



Technology Tools for Research Integrity

Kaylin A. Adipietro, PhD
Research Integrity Specialist

April 30, 2025





Technology tools used at every level

Institutional Level

- Data collection
- Data management and sharing
- Online training modules
- Auditing and Monitoring



Research Integrity Office Level

- Case management
- Email and data sequestration
- Forensic software
- Image manipulation detection
- Plagiarism detection
- AI





Technology tools used at every level

Institutional Level

- Data collection
- Data management and sharing
- Online training modules
- Auditing and Monitoring



Research Integrity Office Level

- Case management
- Email and data sequestration
- Forensic software
- Image manipulation detection
- Plagiarism detection
- AI



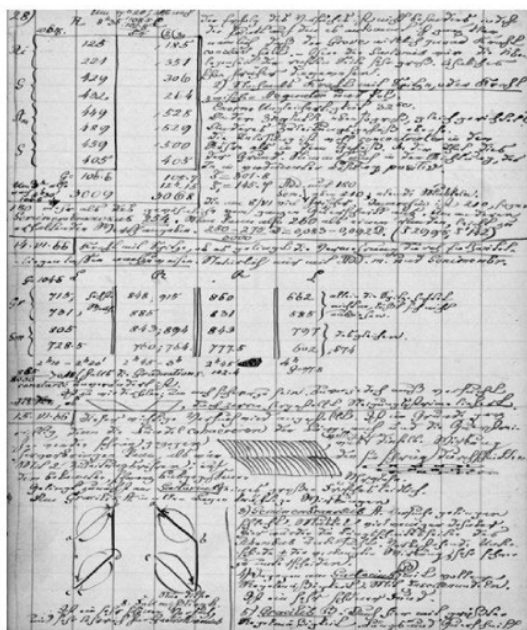


Data Collection

Electronic Lab Notebooks (ELN)

Replicates much like a page in a paper notebook

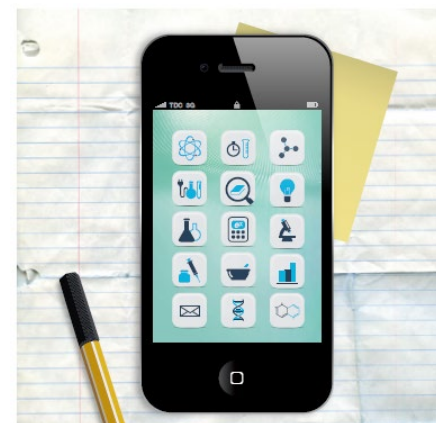
Enter protocols, observations, notes, data



A



B





Selecting an ELN

Using an ELN facilitates good data management

Data security

Supports auditing

Promotes collaboration

Manage inventories, supplies, equipment

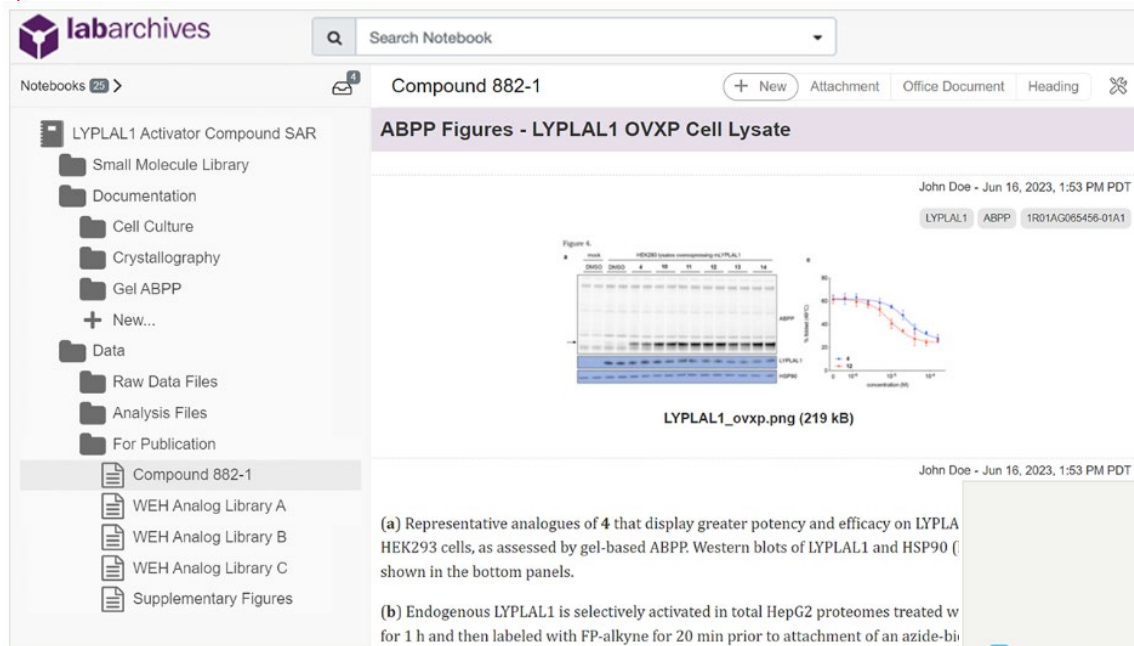
Integrates with common software

- Type of science?
- Institutional ELN policies?
- Security level of data?
- Budget?
- Training lab members?

The image shows a screenshot of a Harvard Archived Martix 2021 table. The table is a large grid with many columns and rows, containing numerical data and some text. The columns are labeled with various categories, and the rows represent individual records. The table is organized into several sections, with some rows highlighted in different colors (yellow, green, blue, red) to indicate different types of data or status. The overall layout is complex and detailed, typical of a large-scale data management system.



LabArchives



labarchives

Search Notebook

Notebooks 25 >

- LYPLAL1 Activator Compound SAR
- Small Molecule Library
- Documentation
- Cell Culture
- Crystallography
- Gel ABPP
- + New...
- Data
- Raw Data Files
- Analysis Files
- For Publication
- Compound 882-1
- WEH Analog Library A
- WEH Analog Library B
- WEH Analog Library C
- Supplementary Figures

Compound 882-1

+ New Attachment Office Document Heading

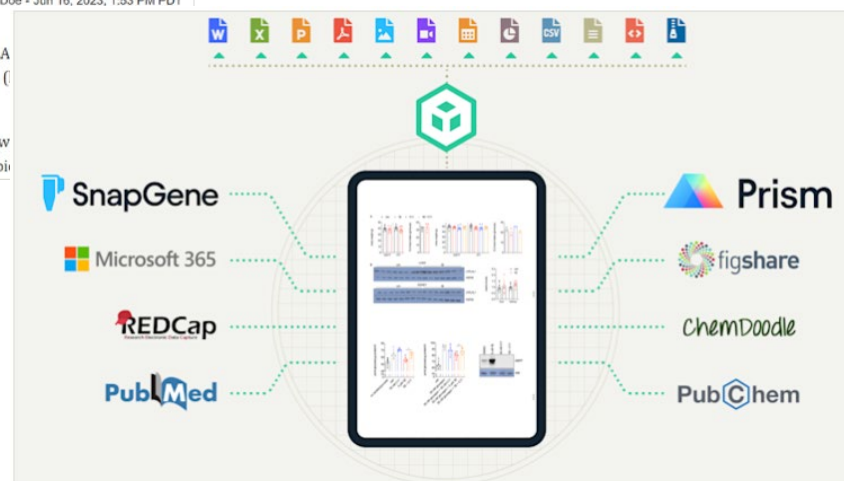
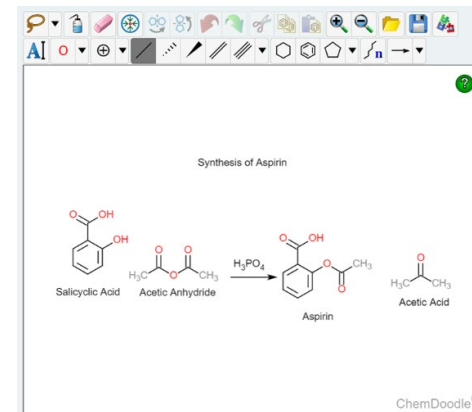
ABPP Figures - LYPLAL1 OVXP Cell Lysate

John Doe - Jun 16, 2023, 1:53 PM PDT

LYPLAL1 ABPP 1R01AG065456-01A1

Figure 4. HEK293 cells expressing LYPLAL1. (a) Representative analogues of 4 that display greater potency and efficacy on LYPLAL1 HEK293 cells, as assessed by gel-based ABPP. Western blots of LYPLAL1 and HSP90 are shown in the bottom panels. (b) Endogenous LYPLAL1 is selectively activated in total HepG2 proteomes treated with 4 for 1 h and then labeled with FP-alkyne for 20 min prior to attachment of an azide-biotin.

