




ISFG
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WORKSHOP

Scientific Publication: Reading, Writing, and Reviewing

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Points of view are mine and do not necessarily represent the official position or policies of the National Institute of Standards and Technology. Certain commercial entities are identified in order to specify experimental procedures as completely as possible. In no case does such identification imply a recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that any of the entities identified are necessarily the best available for the purpose.


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Workshop Abstract

Science benefits from effective communication of ideas. Research results are shared with others through publications and presentations. Scientific publication involves efforts in reading, writing, and reviewing the literature. Editors of peer-reviewed journals rely on input from scientific colleagues to judge the merits of submitted manuscripts. Knowledgeable reviewers providing timely feedback are important for a successful peer-review process. This workshop will share insights based upon editorial experience with *Forensic Science International: Genetics* as well as extensive writing practice in preparing six textbooks and over 180 research articles and invited book chapters. Reviewing manuscripts is a chance to provide an important service and to influence the scientific community for good. In addition to discussing approaches to reading, writing, and reviewing relevant literature, some recent articles covering forensic genetics will be considered and examined.

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Value of Scientific Publication



Gerard Piel
(1915 – 2004)
Publisher of Scientific
American magazine

**“Without publication,
science is dead.”**

In a 1675 letter by Isaac Newton: **“If I have seen further,
it is by standing on the shoulders of Giants.”**



**“A scientific experiment is
not complete until the
results have been published
and understood.”** - Robert A. Day

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Outline and Topics to Be Covered

- Introductions
 - Me & Each of You
- Why Publish?
 - What Bibliometrics Are Used?
- How to Read a Scientific Article
- How to Write
 - Submission and the Peer-Review Process
- How to Review

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Introductions

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Family (six children) **A Little About Me**



<https://strbase.nist.gov>



• I currently work in the Special Programs Office at the National Institute of Standards and Technology (NIST)

• I **perform research** in forensic science, **write articles** (>180 so far), **review articles** (>1,000 so far), and **teach others** about what I have learned (>500 talks in 26 countries so far)

• Researcher with the FBI (1993-1995), AFDIL (1995-1996), a start-up company (1997-1999), and NIST (1995-1997, 1999-2013, 2013-now)



I have written **five textbooks on DNA that are used all over the world**



UNDERSTANDING
FORENSIC DNA

SUZANNE BELL & JOHN BUTLER
Cambridge University Press
2022

Writing the Books on Forensic DNA: Dr. John Butler
<https://www.youtube.com/watch?v=6yDUuV1Tis>

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Acknowledgments for Those Assisting Me in Gaining My Experience in Scientific Writing

- **My father** inspired me to write through his example of authoring textbooks (my first book is dedicated to him)
- **My wife** regularly corrects me and helps me ensure that my words can reach a non-scientist
- Colleagues at NIST (particularly **Kathy Sharpless** & **Dave Duewer**) have provided input on my last three books & other research/review articles over the years
- Graduate school advisors (**Bruce McCord**, **Ralph Allen**, & **Bruce Budowle**) had an important influence on helping me writing my PhD dissertation and my first few research papers

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The 3 R's of Scientific Publication: Reading, (Re-)Writing, and Reviewing

- **Reading**
 - Strategies and tools for reference collection
- **Writing**
 - Preparation and submission process
- **Reviewing**
 - Experiences with *FSI Genetics* and *Journal of Forensic Sciences*

"Writing a manuscript is arguably the single most critical component to being a scientist – one for which, in many cases, formal training is minimal."
- Dr. Nathan Blow, *BioTechniques* editor-in-chief (May 2013, p. 235)

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Introductions & Expectations

- **Your Name**
- **Your Laboratory/Employer**
 - Or are you a student?
- **What you hope to learn in this workshop?**

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Workshop Participant Expectations

To Be Completed during the Workshop

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Why Write and Why Review?

Forensic Science International: Genetics Supplement Series 4 (2015) v155-v158

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 1084
[https://www.fsigeneticsup.com/article/S1875-1768\(13\)00060-7/fulltext](https://www.fsigeneticsup.com/article/S1875-1768(13)00060-7/fulltext)

... "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..."

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Why Publish?

And What Metrics Are Used for Scientific Publications?

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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"

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Different Types of Articles

- **Original research articles**
- **Review articles**
- Short communications (termed "technical notes" in *JFS*)
- Book reviews
- Case studies (termed "case reports" in *JFS*)
- Opinion or commentary
- Letters to the Editor
 - typically correcting or commenting on a previous publication
- With *FSI Genetics*: Forensic population genetics (original paper, short communication, or correspondence)

Different journals can have different categories and/or required structures for manuscript submission

<https://www.elsevier.com/journals/forensic-science-international-genetics/1872-4973/guide-for-authors>

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Ranking of the Value and Relevance of Scientific Writing

Lesser value

Greater 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"**

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van Noorden, R. et al. (2014) The top 100 papers. *Nature* 514: 550-553

57,798,126 papers examined using Web of Science (1900-2014)

# citations	# articles	%
0	25,332,701	44 %
1 to 9	18,280,005	32 %
10 to 99	13,104,875	23 %
100 to 999	1,066,046	1.8 %
1000 to 9999	14,351	0.025 %
>10,000	148	
>100,000	3	

A 2014 Study on Citations

- "Older papers [have] more time to accrue citations"
- "Biologists tend to cite one another's work more frequently than, say, physicists."
- The top article, a 1951 publication on protein measurement, had been cited **305,148 times**
- Watson & Crick 1953 article on the structure of DNA had been cited **5,207 times**
- Hirsch's 2005 proposal for the h-index to measure scientific productivity had been cited **1,797 times**
- **25,332,701 items had received zero citations** while **18,280,005** were cited 1-9 times → **more than three-fourths of published papers receive less than 10 citations**

<https://www.nature.com/news/the-top-100-papers-1.16224>

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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

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Times cited – ranked highest to lowest with publication year
only first 75 articles shown
My book (2nd edition)

John M Butler
Google Scholar Search
24 May 2022

17992 citations
H-index = 136

h-index = 67

rank	year	# cites	rank	year	# cites	rank	year	# cites	rank	year	# cites
1	2005	2032	16	2002	232	31	2005	163	46	2007	112
2	2006	840	17	2010	214	32	2014	159	47	1994	106
3	2003	681	18	2003	214	33	1998	157	48	2008	103
4	2009	661	19	2000	211	34	2012	153	49	2011	98
5	2011	658	20	2007	210	35	2013	143	50	2009	98
6	2006	658	21	2004	204	36	2011	143	51	1997	95
7	2004	560	22	2016	200	37	2003	133	52	2017	92
8	2001	400	23	2008	196	38	2010	127	53	1999	92
9	2005	384	24	2005	189	39	2003	127	54	2012	89
10	2007	331	25	2004	181	40	2013	126	55	1998	85
11	2004	330	26	2015	179	41	2016	121	56	1994	81
12	1995	294	27	2002	177	42	2011	121	57	2016	80
13	2002	290	28	2006	169	43	2005	118	58	1995	79
14	2014	268	29	2015	163	44	2004	117	59	2013	77
15	1999	252	30	2013	163	45	2005	114	60	2001	77
									61	2006	73
									62	2005	71
									63	2016	69
									64	2002	68
									65	1996	68
									66	2013	67
									67	2004	67
									68	2008	65
									69	2008	63
									70	2018	62
									71	2018	62
									72	2015	57
									73	2004	57
									74	2006	56
									75	2017	54

