Writing and Presenting Effective Technical Reports

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Technical reports in the workplace

Feasibility study

Progress report

Environmental impact report

Safety and compliance verification

Client-facing technical summary or white paper

Lab report

Reports provide documentation that outlives you: people will use your report without you in the room

Goals for today

Analyze your audience and purpose for writing

Choose a clear, logical structure using headings that tell the reader a story

Design effective figures and tables accompanied by informative captions

Understand how and why to cite references

Audience and purpose

Consider your audience before you begin and throughout the writing process

Reports often have multiple audiences and may be passed from one reader to another

Both inform and persuade. What do readers need to KNOW? What should they DO?

BLUF → Bottom Line Up Front

Define assumptions, constraints, and success criteria

Anatomy of a technical report

Title page

Abstract and/or executive summary

Introduction and background: problem + context

Methods/experimental setup/modeling approach

Results and analysis

Conclusions

Recommendations

References

Appendices

Executive summary contents and purpose

Executive summary is geared toward decision makers, not a technical audience

Provides a complete overview of the report

Longer than an abstract and contains recommendations—might be 10% of report length

Contains minimal jargon

Report structure tells a story

Each section answers a question:

Introduction – What is the problem and why does it matter?

Methods – What did you do to address it?

Results – What did you find?

Discussion / Conclusions – What does it mean?

Recommendations – What should we do?

Sections and subheadings

Use a consistent hierarchy—use the same numbering throughout; use emphasis (bold, underline) in a consistent and purposeful way

Make headings informative, not vague—good headings aid both comprehension and selective reading

Allow readers to skim only headings and still follow the story

Break long sections into logical chunks of 1–2 pages

Presenting your report

Lead with BLUF: begin with the decision or takeaway your audience needs

One main idea per slide

Use visuals when possible

Readable design: ≥24-pt body text, high contrast, generous margins, consistent styles

Plan for Q&A: backup slides (methods/data)

Presentation pitfalls

Walls of text or tiny figures/tables—start with way too big and scale down until it looks right

Reading slides verbatim

Using low-resolution images—test it on a projector

Inconsistent notation or units across slides

Overusing animations/transitions—don’t distract!

Overcrowding slides

Using figures and tables

Use figures for trends, patterns, and comparisons, or for images and schematics

Use tables when exact numerical values are needed

Do not duplicate the same information in both formats

For many variables, consider multiple simple visuals over one crowded one

Don’t do this to your reader

L. Zeng, S.B. Jacobsen, D.D. Sasselov, M.I. Petaev, A. Vanderburg, M. Lopez-Morales, J. Perez-Mercader, T.R. Mattsson, G. Li, M.Z. Heising, A.S. Bonomo, M. Damasso, T.A. Berger, H. Cao, A. Levi, & R.D. Wordsworth, Growth model interpretation of planet size distribution, Proc. Natl. Acad. Sci. U.S.A. 116 (20) 9723-9728, https://doi.org/10.1073/pnas.1812905116 (2019).