LYPLAL1_ovxp.png (219 kB)

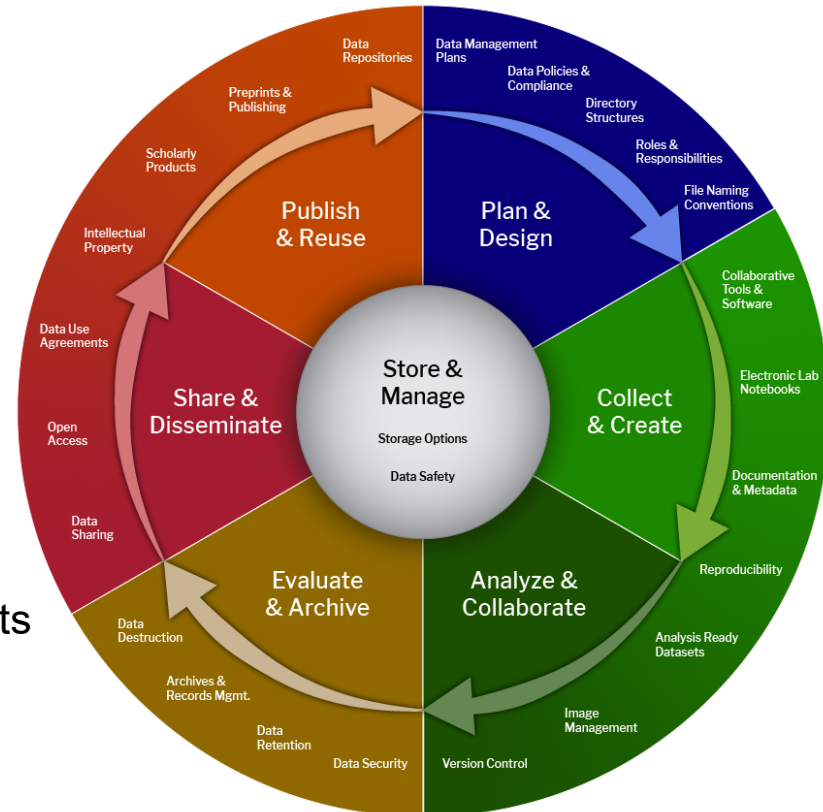




Data Management and Sharing: Data Lifecycle

Why share data?

- Supports open scientific inquiry
- Helps to verify and replicate studies
- Encourages new research and use of alternate methods
- Encourages collaboration
- Provides learning resources for students
- Protects against faulty or fraudulent data
- Improves visibility and impact of research projects





Lab Servers: Saving data for local level access

OneDrive and SharePoint (Microsoft)

DropBox.com

Box.com

Google drive

Cloud associated with ELN



Repositories: Broad sharing of data sets

Discipline-specific

Generalist

Institutional

Open or Controlled Access





Online Training Modules

CITI (Collaborative Institutional Training Initiative)



Center
for
Bioethics & Research

[Home](#)

[About](#)

[Research capacity
development](#)

[Community Engagement](#)

[AI Ethics](#)

[Research](#)

[News](#)



The CITI program is a subscription service which C.B.R has collaborated with to provide research ethics education to all members of the research community.

✓ [How to complete the CITI-IRB training program](#)

✓ [Click here to go to the CITI program](#)

Browse our various training programs on CITI platform



Main Course

Informed consent

Responsible Conduct of Research (RCR)

Conflict of Interest

Biosafety

Good Clinical Practice (GCP)

Good Laboratory Practice (GLP)

Safe Research Environments



New Training Courses

✓ [Artificial Intelligence \(AI\) and Human Subject Protections](#)

✓ [Ethics & Policy issues in CRISPR Gene Editing](#)

✓ [Social Media and Research Recruiting](#)

✓ [Communicating Research Findings](#)

✓ [New Plagiarism Refresher module on CITI](#)

✓ [Ethical and Appropriate Uses of Administrative Data for Research and Evaluation](#)

✓ [Research Study Design](#)

✓ [Essentials of Grant Proposal Development](#)

✓ [Essentials of Statistical Analysis \(EOSA\)](#)

[Start Here](#)





Compliance Auditing and Monitoring Systems

Electronic system for creating, submitting, reviewing, and routing protocols



Welcome to CICERO (Collaborative Institutional Comprehensive Evaluation of Research Online) - the University of Maryland, Baltimore's Research Evaluation Portal.

CICERO is a comprehensive online solution for the review of human, animal, and in vitro research. It is a cooperative effort among multiple committees responsible for supporting the research community at the University of Maryland. CICERO is where research teams can create and submit online all the forms needed for evaluation and approval of research studies by the Institutional Review Board (IRB), the Institutional Animal Care and Use Committee (IACUC), the Institutional Biosafety Committee (IBC), the Radiation Safety Committee (RSC), and the General Clinical Research Center (GCRC).

The screenshot shows the CICERO Research Evaluation Portal dashboard. At the top, there is a navigation bar with tabs for Dashboard, Home, IRB, RSC, and GCRC. The user is logged in as Kaylin Adipietro. The main content area is divided into two sections: 'My Roles & Submissions' and 'Actions...'. The 'My Roles & Submissions' section lists various roles and their corresponding submission counts. The 'Actions...' section contains a 'Manage My Disclosures' button. The 'My Roles & Submissions' section is further divided into 'Annual Disclosures/Updates' and 'Draft Annual Disclosures/Updates'. Both sections show a table of submissions with columns for ID, Name, Date Modified, Status, and Submission Type. The 'Annual Disclosures/Updates' table is currently empty, showing 'No data to display.' The 'Draft Annual Disclosures/Updates' table is also empty, showing 'No data to display.'





