong probably because of a similar pronunciation.}

Materialien V. sv. str. 236. itd., and Tausch Rechtsfälle str. 605. itd., G. presuda glavnoga d`erz. sudišta u Beču od 11. kolovoza, 4. rujna i 24. studenoga 1851. Gl. §. 178. kaz. postupnika od 17. sječnja 1850., i §. 155. građ.par. post. , Gl. Gerichtszeitung br. 53. i 70. Jahrgang 1853. and Jahrgang 1852. No. 125. on page 485., followed by Hye's Comentar des öst. Strafgesetzes 7th in the note on page 599.

There is a regular section in *Pravdonoš*a (from #31/1851.10.25 - #39/1851.12.20) which is kind of a "technical paper". Apart from explanatory notes there are references to earlier sources. Such a direct reference (in 1851 – nine years after the one in *Gospodarski list*!) is in a serialized paper from #32 to #29. This however is a link to a back issue of the same, domestic journal (not to any foreign one).

Let us remind ourselves that *Citation Index* appeared by mid-20st century when his inventor *Eugene Garfield*¹ realized that there is an important potential in the law literature (because of traditionally referring to earlier court cases) for scientific communication in general.

We conclude that the Croatian law journals from mid-19-th century bear the same characteristics which are so important for the development of the scientific process.

Napredak (1859-) - The footnotes in the first year are due to the editor (not the author) mainly by way of clarifying details, without quoting earlier studies. In 1860. (p. 152.) the author does refer to two studies substantiating the new results, and in 1862 there is a reference to a foreign source: "see Volksschule Nr. 10. 1861."

The documentary attitude is exemplified by the following:

(1862. Vol. III. No. 18. p. 278./footnote): „Taken from the book: *The parliamentary records of the Kingdoms of Dalmatia, Croatia, and Slavonia year 1861*. Edited and published by...”;

(1863. vol. IV. No. 22. pp. 337-346): there are very restricted references bearing only the authors' surnames – obviously it goes for well known education textbooks;

(1865. vol. VI. Broj 22. str. 337-340): the references are ordered consecutively throughout the articles and not by page.

Until the foundation of JAZU scientists used to gather around the journal *Književnik*. It was published 1864-68, and here it is of interest also because it used to be a journal of an holistic approach: „for language, history Croatian and Serbian and natural sciences” (emphasis by S.M. and B.S.). The first Editor-in-chief of the Croatian Encyclopaedia, Mate Ujević writes⁶ about *Književnik*: „It was the intention of the initiators and the editor of *K.* that the journal had to instigate scientific research in Croatia, thus preparing the foundation of the Yugoslavian^d Academy of Sciences and Arts. In spite of the fact that *K.*

^d This form (-vian) rather than (-ve) of the adjective is meant to distinguish two meanings: the first reflecting an overall political strive of the South Slaves from the 19th century, and the other from the 20st century depicting the historico-political entity (Yugoslavia).

was preceded by the *Arkiv* which had been publishing serious scientific contributions *K.* is in fact our first scientific journal of a general type without yielding at all to dilettantism ... The contributions are mostly dealing with the humanistic scientific disciplines, foremost the linguistics and national history, but there are also the first works from natural sciences...”

Književnik, thus, appears to be a reliable source about the scientific character of its contributions, and especially those from the natural sciences. Here are kind of references which appeared in it. In a paper of the first year (1864.), pp. 264-274 („dr. Fr.(anjo) J.(akov) Tkalac: Hrvatsko-slavonske voderudnice.“) the style of the references is even astonishingly alike the current one (21st century). In the article by J. Torbar (pp. 389-395) there is an example of a split reference: the author's name (=scientist Scipion Gras...) is given in the text, and the corresponding quotation is marked by an asterisk which at the end of the page leads to the source: „*Compte rendus de l'Academie des Science, t. LIV.*“ “This is already (1864) an example of a pointer to foreign literature, i.e. outside the thence Austro-Hungarian monarchy.”

In the second year (1865) in a serialized paper (pp. 114-121, 274-281, 422-437 and 480-505) “The progress in natural science up to now” there are a few references per page, numbered consecutively. Many of them point to books in German, but there are a few full references to German journals. Likewise there is a very detailed connectivity with the German literature in a paper (pp. 281-290) by „a G.P. in Zagreb“.

In papers of natural sciences proper there are references to contemporary foreign journals: „*Aus der Natur*“...[III/290, 541, 543, 546, 547], „*Zeitschrift für die gesammten Naturwissenschaften..Jahrg. 1866, str. 80 i 81.*“...[III/545].

