W1: **Information Does Exist Beyond the First Page of Your Google® Search!**
American Academy of Forensic Sciences
Las Vegas, NV (February 22, 2016)

Why Search and Read the Forensic Science Literature?

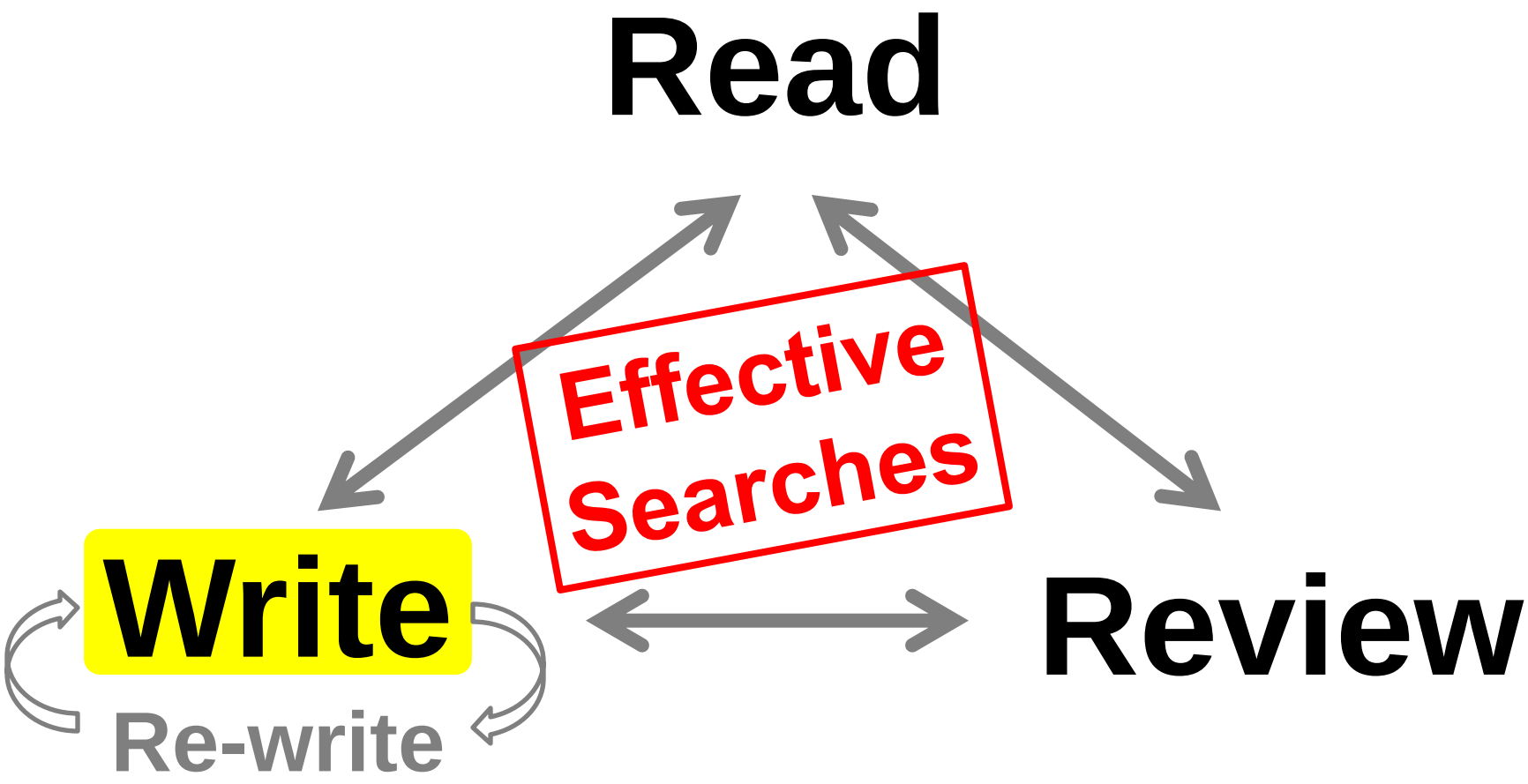
John M. Butler
NIST Fellow & Special Assistant to the Director for Forensic Science
National Institute of Standards and Technology

Greg Matheson on Forensic Science Philosophy

The CAC News – 2nd Quarter 2012 – p. 6
"Generalist vs. Specialist: a Philosophical Approach"
http://www.cacnews.org/news/2ndq12.pdf

"If you want to be a technician, performing tests on requests, then just focus on the policies and procedures of your laboratory. If you want to be a scientist and a professional, learn the policies and procedures, but go much further and learn the philosophy of your profession. **Understand the importance of why things are done** the way they are done, the scientific method, the viewpoint of the critiques, the issues of bias and the importance of ethics."

The Triad of Scientific Publishing



Making full use of the scientific literature…

What I have written on this topic…

Forensic Science International: Genetics Supplement Series 4 (2013) e115–e116

Contents lists available at ScienceDirect

Forensic Science International: Genetics Supplement Series

journal homepage: www.elsevier.com/locate/FSIGSS

The triad of scientific publication: Reading, writing, and reviewing

John M. Butler *

National Institute of Standards and Technology, Gaithersburg, MD, USA

…"An important purpose of scientific publication is to document work performed to aid the advancement of science. In short, writing enables history."

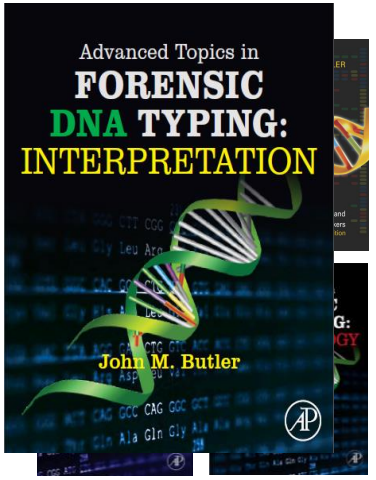
…"Reviewing manuscripts is a chance to influence the community for good and to provide service back to journals…"

My Qualifications on this Topic

- Degrees in chemistry
  - BYU (B.S., 1992), University of Virginia (Ph.D., 1995)
  - **Undergraduate classes on scientific writing and public speaking**

Experience

- Research-focused career
  - **Published >150 articles and invited book chapters**
  - Given >300 presentations on scientific topics



- Love for teaching
  - More than 50 workshops on DNA topics
  - **Written five books (so far) on forensic DNA typing**
- Active reviewer and journal editor responsibilities
  - Associate editor of *Forensic Science International: Genetics* since 2007
  - **Reviewed hundreds of articles for >20 different journals**
- Avid lifelong reader of history and science
  - **Read >2,000 books and thousands of articles**

THOMSON REUTERS
SCIENCE WATCH

Named by ScienceWatch in July 2011, as **the #1 world-wide high-impact author in legal medicine and forensic science over the previous decade**

Reading Scientific Articles: *Why and How?*

Why Read the Literature?