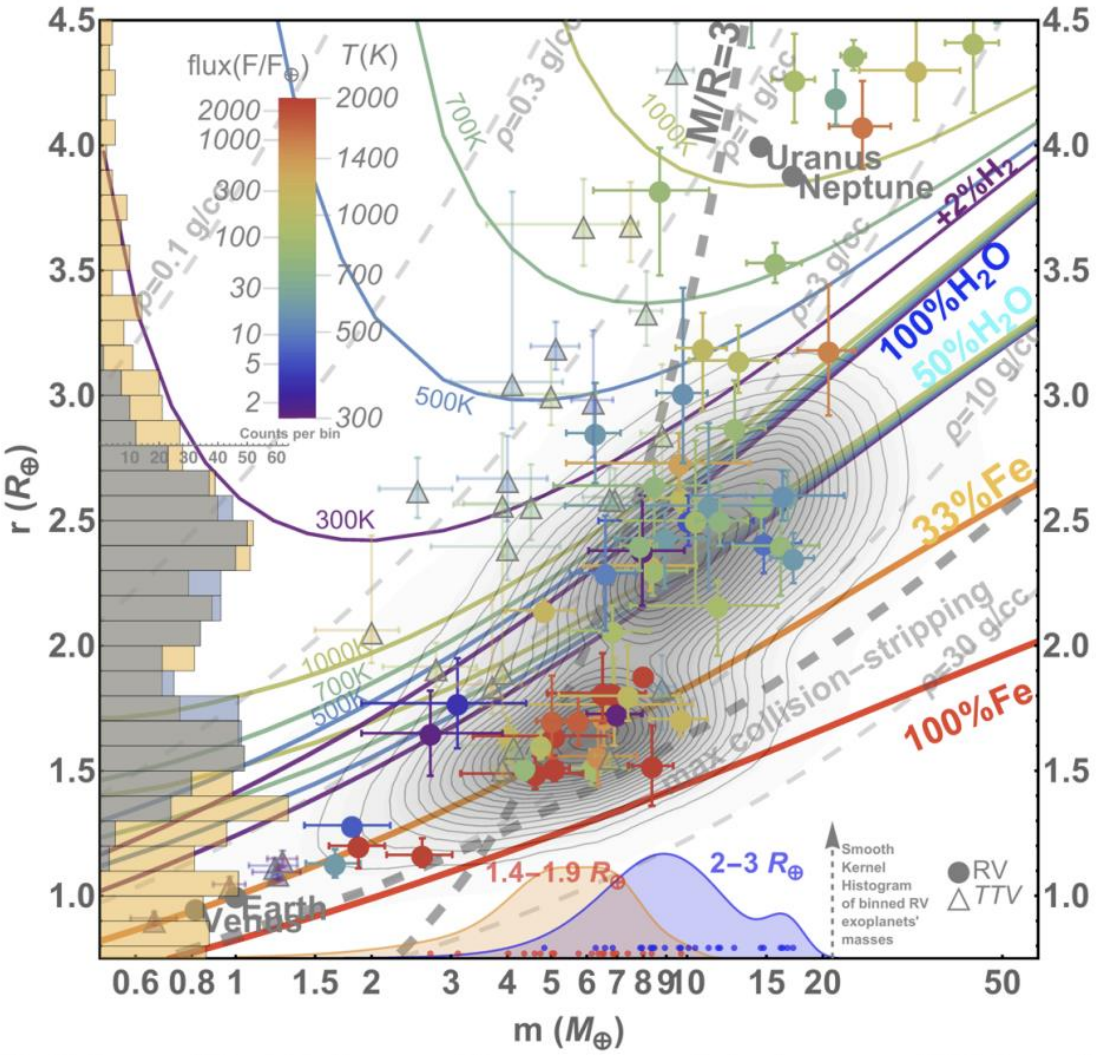


Fig. 2 Blowup of **Fig. 1**. Radius gap at 2 $R_\oplus$ separates two distinctive groups of RV planets (1.4-1.9 $R_\oplus$ and 2-3 $R_\oplus$). Their smooth kernel mass distributions on the bottom X-axis show a significant offset, with truncation of the super-Earths (yellow) and sub-Neptunes (purple) at ~10 $M_\oplus$ and ~20 $M_\oplus$, respectively. The histogram on the left Y-axis compares the results of Monte-Carlo simulation (light blue) with the observations (yellow). Two sets of H_2O M-R curves (blue - 100 mass% H_2O, cyan - 50 mass% H_2O; cores consist of rock and H_2O ice in 1:1 proportion by mass) are calculated for an isothermal fluid/steam envelope at 300K, 500 K, 700 K, 1000 K, sitting on top of ice VII-layer at the appropriate melting pressure. A set of mass-radius curves (upper portion of the diagram) is calculated for the same temperatures assuming the addition of an isothermal 2 mass % H_2-envelope to the top of the 50 mass% H_2O-rich cores.

Designing readable figures

- Assume print on letter size paper: figure should span at least one column width
- Final font size on axes/labels ≥ 10–12 pt
- Use sufficiently thick lines and large markers
- Remove non-essential decoration (3D effects, heavy gridlines)
- Check readability from the back of the room or on a laptop screen
- Use high resolution images