Technology tools used at every level

Institutional Level

- Data collection
- Data management and sharing
- Online training modules
- Auditing and Monitoring



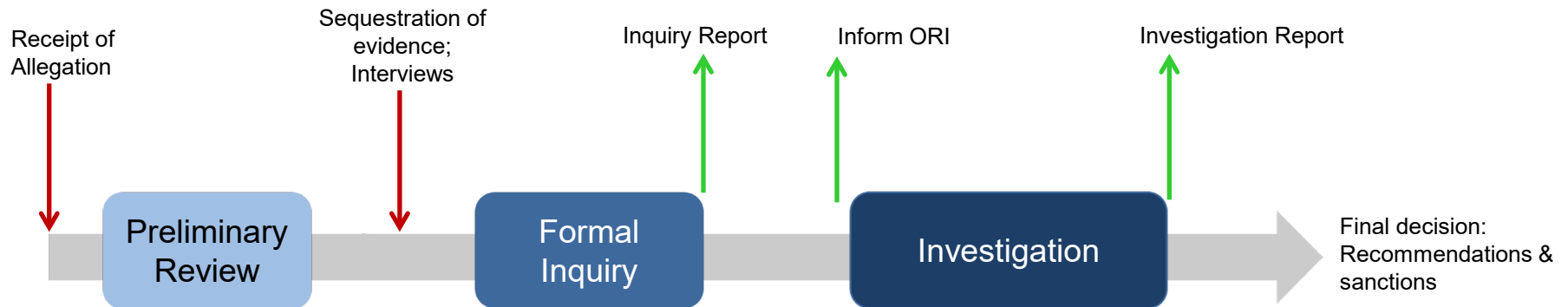
Research Integrity Office Level

- Case management
- Email and data sequestration
- Forensic software
- Image manipulation detection
- Plagiarism detection
- AI





Research Integrity Office



Where Technology is Needed

- Case Management
- Email sequestration
- Data sequestration
- Forensic software
- Plagiarism detection
- Image manipulation detection
- AI programs





Case management System

ETHICSPPOINT®
Incident Management



EthicsPoint® Incident Management OPEN NEW CASE

Home Cases Open New Case Assignments Analytics Analytics Search Admin

Acme
Securities Violations
General Location Participants Items Agencies Attachments Summary Restricted Access Review

* Required

Case type: Intake method:

Received/reported date (mm/dd/yyyy): Alleged incident date (mm/dd/yyyy):

☐ Confidential

Legacy Case Information
Enter this only if you are transcribing a case from another system.

Legacy case number:

Originally entered by:

Date originally entered (mm/dd/yyyy):

Date closed (mm/dd/yyyy):

Primary Issue
Securities Violations

Case Details

Reporter anonymous? ☐ Yes ☒ No

Reporter identity: Prefix: First name: M.I.: Last name: Phone number: Email:

Mike Dropdown:

0 Mike Custom field with Quotes:

6.5 checkbox: ☐

6.6 Tierspecific Date CF: (mm/dd/yyyy)

Custom Field with "Double Quote":

Dans Assignee Dropdown: No assignees available

Dans Checkbox: ☐

Summary - Process Status



● Closed
● In Process
● Abeyant

University of Maryland, Baltimore

Show All Cases opened in All dates

Drag a column heading here to group by that column.

Priority	Source	Case #	EPRS #	Date Opened	Tier	Primary issue	Status	Type	More Info
	Hotline	4842	4/10/2025-1482	04/10/2025	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Non-Hotline	4837		04/04/2025	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Non-Hotline	4795		03/17/2025	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Hotline	4583	10/23/2024-1370	10/23/2024	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Non-Hotline	3447		08/22/2022	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Non-Hotline	3396		06/23/2022	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Non-Hotline	3331		04/12/2022	University of Maryland, Baltimore	Research	In Process	Allegation	More Info...
	Non-Hotline	4777		03/14/2025	University of Maryland, Baltimore	Research	Closed	Allegation	More Info...



Email and data sequestration

RIO works with Center for Information Technology Services
(CITS at UMB)

Digital

- Request emails archives as .pst file
- OneDrive folders
- University-run servers
- Hard drives



Physical sequestration

- Lab notebooks





Email analysis

basic



- Open .pst files in Outlook and employ search function
- Save pertinent files and attachments as PDFs

enhanced

Mail Xaminer		Forensic email analysis	Windows	\$1999 (Basic) \$2499 (Pro)	Forensic email examination program with evidence and case management capabilities.
eDiscovery		Forensic email analysis	Windows		Email examination program through Microsoft outlook



Copy harddrives or make a Forensic copy (image file)

basic



- Copy computer data onto an external drive

enhanced

Forensic tool Kit Imager (FTK Imager)		Forensic Copy	Windows	Free	Create Raw (dd), E01, SMART, AFF image type
Belkasoft Acquisition Tool		Forensic Copy	Windows	Free	Pros/Cons
Macquisition		Forensic Copy	OSX	\$1,000	Macquisition is a dongle used to create forensic copy from Mac computers (Desktops, laptops) without removing the hard drive. No write blocker needed
Kali Linux Forensic boot CD/USB		Forensic Copy	Windows/OSX	Free	This alternative is useful in case the drive cannot be removed (Macs and hardware RAID devices for example). Kali is similar to Macquisition but might require more IT expertise
Tableau Forensic Imager (TX1 Imager)		Forensic Copy	Proprietary	\$3,000	TX1 is a computer that can copy 2 hard drives simultaneously on one destination drive. Write blocker is included. Nothing else is needed
Logicube Forensic Falcon-Neo		Forensic Copy	Proprietary	\$3,000	Same as TX1 imager



Data triage

basic



- Search hard drive copy
- Search hard drive copy using a Write-Blocker



enhanced

Encase v8		Data Triage	Windows	\$3,700	Encase is used by ORI, it can read most of the forensic formats (DD, E01, Ix01). It also includes an acquisition tool such as FTK
E3:P2C		Data Triage	Windows	\$1,990	Similar to Encase with less flexibility in the format it can read (it reads DD, E01)
Forensic tool Kit (FTK)		Data Triage	Windows	Free	FTK is free but has only basic search tools and does not allow the carving of data (searching for deleted files) offered by the paid solutions.
BlackLight		Data Triage	Windows/OSX	\$1,700	Unlike Encase and E3:P2C BlackLight runs on Mac OS and Windows. More user friendly than Encase and E3
Autopsy		Data Triage	Windows/OSX	Free	Open source software sharing some of the features found in expensive solutions

AUTOPSY
DIGITAL FORENSICS



AUTOPSY

DIGITAL FORENSICS

xpinfo1 - Autopsy 3.0.0b3

File Edit View Tools Window Help

Close Case Add Image Generate Report

Keyword Lists Search...

Directory Listing
xp-sp3-v4.001\vol2

Table View Thumbnail View

Name	Mod. Time	Change Time	Access Time	Created Time	Size	Flags(Dir)	Flags
\$Boot	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	8192	Allocated	Alloc
\$Extend	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	344	Allocated	Alloc
\$LogFile	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	23085056	Allocated	Alloc
\$MFT	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	15859712	Allocated	Alloc
\$MFTMirr	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	4096	Allocated	Alloc
\$Secure\$SDS	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	0	Allocated	Alloc
\$UpCase	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	131072	Allocated	Alloc
\$Volume	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	2012-01-20 12:09:03	0	Allocated	Alloc
AUTOEXEC.BAT	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	0	Allocated	Alloc
boot.ini	2012-01-20 17:19:25	2012-01-20 17:20:54	2012-01-20 17:19:25	2012-01-20 12:10:10	211	Allocated	Alloc
CONFIG.SYS	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	0	Allocated	Alloc
Documents and Settings	2012-03-22 19:29:54	2012-03-22 19:29:54	2012-03-10 14:40:46	2012-01-20 12:10:41	56	Allocated	Alloc
IO.SYS	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	0	Allocated	Alloc
MSDOS.SYS	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	2012-01-20 17:20:49	0	Allocated	Alloc
NTDETECT.COM	2008-04-13 22:13:04	2012-01-20 12:11:07	2012-01-20 12:10:07	2008-04-13 22:13:04	47564	Allocated	Alloc
ntldr	2008-04-14 00:01:44	2012-01-20 12:11:07	2012-01-20 12:10:07	2008-04-14 00:01:44	250048	Allocated	Alloc
pagefile.sys	2012-03-10 14:44:29	2012-03-10 14:44:29	2012-03-10 14:44:29	2012-01-20 12:09:08	20971520	Allocated	Alloc
Program Files	2012-03-20 19:25:02	2012-03-20 19:25:02	2012-03-10 14:40:46	2012-01-20 12:11:01	56	Allocated	Alloc
System Volume Information	2012-01-20 17:21:37	2012-01-20 17:21:37	2012-03-10 14:40:46	2012-01-20 12:09:08	56	Allocated	Alloc
WINDOWS	2012-03-05 19:12:38	2012-03-05 19:12:38	2012-03-10 14:40:46	2012-01-20 12:09:08	56	Allocated	Alloc
\$OrphanFiles	0000-00-00 00:00:00	0000-00-00 00:00:00	0000-00-00 00:00:00	0000-00-00 00:00:00	0	Allocated	Alloc