- Reading the relevant literature is crucial to developing expertise in a scientific field
- You must keep reading to be familiar with advances that are regularly being made
- Your writing improves the more you read
  - Being widely read in your field helps you prepare **relevant reference** lists and **insightful introductions** to your manuscripts
- Your ability to review other's work will improve…

FBI Quality Assurance Standards

Requirement for Literature Review with DNA Labs

Quality Assurance Standards for Forensic DNA Testing Laboratories
(effective September 1, 2011)

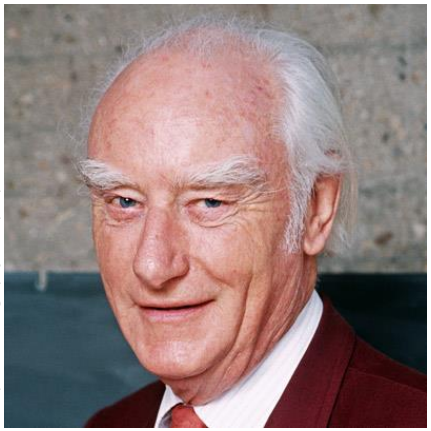
5.1.3.2. The laboratory shall have **a program** approved by the technical leader **for the annual review of scientific literature that documents the analysts' ongoing reading of scientific literature. The laboratory shall maintain or have physical or electronic access to a collection of current books, reviewed journals, or other literature applicable to DNA analysis.**

http://www.fbi.gov/about-us/lab/biometric-analysis/codis/qas-standards-for-forensic-dna-testing-laboratories-effective-9-1-2011

Benefits of Reading the Literature

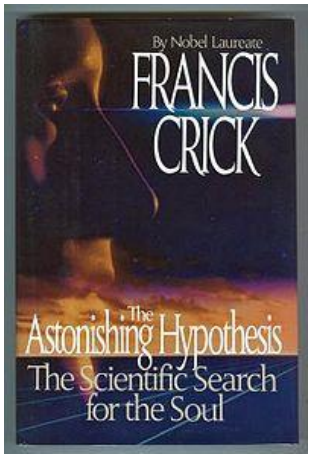
- You become familiar with authors and institutions
- You can improve as a writer and a presenter
- Your laboratory can improve its protocols
- Over time you will be building your knowledge
  - In graduate school, I read over 100 articles on PCR before I ever did a single experiment
  - I have gathered and cataloged ~9,000 articles over the last 20 years of work in the forensic DNA field
  - My books include reference lists that are as comprehensive as possible (because of this reference collection)
- Remember: **You don't have to master every paper…**

How many scientific articles have you read recently?



Francis Crick

The Astonishing Hypothesis (1994), page xiii



"There is no form of prose more difficult to understand and more tedious to read than the average scientific paper."

My thoughts on how to read a scientific article

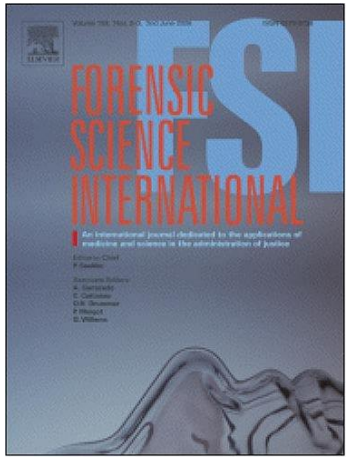
- Skim the article first
  - Start with title and abstract (may consider authors as well)
  - Scan tables, figures and figure captions
- Examine results and conclusions
  - Do the data presented support the statements made?
- Do not worry about trying to comprehend the entire article at first
  - Most articles will be skimmed rather than read from start to finish
- Highlight key points and make notes on the paper itself so you can go back to them later to refresh your memory

Journal Clubs

- Do you have one in your laboratory?
- How often do you meet?
- Is it effective?

Some Forensic Science Journals

Elsevier

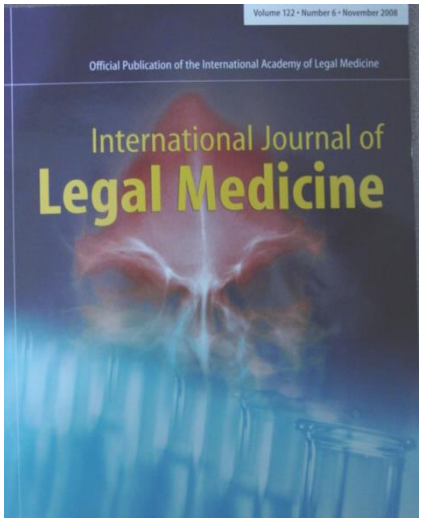


Elsevier

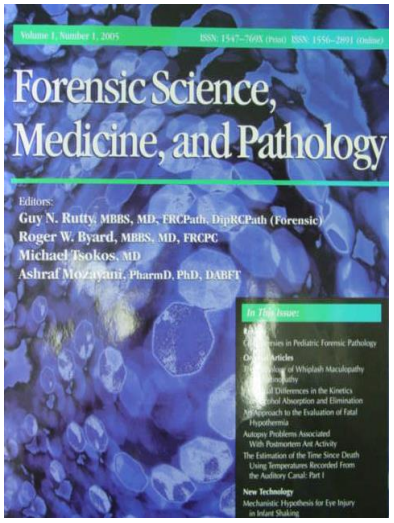
Elsevier

Elsevier

Elsevier

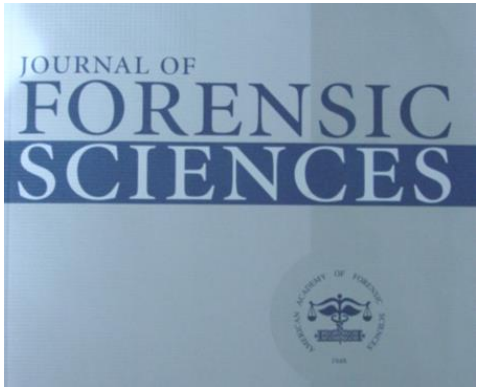


Springer



Springer

Taylor & Francis



Wiley-Blackwell

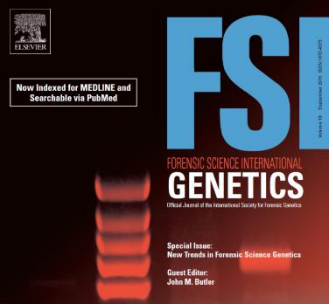
Searching
for what to read

Approaches to Retrieving Information

- **Passive reading**
  - You just happen to come across something interesting while browsing a journal that comes across your desk
- **Active searching** on a specific topic
  - Online tools (free resources and subscription databases)
  - Search strategies and key words used make a difference
- **Automated information push** from key words
  - Subscribing to a website RSS (rich site summary) feed informs you as the user to receive notification of any updates to the site based on key words provided

