Proposal, further to the Rhetorical Document Model conference call 15/11/10, for a Document Rhetoric Ontology, DRO, and its integration with ORB, the Ontology of Rhetoric Blocks and with DoCO, the Document Components Ontology

based on the proposal for a

Medium-Grained Document Structure by Anita de Waard, 10/7/10

http://esw.w3.org/HCLSIG/SWANSIOC/Actions/RhetoricalStructure/models/medium

1 ORB, the Ontology of Rhetorical Blocks

ORB, the Ontology of Rhetorical Blocks developed by Tim and Tudor, is intentionally restricted in scope to the primary sections of a typical scientific journal article: *Header, Introduction, Methods, Results, Discussion, Conclusion, References*. This focus permits different semantic categories – rhetorical and structural – to be conflated for simplicity. Each of the ORB classes is, implicitly, a document section with a specific rhetorical purpose.

2 DoCO, the Document Components Ontology

In contrast, DoCO, the Document Components Ontology, is a general ontology for describing the rhetorical and structural components of many types of documents – journal articles, books, reports, etc. It does this at moderate granularity, roughly equivalent to that of publishers' DTD markup. It separates the concept of rhetorical elements of a document from the concept of physical sections of a document. These may or may not be related. Thus an essay may have a rhetorical introduction that is *not* separated into a document section entitled "Introduction".

DoCO uses all the rhetorical classes of the SALT Rhetorical Ontology, SRO (e.g. *sro:Abstract, sro:Discussion, sro:Conclusion*), to which it adds more of its own (e.g. *doco:Introduction, doco:Methods, doco:Results, doco:Acknowledgements*). In doing so, it covers all the medium-grained rhetorical requirements of Anita's proposal for medium-grained document structure, as shown below.

3 DRO, the Document Rhetoric Ontology

At http://esw.w3.org/HCLSIG/SWANSIOC/Actions/RhetoricalStructure/models/medium, Anita has proposed the development of a document rhetoric ontology of intermediate granularity, which, for the purposes of the following discussion, I will call **DRO, the Document Rhetoric Ontology**. Like ORB, its focus is the typical scientific journal article, rather than something more general.

One way to develop DRO would be to start from scratch. An easier alternative might be for DRO to import DoCO, which provides 19 of the required classes, and then to extend it as required by adding 13 additional sub-classes to cover the more fine-grained rhetorical requirements set out by Anita, as shown highlighted in (a) below.

(a) Coverage of Anita's required rhetorical elements, as set forth in her document (her text shown in blue)

(Sub-classses shown by indents)

Head	*doco:FrontMatter* (c.f. *orb:Header*)
• Title	*doco:Title*
• Authors	
o Author	*doco:ListOfAuthors*
o Affiliation	*doco:ListOfOrganizations*
• Source (Journal, book, etc)	(Relevant classes are covered in FaBiO, e.g. *fabio:Journal*, *fabio:Book*)
• DOI	(Relevant PRISM data property is in FaBiO: *prism:doi*)
• Abstract	*doco:Abstract*
Body	*doco:BodyMatter*
• Introduction	*doco:Introduction* (c.f. *orb:Introduction*)
o Positioning	*dro:Positioning*
o Central problem	*doco:ProblemStatement*
o Hypothesis	*dro:Hypothesis*
o Summary of results	*dro:ResultsSummary*
• Method	*doco:Methods* (c.f. *orb:Methods*)
o Purpose:	
▪ Positioning of experiment	*dro:ExperimentalPositioning*
▪ Central problem for experiment	*dro:ExperimentalProblem*
▪ Hypothesis for experiment	*dro:ExperimentalHypothesis*
o Objects of study	*doco:Materials*
▪ Identification/ Classification	*dro:SpecimenClassification*
▪ Description/ Definition	*dro:SpecimenDescription*
o Tools and procedures	*doco:Methods*
▪ Equipment	*dro:Equipment*
▪ Experimental procedures	(? *fabio:ExperimentalProtocol*)
• Results	*doco:Results* (c.f. *orb:Results*)
o Direct representation of measurements	*dro:Measurements*
o Description of results	*dro:ResultsDescription*
o Analysis of results	*dro:ResultsAnalysis*
o Remaining questions	*dro:RemainingQuestions*
• Discussion	*sro:Discussion* (c.f. *orb:Discussion*)

- Related work — *doco:RelatedWork*
- Conclusions — *sro:Conclusion* (c.f. *orb:Conclusion*)
- Further research — *doco:FutureWork*

Tail — *doco:BackMatter*

- Acknowledgement — *doco:Acknowledgements*
- References — *doco:BibliographicReferenceList* (c.f. *orb:References*)
- Supplementary Material — *doco:SupplementaryInformationDescription*

