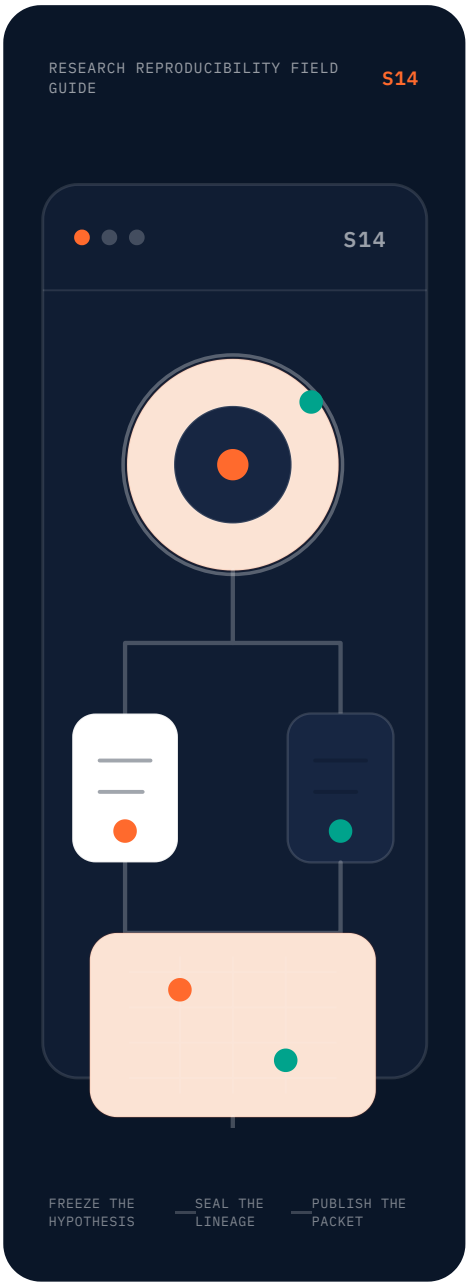
RESEARCH REPRODUCIBILITY FIELD GUIDE · S14

The research reproducibility field guide

One pre-registered figure, followed from hypothesis H3 and ethics record to raw samples, feature extractor, PI signature, DOI, and independent replay.

PRE-REGISTRATION · DATA LINEAGE · PI AUTHORITY · FIGURE REPLAY



Not a generic AI catalogue. One figure with its hypothesis, ethics boundary, data, code, environment, method, PI, DOI, and replay packet kept together.

S14

CONTENTS

The result, from hypothesis to replication

This field guide stays with figure 3 from pre-registration 2026-0184, hypothesis H3. The ethics record, 14,820 samples, feature extractor, environment, PI signature, DOI, and replication state remain connected.

PRIMARY READERS	READING DEPTH	DECISION THIS SUPPORTS
research reproducibility field guide domain, operations and assurance teams	Sector specialist	A research-specific working book for principal investigators, analysts, data stewards, ethics boards, research-integrity teams, funders, reviewers, and replicators.

HOW TO USE IT

Replace the illustrative study, ethics record, dataset, code, environment, PI, and DOI with one research-owned result. Keep the evidence shape, but do not treat this book as a statistical method, ethics approval, funder rule, or replication guarantee.

SOURCE DISCIPLINE

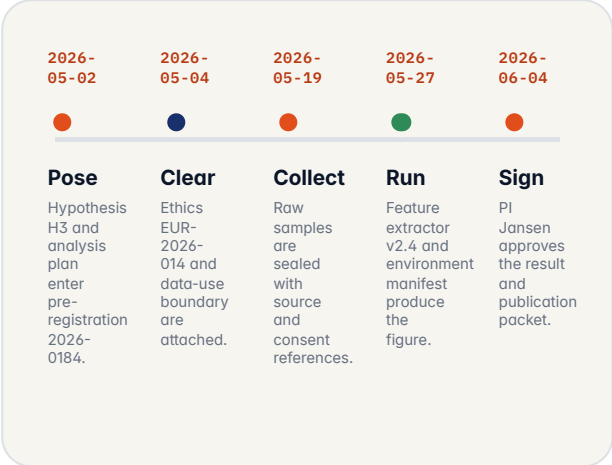
Dweve-specific facts are taken directly from the English website text audited 2026-07-20; web-navigation wording is humanised for print. Evaluation guidance is editorial, and scenarios and derived visuals are illustrative. Unsupported synthesis is replaced by canonical copy or omitted.