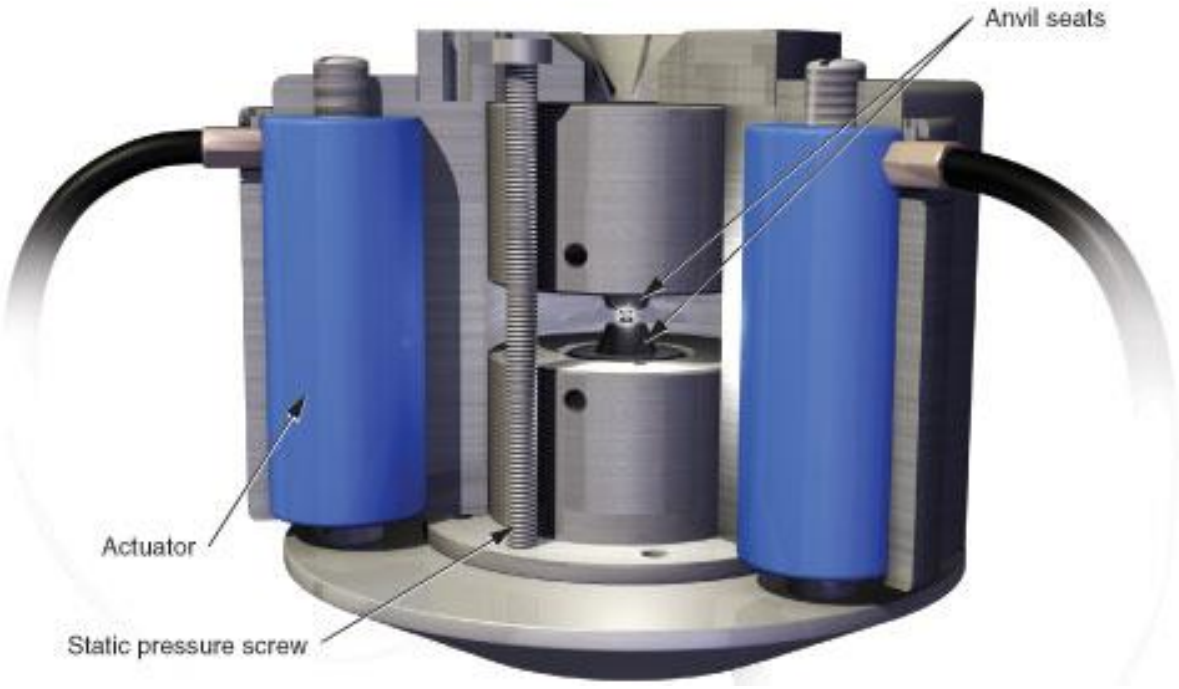
Making Figures Accessible

- Do not rely on color alone – use line styles, markers, and annotations
- Avoid problematic color pairs (especially red/green)
- Use high-contrast colors and backgrounds
- Label important curves or regions directly in the plot when possible
- Briefly describe the figure's message in the caption for all readers

Labeling figures and tables

- Number figures and tables separately in order of appearance: Figure 1, Figure 2, Table 1, Table 2
- Label axes and include units—labels should be big enough to read
- Include descriptive captions—above for tables, below for figures
- Explain symbols, line styles, and error bars in legend or caption
- Refer in text by number: “As shown in Figure 2…” (never “in the figure below”)

Problems with this figure?



Here's a better version

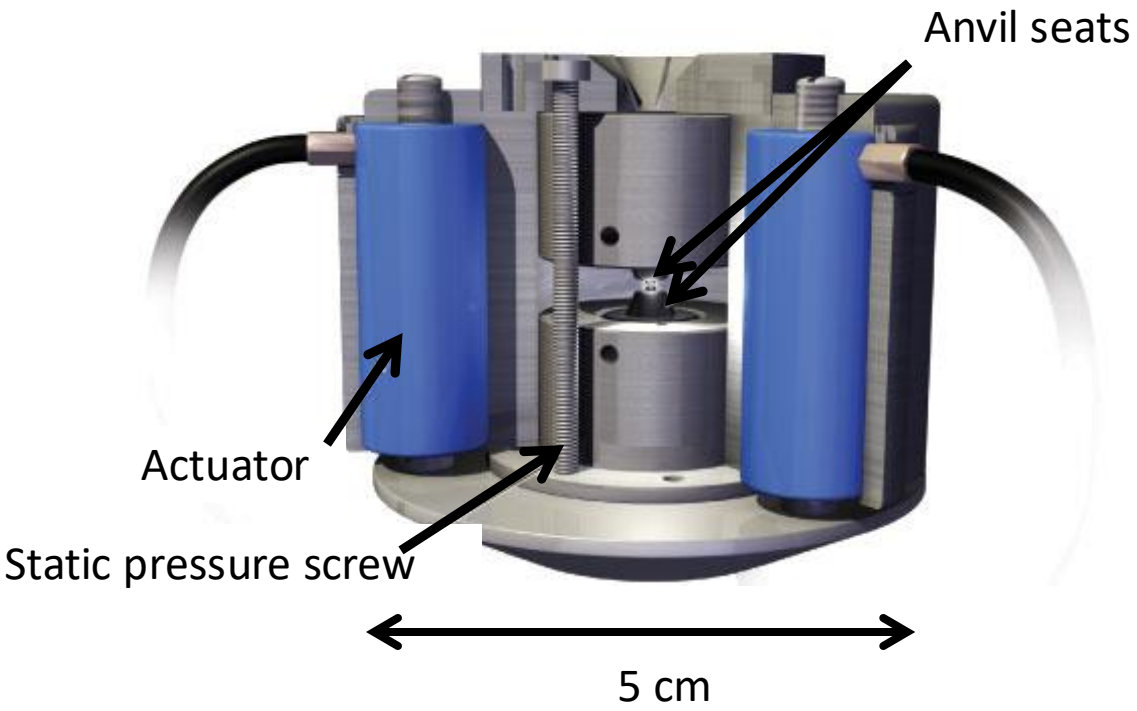


Figure 3. Drawing of a dynamic diamond-anvil cell (dDAC). As diamond anvils compress micrometer-size samples, the piezoelectric actuator varies the static pressure, allowing researchers to examine how compression rates affect materials' behavior. [Taken from Ref. 1]

1. Kristen Light, "Diamonds Put the Pressure on Materials," Science & Technology Review, June 2010, Lawrence Livermore National Laboratory. Published online at https://str.llnl.gov/June10/evans.html.