Result View Hex View Media View String View Text View

Page: 1 of 3 Page Go To Page:

```

0x000000: 66 55 66 39 EC 66 FD E5 FF FF 00 00 1E 06 66 53 EVU...f.....ES
0x000010: 66 56 67 B9 FD A4 C1 E9 04 52 CB 03 C1 7D DB EFV...f.....
0x000020: 7D 0C 66 39 CC CC 66 30 0E 00 00 52 D1 30 0E 04 00 f..f.N.f.v.f..
0x000030: 66 39 52 08 66 39 42 0C 66 39 76 14 66 39 7E 14 f..f.N.f.v.f..
0x000040: 66 39 56 18 66 39 6E 1C 7D 0D 66 BC 06 10 00 00 f.v.f.N.f.v.f..
0x000050: 66 55 66 52 66 57 66 56 66 51 66 53 66 39 0C 66 FUVFNVFCOS.f
0x000060: 39 DB 66 39 C9 66 39 66 39 66 39 FF E8 B7 39 4A 4B f..f.f.f.f.f..
0x000070: 02 66 0F B2 26 00 00 66 5F 66 52 66 5B 07 1F 66 j.....
0x000080: 5D CB 00 00 00 00 00 00 00 00 00 00 00 00 00 00 j.....
0x000090: 55 39 EC 56 57 53 60 42 06 B8 00 D8 CD 15 53 39 U.V.W.X.N.....S
0x0000a0: 5E 04 C6 27 C6 41 58 66 07 02 C6 47 03 30 4F ...G.X.g.G.O.
0x0000b0: 04 C6 77 06 C6 57 07 30 7F 08 30 77 0A 5B 5F 5E .W.W.W.W.W.W[_
0x0000c0: 6D C3 39 5C 56 B8 01 D8 60 42 06 60 6E 08 39 j.U.V.....N....
0x0000d0: 76 04 CD 16 60 C4 SE SD C3 06 53 B8 00 FD 7D C0 v.....l.S.....
    
```