In view of the uncertainties in deducing the content of a journal from its title (like here with *Književnik*), we also scanned *Kolo* which appeared in 1842-(lasting to present days). Only some years later - VII (1850.)/p. 53 and VIII (1851.)/p. 114 – do references appear but in treatises on history quoting works of the classics. There are also footnotes with references, however they are notes by the Editor (!) and not by the author.

Arkiv za pověstnicu jugoslavensku - Altogether there were 22 distinct sections within the 12 volumes (years) of this journal of a serious ambition towards the scientific. The longest (8 years) lasted Politička pověstnica (=Political history); more than once appeared Zemljopisni (4x), and 3 times (years) each Crkvena povijest (=Church history), Književnost i umjetnost (=Literature and arts) and Gradjanska pověstnica (= Civic history). Such an editing dynamics of the Arkiv's content is indicative of a gradual consolidation of the scientific communication in Croatia in mid-19th century. Primarily it was a journal for history, but also for other parts of the humanities. Only Zemljopisni dio (=Geography) does somewhat announce the natural sciences.

Already in the *issuue I/1851* references are found in all articles at the page bottom with the corresponding asterisks in the texts. *Ivan Kukuljević Sakcinski*, the editor and publisher was the author of all the articles.

Hence, one may say the initiator of references into Croatian humanities journals was - Ivan Kukuljević Sakcinski.

As for the interconnecting worldwide the first traces are found in *Arkiv's* issue *II/1853* in which *Sakcinski* defines on p. 131: "What I write is simply description of the lives of our artists known to me. Whatever I say about their works, those are mostly the words of foreign writers." (The emphasis here and henceforth by S.M. and B.S.) *I.K.S* then quotes the translated words of *Juraj Vasari* about the importance of Klović, without referring to any particular source. From the footnote accompanying Vasari's words the same (missing of sources) applies to some two dozen opinions about Klović by other foreign authors. The crux of the reference is given, though, without enabling one to locate it easily, so that, conditionally, this case could be taken as a forerunner of worldwide inter-connecting through the (Croatian) scientific communication in the humanities. Namely, *Kukuljević* informs about the foreign authors' opinions, but not directly about the sources. There is still no complete a reference.

In the same issue on p. 423, under the subtitle "Razděl II., III. Zemljopisni dio" (= Geographical part) there is a brief description of a county by Dr. Antun Pavić. In the article it appears as a rule to give the references (sources) in footnotes while indicating them in the text by asterisks.

In the *Issue III/1854*, there is on p. 343 "An overview of all historical and learned societies in the Austrian Kingdom and outside, which are connected with the South-Slavic historical and archeological society". There are twenty of them which certainly is a sign of insitutionalized scientific ties between Croatia and the world, to be gradually expressed by the individual ("capillary") scientific communication through the references in articles.

In issues *VIII/1865 - XII/1875* the authors' numbers are on an increase, and from the issue *VIII* the consecutive numbering of the references by arabic numerals becomes ever more regular, though not through whole articles, but mostly by pages.

The references are in the same way marked also throughout the first three issues (two years, 1868-9) in the *Rad Jugoslavenske akademije znanosti i umjetnosti*. During that time there were no subdivisions in the journal by scientific fields. It is interesting that there were no differences in the way the references were quoted. Those to foreign literature have mainly been to Austrian, Italian and Russian scientific publications.

To check further on the beginning of referencing, at a time there were yet no journals fully for natural sciences, we made use of the study of the five years (i.e. the publication time, 1844-1849) of *Zora Dalmatinska*. In that analysis⁷ *Ž.Dadić* listed the names of natural science authors: Kuzmanić (*Kuzmanich*) Ante, Ivičević (*Ivichevich*) Stjepan and *Vrdoljak* Jerolim ("Imoćanin"). Their articles were not scientific in the present-day sense of the word, but they did describe various natural phenomena (lightning, earthquakes, violent winds, and the like).

The first Croatian natural sciences journals

Šumarski (=Forestry) list - In three (of them four) issues from the year 1877 there are over 120 pages of a serialized article about "kras" of the Croatian krajina, without a single reference in spite of an otherwise very good documentation. The references were not "a rule" in this journal at its beginning. In its second year (1878), in continuation of the study on "kras" there is one reference with its author's name in the text and the full data about the source at the page end. (Although without references in the articles, there are two subject bibliographies in the journal.)

Liečnički(=medical) viestnik - During the first three years of publication (1877-1879) the articles are without any references. In the first issue of the year IV (1880) there appear, numbered consecutively by pages, references to several German and English books, but in No. 2 (february 1881) there is one (p. 22) full reference (with the author's name in the text) to *Archiv für Ophtalmologie*. From the year VI (1883) there is a subject index with all the titles of articles together with a section named "From journals". In it, translated into Croatian, there are articles from several German and Austrian periodicals, but, except very rarely, there are no original references by Croatian authors. It may thus be concluded that in the beginning (till 1885) the references were not common in *Liečnički(=medical) viestnik*.