Most recent articles shown

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Forensic Science, Medicine and Pathology (2022) 18:37–44
https://doi.org/10.1007/s12024-021-00447-0

Top-Ten Most Highly Cited Scientists in Legal and Forensic Medicine

Table 4 Values of the six citation metrics (excluding self-citations) and composite scores for the top-ten most highly cited scientists in the discipline legal and forensic medicine using citation data to end of 2020

ORIG	Scientists	Papers ¹	All citations ²	H-index	H ₅ -index	S-author ³ (cites)	S + F author ⁴ (cites)	S + F + L author ⁵ (cites)	Composite score ⁶
	Kintz, P	528	9,453	50	33.7	72 (1,066)	277 (4,825)	367 (6,706)	4,1313
	Kopser, M	326	16,649	69	21.7	14 (358)	56 (3,070)	173 (8,593)	4,0327
	Gill, P	206	11,092	59	22.9	16 (501)	72 (3,876)	142 (7,791)	4,0250
	Byard, RW	934	8,711	36	23.8	218 (918)	517 (3,886)	847 (6,559)	3,9657
	Drummer, OH	290	8,031	47	27.3	37 (862)	90 (2,236)	201 (5,210)	3,9649
	Jones, AW	310	4,885	37	29.2	109 (1,402)	224 (3,407)	274 (4,415)	3,9599
	Butler, JM	151	8,978	50	22.9	23 (1,052)	58 (2,592)	96 (4,280)	3,8991
	Budowle, B	587	12,795	57	25.9	22 (90)	131 (3,577)	362 (7,987)	3,8084
	Maska, B	747	8,217	45	28.8	55 (431)	179 (1,396)	605 (6,413)	3,8005
	Brinkman, B	455	8,843	45	24.9	20 (360)	106 (1,643)	345 (5,268)	3,8488

¹ Number of papers in SCOPUS database 1960–2020
² Number of citations to all articles with that person's name
³ Number of papers with that person's name as single author and cumulative number of citations
⁴ Number of papers with that person's name as single + first author and cumulative number of citations
⁵ Number of papers with that person's name as single + first + last author and cumulative number of citations
⁶ Derived using a mathematical formula that incorporates each of the six citation metrics

Note: This H-index is different as it is developed from a different database (Scopus instead of Google Scholar)

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Nobel Laureate Richard Roberts Calls for Eliminating the Journal Impact Factor

Roberts, R.J. (2017) An obituary for the impact factor. *Nature* 546: 600

- "I suggest that the time has come to formally declare this metric's [the impact factor's] demise."
- "The impact factor is often used, improperly, to provide a mathematical measure of a scientist's productivity, on the basis of where they published their results. It has proved popular with bureaucrats, and even with many researchers, because it seems to offer an easy way to determine the value of a scientist's output for someone who is either unable or too lazy to read that scientist's papers and judge their true worth."
- "It should never have been used and has done great damage to science. Let us bury it once and for all."

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Reading Scientific Articles

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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 submitted manuscripts or in your internal validation summaries
- Your ability to review other's work will improve...
 - Being widely read in your field helps you be better able to critique different papers and to design better experiments (e.g., you can go back to well-designed studies for examples)
 - Remember that just because something is published does not mean that it is necessarily the "best" work or completely relevant to what you may be doing

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Think of a paper that you enjoyed reading

What are the qualities that made it worth reading?

- Interesting title
- Concise and to the point
- New information
- Case work information
- Easy to understand
- New solutions to problems
- Short statements
- Short articles with good findings
- If you want to reproduce a method, then you appreciate the detail
- Articles that inspire you (new fields that are discovered)

Some Responses from Participants in my 2019 Workshop

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The "IMRAD" Format to Scientific Articles

- Introduction – what question is being studied?
- **M**ethods (& Materials) – how study was performed?
- **R**esults – what were the findings in the study?
- **A**nd
- **D**iscussion – what do these findings mean?

- The first scientific journals appeared in 1665 but early articles were descriptive in nature
- The IMRAD approach began to be used in the mid-20th century to focus articles and to make indexing and reviewing easier
- IMRAD was formally defined in 1979 by the American National Standards Institute (ANSI Z39.16-1979) "American National Standard for the Preparation of Scientific Papers for Written or Oral Presentation"

From Day, R.A. (1998). How to Write & Publish a Scientific Paper, 8th edition, Cvx Press, Phoenix, Arizona.

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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
 - **Many articles are never read in detail**
- **Highlight key points and make notes on the paper** itself so you can go back to them later to refresh your memory

John Butler's perspective and not a formal standard!

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Read Print or Electronic Format?

- I prefer articles in print format to read them because I like to mark meaningful passages and make notes in the margins for future use
- I do download and store articles electronically as pdf files (often for future printing purposes)
 - I typically name my files with the following format: **First Author's Last Name / Publication Date / Journal / Title or Brief Description** (e.g., "Butler 2006 J Forensic Sci – genetics and genomics of STR markers.pdf")

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Do You Use a "File Pile" Filing System?



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Benefits of Using a Reference Management Software Program

1. Enables connection to pdf files or indexing of paper records
2. Enables searching and storage of literature citations in a common format
3. Enables easy formatting of references for different journal styles

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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 ~10,000 articles over the last 25 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?

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Journal Clubs

- A journal club is a group of individuals who meet regularly (in person, online, or both) to **critically evaluate recent articles** in the academic literature (*Wikipedia*)
- Do you have one in your laboratory?**
- How often do you meet? Is it effective?**
- We can learn from how the medical profession has conducted journal clubs as a method to learn from colleagues
 - Deenadayalan, Y., et al. (2008) How to run an effective journal club: a systematic review. *Journal of Evaluation in Clinical Practice* 14(5): 898-911

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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



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Selecting What to Read is Important

- 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>
- Sign up for table of contents delivery via email
- Examine publications cited in review articles**
 - You are trusting someone else (that you respect) to provide your reading list

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19th Interpol International Forensic Science Managers Symposium Proceedings



- Topics:** DNA, fire investigation, forensic management, firearm examination, glass & paint, gunshot residue, questioned documents, fingermarks, fibers & textiles, digital evidence, shoe & tool marks, imaging & video, toxicology, controlled substances, explosives
- DNA review: 235 articles discussed

<https://www.sciencedirect.com/journal/forensic-science-international-synergy/special-issue/T0QWNF78TVR>

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Lessons Learned on Searching (from Jeff Teitelbaum)

- Publicly accessible databases and search engines can be incredibly useful
- Never rely on only one resource.** Using multiple resources is essential to quality results
- Using search operators can dramatically improve your search results
- Spend time to learn about the advanced features and techniques for each resource
- Work to find the specific terminology used in the scientific literature.** Using PubMed search box prompts can be useful.