THE REVIEWER QUESTION

The figure is not the result a reviewer is asking for

A paper shows the conclusion. A reproducible research record shows the hypothesis, data rights, processing, method, environment, deviation, author authority, and route to rerun it.

The illustrative question is: how was figure 3 produced? Pre-registration 2026-0184 records hypothesis H3, 14,820 samples were collected under ethics approval EUR-2026-014, feature extractor v2.4 was applied, and PI Jansen signed the figure on 2026-06-04. The important record is not the numbers alone. It is the relation between the research question, permitted data, code, environment, method, result, and sign-off.



The scientific conclusion comes after the commitments that make it interpretable.

One figure has several legitimate audiences

The analyst needs implementation and dependencies. The PI owns interpretation and scientific conclusion. The data steward and ethics board need purpose, consent, access, and disclosure. The reviewer needs method and deviation. The replicator needs a permitted packet and environment. A hash alone satisfies none of them.

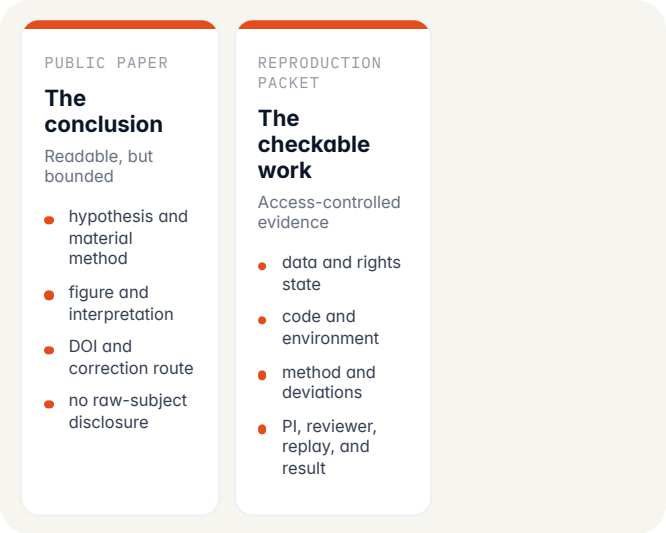
RESEARCH TEST

If the team must search notebooks, email, a registry, and a cluster to reconstruct figure 3, the paper has a citation trail but not a reproducible result record.

THE RESULT AND THE ACCESS BOUNDARY

Reproducibility is not unrestricted disclosure

A result can be reproducible for an authorised reviewer without making sensitive subjects, restricted data, or protected methods public.



A public result and a controlled reproduction packet can be related without being identical.

The research website description names GDPR, FAIR, Open Access, ethics, funder themes, and the EU AI Act as design considerations. The organisation still decides what data may be shared, with whom, under what consent and data-use agreement, for how long, and through which review route. FAIR does not mean “publish every row”.

Keep five questions separate

- What hypothesis and analysis plan did the researchers commit to before inspecting the result?
- Which source data, consent, ethics, licence, and access boundary applied?
- What code, method, environment, seed, and deviation transformed data into figure 3?
- Who had authority to interpret, challenge, sign, correct, or retract the result?
- What may a public reader, reviewer, replicator, or auditor actually rerun?

NO FALSE REPRODUCIBILITY

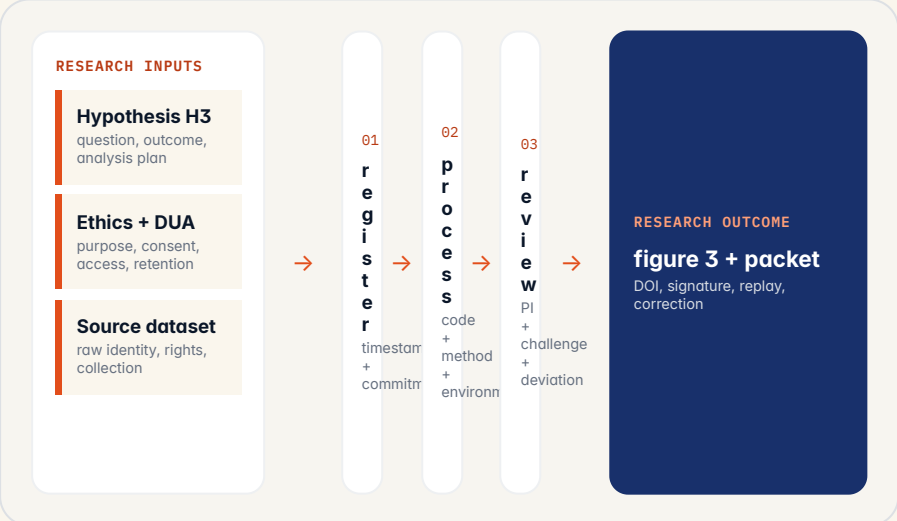
A bit-identical rerun can prove computational repeatability under a declared scope. It cannot prove the sample was unbiased, the hypothesis was sound, or the ethics were adequate.