Selecting What to Read…

- Review entire journal listing of articles
  - Examine journal issue or view table of contents on-line
- Perform directed searches on specific topics
  - PubMed **http://www.ncbi.nlm.nih.gov/PubMed**
  - Web of Science **http://apps.webofknowledge.com**
- Sign up for table of contents delivery via email
- **Examine publications cited in review articles**



Review Articles and Citations in Volume 18

Special Issue: New Trends in Forensic Genetics

1591 references cited in these 14 articles

Author(s)	Topic	Total Citations
J.M. Butler	Introduction and issue summary	14
J.M. Butler	U.S. initiatives to strengthen forensic science	141
T. Sijen	Molecular approaches for forensic cell type identification	153
M. Kayser	Forensic DNA phenotyping	100
C. Phillips	Bio-geographical ancestry	111
R. Cotton & M. Fisher	Sperm & seminal fluid properties	102
C. Børsting & N. Morling	Next generation sequencing	94
E. Romsos & P, Vallone	Rapid PCR of STR markers	118
P. Gill et al.	Historical overview of STR genotyping and interpretation	177
K. Gettings et al.	STR allele sequence variation	110
R. Just et al.	Mitochondrial DNA heteroplasmy & NGS	88
T.M. Diegoli	STR markers on the X and Y chromosomes	248
R. Ogden & A. Linacre	Wildlife forensic science & genetic geographic origin assignment	63
M. Brion et al.	Molecular autopsy & NGS	72

Contributions from Focused Meetings

From a UK Royal Society Meeting Held in London February 2015

PHILOSOPHICAL TRANSACTIONS B

rstb.royalsocietypublishing.org

Opinion piece

Cite this article: Butler JM. 2015 The future of forensic DNA analysis. *Phil. Trans. R. Soc. B* **370**: 20140252.
http://dx.doi.org/10.1098/rstb.2014.0252

Accepted: 26 February 2015

One contribution of 15 to a discussion meeting issue 'The paradigm shift for UK forensic science'.

The future of forensic DNA analysis

John M. Butler

National Institute of Standards and Technology, Gaithersburg, MD, USA

The author's thoughts and opinions on where the field of forensic DNA testing is headed for the next decade are provided in the context of where the field has come over the past 30 years. Similar to the Olympic motto of 'faster, higher, stronger', forensic DNA protocols can be expected to become more rapid and sensitive and provide stronger investigative potential. New short

will impact the future of forensic DNA are explored including the need for education and training to improve interpretation of complex DNA profiles.

Email author to request a copy

john.butler@nist.gov

https://royalsociety.org/events/2015/02/forensic-science/

Storage & Retrieval

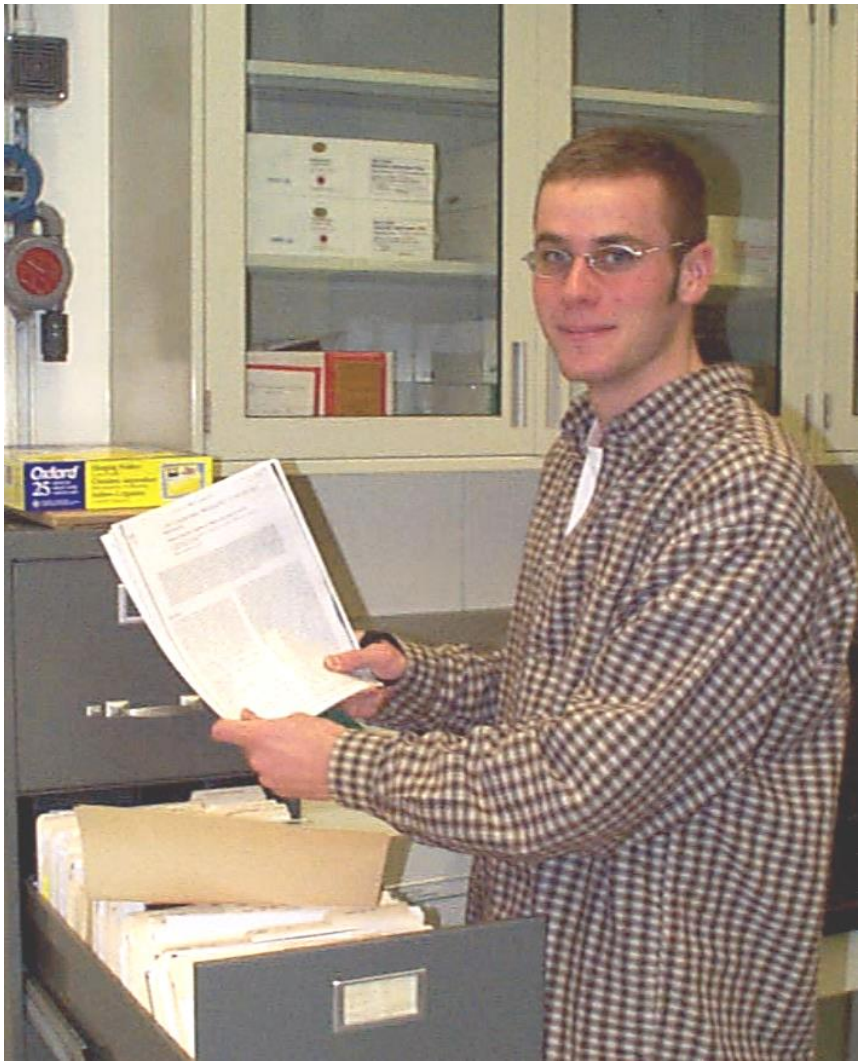
Curation of Collected Articles

- I collect digital copies of articles and have dedicated folders on my desktop computer
- I prefer to read an article from a printed copy so that I can make notes on it

- Do you have piles of paper in your office?
  - If so, how do you find information when you need it later?