Slide from AAFS 2016 workshop (Information Does Exist Beyond the First Page of Your Google Search)
Jeff Teitelbaum "Free Forensic Science Information Resources for the Practitioner"
Available at http://strbase.nist.gov/training/5_Case%20Example_Teitelbaum.pdf

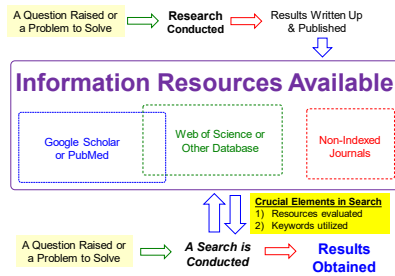
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Curation of Collected Articles

- 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

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“Ecosystem” of Scientific Knowledge



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Writing Scientific Articles

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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

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Who is Your Audience? When You Write a Scientific Paper

- Other scientists
 - Your colleagues (those in the same field – e.g., forensic genetics)
 - Scientists reading outside their discipline (e.g., molecular biologists)
 - Students who are just getting started in the field
 - Non-native English speaking scientists
- In some cases, members of the general public such as journalists or lawyers

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

- David McCullough, Pulitzer Prize winner



<https://www.goodreads.com/quotes/320581-writing-is-thinking-to-write-well-is-to-think-clearly>
(Interview with NEH chairman Bruce Cole, *Humanities*, July/Aug. 2002, Vol. 23/No. 4)

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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

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Some Helpful Resources

- Duke Graduate School Scientific Writing Resource (<https://sites.duke.edu/scientificwriting/>)
- Whitesides, G.M. (2004). Whitesides' group: writing a paper. *Advanced Materials*, 16, 1375-1377. See video <https://gmwgroup.harvard.edu/news/george-whitesides-how-write-paper-communicate-your-research>.
- Day, R.A. (1998). *How to Write & Publish a Scientific Paper*, 5th edition. Oryx Press: Phoenix, Arizona. [8th edition was published in 2016]
- Gopen, G.D., & Swan, J.A. (1990). The science of scientific writing. *American Scientist*, 78, 550-558.
- Ecartot, F., et al. (2015). Writing a scientific article: A step-by-step guide for beginners. *European Geriatric Medicine*, 6, 573-579.

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How to Write & Publish a Scientific Paper (5th edition)
Table of Contents

1. What is Scientific Writing?	13. How to Design Effective Tables	25. How to Write a Review Paper
2. Origins of Scientific Writing	14. How to Prepare Effective Graphs	26. How to Write a Conference Report
3. What is a Scientific Paper?	15. How to Prepare Effective Photographs	27. How to Write a Book Review
4. How to Prepare the Title	16. How to Keyboard the Manuscript	28. How to Write a Thesis
5. How to List the Authors and Addresses	17. Where and How to Submit the Manuscript	29. How to Prepare a Paper Orally
6. How to Prepare the Abstract	18. The Review Process (How to Deal with Editors)	30. How to Prepare a Poster
7. How to Write the Introduction	19. The Publishing Process (How to Deal with Proofs)	31. Ethics, Rights, and Permissions
8. How to Write the Materials and Methods Section	20. Electronic Publishing Formats	32. Use and Misuse of English
9. How to Write the Results	21. The Internet and WWW	33. Avoiding Jargon
10. How to Write the Discussion	22. The Electronic Journal	34. How and When to Use Abbreviations
11. How to State the Acknowledgments	23. E-mail and Newsgroups	35. A Personalized Summary
12. How to Cite the References	24. How to Order and Use Reprints	

also 7 Appendices, a Glossary, and Reference List

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Title citing Drug/Intervention, Context, Design & Main Finding: Use subtitles sparingly for study group names	
Abstract: Comprehensible by itself. Introduction, methods, results, conclusion.	
Introduction	Explain current state of knowledge, with references. Identify the gap in knowledge that you wish to fill with your study. Outline objectives (primary and secondary).
Methods	Describe in detail what you did, and how. Detail selection criteria for study population. Describe all tests, interventions, analyses, techniques... Detail endpoints (primary and secondary). Ethical considerations must be outlined. Statistical methods to be described in dedicated paragraph.
Results	Describe study results. Avoid commentary and interpretation. Give a result for every method presented in previous section. Use appropriate illustrations (Tables and Figures).
Discussion	Start with recap of your main finding. Put your results in perspective with other reports in the literature. Explain significance of results, and how they contribute to the overall state of knowledge, or how they advance knowledge. Outline strengths and limitations.
References	List all sources used as a basis for your work. Check accuracy of all references, even if copied from other papers.

Fig. 1. Summary of basic guidelines regarding the items to include in each section of a scientific manuscript. Ecartot, F., et al. (2015). Writing a scientific article: A step-by-step guide for beginners. *European Geriatric Medicine*, 6, 573-579.

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Important Steps to Address When 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
 - Research article, technical report, case report, etc.
- Pay attention to the reference format

As an editor, one of the first things I examine is the reference list...
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!**

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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?

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Thoughts on How to Write a Scientific Paper

- **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!

Read the "Author Guidelines", which are available from most journals!

Journal of Forensic Sciences: <https://onlinelibrary.wiley.com/page/journal/15564029/homepage/for-authors.html>
Forensic Sci. Int. Genet.: <https://www.elsevier.com/journals/forensic-science-international-genetics/1872-4973/guide-for-authors>

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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)

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The Science of Scientific Writing George Gopen & Judith Swan (1990)

Some Recommendations to Improve Accessibility:

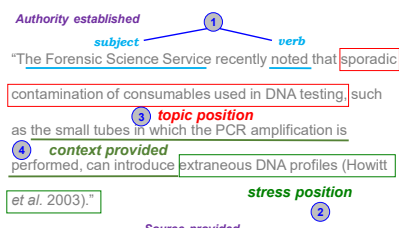
- 1) Put grammatical subjects close to their verbs
- 2) Put information intended to be emphasized towards the end of a sentence (the **stress position**)
- 3) Place the person or thing whose "story" a sentence is telling at the beginning of the sentence (the **topic position**)
- 4) Provide context for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

To provide good flow, place old information in topic positions, and place new, emphasis-worthy information in stress positions.