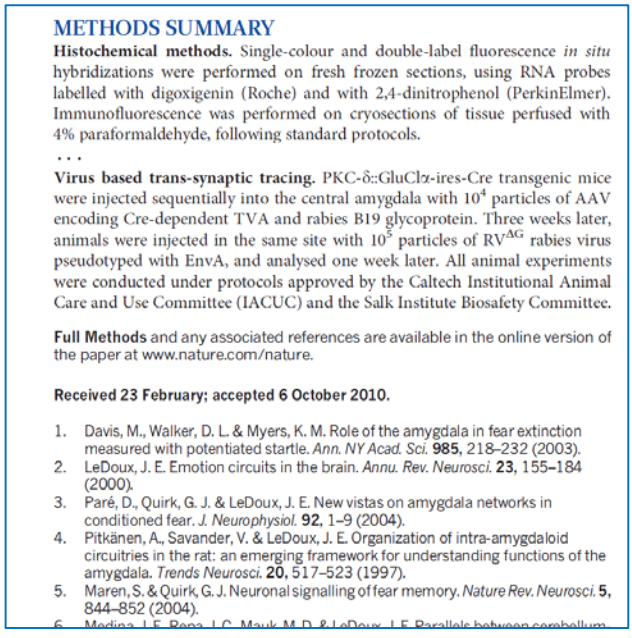
Note 1: Anita's categories were developed with Physics journals in mind. Additional rhetorical sub-classes can of course be added to accommodate the specific requirements of biomedical journal articles, e.g. "Subjects", "Habitat".

Note 2: Supplementary Information Files are typically independent documents in their own right (defined by *fabio:SupplementaryInformationFile*) , downloadable from separate URIs. In this case, they are usually briefly described and referenced in a section within the document that has the rhetorical purpose defined by the DoCO class *doco:SupplementaryInformationDescription*. Rarely, they may be contained within an appendix of the document itself, for which the section *doco:Appendix* is available.

Note 3: A 'reference' can be a reference to a specific part of the same document (e.g. "Fig. 2"), *or* to another publication. Thus *doco:ListOfReferences* is defined as "a list of items representing references to a specific part of the same document, or to another publication". Dataset IDs and accession numbers are examples of non-bibliographic references to other publications that typically appear outside the bibliographic reference list. The DoCO class *doco:DatasetDescription* has the rhetorical purpose of defining the section of the document containing such identifier or accession number references and accompanying descriptive text.

doco:BibliographicReferenceList is a subclass of *doco:ListOfReferences*, defined as "a list, usually within a bibliography, of the references within the citing document that refer to journal articles, books, book chapters, Web sites or similar publications."

A *doco:Bibliography* is defined as "A document section containing a list of bibliographic references." This may appear without a title, as in the Nature paper by Haubensak *et al*. (2010), following the METHODS SUMMARY section:



METHODS SUMMARY

Histochemical methods. Single-colour and double-label fluorescence *in situ* hybridizations were performed on fresh frozen sections, using RNA probes labelled with digoxigenin (Roche) and with 2,4-dinitrophenol (PerkinElmer). Immunofluorescence was performed on cryosections of tissue perfused with 4% paraformaldehyde, following standard protocols.

. . .

Virus based trans-synaptic tracing. PKC-δ::GluClα-ires-Cre transgenic mice were injected sequentially into the central amygdala with 10^4 particles of AAV encoding Cre-dependent TVA and rabies B19 glycoprotein. Three weeks later, animals were injected in the same site with 10^5 particles of $RV^{\Delta G}$ rabies virus pseudotyped with EnvA, and analysed one week later. All animal experiments were conducted under protocols approved by the Caltech Institutional Animal Care and Use Committee (IACUC) and the Salk Institute Biosafety Committee.

Full Methods and any associated references are available in the online version of the paper at www.nature.com/nature.