Glasnik hrvatskoga naravoslovnoga (=natural sciences) *društva* (1866-*) - In the first issue (1886) the Society's rules were recorded, wherefrom section "III. Publications, books and objects of the Society" is of particular interest here, because some of the paragraphs are related to the scientific character of this journal:

"§. 19. Society's "Glasnik" must contain names of the membership, minutes from meetings and scientific (emphasis hereinafter by S.M. and B.S.) treatises; however the popular lectures will not be published in "Glasnik" and it is recommended that the authors publish them in some Croatian newspaper."

"§. 21. Scientific treatises must be in Croatian and only exceptionally in Latin, Russian, English, German, French and Italian."

"§. 25. The Managing Board may let an expert evaluate the submitted treatises, in case no expert is available within the Board."

Apart from these paragraphs which most directly indicate the journal was conceived as scientific from the very outset, this is corroborated by the list (pp. XXXIII-XXXV) of "academies, societies and editorial boards, with which the Croatian Society for Natural Sciences exchanges its publications".

This means that the Society cherished institutionalized scientific communication ties before its journal came into being.

In the very first article ("*Man and the Natural Science*", by Oton Kučera) there are 55 references numbered consecutively in the text and listed at the end of the article. A few translated articles have no references, whereas in some the references are at the end of pages with corresponding markers in the text. In another article the references are indicated in the text by consecutive numbering and then listed as "Notes" at the end of the article.

Issue III appeared in 1888. It contains articles without any references, but also those at the page bottoms. It is interesting to note at the end of the article a list under the title "Literature" (pp. 108-112) followed by this note: "(Works of more general contents are not cited, and also not some of the most recent [1888] works as I know them only by their titles)" (emphasis S.M. and B.S.).

DISCUSSION

Five periods are distinguished in a periodization⁸ of the development of Croatian journal publication:

“• the first appearance of journals in Croatia in mid-19th century;

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- the diversity of the strive for independence in Croatian cultural and political setting in the second half of the 19th century till W.W.I;
- the period between the two World Wars;
- the second half of the 20st century;
- the beginning of the 21st century.»

In looking for the appearance of references in articles published by Croatian journals we checked the first two periods until the end of the 19th century. The attention was paid to the following aspects: (1) are the references incorporated in articles from the start of the journal; (2) is any foreign literature referenced to; (3) what is the placement (site) of the references within the article.

The gradual incorporation of the references into the articles may be illustrated by the following examples:

Gospodarski list (thence *List mēsečni horvatsko-slavonskoga Gospodarskoga Društva*) –1(1842), p. 168. : *Anl. zur Kenntn. der engl. Landwirtschaft I sv. st.85*. This is almost a complete reference: the author (*Thär*) is given in the text of this anonymous article („Zemlja“=earth, soil), but not the title of the reference, though, it could be traced to the foreign source (see footnote ^b). *This is the first case (in 1842) from Croatia of a "capillary" scientific communication*^c.

In the *Arkiv II/1853* one learns from Kukuljević about the opinions of foreign authors (on Klović), but not directly about the sources, as there is yet no complete reference. The crux of the reference is there without enabling the reader to find it easily. Thus, conditionally, this may be regarded as a forerunner (in 1853) of a worldwide inter-connection by scientific communication in the Croatian humanities. This is done almost as a rule with the references (sources) at the end of pages marked in the texts with asterisks.

A year later *Arkiv* publishes the list of societies in the "Austrian Kingdom and outside it" which are connected with the Croatian historical society. This is indicative of an institutionalized tying up of the scientific process in Croatia with the one worldwide. This was probably preceded by, or gradually making use of the referencing in articles.

Since *Arkiv VIII/(1865)* the references are being numbered consecutively (by pages) in arabic ordinal numerals. This reflects an overall stabilization in dealing with the references, or, in other words, a maturing of this aspect in Croatian scientific communication.

Initially, i.e. about 1850 and soon afterwards, the Croatian journals were preponderantly published from the humanities. Gradually there appear those which partially and somewhat later completely contain articles from the natural sciences.

By its content *Zora Dalmatinska* is a journal of mixed content, and in its first year (1844) it has no references to original sources.

A clear chronological border-line has been set by the appearance of *Glasnik hrvatskoga naravoslovnoga* (=natural sciences) *društva*. Its publisher, the society bearing the same name had been very carefully preparing the publishing of its journal in 1886, when it already contains references. It seems obvious that in Croatia by that time a research core in natural sciences had been established. It must have had rather regular communication with the corresponding sciences worldwide. However, it all did not happen in a simple manner, as there were two quite opposed standpoints about the strategy for developing science in Croatia.