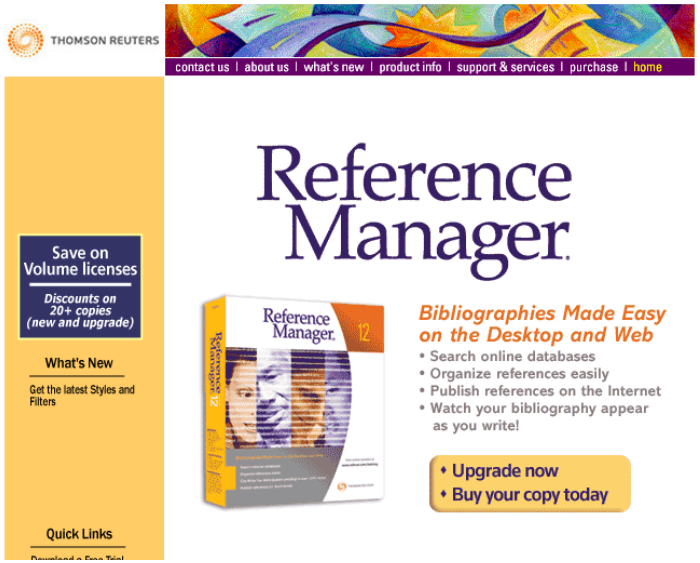
- Do you have an organized filing system that enables efficient retrieval of articles and information you have collected in the past?
  - Upfront curation and classification will improve retrieval

Creating a Reference Collection

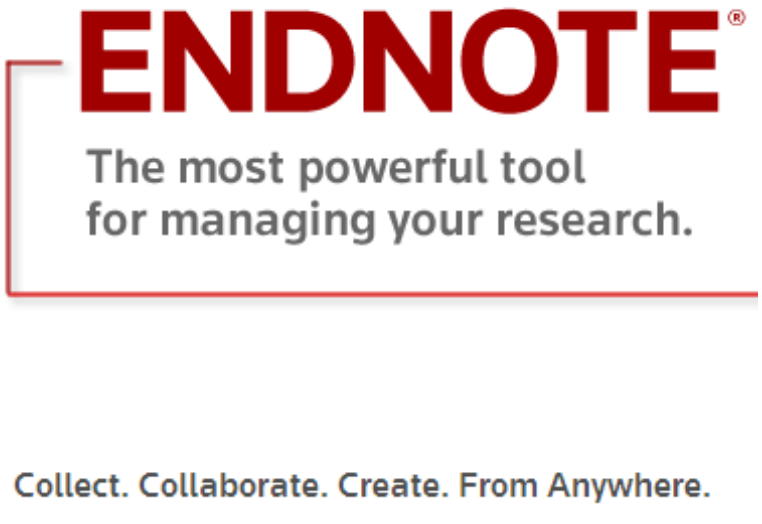


- My forensic DNA reference collection began while I was in graduate school
  - Continued over the years with the help of student interns like Christian Ruitberg shown here
- Mostly printed copies of articles are stored
  - has increasing become digital (this part is not as well organized)

Reference Management Systems



http://www.refman.com/



http://www.endnote.com/

- Article information storage and search retrieval
- Reference formatting for different journals

Develop a system and strategy that works for you to store information

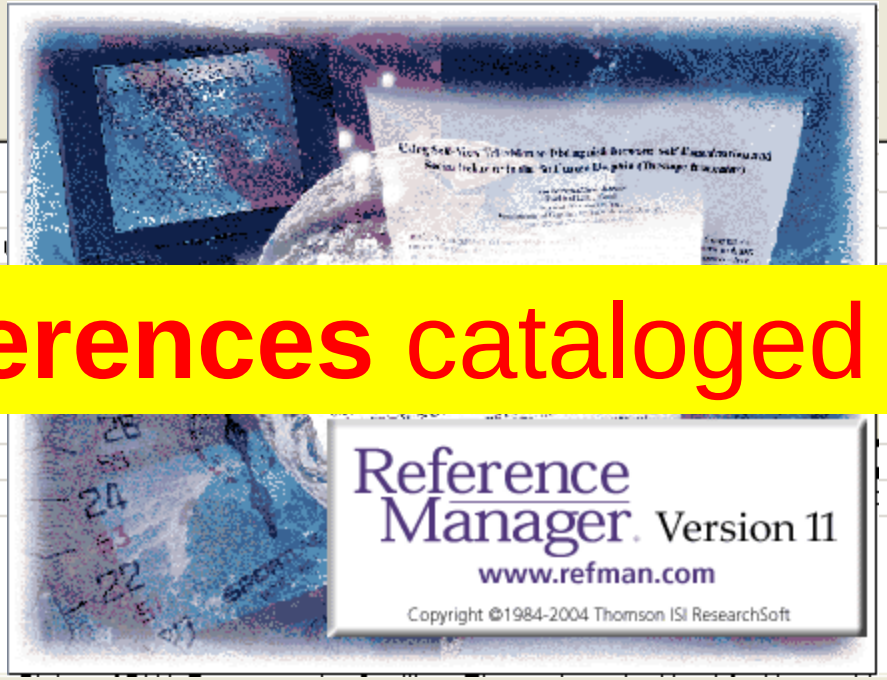
Reference Manager Database

As of Aug 2013: 5115 references in **AllRef** and 3683 references in **STR_Ref**

Reference Manager 11 - [Reference List - str_ref_12 Database: Journal Reference ID 2625]

File Edit View References Tools Window Help

Ref Type*	Journal
Ref ID*	2625
Title	Genetics and genomics of core short tandem repeat loci
Authors	Butler,J.M.;
Pub Date*	2006
Web/URLs	PM:16566758
File Attachments	
Link to Full-text	
Related Links	
Image(s)	
Notes	DA - 20060328 IS - 0022-1198 (Print) LA - eng PT - Journal Article PT - Review