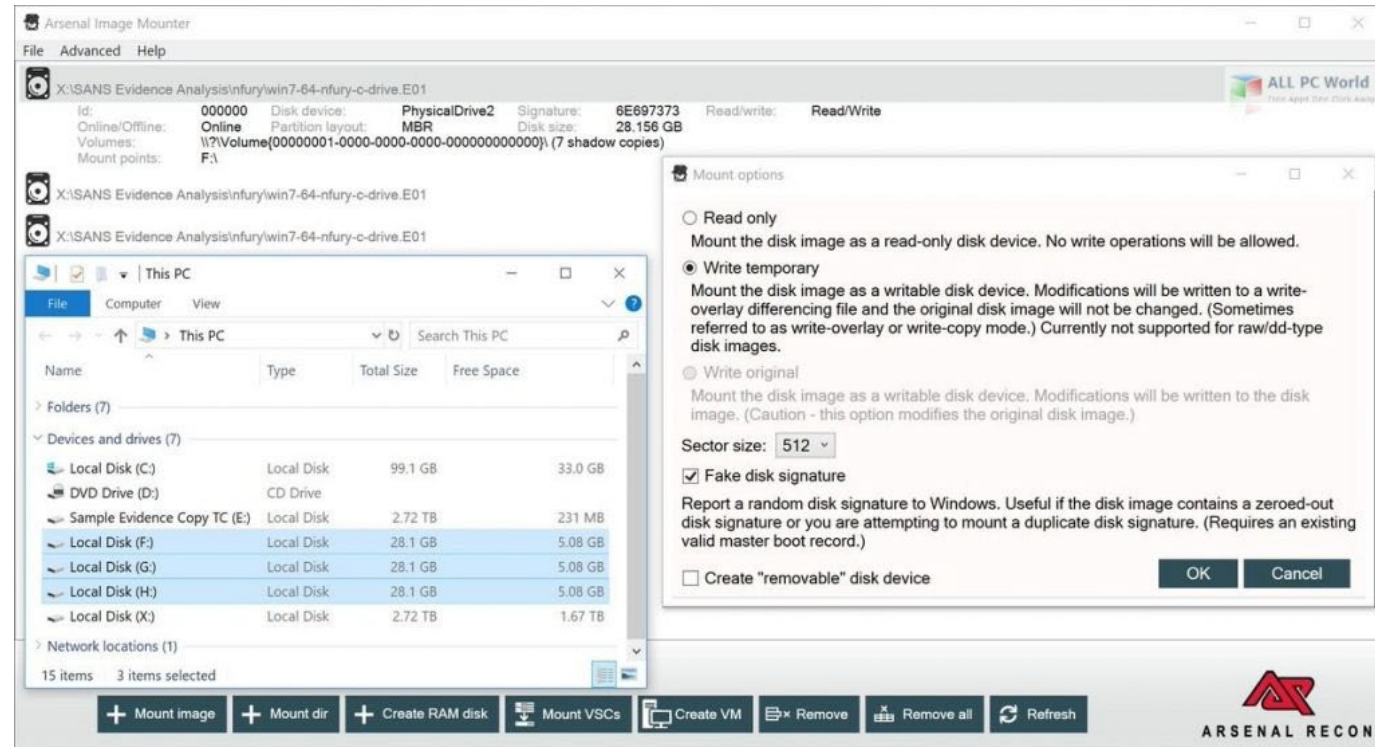




Arsenal image mounter

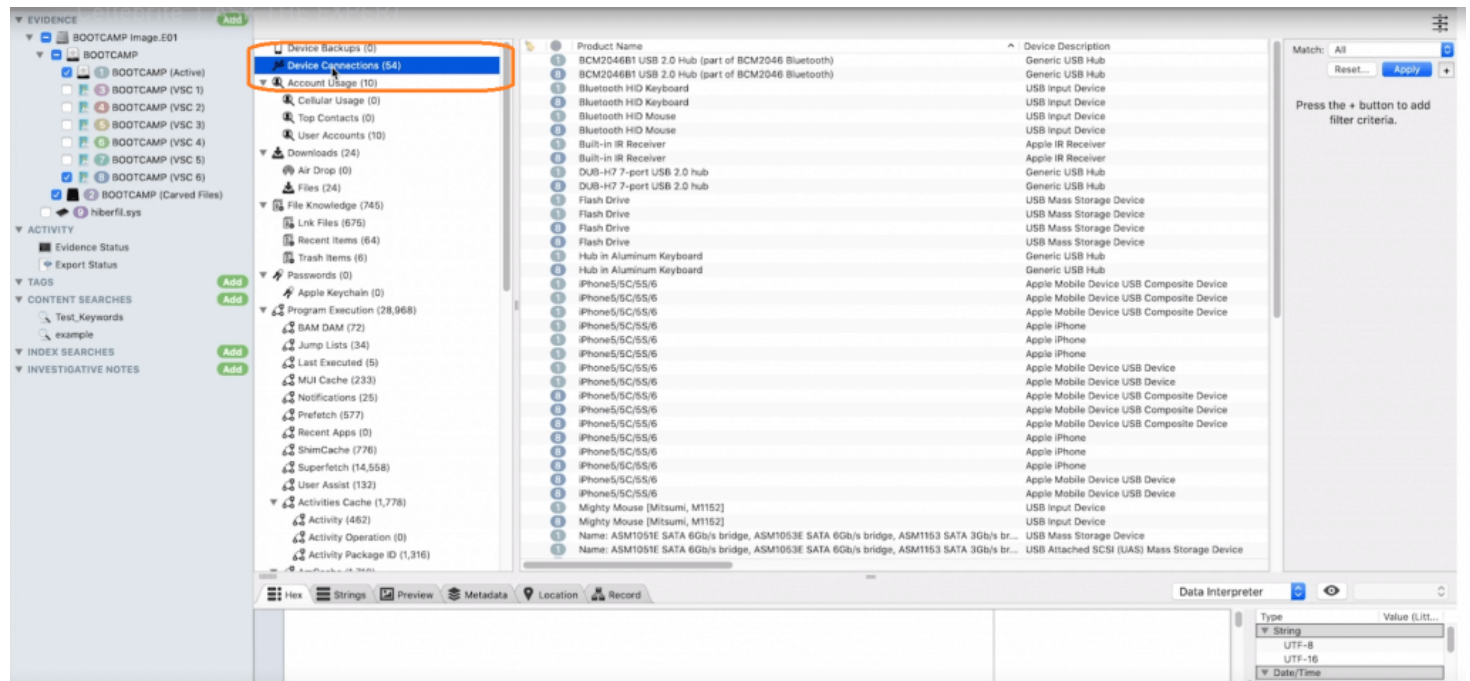


ARSENAL RECON





Cellebrite/Blacklight





Plagiarism detection

Name	Website	Function	Operating System	Price
PapersOwl	https://papersowl.com/free-plagiarism-checker	Compare documents to a database	Windows/OSX	FREE
Duplichecker	https://www.duplichecker.com/	Compare documents to a database	Windows/OSX	Free trial then 100 submissions for \$7/month
Quetext	https://www.quetext.com/	Compare documents to a database	Windows/OSX	Free trial then 200 pages for \$9.99/month
Grammarly	https://www.grammarly.com/plagiarism-checker	Compare documents to a database	Windows/OSX	FREE

Pros

- Free or Low Cost

Cons

- Poor Results—inconsistent, incomplete
- Slow to Process
- Word Limit (Duplichecker, Quetext)
- Security of Search or Documents
- Ethics of Provider





Plagiarism detection

Name	Website	Function	Operating System	Price
Google	http://www.google.com	Compare short sentence to a database	Windows/OSX	FREE
Google Scholar	https://scholar.google.com/	Compare short sentence to a database	Windows/OSX	FREE
Adobe Acrobat	https://adobe.com/	Side-by-side comparison	Windows/OSX	FREE TRIAL

Pros

- Free
- Fast
- Familiar/Easy to Use
- Good Place to Start

Cons

- Basic but limited searches
- Simple comparisons
- Security of Search or Documents





Plagiarism detection

Name	Website	Function	Operating System	Price
iThenticate	https://www.ithenticate.com/	Compare documents side-by-side or to a database	Windows/OSX	\$100/submission (up to 25,000 words/submission)
CopyLeaks	https://copyleaks.com/	Compare documents side-by-side or to a database	Windows/OSX	Free trial then \$10.99 for 25,000 words/month
SimTexter	https://people.f4.htw-berlin.de/~weberwu/simtexter/app.html	Side-by-side comparison	Windows/OSX	FREE
WCopyFind	https://plagiarism.bloomfieldmedia.com/software/wcopyfind/	Side-by-side comparison	Windows	FREE

Pros

- Some Free
- Some Standalone Programs
- Good Security
- Good Results
- Detailed Reports

Cons

- Cost
- Time to Process

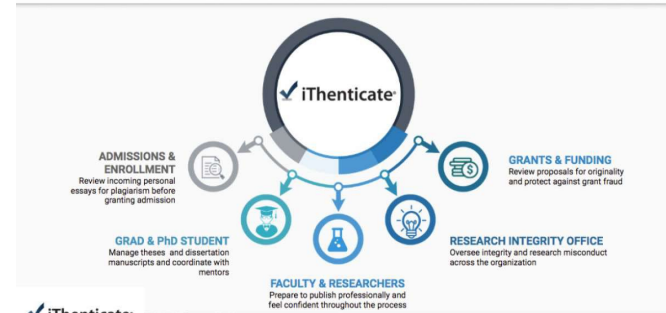




iThenticate

Software detects **Text Duplication**
not Plagiarism

Using iThenticate Across the Organization



26-May-2022 02:54PM 1010 words • 13 matches • 4 sources FAQ

iThenticate Plagiarism detection tools are not what you think they are. Quotes Included 25% Bibliography Included SIMILAR

BY KATHERINE STEBBINS

Plagiarism-detection is big business: earlier this year, a company offering plagiarism-detection software announced that it would be acquired for US\$1.7 billion. However, plagiarism-detection may also be a big pile of horsefeathers, as my grandmother would have said; although these systems can identify some copied text, it is a mistake to think they detect all—or even most—cases of plagiarism.

For the last decade, academic institutions and publishers have relied on percentage and similarity to decide if plagiarism has occurred. A profitable market for investors is web services offering detection capability based on obscure algorithms that purport to show how well one text matches others. Because these systems can detect some cases of plagiarism, there is a misinformed belief that they properly document all cases.

Anyone who has tested plagiarism-detection tools for the past 15 years will agree that the reports they produce are hard to understand, tricky to decipher, and often not accurate. Most of this software provides false positives for frequently used sentences, names of institutions, or lists of references cited. These plagiarism-detection tools also have false negatives. The software might miss a plagiarized case if the original document is not digitized, has typos, or is not in the system's database. Many cases of plagiarism slip through undetected when material is translated or taken from multiple sources. Assessments depend on both the algorithms used and on the corpus of work available for comparison. Depending on the software used, the same text can be reported as fully plagiarized, partially plagiarized, or plagiarism-free. Because results could vary from one day to another, reliability is an issue and will continue to be as long as the algorithms are kept in an impenetrable "black box" containing the algorithm.

As mentioned by Dr. Weber-Wulff, "The number that these systems produce — variously known as 'originality score', 'non-unique content' or 'PlagLevel' — is usually taken at face value". Whatever plagiarism detection software is being used, the produced reports still need a human eye to filter the properly referenced methods and quoted material that should not be flagged.

Unfortunately, institutions' and journal editors' decisions rely on the magic number provided by the algorithm. Even if a report indicates a low plagiarism number, the reviewer must verify that the

Match Overview

1	Internet 222 words crawled on 27-May-2020 www.nature.com	22%
2	Internet 17 words crawled on 14-May-2019 wcr2019.org	2%
3	Internet 10 words crawled on 03-Apr-2021 go.gale.com	1%
4	Crossref 6 words Debora Weber-Wulff, "Plagiarism detectors are a crutch, and a problem", Nature, 2019	1%

PAGE: 1 OF 2 Text-Only Report



Image manipulation



**Adobe
Photoshop**

Artwork by Guillermo Flores Pacheco

© 1990-2024 Adobe. All rights reserved.
For more details and legal notices, go to the
About Photoshop screen.

Initializing tools...