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

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An Example of These Gopen & Swan (1990) Recommendations



Passage from J.M. Butler (2005) *Forensic DNA Typing*, 2nd edition, p. 153

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English Language Assistance

- If English is not your primary language, it may be helpful to obtain language editing help
- **Reviewers and editors may reject your article outright if it contains poor English**
 - This is a common challenge for many articles submitted from Asia
- On-line resources exist to improve your English writing skills (e.g., <https://sites.duke.edu/scientificwriting/>)
- Fees to perform English editing can be hundreds of dollars per manuscript

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Authorship

- **Authorship brings both credit and responsibility**
 - Can **each author** explain and defend the data and conclusions made in the article?
 - Co-authors should read and agree with the final version of the article PRIOR to submission!
 - The acknowledgments section exists to express appreciation for those who have contributed but not enough for authorship
 - not necessarily appropriate to include everyone in your lab
 - simple sample contribution should not guarantee authorship
- For a discussion on authorship vs. contributorship, see <http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html>
- **Many journals now require the role of each listed author to be described**

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The Order of Authors

- First author (or joint first authors)
 - Primary drafter of the manuscript
- Anchor author
 - Last author listed, usually the principal investigator
- Corresponding author
 - Handles submission and correspondence with the editor
 - Often the first author (who drafts the manuscript) or anchor author (who typically oversees the project)
- **Authorship should ideally be decided by those contributing to the research before the project is completed and the manuscript is written**
- Recommend consistently using full names (e.g., "John M. Butler" rather than "J.M. Butler") as this helps indexing and searching

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Writing the Abstract

- Sketch out text at the beginning stages but **finish the abstract last after the article is written**
- **This should be your best work** as it will be the most read portion of your paper (next to the title)
- Provide sufficient detail to encourage the reader to decide to read the entire paper but ensure that you are accurate in summarizing your work so as to not falsely advertise information that is not in the paper

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Selecting Appropriate Keywords

- Selecting appropriate keywords aids indexing services so that other researchers can find your paper when they perform searches
 - Robert Day commented: "The words in [a scientific] paper should be weighed as carefully as the reagents in the laboratory."
- Your keywords and subject classification during submission can help editors find appropriate peer reviewers

Day, R.A. (1998). *How to Write & Publish a Scientific Paper*, 5th edition. Oryx Press: Phoenix, Arizona; see Chapter 35 "A Personalized Summary"

64

Preparing the Introduction to a Paper

- The purpose of the introduction is **to describe the problem you are studying and some of its history** – **not to just cite previous papers from your group** (to try and improve someone's h-index)
- **You need to understand the history of the problem, but you do not need to share everything you know!**

"All problems have histories and the wisest route to a successful solution to nearly any problem begins with understanding its history."
- David McCullough (2017) *The American Spirit*, Simon & Schuster, New York, p. 20

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Often the first portion of an article that is written

Writing the Materials and Methods Section

- Describe experimental details with enough information so that someone else could replicate your measurements and interpretation if desired
 - List the city and country the first time a manufacturer's product is named
 - List software programs used, and statistical tests employed for calculations
 - List any variations from manufacturer's protocol
 - Cite institutional review board approval (if applicable)
- Significant figures with numerical results reported
 - Relates to population allele frequencies and DNA quantitation values
 - For example, using "15.125 pg" is not appropriate as this number of significant figures implies a level of certainty that does not exist

66

Results and Discussion

- Decide on how to tell the story of your project
- Prepare figures and tables first
- **Describe findings step-by-step in walking the reader through your data**
- Interpret your results in the discussion section in the context of other work, which may have been mentioned in the introduction
 - Sometimes a separate "Conclusions" section can be included at the end of your article

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Reference List

- Should be appropriate, relevant, and without any mistakes
 - In my opinion, your scientific abilities and reputation are connected to quality citations to appropriate references
- As an editor, I use the reference list as a gauge for the attention to detail that authors exhibit
 - If references are incomplete, have mistakes, or are in different formats, then I can lose confidence in quality of the work coming from the authors
- **Extensive self-citation suggests both a lack of humility and perhaps failure to appreciate the work of others in the field**
 - Are you really familiar with the literature if you can only cite your own work?

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Acknowledgments

- Credit funding sources (\$)
- Express appropriate appreciation for input of other individuals who are not coauthors but who assisted in some way
 - you can be specific with describing their contributions
- If the anonymous reviewers (and possibly editor) provided useful feedback in their initial reviews, then they may be recognized in the revised manuscript

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Suggestions for Writing and Re-Writing

- Write, then read, then re-write, then read, then re-write (continue this process as needed)
 - **Dozens of drafts may be required to polishing a text into the desired document**
- **Read the text out loud as you are editing...**
 - Write as if you were presenting to a friend
- Write in short sentences where possible
 - Omit unnecessary words
 - Don't use words your audience will likely not understand. Your goal is to clearly explain your work, not sound smart.

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

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Additional Thoughts on Writing

- **Writing involves a lot of re-writing** (edit, edit, edit)
- Re-read your manuscript one final time before submission (perhaps after waiting a day or two to approach it with a fresh perspective)
- **Ask others for their input (and be willing to listen and learn from their suggestions)**
 - At NIST, we have an internal review process for all manuscripts before they are submitted to a journal

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Errata and Letters to the Editor

- **Mistakes happen and should be corrected to fix the scientific record**
- If you discover the mistake
 - a Letter to the Editor can be written and submitted to note the correction needed (called an "erratum"; "errata" is plural form)
- If someone else discovers your mistake or raises a concern (regarding an issue that is real or perceived), then the critic(s) may write a Letter to the Editor exposing the issue
 - Original authors being criticized are typically given an opportunity to respond
 - Be kind in responding to critics and treat them with respect even if you disagree with their position

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How Data Are Presented Makes a Difference

(A) t (time) = 15', T (temperature) = 32°; $t = 0'$, $T = 25°$;
 $t = 6'$, $T = 29°$; $t = 3'$, $T = 27°$; $t = 12'$, $T = 32°$; $t = 9'$, $T = 31°$

(B)

Time (min)	Temperature (°C)
0	25
3	27
6	29
9	31
12	32
15	32

(C)

Temperature (°C)	Time (min)
25	0
27	3
29	6
31	9
32	12
32	15

Gopen, G.D., & Swan, J.A. (1990). The science of scientific writing. *American Scientist*, 78, 550-553

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Why Readers Prefer a Specific Order