8,798 references cataloged

Ref ID	Authors	Title
2153	Butler,J.M.	Forensic DNA typing by capillary electrophoresis using the ABI Prism 310 and 3100 genetic analyzers for STR analysis
2201	Butler,J.M.	Duplication of DYS19 flanking regions in other parts of the Y chromosome
2461	Butler,J.M.	Locus-specific brackets for reliable typing of Y-chromosome short tandem repeat markers
2477	Butler,J.M.	Chromosomal duplications along the Y-chromosome and their potential impact on Y-STR interpretation
2492	Butler,J.M.	U.S. population data for the multi-copy Y-STR locus DYS464
2550	Butler,J.M.	Allele frequencies for 27 Y-STR loci with U.S. Caucasian, African American, and Hispanic samples
2625	Butler,J.M.	Genetics and genomics of core short tandem repeat loci used in human identity testing
3015	Butler,J.M.	Short tandem repeat typing technologies used in human identity testing
3035	Butler,J.M.	STRs vs. SNPs: thoughts on the furure of forensic DNA testing

Strategies for Scientific Literature Collection and Curation

- Use electronic papers only
- **Put everything into a single file** (e.g., AllRef)
  - use keywords or authors to find specific articles
- **Create separate files for individual projects**
  - Classification problems can arise if an article could possible fit into multiple projects

Fruits of a Good Literature Collection

Review Articles

J Forensic Sci, March 2006, Vol. 51, No. 2
doi:10.1111/j.1556-4029.2006.00046.x
Available online at: www.blackwell-synergy.com

John M. Butler,[1] *Ph.D.*

Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing

Anal. Chem. **2007**, *79*, 4365−4384

Analytical Chemistry **(June 15, 2007 issue)**

Forensic Science

T. A. Brettell*

Department of Chemical and Physical Sciences, Cedar Crest College, 100 College Drive, Allentown, Pennsylvania 18104-6196

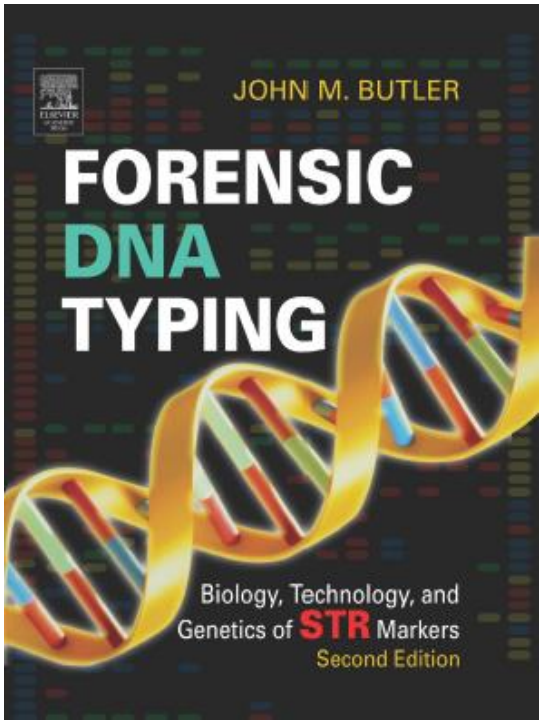
J. M. Butler

Biochemical Science Division, National Institute of Standards and Technology, Gaithersburg, Maryland 20899-8311

J. R. Almirall

Department of Chemistry and Biochemistry and International Forensic Research Institute, Florida International University, University Park, Miami, Florida 33199

Textbooks



2nd Edition 688 pp.
Feb 2005

Butler Books on **Forensic DNA Typing**

Fairly comprehensive reference citations are provided with each topic and chapter