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2. LeDoux, J. E. Emotion circuits in the brain. *Annu. Rev. Neurosci.* **23**, 155–184 (2000).
3. Paré, D., Quirk, G. J. & LeDoux, J. E. New vistas on amygdala networks in conditioned fear. *J. Neurophysiol.* **92**, 1–9 (2004).
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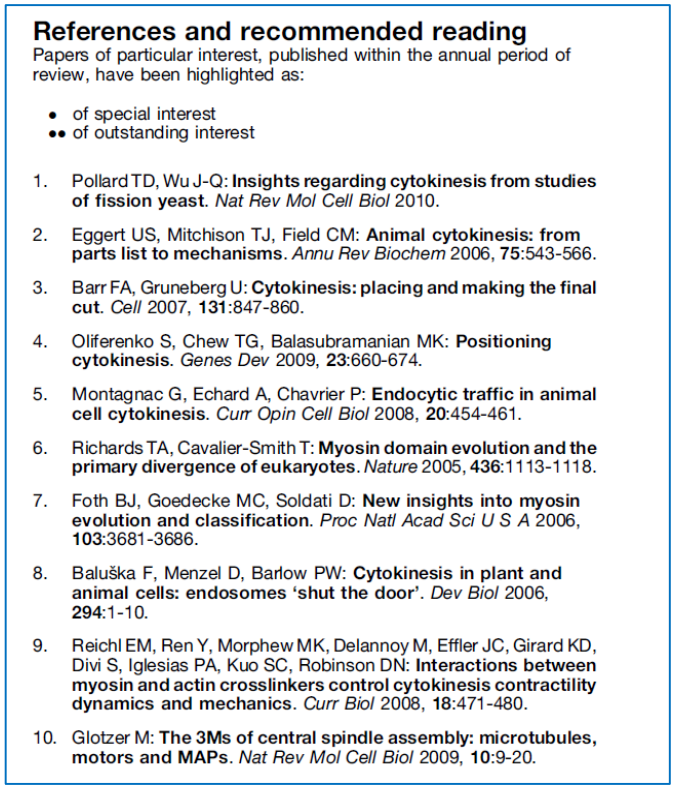
Alternatively, the Bibliography may be a Headed Container containing, in addition to the Bibliographic Reference List, a title “References”, or a title and additional prefatory text that is not part of the list, as in

> Pollard, TD (2010) Mechanics of cytokinesis in eukaryotes. Current Opinion in Cell Biology 22: 50-56 (February 2010). doi:10.1016/j.ceb.2009.11.010.



References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

1. Pollard TD, Wu J-Q: **Insights regarding cytokinesis from studies of fission yeast**. *Nat Rev Mol Cell Biol* 2010.
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4. Oliferenko S, Chew TG, Balasubramanian MK: **Positioning cytokinesis**. *Genes Dev* 2009, **23**:660-674.
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8. Baluška F, Menzel D, Barlow PW: **Cytokinesis in plant and animal cells: endosomes 'shut the door'**. *Dev Biol* 2006, **294**:1-10.
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10. Glotzer M: **The 3Ms of central spindle assembly: microtubules, motors and MAPs**. *Nat Rev Mol Cell Biol* 2009, **10**:9-20.

(b) Coverage of the ORB classes

Additionally, DoCO’s Section class could be sub-classed to cover the ORB classes, thus:

doco:Section
- *dro:JournalArticleSection*
  - *dro:IntroductionSection*
  - *dro:MethodsSection*
  - *dro:ResultsSection*
  - *dro:DiscussionSection*
  - *dro:ConclusionsSection*

Each of these sub-classes would be both a *dro:JournalArticleSection* and restricted to be the appropriate SRO or DoCO rhetorical component *doco:Introduction*, *doco:Methods*, *doco:Results*, *sro:Discussion* or *sro:Conclusions*, all being part of *doco:BodyMatter*.

The class *orb:Header* is covered by *doco:FrontMatter*.

DoCO also provides *doco:BackMatter*, which is normally taken to include the Bibliography, and may also include the Acknowledgements and additional elements not covered by ORB, as shown below the final bibliographic reference in

Haubensak W *et al*. (2010) Genetic dissection of an amygdala microcircuit that gates conditioned fear. *Nature* **468**: 270–276 (11 November 2010). doi:10.1038/nature09553.

RESEARCH ARTICLE

40. Wickersham, I. R., Finke, S., Conzelmann, K. K. & Callaway, E. M. Retrograde neuronal tracing with a deletion-mutant rabies virus. *Nature Methods* **4,** 47–49 (2007).
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Supplementary Information is linked to the online version of the paper at www.nature.com/nature.

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Author Contributions W.H. initiated the project, generated BAC constructs, designed experiments, performed anatomical, viral injections and behavioural experiments, and wrote the manuscript. P.S.K. contributed to experimental design, performed viral injections, behavioural experiments, data analysis and interpretation. H.C. contributed to experimental design and performed viral injections and slice electrophysiology experiments, data analysis and interpretation. S.C. and A.L. designed, performed and interpreted *in vivo* recording experiments (Fig. 5). N.R.W. and E.M.C. performed rabies virus injection experiments. R.P. performed supplementary behavioural experiments and M.S.F. contributed to their interpretation and to statistical analysis. J.B. and H.-W.D. performed supplementary stereotaxic viral injection experiments. K.D. provided Cre-dependent ChR2 constructs and advice. D.J.A. conceived the project, contributed to experimental design and interpretation and wrote the manuscript. P.S.K., H.C. and S.C. contributed equally. All authors discussed the results and commented on the manuscript.

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