Contextual information appearing in regular steps

The "new" (measured) information

Time (min)	Temperature (°C)
0	25
3	27
6	29
9	31
12	32
15	32

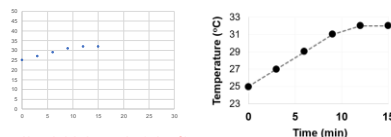
- In English, we read left to right
- Thus, we prefer **contextual information on the left** (in this example, time)
- And our brains prefer **the new information**, what we are trying to "discover" from the measurements made, **on the right** (in this example, temperature)

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

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The Same Data – but in a Figure Format

t (time) = 15', T (temperature) = 32°; t = 0', T = 25°;
t = 6', T = 29°; t = 3', T = 27°; t = 12', T = 32°; t = 9', T = 31°



- No axis labels or units (min, °C)
- Small axis values
- Not scaled to emphasize data
- Data points are small
- Grid lines can be distracting

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Table and Figure Captions

- Captions should be **descriptive enough** so that the table or figure can be **understandable independent of the text**
- I try to think through each element of the table or figure as if I was a reader encountering the information for the first time
 - Remember that writing involves telling a story about your findings so think carefully about how data are conveyed and described

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Submission & the Peer-Review Process

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2015 Numbers from Elsevier

- **Authors:** 1.8 million unique authors worldwide submitted 1.3 million manuscripts to Elsevier journals. (For context, we estimate the total number of active researchers globally at some 7.8 million in 2015.)¹
- **Reviews:** 700,000 peer reviewers conducted 1.8 million article reviews, under the guidance of approximately 17,000 high level handling editors.² An additional 63,000 editors are affiliated with our journals, totaling 80,000 Elsevier editors. Approximately 7,000 of those editors were appointed in 2015.
- **Articles:** Approximately 400,000 of those manuscripts were eventually published in approximately 2,500 active Journals — 73 of which were launched in 2015. 400,000 is about 16%² of the total number of scholarly articles published worldwide in 2015.
- **Archive:** The 400,000 new articles brought the total number of documents available on ScienceDirect to more than 13 million. (It is over 14 million today.)
- **Access:** These articles were accessed by around 12 million people per month, with close to 900 million full-text article downloads for the year.
- **Citations:** Elsevier articles published in the 5 years ending 2014 were cited 11.5 million times in the same period — meaning Elsevier punches above its weight with more than 25% citation share.

<https://www.elsevier.com/connect/elsevier-publishing-a-look-at-the-numbers-and-more>

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Importance of Selecting an Appropriate Journal

- Depends on your intended audience
- Speed to publication
- Impact factor of the journal
- Remember that **peer-review is not perfect**
 - If a poor quality article (or one you have a specific concern with) makes it through the process, then a letter to the editor may be an appropriate avenue to pursue further clarification or correction
- **An editor can reject an article if it is not considered appropriate for the journal's intended audience**

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Predatory Open Access Journals



Predatory Open Access

Librarian Jeffrey Beall of the University of Colorado, Denver maintains a celebrated scholarly publishing "hall of shame"

<http://scholarlyoa.com/publishers/>
<http://scholarlyoa.com/2012/11/30/criteria-for-determining-predatory-open-access-publishers-2nd-edition/>

The New York Times

Scientific Articles Accepted (Personal Checks, Too)
by Gene Smith

The scientists who were recruited to appear at a conference called Entomology 2012 (without the hyphen). The one they had signed up for featured speakers who were recruited by e-mail, not vetted by leading academics. Those who agreed to appear were later charged a hefty fee for the privilege, and pretty much anyone who paid got a spot on the podium that could be used to pad a résumé.

But they found out the hard way that they were wrong. The prestigious, academically sanctioned conference they had in mind has a slightly different name: Entomology 2012 (with the hyphen). The one they had signed up for featured speakers who were recruited by e-mail, not vetted by leading academics. Those who agreed to appear were later charged a hefty fee for the privilege, and pretty much anyone who paid got a spot on the podium that could be used to pad a résumé.

"I think we were duped," one of the scientists wrote in an e-mail to the Entomological Society.

Those scientists had stumbled into a parallel world of pseudo-academia, complete with prestigiously titled conferences and journals that sponsor them. Many of the journals and meetings have names that are nearly identical to those of established, well-known publications and events.


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Manuscript Submission

- Cover letter
 - Although not always required, it helps to **introduce your article with a brief letter to the editor** briefly reviewing your work and its importance
- Suggested reviewers
 - You are welcome to **identify potential reviewers** and reviewers who may have a conflict of interest (suggest who should not review your work)
- **Do NOT co-submit** your article to another journal!
 - We have caught several authors who have done this in the past few years and have banned them from submission to both journals for a period of time

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Other Items with Submissions



- Review the Journal's Guide for Authors
 - <https://www.elsevier.com/journals/forensic-science-international-genetics/1872-4973/guide-for-authors>
- **Include line numbers** next to the text for submitted manuscripts so that these numbers can be used for peer-review purposes
- Please **work on the English grammar** and spelling BEFORE submitting the manuscript (peer-reviewers should not be your language police)

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A (Poor) Example...

- **Editor:** "Please work with a native English speaker if possible to help polish the language as noted by Reviewer #1 below. Once the grammar is improved further, the article appears ready for publication."
- **Response:** "We have revised the language as noted by Reviewer #1 and **polished the grammar as possible as we can.**"

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BioTechniques' Top 10 Submission Tips

from Nathan S. Blow, PhD, editor-in-chief, August 2014

1. Know the journal
2. Know the submission and formatting guidelines
3. Write with an active voice
4. Avoid "wordiness"
5. Practice quality control
6. Create a true cover letter
7. Know your references
8. Format figures and captions correctly
9. Ask the editor
10. Rebut decisions effectively (and respectfully)

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Editor Options with FSI Genetics Articles

No Decision

Reject pre review and suggest transfer

Reject post review and suggest transfer

Reject due to Poor Language

Minor Revision & Submit Interactive Plots

Accept

Revise not Ready for Peer Review

Provisionally Accept

Revise

Reject

the manuscript can be transferred to another Elsevier journal for consideration

- Forensic Science International
- Science & Justice
- Legal Medicine

	Original Submission	Revision 1
Review #1	Minor Revision	Minor Revision
Review #2	Major Revision	Accept
Editor	Revise	Revise

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Some Reasons Why Articles Are Rejected

- Material covered in the article is deemed **inappropriate for the journal or insufficiently novel** by the reviewers and/or the editor
- **Poor English language and grammar** make it challenging for the article to be understood
- One or more of the reviewers feel that **conclusions cannot be supported** by the results
- **Poor experimental design** such that results obtained are not meaningful
- **Rude responses** to reviewers and/or editors **that fail to address concerns** raised during revision

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Responding to Reviews with Revisions

