

Why are we still reading “papers” in a digital world?

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American Chemical Society





Lorrin
clearing out
his
cumulative
monthly
reports upon
retirement



What is a “paper”?

- A cellulose-based matrix for storing “bits” of information, in the form of ink, graphite, etc.
- A report of scholarly research, printed on paper
- An oral presentation of scholarly research
- A presentation of scholarly research, without regard to format



A “paper” means different things ...

- ...depending on context
- The word comes with some “baggage”
 - The use of the word carries some connotations of the medium
 - It also perhaps suggest some of the limitations of the medium



Some suggestions to replace “paper”

- Article
- Document
- Compuscript
- Compuprint
- Eprint
- Compound Document
- Datument

These are intended
to help us focus
more on the
properties of the
object, rather than
on the medium



Notice to Authors of Papers

(Revised January 2005)

Major Changes for 2005

- All manuscripts must be submitted through the ACS Paragon System. **Hardcopy submissions of manuscripts and Supporting Information are no longer accepted.**
- References with more than 10 authors must be truncated; the full author list must be given in the Supporting Information.
- The Abstract length for Articles is limited to about 250 words.
- Appendices should appear in the Supporting Information.
- The receipt date will be recorded as the date the complete, properly formatted manuscript is received in the Editor's office and is ready for evaluation.
- References and footnotes must be grouped at the end of the manuscript.
- All the graphics and tables must be inserted in the text near the point of first mention, not grouped at the end of the text.

Other Important Manuscript Submission Requirements

- Communications and Articles must contain both an Abstract and a Table of Contents (TOC) graphic in the manuscript file.
- Crystallographic data are furnished in crystallographic information file (CIF) format as Supporting Information.
- Copies of related work that are in press (accepted) or submitted for publication must be uploaded as "Review-Only Material".
- Pages of Articles must be numbered consecutively to the end.
- Dedications may appear only in the Acknowledgment.

Scope and Editorial Policy

The *Journal of the American Chemical Society* is published weekly and is devoted to the publication of fundamental research

predictions of broad interest. Articles which mainly expand findings that were previously published as Communications in

Web Representations of a “paper”

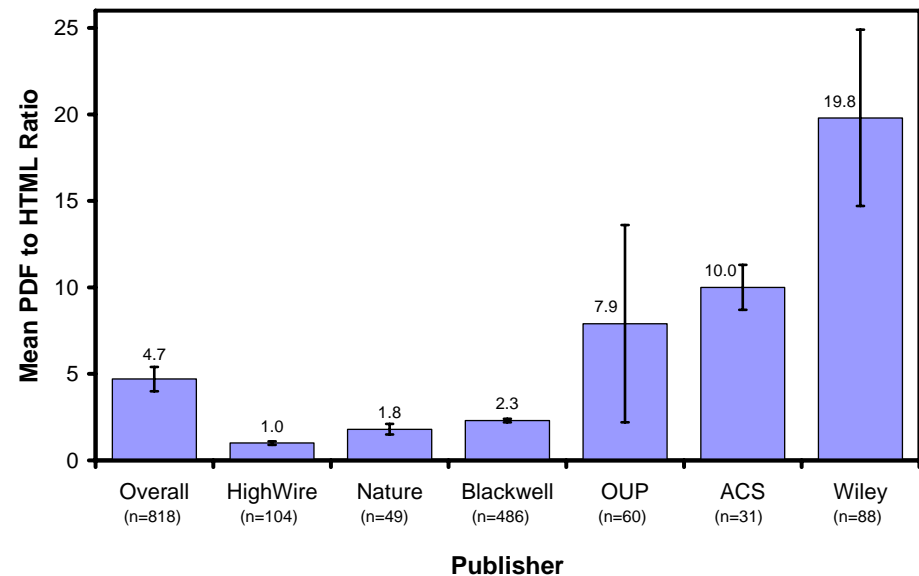
- HTML
 - one long page, like a scroll
 - enhancements: cited reference links, links to dynamic content, etc.
- PDF
 - Text broken into many pages, like a printed journal
 - Few, if any, enhancements



Usage data for HTML vs. PDF

- Study by Philip Davis and Jason Price, eJournal interface can influence usage statistics: implications for libraries, publishers, and Project COUNTER, accepted JASIST, <http://people.cornell.edu/pages/pmd8/interface.doc>

Figure 1. Mean ratio of PDF to HTML article downloads varies across publishers. Cornell University downloads, 2004



Are we digital yet?