Writing Effective Captions

The caption is a mini-abstract for the figure or table

Start with a short title phrase, then add 1–3 sentences of explanation

State what is plotted, under what conditions, and what the main trend is

Note key details: sample ID, temperature, pressure, model parameters, etc.

Make multi-panel figures self-explanatory: describe panels (a), (b), (c)…

Identify parts of a figure by letters, not spatial descriptions

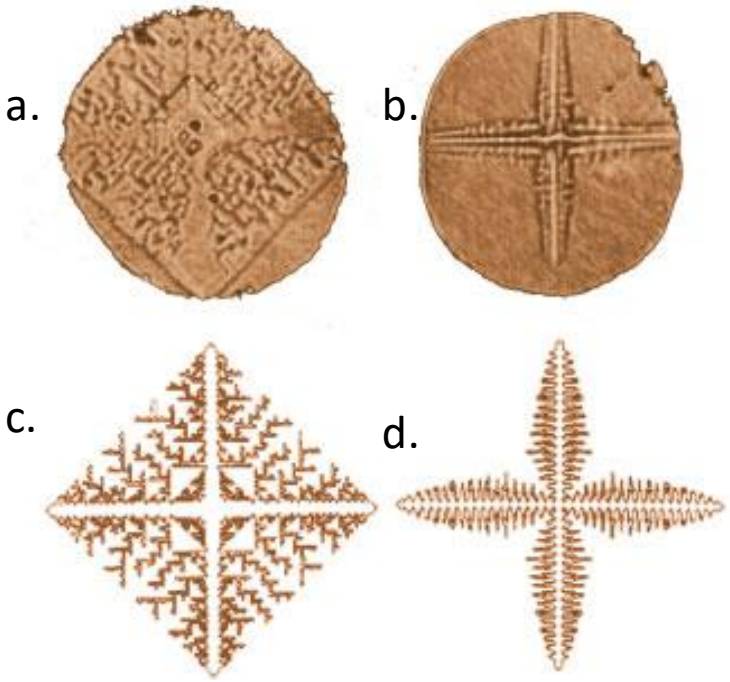


Figure 6. Microphotographic images of pressure-induced dendritic crystals (a, b) are remarkably similar to the patterns produced in computer simulations of temperature-driven dendritic crystal growth (c, d). [1]
(Courtesy Lawrence Livermore National Laboratory)

In-Text Citations and Reference Lists

Follow the required style (e.g., numeric [3] vs. author–year (Smith, 2023))

Be consistent

Place citations where the claim is made, usually before punctuation

Ensure every in-text citation has a full entry in the reference list

Check details: authors, title, journal, year, volume, pages, DOI

Why References Matter

Give credit for prior ideas, data, and methods—you must cite when you use someone else's work

Get credit for your own work—cite yourself

Position your work within a larger context while differentiating it from prior work

Help readers find additional sources

Avoid plagiarism and protect your professional reputation—plagiarism ends careers!

Tools for managing references

- Use a reference manager (Zotero, Mendeley, EndNote, BibTeX, etc.)
- Tag and organize references by project or topic
- Use journal or style-specific templates instead of manual formatting
- Store annotated PDFs so you remember why you cited something
- Back up your reference library across devices

Ethics, attribution and permissions

Cite papers, standards, datasets, and software with versions/DOIs

Reused figures/tables: verify license or obtain permission and credit clearly

Data integrity: disclose processing and never fabricate or selectively omit

Confidentiality: mark and handle appropriately

Checklist

- ✓ Headings are informative and logically ordered
- ✓ Every figure and table is numbered, labeled, and referenced in the text
- ✓ Every figure and table has a descriptive caption
- ✓ Axes and columns have units; fonts are large enough to read
- ✓ Reference list is complete, consistent, and free of formatting errors

Summary

Consider your audience's needs and expectations

Use purposeful sections and headings

Tell the story of your data through figures, tables, and captions

Connect your work to the broader field and add to your credibility using ample references

Aim for reports that are usable without you in the room