- Address reviewer and editor concerns point-by-point in a direct and pleasant manner
 - Your purpose is to convince the editor (and often the original reviewers) that you have carefully considered the initial concerns raised
- Provide respectful rebuttals
 - Criticism is hard to take but is necessary to improve your work

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Potential Reasons for Delays

- Handling editor may be busy or on travel and slow in assigning potential reviewers
- Potential reviewers decide not to accept and editor has to find other reviewers
- Reviewers are busy and delay turning in their reviews (and editor may have to wait for a second or third review before making a decision)
- Once all reviews are into the editorial system, handling editor is notified but may be busy or on travel and slow in making a decision

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Some Problems I Have Seen as an Editor

- All authors did not review article before submission of revision (and the corresponding author had moved to another laboratory)
- Methods were missing critical details so that experiments could not be repeated
- Misspellings and grammar mistakes
- Potential conflicts of interest not identified

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Galley Proof Review

- Galley proofs are provided to authors to verify the type composition when a manuscript is laid out for publication
- **Review them carefully – all authors should see them** – this is your last chance to avoid appearing foolish before your article goes into print...
- **This can be a lot of work** for the first author and/or corresponding author

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Reviewing Scientific Articles

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The Peer-Review Process

Based on My Perspective as an Editor for Many Years

- Authors write article according to journal guidelines (each journal has an "Instructions for Authors")
- Steps during review
 - Article submitted to journal by corresponding author
 - Assigned to an editor
 - Editor asks 2 or more scientists to review the article in a specific timeframe (usually 2-3 weeks)
 - Editor takes reviews into consideration and responds to author with **Accept, Revise, or Reject**; **"Revise" is most common**
 - Author revises article and resubmits it for another review

Unfortunately, busy scientists often do not complete their reviews in a timely fashion (requiring the editor to remind them)

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Example Timeline for Process of Review

extracted from *FSI Genetics* correspondence history

Step	Date	# Days	Activity
1	11 May	0	Authors submit their manuscript
2	12 May	1	Submission verified by journal
3	3 June	23	Handling Editor assigned
4	6 July	56	Reviewed invited
5	8 July	58	Reviewer #1 accepts invitation
6	6 Aug	87	Reviewer #1 completes review and requests minor revisions
7	7 Aug	88	Reviewer #2 accepts invitation
8	11 Sept	123	Reviewer #2 completes review and requests major revisions
9	28 Sept	140	Handling Editor completes review and provides feedback to authors to revise their submission
10	3 Nov	176	Authors submit revision
11	5 Nov	178	Handling Editor assigned
12	5 Nov	178	Same reviewers invited to examine revision
13	12 Nov	185	Reviewer #2 accepts invitation
14	14 Nov	187	Reviewer #2 completes review and accepts revision
15	20 Nov	193	Reviewer #1 accepts invitation
16	29 Nov	202	Reviewer #1 completes review and accepts revision
17	29 Nov	202	Handling Editor accepts the revision and notifies the authors
18	22 Dec	225	Publisher notification of accepted manuscript

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If Asked to Review...

- Respond quickly with a "yes" or "no" and **be honest** if you cannot complete the review in the requested time period (usually 2 to 3 weeks)
- If the topic is outside your expertise or you think there may be a potential conflict of interest, then you should decline to perform a review on the requested submission
- Helpful to know that you (as a potential reviewer) are out of the office so an editor can avoid inviting you during this time period
 - For some journals, it is possible to alert editors by putting a note in your reviewer on-line profile

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Declining to review

(Source: Peer Review Survey 2009)

If you decline, your suggestions for an alternative reviewer are appreciated

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Qualities of a Good Reviewer

... "Good reviewers provide **objective feedback** to editors and **constructive comments** to authors." -John M. Butler (The triad of scientific publication: reading, writing, and reviewing. *FSI Genetics Suppl. Ser.* 2013, 4: e115-e116)

- Objective
- Thorough and constructive feedback to editor and authors
 - Clear recommendation to the editor
 - Collegial comments to the authors
 - The more detail, the better to improve the article during a revision process
- **Review completed in the requested timeframe**
- Keep contents confidential following review
 - Destroy copy of manuscript

• If you were the author of the article, how would you like a reviewer to treat you?

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Your Review Should Be More Descriptive than This Example...

"This paper contains much that is new and much that is true. Unfortunately, that which is true is not new and that which is new is not true."

• Attributed as a referee's report in H. Eves, *Return to Mathematical Circles* (1988). Also attributed to a 19-th century scientist commenting on one of his competitor's papers, cited in I. M. Klotz, 'How to become famous by being wrong in science', *International Journal of Quantitative Chemistry*, 24, 881-890, which is quoted in Frederick Grinnell, *Everyday Practice of Science* (2008), 86.

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Some Logistics of Reviewing

- I like to **print out the article** so that I can mark corrections and comments on it
- I first **skim** the article to get an idea of the topic and scope involved
- I review the **title, abstract, and conclusions** first
- I check the **reference list** for consistency and format
- I examine the **Materials and Methods** to see if sufficient detail is present
- I **read text and examine figures and tables** carefully and mark comments on the article
- I **type up my comments** and provide them to the editor with a recommendation for acceptance, revision or rejection

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Writing Your Review

- Provide a **brief summary of the article's purpose**
- Provide a **recommendation to the editor** (acceptance, revision, or rejection)
- Provide support for your recommendation through **specific comments** addressed to the authors
- Include **major concerns first** then cover minor issues
- Some changes may be essential and others just suggestions to improve the manuscript (make concerns clear to authors)
 - A reviewer should not copy-edit the manuscript if English grammar needs significant work (just state concern with the readability of the text and perhaps recommend rejection)

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Requesting Additional Experiments

- Remember that this article is not your work...
- Ask and address the question: **"Did the authors adequately set up their study and would their study require any extra work to support their conclusions?"**

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Questions about Tables and Figures

- **Appropriate**
 - Are they necessary? Do they add value to the article? Are there too many or too few?
- **Understandable**
 - Are they easy to understand?
 - Does a figure need color to make it clear?
 - Are captions complete?
 - Are sizes of figures appropriate for what is being shared?
 - Are the quality and readability of the image sufficient?
 - Are figures consistent across the manuscript in terms of font size and style, legends, and axes?

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Additional Areas to Examine

- **Conclusions**
 - Sometimes authors include unjustified claims or make generalizations that are not supported by their results (i.e., they over extrapolate their conclusions)
- **References**
 - Are they appropriate, up-to-date, too many self-citations, or too few citations?

In my opinion, reviewers should not ask for authors (as part of the review) to cite the reviewer's work!