Publication Year

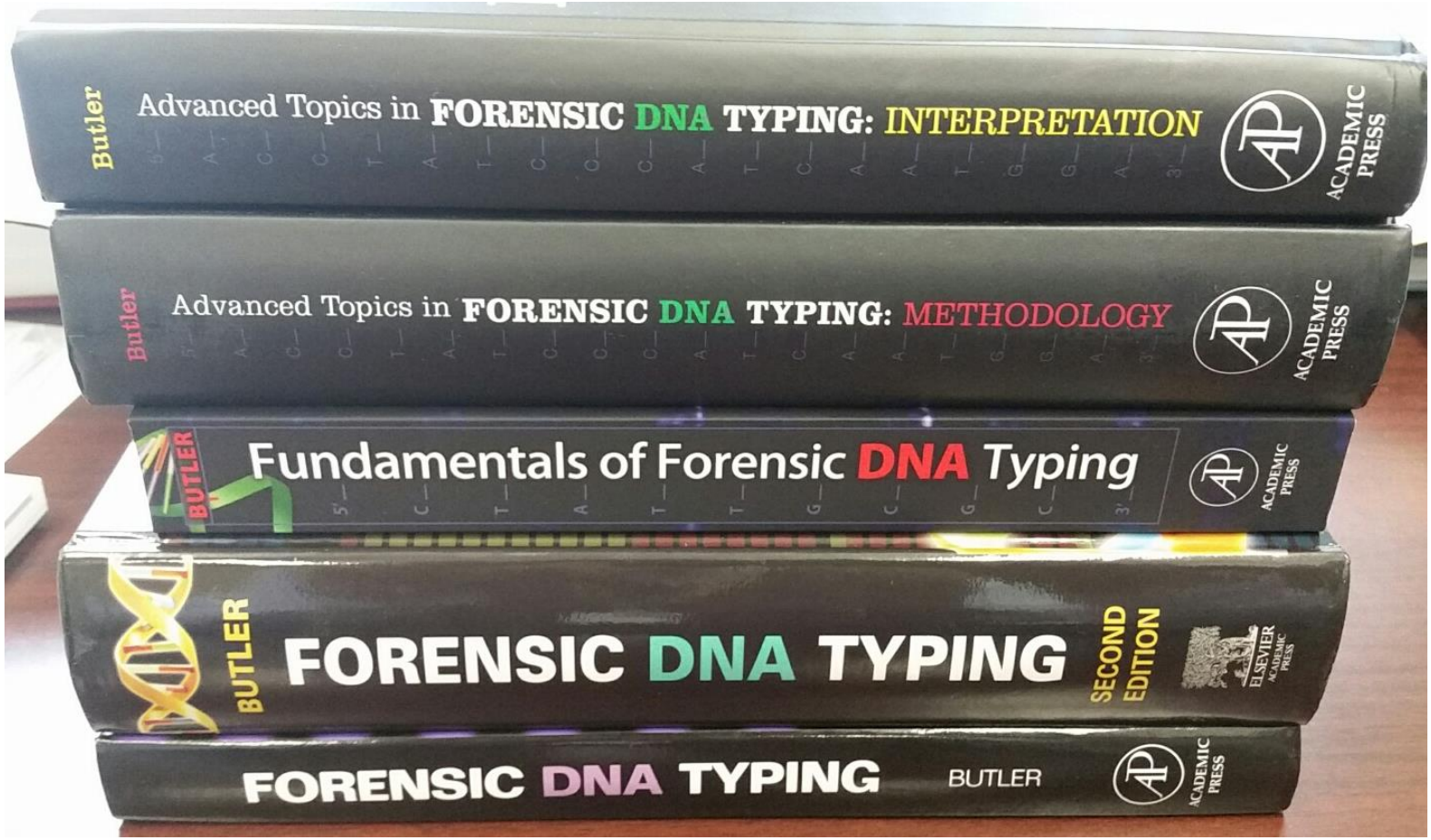
2015

2012

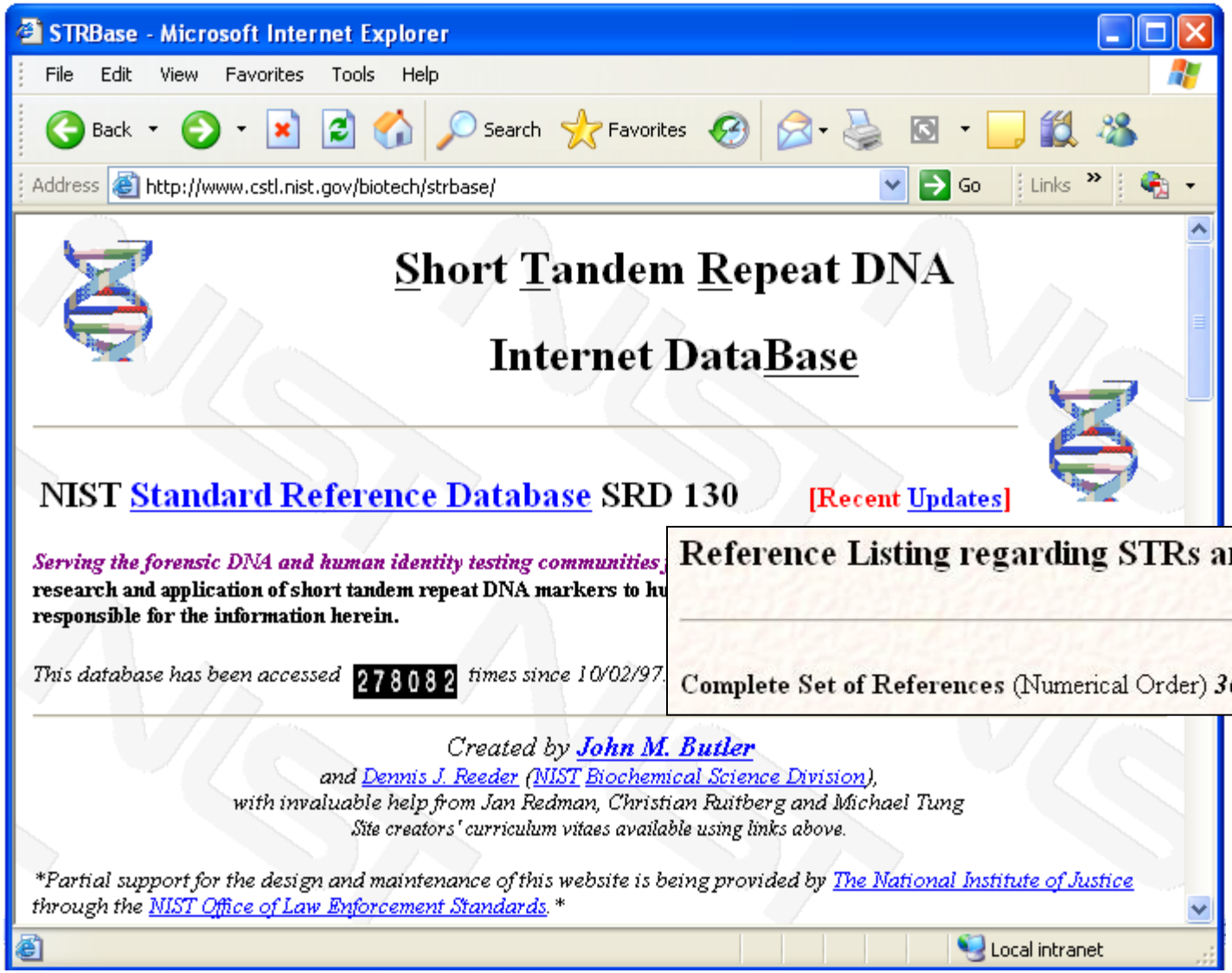
2010

2005

2001



And a Useful Reference Website…



STRBase

Writing
Scientific Articles

Why you need to write up your work

- Peer-review usually generates higher-quality information (but the quality control is not perfect)
- Talks are not held to the same standard as a written publication (that has been peer-reviewed)
- A written publication is also accessible to those who did not attend a presentation and is archived for future scientists to read

Why Publish Scientific Articles?

- **To spread information and share new knowledge with others**
- To gain recognition, success and prestige for the authors and their institutions
- To win promotion to higher positions, job security, and tenure within academia
- To enhance chances of obtaining grants and research funding
- To gain priority for making a discovery

From Prof. Wayne Jones presentation at 19th IAFS meeting (Madeira, Portugal), 15 Sept 2011
"Publishing in Forensic Sciences: Where and How to Publish and the Meaning of Numbers"

Thoughts on How to Write a Scientific Article

- **Outline the ideas first** with a purpose and plan
  - Decide on scope & audience and select target journal
- Write Materials and Methods section first
- Prepare all figures & tables
  - captions should be stand-alone
- Write Results and Discussion based on data shown in figures & tables
- Write Introduction to provide context to your work
- Prepare reference list according to journal format
- **Write abstract last and then finalize title**
  - Most critical pieces since they will be the most read!