- For ACS, a 10:1 preference for PDF over HTML has been reported. Some publishers show closer parity, but in at least some of those, the mechanism of getting to PDF leads to the conclusion that the PDF version is preferred.
- PDF represents a digital delivery of a paper facsimile.



Conclusion:

- We are not truly interacting in a digital medium yet
- We are, in reality, delivering paper electronically
- We often print out the paper onto real paper ourselves



Paper: some advantages

- Durable
- Minimal power consumption
- Easy to read in varying light conditions
 - except in the dark
- Light weight
 - unless you want to carry multiple objects
- Flexible
- Ergonomically adjustable
- Comment friendly



Paper: some disadvantages

- Static: information is not interactive
- You have to remember to print it out to take it with you
- You have to store it somewhere
 - Library shelves
 - File cabinet
 - Desktop
- Difficult to search
- Can't be used for data mining



Digital Media: some advantages

- Can take a lot with you
- Easy to deliver – anywhere, anytime
 - WiFi
 - Cellular cards
- Dynamic
 - interactive graphics (structures, graphs, etc.)
 - 3D-perspectives
 - 3D projections terminals



Digital Media: some disadvantages

- Heavy
- Awkward ergonomics
 - Nobody reads a book or paper at a 90° vertical orientation
- Orientation of a computer screen doesn't correspond to orientation of printed page



Question: Is “paperless” possible?

- New formats
 - NewsStand/Zinio offer a complete issue in a single “package”
 - eBooks are becoming more common, both for reference works and for popular books
- New devices
 - Tablet PCs offer:
 - an orientation more like paper
 - greater flexibility in viewing
 - better commenting features



Advantages of Digital Editions

- Entire print facsimile is available
- Circulation numbers approved
- After browsing, you know you've read the whole thing
- Details of user behavior can be collected



TabletPC rendering of a full page from NewsStand edition

Viewer - Journal of American Chemical Society 8/31/2005

JACS COMMUNICATIONS
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Switch-Peptides: Controlling Self-Assembly of Amyloid β -Derived Peptides in vitro by Consecutive Triggering of Acyl Migrations

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The onset of conformational transitions as the origin of peptide self-assembly is considered as a fundamental molecular event in early processes relevant in degenerative diseases.^{1,2} A detailed investigation of these processes is hampered by intrinsic problems, such as the high tendency of the involved peptides for β -sheet formation and spontaneous aggregation, limiting their experimental accessibility.³ We have recently developed a new generation of switch-peptides,⁴ allowing for the induction of conformational transitions using intramolecular O \rightarrow N-acyl migrations⁵⁻⁸ in situ.

For potential applications in vitro and in vivo, we explore the sequential triggering of O \rightarrow N-acyl migrations in amyloid β ($A\beta$)-derived switch-peptides as a tool for studying onset and inhibition in polypeptide folding, self-assembly, and aggregation. As shown in Scheme 1, N(Y)-protected O-acyl isopeptides ("switch (S)-peptides") serve as stable, self-contained folding precursors, in which folding and self-assembly is blocked by the presence of the Ser-, Thr-, or Cys-derived switch (S)-elements dissecting the regular peptide backbone by an ester and a flexible C-C bond (S_{off}).

Here, we focus on the design and chemical synthesis of S-peptides (Scheme 2) and investigate the specific cleavage of the N-protecting groups, Y, using chemical or enzymatic triggers, I (step a, Scheme 1), the spontaneous intramolecular O \rightarrow N-acyl migration (b) and the induction of folding events (c) such as self-assembly, β -sheet and fibril formation in statu nascendi (ISN) of the molecule. The amphipathic S-peptide P serves as a model for the onset of β -sheets, applying variable triggering systems (Scheme 2). Orthogonal triggering is exemplified for $A\beta$ -derived S-peptides II, taking the fibril nucleating segment $A\beta$ (14-24)⁹ for the in situ induction of helical structures (IIa) and as a guest sequence in a β -sheet promoting host peptide (IIb).⁴ S-peptide IIc serves as a prototype for the consecutive switching on of folding processes in total $A\beta$ (1-42). For the selective removal of Y_i by a trigger T_i, the use of exopeptidases with "non-native" specificities, such as pyroglutamate aminopeptidase (pGAP) and D-amino acid peptidase (Dap), or with unique cleavage sites, such as dipeptidyl peptidase IV (DPPIV, specific for N-terminal Axo-Pro), is examined.