Russell Preston Brown, Jerry Harris, Mike Shaw, Steve Snyder, Yukie Takahashi, Sarah Kong, David Howe, John Peterson, Kellisa Sandoval, Jonathan Lo, Adam Jerugim, Tom Attk, Yuko Kagita, Meredith Payne-Stotmer, Vinod Balakrishnan, Tai Luxon, Dave Dobish, Alan Erickson, Melissa Monroe, Chad Roff, Steve Guilhemet, Maria Yap, John Fitzgerald, Pam Clark, Foster Breerton, Daniel Pinedo, David Hackel, Kevin Hopps, Pete Falco, Jesper Storm Bache, Tanu A gervai, Hannah Pearl, Tushar Turkar, Shamit Kumar Mehta, Poonam Bhalla, Jeff Tranberry, Matt Furch, Soumya Lakshmi, Sohrab A minghodi, Neeraj Arora, Jayesh Viradiya, Betty Leong, Praneet Surabhi, Mansi Chaudhari, Seth Shaw, Zijun Wei, Carlene Gonzalez



- **Forensic Droplets**

Records and saves sequences of steps in the Actions Palette in Photoshop

Forensic Gradient Maps Look Up Table (LUT) that has multiple cycles for contrast or color. Details in images with which contrast or artifacts will be better revealed.

Color Coded Overlay Overlays two images, and color codes each so that individual features in the overlap can be linked back to their respective image.

Features overlap will appear RED, and areas of overlapping background will appear CYAN. Features unique to one or the other image will be WHITE or BLACK. If the same object is common to both images it 1) must be RED and 2) must have a uniform boundary of either BLACK or WHITE.

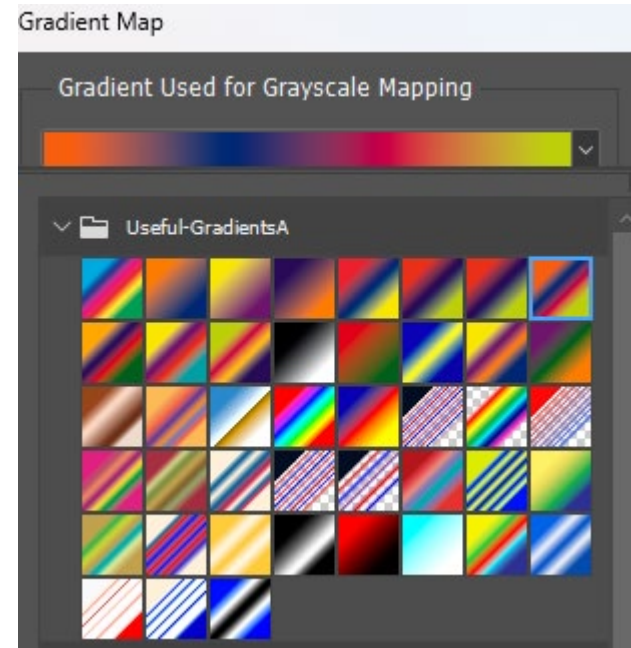
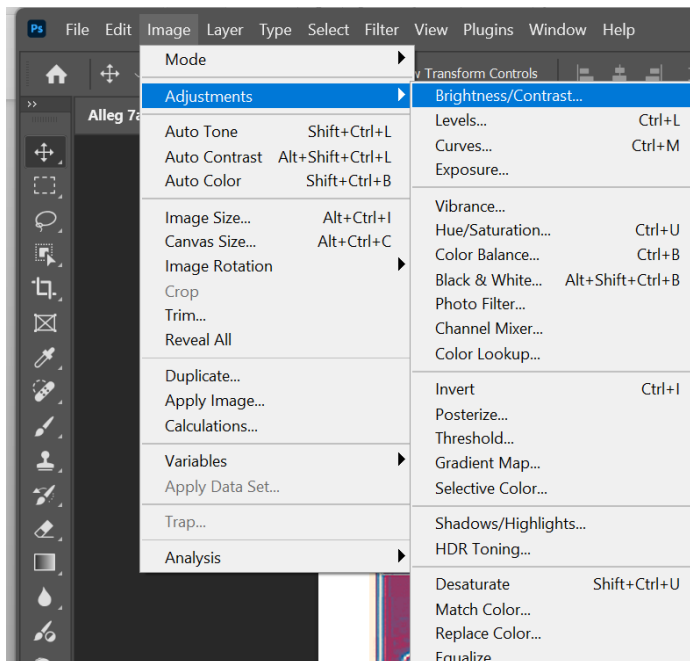