01

PRE-REGISTRATION 2026-0184

Freeze the question before the result is visible

The worked study is specific because post-hoc reconstruction becomes vague when hypothesis, method, data, and interpretation are allowed to blur together.



The study has a question boundary, a data boundary, a computation boundary, and an interpretation boundary.

PRE-REGISTRATION, ETHICS, AND DATA RIGHTS

H3 has one commitment identity

The first research control is knowing which hypothesis, population, data purpose, ethics approval, and analysis plan the figure belongs to.

Pre-registration 2026-0184 and hypothesis H3 are illustrative identifiers in this edition. A live study should correlate registry, ethics, DMP, dataset, code, run, figure, paper, and DOI without copying sensitive subject identity into every analysis artefact.

Freeze what was permitted then

A current consent or data-use agreement is not automatically the agreement under which the original samples were collected. Retain the purpose, approval, version, population, access role, retention and deletion rule, correction route, and disclosure decision needed to distinguish a permitted historical analysis from a later request.

- study and run identity, hypothesis, preregistration timestamp, and planned outcome
- ethics approval, data-use agreement, consent or lawful basis, and purpose
- dataset identity, collection window, source, population, missingness, and rights
- analysis plan, permitted deviations, reviewer state, and publication boundary
- stable relation to registry, code, environment, figure, paper, and DOI

`study.identity` BOUND

Study

2026-0184 · hypothesis H3 · figure 3

`ethics.approval` PINNED

Ethics

EUR-2026-014 · approved purpose and population

`dataset.source` COMMITTED

Source

14,820 samples · source and DUA reference

`analysis.plan` DECLARED

Plan

Pre-registered outcome, method, and deviation rule

`publication.identity` RECONCILED

Publication

Figure 3, DOI, PI signature, correction route

SUBJECT BOUNDARY

A study packet should let an authorised reviewer verify lineage without making the packet itself a new source of identifiable subject data.

RAW, PROCESSED, FEATURE, RESULT

Lineage is more than a Git commit

The result is only as interpretable as the transformations between source data and figure remain visible, permitted, and replayable.

Each transformation needs identity, purpose, method, owner, and permitted downstream use.

Spindle can keep source atoms, dataset references, transformation lineage, rights, and quality state. Bindery can structure incoming documents or data packages. The research organisation still decides whether a source, derived feature, or result is fit for this hypothesis and what access it may have.

Lineage questions

- Can a reviewer retrieve the original data or a permitted substitute for each material feature?
- Which cleaning, exclusion, imputation, unit, and transformation rules changed the data?
- Are code, method, package, compiler, operating system, and hardware captured at the run?
- What happens when a source is corrected, withdrawn, reclassified, or deleted?
- Can the figure be reproduced without bypassing the ethics and data-use boundary?

THE IMPORTANT BOUNDARY

Data provenance identifies origin and transformation. It does not prove that the data is representative, ethical, or scientifically adequate.

CODE, ENVIRONMENT, AND DECLARED COMPUTE

The notebook is not the method contract

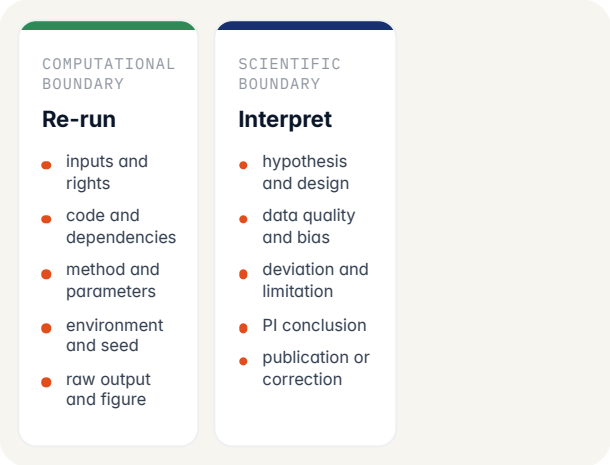
Existing Jupyter notebooks, R scripts, and Stata do-files can remain. The reproducibility boundary is the identity of the code, dependencies, runtime, inputs, parameters, and output.