Solid-phase synthesis of peptides I and II was achieved by applying Fmoc/Boc-based chemistry.^{10,11} Most notably, the presence of one (I) or two (II) S-elements results in highly soluble compounds (folding precursors), facilitating HPLC purification and structural characterization. As shown by CD, the conformational decoupling of the S-spaced peptide blocks results in flexible random coil (rc) conformations (CD curves S_{off} , Figure 1). Even after 24 h at physiological pH, no changes in the HPLC and CD spectra are observed for the S_{off} state of the S-peptides, pointing to high chemical and conformational stability.

In contrast, the controlled removal of Y in the individual S-elements provokes spontaneous intramolecular O, N-acyl migration, resulting in dramatic changes of the conformational and

Scheme 1. Switch-Peptides as Folding Precursors: Consecutive Triggering of O, N-Acyl Migrations (ACM) in Switch-Peptides (S_{off}) for the Onset (S_{on}) of Peptide Folding and Self-Assembly in statu nascendi (ISN) of the Native Molecule

Scheme 2. Investigated Switch-Peptides and Triggering Systems (See Scheme 1)^a

I	Y _i	T _i
1	H ⁺	OH ⁻
2	Nvoc	Iv
3	ArgPro	DPPIV
4	pGlu	pGAP
5	Arg	Trypsin
6	D-Ala	Dap

^a $A\beta$ sequences in square brackets. S = (Y₁)₁SetThr; S₁S₂ = (Y₂Y₁)₁Set (IIa); (Y₂Y₁)₁Set (IIb); (Y₂Y₁)₁Set (IIc). Nomenclature dipeptides, see ref 11.

physical properties (S_{on} state). For example, after adding enzyme DPPIV to S-peptide I, the evolution of the cleaved dipeptide Arg-Pro (Figure 1A, HPLC peak 3), the gradual disappearance of the S_{off} (peak 1), as well as the onset of a new peak (2, S_{on}) reflect the overall time course for steps a and b respectively (Scheme 1). As a general observation, the evolution and subsequent degradation of the S_{on} peak points to fast aggregation originating from rc to β -sheet transitions (CD, Figure 1A). As studied on I, the time course for the process $S_{\text{off}} \rightarrow S_{\text{on}}$ strongly depends on the triggering system (minutes up to hours in the rate-limiting step a in trigger systems $j = 3-6$, Scheme 2), whereas the intramolecular O, N-acyl transfer reaction proceeds generally fast (absence of intermediates) at physiological pH ($\text{Thr} \leq \text{Ser} \ll \text{Cys}$).

The consecutive "switching on" of S-elements according to Scheme 1 provides an experimental tool for evaluating the impact of individual peptide segments upon folding and self-assembly. For example, the pH-induced acyl migration at S₂ in IIa (HPLC, Figure 1B) does not result in a significant effect upon the CD spectra (predominant rc structure), whereas the switching on of the helix-

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10.1021/ja052082a.ccc.130.25 © 2005 American Chemical Society

30 of 232 (11888) General



Conclusions

- The TabletPC is a good device for reading
 - Digital editions
 - PDF files
 - eBooks
- Handwriting recognition is good, even for my poor, left-handed, handwriting
- Correction of handwriting recognition is tedious, and very slow. Especially poor is web surfing, where a dictionary is of little help



Digital Galley Correction Pilot

- Using Adobe Document Server, galley proofs could be “comment-enabled”, so anyone using Acrobat Reader could enter comments digitally
- Author instructions were provided on how to use the commenting facility
- Statistics were kept to compare processing of digital comments vs. processing of traditional comments



Conclusions

- Authors can't or won't follow instructions
- Processing of digital comments takes longer than processing comments on paper
 - Because of the way Adobe Acrobat displays comments
 - Because entering comments from a PDF file back into the composition system is tedious, especially where special characters may be involved



Digital paper

- What is the status of electronic ink products?
 - E-Ink
 - Gyricon/Xerox PARC
 - Philips
 - Sony
 - Canon
 - GE
 - IBM