Photoshop

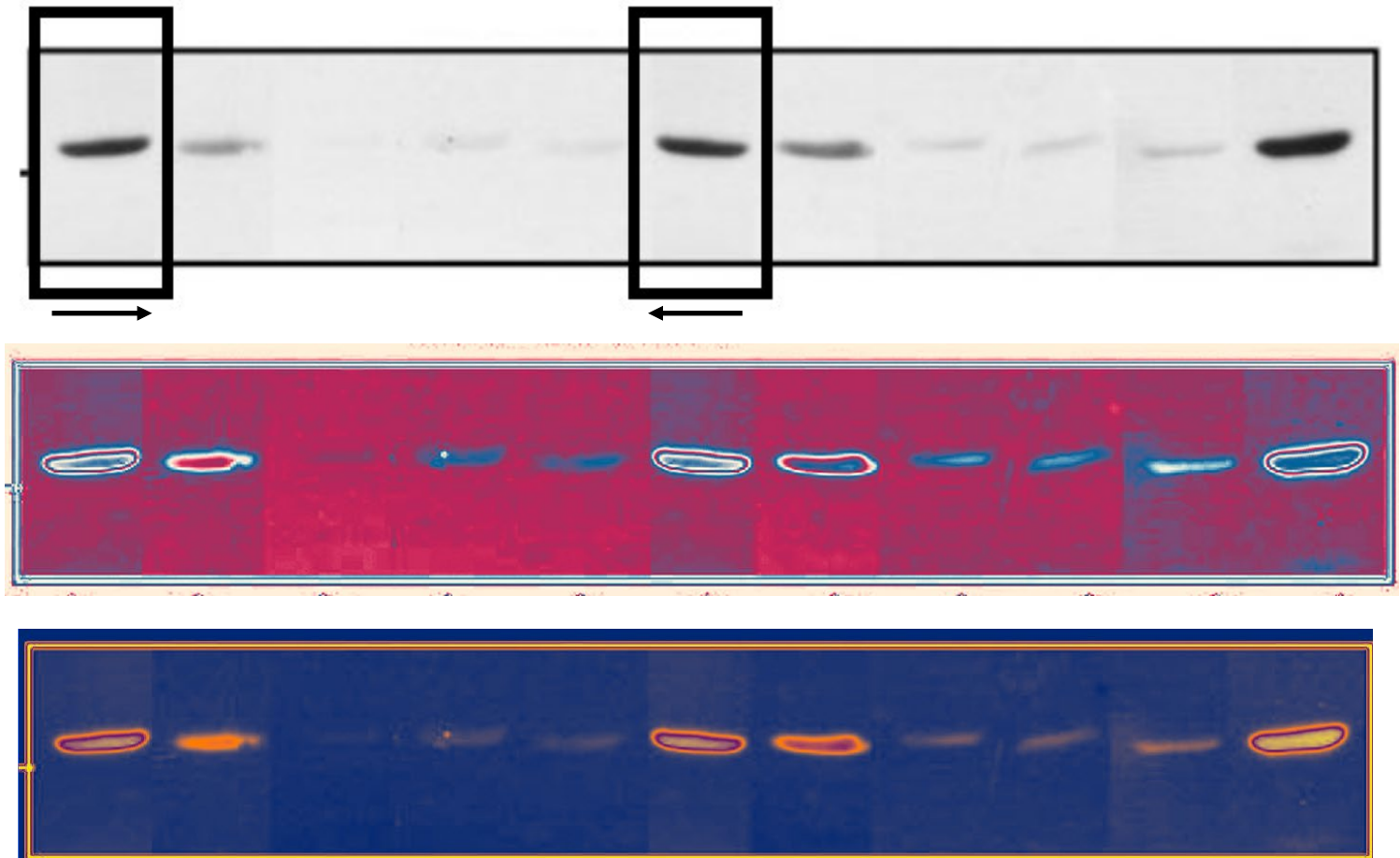
basic

- Adjust brightness and contrast
- Invert colors
- Gradient maps





Gradient map

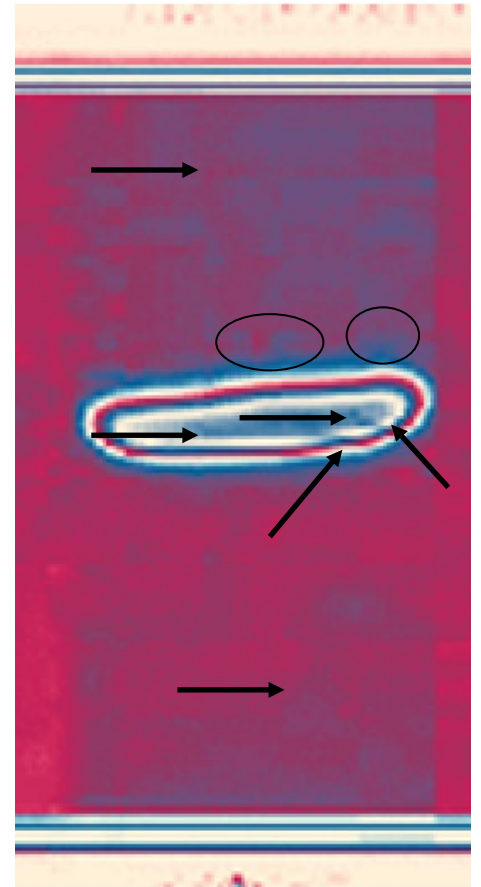
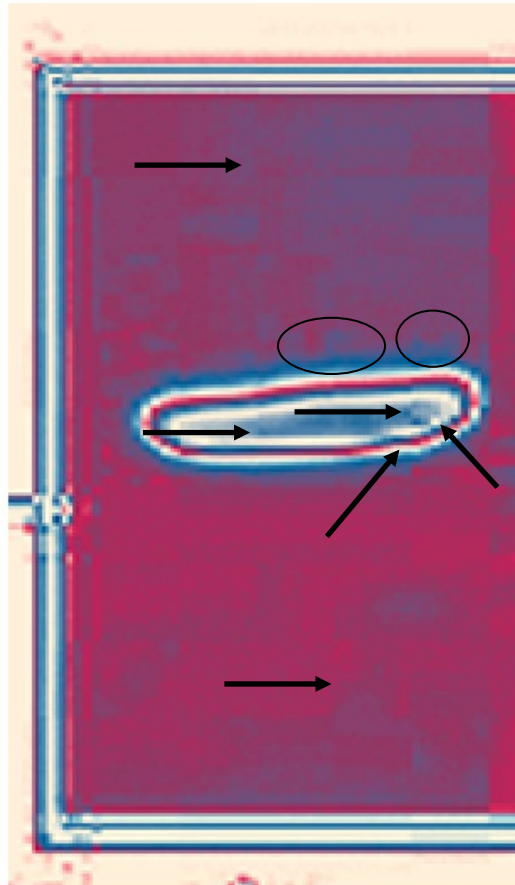




“Too similar to be different”

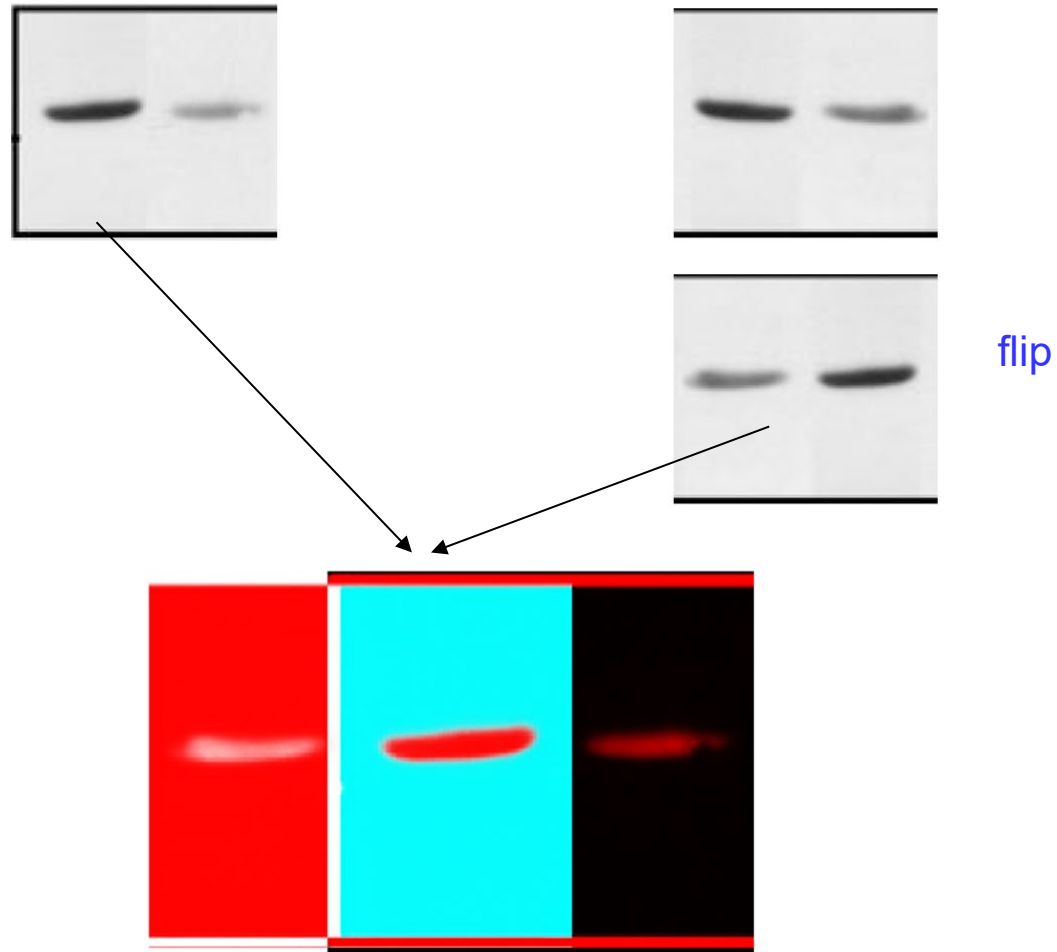


flip





Overlay





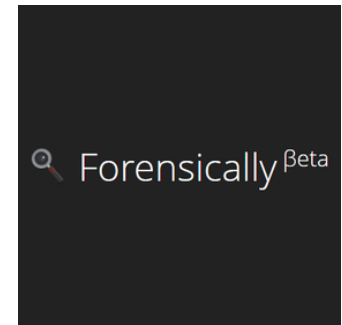
Additional image analysis tools

- PowerPoint → basic image brightness/contrast
- Image J → image processing program from NIH
- Forensically → Free online photo forensic tools
- AI...