The website describes a deterministic layer around notebooks, scripts, and lab information systems, with bit-identical replay, CPU-native execution, high-precision checking, and a signed packet. Those are claims to verify under the selected method and environment. A recorded notebook can still contain an untracked manual edit, data leakage, an invalid model, or a post-hoc choice.

Illustrative figure witness

```
study = 2026-0184 · hypothesis = H3
data = dataset://ethics-EUR-2026-014@14_820-samples
code = git://analysis/figure-3@commit-7d2a
feature_extractor = v2.4
method = survival_curve@registered-plan
environment = cpu + os + compiler + package-lock
seed = declared-or-not-applicable
deviation = none recorded / reviewer decision required
result = figure-3 + table-2
pi = Jansen · signature = 2026-06-04
```

The values are illustrative. The research team owns the method, environment, deviation, and interpretation.



A reproducible computation and a valid scientific conclusion answer different questions.

STOP CONDITION

If the environment, data rights, method version, or deviation state cannot be resolved, the packet must mark the figure non-reproducible or conditional. It must not quietly produce a clean-looking curve.

NOTEBOOKS, LIMS, REGISTRY, REPOSITORY, AND ARCHIVE

The lab estate stays authoritative

The decision layer wraps the research estate. It does not become a second data repository, ethics board, publication system, or scientific authority.

The integration is a set of access, authority, and evidence boundaries, not a replacement lab stack.

A first proof should sit beside one figure-producing workflow. The research organisation chooses registry, repository, cluster, identity, scheduler, archive, DOI, and reviewer surfaces. The proof records which data remains a reference, how restricted material is protected, how a rerun is isolated, how a correction changes the publication view, and how an external replicator receives only what is permitted.

Keep the run boundary explicit

- one stable study and run identity across registry, data, code, environment, result, and paper
- role and purpose checks before restricted data or code is read
- receipt that distinguishes submitted, running, failed, published, corrected, and unknown
- reconciliation between packet, figure, DOI, paper, reviewer, and replication state

INTEGRATION ACCEPTANCE

A packet is incomplete when it says the notebook ran. It is complete when the research team can say what data, code, environment, method, author, publication, and reviewer state resulted.

AUTHOR, REVIEWER, AND DATA-STEWARD AUTHORITY

The PI signature is an interpretation gate

A signed figure records responsibility. It does not delegate scientific interpretation to a runtime or convert a reviewer into an approver.

A PI gate has meaningful choices. A signature beside a finished figure is not governance.

What the PI or reviewer must inspect

- the hypothesis, registered outcome, data population, and material limitations
- the source, ethics, rights, cleaning, feature, method, and environment state
- the raw output, figure, statistical result, deviation, and uncertainty
- the intended audience, access boundary, DOI, correction, and retraction route
- the consequence of signing, amending, holding, restricting, or refusing

The action needs timestamp, identity, role, study, authority, reason, and relation to the run. “PI reviewed” is not enough. Distinguish signed, amended, returned for evidence, restricted, corrected, retracted, and refused.

02

REPRODUCTION PACKET

Make the result portable without breaking its access boundary

The packet is smaller than the lab estate and stronger than a figure export. It binds the permitted evidence needed to understand and rerun the selected result.

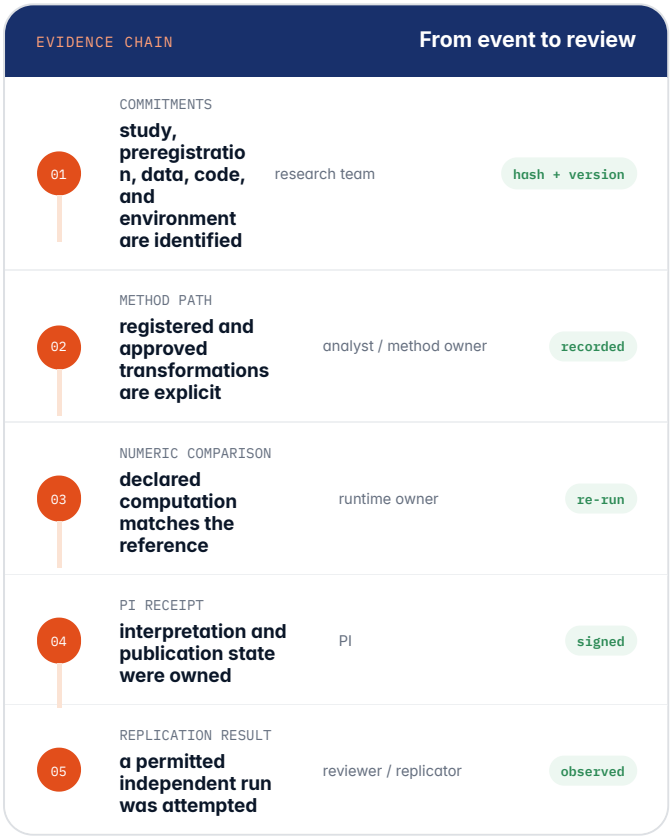
Each link answers a different research question. No signature makes an unpermitted dataset public.