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Do's and Don'ts of the Review Process

Do

- 1) Provide clear comments to authors
- 2) Be consistent with comments to authors and editor
- 3) Provide specific references to text to support your critiques
- 4) Reread your review to ensure you are not too harsh
- 5) Treat authors of a manuscript as your equal independent of quality

Do Not

- 1) State in your comments to the authors your recommendation to the editor
- 2) Praise manuscript in authors comments and disparage it in confidential comments to editor
- 3) Make vague text references or opinions not supported by data
- 4) Send off your review without looking over it at least once
- 5) Talk down to authors (remember that science is a collaborative process)

Lovejoy, T.J., Revenson, T.A., France, C.R. (2011). Reviewing manuscripts for peer-reviewed journals: a primer for novice and seasoned reviewers. *Annals of Behavioral Medicine*, 42, 1-13.

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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
 - Editors appreciate your willingness to be a reviewer when you are asked to help
 - Participating is an important way to give back to the community

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A 2017 U.S. National Academies of Sciences Report

Communicating SCIENCE Effectively

A Research Agenda

Committee on the Science of Science Communication:
A Research Agenda
Division of Behavioral and Social Sciences and Education
A Report of
The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Available at <https://www.nao.edu/download/23074>

- “Communicating science effectively ... is a complex task and an **acquired skill**.” (p. 1)
- “Many believe the scientific community has a **duty to engage with society to disseminate this knowledge** and provide a return on society’s investment in the science enterprise.” (p. 11)
- “Any **communication involves a communicator, an audience, and channels of communication** that are often bidirectional...” (p. 11)
- “The scientific community has an **obligation to communicate** the results of its work to the rest of society.” (p. 16)

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Thank you for your attention!

John Butler
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<https://www.nist.gov/topics/forensic-science>

Questions?

Points of view are mine and do not necessarily represent the official position or policies of the National Institute of Standards and Technology. Certain commercial entities are identified in order to specify experimental procedures as completely as possible. In no case does such identification imply a recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that any of the entities identified are necessarily the best available for the purpose.

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ISFG Official Journal



Year	Volume 1, Issue 1 (March 2007)	v2.1.2	Articles
2007	v2.1.1	v2.1.2	56 articles
2008	v2.1.1	v2.1.2	94 articles
2009	v3.1.2	v3.1.3	90 articles
2010	v4.1.2	v4.1.3	77 articles
2011	v5.1.1	v5.1.2	147 articles
2012	v6.1.1	v6.1.2	186 articles
2013	v7.1.1	v7.1.2	134 articles
2014	v8.1	v8.2	201 articles
2015	v9.1	v9.2	190 articles
2016	v10.1	v10.2	183 articles
2017	v11.1	v11.2	197 articles
2018	v12.1	v12.2	179 articles
2019	v13.1	v13.2	191 articles
2020	v14.1	v14.2	176 articles
2021	v15.1	v15.2	126 articles
2022	v16.1	v16.2	116 articles

since ISFG 2019

439 articles

(v43 to v60)

<https://www.fsigenetics.com/>

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Experts Need Up-to-Date Knowledge in Their Field

Dr. Gillian Tully, the UK Forensic Science Regulator at the time, stated in her 2017 annual report:

“It is a clear expectation of the courts that expert evidence is presented by people who are indeed experts in their field. This necessitates **an up-to-date knowledge of developments in the relevant field**, which in turn necessitates access to scientific literature and sufficient time **to ensure that each expert has the current relevant knowledge that they need.**”

<https://www.gov.uk/government/publications/forensic-science-regulator-annual-report-2017>
(published January 19, 2018, quote from page 10)

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Development of Expert Knowledge


DNA analysts benefit from at least three different levels of expert knowledge:

1. **Education in basic science** covering biochemistry, biology, chemistry, genetics, molecular biology, population genetics, and statistics
2. **Training in forensic science** and specific methods and protocols used in their laboratory to develop competency needed to perform casework
3. **Continued education and professional development** to keep up-to-date as the field evolves and new methods become available

#3 involves knowing the ever-growing scientific literature

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A Constantly Growing DNA Literature...



Review of forensic biology and DNA publications from 2016 to 2019 (12 categories):

1. Core Loci Expansion
2. Rapid Analysis of STR Markers
3. Investigative Genetic Genealogy
4. Next-Generation Sequencing
5. DNA Mixture Interpretation and Probabilistic Genotyping Software
6. DNA Transfer and Activity Level Evaluations
7. Forensic Biology and Body Fluid Identification
8. DNA Phenotyping
9. Privacy and Ethical Issues
10. Guidance Documents (SWGAM, OSAC, ASB, ENFSI, UK Regulator)
11. Contamination Avoidance and DNA Success Rates
12. Recent Special Issues and Review Articles of Note

INTERPOL Review 2016-2019

**Discussed 235 references
from 35 journals
across 12 categories**

INTERPOL Review 2019-2022 (in progress) = **1884+ articles across 32 categories**

- Scopus and Web of Science searches with "forensic DNA" and then removing duplicates and non-English articles
- Manual searches of non-indexed journals such as FSI Reports, WIREs Forensic Science

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Some Improvements That Could Be Beneficial to the Forensic DNA Community

An AAFS 2021 workshop was intended as a start

1. **An agreed upon, defined body of knowledge for DNA analysis and interpretation** and a means to update and remove outdated information as methods evolve
2. **Access to appropriate relevant literature** for technical leaders and analysts
3. **Dedicated time in the workday to read the literature** so that technical leaders and analysts can keep up-to-date with developments
4. **Uniformly documented knowledge assessment**
5. **A method to acknowledge competence in a specific area** to allow true expertise in testimony (e.g., DNA transfer and activity assessments, see van Oorschot et al. 2019)
6. **Additional training for technical leaders in experimental design and data analysis** to assist with validation studies and protocol development

From deliberations and discussions of NIST team members and Resource Group in connection with the Scientific Foundation Review on DNA Mixture Interpretation (see Appendix 2 in NISTIR 8351-DRAFT published in June 2021)

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Creating a Most Valuable Publications (MVP) List

- Experience with an extensive examination of the literature for the NIST Scientific Foundation Review on DNA Mixture Interpretation (2018-2021) – *collecting and studying >1,000 articles*
- Consideration of the new SWGDAM Training Guidelines (published in July 2020)
 - **129 references** in five categories + 6 websites
- Developed initial MVP list in September 2020
 - My assistance was requested from an OSAC task group (I expanded on their initial efforts)
- **Created 26 category groups** (labeled A-to-Z) for various forensic DNA topics
 - Subjective selection of a #1 article followed by reference citations defined by date of publication
 - Selected a **total of 480 articles plus 17 books** = 497 MVPs
- **Conducted a virtual workshop in February 2021 with three co-presenters**
 - Input on articles from experienced practitioners and researchers including Robin Cotton, Mecki Prinz, Charlotte Word, Amy Brodeur, Teresa Chermicha, and Phil Danielson
- **Reduced MVP list from 480 articles to 85 articles** for AAFS 2022 workshop


SWGDM (2020): "This list is not meant to be all inclusive. The laboratory should develop a list tailored to its specific needs."