E Ink

- First E Ink consumer product: an ebook reader
- Second E Ink consumer product: a Citizen watch
- Projection: paper-like medium at consumer price levels will be available in 2 years



2002

Tokyo, Japan , Amsterdam, The Netherlands, Cambridge, MA, USA,

2001

March 24, 2004 - Royal Philips Electronics (NYSE: PHG, AEX: PHI), Sony Corporation (NYSE: SNE) and E Ink Corporation announced today the world's first consumer application of an electronic paper display module in Sony's new e-Book reader, LIBRIé, scheduled to go on sale in Japan in late April. This "first ever" Philips' display utilizes E Ink's revolutionary electronic ink technology which offers a truly paper-like reading experience with contrast that is the same as newsprint.

2000

1999

1998

The Electronic Paper Display is reflective and can be easily read in bright sunlight or dimly lit environments while being able to be seen at virtually any angle - just like paper. Its black and white ink-on-paper look, combined with a resolution in excess of most portable devices at approximately 170 pixels per inch (PPI), gives an appearance similar to that of the most widely read material on the planet - newspaper. Because the display uses power only when an image is changed, a user can read more than 10,000 pages before the four AAA Alkaline batteries need to be replaced. The unique technology also results in a compact and lightweight form factor allowing it to be ideal for highly portable applications.

Sony's e-Book reader LIBRIé, the first device to utilize Philips' display solution for enhanced reading, is similar in size and design to a paperback book. LIBRIé allows users to download published content, such as books or comic strips from the Internet, and enjoy it anywhere at any time. LIBRIé can store up to 500 downloaded books.



[click to enlarge](#)

Sony LIBRIé e-Book Reader utilizing Philips Electronic Paper Display featuring E Ink's electronic ink technology

[2005](#)

CITIZEN TO LAUNCH REVOLUTIONARY CURVED CLOCK USING E INK'S ELECTRONIC PAPER DISPLAY

[2004](#)[2003](#)[2002](#)

Tokyo, Japan and Cambridge, MA, USA - June 15, 2005 - Citizen Watch Co., Ltd. (president, Makoto Umehara), T.I.C.-Citizen Co., Ltd. (president, Toshio Takahashi), and E Ink Corporation (Massachusetts, U.S.A., president & CEO, Russell J. Wilcox) are pleased to announce the demonstration of the world's first curved clock product to utilize an electronic paper display (EPD). This unique design is enabled by E Ink® Imaging Film. This easy-to-read, low-power display component is fully conformable, allowing product designers more creative freedom than ever before. Citizen Watch Co. and T.I.C.-Citizen Co. worked closely with E Ink to develop the electronic paper display used in this new clock.

[2001](#)[2000](#)[1999](#)[1998](#)

Displays made with E Ink Imaging Film provide a number of benefits over traditional display technologies, including:

Exceptional Readability : Roughly twice the contrast of a reflective LCD, EPD's can be easily read in bright sunlight or in dimly lit environments and at virtually any angle.

Low Power Consumption: In addition to the fact that no backlighting is required, the display also has an inherently stable "memory effect" which requires no power to maintain an image - both of which drastically increase the battery life. The result is 1/100 the power consumption of traditional display options.

Versatile, Flexible Form: E Ink Imaging Film allows product designers to create entirely new designs that were never possible before. This thin, flexible display can be used to create curved, eye-catching shapes.

These benefits allow the clock to be installed in locations that would otherwise be difficult with other technologies. In applications where portability is valued, this extended battery life enables the clock to be easily used as a "mobile" product.

Citizen Watch Co. and T.I.C.-Citizen Co. have not yet announced a launch date for this product, but it is expected to be commercialized in Japan in 2005. Plans for the international launch are under consideration, along with other design interpretations.



World's first curved clock to utilize an electronic paper display

Is paperless possible?

- With all of the talk about machine processing, data mining, and extracting knowledge from information, a human still needs to read the paper on some medium
- It is possible to read on screen, but...
 - You have to be committed
 - It's not seamless
- Reading on electronic paper may not be far off



A dream for the future



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- Lorrin Garson



Why are we still viewing
“slides” in the digital age?

Please come to my next talk:



Please come to my next talk:

Why are we still viewing
“slides” in the digital age?