INDEPENDENT REPLAY AND CORRECTION

A result certificate is not a scientific verdict

A reviewer or replicator may need to check figure 3 outside the environment that produced it, while the original data remains protected.

AION's portable decision-certificate concept can give figure 3 a proof surface that travels with the permitted reproduction packet. It can commit to the hypothesis, data and rights references, code and environment, method, result, PI action, and verifier material. It does not certify the hypothesis, sample quality, ethics, statistical validity, or publication conclusion. It makes the declared work checkable under the supported access model.



Independent checking separates computational evidence from the institution that produced it.

What the certificate does not do

- It does not make a biased sample representative.
- It does not replace ethics review, data governance, method review, or scientific judgement.
- It does not make restricted data shareable with an unauthorised replicator.
- It does not prove a public reader understood a conclusion merely because a DOI exists.

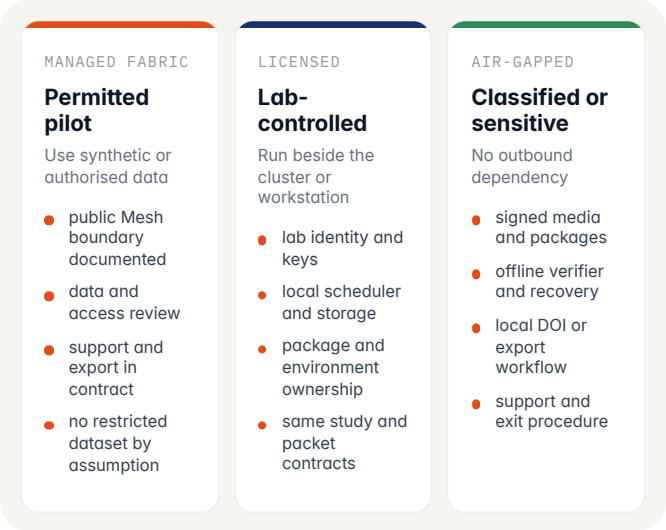
REPLICATOR QUESTION

Can an authorised reviewer rerun the permitted packet and report divergence without receiving permission to change the source dataset or publication record?

MANAGED, LICENSED, OR AIR-GAPPED

A lab cluster is part of the result boundary

The three operating postures can share study contracts and packet shape while carrying different data, scheduler, package, key, support, and recovery responsibilities.



A deployment posture is a hypothesis until the organisation observes its actual data, package, and recovery path.

The research website description describes managed Fabric on the public Mesh, licensed operation on lab hardware, and air-gapped operation for classified or sensitive-subject data. The proof should preserve one typed study contract while measuring actual scheduler, identity, package, data, key, publication, support, and restore conditions in each posture.

Posture-specific evidence

- Managed: processing boundary, access roles, data location, retention, incident path, export, and continuity.
- Licensed: cluster ownership, local keys, scheduler, packages, capacity, backup, restore, and patch responsibility.
- Air-gapped: signed media, offline dependencies, local verifier, private publication route, recovery, and no-egress test.

NO IDENTICAL-ACCESS CLAIM

If the same study is promised across postures, prove that the method, packet, access boundary, reviewer route, and correction behaviour remain intact. Do not assume identical research risk.

THE ACCEPTANCE CORPUS

Run the proof against research edges

A credible reproducibility proof includes clean reruns, source and rights changes, method deviations, failed and null results, restricted data, publication correction, and independent replication.

CORPUS SLICE	INCLUDE	EXPECTED OBSERVATION
Registered result	H3, approved data, feature extractor v2.4, clean run	figure, packet, and PI state close
Plan transition	registered method change or approved deviation	original and amended plan remain visible
Data defect	missing, corrected, withdrawn, or restricted source	hold or quarantine names the impact
Environment drift	package, compiler, OS, seed, or hardware change	divergence is measured and explained
Scientific challenge	reviewer questions method, bias, or interpretation	response and limitation remain linked
Publication path	DOI, funder report, Open Access, correction, retraction	public and private views reconcile
Replication	permitted external rerun on a second machine	same, divergent, or blocked result is explicit
Abuse	cross-study access, notebook injection, subject-data export	denied, correlated, and investigated

The corpus is part of the research decision. One clean notebook run is not acceptance.