In the journal *Kolo* its new editor-in-chief did not agree [*Kolo IX (1853)* p. 92/footnote] with the ideas of an author expressed in his journal: «I completely disagree with M. L.(judevit) V.(ukotinović) in this respect - especially as far as these words relate to our people: "...It ought then the natural sciences to be firstly introduced and widely spread in a strictly scientific way*, and only then the learned natural scientists to prepare such writings about natural sciences which would serve the public at large..." First of all we shall bear in mind: how much are we lagging behind other nations in almost all subjects of serious knowledge. – Hence, until such people could be found who would be able to write up complete learned works a lot of time would pass by again without any benefit for our people, if however on the contrary, one begins now to write in a simple everyday life way, like I exposed it in an essay titled *The tasks for our writers in the present times* – the desired goal could be achieved faster.»

Apart from the para 19 and 25 of the "Rules..." which most directly testify that *Glasnik* was conceived from the very beginning to be scientific, it could also be discerned from the list (pp. XXX XXXIII-XXXV) of academies, societies and editorial boards, with which the Natural Sciences Society exchanges its publications (emphasis S.M. and B.S.).

Already in the very first article (*The Man and the Natural Science* by Oton Kučera) there are 55 references at the end of the article, marked in the text by ordinal numbers.

In the first year (1864), in the Contents – Mathematics and natural sciences – the article on pp. 264-274 "dr. Fr.(anjo) J.(akov) Tkalac: Croatian-and-Slavonic spring waters." is an outstanding one by its likeness with the current ones (21st century) with regard to references style.

Šumarski list in its second year (1878) in continuation of the subject Kras of Croatian Krajina has a reference with its author stated in the text while the full source is given at the end of page. Simultaneously, *Liečnički viestnik* (1877-1879) is without references at all. In this journal the references were not common until 1885.

Let us now turn to the lecture⁹ given by Ž. Dadić some 20 years ago. In it, the author deals with the science development in Croatia with respect to the world. Dadić compares the substance of the science in Croatia with the one worldwide, while we chose here just one detail as reflection of that substance – namely the appearance of references in the articles. Dadić says (⁹p. 9): "...the western science began to influence the countries which had been under the dominance of the byzantine type of science, more seriously only in the 18th century..." He then concerns himself with Croatia and in comparing some specific scientific results..., "he bears in mind the circumstances in achieving scientific results, and the influences in Croatia by the western sciences, because they were conditions for locally creating scientific results, and finally, he takes into account the communication of scientific ideas (emphasis by S.M. and B.S.) between Croatia and other countries."

In spite of the quite different approaches to the investigation, our observations here about the scientific communication of Croatia with the world during the second half of the 19th century are in agreement with those by Dadić (⁹str. 16): "After the Yugoslav Academy of Sciences and Arts was founded, and somewhat later the Croatian Natural Sciences Society too, the circumstances for scientific research became even better, so that more was being published not only through the (secondary) schools, but also in the *Rad JAZU* and in the *Glasnik Hrvatskoga prirodnoslovnog društva*".

A REFLECTION

Gross, Harmon and Reidy⁴ follow the development of the scientific article through English, French and German journals. In Appendix A⁴, about their sampling technique, they mention within Table A.1. that there are no journals in German in the 17th century (i.e. there is no mention of "journals from Germany" in the list of journals at their disposal). While England and France of that period were complete statehoods, Germany was not until mid-19. century. It goes, therefore, for journals in German language. It is similarly with Croatian journals. In the 19th century, although within the common Austro-Hungarian State, Croatia was one of the "three Kingdoms" with Slavonia and Dalmatia. The literary Croatian was just being introduced in mid-19th century.

Judging by the here described acceptance of the habit of referring to the predecessors' works, the development of the scientific article in Croatian journals has closely followed the foundation of the journals themselves, within two or three decades since mid-19th century. We shall not go into the explanation⁴ of that development which is, but, interesting just because although there was no homogenous Croatian state yet bearing an overall cultural infrastructure, the scientific article "hatched out"

so quickly. This may probably be ascribed to the "ties worldwide" established by those scientists who began to found scientific journals in the mid-19th century. To some extent it may be said that Croatia got well into the "journal race" which began in 17th century in England and France.

This case might also be interesting for it signifies to what extent the inner mechanisms of science development were (are) not straightforwardly dependent upon the surroundings. As if the science development "lines of force" are inherently so strong that extraneous conditions do not influence it as one might expect.

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<http://www.garfield.library.upenn.edu/wouters/wouters.pdf> (See in particular (p.10) 1.6 The reference and the citation)
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