Important Steps to Address in Writing a Scientific Article

- Select a journal based on desired audience
- Decide on the scope of information
  - How much data will be covered? Should the material be subdivided into more than one article?
- Decide on article category
  - Original article, technical report, case report, etc.
- Pay attention to the reference format

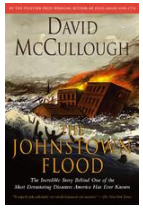
<u>As an editor, one of the first things I examine is the reference list…</u>
If the authors are not consistent with their reference format or sloppy with details (e.g., missing volume or page numbers), then I may have concern with the quality of the work because **DETAILS MATTER IN SCIENCE!**

Some Decisions to Be Made

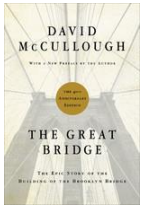
- How to subdivide information into digestible sections?
- What information is needed in Materials and Methods to permit someone to follow and repeat your experiments?
- What should be covered in a figure or table?
- What should be supplemental material versus material in the paper itself?

David McCullough

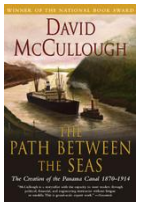
www.barnesandnoble.com



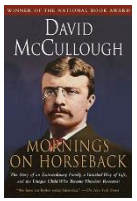
1968



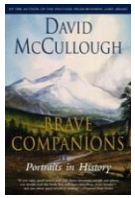
1972



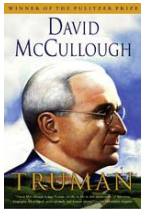
1977



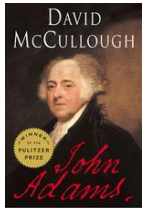
1981



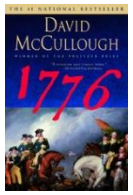
1992



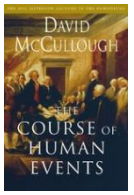
1992



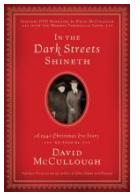
2002



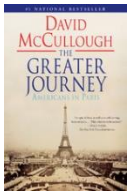
2005



2009



2010



2011

"Writing is thinking. **To write well is to think clearly**. That's why it's so hard."

–David McCullough, Pulitzer Prize winner

(http://www.neh.gov/about/awards/jefferson-lecture/david-mccullough-interview)

My experience with writing

- **Focus**
  - Environment – I need **a quiet place** with no interruptions in order to get into the flow of writing
  - Time – I need **long blocks of time** (around 6 hours has been optimal for me, which typically means late at night)

- **Perspective**
  - **Think from the readers' perspective** (this will require learning to step outside of yourself and see what you have written with fresh eyes)
  - Work on **content flow and clarity** (this will require multiple re-writes to your manuscript)
  - **Know your audience** (you should select a journal from which you have read articles previously)

Training in Scientific Writing is Needed

"To expect scientists to produce readable work without any training, and without any reward for success or retribution for failure, is like expecting us to play violins without teachers or to observe speed limits without policemen. Some may do it, but most won't or can't."

- **Martin W. Gregory** (1992) "The infectiousness of pompous prose", *Nature* 360: 11-12

The Science of Scientific Writing

George Gopen & Judith Swan (1990)

http://www.americanscientist.org/issues/pub/the-science-of-scientific-writing

Some Recommendations to Improve Accessibility:

1) Put grammatical subjects close to their verbs
2) Put information intended to be emphasized towards the end of a sentence (the **stress position**)
3) Place the person or thing whose "story" a sentence is telling at the beginning of the sentence (the **topic position**)
4) Provide context for the reader before sharing anything new

Gopen, G.D., & Swan, J.A. (1990). The science of scientific writing. *American Scientist, 78,* 550-558

http://www.ees.elsevier.com/fsigen/

Forensic Science International: Genetics

Welcome to the online submission and editorial system for *Forensic Science International: Genetics*.

FSI: Genetics will be specifically devoted to Forensic Genetics. This branch of Forensic Science can be defined as the application of Genetics (in the sense of a science with the purpose of studying inherited characteristics for the analysis of inter- and intraspecific variations in populations) for the resolution of legal conflicts. This includes paternity testing, criminal casework, and identification of human remains. Although protein and enzyme polymorphisms were firstly used to fullfil the aims of the field they have been substituted nowadays by DNA polymorphisms analyzed by a variety of molecular biological typing technologies. The amount of work in this field has increased enormously with no signs of slowing down with many new applications such as the application to non-human DNA material (crime scene, illegal trade in endangered species evidences, and bioterrorism) and the building and appropriate management of DNA databases.

The scope of the journal includes:

- Forensic applications of human polymorphism: testing of paternity and other family relationships, imigration cases, typing of biological stains and tissues from

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Tutorial for Authors
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Funding Bodies Compliance
Language Services
Authors' Update

Reviewer Information

Log in
Reviewer Guidelines
Tutorial for Reviewers
Reviewers' Home
Reviewers' Update

The Elsevier Publishing Campus

https://www.publishingcampus.elsevier.com/

Free lectures, training and advice in:

- **writing** a journal article or book,
- learning **how to conduct peer review**,
- **understanding** research and publishing **ethics**
- **preparing a successful grant application**

Ranking of the Value and Relevance of Scientific Writing

Lesser value

- Website blogs and opinion pieces
- Non-peer reviewed articles
  - Conference proceedings
  - Letters to the editor
  - Many review articles
- Peer-reviewed research articles – with data!
- **Highly cited scientific articles**
  - Shows support from other scientists over time
  - **Truly a measure of "scientific acceptance"**

Greater value

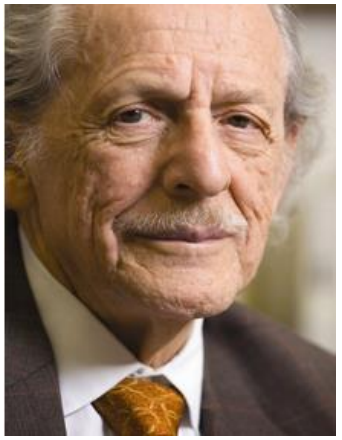
Bibliometrics

efforts to measure scientific productivity
in an academic world of “Publish or Perish”

- **Impact factor (for journals)** http://en.wikipedia.org/wiki/Impact_factor
  - **a measure of the citations to science journals**
  - **can reflect relative importance of a journal to its field**
  - devised by Eugene Garfield, the founder of the Institute for Scientific Information
  - calculated yearly starting from 1975 for those journals that are indexed in the *Journal Citation Reports*

- **h-index (for authors)** http://en.wikipedia.org/wiki/H-index
  - described in 2005 by Jorge Hirsch (*Proc Natl Acad Sci* 102: 16569-16572)
  - an attempt to measure an author’s productivity and impact
  - based on a list of an author’s publications ranked in descending order by the number of times each publication is cited
  - value of h is equal to the number of papers (N) in the list that have N or more citations