Measure what a later reviewer can inspect

- hypothesis, ethics, data rights, lineage, and access state at the original run
- code, method, environment, seed, numeric comparison, and output identity
- PI, reviewer, deviation, limitation, publication, and correction alignment
- packet completeness, integrity check, retrieval time, and permitted replay
- restriction, incident, restore, deletion, and external replication outcome
- funder, journal, DOI, and Open Access evidence without duplicate reconstruction

Do not lead with a reproducibility percentage detached from data access, method, and environment. Record raw runs, expected links, failed assertions, blocked replications, corrections, and reviewer conclusions. A research organisation needs evidence a successor can inspect without bypassing the study's ethics boundary.

GO, NARROW, HOLD, OR STOP

The research organisation decides whether to publish

A proof ends with a recorded research decision, not with the last successful figure render.

The PI, analyst, data steward, ethics owner, research-integrity team, reviewer, funder, security owner, publication owner, and affected-participant representatives may each own a different production condition. They decide the study and population, data and access scope, method and environment, reviewer gate, public/private packet, DOI, correction, retention, deletion, support, and exit state.

RESEARCH PRODUCTION RECORD	Figure 3 reproducibility decision	
STUDY	**2026-0184 · hypothesis H3 · figure 3**	BOUNDED
DATA	**14,820 samples + ethics EUR-2026-014 + DUA**	SCOPED
METHOD	**Code + feature extractor + environment + deviation**	LINKED
AUTHORITY	**Analyst + PI + reviewer + data steward**	REVIEWED
PUBLICATION	**DOI, public view, restricted packet, correction**	OWNED
OPERATION	**Retention, deletion, restore, support, replication**	DATED
DECISION	**Go / narrow / hold / stop**	SIGNED

The signed record should remain understandable after the grant, paper, lab, and original reviewers have moved on.

The smallest credible next step

Run figure 3 and a deliberately chosen boundary set beside the existing registry, data store, Git, notebook, cluster, publication, and archive. Make the PI, analyst, data steward, ethics owner, security owner, reviewer, and publication owner inspect the same packet. If they cannot answer their different questions without reconstruction, narrow the proof until they can.

PRIMARY ACCEPTANCE CRITERION

The research organisation can identify the exact hypothesis, ethics and data state, lineage, code, environment, method, PI decision, public/private packet, DOI state, and permitted replay result for every selected figure.

That is a credible beginning. It is not permission to generalise one reproducibility proof to every method, dataset, lab, population, paper, funder, or ethics duty.

FIND A SUBJECT

Subject index

Page references point to the substantive explanation, worked example, control, boundary, or decision record, not merely to a passing label.

SUBJECT INDEX CONTINUED

Subject index · R–W

Terms are grouped alphabetically. Consecutive page references are collapsed into ranges.

CLOSING RECORD

Start with the figure you most dread reproducing

Choose one research workflow, name its scientific and data authorities, and make the answer retrievable before reviewer 2 asks for it.

Write the study and run identity, hypothesis and preregistration, ethics and DUA boundary, dataset and lineage, code and environment, method and deviation, PI and reviewer authority, figure and DOI, public/private packet, verifier, deployment posture, recovery, retention, deletion, export, and stop conditions.

Then choose the difficult test: a corrected dataset, withdrawn consent, restricted raw material, package drift, unregistered analysis, null result, reviewer challenge, DOI correction, retraction, external replication, or air-gapped restore. A field guide is useful when it makes the hard research state concrete enough to run.

STUDY

One bounded hypothesis, analysis, figure, or replication

Do not begin with the entire lab

SOURCE

Registry, ethics, data, code, method, environment, DOI

Each has a permitted state

AUTHORITY

PI, analyst, reviewer, data, ethics, and publication owners

Roles stay distinct

EVIDENCE

Lineage, output, signature, packet, and replay

Access matters

DECISION

Go, narrow, hold, or stop

Signed with correction and review triggers

THE RESEARCH STANDARD

A figure can be rendered again. A defensible result also shows the hypothesis, permitted data, lineage, code, environment, method, authority, publication state, access boundary, and replay evidence that existed when the researchers concluded.