ImageJ

Image Processing & Analysis in Java





AI tools to detect research misconduct

- Machine learning is predictive or problem solving that train algorithms on historical data
 - Imagetwin
 - Proofig
- Generative AI is a deep learning model that can create new content
 - Adobe Photoshop
 - ChatGPT etc

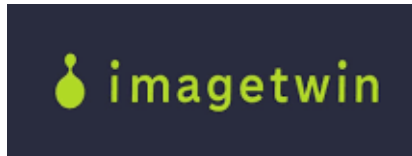
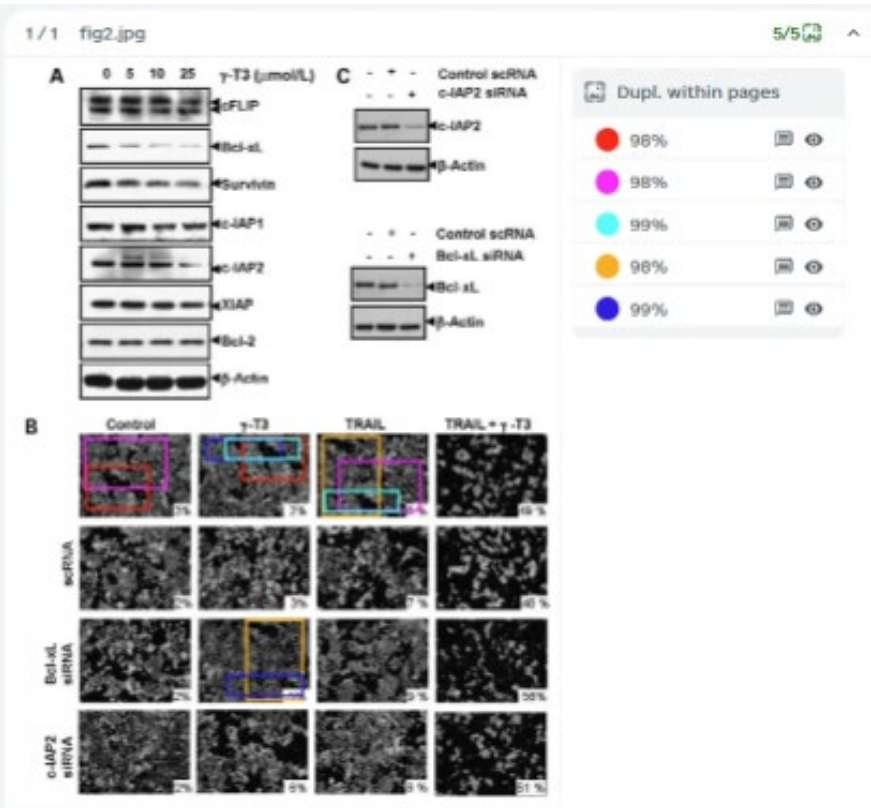




Imagetwin

- Plagiarism detection
- Image manipulation detection
- Compares images within a publication
- Compares against a database of over 50 million images



[illegible][illegible]

The results demonstrate that the fidelity of the NNV helix is independent of the molar ratio of cholesterol and CHENS and also independent of inclusion of AG inside these vesicular structures (Table 2). There was no variation

Figure 5. Transmission electron micrographs of networks as formed inside after direct heating, (1) 0A, (2) 1A, (3) 2B, and (4) 3B. Scale bars, 100 nm.

agreement with the kinetics of release of NG from the NSVs, which also exhibited a biphasic profile *in vitro* (Figure 7). The effect depends on the NG permeability coefficient through the bilayer and is related to modification of the structure of the NSVs (Table 2). A lag time was observed in the first 3 hours, followed by zero-order kinetics until 8 hours of incubation.

Serum stability was further investigated to determine the effect of the *in vitro* environment on NSV. Samples were incubated in HEPES buffer (10 mM, pH 7.4) with (10% v/v) or without (0% v/v) dialyzed bovine serum. The results show that serum content does not modify the profile of AGN-oligosac from NSV at pH 7.4 (less than 0.05 of the integrated drug) after 2 hours (Table S.2).

In vivo evaluation of anti-inflammatory and antinociceptive activity

Our previous results are reported in Figure 6. Figure 6A shows the effect of NCVs on the values induced by zymosan, and Figure 6B shows the effects of NCVs on the macrophage induced by formicin (Figure 6A). The preliminary data demonstrate that empty NCVs (Table 1) have an effect similar to that of HBPS buffer (30 mM, pH 7.4, control).



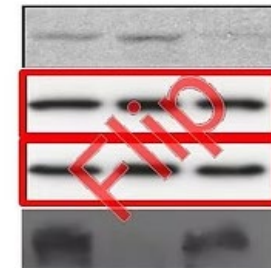
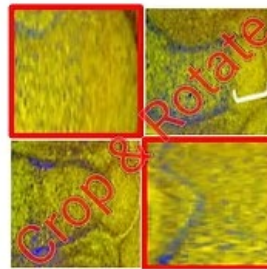
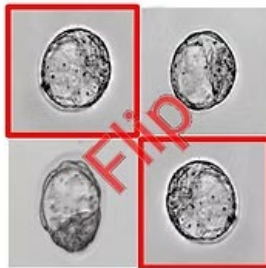
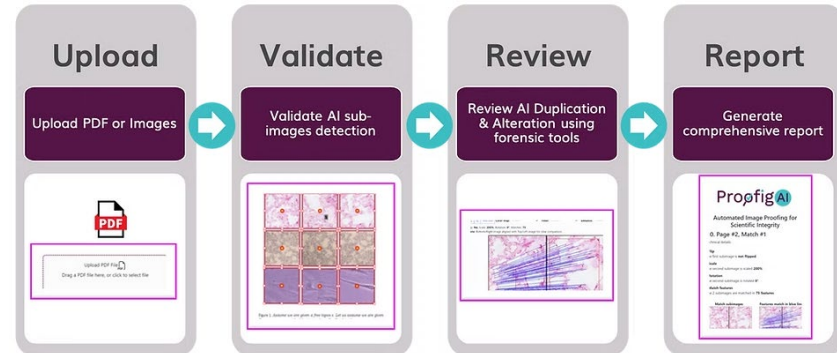
Proofig

- Plagiarism detection
 - Image manipulation detection
 - AI generated image detection
-
- Compares images within a publication
 - Compares against PubMed
 - Forensic tools within the application to analyze further





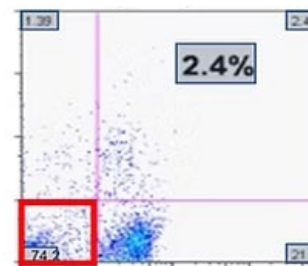
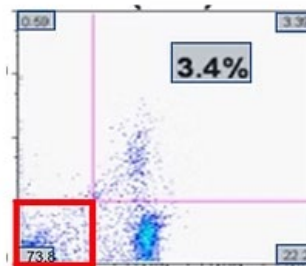
Proofig AI



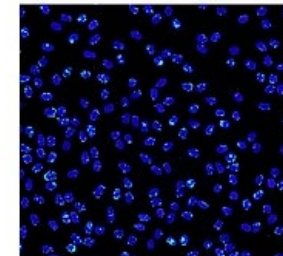
Spliced Western blot image



Splice via Histogram Equalization



AI-Generated Image





AI tools to detect research misconduct

- AI applications are tools and not a determination of research misconduct
- AI cannot determine intentionally, knowingly, or recklessly
- AI detection tools can help assess allegations but should not replace forensic analysis by the RIO—**Supplement!**





AI tools to generate text fake data

- Already in use to generate text in publications
- Complex data and images will require more training
- Can make modifications to an image that may not be detectable

Institutional-level policies in development for acceptable use of AI programs





Questions?

UMB OAC

Research Integrity Office

620 W. Lexington St., 5th floor

Baltimore, MD 21201

Stephan Vignes, PhD

Research Integrity Officer

Director Research Integrity Office

svignes@umaryland.edu

Kaylin Adipietro, PhD

Research Integrity Specialist

kaylinadipietro@umaryland.edu