Impact Factor of a Journal



Eugene Garfield

- Concept first described in 1955 and developed by Eugene Garfield
- Reflects the average number of citations to recent articles published in the journal
- An impact factor for 2012 (released in 2013)

The number of times that articles published in the journal in 2010 and 2011 were cited by articles in indexed journal during 2012

The total number of "citable items" published in that journal in 2010 and 2011

See Garfield, E. (2006). The history and meaning of the journal impact factor. *Journal of the American Medical Association* 295: 90-93

My Overall Summary Thoughts

READ

- The best preparation to write well is to **critically read a lot of papers**

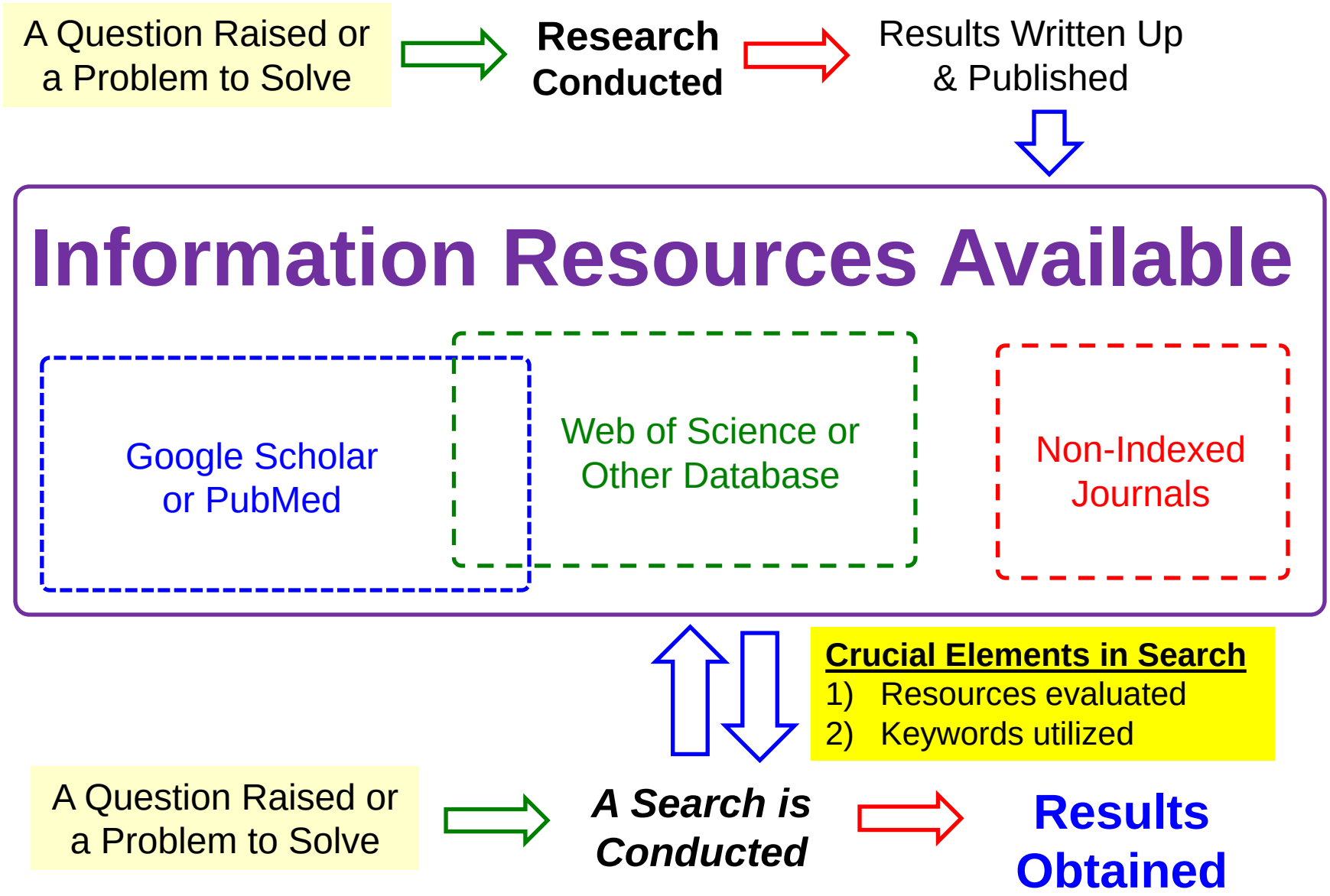
WRITE

- **Writing well takes practice** and is one of the most valuable skills you can develop
  - Effective communication benefits scientific advancement

REVIEW

- **Help review** the work of other scientists
  - As an editor, I appreciate your willingness to be a reviewer when you are asked to help
  - An important way to give back to the community

“Ecosystem” of Scientific Knowledge



Thank you for your attention!

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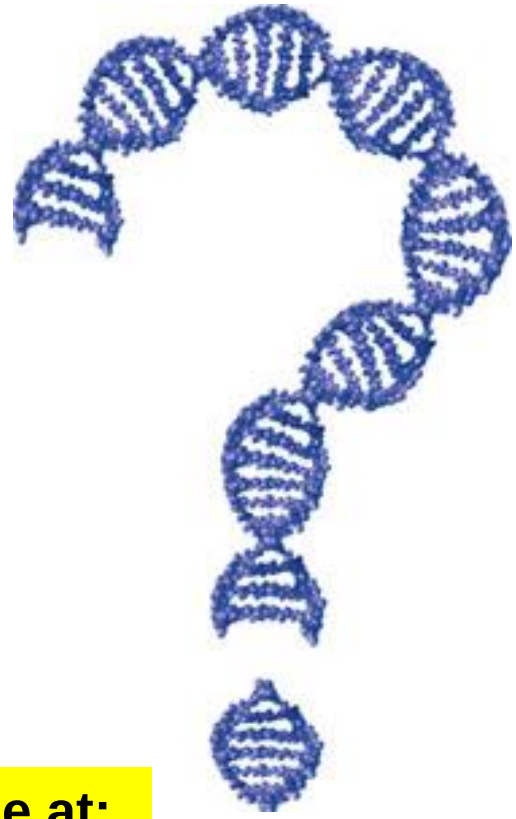
  - Funding from NIST Special Programs Office Forensic Science Program



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http://www.cstl.nist.gov/strbase/NISTpub.htm

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