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(MVP 2021 List) Category A: Plain Language Guides to Forensic DNA Analysis

(MVP 2022 List)

- A1. **Sense about Science (2017) Making Sense of Forensic Genetics.**
A 40-page plain language guide available at <https://senseaboutscience.org/activities/making-sense-of-forensic-genetics/>.
- A2. Jobling, M.A. and Gill, P. (2004) Encoded evidence: DNA in forensic analysis. *Nature Reviews: Genetics* 5(10): 739-751.
- A3. The Royal Society (2017) *Forensic DNA Analysis: A Primer for Courts.*
A 60-page plain language guide available at <https://royalsocietypublishing.org/journal/rsos/170101>
- A4. Press, R. (2019) DNA Mixtures: A Forensic Science Explainer.
Available at <https://www.nist.gov/featuredstories/dna-mixtures-forensic-science-explainer>. See also *Forensic Science Review* 31: 87-91 available at [http://forensicsciencejournal.com/Abstract/31\(2\)-R&C%20Full%20text.pdf](http://forensicsciencejournal.com/Abstract/31(2)-R&C%20Full%20text.pdf)



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Informative Forensic DNA Reviews and Research Studies (A-to-Z)		# Articles	
Category Group	Topic(s) Covered	480 (2021)	85 (2022)
A	Plain Language Guides to Forensic DNA Analysis	4	2
B	Serology and Body Fluid Identification	24	3
C	Collection and Storage of Biological Material	25	2
D	DNA Extraction/Purification, Differential Extraction	18	2
E	DNA Quantitation, Degraded DNA	10	2
F	PCR Amplification, Inhibition, and Artifacts	13	3
G	Capillary Electrophoresis Separation and Detection	12	2
H	Assessing Sample Suitability & Complexity, Low-Template	7	2
I	Estimating the Number of Contributors	12	4
J	Data Interpretation, Mixture Deconvolution, Interlab Studies	12	4
K	Interpretation: Binary Approaches (CPI, RMP, LR)	11	5
L	Interpretation: Probabilistic Genotyping Software	44	4
M	Report Writing and Technical Review	8	4

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Informative Forensic DNA Reviews and Research Studies (A-to-Z)		# Articles	
Category Group	Topic(s) Covered	480 (2021)	85 (2022)
N	Court Testimony, Communication, Juror Comprehension	22	5
O	Autosomal STR Markers and Kits	29	2
P	Mitochondrial DNA Testing	11	3
Q	Y-Chromosome and X-Chromosome Testing	17	4
R	DNA Databases and Investigative Genetic Genealogy	14	3
S	Statistical Analysis	11	2
T	Population Genetics	11	2
U	DNA Phenotyping (Ancestry, Appearance, Age)	24	2
V	New Technologies (Rapid DNA, Massively Parallel Sequencing)	35	5
W	DNA Transfer and Activity Level Reporting	57	8
X	Non-Human DNA Testing	15	2
Y	Method Validation, Quality Control, and Human Factors	23	5
Z	General Forensic Science Topics	11	3

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**(MVP 2022 List) Category W:
DNA Transfer and Activity Level Reporting**

- van Oorschot, R.A.H., Szkuta, B., Meakin, G.E., Kookshoorn, B., Goray, M. (2019) DNA transfer in forensic science: a review. *Forensic Science International: Genetics* 38: 140-166.
- Taylor, D., Abarno, D., Rowe, E., Rask-Nielsen, L. (2016) Observations of DNA transfer within an operational Forensic Biology Laboratory. *Forensic Science International: Genetics* 23: 33-49.
- Kookshoorn, B., Blankers, B.J., de Zoete, J., Berger, C.E.H. (2017) Activity level DNA evidence evaluation: On propositions addressing the actor or the activity. *Forensic Science International* 278: 115-124.
- Taylor, D., Kookshoorn, B. and Biedermann, A. (2018) Evaluation of forensic genetics findings given activity level propositions: A review. *Forensic Science International: Genetics* 36: 34-49.
- Burrill, J., Daniel, B., Frascione, N. (2019) A review of trace "touch DNA" deposits: Variability factors and an exploration of cellular composition. *Forensic Science International: Genetics* 39:8-18.
- Gosch, A. and Courts, C. (2019) On DNA transfer: the lack and difficulty of systematic research and how to do it better. *Forensic Science International: Genetics* 40: 24-36.
- Gosch, A., Euteneuer, J., Preuss-Wossner, J., Courts, C. (2020) DNA transfer to firearms in alternative realistic handling scenarios. *Forensic Science International: Genetics* 48: 102355.
- van Oorschot, R.A.H., Meakin, G.E., Kookshoorn, B., Goray, M., Szkuta, B. (2021) DNA transfer in forensic science: recent progress towards meeting challenges. *Genes* 12: 1766. Available [open access] at <https://www.mdpi.com/2073-4425/12/11/1766>.

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**Testing the Current 26 MVP "A-to-Z" Categories
with the 2019-2022 INTERPOL Review**

Starting with
4,087 articles
Scopus & Web of Science forensic DNA searches
January 2019 to March 2022 (with some additions)

Removed duplicates
and sorted
into 26 categories
MVP "A to Z"
+ 6 additional ones

1,884 articles

MVP	# articles	MVP	# articles	Additional Categories
A	9	N	18	Human Remains ID (DVI)
B	56	O	49	92
C	116	P	95	Microbial & Viral DNA
D	100	Q	117+25	59
E	27	R	77	Microhaplotypes/InDels
F	38	S	54	53
G	5	T	147	Proteomics
H	3	U	172	15
I	10	V	105+32	Sexual Assault Policy
J	20	W	57	33
K	6	X	126	Other Applications
L	63	Y	22	48
M	2	Z	18	(*12 unsorted)

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Some Final Thoughts

- No selection criteria or reference list will be perfect or complete
 - continuing research and future review articles add knowledge to our field
 - some references could be removed to focus content in various categories
- I would love to hear your ideas on how to best maintain an updated list to benefit the community
 - Are there other category groups that should be included in MVP lists?
- How could a national/international MVP list benefit future training?
 - Would it be worth conducting an AAFS or EAFFS survey on this topic?
 - It would be nice to have all of the articles available as PDF files that could be freely shared
 - If we understand the need, then we can lay the groundwork for future possibilities in funding

MVPs of DNA
 2021 (480): https://strbase.nist.gov/pub_pres/AAFS2021-W19-Handouts.pdf (pp. 3-35)
 2022 (85): https://strbase.nist.gov/pub_pres/AAFS2022-W2-NIST-Forensic-DNA-Activities-FINAL.pdf (pp. 77-84)

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